Scientific and Technical Aerospace Reports

STAR

Volume 38
March 24, 2000

National Aeronautics and
Space Administration
Langley Research Center

**Scientific and Technical
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- Translations in report form;
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses.

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

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

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references.

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Subject Divisions

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

Indexes

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

Subject Term Index

Personal Author Index

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Select a category to view the collection of records cited.

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 3

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 18

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 22

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 24

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*.

07 Aircraft Propulsion and Power 29

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 31

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) 34

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).*

Subject Categories of the Division B. Astronautics

Select a category to view the collection of records cited.

12 Astronautics (General) 35

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 36

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

15 Launch Vehicles and Launch Operations 36

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 37

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 42

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 43

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 47

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 50

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*.

C. Chemistry and Materials

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited.

23 Chemistry and Materials (General) 54

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 56

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

25 Inorganic, Organic, and Physical Chemistry 58

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

26 Metals and Metallic Materials 63

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

27 Nonmetallic Materials 66

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

28 Propellants and Fuels 72

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

29 Space Processing 75

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

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited.

31 Engineering (General) 77

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 78

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 89

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

34 Fluid Mechanics and Thermodynamics 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 100

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 106

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 107

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 108

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

39 Structural Mechanics 111

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

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited.

42 Geosciences (General) 115

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 117

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 121

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 122

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

46 Geophysics 134

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 147

Includes weather observation forecasting and modification.

48 Oceanography 154

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

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited.

51 Life Sciences (General) 157

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 161

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*.

53 Behavioral Sciences 170

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

54 Man/System Technology and Life Support 174

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

Select a category to view the collection of records cited.

59 Mathematical and Computer Sciences (General) 179

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

61 Computer Programming and Software 180

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 185

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 187

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 190

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

65 Statistics and Probability 190

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

66 Systems Analysis and Operations Research 191

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

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited.

70 Physics (General) 192

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 193

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 196

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

74 Optics 199

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

75 Plasma Physics 203

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

76 Solid-State Physics 207

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 210

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

Subject Categories of the Division I. Social and Information Sciences

Select a category to view the collection of records cited.

81 Administration and Management 210

Includes management planning and research.

82 Documentation and Information Science 212

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 217

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

Subject Categories of the Division J. Space Sciences

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89 Astronomy 218

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

90 Astrophysics 221

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

91 Lunar and Planetary Science and Exploration 224

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 228

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

93 Space Radiation 231

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

Subject Categories of the Division K. General

Select a category to view the collection of records cited.

99 General 234

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

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Typical Report Citation and Abstract

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

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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VOLUME 38, MARCH 24, 2000

01
AERONAUTICS (GENERAL)

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

20000021221 NASA Glenn Research Center, Cleveland, OH USA
Unsteady Cascade Aerodynamic Response Using a Multiphysics Simulation Code
Lawrence, C., NASA Glenn Research Center, USA; Reddy, T. S. R., Toledo Univ., USA; Spyropoulos, E., ANSYS, Inc., USA; January 2000; 20p; In English
Contract(s)/Grant(s): RTOP 509-10-11
Report No.(s): NASA/TM-2000-209635; NAS 1.15:209635; E-11964; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The multiphysics code Spectrum(TM) is applied to calculate the unsteady aerodynamic pressures of oscillating cascade of airfoils representing a blade row of a turbomachinery component. Multiphysics simulation is based on a single computational framework for the modeling of multiple interacting physical phenomena, in the present case being between fluids and structures. Interaction constraints are enforced in a fully coupled manner using the augmented-Lagrangian method. The arbitrary Lagrangian-Eulerian method is utilized to account for deformable fluid domains resulting from blade motions. Unsteady pressures are calculated for a cascade designated as the tenth standard, and undergoing plunging and pitching oscillations. The predicted unsteady pressures are compared with those obtained from an unsteady Euler co-de refer-red in the literature. The Spectrum(TM) code predictions showed good correlation for the cases considered.
Author
Unsteady Aerodynamics; Computer Programs; Aerodynamic Characteristics; Airfoils; Computerized Simulation

20000021481 NASA Langley Research Center, Hampton, VA USA
Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 408
October 1999; 86p; In English
Report No.(s): NASA/SP-1999-7037/SUPPL408; NAS 1.21:7038/SUPPL408; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, a Continuing Bibliography with Indexes (NASA/SP#1999-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section. Two indexes#subject and author are included after the abstract section.
NASA
Aeronautical Engineering; Bibliographies; Aerodynamics; Indexes (Documentation)

20000024798 NASA, Washington, DC USA

Aeronautics. An Educator's Guide with Activities in Science, Mathematics, and Technology Education: What Pilot, Astronaut, or Aeronautical Engineer didn't Start out with a Toy Glider?

Biggs, Pat, Editor, NASA, USA; Huetter, Ted, Editor, NASA, USA; September 1998; 128p; In English

Report No.(s): NASA/EG-1998-09-105-HQ; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Welcome to the exciting world of aeronautics. The term aeronautics originated in France, and was derived from the Greek words for "air" and "to sail." It is the study of flight and the operation of aircraft. This educator guide explains basic aeronautical concepts, provides a background in the history of aviation, and sets them within the context of the flight environment (atmosphere, airports, and navigation). The activities in this guide are designed to be uncomplicated and fun. They have been developed by NASA Aerospace Education Services Program specialists, who have successfully used them in countless workshops and student programs around the USA. The activities encourage students to explore the nature of flight, and experience some real-life applications of mathematics, science, and technology. The subject of flight has a wonderful power to inspire learning.

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20000024885 NASA Langley Research Center, Hampton, VA USA

Aeronautical Engineering: A Continuing Bibliography, Supplement 405

July 1999; 112p; In English

Report No.(s): NASA/SP-1999-7037/Suppl405; NAS 1.21:7037/Suppl405; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report lists reports, articles and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

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20000024886 NASA Langley Research Center, Hampton, VA USA

Aeronautical Engineering: A Continuing Bibliography With Indexes, Supplement 407

September 1999; 82p; In English

Report No.(s): NASA/SP-1999-7037/SUPPL407; NAS 1.21:7037/SUPPL407; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-1999-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract. The NASA CASI price code table, addresses of organizations, and document availability information are included before the abstract section. Two indexes-subject and author are included after the abstract section.

Author

Aeronautical Engineering; Bibliographies; Aerodynamics; Indexes (Documentation)

20000024887 NASA Langley Research Center, Hampton, VA USA

Aeronautical Engineering: A Continuing Bibliography with Indexes, Supplement 410, Supplement 410

December 1999; 110p; In English

Report No.(s): NASA/SP-1999-7037/SUPPL410; NAS 1.21:7037/SUPPL410; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP-1999-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics,

aeronautics, and ground support equipment for aeronautical vehicles. Each entry in the publication consists of a standard bibliographic citation accompanied, in most cases, by an abstract.
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20000025460 NCI Information Systems, Inc., Hanover, MD USA
Building on the Shoulders of Giants: Volume 1
March 2000; In English; 6 CD-ROMs; System requirements: Windows 95/98/NT; minimum 64 MB; installation on hard drive requires 3 GB
Contract(s)/Grant(s): NAS1-96010; No Copyright; Avail: CASI; E05, CD-ROM; The database may be accessed locally from the 6 CD-ROM set, or a 5-user license agreement is available from CASI for LAN access.

Many of the achievements in aerospace science and engineering are based on discoveries made during the years just before, during, and somewhat after the two world wars. From the early discoveries in aerodynamics to the first moments of the space race incited by the Russian satellite Sputnik, the National Advisory Council on Aeronautics (NACA), NASA's forebear, shepherded the advancement of critical technologies in airplane and rocket design. Now anyone can relive those groundbreaking days, and learn from the people who launched mankind into powered flight. Rare photographs, video clips from documentary footage, and practical documents, some of which have never been widely available, let the users pilot their way into a dynamic sphere of human experience, adventure, and aviation achievement. The database leads to selected full text documents, citations, and multimedia clips all with the ease and versatility of the Alchemy search engine. This product will appeal to the aviation enthusiast, engineering student, and aviation engineer--anyone who wants the advantage of a wide range of information topics, such as performance and testing, mechanical engineering, and aircraft design, all on a handy, locally controlled CD-ROM. Whether the goal is building a model, checking the specifications on a drawing, reliving old glory, or looking for inspiration for an innovation, Building on the Shoulders of Giants makes discovering the value of NACA's science and engineering advancements easier than ever.
CASI
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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.

20000021080 NASA Langley Research Center, Hampton, VA USA
1999 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 2, High Lift
Hahne, David E., Editor, NASA Langley Research Center, USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; 488p; In English; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop, 8-12 Feb. 1999, Anaheim, CA, USA; See also 20000021081 through 20000021088
Contract(s)/Grant(s): RTOP 537-07-51-10
Report No.(s): NASA/CP-1999-209704/VOL2/PT2; L-17911D; NAS 1.55:209704/VOL2/PT2; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

NASA's High-Speed Research Program sponsored the 1999 Aerodynamic Performance Technical Review on February 8-12, 1999 in Anaheim, California. The review was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in the areas of Configuration Aerodynamics (transonic and supersonic cruise drag prediction and minimization), High Lift, and Flight Controls. The review objectives were to (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among die scientists and engineers working on HSCT aerodynamics. In particular, single and midpoint optimized HSCT configurations, HSCT high-lift system performance predictions, and HSCT simulation results were presented, along with executive summaries for all the Aerodynamic Performance technology areas. The HSR Aerodynamic Performance Technical Review was held simultaneously with the annual review of the following airframe technology areas: Materials and Structures, Environmental Impact, Flight Deck, and Technology Integration. Thus, a fourth

objective of the Review was to promote synergy between the Aerodynamic Performance technology area and the other technology areas of the HSR Program. This Volume 2/Part 2 publication covers the tools and methods development session.
Author
Supersonic Transports; Computational Fluid Dynamics; Aircraft Design; Wind Tunnel Tests; Aerodynamic Configurations

20000021081 Boeing Co., Long Beach, CA USA
Numerical Analysis of a 5% HSCT TCA Model in the NASA Ames 12-ft Pressure Tunnel
Woan, Chung-Jin, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 551-646; In English; See also 20000021080; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

The presentation of this paper starts with a statement of objectives followed by the definitions of problems, gridding strategy, enhancements of CFL3D/MAGGIE, Baldwin-Lomax/Degani-Schiff turbulence model, and results. A few concluding remarks and recommendations will be made at the end of the presentation. The overall objective of this task is to develop an integrated wind-tunnel/free-air-CFD process to speed up CFD turnaround time in HSCT high-lift configuration development. The specific objective of this paper is to investigate the effects of the NASA/Ames 12-ft wind tunnel wall and model supports on the model aerodynamic characteristics using CFD, to evaluate the CFD results by comparison with experimental data, and to share our experience in obtaining the Navier-Stokes solutions of the wind tunnel flow simulations for the 5% TCA model. MAGGIE has been greatly enhanced in speed and capability for handling complex geometries. NASA/Ames FOMOCO has been coupled (externally) with CFL3D/MAGGIE for force and moment integration for configurations with overlapping surface grids. CFL3D has been enhanced with FORTRAN 90 run-time memory allocation capability, allowing one executable for all the problems and eliminating the need of user's effort to compile and recompile programs for problems of varying memory sizes. This can increases user's productivity in an application environment. Navier-Stokes solutions for the 5% TCA model in the NASA/Ames 12-ft pressure tunnel have been presented and compared with the free-air CFD solution and test data in terms of C(sub P), C(sub L), C(sub D), and C(sub M). Numerical results indicated that based on the CFL3D default implementation of the Baldwin-Lomax/Degani-Schiff model, the turbulence length scale was computed as the distance from the solid wall to the core of the primary vortex, resulting reduced vortex suction peak. Using reduced cutoff of searching distance, the CFD solutions were greatly improved in the regions of both leading and trailing edge flaps. It is numerically difficult to implement the Degani-Schiff modification in the region where off-body vortex flow exists and or flow is separated. In general, the CFD calculated surface pressures, lift and drag coefficients are compared very favorably with the wind-tunnel test data. CFD calculated vortex strength and location agree well with the experiment. However, the CFD calculated attack of attack of the LE vortex flow separation is smaller than that of the experiment. In general, the CFD calculated surface pressures, lift and drag coefficients are compared very favorably with the wind-tunnel test data. The CFD calculated post effects on the lower wing surface pressures agree well with the test data.
Derived from text
Supersonic Transports; Wind Tunnel Tests; Wind Tunnel Models; Applications Programs (Computers); Computational Fluid Dynamics; Baldwin-Lomax Turbulence Model; Aerodynamic Configurations

20000021082 Boeing Co., Long Beach, CA USA
CFD Assessment of TCA High-Lift Configurations
Yeh, David T., Boeing Co., USA; Clark, Roger W., Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 647-726; In English; See also 20000021080; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

This report starts with the description of the objective for the HSCT high-lift CFD analysis, and the focus of current study, followed by the numerical approach. Numerical results will be presented on the effects of the wing planforms, inboard LE flap extent and the forebody chine effects at high-lift conditions. For the Wing/Body/Canard configurations, the influence of the canard on the high-lift configuration will be discussed. Code validation will be presented through the direct correlation with available tunnel test data. This report concludes with a summary and a description of the on- going high-lift CFD effort. The objective of the high-lift CFD analysis is to provide the numerical tools for the design and optimization of the high-lift system including wind-tunnel support and the evaluation of the aerodynamic performance as the configuration evolves. to accomplish this objective, it is necessary to develop and enhance the numerical modeling capability for the high-lift devices such as various types of LE & TE flaps and forebody control surfaces. It is also necessary to assess the numerical capability to accurately model the flow phenomena under the high-lift conditions, near design as well as off-design conditions. The numerical solutions are also utilized to provide a better physical understanding of the flow physics. In summary, the numerical modeling capability for the high-lift devices including multiple LE and TE flap surfaces and the forebody control surfaces has been demonstrated. The

numerical results have shown the ability to capture the effects of planforms, inboard LE flaps and canard influence on the high-lift configurations. The pre-test analysis of ground roll inlet ingestion of the canard tip vortex was verified in the TCA-4 wind tunnel test. An alternative high-mount canard has been studied to move the canard vortex above the wing at alpha = 0. Additional study of the numerical issues is needed in the off-design conditions in order to accurately capture the viscous phenomena associated with flow separation, reattachment as well as vortex formation, convection and their interactions with the wing. The numerical results are summarized as follows: Full span LE flaps have been shown to promote attached flow as compared to the part-span LE flaps resulting in a better lift-to-drag ratio and more favorable pitch characteristics. In terms of the flow features for the different planforms, the numerical solutions have shown similar forebody and inboard wing flow patterns for the TCA-4 tested planforms. One of the noticeable distinctions is the appearance of the outboard LE flap vortex on the baseline TCA near the design condition (CL = .5) while attached flow is observed in the outboard region for W2 and W3 wings. The forebody chine is predicted to have little influence on the lift and drag forces, but it creates a slightly higher nose-up pitching moment. The effect of the TCA-4 canard is seen to create a downwash in the inboard region near the wing apex. The upwash influence associated with canard tip vortex appears to be insignificant. As a result, the influence of the planform change on the canard effect is expected to be small due to the local changes on the apex vortex that alters the downstream flow field primarily in the inboard region. The simulated canard tip vortex that enters the inlets at alpha = 0 has been verified experimentally in the TCA-4 test. The TCA-5 high-mount canard tip vortex is predicted to pass above the wing at alpha = 0.
Derived from text
Aerodynamic Characteristics; Canard Configurations; Computational Fluid Dynamics; Flaps (Control Surfaces); Forebodies; Supersonic Transports; Wind Tunnel Tests; Body-Wing Configurations

20000021083 Boeing Commercial Airplane Co., Seattle, WA USA
A Comparison of CFL3D and TLNS CFD Results on TCA and Ref-H High Lift Configurations
Siebersma, Tim, Boeing Commercial Airplane Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 727-802; In English; See also 20000021080; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

This report begins with a list of the objectives for this study. Next, numerical results are presented for a TCA 2.8-38 high lift configuration. These include CFL3D results with two different grids, as well as comparisons between CFL3D, TLNS and wind tunnel data. Ref-H numerical results are then presented. These include both a flaps up CFL3D comparison with NTF wind tunnel data, and a leading edge flap span effect comparison between CFL3D, TLNS and 14x22 wind tunnel data. The report ends with a list of conclusions and recommendations. This study has shown that with the Boeing Phantom Works gridding tools, even an inexperienced CFD user can now successfully run 3D Navier-Stokes on a high lift HSCT configuration. These gridding tools simplify the creation of the flaps down grid, and significantly reduce the cycle time required for the numerical analysis. Running on several configurations has also created an opportunity to make the tools more general and more robust. This study has also shown that the grid topology on the forebody of an HSCT configuration can affect the flow field over the body. This should not significantly influence the results of wing or flap studies, but may become important when looking at canard, chin fin, or other forebody studies. It remains to be verified which of the two body flow fields seen in these results is more realistic. On the TCA 2.8-38 configuration, the CFD results have shown that CFL3D consistently shows better agreement with the wind tunnel force data than does TLNS. While both codes successfully capture the main flow features, several differences can be seen in the details of the flow field. Various aspects of each code's results are supported by the test data, and further comparison and analysis is warranted. On the Ref-H configuration, CFL3D was shown to have better agreement with the test data in terms of the effect of leading edge flap span on lift and drag at the operating condition. Both CFL3D and 14x22 test data showed a negligible effect for changing the flap span, while TLNS showed a significant increase in drag for the part-span flaps relative to the full-span flaps. At angles of attack significantly higher than that for the operating condition, CFL3D did not converge well, especially with the part-span leading edge. Previous results with TLNS have shown good convergence and good results at these higher angles of attack. This study has also left many questions unanswered and has shown a need for more comparisons between CFD results and test data. The upcoming CFD wind tunnel test in the Ames 7x10 tunnel and the upcoming TCA-5 test in the Ames 12' tunnel should provide a wealth of good data for further study of this kind. The CFD test will be using the Ref-H configuration, while TCA-5 will be using the TCA 2.8-38 configuration. Continued work in this area will pave the way for further optimization of high lift aerodynamic performance.
Derived from text
Aerodynamic Configurations; Computational Fluid Dynamics; Lift; Supersonic Transports; Wind Tunnel Tests; Applications Programs (Computers); Aircraft Configurations

20000021084 ASE Technologies, Inc., Cincinnati, OH USA

Comparison of CFD Solutions with Test Data for TCA High Lift Configurations

Fan, Xuetong, ASE Technologies, Inc., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 803-856; In English; See also 20000021080; No Copyright; Avail: CASI; A04, Hardcopy; A04, Microfiche

This report documents the comparison between CFL3D solutions and wind tunnel test data for TCA high lift wing/body and wing/body/nacelle configurations. Part 1 compares the lift and drag coefficients between CFL3D and test data with emphasis on the predicted measured lift and drag increments due to nacelles. Part 2 compares the pressure distribution on wing upper and lower surfaces between CFL3D and test data to show the strength and locations of leading edge (LE) vortices. Part 3 compares the change in pressure distribution from wing/body to wing/body/nacelle on wing upper surface. This comparison will reveal the effect of nacelles on the LE vortices.

Derived from text

Computational Fluid Dynamics; Body-Wing Configurations; Aerodynamic Coefficients; Wind Tunnel Tests; Pressure Distribution; Wing Nacelle Configurations

20000021085 Boeing Co., Long Beach, CA USA

Numerical Analysis of Lateral Control Characteristics of HSCT Forebody Control Surfaces

Yeh, David T., Boeing Co., USA; Clark, Roger W., Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 857-912; In English; See also 20000021080; No Copyright; Avail: CASI; A04, Hardcopy; A04, Microfiche

This report starts with the description of the objective and the focus of current study, followed by the approach. The numerical results will be presented for the chin fin lateral control effectiveness at various angle-of-attack and an alternative control concept using the high-mount canards with asymmetric elevator deflection. The numerical results for the chin fin study will be compared with TCA 4 test results for data correlation. The numerical results for the high-mount canards will be used to define some of the CFD runs in TCA-5 test. In summary, the numerical capability to model forebody control surfaces has been demonstrated for the chin fin and asymmetric canard deflections. Favorable comparisons of the trends for the side force and yawing moment are observed between the numerical prediction and the TCA-4 chin fin test results. The numerical results have shown that the chin fin provides the lateral control at alpha zero, but the effectiveness vanishes at alpha 10 degrees due to the counteracting vortex influence on the side of the forebody. On the other hand, the lateral control is enhanced at alpha= -10, which is equivalent to a top-mount control surface at alpha= 10, due to the favorable vortex interaction in the cross flow. The numerical solutions have also shown that the high-mount canard with asymmetric elevator deflections provides the lateral control effectiveness. Based on the simulated cases, it is observed that the lateral control would be enhanced when one side of the canard/elevator is unloaded. By unloading one side, the potential stalling phenomenon can be avoided which would provide a greater asymmetry in the canard region. The asymmetrical influence by the favorable vortex interaction in cross flow further enhances the lateral control authority.

Author

Lateral Control; Computational Fluid Dynamics; Canard Configurations; Supersonic Transports; Control Surfaces

20000021086 NASA Langley Research Center, Hampton, VA USA

High-Lift CFD Validation

Lessard, Wendy B., NASA Langley Research Center, USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 913-948; In English; See also 20000021080; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

It is not unusual when comparing CFD data to experimental data to find discrepancies between the results. Sometimes forces and moments compare well, while surface pressures do not, and vice versa. It is commonplace for the researcher to believe that the flow field has been accurately simulated when these types of measurements compare well. However, being able to routinely predict boundary layer transition and separated flows are not guaranteed. In fact accurate simulation of these types of flow physics has been a challenge to the CFD community. In order to improve Navier-Stokes predictions for complex vortical flow fields, more detailed information about the flow physics is necessary. Unfortunately, the many wind-tunnel tests performed in Langley's NTF and 14x22 facilities as well as in the Ames' 12 ft. Tunnel provided little information about the detailed flow physics, and no priority was given to obtaining any CFD measurements. Using the latest experimental techniques, this information can and should be obtained for present and future use.

Derived from text

Computational Fluid Dynamics; Navier-Stokes Equation; Applications Programs (Computers); Boundary Layer Transition; Flow Distribution

20000021087 Boeing Co., Long Beach, CA USA

Panel Method Analysis of Wind Tunnel Model Support Effects in the Langley 14x22-ft and Ames 12-ft Wind Tunnels

Polito, Ryan, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 949-992; In English; See also 20000021080; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper is separated into two sections. Section 1 is a continuation of an earlier paper presented at the 1997 HSR Workshop and centers around LaRC 442 Ref H U&I test conducted in November, 1996. Section 2 is an attempt to apply what was learned from the U&I test to the TCA configuration in the LaRC 14x22-ft and Ames 12-ft tunnels.

Derived from text

Panel Method (Fluid Dynamics); Wind Tunnel Tests; Aerodynamic Configurations; Support Interference

20000021088 Boeing Co., Long Beach, CA USA

Evaluation of the Linear Prediction of the Effects of Planform Variation and Flap Deflection

Clark, Roger, Boeing Co., USA; Polito, Ryan, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 2, pp. 993-1030; In English; See also 20000021080; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents a documentation of the capabilities of the linear performance prediction code, Aero2s/Aero3s, which is widely used to provide aerodynamic performance build up required for aircraft sizing studies. The code predictions are evaluated against the database obtained for the TCA 5% high-lift model tested in the Langley 14x22-foot Wind Tunnel in tests TCA 1 (LARC 449) and TCA 4 (LARC 473). These tests provide data for the baseline TCA configuration, as well as for two alternate planform configurations.The conclusions from this study are outlined here. While the code does a reasonable job of predicting the forces for predominantly attached flow, it becomes unreliable as the effects of viscous separation become larger. For the baseline TCA wing, W1, where there is significant flow separation on the outboard wing panel at the nominal design point, Aero2s significantly under-predicts the drag. On the other hand, for the higher aspect ratio wings, W2 and W3, the absolute levels of lift and drag are predicted reasonably well. This means that the performance increments resulting from the change in aspect ratio and outboard wing sweep are not well captured by the code. The use of Navier-Stokes methods can give a much more accurate indication of high-lift performance, but the complexity and computational cost of such methods does not yet permit extensive use in the preliminary design process.

Derived from text

Linear Prediction; Planforms; Aerodynamic Drag; Trailing Edge Flaps; Leading Edge Flaps; Aerodynamic Characteristics; Applications Programs (Computers); Computational Fluid Dynamics

20000021216 NASA Langley Research Center, Hampton, VA USA

Unstructured Grid Euler Method Assessment for Longitudinal and Lateral/Directional Aerodynamic Performance Analysis of the HSR Technology Concept Airplane at Supersonic Cruise Speed

Ghaffari, Farhad, NASA Langley Research Center, USA; December 1999; 44p; In English

Contract(s)/Grant(s): RTOP 537-07-22-24

Report No.(s): NASA/TP-1999-209543; L-17737; NAS 1.60:209543; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Unstructured grid Euler computations, performed at supersonic cruise speed, are presented for a High Speed Civil Transport (HSCT) configuration, designated as the Technology Concept Airplane (TCA) within the High Speed Research (HSR) Program. The numerical results are obtained for the complete TCA cruise configuration which includes the wing, fuselage, empennage, diverters, and flow through nacelles at M (sub infinity) = 2.4 for a range of angles-of-attack and sideslip. Although all the present computations are performed for the complete TCA configuration, appropriate assumptions derived from the fundamental supersonic aerodynamic principles have been made to extract aerodynamic predictions to complement the experimental data obtained from a 1.675%-scaled truncated (aft fuselage/empennage components removed) TCA model. The validity of the computational results, derived from the latter assumptions, are thoroughly addressed and discussed in detail. The computed surface and off-surface flow characteristics are analyzed and the pressure coefficient contours on the wing lower surface are shown to correlate reasonably well with the available pressure sensitive paint results, particularly, for the complex flow structures around the nacelles. The predicted longitudinal and lateral/directional performance characteristics for the truncated TCA configuration are shown to correlate very well with the corresponding wind-tunnel data across the examined range of angles-of-attack and sideslip. The complementary computational results for the longitudinal and lateral/directional performance characteristics for the complete TCA configuration are also presented along with the aerodynamic effects due to empennage components. Results are

also presented to assess the computational method performance, solution sensitivity to grid refinement, and solution convergence characteristics.
Author
Computational Fluid Dynamics; Supersonic Transports; Unstructured Grids (Mathematics); Euler Equations of Motion; Mathematical Models; Aerodynamic Characteristics; Wind Tunnel Tests

20000021219 Vigyan Research Associates, Inc., Hampton, VA USA
Low Speed Analysis of Mission Adaptive Flaps on a High Speed Civil Transport Configuration
Lessard, Victor R., Vigyan Research Associates, Inc., USA; December 1999; 82p; In English
Contract(s)/Grant(s): NAS1-19672; RTOP 537-07-22
Report No.(s): NASA/CR-1999-209524; NAS 1.26:209524; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Thin-layer Navier-Stokes analyses were done on a high speed civil transport configuration with mission adaptive leading-edge flaps. The flow conditions simulated were Mach = 0.22 and Reynolds number of 4.27 million for angles-of-attack ranging from 0 to 18 degrees. Two turbulence closure models were used. Analyses were done exclusively with the Baldwin-Lomax turbulence model at low angle-of-attack conditions. At high angles-of-attack where considerable flow separation and vortices occurred the Spalart-Allmaras turbulence model was also considered. The effects of flow transition were studied. Predicted aerodynamic forces, moment, and pressure are compared to experimental data obtained in the 14- by 22-Foot Subsonic Tunnel at NASA Langley. The forces and moments correlated well with experimental data in terms of trends. Drag and pitching moment were consistently underpredicted. Predicted surface pressures compared well with experiment at low angles-of-attack. Above 10 angle-of-attack the pressure comparisons were not as favorable. The two turbulent models affected the pressures on the flap considerably and neither produced correct results at the high angles-of-attack.
Author
Thin Films; Low Speed; Flapping; Turbulence Models; Pitching Moments; Mathematical Models; Leading Edge Flaps; Boundary Layer Separation; Baldwin-Lomax Turbulence Model

20000021448 NASA Langley Research Center, Hampton, VA USA
Dynamics of Active Separation Control at High Reynolds Numbers
Pack, LaTunia G., NASA Langley Research Center, USA; Seifert, Avi, National Academy of Sciences - National Research Council, USA; [2000]; 16p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0409; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of active flow control experiments were recently conducted at high Reynolds numbers on a generic separated configuration. The model simulates the upper surface of a 20% thick Glauert-Goldschmied type airfoil at zero angle of attack. The flow is fully turbulent since the tunnel sidewall boundary layer flows over the model. The main motivation for the experiments is to generate a comprehensive data base for validation of unsteady numerical simulation as a first step in the development of a CFD design tool, without which it would not be possible to effectively utilize the great potential of unsteady flow control. This paper focuses on the dynamics of several key features of the baseline as well as the controlled flow. It was found that the thickness of the upstream boundary layer has a negligible effect on the flow dynamics. It is speculated that separation is caused mainly by the highly convex surface while viscous effects are less important. The two-dimensional separated flow contains unsteady waves centered on a reduced frequency of 0.8, while in the three dimensional separated flow, frequencies around a reduced frequency of 0.3 and 1 are active. Several scenarios of resonant wave interaction take place at the separated shear-layer and in the pressure recovery region. The unstable reduced frequency bands for periodic excitation are centered on 1.5 and 5, but these reduced frequencies are based on the length of the baseline bubble that shortens due to the excitation. The conventional swept wing-scaling works well for the coherent wave features. Reproduction of these dynamic effects by a numerical simulation would provide benchmark validation.
Author
Active Control; High Reynolds Number; Computational Fluid Dynamics; Three Dimensional Flow; Two Dimensional Flow; Turbulent Flow

20000021524 NASA Langley Research Center, Hampton, VA USA
A Factorial Data Rate and Dwell Time Experiment in the National Transonic Facility
DeLoach, R., NASA Langley Research Center, USA; [2000]; 16p; In English; 38th; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0828; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is an introductory tutorial on the application of formal experiment design methods to wind tunnel testing, for the benefit of aeronautical engineers with little formal experiment design training. It also describes the results of a Study to determine whether increases in the sample rate and dwell time of the National Transonic Facility data system Would result in significant changes in force and moment data. Increases in sample rate from 10 samples per second to 50 samples per second were examined, as were changes in dwell time from one second per data point to two seconds. These changes were examined for a representative aircraft model in a range of tunnel operating conditions defined by angles of attack from 0 deg to 3.8 degrees, total pressure from 15.0 psi to 24.1 psi, and Mach numbers from 0.52 to 0.82. No statistically significant effect was associated with the change in sample rate. The change in dwell time from one second to two seconds affected axial force measurements, and to a lesser degree normal force measurements. This dwell effect comprises a ”rectification error” caused by incomplete cancellation of the positive and negative elements of certain low frequency dynamic components that are not rejected by the one-Hz low-pass filters of the data system. These low frequency effects may be due to tunnel circuit phenomena and other sources. The magnitude of the dwell effect depends on dynamic pressure, with angle of attack and Mach number influencing the strength of this dependence. An analysis is presented which suggests that the magnitude of the rectification error depends on the ratio of measurement dwell time to the period of the low-frequency dynamics, as well as the amplitude of the dynamics The essential conclusion of this analysis is that extending the dwell time (or, equivalently, replicating short-dwell data points) reduces the rectification error.
Author
Factorials; Data Integration; Dwell; Time Functions; Experimentation; Experiment Design; Dynamic Pressure; Aircraft Models

20000021525 NASA Langley Research Center, Hampton, VA USA
Unsteady Slat-Wake Characteristics of a High-Lift Configuration
Paschal, K., NASA Langley Research Center, USA; Jenkins, Luther, NASA Langley Research Center, USA; Yao, Cungsheng, NASA Langley Research Center, USA; [2000]; 10p; In English; 38th; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2000-0139; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Unsteady characteristics of the slat wake associated with a three-element high-lift model were investigated with Particle Image Velocimetry (PIV). The test was conducted in the NASA Langley Basic Aerodynamic Research Tunnel (BART) employing sidewall blowing to maintain 2-D flow over the high-lift configuration. The main goal of the experiment was to document spatial characteristics of the unsteady slat wake in an effort to further guide computational efforts. PIV measurements were made at 4, 8, and 10 degrees angle of attack. Instantaneous vector maps revealed organized structures that had been ejected from the slat cove merging with the slat wake. This phenomenon is attributed to the unsteadiness of the recirculation region in the slat cove. The unsteadiness is most pronounced at 4 degrees. Mean data show a wide, diffuse wake at 4 degrees that becomes both narrow and well defined at 10 degrees angle of attack. Second-order statistics suggest a similar trend. These statistics show higher levels of fluctuations due to slat cove unsteadiness and turbulence at 4 degrees, while the slat cove flow has apparently stabilized at the higher angles of attack.
Author
Wakes; Unsteady State; Turbulence; Two Dimensional Models

20000021526 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Parallel Unstructured Mesh Analysis of High-Lift Configurations
Mavriplis, D. J., Institute for Computer Applications in Science and Engineering, USA; 2000; 16p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0923; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Reynolds-averaged Navier-Stokes solver based on unstructured mesh techniques for analysis of high-lift configurations is described. The method makes use of an agglomeration multigrid solver for convergence acceleration. Implicit line-smoothing is employed to relieve the stiffness associated with highly stretched meshes. A GMRES technique is also implemented to speed convergence at the expense of additional memory usage. Tile solver is cache efficient and fully vectorizable, and is parallelized using a two-level hybrid MPI-OpenMP implementation suitable for shared and/or distributed memory architectures, as well as clusters of shared memory machines. Convergence and scalability results are illustrated for various high-lift cases.
Author
Aerodynamic Configurations; Architecture (Computers); Computational Grids; Unstructured Grids (Mathematics); Lift

20000021552 NASA Langley Research Center, Hampton, VA USA

Experimental and Numerical Optimization of a High-Lift System to Improve Low-Speed Performance, Stability, and Control of an Arrow-Wing Supersonic Transport

Hahne, David E., NASA Langley Research Center, USA; Glaab, Louis J., Lockheed Engineering and Sciences Co., USA; December 1999; 86p; In English

Contract(s)/Grant(s): RTOP 537-03-22-08

Report No.(s): NASA/TP-1999-209539; NAS 1.60-209539; L-17537; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An investigation was performed to evaluate leading-and trailing-edge flap deflections for optimal aerodynamic performance of a High-Speed Civil Transport concept during takeoff and approach-to-landing conditions. The configuration used for this study was designed by the Douglas Aircraft Company during the 1970's. A 0.1-scale model of this configuration was tested in the Langley 30- by 60-Foot Tunnel with both the original leading-edge flap system and a new leading-edge flap system, which was designed with modem computational flow analysis and optimization tools. Leading-and trailing-edge flap deflections were generated for the original and modified leading-edge flap systems with the computational flow analysis and optimization tools. Although wind tunnel data indicated improvements in aerodynamic performance for the analytically derived flap deflections for both leading-edge flap systems, perturbations of the analytically derived leading-edge flap deflections yielded significant additional improvements in aerodynamic performance. In addition to the aerodynamic performance optimization testing, stability and control data were also obtained. An evaluation of the crosswind landing capability of the aircraft configuration revealed that insufficient lateral control existed as a result of high levels of lateral stability. Deflection of the leading-and trailing-edge flaps improved the crosswind landing capability of the vehicle considerably; however, additional improvements are required.

Author

Numerical Analysis; Experimentation; Data Acquisition; Lift Devices; Leading Edge Flaps; Lateral Control; Lateral Stability; Analysis (Mathematics); Performance Tests

20000021556 NASA Langley Research Center, Hampton, VA USA

Sweep and Compressibility Effects on Active Separation Control at High Reynolds Numbers

Seifert, Avi, National Academy of Sciences - National Research Council, USA; Pack, LaTunia G., NASA Langley Research Center, USA; [2000]; 18p; In English; 38th; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-0410; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper explores the effects of compressibility, sweep and excitation location on active separation control at high Reynolds numbers. The model, which was tested in a cryogenic pressurized wind tunnel, simulates the upper surface of a 20% thick Glauert Goldschmied type airfoil at zero angle of attack. The flow is fully turbulent since the tunnel sidewall boundary layer flows over the model. Without control, the flow separates at the highly convex area and a large turbulent separation bubble is formed. Periodic excitation is applied to gradually eliminate the separation bubble. Two alternative blowing slot locations as well as the effect of compressibility, sweep and steady suction or blowing were studied. During the test the Reynolds numbers ranged from 2 to 40 million and Mach numbers ranged from 0.2 to 0.7. Sweep angles were 0 and 30 deg. It was found that excitation must be introduced slightly upstream of the separation region regardless of the sweep angle at low Mach number. Introduction of excitation upstream of the shock wave is more effective than at its foot. Compressibility reduces the ability of steady mass transfer and periodic excitation to control the separation bubble but excitation has an effect on the integral parameters, which is similar to that observed in low Mach numbers. The conventional swept flow scaling is valid for fully and even partially attached flow, but different scaling is required for the separated 3D flow. The effectiveness of the active control is not reduced by sweep. Detailed flow field dynamics are described in the accompanying paper.

Author

Airfoils; Boundary Layer Flow; Excitation; Flow Distribution; High Reynolds Number; Subsonic Speed; Sweep Angle; Turbulence; Compressibility

20000021569 NASA Langley Research Center, Hampton, VA USA

Low-Speed Aerodynamic Data for an 0.18-Scale Model of an F-16XL with Various Leading-Edge Modifications

Hahne, Daniel E., NASA Langley Research Center, USA; December 1999; 170p; In English

Contract(s)/Grant(s): RTOP 537-03-22-08

Report No.(s): NASA/TM-1999-209703; NAS 1.15:209703; L-17921; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Using the F-16XL as a test-bed, two strategies for improving the low-speed flying characteristics that had minimal impact on high-speed performance were evaluated. In addition to the basic F-16XL configuration several modifications to the baseline configuration were tested in the Langley 30- X 60-Foot Tunnel: 1) the notched area at the wing leading edge and fuselage juncture was removed resulting in a continuous 70 deg leading-edge sweep on the inboard portion of the wing; 2) an integral attached-flow leading-edge flap concept was added to the continuous leading edge; and 3) a deployable vortex flap concept was added to the continuous leading edge. The purpose of this report is simply to document the test configurations, test conditions, and data obtained in this investigation for future reference and analysis. No analysis is presented herein and the data only appear in tabulated format.
Author
Scale Models; Leading Edges; Data Bases

20000021572 Mississippi State Univ., Mississippi State, MS USA
ICEG2D: An Integrated Software Package for Automated Prediction of Flow Fields for Single-Element Airfoils with Ice Accretion *Final Report*
Thompson, David S., Mississippi State Univ., USA; Soni, Bharat K., Mississippi State Univ., USA; February 2000; 66p; In English
Contract(s)/Grant(s): NAG3-2235; RTOP 548-20-23
Report No.(s): NASA/CR-2000-209914; NAS 1.26:209914; E-12146; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An integrated software package, ICEG2D, was developed to automate computational fluid dynamics (CFD) simulations for single-element airfoils with ice accretion. ICEG2D is designed to automatically perform three primary functions: (1) generating a grid-ready, surface definition based on the geometrical characteristics of the iced airfoil surface, (2) generating a high-quality grid using the generated surface point distribution, and (3) generating the input and restart files needed to run the general purpose CFD solver NPARC. ICEG2D can be executed in batch mode using a script file or in an interactive mode by entering directives from a command line. This report summarizes activities completed in the first year of a three-year research and development program to address issues related to CFD simulations for aircraft components with ice accretion. Specifically, this document describes the technology employed in the software, the installation procedure, and a description of the operation of the software package. Validation of the geometry and grid generation modules of ICEG2D is also discussed.
Author
Applications Programs (Computers); Software Development Tools; Prediction Analysis Techniques; Aircraft Icing; Computational Fluid Dynamics; Computerized Simulation; Algorithms

20000021583 NASA Langley Research Center, Hampton, VA USA
Subsonic Investigation of Leading-Edge Flaps Designed for Vortex- and Attached-Flow on a High-Speed Civil Transport Configuration
Campbell, Bryan A., NASA Langley Research Center, USA; Kemmerly, Guy T., NASA Langley Research Center, USA; Kjerstad, Kevin J., NASA Langley Research Center, USA; Lessard, Victor R., Vigyan Research Associates, Inc., USA; December 1999; 108p; In English
Contract(s)/Grant(s): RTOP 537-03-22-02
Report No.(s): NASA/TM-1999-209701; NAS 1.15:209701; L-17919; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A wind tunnel investigation of two separate leading-edge flaps, designed for vortex and attached-flow, respectively, were conducted on a High Speed Civil Transport (HSCT) configuration in the Langley 14- by 22-Foot Subsonic Tunnel. Data were obtained over a Mach number range of 0.12 to 0.27, with corresponding chord Reynolds numbers of 2.50 x 10 (sup 6) to 5.50 x 10 (sup 6). Variations of the leading-edge flap deflection angle were tested with outboard leading-edge flaps deflected 0 deg. and 26.4 deg. Trailing-edge flaps were deflected 0 deg., 10 deg., 12.9 deg., and 20 deg. The longitudinal and lateral aerodynamic data are presented without analysis. A complete tabulated data listing is also presented herein. The data associated with each deflected leading-edge flap indicate L/D improvements over the undeflected configuration. These improvements may be instrumental in providing the necessary lift augmentation required by an actual HSCT during the climb-out and landing phases of the flight envelope. However, further tests will have to be done to assess their full potential.
Author
Subsonic Wind Tunnels; Leading Edge Flaps; Vortices; Supersonic Transports; Aerodynamic Configurations; Separated Flow

20000023168 NASA Ames Research Center, Moffett Field, CA USA

Aerodynamic Spring and Damping of Free-Pitching Tips on a Semispan Wing

Young, Larry A., NASA Ames Research Center, USA; Martin, Daniel M., Sterling Software, Inc., USA; [1992]; 19p; In English; Dynamics Specialist Conference, 16-17 Apr. 1992, Dallas, TX, USA; Sponsored by American Inst. of Aerodynamics and Astronautics, USA

Report No.(s): AIAA Paper 92-2111; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A test was conducted in the NASA Ames 7- by 10-Foot Wind Tunnel to derive aerodynamic spring and damping estimates for free-pitching tips on a semispan wing. The test model was a rectangular planform semispan wing with wing tips that had a single rigid-body pitch degree of freedom with respect to the inboard wing. A number of different tip planform geometries were tested, incorporating a range of quarter-chord sweep angles and taper ratios. The wing-tip dynamic response characteristics were measured at several wing angles of attack and tunnel dynamic pressures. The tip oscillations were initiated by releasing the tips from prescribed angles of attack. A new method to isolate Coulomb damping from aerodynamic damping from these tip-motion time histories is developed and applied. Correlations were performed between the experimentally derived wing-tip aerodynamic spring and damping values and predictions from a semiempirical analysis based on steady-state tip aerodynamic loads.

Author

Springs (Elastic); Damping; Wings; Wind Tunnel Tests; Pitch (Inclination)

20000023177 NASA Langley Research Center, Hampton, VA USA

Subsonic Investigation of a Leading-Edge Boundary Layer Control Suction System on a High-Speed Civil Transport Configuration

Campbell, Bryan A., NASA Langley Research Center, USA; Applin, Zachary T., NASA Langley Research Center, USA; Kemmerly, Guy T., NASA Langley Research Center, USA; Coe, Paul L., Jr., NASA Langley Research Center, USA; Owens, D. Bruce, NASA Langley Research Center, USA; Gile, Brenda E., NASA Langley Research Center, USA; Parikh, Pradip G., Boeing Co., USA; Smith, Don, Boeing Co., USA; December 1999; 134p; In English

Contract(s)/Grant(s): RTOP 537-03-22-02

Report No.(s): NASA/TM-1999-209700; L-17917; NAS 1.15:209700; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A wind tunnel investigation of a leading edge boundary layer control system was conducted on a High Speed Civil Transport (HSCT) configuration in the Langley 14- by 22-Foot Subsonic Tunnel. Data were obtained over a Mach number range of 0.08 to 0.27, with corresponding chord Reynolds numbers of 1.79 x 10(exp 6) to 5.76 x 10(exp 6). Variations in the amount of suction, as well as the size and location of the suction area, were tested with outboard leading edge flaps deflected 0 and 30 deg and trailing-edge flaps deflected 0 and 20 deg. The longitudinal and lateral aerodynamic data are presented without analysis. A complete tabulated data listing is also presented herein.

Author

Boundary Layer Control; Leading Edges; Wind Tunnel Tests; Flaps (Control Surfaces); Pressure Effects; Subsonic Speed; Supersonic Transports; Aerodynamic Configurations

20000023178 NASA Glenn Research Center, Cleveland, OH USA

An Experimental Study of Turbulent Skin Friction Reduction in Supersonic Flow Using a Microblowing Technique

Hwang, Danny P., NASA Glenn Research Center, USA; December 1999; 12p; In English; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 523-36-13

Report No.(s): NASA/TM-1999-209632; E-11959; AIAA Paper 2000-0545; NAS 1.15:209632; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new turbulent skin friction reduction technology, called the microblowing technique has been tested in supersonic flow (Mach number of 1.9) on specially designed porous plates with microholes. The skin friction was measured directly by a force balance and the boundary layer development was measured by a total pressure rake at the tailing edge of a test plate. The free stream Reynolds number was 1.0(10 exp 6) per meter. The turbulent skin friction coefficient ratios (C(sub f)/C(sub f0)) of seven porous plates are given in this report. Test results showed that the microblowing technique could reduce the turbulent skin friction in supersonic flow (up to 90 percent below a solid flat plate value, which was even greater than in subsonic flow).

Author

Skin Friction; Friction Reduction; Turbulent Flow; Supersonic Flow; Porous Plates

20000024815 NASA Langley Research Center, Hampton, VA USA

1999 NASA High-Speed Research Program Aerodynamic Performance Workshop, Volume 2, High Lift

Hahne, David E., Editor, NASA Langley Research Center, USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; 562p; In English; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop, 8-12 Feb. 1999, Anaheim, CA, USA; Sponsored by NASA, USA; See also 20000024816 through 20000024823

Contract(s)/Grant(s): RTOP 537-07-51-10

Report No.(s): NASA/CP-1999-209704/VOL2/PT1; L-17911C; NAS 1.55:209704/VOL2/PT1; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

The High-Speed Research Program sponsored the NASA High-Speed Research Program Aerodynamic Performance Review on February 8-12, 1999 in Anaheim, California. The review was designed to bring together NASA and industry High-Speed Civil Transport (HSCT) Aerodynamic Performance technology development participants in areas of: Configuration Aerodynamics (transonic and supersonic cruise drag prediction and minimization) and High-Lift. The review objectives were to: (1) report the progress and status of HSCT aerodynamic performance technology development; (2) disseminate this technology within the appropriate technical communities; and (3) promote synergy among the scientist and engineers working HSCT aerodynamics. The HSR AP Technical Review was held simultaneously with the annual review of the following airframe technology areas: Materials and Structures, Environmental Impact, Flight Deck, and Technology Integration Thus, a fourth objective of the Review was to promote synergy between the Aerodynamic Performance technology area and the other technology areas within the airframe element of the HSR Program. This Volume 2/Part 1 publication presents the High-Lift Configuration Development session.

Author

Civil Aviation; Supersonic Transports; Performance Prediction; Aerodynamic Configurations; Wind Tunnel Tests; Aerodynamic Stability

20000024816 NASA Ames Research Center, Moffett Field, CA USA

Data Corrections and Wind-Tunnel Data Comparisons of a 5% TCA Model in the NASA Ames 12-ft Pressure Tunnel

Zuniga, Fanny A., NASA Ames Research Center, USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 1-56; In English; See also 20000024815; No Copyright; Avail: CASI; A04, Hardcopy; A04, Microfiche

The objectives of this research are: 1) to determine the effect of geometric variations near the inboard leading-edge flap on high-lift and stability and control performance data; 2) to determine Re effects on TCA (Technology Concept Aircraft) high-lift configuration for optimum high-lift and stability and control performance at takeoff, climbout, approach and landing conditions; and 3) to obtain flow-visualization data on upper surface of wing for CFD validations. This paper is presented in viewgraph form.

CASI

Wind Tunnel Tests; Computational Fluid Dynamics; Aircraft Models; Data Processing; Aircraft Configurations

20000024817 Boeing Co., Phantom Works, Long Beach, CA USA

Wind Tunnel Test of a 5% HSCT (TCA) Model in the NASA Ames 12-ft Pressure Tunnel

Edwards, Robin, Boeing Co., USA; Clark, Roger, Boeing Co., USA; Yeh, David, Boeing Co., USA; Polito, Ryan, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 57-158; In English; See also 20000024815; No Copyright; Avail: CASI; A06, Hardcopy; A04, Microfiche

The objectives of this research are: 1) to determine the effect of geometric variations of the inboard leading edge flap on high lift, stability and control performance data; 2) to determine the Reynolds number effects on TCA (Technology Concept Aircraft) high lift configuration for optimum high-lift and stability and control performance at take-off, climbout, approach and landing conditions; and 3) Obtain flow visualization data on the upper surface of the wing for CFD validation and flow physics. This paper is presented in viewgraph form.

CASI

Wind Tunnel Tests; Aircraft Configurations; Civil Aviation; Computational Fluid Dynamics; Aircraft Models; Supersonic Transports

20000024818 Boeing Co., Phantom Works, Long Beach, CA USA

Wind Tunnel Test of a 5% HSCT (TCA) Model in the NASA Ames 12-ft Pressure Tunnel (Stability and Control Summary)

Glessner, Paul T., Boeing Co., USA; Kubiatko, Paul, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 159-189; In English; See also 20000024815; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The test objectives of the Ames 12' (TCA-3) test were to: 1) determine the effect of geometric variations of the inboard leading edge flap on high-lift (HL) performance and stability & control (S&C) characteristics, 2) determine Re effects on the Technology Concept Airplane (TCA) configuration for optimum performance at takeoff (TO), climbout (CO), approach (AP), and landing (LDG) conditions, 3) obtain f1ow-visualization (flo-viz) data on the upper surface of the wing for comparison to computational fluid dynamic (CFD) results, 4) obtain video deformation and pressure sensitive paint (PSP) data. Additionally, data obtained at low Reynolds number could be compared to data obtained on similar configurations in the NASA LaRC 14' x 22' (LaRC 449) to evaluate model installation effects and data correction trends between the two facilities.

Author

Wind Tunnel Tests; Aerodynamic Stability; Civil Aviation; Supersonic Transports; Aircraft Models; Computational Fluid Dynamics

20000024819 Boeing Commercial Airplane Co., Seattle, WA USA

TCA-4/NASA473 Test Results: A High-Lift and Stability and Control Test of the HSR 5% Model Including Planform Variations, Canard and 3-Surface Configurations

Elzey, Michael B., Boeing Commercial Airplane Co., USA; Griffiths, Robert C., Boeing Commercial Airplane Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 191-375; In English; See also 20000024815; No Copyright; Avail: CASI; A09, Hardcopy; A04, Microfiche

This material is presented as follows: First, test objectives and background are discussed. Background material includes part description, test statistics and progress made. Second, general test results ware discussed, including data quality and test-to-test comparisons. Third, high-lift results are presented, followed by stability and control. Each section summarizes respective conclusions. Finally, general recommendations are presented and discussed.

Author

Canard Configurations; Aerodynamic Stability; Aircraft Models; Wind Tunnel Tests; Planforms; Lift

20000024820 Boeing Commercial Airplane Co., Seattle, WA USA

TCA Final Assessment and Test/Theory Comparisons for Sealed Slats

Chen, Allen W., Boeing Commercial Airplane Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 377-439; In English; See also 20000024815; No Copyright; Avail: CASI; A04, Hardcopy; A04, Microfiche

This paper presents the TCA Final Assessment and Test/Theory comparisons for Sealed Slats. The topics include: 1) Review of exit criteria for TCA (Technology Concept Airplane) final assessment; 2) Summary of TCA assessment; 3) Process for assessment; 4) Review of Wind Tunnel Data; 5) Assessment; 6) Seal Slats; and 7) Conclusions and recommendations. This paper is presented in viewgraph form.

CASI

Technology Assessment; Wind Tunnel Tests; Seals (Stoppers); Aerodynamic Configurations

20000024821 Boeing Commercial Airplane Co., High Lift Aerodynamics, Seattle, WA USA

HSR Leading Edge Trade Study

Burggraf, Warren, Boeing Commercial Airplane Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 441-476; In English; See also 20000024815; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The motivation of this study was to improve the Lift to Drag ratio of the configuration at the critical climb-out condition and thereby reduce the climb-out noise. Lift by itself is not the issue on this airplane but instead drag at the climb-out lift condition. This study concentrated on sealed leading edge devices with reductions in wing upper surface curvature when deflected. The reason for this was that recent wind tunnel tests and prior art have shown that these kinds of devices show superior lift to drag characteristics. The purpose of the study was to evaluate the impact/advantages relative to the plain flap leading edge of using a sealed slat or a variable camber leading edge on the PTC 1080-1494 wing. The study was an extension of a 1993 study in that new information and methods are now available which impacts the conclusions drawn, in particular new wind tunnel data and

new analytical tools (NSU2D). Aerodynamics, Structures, Mech/Elec Systems, Weights, and Aero Performance participated in the study.
Derived from text
Wind Tunnel Tests; Aerodynamic Configurations; Supersonic Speed; Leading Edge Flaps; Computational Fluid Dynamics

20000024822 Boeing Co., Phantom Works, Long Beach, CA USA
TCA 2.8-38 Outboard LE Flap Chord Study (and Sliding Hingeline Fairings)
Powell, Art, Boeing Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 477-513; In English; See also 20000024815; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper is a brief discussion of some work that was undertaken by the author in support of HSCT high lift technology development. The configuration studied is basically the PTC, but with the 2.8-38 wing. The 2.8-38 wing features a high-aspect-ratio low-sweep outer panel, occupying the outermost 50% semi-span. This panel is of necessity quite thin, and therefore heavy, so reducing leading-edge flap chord there has the potential for reducing wing weight by enlarging the wing structural box. TCA-4 experimental oil-flow surface streamline pictures show attached or nearly attached flow over the outer panel at the nearly-optimal 30 degree leading-edge flap deflection and 10 degrees angle-of-attack. Whether or not the leading-edge flap chord could be reduced further depends on whether hingeline separation can be prevented by some means.
Author
Leading Edge Flaps; Supersonic Transports; Chords (Geometry); Aerodynamic Configurations; Hinges

20000024823 Boeing Commercial Airplane Co., High Lift Aerodynamics, Seattle, WA USA
Impact of Wing Planform, Canard, and Leading Edge Flap Type on High Lift Performance and Technology Projection
Meredith, Paul, Boeing Commercial Airplane Co., USA; 1999 NASA High-Speed Research Program Aerodynamic Performance Workshop; December 1999; Volume 2, Part 1, pp. 515-550; In English; See also 20000024815; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper presents the Impact of Wing Planform, Canard, and Leading Edge Flap Type on High Lift Performance and Technology Projection. This paper is presented in viewgraph form. The topics include: 1) L/D Summary; 2) Full Scale Drag Build-ups (Effects of Wing Planform, Canards, and Sealed Slats); 3) Technology Projection (Components of Drag, Limits on Suction Parameter); 4) High Lift Metrics AP-3 and AP-4; and 5) Conclusions and Recommendations.
CASI
Wing Planforms; Canard Configurations; Leading Edge Flaps; Wind Tunnel Tests; Technology Assessment; Lift

20000024854 NASA Langley Research Center, Hampton, VA USA
Aerodynamic Characteristics, Database Development and Flight Simulation of the X-34 Vehicle
Pamadi, Bandu N., NASA Langley Research Center, USA; Brauckmann, Gregory J., NASA Langley Research Center, USA; Ruth, Michael J., Orbital, USA; Fuhrmann, Henri D., Orbital, USA; [2000]; 18p; In English; 38th; 38th Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0900; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An overview of the aerodynamic characteristics, development of the preflight aerodynamic database and flight simulation of the NASA/Orbital X-34 vehicle is presented in this paper. to develop the aerodynamic database, wind tunnel tests from subsonic to hypersonic Mach numbers including ground effect tests at low subsonic speeds were conducted in various facilities at the NASA Langley Research Center. Where wind tunnel test data was not available, engineering level analysis is used to fill the gaps in the database. Using this aerodynamic data, simulations have been performed for typical design reference missions of the X-34 vehicle.
Author
Wind Tunnel Tests; Aerodynamic Characteristics; Data Bases; Flight Simulation; Data Simulation

20000024908 NASA Langley Research Center, Hampton, VA USA
Piloted Simulation Study of the Effects of High-Lift Aerodynamics on the Takeoff Noise of a Representative High-Speed Civil Transport
Glaab, Louis J., Lockheed Engineering and Sciences Co., USA; Riley, Donald R., NASA Langley Research Center, USA; Brandon, Jay M., NASA Langley Research Center, USA; Person, Lee H., Jr., NASA Langley Research Center, USA; Glaab, Patricia C., Unisys Corp., USA; December 1999; 52p; In English
Contract(s)/Grant(s): RTOP 537-03-22-01

Report No.(s): NASA/TP-1999-209696; NAS 1.60:209696; L-17220; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

As part of an effort between NASA and private industry to reduce airport-community noise for high-speed civil transport (HSCT) concepts, a piloted simulation study was initiated for the purpose of predicting the noise reduction benefits that could result from improved low-speed high-lift aerodynamic performance for a typical HSCT configuration during takeoff and initial climb. Flight profile and engine information from the piloted simulation were coupled with the NASA Langley Aircraft Noise Prediction Program (ANOPP) to estimate jet engine noise and to propagate the resulting source noise to ground observer stations. A baseline aircraft configuration, which also incorporated different levels of projected improvements in low-speed high-lift aerodynamic performance, was simulated to investigate effects of increased lift and lift-to-drag ratio on takeoff noise levels. Simulated takeoff flights were performed with the pilots following a specified procedure in which either a single thrust cutback was performed at selected altitudes ranging from 400 to 2000 ft, or a multiple-cutback procedure was performed where thrust was reduced by a two-step process. Results show that improved low-speed high-lift aerodynamic performance provides at least a 4 to 6 dB reduction in effective perceived noise level at the FAA downrange flyover measurement station for either cutback procedure. However, improved low-speed high-lift aerodynamic performance reduced maximum sideline noise levels only when using the multiple-cutback procedures.

Author

Pilot Support Systems; Computerized Simulation; Takeoff; Noise Intensity; Aerodynamic Noise; Aircraft Configurations; Noise Prediction (Aircraft); Noise Reduction; Lift

20000024913 Department of the Air Force, Washington, DC USA

General Flight Test Theory Applied to Aircraft Modifications

Alford, Lionel D.; Knarr, Robert C.; Jan. 1999; 12p; In English

Report No.(s): AD-A371942; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Any external aircraft modification has potentially far-reaching effects on the capability of the aircraft to succeed or fail in its mission. The authors take a systematic look at the effects that small changes can have upon the whole, with a series of examples that demonstrate why careful review of data or testing is often vital in the assessment of system modifications.

DTIC

Flight Tests; Revisions; Aircraft Design

20000025039 Boeing Commercial Space Co., Seattle, WA USA

Acoustic and Aerothermal Performance Test of the Axisymmetric Coannular Ejector Nozzle, Volume 2, Acoustic Performance *Final Report*

Herkes, William, Boeing Commercial Space Co., USA; February 2000; 118p; In English

Contract(s)/Grant(s): NAS3-25963; RTOP 714-04-50

Report No.(s): NASA/CR-2000-209813/VOL2; NAS 1.26:209813/VOL2; E-12122; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Acoustic and propulsion performance testing of a model-scale Axisymmetric Coannular Ejector nozzle was conducted in the Boeing Low-speed Aeroacoustic Facility. This nozzle is a plug nozzle with an ejector design to provide aspiration of about 20% of the engine flow. A variety of mixing enhancers were designed to promote mixing of the engine and the aspirated flows. These included delta tabs, tone-injection rods, and wheeler ramps. This report addresses the acoustic aspects of the testing. The spectral characteristics of the various configurations of the nozzle are examined on a model-scale basis. This includes indentifying particular noise sources contributing to the spectra and the data are projected to full-scale flyover conditions to evaluate the effectiveness of the nozzle, and of the various mixing enhancers, on reducing the Effective Perceived Noise Levels.

Author

Acoustic Properties; Aeroacoustics; Effective Perceived Noise Levels; Noise Reduction; Performance Tests; Plug Nozzles; Ejectors; Aerodynamic Noise; Jet Aircraft Noise; Wind Tunnel Tests

20000025060 Maritime Research Inst. Netherlands, Wageningen, Netherlands

The Design and Testing of a Propeller with an Extreme Radial Load Distribution

Holtrol, Ir J., Maritime Research Inst. Netherlands, Netherlands; October 1999; 43p; In English; original contains color illustrations

Contract(s)/Grant(s): A97/KM/122

Report No.(s): TD99-0379; Rept-12958-1-CT; Copyright; Avail: Issuing Activity

In this report the design and model tests are presented for a slowly rotating propeller with extremely unloaded blade tips. The design parameters with this slowly rotating propeller have led to an extreme radial gradient of the circulation. The experiments were made to examine in which conditions trailing vortex cavitation starts when the actual blade tip is free of tip-vortex cavitation. The experiments have indicated that there is a need for a rule for the inception of leading-edge vortex cavitation.
Author
Design Analysis; Propellers; Propeller Blades; Blade Tips; Radial Distribution

20000025188 Utah State Univ., Mechanical and Aerospace Engineering Dept., Logan, UT USA
Experimental Study of the Structure of a Wingtip Vortex, *Feb. 1998 - Dec. 1999*
Anderson, Elgin A., Utah State Univ., USA; Wright, Christopher T., Utah State Univ., USA; February 2000; 63p; In English
Contract(s)/Grant(s): NAG1-1999; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A complete look at the near-field development and subsequent role-up of a wingtip vortex from a NACA 0015 wing section is investigated. Two separate but equally important surveys of the vortex structure in the region adjacent to the wingtip and approximately one chord length downstream of the trailing edge are performed. The two surveys provide qualitative flow-visualization an quantitative velocity measurement data. The near-field development and subsequent role-up of the vortex structures is strongly influenced by the angle-of-attack and the end-cap treatment of the wing section. The velocity field near the wingtip of the NACA 0015 wing section was measured with a triple-sensor hot wire probe and compared to flow visualization images produced with titanium tetrachloride smoke injection and laser illumination. The flat end-cap results indicate the formation of multiple, relatively strong vortex structures as opposed to the formation of a single vortex produced with the round end-cap. The multiple vortices generated by the flat end-cap are seen to rotate around a common ce te in a helical pattern until they eventually merge into a single vortex. Compared to a non-dimensional loading parameter, the results of the velocity and flow visualization data shows a ”jetlike” axial velocity profile for loading parameter values on the order of 0.1 and a ”wakelike” profile for much lower loading parameter values.
Author
Wing Tips; Vortices; Subsonic Wind Tunnels; Aerodynamic Configurations; Aerodynamic Characteristics

20000025200 Vigyan Research Associates, Inc., Hampton, VA USA
Computational Assessment of Aft-Body Closure for the HSR Reference H Configuration
Londenberg, W. Kelly, Vigyan Research Associates, Inc., USA; December 1999; 42p; In English
Contract(s)/Grant(s): NAS1-19672; RTOP 537-07-20-03
Report No.(s): NASA/CR-1999-209521; NAS 1.26:209521; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study has been conducted to determine how well the USM3D unstructured Euler solver can be utilized to predict the flow over the High Speed Research (HSR) Reference H configuration with an ultimate goal of prediction of Sting interference so after body closure effects may be evaluated. This study has shown that the code can be used to predict the interference effects of a lower mounted blade sting with a high degree of confidence. It has been shown that wing and fuselage pressures, both levels and trends, can be predicted well. Force and moment levels are not predicted well but experimental trends are predicted. Based upon this, predicted force and moment increments are assumed to be predicted accurately. Deflection of the horizontal tail was found to cause a non-linear increment from the non-deflected sting interference effects.
Author
Afterbodies; Closures; Aerodynamic Configurations

20000025206 NASA Langley Research Center, Hampton, VA USA
Investigation of Vortex Flaps and Other Flow Control Devices on Generic High-Speed Civil Transport Planforms
Kjerstad, Kevin J., NASA Langley Research Center, USA; Campbell, Bryan A., NASA Langley Research Center, USA; Gile, Brenda E., NASA Langley Research Center, USA; Kemmerly, Guy T., NASA Langley Research Center, USA; December 1999; 126p; In English
Contract(s)/Grant(s): RTOP 537-03-22-02
Report No.(s): NASA/TP-1999-209537; NAS 1.60:209537; L-17458; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A parametric cranked delta planform study has been conducted in the Langley 14- by 22-Foot Subsonic Tunnel with the following objectives: (1) to evaluate the vortex flap design methodology for cranked delta wings, (2) to determine the influence of leading-edge sweep and the outboard wing on vortex flap effectiveness, (3) to evaluate novel flow control concepts, and (4) to validate unstructured grid Euler computer code predictions with modeled vortex and trailing-edge flaps. Two families of cranked delta planforms were investigated. One family had constant aspect ratio, while the other had a constant nondimensional

semispan location of the leading-edge break. The inboard leading-edge sweep of the planforms was varied between 68 deg., 71 deg., and 74 deg., while outboard leading-edge sweep was varied between 48 deg. and 61 deg. Vortex flaps for the different planforms were designed by an analytical vortex flap design method. The results indicate that the effectiveness of the vortex flaps was only slightly influenced by the variations in the parametric planforms. The unstructured grid Euler computer code was successfully used to model the configurations with vortex flaps. The vortex trap concept was successfully demonstrated.
Author
Vortex Flaps; High Speed; Planforms; Subsonic Wind Tunnels; Computational Fluid Dynamics; Control Surfaces; Civil Aviation

20000025235 NASA Glenn Research Center, Cleveland, OH USA
Smagglce: Surface Modeling and Grid Generation for Iced Airfoils: Phase 1 Results
Vickerman, Mary B., NASA Glenn Research Center, USA; Choo, Yung K., NASA Glenn Research Center, USA; Braun, Donald C., NASA Glenn Research Center, USA; Baez, Marivell, NASA Glenn Research Center, USA; Gnepp, Steven, NASA Glenn Research Center, USA; December 1999; 20p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 548-20-23
Report No.(s): NASA/TM-1999-209678; NAS 1.15:209678; AIAA Paper 2000-0235; E-12033; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

SmaggIce (Surface Modeling and Grid Generation for Iced Airfoils) is a software toolkit used in the process of aerodynamic performance prediction of iced airfoils with grid-based Computational Fluid Dynamics (CFD). It includes tools for data probing, boundary smoothing, domain decomposition, and structured grid generation and refinement. SmaggIce provides the underlying computations to perform these functions, a GUI (Graphical User Interface) to control and interact with those functions, and graphical displays of results, it is being developed at NASA Glenn Research Center. This paper discusses the overall design of SmaggIce as well as what has been implemented in Phase 1. Phase 1 results provide two types of software tools: interactive ice shape probing and interactive ice shape control. The ice shape probing tools will provide aircraft icing engineers and scientists with an interactive means to measure the physical characteristics of ice shapes. On the other hand, the ice shape control features of SmaggIce will allow engineers to examine input geometry data, correct or modify any deficiencies in the geometry, and perform controlled systematic smoothing to a level that will make the CFD process manageable.
Author
Software Development Tools; Computational Fluid Dynamics; Grid Generation (Mathematics); Airfoils; Aircraft Icing; Computer Aided Design

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.

20000021144 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Operational Risk Management and Military Aviation Safety
Ashley, Park D.; Sep. 1999; 101p; In English
Report No.(s): AD-A369672; AFIT/GLM/LAL/99S-2; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The Air Force Class A aviation mishap rate has hovered around 1.5 mishaps per 100,000 flight hours since 1985. Recent attention on Air Force accidents has caused the leadership to seek to reduce its mishap rate. The Army's Class A aviation mishap rate declined after it implemented risk management (RM) principles in 1987. This reduction caught the attention of Air Force leadership who have since stated that the application of operational risk management (ORM) is how the Air Force will reduce, even eliminate, mishaps. With current budget constraints, ORM is considered to be the most cost-effective way the Air Force can reduce its mishap rate. The purpose of this research was to determine whether the Air Force can expect its mishap rate to significantly decline due to ORM implementation. This determination is based on the relationship between the Army's implementation of RM and its aviation mishap rate. The analysis of the Army's aviation mishap rates and available causal data was performed primarily using discontinuous piecewise linear regression. Results showed that the effect of RM was not reflected

in the Army's mishap rates. As a result, the Air Force should not expect its mishap rate to significantly decline due to ORM implementation.
DTIC
Risk; Flight Safety; Aircraft Safety

20000021392 Alabama Univ., Dept. of Aerospace Engineering and Mechanics, Tuscaloosa, AL USA
In-Flight Advisor, Phase 1 ***Final Report***
Bass, E.; Gainer, C.; Katz, A.; McInerny, S.; Merritt, W. T.; Dec. 1999; 92p; In English
Report No.(s): PB2000-102393; DOT/FAA/AR-99/67; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This report is the result of a feasibility study to assess the use of artificial intelligence (AI) in altering the crew of potential emergency situations before they actually occur. The objectives of the project are to specifically determine the feasibility of applying AI methodologies to reduce information overload on the pilot, to monitor data from selected components of an aircraft in flight, to inform the pilot of potentially critical events occurring or materializing, and to advise the pilot of specific actions to be taken in order to avoid potential mishaps.
NTIS
Artificial Intelligence; Flight Instruments; In-Flight Monitoring

20000021419 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA
Engine Debris Penetration Testing ***Final Report***
Nov. 1999; 154p; In English
Report No.(s): AD-A372688; DOT/FAA/AR-99/19; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The damaging effects from an uncontained aircraft turbine engine failure can be catastrophic. As a result, the Federal Aviation Administration (FAA) has commissioned a program to mitigate the damaging effects of such an event. The Uncontained Engine Debris Mitigation Program will involve both industry and government to determine possible engineering solutions to this problem. As part of this program, the Naval Air Warfare Center Weapons Division (NAWCWPNS) has been tasked to evaluate ballistic damage analysis tools and techniques that are currently in use by the defense community. The intent is to determine their applicability in predicting the damaging effects from an uncontained engine failure. This report documents testing that was conducted and the evaluation of several empirical penetration equations under the circumstances present during engine failure events. The data generated under this effort showed that variations in the velocity, orientation, and shape of the debris results in differing failure modes of the targets. When plugging failures of the targets occur, the results of the defense equations are quite good. When petaling failures occur the prediction accuracy was degraded. This resulted in the development of an FAA Energy Equation through numerical curve-fitting of the test data for 2024 T3 aluminum targets. Additional testing is planned to evaluate the penetration equations performance with real aircraft structure and varying obliquity angles at impact under phase II testing.
DTIC
Damage Assessment; Gas Turbine Engines; Aircraft Engines; Aircraft Accidents

20000021425 SRI International Corp., Menlo Park, CA USA
Full-Scale Tests of Lightweight Fragment Barriers on Commercial Aircraft ***Final Report, 30 Dec. 1998-30 Jun. 1999***
Shockey, Donald A.; Erlich, David C.; Simons, Jeffrey W.; Nov. 1999; 14p; In English
Report No.(s): AD-A372648; DOT/FAA/AR-99/71; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Because fragments from inflight engine failures can damage critical aircraft components and produce catastrophic consequences, the Federal Aviation Administration is sponsoring research to mitigate the effects of uncontained engine bursts. SRI International is evaluating the ballistic effectiveness of fabric structures made from advanced polymers and developing a computational ability to design fragment barriers. In this reporting period, SRI performed full scale fabric barrier tests on an aircraft fuselage at the Navy Air Warfare Center in China Lake, CA. The tests examined the effects of polymer material, number of plies, location of the fabric within the fuselage wall, and gripping arrangements. The results were very encouraging. For example, three plies of polybenzoxazole (PBO) Zylon woven fabric glued to the outboard side of the insulation packet and weighing only 0.05 g/sq cm (0.1 lb/sq ft) prevented a 166-g (0.37-lb) sharp edged fan blade fragment impacting edge-on at 230 m/s (756 ft/s) from penetrating into the cabin. The absorbed energy of 4400 joules (3250 ft-lb) is nearly an order of magnitude greater than that absorbed by the unfortified fuselage wall. The results confirmed that high strength polymer fabrics offer an extremely effective, low weight solution for mitigating the effects of uncontained turbine engine fragments on commercial aircraft.
DTIC
Full Scale Tests; Low Weight; Fragments; Commercial Aircraft; Impact Tests; Damage Assessment

20000021459 Aeronautical Radio, Inc., Annapolis, MD USA

Health Monitoring System Technology Assessments: Cost Benefits Analysis

Kent, Renee M., Aeronautical Radio, Inc., USA; Murphy, Dennis A., Aeronautical Radio, Inc., USA; January 2000; 171p; In English

Contract(s)/Grant(s): GS-35F-4825G; RTOP 728-30-10-02

Report No.(s): NASA/CR-2000-209848; NAS 1.26:209848; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The subject of sensor-based structural health monitoring is very diverse and encompasses a wide range of activities including initiatives and innovations involving the development of advanced sensor, signal processing, data analysis, and actuation and control technologies. In addition, it embraces the consideration of the availability of low-cost, high-quality contributing technologies, computational utilities, and hardware and software resources that enable the operational realization of robust health monitoring technologies. This report presents a detailed analysis of the cost benefit and other logistics and operational considerations associated with the implementation and utilization of sensor-based technologies for use in aerospace structure health monitoring. The scope of this volume is to assess the economic impact, from an end-user perspective, implementation health monitoring technologies on three structures. It specifically focuses on evaluating the impact on maintaining and supporting these structures with and without health monitoring capability.

Derived from text

Systems Health Monitoring; Cost Analysis; Aircraft Structures; Structural Analysis; Damage Assessment; Technology Assessment

20000021581 National Transportation Safety Board, Washington, DC USA

Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue

May 1999; 109p; In English

Report No.(s): AD-A372555; NTSB/SR-99/01; No Copyright; Avail: Defense Technical Information Center (DTIC)

During the 1980s, the National Transportation Safety Board investigated several aviation, highway, and marine accidents that involved operator fatigue. Following completion of these accident investigations, the Safety Board in 1989 issued three recommendations to the U.S. Department of Transportation (DOT) addressing needed research, education, and revisions to hours-of-service regulations. Ten years have passed since these safety recommendations were issued. In the interim, the Safety Board has issued more than 70 additional recommendations to the DOT, States, industry, and industry associations to reduce the incidence of fatigue-related accidents. In response to the three 1989 recommendations, the DOT and the modal administrations have, in general, acted and responded positively to the recommendations addressing research and education; little action, however, has occurred with respect to revising the hours-of-service regulations. Nevertheless, the Safety Board believes that support has grown in recent years to make substantive changes to these regulations. This report provides an update on the activities and efforts by the DOT and the modal administrations to address operator fatigue and, consequently, the progress that has been made in the past 10 years to implement the actions called for in the three intermodal recommendations and other fatigue-related recommendations. The report also provides some background information on current hours-of-service regulations, fatigue, and the effects of fatigue on transportation safety. As a result of this safety report, the National Transportation Safety Board issued new safety recommendations to the U.S. Department of Transportation, the Federal Aviation Administration, the Federal Highway Administration, the Federal Railroad Administration, the Research and Special Programs Administration, and the USA Coast Guard.

DTIC

Fatigue (Biology); Accident Investigation; Operator Performance; Transportation; Accidents

20000024843 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Improving African Fuel Availability in Support of Humanitarian Relief Operations

Dye, Steven C.; Jun. 1999; 63p; In English

Report No.(s): AD-A372323; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Airlift operations into Africa are fuel intensive due to the great distance from the US to the Africa as well as size of Africa itself. Poor fuel infrastructure in Africa makes airlift operations increasingly difficult. United States European Command requested this study to examine methods for meeting the fuel requirement for a humanitarian relief operation in Africa. The three methods include air refueling as was done in Operation SUPPORT HOPE, a new initiative from USA European Command, and Offshore Petroleum Distribution System. Operation SUPPORT HOPE, humanitarian relief of Rwandan refugees, is examined for two reasons. First, it is the model for the expected airlift for just such an operation. Second, Operation SUPPORT HOPE was considered a success, so the methods may be the best possible solution. United States European Command's initiative is to either store fuel or contract for guaranteed fuel delivery at several locations in Africa. The final method examined is using the Offshore

Petroleum Distribution System (OPDS). The OPDS is a specially equipped tanker ship capable of mooring four miles from shore and pumping aircraft fuel to the shore. The paper examines each option in terms of operational considerations and cost.
DTIC
Aircraft Fuels; Aircraft Fuel Systems

20000024874 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Lincoln Laboratory Evaluation of TCAS 2 Logic, Volume 2, Appendices, Version 7
Chludzinzki, Barbara J.; Dec. 13, 1999; 307p; In English
Report No.(s): AD-A372380; ATC-268-Vol-2; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
Volume 1 described the analysis procedures and inputs. This volume presents tables and figures that were generated during the assessment to the TCAS (Traffic Alert and Collision Avoidance System) Logic Performance.
DTIC
Air Traffic Control; Civil Aviation; Collision Avoidance; Logic Programming

20000025001 Army Natick Development Center, MA USA
Passive Airbag Vent Control Valve Study *Final Report, Oct. 1996 - Dec. 1998*
Rosato, Nicholas P., Army Natick Development Center, USA; Dec. 1999; 82p; In English
Contract(s)/Grant(s): DA Proj. 1L1-62786\D283
Report No.(s): AD-A372164; NATICK-TR-00-010; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy
The U.S. Army currently uses paper honeycomb material to both dissipate the ground impact energy and to cushion parachute delivered airdropped payload from damage. This report documents exploring the use of pressurized airbags with passively controlled exhaust vents as a means to mitigate ground impact landing shock. The results of both computational and experimental research that examined the performance of passively controlled venting candidates are presented. The venting candidates studied consisted of two different linear spring check valve designs, a magnetostatic check valve design, along with two precision release blowout vents configured using a four pole magnetic valve seat design.
DTIC
Air Bag Restraint Devices; Impact; Control Valves; Venting; Mechanical Shock; Honeycomb Structures; Vents

20000025078 NASA Langley Research Center, Hampton, VA USA
An Initial Study of the Sensitivity of Aircraft Vortex Spacing System (AVOSS) Spacing Sensitivity to Weather and Configuration Input Parameters
Riddick, Stephen E., NASA Langley Research Center, USA; Hinton, David A., NASA Langley Research Center, USA; January 2000; 26p; In English
Contract(s)/Grant(s): RTOP 576-02-11-11
Report No.(s): NASA/TM-2000-209849; NAS 1.15:209849; L-17947; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A study has been performed on a computer code modeling an aircraft wake vortex spacing system during final approach. This code represents an initial engineering model of a system to calculate reduced approach separation criteria needed to increase airport productivity. This report evaluates model sensitivity toward various weather conditions (crosswind, crosswind variance, turbulent kinetic energy, and thermal gradient), code configurations (approach corridor option, and wake demise definition), and post-processing techniques (rounding of provided spacing values, and controller time variance).
Author
Aircraft Wakes; Aircraft Approach Spacing; Air Traffic Control; Weather; Vortex Advisory System; Computer Programs

20000025231 NASA, Washington, DC USA
Aerospace Safety Advisory Panel Annual Report for 1999 *Annual Report, 1999*
blomberg, Richard D., NASA, USA; February 2000; 140p; In English; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This report covers the activities of the Aerospace Safety Advisory Panel (ASAP) for the calendar year 1999.This was a year of notable achievements and significant frustrations. Both the Space Shuttle and International Space Station (ISS) programs were delayed.The Space Shuttle prudently postponed launches after the occurrence of a wiring short during ascent of the STS-93 mission. The ISS construction schedule slipped as a result of the Space Shuttle delays and problems the Russians experienced in readying the Service Module and its launch vehicle. Each of these setbacks was dealt with in a constructive way. The STS-93 short circuit led to detailed wiring inspections and repairs on all four orbiters as well as analysis of other key subsystems for similar

types of hidden damage. The ISS launch delays afforded time for further testing, training, development, and contingency planning. The safety consciousness of the NASA and contractor workforces, from hands-on labor to top management, continues high. Nevertheless, workforce issues remain among the most serious safety concerns of the Panel. Cutbacks and reorganizations over the past several years have resulted in problems related to workforce size, critical skills, and the extent of on-the-job experience. These problems have the potential to impact safety as the Space Shuttle launch rate increases to meet the demands of the ISS and its other customers. As with last year's report, these work- force-related issues were considered of sufficient import to place them first in the material that follows. Some of the same issues of concern for the Space Shuttle and ISS arose in a review of the launch vehicle for the Terra mission that the Panel was asked by NASA to undertake. Other areas the Panel was requested to assess included the readiness of the Inertial Upper Stage for the deployment of the Chandra X-ray Observatory and the possible safety impact of electromagnetic effects on the Space Shuttle. The findings and recommendations in this report do not highlight any major, immediate issues that might compromise the safe pursuit of the various NASA programs. They do, however, cover concerns that the Panel believes should be addressed in the interest of maintaining NASA's excellent safety record.The Panel is pleased to note that remedial efforts for some of the findings raised are underway. Given appropriate funding and cooperative efforts among the Administration, the Congress and the various contractors, the Panel is convinced that safety problems can be avoided or solved resulting in lower risk for NASA's human space and aeronautics programs. Section II of this report contains specific findings and recommendations generated by Panel activities during the calendar year 1999. Section III presents more detailed information in support of these findings and recommendations. A current roster of Panel members, consultants, and staff is included as Appendix A. Appendix B contains NASA's response to the findings and recommendations from the 1998 annual report. It has been augmented this year to include brief explanations of why the Panel classified the NASA response as " open,""continuing," or "closed." Appendix C lists the fact-finding activities of the Panel in 1999.
Author
Aerospace Safety; NASA Programs; Planning; Risk; Safety; Safety Factors; Spacecraft Launching; Safety Management

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.

20000021153 Department of Defense, Office of Inspector General, Arlington, VA USA
Preparation of the Global Positioning System for Year 2000
Aug. 09, 1999; 29p; In English
Contract(s)/Grant(s): Proj. 8AL-0041.05
Report No.(s): AD-A366989; IG/DOD-99-229; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The audit objective was to determine whether planning and management are adequate to ensure that the Global Positioning System will continue to operate effectively in the year 2000. The Global Positioning System consists of an Operational Control Segment, a Space Segment, and a User Segment. Specifically, we audited the Operational Control and the Space Segments. The year 2000 compliance status of the User Segment was addressed in Inspector General, DoD, Report No. 99-063. (See Appendix A, Summary of Prior Coverage.) Because the Global Positioning System has a unique internal time system designated as "Global Positioning System Time," we also determined whether the Global Positioning System Time would operate effectively after the End-of-Week rollover on August 21, 1999.
DTIC
Global Positioning System; Computer Information Security; Software Reliability

20000024848 Pennsylvania State Univ., Dept. of Computer Science and Engineering, University Park, PA USA
Performance Characterization of Obstacle Detection Algorithms for Aircraft Navigation ***Final Report, 1 Aug. 1997 - 31 Dec. 1999***
Kasturi, Rangachar, Pennsylvania State Univ., USA; Camps, Octavia, Pennsylvania State Univ., USA; Coraor, Lee, Pennsylvania State Univ., USA; Gandhi, Tarak, Pennsylvania State Univ., USA; Hartman, Kerry, Pennsylvania State Univ., USA; Yang, Mau-Tsuen, Pennsylvania State Univ., USA; Jan. 28, 2000; 3p; In English
Contract(s)/Grant(s): NAG2-1152
Report No.(s): CSE-00-002; No Copyright; Avail: Issuing Activity; Abstract Only

The research reported here is a part of NASA's Synthetic Vision System (SVS) project for the development of a High Speed Civil Transport Aircraft (HSCT). One of the components of the SVS is a module for detection of potential obstacles in the aircraft's flight path by analyzing the images captured by an on-board camera in real-time. Design of such a module includes the selection and characterization of robust, reliable, and fast techniques and their implementation for execution in real-time. This report describes the results of our research in realizing such a design.
Author
Air Navigation; Flight Paths; Aircraft Instruments; Flight Safety; Flight Hazards; Collision Avoidance; Image Processing; Image Analysis; Algorithms

20000025044 Technion Research and Development Foundation Ltd., Haifa, Israel
A Cognitive Game Theoretic Analysis of Conflict Alerts in Air Traffic Control ***Final Report, 15 May 1997 - 7 Nov. 1999***
Erev, Ido, Technion Research and Development Foundation Ltd., Israel; Gopher, Daniel, Technion Research and Development Foundation Ltd., Israel; Remington, Roger, Technion Research and Development Foundation Ltd., Israel; [1999]; 6p; In English
Contract(s)/Grant(s): NCC2-995
Report No.(s): Rept-197-309; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The current research was motivated by the recommendation made by a joint Government/Industry committee to introduce a new traffic control system, referred to as the Free Flight. This system is designed to use recent new technology to facilitate efficient and safe air transportation. We addressed one of the major difficulties that arise in the design of this and similar multi-agent systems: the adaptive (and slippery) nature of human agents. To facilitate a safe and efficient design of this multi-agent system, designers have to rely on assessments of the expected behavior of the different agents under various scenarios. Whereas the behavior of the computerized agents is predictable, the behavior of the human agents (including air traffic controllers and pilots) is not. Experimental and empirical observations suggest that human agents are likely to adjust their behavior to the design of the system. to see the difficulty that the adaptive nature of human agents creates assume that a good approximation of the way operators currently behave is available. Given this information an optimal design can be performed. The problem arises as the human operator will learn to adjust their behavior to the new system. Following this adjustment process the assumptions made by the designer concerning the operators behavior will no longer be accurate and the system might reach a suboptimal state. In extreme situations these potential suboptimal states might involve unnecessary risk. That is, the fact that operators learn in an adaptive fashion does not imply that the system will become safer as they gain experience. At least in the context of Safety dilemmas, experience can lead to a pareto deficient risk taking behavior.
Author
Air Traffic Control; Air Traffic Controllers (Personnel); Psychological Factors; Aviation Psychology; Human Factors Engineering

20000025198 Oklahoma Univ., Norman, OK USA
Reduced Posting and Marking of Flight Progress Strips for En Route Air Traffic Control ***Final Report***
Truitt, Todd R., Oklahoma Univ., USA; Durso, Francis T., Oklahoma Univ., USA; Crutchfield, Jerry, Oklahoma Univ., USA; Moertl, Peter, Oklahoma Univ., USA; Manning, Carol A., Civil Aeromedical Inst., USA; February 2000; 46p; In English
Contract(s)/Grant(s): FAA-96-G-040
Report No.(s): DOT/FAA/AM-00/5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The new Display System Replacement (DSR) being implemented in air route traffic control centers (ARTCCS) will allow the data-side controller less room to post Flight Progress Strips (FPSs). We tested a new FPS marking and posting procedure designed to reduce the controller's need for, or reliance on, the FPS. The experiment was conducted at Cleveland (ZOB) and Jacksonville (ZJX) ARTCCs utilizing individual controllers and controller teams operating in either high- or low-altitude sectors. Each controller ran two, 30-minute scenarios. Scenarios were counterbalanced, but sample sizes did not allow counterbalancing of conditions. In the Normal scenario, controllers worked as they normally would. During the Experimental scenario, controllers were asked to remove FPSs that were not needed after radar contact and communications were established. Also, FPS marking was not required for any information that was recorded elsewhere, such as via computer entry or landline communication. Controllers responded to the Workload Assessment Keypad (WAK) every 5 minutes while a subject matter expert made performance ratings. Experimenters recorded activity relevant to the plan view display, computer readout device, and FPSS. At the end of each scenario, controllers provided a position relief briefing and completed a modified version of the NASA Task Load Index. For individuals and teams at ZOB and ZJX, results showed that controllers posted fewer FPSs and marked them less often in the experimental procedure. No detrimental effects on performance, workload, position relief briefings, or team

communications were observed. On-line measures of workload (i.e., the WAK) were comparable and sometimes lower for the experimental condition. Most controllers reported that they preferred the experimental procedure.
Author
Air Traffic Control; Workloads (Psychophysiology); Performance Tests; Aircraft Guidance; Flight Control

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

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

20000021152 Department of Defense, Office of Inspector General, Arlington, VA USA
Operational Testing and Evaluation of F/A-18E/F Super Hornet
Jul. 07, 1999; 40p; In English
Contract(s)/Grant(s): Proj. 9AE-0087
Report No.(s): AD-A366987; IG/DOD-99-205; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We conducted the audit in response to a request by the Honorable Russell D. Feingold, U.S. Senator from Wisconsin. The Senator was concerned about the quality of operational testing and evaluation provided in support of the F/A-18E/F Super Hornet program production decisions. He was also concerned that the Office of the Secretary of Defense might not have received timely information on the problem known as wing drop. The F/A-18E/F Super Hornet is a major model upgrade to the F/A-18 aircraft. It is a high-performance twin-engine, mid-wing multi-mission tactical aircraft designed to replace the F/A-18C/D Hornet, the A-6E Intruder, and the F-14 Tomcat aircraft. Our objective was to evaluate and monitor the process for planning, executing, and reporting operational test results in support of the third low-rate production decision made on January 29, 1999, and in preparing for the operational evaluation that began in May 1999, for the F/A-18E/F Super Hornet program. We also determined when F/A-18E/F Super Hornet program officials provided the Office of the Secretary of Defense with timely information on the wing drop problem.
DTIC
F-18 Aircraft; Wings; Performance Tests

20000021171 Princeton Univ., Dept. of Mechanical and Aerospace Engineering, NJ USA
Adding In-Plane Flexibility to the Equations of Motion of a Single Rotor Helicopter ***Final Report, 1 Feb. 1989 - 31 Jan. 2000***
Curtiss, H. C., Jr., Princeton Univ., USA; Feb. 06, 2000; 25p; In English
Contract(s)/Grant(s): NAG2-561; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a way to add the effects of main rotor blade flexibility in the in- plane or lead-lag direction to a large set of non-linear equations of motion for a single rotor helicopter with rigid blades(l). Differences between the frequency of the regressing lag mode predicted by the equations of (1) and that measured in flight (2) for a UH-60 helicopter indicate that some element is missing from the analytical model of (1) which assumes rigid blades. A previous study (3) noted a similar discrepancy for the CH-53 helicopter. Using a relatively simple analytical model in (3), compared to (1), it was shown that a mechanical lag damper increases significantly the coupling between the rigid lag mode and the first flexible mode. This increased coupling due to a powerful lag damper produces an increase in the lowest lag frequency when viewed in a frame rotating with the blade. Flight test measurements normally indicate the frequency of this mode in a non-rotating or fixed frame. This report presents the additions necessary to the full equations of motion, to include main rotor blade lag flexibility. Since these additions are made to a very complex nonlinear dynamic model, in order to provide physical insight, a discussion of the results obtained from a simplified set of equations of motion is included. The reduced model illustrates the physics involved in the coupling and should indicate trends in the full model.
Derived from text
H-53 Helicopter; Rotor Blades (Turbomachinery); Rotary Wings

20000021266 Boeing Phantom Works, Seattle, WA USA

Demonstration of ATM-Based Advanced AWACS Network With Integrated Battlespace Simulation ***Final Report, Aug. 1996 - Nov. 1998***

Kim, Jae H.; Thompson, Michael Y.; Ray, Sankar; Jul. 1999; 150p; In English

Contract(s)/Grant(s): F30602-96-C-0212; AF Proj. 4519

Report No.(s): AD-A368874; AFRL-IF-RS-TR-1999-157; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Future C4I aircraft mission avionics suites will be required to handle a much greater aggregate data rate than is the case today, and also be required to provide a much more comprehensive set of network services to support on-board battle staffs. Current on-board networking technology cannot meet these emerging requirements. Asynchronous Transfer Mode (ATM) networking technology has been identified as a significant potential backbone network for future mission avionics. ATM technology has been successfully demonstrated for some military applications, such as for fixed ground-based fiber networks, and the extension of this technology into the RF medium is currently under way with field demonstrations expected to take place very soon. For potential applications to airborne C4I, an ATM local-area network had been successfully demonstrated on Casey 01, but the demonstration did not include an operational scenario nor was it configured with a realistic C4I aircraft avionics mite. Thus, while ATM undoubtedly shows significant potential to meet on-board C4I network requirements, ATM network applicability and cost effectiveness for realistic C4I aircraft applications has to be fully implemented, quantitatively assessed, and operationally demonstrated. The objective of this program was to design, implement, assess, and demonstrate an ATM network in a realistic airborne C4I demonstration system (i.e., Advanced AWACS prototype).

DTIC

Asynchronous Transfer Mode; Military Technology; Computerized Simulation; Communication Networks

20000021279 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

Defense Acquisitions: Progress in Meeting F-22 Cost and Schedule Goals

Dec. 07, 1999; 9p; In English; Testimony before the Committee on Government Reform, Subsommittee on National Security, Veterans Affairs, and International Relations, House of Representatives.

Report No.(s): AD-A371350; GAO/T-NSIAD-00-58; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Thank you for the opportunity to submit this statement for the record. The Subcommittee requested that we provide information on the status of cost and schedule issues of the Air Force's F-22 aircraft development and procurement program.

DTIC

Fighter Aircraft; Aircraft Design

20000021390 Cherry (R. G. W.) and Associates Ltd., Hertford, UK

Benefit Analysis for Nitrogen Inerting of Aircraft Fuel Tanks against Ground Fire Explosion ***Final Report***

Cherry, R.; Warren, K.; Dec. 1999; 126p; In English

Report No.(s): PB2000-102443; DOT/FAA/AR-99/73; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The objective of this analysis was to access the potential benefits, in terms of reducing fatalities and injuries, resulting from three methods of aircraft fuel tank inerting. The methods analyzed were ground nitrogen inerting in center fuel tank only, ground nitrogen inerting in all fuel tanks, and onboard nitrogen inerting in all fuel tanks. Thirteen accidents to transport category aircraft were identified during the period from 1966 to 1995 that may have involved a fuel tank explosion. A mathematical technique was used to model each accident scenario and a Monte Carlo simulation was used to assess a high, median, and low value for the total achievable benefits.

NTIS

Nitrogen; Fuel Tanks; Aircraft Fuels; Explosions; Fires

20000023179 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA

Flexible Wing Model for Structural Sizing and Multidisciplinary Design Optimization of a Strut-Braced Wing

Gern, Frank H., Virginia Polytechnic Inst. and State Univ., USA; Naghshineh, Amir H., Virginia Polytechnic Inst. and State Univ., USA; Sulaeman, Erwin, Virginia Polytechnic Inst. and State Univ., USA; Kapania, Rakesh K., Virginia Polytechnic Inst. and State Univ., USA; Haftka, Raphael T., Florida Univ., USA; [2000]; 13p; In English; 41st; 41st Structures, Structural Dynamics and Materials Meeting, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-1327; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a structural and aeroelastic model for wing sizing and weight calculation of a strut-braced wing. The wing weight is calculated using a newly developed structural weight analysis module considering the special nature of strut-braced wings. A specially developed aeroelastic model enables one to consider wing flexibility and spanload redistribution during

in-flight maneuvers. The structural model uses a hexagonal wing-box featuring skin panels, stringers, and spar caps, whereas the aerodynamics part employs a linearized transonic vortex lattice method. Thus, the wing weight may be calculated from the rigid or flexible wing spanload. The calculations reveal the significant influence of the strut on the bending material weight of the wing. The use of a strut enables one to design a wing with thin airfoils without weight penalty. The strut also influences wing spanload and deformations. Weight savings are not only possible by calculation and iterative resizing of the wing structure according to the actual design loads. Moreover, as an advantage over the cantilever wing, employment of the strut twist moment for further load alleviation leads to increased savings in structural weight.
Author
Multidisciplinary Design Optimization; Struts; Flexible Wings; Aircraft Design; Design Analysis; Structural Design

20000023189 NASA Langley Research Center, Hampton, VA USA
A Rapid Empirical Method for Estimating the Gross Takeoff Weight of a High Speed Civil Transport
Mack, Robert J., NASA Langley Research Center, USA; December 1999; 20p; In English
Contract(s)/Grant(s): RTOP 537-07-21
Report No.(s): NASA/TM-1999-209535; NAS 1.15:209535; L-17743; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the cruise segment of the flight mission, aircraft flying at supersonic speeds generate sonic booms that are usually maximum at the beginning of cruise. The pressure signature with the shocks causing these perceived booms can be predicted if the aircraft's geometry, Mach number, altitude, angle of attack, and cruise weight are known. Most methods for estimating aircraft weight, especially beginning-cruise weight, are empirical and based on least- square-fit equations that best represent a body of component weight data. The empirical method discussed in this report used simplified weight equations based on a study of performance and weight data from conceptual and real transport aircraft. Like other weight-estimation methods, weights were determined at several points in the mission. While these additional weights were found to be useful, it is the determination of beginning-cruise weight that is most important for the prediction of the aircraft's sonic-boom characteristics.
Author
Takeoff; Structural Weight

20000023217 NASA Ames Research Center, Moffett Field, CA USA
Future Civil Aircraft and Technologies
Albers, J., NASA Ames Research Center, USA; Zuk, J., NASA Ames Research Center, USA; SAE Transactions; 1989; In English
Report No.(s): SAE-1989-1642; Copyright; Avail: Issuing Activity, Hardcopy

New aircraft technologies are presented that have the potential to expand the air transportation system and reduce congestion through new operating capabilities while also providing greater levels of safety and environmental compatibility. These new capabilities will result from current and planned civil aeronautics technology at the NASA Ames, Lewis, and Langley Research Centers and will cover the complete spectrum of current aircraft and new vehicle concepts including rotorcraft (helicopters and tilt rotors), vertical and short takeoff and landing (V/STOL), and short takeoff and landing (STOL) aircraft, subsonic transports, high-speed transports, and hypersonic/transatmospheric vehicles. New technologies will improve efficiency, affordability, safety, and environmental compatibility of current aircraft and will enable the development of new transportation system. The new capabilities of vehicles could lead to substantial market opportunities and economic growth and could improve the competitive position of the U.S. aerospace industry.
Author
Aeronautical Engineering; Aircraft Industry; Air Transportation; Transport Aircraft; Civil Aviation

20000023236 Virginia Polytechnic Inst. and State Univ., Aerospace and Ocean Engineering Dept., Blacksburg, VA USA
Multidisciplinary Design Optimization of a Strut-Braced Wing Transonic Transport
Gundlach, John F., IV, Virginia Polytechnic Inst. and State Univ., USA; Tetrault, Phillippe-Andre, Virginia Polytechnic Inst. and State Univ., USA; Gern, Frank, Virginia Polytechnic Inst. and State Univ., USA; Nagshineh-Pour-Amir, Virginia Polytechnic Inst. and State Univ., USA; Ko, Andy, Virginia Polytechnic Inst. and State Univ., USA; Schetz, Joseph, Virginia Polytechnic Inst. and State Univ., USA; Mason, William, Virginia Polytechnic Inst. and State Univ., USA; Kapania, Rakesh, Virginia Polytechnic Inst. and State Univ., USA; Grossman, Bernard, Virginia Polytechnic Inst. and State Univ., USA; Haftka, Raphael T., Florida Univ., USA; [2000]; 14p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0420; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent transonic airliner designs have generally converged upon a common cantilever low-wing configuration. It is unlikely that further large strides in performance are possible without a significant departure from the present design paradigm. One such alternative configuration is the strut-braced wing, which uses a strut for wing bending load alleviation, allowing increased aspect ratio and reduced wing thickness to increase the lift to drag ratio. The thinner wing has less transonic wave drag, permitting the wing to unsweep for increased areas of natural laminar flow and further structural weight savings. High aerodynamic efficiency translates into smaller, quieter, less expensive engines with lower noise pollution. A Multidisciplinary Design Optimization (MDO) approach is essential to understand the full potential of this synergistic configuration due to the strong interdependency of structures, aerodynamics and propulsion. NASA defined a need for a 325-passenger transport capable of flying 7500 nautical miles at Mach 0.85 for a 2010 service entry date. Lockheed Martin Aeronautical Systems (LMAS), as Virginia Tech's industry partner, placed great emphasis on realistic constraints, projected technology levels, manufacturing and certification issues. Numerous design challenges specific to the strut-braced wing became apparent through the interactions with LMAS.
Author
Multidisciplinary Design Optimization; Struts; Aircraft Design; Design Analysis; Wings

20000024808 Air Force Materiel Command, Wright-Patterson AFB, OH USA
Flight Test Theory Applied to Aircraft Modifications
Alford, Lionel D., Jr., Air Force Materiel Command, USA; Knarr, Robert C., Knarr (Robert), USA; Cockpit; Oct., Nov., Dec. 1999; ISSN 0742-1508, pp. 6-13; In English; Copyright; Avail: Issuing Activity

A new design aircraft program always conducts an instrumented test to validate the analyses. A modification program, on the other hand, may rely on previously collected data for model validation. It is imperative that a modification program adequately demonstrate the effects of the modification on the aircraft and its mission. The user must judge these effects for their desirability especially when they degrade mission capability. But, to be judged, they must be fully understood. Historical data and/or test must be used to validate the data by which these effects on aircraft capability are judged. In this article, we address critical Test & Evaluation consideration for an external aircraft modification. In each case, we define the subject area and explain its importance to the C-130 by discussing the Rationale behind the standard design practices and Air Worthiness & Operational Consideration for the fleet aircraft. We will also give concrete examples of each case. Although only effects to the C-130 aircraft are discussed in detail, these principles and observations apply to any aircraft.
Author
Aircraft Design; C-130 Aircraft; Flight Tests; Structural Design; Aircraft Reliability; Aircraft Performance

20000024877 Defence and Civil Inst. of Environmental Medicine, Toronto, Ontario Canada
Evaluation of NDT Technologies in Support of CP 140 Aircraft Sampling Inspection
Giguere, J. S.; Oct. 1999; 21p; In English
Report No.(s): AD-A372449; DCIEM-TM-1999-116; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This evaluation was undertaken to identify possible nondestructive inspection systems that will fulfill the requirements of the CP140 Aircraft Structural Integrity Programme (ASIP). The CP140 aircraft is fast approaching its originally intended life expectancy and staff from the Directorate of Technical Airworthiness and the CP140 Aircraft Engineering Office are considering an extension. In that light, the third line support contractor (i.e., Industrial Maritime Products (I.M.P.) Group Limited) has identified critical areas via the Reliability Centered Maintenance methodology. More specifically, the Common characteristic of these areas is the fact that they are not inspected under the current maintenance plan. As a result, data is lacking for a proper assessment of the aircraft structure. Hence, I.M.P. Group Limited has devised a number of Shop Instruction Notes (SINs) for the inspection of these areas that will require the use of nondestructive inspection systems. The proposed SINs call for the inspection of large surfaces, which preclude the use of most nondestructive inspection systems on a cost and time constraint basis. However, two systems were perceived as fulfilling the inspection requirements. They are the Magneto-Optic Imager (MOI) by PRI Research and Development Corporation and the D-Sight Aircraft Inspection System (DAIS) by Laser Measurement International (LMI) Inc. Automotive Division Both of these systems could provide for quick inspection of large surfaces. The evaluation documented in this report provides some insight on the advantages and disadvantages associated with both systems. Eased on the evaluation results, the DAIS should enable the quick inspection of the overall aircraft structure and highlight areas with corrosion. However, this inspection systems will not cover all SINs requirements. This deficiency can only be addressed by the use of other inspections systems.
DTIC
Inspection; Aircraft Structures; Nondestructive Tests; Sampling; Aircraft Maintenance

20000024916 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Reparable Inventory Reduction: Impacts on Air Force Fighter Aircraft Mission Capability
Hutson, Gregory E.; Sep. 1999; 297p; In English
Report No.(s): AD-A372066; AFIT/GLM/LAL/99S-6; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

During the 1990's the Air Force experienced severe declines in serviceable inventory levels and a rise in their TNMCS rates. Air Force predictions of TNMCS hours during this time period did not account for the upward trend in TNMCS rates. The Air Force uses a regression equation, consisting of possessed hours, flying hours, and sorties, to predict TNMCS hours. This research, through simple linear regression, found a significant relationship between serviceable inventory levels and TNMCS rates for 8 of the 10 aircraft studied. Using this relationship, serviceable inventory levels were then added to the Air Force equations and new multiple regression equations were derived. Results indicate the addition of serviceable inventory as an explanatory variable renders a better Theil's U-statistic for each of the aircraft studied than the current predictions. The study recommends adding a logistics chain variable to TNMCS predictions and careful consideration of further reparable inventory reductions.
DTIC
Inventories; Fighter Aircraft; Reduction

20000024994 NASA Dryden Flight Research Center, Edwards, CA USA
Cryogenic Fuel Tank Draining Analysis Model
Greer, Donald, NASA Dryden Flight Research Center, USA; 1999; 9p; In English; Cryogenic Engineering, 12-16 Jul. 1999, Montreal, Canada; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One of the technological challenges in designing advanced hypersonic aircraft and the next generation of spacecraft is developing reusable flight-weight cryogenic fuel tanks. As an aid in the design and analysis of these cryogenic tanks, a computational fluid dynamics (CFD) model has been developed specifically for the analysis of flow in a cryogenic fuel tank. This model employs the full set of Navier-Stokes equations, except that viscous dissipation is neglected in the energy equation. An explicit finite difference technique in two-dimensional generalized coordinates, approximated to second-order accuracy in both space and time is used. The stiffness resulting from the low Mach number is resolved by using artificial compressibility. The model simulates the transient, two-dimensional draining of a fuel tank cross section. to calculate the slosh wave dynamics the interface between the ullage gas and liquid fuel is modeled as a free surface. Then, experimental data for free convection inside a horizontal cylinder are compared with model results. Finally, cryogenic tank draining calculations are performed with three different wall heat fluxes to demonstrate the effect of wall heat flux on the internal tank flow field.
Author
Computational Fluid Dynamics; Navier-Stokes Equation; Drainage; Cryogenic Fluid Storage; Finite Difference Theory; Cylindrical Tanks

20000025011 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne Australia
Inspection of Demonstrator Bonded Repairs on a QANTAS 747-300: September 1999
Geddes, Rowab C.; Nov. 1999; 23p; In English
Report No.(s): AD-A371953; DSTO-TR-0900; DODA-AR-011-135; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A visit to the QANTAS Jetbase at Sydney Airport was undertaken to inspect the condition of nine demonstrator bonded repairs which were applied to a Boeing 747, registration VH-EBW in 1990. The repairs had seen in excess of 37,000 hours of service since they were applied to regions of the aircraft which are susceptible to foreign object damage. Most of the repairs exhibited a degree of erosion damage, yet had still maintained their original bond integrity.
DTIC
Bonded Joints; Boeing 747 Aircraft; Damage; Impact Damage; Foreign Bodies

20000025013 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne Australia
F-111 Stiffener Run Out Number 2 Parametric Study
Paul, Julian; Oct. 1999; 52p; In English
Report No.(s): AD-A371994; DSTO-TN-0104; DODA-AR-010-301; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Royal Australian Air Force (RAAF) currently has in service a fleet of F-111 aircraft. The conditions under which the RAAF operates these aircraft have proved to be conducive to cracking in the structurally critical wing pivot fitting, and certification testing in the cold proof load test has demonstrated failures at that location. The RAAF has contracted Lockheed Martin Tactical Aircraft Systems (LMTAS) to perform a Durability and Damage Tolerance Analysis on the aircraft. One control

point of concern, in this report, is the Stiffener Run Out Number 2 in the wing pivot fitting. The Aeronautical and Maritime Research Laboratory (AMRL) developed a bonded boron/epoxy reinforcement to reduce the high plastic strains in this critical region, and as a result has significant experience in analysing this region. LMTAS, in conjunction with the RAAF, requested that the AMRL perform an elastic and plastic stress analysis of Stiffener Run Out Number 2 including the effect of varying the geometric parameters associated with it.
DTIC
Aircraft Maintenance; Cracks; Stiffening; Airframes

20000025207 NASA Langley Research Center, Hampton, VA USA
Advancement of Bi-Level Integrated System Synthesis (BLISS)
Sobieszczanski-Sobieski, J., NASA Langley Research Center, USA; Emiley, Mark S., George Washington Univ., USA; Agte, Jeremy S., San Antonio Air Logistics Center, USA; Sandusky, Robert R., Jr., George Washington Univ., USA; [2000]; 12p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0421; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

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

20000025234 NASA Langley Research Center, Hampton, VA USA
Rapid Model Fabrication and Testing for Aerospace Vehicles
Buck, Gregeory M., NASA Langley Research Center, USA; [2000]; 20p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0826; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Advanced methods for rapid fabrication and instrumentation of hypersonic wind tunnel models are being developed and evaluated at NASA Langley Research Center. Rapid aeroheating model fabrication and measurement techniques using investment casting of ceramic test models and thermographic phosphors are reviewed. More accurate model casting techniques for fabrication of benchmark metal and ceramic test models are being developed using a combination of rapid prototype patterns and investment casting. White light optical scanning is used for coordinate measurements to evaluate the fabrication process and verify model accuracy to +/- 0.002 inches. Higher temperature (is less than 210 C) luminescent coatings are also being developed for simultaneous pressure and temperature mapping, providing global pressure as well as global aeroheating measurements. Together these techniques will provide a more rapid and complete experimental aerodynamic and aerothermodynamic database for future aerospace vehicles.
Author
Fabrication; Wind Tunnel Tests; Aerothermodynamics; Wind Tunnel Models

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.

20000021103 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
Air Force Research in Aero Propulsion Technology ***Final Report, 1 Sep. 1989 - 30 Nov. 1998***
Law, Chung K.; Nov. 30, 1998; 6p; In English
Contract(s)/Grant(s): AF-AFOSR-0473-89; AF Proj. 2308
Report No.(s): AD-A371388; AFRL-SR-BL-TR-99-0256; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The program on Air Force Research on Aero Propulsion Technology (AFRAPT) was conceived by the Air Force Office of Scientific Research, with the support of a consortium of universities, as a means of exposing graduate students to aeropropulsion technology as part of their graduate study experience. The students typically were in residence during the academic year, and were employed by one of the gas turbine companies during summer. During the period of 1989 to 1998, Princeton University actively participated in this program. A total of four students received M.S.E. degrees and seven students received Ph. D. degrees, with either total or partial support from AFRAPT.
DTIC
Propulsion; Aircraft Engines

20000021567 NASA Glenn Research Center, Cleveland, OH USA
Experimental and Numerical Investigation of Losses in Low-Pressure Turbine Blade Rows
Dorney, Daniel J., NASA Glenn Research Center, USA; Lake, James P., NASA Glenn Research Center, USA; King, Paul I., NASA Glenn Research Center, USA; Ashpis, David E., NASA Glenn Research Center, USA; January 2000; 18p; In English; 38th; 38th Aerospace Science Meeting, 10-13 Jan. 2000, Reno, NV, USA; Original contains color illustrations
Contract(s)/Grant(s): NCC3-645; RTOP 523-26-33
Report No.(s): NASA/TM-2000-209910; NAS 1.15:209910; AIAA Paper 2000-0737; E-12137; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental data and numerical simulations of low-pressure turbines have shown that unsteady blade row interactions and separation can have a significant impact on the turbine efficiency. Measured turbine efficiencies at takeoff can be as much as two points higher than those at cruise conditions. Several recent studies have revealed that the performance of low-pressure turbine blades is a strong function of the Reynolds number. In the current investigation, experiments and simulations have been performed to study the behavior of a low-pressure turbine blade at several Reynolds numbers. Both the predicted and experimental results indicate increased cascade losses as the Reynolds number is reduced to the values associated with aircraft cruise conditions. In addition, both sets of data show that tripping the boundary layer helps reduce the losses at lower Reynolds numbers. Overall, the predicted aerodynamic and performance results exhibit fair agreement with experimental data.
Author
Turbine Blades; Losses; Aircraft Wakes

20000024990 Lee (Ed) and Associates, San Ramon, CA USA
[Component and System Level of the FASTRAC Engine] ***Final Report, 20 Jul. - 31 Dec. 1999***
1999; 4p; In English
Contract(s)/Grant(s): NASA Order H-31405-D; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The primary activities of Lee & Associates during the period 7/20/99 to 12/31/99 as specified in the referenced Purchase Order has been in direct support of the Advanced Space Technology Program OfFice's Core Propulsion Project. An independent review to assess the program readiness to conduct component and system level testing of the FASTRAC Engine and to proceed into Fabrication has been provided. This was accomplished through the identification of program weaknesses and potential failure areas and where applicable recommended solutions were suggested to the Program Office that would mitigate technical and program risk. The approach taken to satisfy the objectives has been for the contractor to provide a team of experts with relevant experience from past programs and a strong background of experience in the fields critical to the success of the program. The team participated in Test Planning, Test Readiness Reviews for system testing at Stennis Space Center, Anomaly Resolution Reviews, an Operations Audit, and data analysis. This approach worked well in satisfying the objectives and providing the Project Office with valuable information in real time and through monthly reports. During the month of December 1999 the primary effort involved the participation in anomaly resolution and the detailed review of the data from the final H3 and H4 test series performed on the FASTRAC engine in the b-2 Horizontal Test Facility at Stennis. The more significant findings and recommendations from this review are presented in this report.
Derived from text
Aerospace Engineering; Rocket Engines; Propulsion

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.

20000021116 Natal Univ., Dept. of Electrical Engineering, Durban, South Africa
International Symposium on Quantitative Feedback Theory and Robust Frequency Domain Methods
Boje, Edward, Editor; Eitelberg, Eduard, Editor; Aug. 27, 1999; 249p; In English; Quantitative Feedback Theory and Robust Frequency Domain Methods, 26-27 Aug. 1999, Durban, South Africa
Report No.(s): AD-A368926; EOARD-CSP-99-5011; ISBN 1-86840-330-0; No Copyright; Avail: CASI; A03, Microfiche; A11, Hardcopy

The Final Proceedings for 1999 Quantitative Feedback Theory (QFT) Symposium, 27 August 1999 - 28 August 1999. This is an interdisciplinary conference. Topics include: Quantitative Feedback Theory and Robust Frequency Domain Methods.
DTIC
Frequency Domain Analysis; Conferences; Control Theory

20000021227 Lockheed Martin Engineering and Sciences Co., Hampton, VA USA
Cg/Stability Map for the Reference H Cycle 3 Supersonic Transport Concept Along the High Speed Research Baseline Mission Profile
Giesy, Daniel P., Lockheed Martin Engineering and Sciences Co., USA; Christhilf, David M., Lockheed Martin Engineering and Sciences Co., USA; December 1999; 38p; In English
Contract(s)/Grant(s): NAS1-96014; RTOP 537-07-24-21
Report No.(s): NASA/CR-1999-209527; NAS 1.26:209527; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A comparison is made between the results of trimming a High Speed Civil Transport (HSCT) concept along a reference mission profile using two trim modes. One mode uses the stabilator. The other mode uses fore and aft placement of the center of gravity. A comparison is make of the throttle settings (cruise segments) or the total acceleration (ascent and descent segments) and of the drag coefficient. The comparative stability of trimming using the two modes is also assessed by comparing the stability margins and the placement of the lateral and longitudinal eigenvalues.
Author
Center of Gravity; Lateral Stability; Longitudinal Stability; Supersonic Transports; High Speed; Civil Aviation

20000023160 NASA Langley Research Center, Hampton, VA USA
High Speed Civil Transport Aircraft Simulation: Reference-H Cycle 1, MATLAB Implementation
Sotack, Robert A., George Washington Univ., USA; Chowdhry, Rajiv S., Lockheed Martin Engineering and Sciences Co., USA; Buttrill, Carey S., NASA Langley Research Center, USA; December 1999; 82p; In English
Contract(s)/Grant(s): RTOP 537-07-24-01
Report No.(s): NASA/TM-1999-209530; NAS 1.15:209530; E-17900; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The mathematical model and associated code to simulate a high speed civil transport aircraft - the Boeing Reference H configuration - are described. The simulation was constructed in support of advanced control law research. In addition to providing time histories of the dynamic response, the code includes the capabilities for calculating trim solutions and for generating linear models. The simulation relies on the nonlinear, six-degree-of-freedom equations which govern the motion of a rigid aircraft in atmospheric flight. The 1962 Standard Atmosphere Tables are used along with a turbulence model to simulate the Earth atmosphere. The aircraft model has three parts - an aerodynamic model, an engine model, and a mass model. These models use the data from the Boeing Reference H cycle 1 simulation data base. Models for the actuator dynamics, landing gear, and flight control system are not included in this aircraft model. Dynamic responses generated by the nonlinear simulation are presented and compared with results generated from alternate simulations at Boeing Commercial Aircraft Company and NASA Langley Research Center. Also, dynamic responses generated using linear models are presented and compared with dynamic responses generated using the nonlinear simulation.
Author
Supersonic Transports; Transport Aircraft; Boeing Aircraft; Civil Aviation; Aircraft Models; Mathematical Models; Computerized Simulation; Algorithms

20000023185 Old Dominion Univ., Dept. of Aerospace Engineering, Norfolk, VA USA

Investigation of Inner Loop Flight Control Strategies for High-Speed Research

Newman, Brett, Old Dominion Univ., USA; Kassem, Ayman, Old Dominion Univ., USA; December 1999; 172p; In English

Contract(s)/Grant(s): NAS1-19858; RTOP 537-07-24-01

Report No.(s): NASA/CR-1999-209522; NAS 1.26:209522; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report describes the activities and findings conducted under contract NAS1-19858 with NASA Langley Research Center. Subject matter is the investigation of suitable flight control design methodologies and solutions for large, flexible high-speed vehicles. Specifically, methodologies are to address the inner control loops used for stabilization and augmentation of a highly coupled airframe system possibly involving rigid-body motion, structural vibrations, unsteady aerodynamics, and actuator dynamics. Techniques considered in this body of work are primarily conventional-based, and the vehicle of interest is the High-Speed Civil Transport (HSCT). Major findings include 1) current aeroelastic vehicle modeling procedures require further emphasis and refinement, 2) traditional and nontraditional inner loop flight control strategies employing a single feedback loop do not appear sufficient for highly flexible HSCT class vehicles, 3) inner loop flight control systems will, in all likelihood, require multiple interacting feedback loops, and 4) Ref. H HSCT configuration presents major challenges to designing acceptable closed-loop flight dynamics.

Author

Feedback Control; Flight Control; Supersonic Transports; Control Systems Design

20000024880 Instituto Superior Tecnico, Dept. of Mechanical Engineering, Lisbon Portugal

Application of Adaptive Materials in Flutter Suppression of Aircraft Structures ***Final Report, Oct. 1998 - Oct. 1999***

Suleman, Afzal; Oct. 1999; 62p; In English

Contract(s)/Grant(s): F61775-98-W-E125

Report No.(s): AD-A372473; EOARD-SPC-98-4082; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Instituto Superior Tecnico as follows: The contractor will investigate the application of integrated adaptive actuators to the problem of flutter control in aircraft structures. The research will focus on electro-mechanical finite element models (FEM) their application to simulations of flutter on airframe components.

DTIC

Aircraft Structures; Flutter Analysis; Dynamic Structural Analysis; Mathematical Models; Adaptive Control

20000025077 NASA Langley Research Center, Hampton, VA USA

A Qualitative Piloted Evaluation of the Tupolev TU-144 Supersonic Transport

Rivers, Robert A., NASA Langley Research Center, USA; Jackson, E. Bruce, NASA Langley Research Center, USA; Fullerton, C. Gordon, NASA Dryden Flight Research Center, USA; Cox, Timothy H., NASA Dryden Flight Research Center, USA; Princen, Norman H., Boeing Co., USA; February 2000; 47p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 537-08-23

Report No.(s): NASA/TM-2000-209850; NAS 1.15:209850; L-17945; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two U.S. research pilots evaluated the Tupolev TU-144 supersonic transport aircraft on three dedicated flights: one subsonic and two supersonic profiles. The flight profiles and maneuvers were developed jointly by Tupolev and U.S. engineers. The vehicle was found to have unique operational and flight characteristics that serve as lessons for designers of future supersonic transport aircraft. Vehicle subsystems and observed characteristics are described as are flight test planning and ground monitoring facilities. Maneuver descriptions and extended pilot narratives for each flight are included as appendices.

Author

Flight Characteristics; Flight Tests; Supersonic Transports; TU-144 Aircraft; Proving

20000025202 Lockheed Martin Engineering and Sciences Co., Hampton, VA USA

Modeling the High Speed Research Cycle 2B Longitudinal Aerodynamic Database Using Multivariate Orthogonal Functions

Morelli, E. A., Lockheed Martin Engineering and Sciences Co., USA; Proffitt, M. S., Lockheed Martin Engineering and Sciences Co., USA; December 1999; 86p; In English

Contract(s)/Grant(s): NAS1-19000; RTOP 537-07-24

Report No.(s): NASA/CR-1999-209525; NAS 1.26:209525; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The data for longitudinal non-dimensional, aerodynamic coefficients in the High Speed Research Cycle 2B aerodynamic database were modeled using polynomial expressions identified with an orthogonal function modeling technique. The

discrepancy between the tabular aerodynamic data and the polynomial models was tested and shown to be less than 15 percent for drag, lift, and pitching moment coefficients over the entire flight envelope. Most of this discrepancy was traced to smoothing local measurement noise and to the omission of mass case 5 data in the modeling process. A simulation check case showed that the polynomial models provided a compact and accurate representation of the nonlinear aerodynamic dependencies contained in the HSR Cycle 2B tabular aerodynamic database.
Author
Models; High Speed; Civil Aviation; Aerodynamic Coefficients; Polynomials; Orthogonal Functions; Tabulation Processes; Wind Tunnel Tests

20000025210 NASA Langley Research Center, Hampton, VA USA
Subsonic and Transonic Dynamic Stability Characteristics of the X-33
Tomaek, Deborah M., NASA Langley Research Center, USA; Boyden, Richmond P., NASA Langley Research Center, USA; [2000]; 20p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0266; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
Dynamic stability testing was conducted on a 2.5% scale model of the X-33 technology demonstrator suborbital flight-test vehicle. This testing was conducted at the NASA Langley Research Center (LaRC) 16-Foot Transonic Wind Tunnel with the LaRC High-Speed Dynamic Stability system. Forced oscillation data were acquired for various configurations over a Mach number range of 0.3 to 1.15 measuring pitch, roll and yaw damping, as well as the normal force due to pitch rate and the cross derivatives. The test angle of attack range was from -2 to 24 degrees, except for those cases where load constraints limited the higher angles of attack at the higher Mach numbers. A variety of model configurations with and without control surfaces were employed, including a ”body alone” configuration. Stable pitch damping is exhibited for the baseline configuration throughout the angle of attack range for Mach numbers 0.3, 0.8, and 1.15. Stable pitch damping is present for Mach numbers 0.9 and 0.6 with the exception of angles 2 and 16 degrees, respectively. Constant and stable roll damping were present for the baseline configuration over the range of Mach numbers up to an angle of attack of 16 degrees. The yaw damping for the baseline is somewhat stable and constant for the angle of attack range from -2 to 8 degrees, with the exception of Mach numbers 0.6 and 0.8. Yaw damping becomes highly unstable for all Mach numbers at angles of attack greater than 8 degrees.
Author
Dynamic Stability; Mach Number; Stability; Subsonic Speed; X-33 Reusable Launch Vehicle; Wind Tunnel Tests; Aerodynamic Characteristics; Oscillations; Aerodynamic Stability; Spacecraft Stability

20000025233 NASA Langley Research Center, Hampton, VA USA
Subsonic and Transonic Dynamic Stability Characteristics of the X-33
Tomek, Deborah M., NASA Langley Research Center, USA; Boyden, Richmond P., NASA Langley Research Center, USA; [2000]; 20p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0266; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
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Author
Dynamic Stability; Wind Tunnel Tests; Wind Tunnel Stability Tests

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).

20000021500 NASA Langley Research Center, Hampton,VA USA
An Experimental Investigation of Damaged Arresting Gear Tapes for the Langley Aircraft Landing Dynamics Facility
Mason, Angela J., NASA Langley Research Center, USA; December 1999; 25p; In English
Report No.(s): NASA/TM-1999-209839; NAS 1.15:209839; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental investigation was performed on damaged arresting gear tapes at the Langley Aircraft Landing Dynamics Facility. The arrestment system uses five pairs of tapes to bring the test carriage to a halt. The procedure used to determine when to replace the tapes consists of a close evaluation of each of the 10 tapes after each run. During this evaluation, each tape is examined thoroughly and any damage observed on the tape is recorded. If the damaged tape does not pass the inspection, the tape is replaced with a new one. For the past 13 years, the most commonly seen damage types are edge fray damage and transverse damage. Tests were conducted to determine the maximum tensile strength of a damaged arresting gear tape specimen. The data indicate that tapes exhibiting transverse damage can withstand higher loads than tapes with edge fray damage.
NASA
Arresting Gear; Tapes; Aircraft Landing

20000024882 Defence Science and Technology Organisation, Aeronautical and Maritime research Lab., Melbourne, Australia
A New Data Acquisition System for the AMRL Low Speed Wind Tunnel
Holland, Owen; Lam, Stephen; Link, Yoel; Nov. 1999; 29p; In English
Report No.(s): AD-A372477; DSTO-TR-0896; DODA-AR-011-129; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The data acquisition system in the Low Speed Wind Tunnel at the Aeronautical and Maritime Research Laboratory was recently upgraded. The MicroVAX II host computer was replaced by a Digital AlphaServer 400 running Digital UNIX, and the Bi-directional Parallel Interface data bus was replaced by ethernet and fast serial communication. The upgrade provides a system which is easier to use; includes a graphical user interface; provides a communication bus based on standard communication protocols, which achieves higher data transfer rates; is far more reliable and easy to maintain; and the system is more flexible than previous versions.
DTIC
Wind Tunnel Tests; Low Speed Wind Tunnels; Data Acquisition; Protocol (Computers)

20000025211 NASA Langley Research Center, Hampton, VA USA
Rapid Model Fabrication and Testing for Aerospace Vehicles
Buck, Gregory M., NASA Langley Research Center, USA; 2000; 20p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0826; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Advanced methods for rapid fabrication and instrumentation of hypersonic wind tunnel models are being developed and evaluated at NASA Langley Research Center. Rapid aeroheating model fabrication and measurement techniques using investment casting of ceramic test models and thermographic phosphors are reviewed. More accurate model casting techniques for fabrication of benchmark metal and ceramic test models are being developed using a combination of rapid prototype patterns and investment casting. White light optical scanning is used for coordinate measurements to evaluate the fabrication process and verify model accuracy to +/- 0.002 inches. Higher-temperature (is less than 210C) luminescent coatings are also being developed for simultaneous pressure and temperature mapping, providing global pressure as well as global aeroheating measurements. Together these techniques will provide a more rapid and complete experimental aerodynamic and aerothermodynamic database for future aerospace vehicles.
Author
Fabrication; Hypersonic Wind Tunnels; Wind Tunnel Models; Wind Tunnel Tests; Aerospace Vehicles

12
ASTRONAUTICS (GENERAL)

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

20000021374 Alabama Univ., Huntsville, AL USA
Spacelab Science Results Study: Executive Summary ***Final Report***
Naumann, Robert J., Editor, Alabama Univ., USA; Aug. 18, 1999; 70p; In English
Contract(s)/Grant(s): NAS8-97095; NASA Order H-30194-D; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Beginning with OSTA-1 in November 1981, and ending with Neurolab in March 1998, thirty-six shuttle missions are considered Spacelab missions because they carried various Spacelab components such as the Spacelab module, the pallet, the Instrument Pointing System (IPS), or the MPESS. The experiments carried out during these flights included astrophysics, solar physics, plasma physics, atmospheric science, Earth observations, and a wide range of microgravity experiments in life sciences, biotechnology, materials science, and fluid physics which includes combustion and critical point phenomena. In all, some 764 experiments were conducted by investigators from the USA, Europe, and Japan. These experiments resulted in several thousand papers published In refereed journals, and thousands more in conference proceedings, chapters in books, and other publications. The purpose of this Spacelab Science Results Study is to document the contributions made in each of the major research areas by giving a brief synopsis of the more significant experiments and an extensive list of the publications that were produced. We have also endeavored to show how these results impacted the existing body of knowledge, where they have spawned new fields, and, if appropriate, where the knowledge they produced has been applied.
Author
Research; Astrophysics; Solar Physics; Plasma Physics; Atmospheric Physics; Atmospheric Chemistry; Gravitational Effects; Microgravity; Osta-1 Payload; Spacelab

20000024988 Alpha Technology, Huntsville, AL USA
Human Mars Mission Performance Crew Taxi Profile ***Final Report, 7 May - 30 Sep. 1999***
Duaro, Vince A., Alpha Technology, USA; Oct. 07, 1999; 53p; In English
Contract(s)/Grant(s): NASA Order H-28653-D-PT1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Using the results from Integrated Mission Program (IMP), a simulation language and code used to model present and future Earth Moon, or Mars missions, this report presents six different case studies of a manned Mars mission. The mission profiles, timelines, propellant requirements, feasibility and perturbation analysis is presented for two aborted, two delayed rendezvous, and two normal rendezvous cases for a future Mars mission.
CASI
Manned Mars Missions; Mission Planning; Simulation; Interplanetary Flight; Runge-Kutta Method; Space Navigation; Round Trip Trajectories

20000025009 Air Force Space Battlelab, Schriever AFB, CO USA
Space Surveillance Network (SSN) Optical Augmentation (SOA) After Initiative Report: Appendix
Andress, Walter; Apr. 1999; 50p; In English
Report No.(s): AD-A371925; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report contains detailed textual and graphical data obtained during the SOA initiative.
DTIC
Augmentation; Graphs (Charts); Space Surveillance (Spaceborne); Light Emission

20000025010 Air Force Space Battlelab, Schriever AFB, CO USA
Space Surveillance Network (SSN) Optical Augmentation (SOA) After Initiative Report
Andress, Walter; Apr. 1999; 55p; In English
Report No.(s): AD-A371927; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this initiative was to demonstrate the potential for remote, autonomous collection and reporting of metric data to augment the optical deep space tracking capabilities of the SSN. The demonstration used low cost, commercial off-the-shelf

technology to increase the capacity and performance of the SSN by off-loading the routine tasking and observation burden from more capable telescopes.
DTIC
Remote Sensing; Satellite Tracking; Augmentation; Optical Tracking; Space Surveillance (Ground Based)

20000025221 Naval Space Command, Dahlgren, VA USA
Space Tracks: A Naval Space Command Bulletin on Naval Space Issues and Initiatives, January 2000
Jan. 2000; 20p; In English
Report No.(s): AD-A372283; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
SPACE TRACKS is published four times a year in January, April, July and October as an official, authorized publication of Naval Space Command. Its purpose is to discuss naval space issues end initiatives, and promote a broader awareness of specs support available to the naval warfighter. This issue contains articles on Navy communications satellites, mobile satellite service holding potential for the military, mobile warfighter need, network installation and Navy satellites to chart star positions.
DTIC
Communication Satellites; Satellite Communication; Satellite Networks; Artificial Satellites; Network Control; Communication Networks

13
ASTRODYNAMICS

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

20000021331 National Defence Research Establishment, Div. of Systms and Underwater Technology, Stockholm, Sweden
ROSA: A Simulation Program for Collaborating Missiles; User's Manual and Software Description *ROSA: En Simuleringsmiljoe foer Samverkande Robotar Anvaendarhandledning och Programbeskrivning*
Alva, P.; Kallstenius, S.; Astroem, U. S.; Oct. 1998; 104p; In Swedish
Report No.(s): PB2000-101468; FOA-R-98-00889-314-SE; No Copyright; Avail: Issuing Activity
Principles for cooperative missile control, in particular for a system of fiber optic guided missiles, is studied at FOA. A simulation program for collaborating missiles, ROSA, is developed as a test platform for the control algorithms. ROSA is implemented with Borland Delphi for Windows NT. This report is description of the software for ROSA.
NTIS
User Manuals (Computer Programs); Documentation; Computerized Simulation; Missile Control

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.

20000021229 NASA Marshall Space Flight Center, Huntsville, AL USA
Comprehensive Design Reliability Activities for Aerospace Propulsion Systems
Christenson, R. L., NASA Marshall Space Flight Center, USA; Whitley, M. R., NASA Marshall Space Flight Center, USA; Knight, K. C., Sverdrup Technology, Inc., USA; January 2000; 146p; In English
Report No.(s): NASA/TP-2000-209902; NAS 1.60:209902; M-958; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This technical publication describes the methodology, model, software tool, input data, and analysis result that support aerospace design reliability studies. The focus of these activities is on propulsion systems mechanical design reliability. The goal of these activities is to support design from a reliability perspective. Paralleling performance analyses in schedule and method, this requires the proper use of metrics in a validated reliability model useful for design, sensitivity, and trade studies. Design reliability analysis in this view is one of several critical design functions. A design reliability method is detailed and two example analyses are provided-one qualitative and the other quantitative. The use of aerospace and commercial data sources for quantification is discussed and sources listed. A tool that was developed to support both types of analyses is presented. Finally,

special topics discussed include the development of design criteria, issues of reliability quantification, quality control, and reliability verification.
Author
Reliability Analysis; Design Analysis; Propulsion System Configurations; Quality Control

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.

20000021102 NASA Kennedy Space Center, Cocoa Beach, FL USA
Delta Fuse 2nd Stage Erection at Launch Complex 17A
Jun. 07, 1999; In English; Videotape: 4 min. 50 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000010633; KSC99-90131; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Live footage shows workers removing the protective covering from the second stage fuse. Scene shows the lifting to the fuse onto the launch complex.
CASI
Construction; Aircraft Production; Production Engineering

20000021160 NASA Johnson Space Center, Houston, TX USA
STS-99 Crew Activities Report / Flight Day 11 Highlights
Feb. 21, 2000; In English; Videotape: 19 min. 6 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000022261; BRF-1421K; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (STRM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface.. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. The mission was led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri, the National Space Development Agency (Japanese Space Agency) and Gerhard P. J. Thiele, from DARA (German Space Agency). The astronauts finished the mapping operations early on day 11, and then retracted the 200 foot long mast into its payload bay canister. The mast, the longest rigid structure ever deployed in space, supported the external antenna during the mapping operation. The videotape shows the mast folding into the canister. The final stowage was delayed when the three latches on the lid of the canister failed to engage as expected. After a few procedures were executed the mast canister was sealed, on the third attempt, as shown on the videotape. The video also contains several views from the STRM. They include a computerized animation of a flight from Pasadena to Palmdale, a still view of Fiji, a view of the San Francisco Bay Area, and another of Pasadena.
CASI
Endeavour (Orbiter); Rigid Structures; Shuttle Imaging Radar; Earth Observations (From Space); Topography; Folding Structures

20000021173 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Crew Activities Report / Flight Day 06 Highlights
Feb. 16, 2000; In English; Videotape: 25 min. 5 sec. playing time, in color, with sound
Report No.(s): BRF-1421F; NONP-NASA-VT-2000022120; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (STRM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface.. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. The mission was led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri, the National Space Development Agency (Japanese Space Agency) and Gerhard P. J. Thiele, from DARA (German Space Agency). This tape shows some of the activities on board the shuttle during day six of the

mission. by the end of day six, the mission to map 32 million square miles of the Earth's surface was about 67.2 percent complete. On this video tape there is discussion about the attempts to conserve propellant, to allow for the completion of the planned mapping. There is discussion by Mamoru Mohri about the mission, and Gerhard Thiele answers questions from the German Press about the mission. New radar images from the SRTM of the Kamchatka Peninsula and northwestern Mongolia are shown. There are shots of Endeavour's 200-foot mast, which required troubleshooting due to a balky small thruster.
CASI
Endeavour (Orbiter); Radar Imagery; Shuttle Imaging Radar; Topography; Earth Observations (From Space); Spacecrews

20000021242 NASA Johnson Space Center, Houston, TX USA
STS-99 Crew Activities Report / Flight Day 07 Highlights
Feb. 17, 2000; In English; Videotape: 23 min. 10 sec playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000022121; BRF-1421G; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Live footage shows the Blue Team of STS-99, Pilot Dominic L. Pudwill Gorie, and Mission Specialists Mamoru Mohri and Janet E. Voss, participating in a discussion with the Launch Control Center (LCC). Gorie and Mohri are also seen speaking with the Prime Minister of Japan. The Blue Team also answers questions from students. Footage also includes various shots of the mass hanging from the shuttle, the star tracker, the X- and C-band panels on the shuttle, and the dumping of water from the shuttle. Still shots of the (Shuttle Radar Topography Mission) SRTM Coverage Map are also presented. Places shown include the San Andreas Fault, San Gabriel Mountains, Simi Valley, Las Angeles, New Zealand, New Mexico, and Hokkaido Japan.
CASI
Shuttle Imaging Radar; Radar Imagery; Relief Maps; Topography; Earth Surface; Space Transportation System; Space Transportation System Flights; Endeavour (Orbiter)

20000021274 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-88 Endeavour: TCDT-Press Q & A at KSCNF Auditorium
Nov. 05, 1998; In English; Videotape: 45 min. 12 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000008136; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Live footage of the (Terminal Countdown Demonstration Test) TCDT shows the crew of STS-88, Commander Robert D. Cabana, Pilot Frederick W. Sturckow, and Mission Specialists Nancy J. Curry, Jerry L. Ross, James H. Newman, and Sergei K. Krikalev, participating in a press conference. The moderator Bruce Buckingham is seen introducing Bob Cabana, who then introduces the rest of the crewmembers. Cabana explains the mission and addresses the flight day activities. He includes the building of the Node 1 station element to the Functional Energy Block (FGB) which will already be in orbit, and two space-walks to connect power and data transmission cables. The crewmembers took turn answering questions from both the audience and via radio communication with the Johnson Space Center.
CASI
Astronaut Training; International Space Station; Unity Connecting Module; Zarya Control Module; Space Station Structures; Construction; Data Transmission

20000021585 NASA Johnson Space Center, Houston, TX USA
STS-99 Crew Activities Report / Flight Day 08 Highlights
Feb. 18, 2000; In English; Videotape: 24 min. 23 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000022260; BRF-1421H; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Live footage shows the Red Team of STS-99, Commander Kevin R. Kregel and Mission Specialists Janet L. Kavandi and Gerhard P.J. Thiele, participating in interviews with the Launch Control Center (LCC). Kregel discusses the mapping system, and Thiele speaks about the antenna. The Red Team completes the flight cast maneuver for the day. Footage also shows the Red Team, Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet E. Voss and Mamoru Mohri, participating in discussion with the LCC. Voss explains how the equipment works, while Mohri and Gorie discusses the mass. Also seen is the entire crew gathered on the flight deck participating in an interview with the LCC.
CASI
Spacecraft Maneuvers; Radar Antennas; Radar Maps; Relief Maps; Topography; Earth Surface

20000023167 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-93/ Chandra Science Briefing
Jul. 19, 1999; In English; Videotape: 36 min. 20 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000008138; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

This video shows a press briefing, reviewing the type of information which scientist hope to get from the Chandra X-ray Telescope. The telescope is scheduled to be launched during the STS-93 flight. The participants in the briefing are: Don Savage, of NASA Headquarters; Ed Weiler, Associate Administrator for Space Sciences; Alan Bunner, Chandra Project Scientist and Michael Turner, an astrophysicist at the University of Chicago. After the introduction by Mr. Savage, the broad scientific goals of the Chandra mission are reviewed by Dr. Weiler. This is followed by an acknowledgement of many of the people who participated in the development of the Chandra Telescope. This is followed by a discussion of the astrophysics and the information which the telescope should provide. Mrs. Chandrasekhar, the widow of Subrahmanyan Chandrasekhar, was in the audience. She was introduced and spoke briefly about the late Nobel Laureate astrophysicist.
CASI
Astrophysics; X Ray Astrophysics Facility; Spaceborne Astronomy; X Ray Astronomy

20000023223 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37/Atlantis/GRO
Apr. 11, 1991; In English; Videotape: 55 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000013422; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

The primary objective of the STS-37 mission was to deploy the Gamma Ray Observatory. The mission was launched at 9:22:44 am on April 5, 1991, onboard the space shuttle Atlantis. The mission was led by Commander Steven Nagel. The crew was Pilot Kenneth Cameron and Mission Specialists Jerry Ross, Jay Apt, and Linda Godwing. This videotape shows the crew having breakfast on the launch day. It then shows the crew's final preparations and the entry into the shuttle. The countdown and launch is shown including the shuttle separation from the solid rocket boosters. The launch is reshown from several different camera views. Some of the other camera views were in black and white. The deployment of the Gamma Ray Observatory is shown, including an unscheduled spacewalk to deploy the high gain antenna. The landing at Edwards Air Force Base is shown. The landing is also shown from several different cameras views.
CASI
Gamma Ray Observatory; Spacecrews; Launching; Extravehicular Activity; Horizontal Spacecraft Landing

20000024783 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Atlantis, Shuttle Radar Topography Mission (SRTM) in the MPPF with Technicians working
Mar. 22, 1999; In English; Videotape: 1 min. playing time, in color, no sound except background noise
Report No.(s): KSC99-90051; NONP-NASA-VT-2000027987; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This videotape shows technicians in clean room suits working on the SRTM in the Multi-Payload Processing Facility (MPPF).
CASI
Clean Rooms; Payloads; Shuttle Imaging Radar

20000024784 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Payload Door Closure in Orbiter Processing Facility # 2, Endeavour, (SRTM)
Nov. 29, 1999; In English; Videotape: 3 min playing time in color,no sound except background sound
Report No.(s): KSC99-90277; NONP-NASA-VT-2000027986; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This videotape shows the SRTM in Endeavour's payload bay, while the payload bay doors are being closed. There are some views of the Orbiter Processing Facility and technicians in the clean room environment.
CASI
Bays (Structural Units); Doors; Endeavour (Orbiter); Shuttle Imaging Radar

20000024868 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37 Payload Gamma Ray Observatory Pad-B in PCR
Mar. 17, 1991; In English; Videotape: 2 min. 20 sec., in color with background sound
Report No.(s): NONP-NASA-VT-2000013432; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-37 mission was to deploy the Gamma Ray Observatory. The mission was launched at 9:22:44 am on April 5, 1991, onboard the space shuttle Atlantis. This videotape shows the Gamma Ray Observatory being placed in the payload bay of the shuttle. The Payload Changeout Room (PCR) and the clean room operations required to place the payload in the bay are shown.
CASI
Clean Rooms; Gamma Ray Observatory; Payloads; Space Transportation System; Controlled Atmospheres; Bays (Structural Units)

20000025181 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Payload Bay Door Opening at Pad 39A Endeavour
Jan. 17, 2000; In English; Videotape: 4 min. playing time, in color, with sound
Report No.(s): KSC00-00016; NONP-NASA-VT-2000027988; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This videotape shows the doors to the payload bay opening prior to the emplacement of the SRTM. It also shows views of the personnel in the clean room during the process.
CASI
Doors; Payloads; Space Transportation System; Clean Rooms

20000025182 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Crew Arrival for Launch of SRTM, Endeavour
Jan. 27, 2000; In English; Videotape: 6. min playing time, in color, with sound
Report No.(s): KSC00-00020; NONP-NASA-VT-2000027985; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This tape shows the arrival of the crew at Kennedy Space Center. After arrival, each of the crew makes a brief statement to the assembled press.
CASI
Spacecrews; Space Shuttle Payloads; Space Transportation System; Astronauts; Crew Procedures (Preflight)

20000025183 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Crew departs SLF after TCDT
Jan. 17, 2000; In English; Videotape: 7 min. playing time, in color, with sound
Report No.(s): KSC-00013; NONP-NASA-VT-2000027984; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This tape shows the astronauts boarding jet planes at the Shuttle Landing Facility after the Terminal Countdown Demonstration Test.
CASI
Astronauts; Spacecrews; Jet Aircraft; Preflight Operations

20000025184 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Rollover from OPF-2 to VAB
Dec. 02, 1999; In English; Videtape: 4 min playing time, in color, with sound
Report No.(s): KSC99-9027; NONP-NASA-VT-2000027983; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This tape shows the Endeavour Space Shuttle being rolled over from the Orbiter Processing Facility to the Vertical Assembly building.
CASI
Endeavour (Orbiter); Space Shuttles; Space Transportation System; Preflight Operations

20000025185 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Rollout to SRTM 39A
Dec. 14, 1999; In English; Videotape: 5 min. playing time, in color, with sound
Report No.(s): KSC99-90289; NONP-NASA-VT-2000027980; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This videotape shows the shuttle with the solid rocket boosters being rolled out to launch pad 39A.
CASI
Endeavour (Orbiter); Launching; Space Transportation System

20000025186 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 SRTM Lift and Insert into Canister
Jul. 19, 1999; In English; Videotape: 4 min. playing time, in color, with sound
Report No.(s): KSC99-90177; NONP-NASA-VT-2000027276; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi, Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This videotape shows clean room technicians working on a part of the 200 foot long mast that will hold the SRTM in position during the mission. This videotape also shows the lowering of the SRTM into the canister.
CASI
Beams (Supports); Clean Rooms; Shuttle Imaging Radar

20000025249 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-99 Crew Activities Report / Flight Day 10 Highlights
Feb. 20, 2000; In English; Videotape: 26 min. 20 sec. playing time, in color, with sound
Report No.(s): BRF-1421J; NONP-NASA-VT-2000022259; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

The primary objective of the STS-99 mission was to complete high resolution mapping of large sections of the Earth's surface using the Shuttle Radar Topography Mission (SRTM), a specially modified radar system. This radar system produced unrivaled 3-D images of the Earth's Surface. The mission was launched at 12:31 on February 11, 2000 onboard the space shuttle Endeavour. and led by Commander Kevin Kregel. The crew was Pilot Dominic L. Pudwill Gorie and Mission Specialists Janet L. Kavandi,

Janice E. Voss, Mamoru Mohri from the National Space Development Agency (Japanese Space Agency), and Gerhard P. J. Thiele from DARA (German Space Agency). This tape shows the activities of the tenth day of the mission. During this day the mapping of the Earth continued. Each of the astronauts gives a brief statement about the mission or some other point of interest. Some of the equipment and supplies on board the shuttle are shown, including the medical supplies. The videotape ends showing some of the images released during the day from the SRTM. These include views of Oahu, Hawaii; Miquelon Island and St. Pierre Island, Newfoundland; Kamchatka, and Baikal, Russia; Oberpfaffenhofen, Germany; Katmandu, Nepal; and Cotopaxi, Ecuador.
CASI
Astronauts; Shuttle Imaging Radar; Space Transportation System; Spacecrews; Endeavour (Orbiter); Crew Procedures (Inflight)

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.

20000021417 ACT Co., Westlake, OH USA
ACTS: Technology Description and Results
Gedney, Richard T., ACT Co., USA; Schertler, Ronald, ACT Co., USA; Gargione, Frank, Lockheed Martin Missiles and Space, USA; February 2000; 160p; In English
Contract(s)/Grant(s): NAS3-23790; RTOP 315-90-2A
Report No.(s): NASA/CR-2000-209806; NAS 1.26:209806; E-12112; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The ACTS Project was originated at NASA Glenn Research Center in the early 1980's to sponsor the development and application of technology that was intended to be used by the private sector. The program was formulated with the underlying philosophy of maintaining US leadership in satellite communications while focusing technology development for efficient use of the frequency spectrum. This report chronicles the execution and results of the program from the perspective of its technology managers, from inception through hardware and system development to on-orbit experiments and demonstrations of the technology. The first eight sections of the report discuss programmatic background, the specific satellite and ground terminal technology and the results generated by the program including industry relevance. A federally funded program of this type attracted strong advocates and adversaries and the resulting impact on the project schedule is also discussed. The last two sections are a list of useful acronyms and extensive references.
Derived from text
Systems Engineering; Communication Satellites; Research and Development; Technology Utilization; Communications Technology Satellite

20000024920 NASA Glenn Research Center, Cleveland, OH USA
In-Space Internet-Based Communications for Space Science Platforms Using Commercial Satellite Networks
Kerczewski, Robert J., NASA Glenn Research Center, USA; Bhasin, Kul B., NASA Glenn Research Center, USA; Fabian, Theodore P., NASA Glenn Research Center, USA; Griner, James H., NASA Glenn Research Center, USA; Kachmar, Brian A., Analex Corp., USA; Richard, Alan M., Analex Corp., USA; November 1999; 16p; In English; 5th; Ka Band Utilization, 18-20 Oct. 1999, Taormina, Italy; Sponsored by Istituto Internazionale delle Comunicazioni, Italy
Contract(s)/Grant(s): RTOP 632-50-5A
Report No.(s): NASA/TM-1999-209456; E-11954; NAS 1.15:209456; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The continuing technological advances in satellite communications and global networking have resulted in commercial systems that now can potentially provide capabilities for communications with space-based science platforms. This reduces the need for expensive government owned communications infrastructures to support space science missions while simultaneously making available better service to the end users. An interactive, high data rate Internet type connection through commercial space communications networks would enable authorized researchers anywhere to control space-based experiments in near real time and obtain experimental results immediately. A space based communications network architecture consisting of satellite constellations connecting orbiting space science platforms to ground users can be developed to provide this service. The unresolved technical issues presented by this scenario are the subject of research at NASA's Glenn Research Center in Cleveland,

Ohio. Assessment of network architectures, identification of required new or improved technologies, and investigation of data communications protocols are being performed through testbed and satellite experiments and laboratory simulations.
Author
Satellite Communication; Communication Networks; Internets; Space 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.

20000021239 NASA Goddard Space Flight Center, Greenbelt, MD USA
Parametric Study of Variable Emissivity Radiator Surfaces
Grob, Lisa M., Swales Aerospace, USA; Swanson, Theodore D., NASA Goddard Space Flight Center, USA; [2000]; 5p; In English; STAIF, 30 Jan. - 3 Feb. 2000, Albuquerque, NM, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of spacecraft thermal design is to accommodate a high function satellite in a low weight and real estate package. The extreme environments that the satellite is exposed during its orbit are handled using passive and active control techniques. Heritage passive heat rejection designs are sized for the hot conditions and augmented for the cold end with heaters. The active heat rejection designs to date are heavy, expensive and/or complex. Incorporating an active radiator into the design that is lighter, cheaper and more simplistic will allow designers to meet the previously stated goal of thermal spacecraft design Varying the radiator's surface properties without changing the radiating area (as with VCHP), or changing the radiators' views (traditional louvers) is the objective of the variable emissivity (vary-e) radiator technologies. A parametric evaluation of the thermal performance of three such technologies is documented in this paper. Comparisons of the Micro-Electromechanical Systems (MEMS), Electrochromics, and Electrophoretics radiators to conventional radiators, both passive and active are quantified herein. With some noted limitations, the vary-e radiator surfaces provide significant advantages over traditional radiators and a promising alternative design technique for future spacecraft thermal systems.
Author
Spacecraft Design; Thermodynamic Properties; Temperature Effects; Heat Radiators; Design Analysis

20000021243 NASA Goddard Space Flight Center, Greenbelt, MD USA
Flight Dynamics Analysis Branch End of Fiscal Year 1999 Report
Stengle, T., NASA Goddard Space Flight Center, USA; Flores-Amaya, F., NASA Goddard Space Flight Center, USA; January 2000; 46p; In English
Report No.(s): NASA/TM-2000-209485; NAS 1.15:209485; Rept-2000-00275-0; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the major activities and accomplishments carried out by the Flight Dynamics Analysis Branch (FDAB), Code 572, in support of flight projects and technology development initiatives in Fiscal Year (FY) 1999. The report is intended to serve as a summary of the type of support carried out by the FDAB, as well as a concise reference of key analysis results and mission experience derived from the various mission support roles. The primary focus of the FDAB is to provide expertise in the discipline of flight dynamics, which involves spacecraft trajectory (orbit) and attitude analysis, as well as orbit and attitude determination and control. The FDAB currently provides support for missions involving NASA, government, university, and commercial space missions, at various stages in the mission life cycle.
Author
Aerodynamics; Spacecraft Trajectories; Trajectory Analysis; Attitude (Inclination); Goddard Trajectory Determination System; Orbit Calculation; Trajectory Planning

20000021486 NASA Goddard Space Flight Center, Greenbelt, MD USA
HESSI Spacecraft Model
[2000]; 24p; In English; Original contains cut-out model and directions for assembly; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The acronym, HESSI, stnds for the High Energy Solar Spectroscopic Imager. HESSI is a NASA mission proposed by astrophysicists who study the Sun. Their goal is to learn more about the basic physical processes that occur in solar flares. Teams

of astrophysicists and engineers worked together to decide what kinds of observations HESSI would make and what kinds of scientific instrumentation would be required. The HESSI teams will achieve their goal by making ”color” pictures of solar flares in X rays and gamma rays. This model is designed to help students understand the operation and objectives of HESSI.
Derived from text
Spacecraft Models; Astronomical Spectroscopy; Imaging Techniques

20000021509 NASA Marshall Space Flight Center, Huntsville, AL USA
Propulsion From a Rotating EM Tether at Jupiter
Gallagher, D. L., NASA Marshall Space Flight Center, USA; Moore, J., SRS Technologies, USA; [2000]; 1p; In English; 38th; Aerospace Science, 10-13 Jan. 2000, Reno, NV, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The Jovian system with its rapid planetary rotation and strong magnetic field presents exciting opportunities for the use of electrodynamic (EM) tethers. Previous analysis for a radial, 10 km length tether demonstrated the possibility of propulsive forces as large as 50 Newtons near the planet. For orbital positions beyond about 2.5 Jovian radii, an EM tether can simultaneously be used for power and increases in the orbital altitude. Although the previous study demonstrated the physical feasibility of EM tether use at Jupiter, it did not address the issues of limited gravity gradient force for tether orientation and the practical use of this technology in an engineered system. This presentation will discuss these issues and current progress in an ongoing science/engineering transitional study.
Author
Magnetic Fields; Tethering; Tetherlines; Electrodynamics; Electromagnetic Propulsion

20000021571 Science Applications International Corp., Prospect, TN USA
Evaluation of Trapped Radiation Model Uncertainties for Spacecraft Design ***Final Report, Apr. 1995 - Sep. 1999***
Armstrong, T. W., Science Applications International Corp., USA; Colborn, B. L., Science Applications International Corp., USA; February 2000; 47p; In English
Contract(s)/Grant(s): NAS8-40294
Report No.(s): SAIC-TN-99020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The standard AP8 and AE8 models for predicting trapped proton and electron environments have been compared with several sets of flight data to evaluate model uncertainties. Model comparisons are made with flux, dose, and activation measurements made on various U.S. low-Earth orbit satellites (APEX, CRRES, DMSP. LDEF, NOAA) and Space Shuttle flights, on Russian satellites (Photon-8, Cosmos-1887, Cosmos-2044), and on the Russian Mir space station. This report gives a summary of the model-data given in a companion report. Results from the model comparisons with flight data show, for example, that the AP8 model underpredicts the trapped proton flux at low altitudes by a factor of about two (independent of proton energy and solar cycle conditions), and that the AE8 model overpredict the flux in the outer electron belt be an order of magnitude or more.
Author
Dosage; Mathematical Models; Proton Energy; Photons; Radiation Trapping

20000023158 Boeing Aerospace Co., Seattle, WA USA
Flight Results of the Chandra X-Ray Observatory Inertial Upper Stage Space Mission
Tillotson, R., Boeing Aerospace Co., USA; Walter, R., Boeing Aerospace Co., USA; [2000]; 26p; In English, 3 Jan. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-40218; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under contract to NASA, a specially configured version of the Boeing developed Inertial Upper Stage (IUS) booster was provided by Boeing to deliver NASA’s 1.5 billion dollar Chandra X-Ray Observatory satellite into a highly elliptical transfer orbit from a Shuttle provided circular park orbit. Subsequently, the final orbit of the Chandra satellite was to be achieved using the Chandra Integral Propulsion System (IPS) through a series of IPS burns. On 23 July 1999 the Shuttle Columbia (STS-93) was launched with the IUS/Chandra stack in the Shuttle payload bay. Unfortunately, the Shuttle Orbiter was unexpectantly inserted into an off-nominal park orbit due to a Shuttle propulsion anomaly occurring during ascent. Following the IUS/Chandra on-orbit deployment from the Shuttle, at seven hours from liftoff, the flight proven IUS GN&C system successfully injected Chandra into the targeted transfer orbit, in spite of the off-nominal park orbit. This paper describes the IUS GN&C system, discusses the specific IUS GN&C mission data load development, analyses and testing for the Chandra mission, and concludes with a summary of flight results for the IUS part of the Chandra mission.
Author
Space Missions; Space Transportation System; Mission Planning; Inertial Upper Stage; X Ray Astrophysics Facility; Payload Delivery (STS)

20000023227 FDC/NYMA, Inc., Hampton, VA USA

International Space Station Evolution Data Book, Volume 1, Baseline

Jorgensen, Catherine A., Editor, FDC/NYMA, Inc., USA; Cosgrove, Patrick A., NASA Langley Research Center, USA; Antol, Jeffrey, NASA Langley Research Center, USA; Stillwagen, Frederick H., NASA Langley Research Center, USA; Roithmayr, Carlos M., NASA Langley Research Center, USA; Hall, John B., Jr., NASA Langley Research Center, USA; Ganoe, George A., NASA Langley Research Center, USA; Hajos, Gregory A., NASA Langley Research Center, USA; November 1999; 182p; In English

Contract(s)/Grant(s): NAG1-96013

Report No.(s): NASA/SP-1999-6109/VOL1; NAS 1.21:6109/VOL1; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This report provides a focused and in-depth look at the opportunities and drivers for the enhancement and evolution of the International Space Station (ISS) during assembly and beyond the assembly complete stage. These enhancements would expand and improve the current baseline capabilities of the ISS and help to facilitate the commercialization of the ISS by the private sector. Volume 1 provides the consolidated overview of the ISS baseline systems; information on the current facilities available for pressurized and unpressurized payloads; and information on current plans for crew availability and utilization, resource timelines and margin summaries including power, thermal, and storage volumes; and an overview of the vehicle traffic model. Volume 2 includes discussions of advanced technologies being investigated for use on the ISS and potential commercial utilization activities being examined including proposed design reference missions (DRM's) and the technologies being assessed by the Pre-planned program Improvement (p(sup 3)I) Working Group. This information is very high level and does not provide the planned Program Improvement relevant information necessary for detailed design efforts. This document is meant to educate readers on the ISS and to stimulate the generation of ideas for enhancement and utilization of the ISS, either by or for the government, academia. and commercial industry.

Author

International Space Station; Payloads; Commerce

20000024785 NASA Marshall Space Flight Center, Huntsville, AL USA

NASA's Space Environments and Effects Program: Technology for the New Millennium

Hardage, Donna M., NASA Marshall Space Flight Center, USA; Pearson, Steven D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Current trends in spacecraft development include the use of advanced technologies while maintaining the "faster, better, cheaper" philosophy. Spacecraft designers are continually designing with smaller and faster electronics as well as lighter and thinner materials providing better performance, lower weight, and ultimately lower costs. Given this technology trend, spacecraft will become increasingly susceptible to the harsh space environments, causing damaging or even disabling effects on space systems. NASA's Space Environments and Effects (SEE) Program defines the space environments and provides advanced technology development to support the design, development, and operation of spacecraft systems that will accommodate or mitigate effects due to the harsh space environments. This Program provides a comprehensive and focused approach to understanding the space environment, to define the best techniques for both flight and ground-based experimentation, to update the models which predict both the environments and the environmental effects on spacecraft, and finally to ensure that this multitudinous information is properly maintained and inserted into spacecraft design programs. A description of the SEE Program, its accomplishments, and future activities is provided.

Author

Aerospace Environments; Spacecraft Design; NASA Programs; Extraterrestrial Environments; Structural Design

20000024840 Federal Data Corp., Hampton, VA USA

International Space Station Evolution Data Book, Volume 2, Evolution

Jorgensen, Catherine A., Editor, Federal Data Corp., USA; November 1999; 85p; In English

Contract(s)/Grant(s): RTOP 953-20-00-03

Report No.(s): NASA/SP-1999-6109/VOL2; L-17853B; NAS 1.21:6109/VOL2; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report provides a focused and in-depth look at the opportunities and drivers for the enhancement and evolution of the International Space Station (ISS) during assembly and beyond the assembly complete stage. These enhancements would expand and improve the current baseline capabilities of the ISS and help to facilitate the commercialization of the ISS by the private sector. Volume 1 provides the consolidated overview of the ISS baseline systems; information on the current facilities available for

pressurized and unpressurized payloads; and information on current plans for crew availability and utilization, resource timelines and margin summaries including power, thermal, and storage volumes; and an overview of the vehicle traffic model. Volume 2 includes discussions of advanced technologies being investigated for use on the ISS and potential commercial utilization activities being examined including proposed design reference missions (DRM's) and the technologies being assessed by the Pre-planned Program Improvement (P(sup 3) I) Working Group. This information is very high level and does not provide the relevant information necessary for detailed design efforts. This document is meant to educate readers on the ISS and to stimulate the generation of ideas for enhancement and utilization of the ISS, either by or for the government, academia, and commercial industry.
NASA
International Space Station; Commercialization; Space Station Payloads; Spacecraft Instruments

20000024851 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: METSAT AMSU-A2 Antenna Drive Subsystem, P/N 1331200-2, S/N 107
Higgins, T., Aerojet-General Corp., USA; December 1998; 106p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209495; NAS 1.26:209495; Aerojet-11369; CDRL-208; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This is the Performance Verification Report, METSAT AMSU-A 2 Antenna Drive Subsystem P/N13312002, S/N 107 for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).
Author
Advanced Microwave Sounding Unit; Microwave Sounding; Satellite Sounding

20000024871 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Engineering Test Report: AMSU-A1 METSAT Instrument (S/N 105) Qualification, Level Vibration Tests of December 1998 (S/O 605445, OC-419)
Heffner, R. J., Aerojet-General Corp., USA; Feb. 18, 1998; 19p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209498; NAS 1.26:209498; Aerojet-11407; CDRL-207; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This is the Engineering Test Report, AMSU-AL METSAT Instrument (S/N 105) Qualification Level Vibration Tests of December 1998 (S/0 605445, OC-419), for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).
Author
Advanced Microwave Sounding Unit; Vibration Tests

20000024930 NASA Kennedy Space Center, Cocoa Beach, FL USA
Design, Development,and Testing of Umbillical System Mechanisms for the X-33 Advanced Technology Demonstrator
Littlefield, Alan C., NASA Kennedy Space Center, USA; Melton, Gregory S., NASA Kennedy Space Center, USA; Dec. 1999; 16p; In English; 34th; Aerospace Mechanisms, 10-12 May 2000, Greenbelt, MD, USA
Report No.(s): NASA/TM-1999-208562; NAS1.15:208562; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The X-33 Advanced Technology Demonstrator is an un-piloted, vertical take-off, horizontal landing spacecraft. The purpose of the X-33 program is to demonstrate technologies that will dramatically lower the cost of access to space. The rocket-powered X-33 will reach an altitude of up to 100 km and speeds between Mach 13 and 15. Fifteen flight tests are planned, beginning in 2000. Some of the key technologies demonstrated will be the linear aerospike engine, improved thermal protection systems, composite fuel tanks and reduced operational timelines. The X-33 vehicle umbilical connections provide monitoring, power, cooling, purge, and fueling capability during horizontal processing and vertical launch operations. Two "rise-ofF' umbilicals for the X-33 have been developed, tested, and installed. The X-33 umbilical systems mechanisms incorporate several unique design features to simplify horizontal operations and provide reliable disconnect during launch.
Author
Cost Reduction; Technology Assessment; Flight Tests; Proving; Spacecraft Launching; Vertical Landing; X-33 Reusable Launch Vehicle

20000025203 Aerojet-General Corp., Azusa, CA USA

Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report, METSAT (S/N:107) AMSU-A1 Receiver Assemblies: P/N 1356429-1, S/N:F04, P/N 1356409-1,S/N F04

Pines, D., Aerojet-General Corp., USA; February 1999; 584p; In English

Contract(s)/Grant(s): NAS5-32314

Report No.(s): NASA/CR-1999-209496; NAS 1.26:209496; Rept-11413; CDRL-208; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

This is the Performance Verification Report, METSAT (S/N: 107) AMSU-A1 Receiver Assemblies, P/N 1356429-1, SIN: F04, P/N 1356409- 1, S/N: F04, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A). The AMSU-A receiver subsystem comprises two separated receiver assemblies; AMSU-A1 and AMSU-A2 (P/N 1356441-1). The AMSU-A1 receiver contains 13 channels and the AMSU-A2 receiver 2 channels. The AMSU-A receiver assembly is further divided into two parts; AMSU-A I - I (P/N 13 5 6429- 1) and AMSU-A 1 -2 (P/N 1356409-1), which contain 9 and 4 channels, respectively. The AMSU-A receiver subsystem is located in between the antenna and signal processing subsystems of the AMSU-A instrument and comprises the RF and IF components from isolators to attenuators. It receives the RF signals from the antenna subsystem, down-converts the RF signals to IF signals, amplifies and defines the IF signals to proper power level and frequency bandwidth as specified for each channel, and inputs the IF signals to the signal processing subsystem. The test reports for the METSAT AMSU-A receiver subsystem are prepared separately for Al and A2 receivers so that each receiver stands alone during integration of instruments into the spacecraft. This test report presents the test data of the N4ETSAT AMSU-A1 Flight Model No. 4 (FM-4) receiver subsystem. The tests are performed per the Acceptance Test Procedure (ATP) for the AMSU-A Receiver Subsystem, AE-26002/6A. The functional performance tests are conducted either at the component or subsystem level. While the component-level tests are performed over the entire operating temperature range predicted by thermal analysis, most subsystem-level tests are conducted at ambient temperature only. Key performances (bandpass characteristics and noise figure) of the receiver subsystem are verified over the operating temperature.

Derived from text

Advanced Microwave Sounding Unit; Thermal Analysis; Performance Tests; Operating Temperature; Antenna Design; Acceptability

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.

20000021554 Aerojet-General Corp., Azusa, CA USA

Integrated Advanced Microwave Sounding Unit-A (AMSU-A. Engineering Report: Electromagnetic Interface (EMI)/Electromagnetic Radiation (EMR) and Electromagnetic Compatibility (EMC), for the METSAT/METOP AMSU-A1

Valdez, A., Aerojet-General Corp., USA; February 1999; 204p; In English

Contract(s)/Grant(s): NAS5-32314

Report No.(s): NASA/CR-1999-209494; NAS 1.26:209494; Rept-11411; CDRL-207; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This document contains the procedure and the test results of the Advanced Microwave Sounding Unit-A (AMSU-A) Electromagnetic Interference (EMI), Electromagnetic Susceptibility, and Electromagnetic Compatibility (EMC) qualification test for the Meteorological Satellite (METSAT) and the Meteorological Operation Platform (METOP) projects. The test was conducted in accordance with the approved EMI/EMC Test Plan/Procedure, Specification number AE-26151/5D. This document describes the EMI/EMC test performed by Aerojet and it is presented in the following manner: Section-1 contains introductory material and a brief summary of the test results. Section 2 contains more detailed descriptions of the test plan, test procedure, and test results for each type of EMI/EMC test conducted. Section 3 contains supplementary information that includes test data sheets, plots, and calculations collected during the qualification testing.

Author

Advanced Microwave Sounding Unit; Earth Observing System (EOS); Microwave Sounding; Satellite Sounding; Meteorological Satellites

20000024786 NASA Marshall Space Flight Center, Huntsville, AL USA

Validation of a ”Kane’s Dynamics” Model for the Active Rack Isolation System

Beech, Geoffrey S., NASA Marshall Space Flight Center, USA; Hampton, R. David, Alabama Univ., USA; [2000]; 1p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aerosnautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0682; No Copyright; Avail: Issuing Activity; Abstract Only

Many microgravity space-science experiments require vibratory acceleration levels unachievable without active isolation. The Boeing Corporation’s Active Rack Isolation System (ARIS) employs a novel combination of magnetic actuation and mechanical linkages, to address these isolation requirements on the International Space Station (ISS). ARIS provides isolation at the rack (international Standard Payload Rack, or ISPR) level. Effective model-based vibration isolation requires (1) an isolation device, (2) an adequate dynamic (i.e., mathematical) model of that isolator, and (3) a suitable, corresponding controller, ARIS provides the ISS response to the first requirement. In November 1999, the authors presented a response to the second (”A ’Kane’s Dynamics’ model for the Active Rack Isolation System”, Hampton and Beech) intended to facilitate an optimal-controls approach to the third. This paper documents the validation of that high-fidelity dynamic model of ARIS. As before, this model contains the full actuator dynamics, however, the umbilical models are not included in this presentation. The validation of this dynamics model was achieved by utilizing two Commercial Off the Shelf (COTS) software tools: Deneb’s ENVISION, and Online Dynamics’ AUTOLEV. ENVISION is a robotics software package developed for the automotive industry that employs 3-dimensional (3-D) Computer Aided Design (CAD) models to facilitate both forward and inverse kinematics analyses. AUTOLEV is a DOS based interpreter that is designed in general to solve vector based mathematical problems and specifically to solve Dynamics problems using Kane’s method.
Author

Dynamic Models; Isolation; Mathematical Models; Vibration Isolators; Active Control; Proving; Kinematics

20000024849 Aerojet-General Corp., Azusa, CA USA

Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Engineering Test Report: SARR, SARP, DCS Receivers, Link Frequencies, EMI Sensitive Band Test Results, AMSU-A2, S/N 106

Valdez, A., Aerojet-General Corp., USA; Feb. 22, 1999; 78p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209502; NAS 1.26:209502; Aerojet-11382; CDRL-207; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This is the Engineering Test Report, SARR, SARP, DCS Receivers, Link Frequencies EMI Sensitive Band Test Results, AMSU-A2, S/N 107, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).
Author

Advanced Microwave Sounding Unit; Microwave Sounding; Satellite Sounding; Earth Observing System (EOS); Remote Sensing

20000024850 Aerojet-General Corp., Azusa, CA USA

Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: Final Comprehensive Performance Test Report, P/N 1331200-2, S/N 105/A2

Platt, R., Aerojet-General Corp., USA; March 1999; 374p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209507; NAS 1.26:209507; Rept-11426; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This is the Performance Verification Report, Final Comprehensive Performance Test Report, P/N 1331200-2, S/N 105/A2, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).
Author

Advanced Microwave Sounding Unit; Performance Tests

20000025189 National Environmental Satellite Service, Office of Research and Applications, Camp Springs, MD USA

Calibration of the Advanced Microwave Sounding Unit-A Radiometers for NOAA-L and NOAA-M

Mo, Tsan, National Environmental Satellite Service, USA; May 1999; 64p; In English
Report No.(s): NOAA-NESDIS-92; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

After the successful launch of NOAA-K into a morning-configuration orbit in May 1998, NOAA will launch its next two satellites, NOAA-L and -M, in 2000 and 2002, respectively, into afternoon- configured orbits. Both will carry the Advanced Microwave Sounding Unit-A (AMSU-A) radiometers. This report is primarily concerned with the analysis and evaluation of the thermal- vacuum chamber calibration data from the AMSU-A radiometers for both NOAA-L and -M. These pre-launch test data

were analyzed to evaluate the instrument performance, including calibration accuracy, nonlinearity, and temperature sensitivity. We studied the instrument's radiometric characterizations and obtained the Calibration Parameters Input Data Set (CPIDS) which will be used for pre-launch readiness tests and post-launch operations to produce the AMSU-A IB data sets. Particularly, the nonlinearity parameters which will be used for correcting the nonlinear contributions from an imperfect square-law detector were determined from this data analysis. The existence and magnitude of nonlinearity in each channel were established and simulated with a quadratic formula for modeling the nonlinear contributions developed in the analysis of the NOAA-K pre-launch calibration data. The model was characterized by a single parameter u, values of which were obtained for each channel via least-squares fit to the data. We performed a series of simulated in- orbit quadratic corrections which would be expected from the in-orbit data after the launch of AMSU-A into space. In these simulations, the cosmic background radiance corresponding to a cold space temperature 2.73K was adopted as one of the two reference points of calibration. The largest simulated nonlinear correction is about 0.3K. Experience learned from examining the NOAA-15 AMSU-A data provides us with a better understanding of the AMSU-A performance in space. Samples of NOAA-15 AMSU-A 1B data are included to demonstrate the orbital variations of the calibration coefficients, radiometric calibration counts, and channel gains as a function of instrument temperature.
Author
Advanced Microwave Sounding Unit; Calibrating; Radiometers; Correction; Space Temperature

20000025191 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: Final Comprehensive Performance Test Report, P/N 1331720-2TST, S/N 105/A1
Platt, R., Aerojet-General Corp., USA; March 1999; 444p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209503; NAS 1.26:209503; Rept-11428; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche
This is the Performance Verification Report, Final Comprehensive Performance Test (CPT) Report, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A). This specification establishes the requirements for the CPT and Limited Performance Test (LPT) of the AMSU-1A, referred to here in as the unit. The sequence in which the several phases of this test procedure shall take place is shown.
Derived from text
Advanced Microwave Sounding Unit; Performance Tests; Specifications

20000025223 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). As-Designed Parts List: Electrical, Electronic and Electromechanical (EEE) As-Designed Parts List
Lorenz, E., Aerojet-General Corp., USA; Mar. 29, 1999; 114p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): Rept-10385A; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report comprises the Electrical, Electronic, and Electromechanical (EEE) As Designed Parts List to be used in the Integrated Advanced Microwave Sounding Unit-A (AMSU-A) instrument. The purpose of the EEE As-Designed Parts List is to provide a listing of EEE parts identified for use on the Integrated AMSU-A. All EEE parts used on the AMSU-A must meet the parts control requirements as defined in the Parts Control Plan (POP). All part applications are reviewed by the Parts Control Board (PCB) and granted approval if POP requirements are met. The "As Designed Parts Lists" indicates PCB approval status, and thus also serves as the Program Approved Parts List.
Derived from text
Advanced Microwave Sounding Unit; Spacecraft Components; Electric Equipment; Electronic Equipment; Electromechanical Devices

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SPACECRAFT PROPULSION AND POWER

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

20000021228 Forward Unltd., Clinton, WA USA
Interstellar Propulsion Concepts Assessment ***Final Report, 19 Mar. - 5 Oct. 1999***
Forward, Robert L., Forward Unltd., USA; Feb. 17, 2000; 21p; In English
Contract(s)/Grant(s): NASA Order H-30839-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA is investigating the feasibility of conducting extra-solar and interstellar missions over the next 10 to 50 years. An assessment of technologies supporting these near and far term objectives is required. to help meet these objectives the Principal Investigator assessed the feasibility of candidate propulsion systems for the proposed 'Interstellar Probe', a mission to send a spacecraft to the Heliopause at 250 AU and beyond.
Derived from text
Assessments; Propulsion System Configurations; Spacecraft Configurations; Propulsion System Performance

20000021478 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Lifetime Assessment of Rocket Motors for the Royal Netherlands Navy ***Final Report Levensduurbepaling van Raketmotoren voor de Koninklijke Marine***
Calzone, R. F., Prins Maurits Lab. TNO, Netherlands; November 1999; 30p; In Dutch
Contract(s)/Grant(s): A98/KM/431; TNO Proj. 014.10733
Report No.(s): TD99-0129; PML-1999-A34; Copyright; Avail: Issuing Activity

The objective of the present programme is to reinforce the knowledge and the capabilities of the TNO Prins Maurits Laboratory in the field of the lifetime monitoring of rocket motors. The programme (A98KM431, a follow-on of programme A96KM510) is financed by the Royal Netherlands Navy. In 1998, the activities focused on documenting the working procedures that are developed and used in past lifetime monitoring programs. The documented procedures will become part of the TNO-PML Quality Assurance documentation system. Second, a start has been made with the monitoring of the missile storage conditions on board of the L-frigate 'Hr. Ms. Jacob van Heemskerck'. The temperature and the relative humidity of air are measured in the Standard Missile storage compartment beneath the launcher deck, using two small data loggers. Third, TNO-PML contributed to the work on propellant burning properties, carried out by NATO AVT/RTO Working Group 016. Because they determine the performance of a rocket motor, burning properties are mostly verified as part of lifetime monitoring programmes. The contribution to the Working Group 27 will lead to a quality improvement of our research methods by reviewing them in an international framework.
Author
Life (Durability); Accelerated Life Tests; Service Life; Quality Control; Rocket Engines; Netherlands; Navy

20000021505 NASA Marshall Space Flight Center, Huntsville, AL USA
Flow Simulation of Solid Rocket Motors, 2, Sub-Scale Air Flow Simulation of Port Flows
Yeh, Y. P., Silicon Graphics, Inc., USA; Ramandran, N., Universities Space Research Association, USA; Smith, A. W., NASA Marshall Space Flight Center, USA; Heaman, J. P., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The injection-flow issuing from a porous medium in the cold-flow simulation of internal port flows in solid rocket motors is characterized by a spatial instability termed pseudoturbulence that produces a rather non-uniform (lumpy) injection-velocity profile. The objective of this study is to investigate the interaction between the injection- and the developing axial-flows. The findings show that this interaction generally weakens the lumpy injection profile and affects the subsequent development of the axial flow. The injection profile is found to depend on the material characteristics, and the ensuing pseudoturbulence is a function of the injection velocity, the axial position and the distance from the porous wall. The flow transition (from laminar to turbulent) of the axial-flow is accelerated in flows emerging from smaller pores primarily due to the higher pseudoturbulence produced by the smaller pores in comparison to that associated with larger pores. In flows with rather uniform injection-flow profiles (weak or no pseudoturbulence), the axial and transverse velocity components in the porous duct are found to satisfy the sine/cosine analytical solutions derived from inviscid assumptions. The transition results from the present study are compared with previous

results from surveyed literature, and detailed flow development measurements are presented in terms of the blowing fraction, and characterizing Reynolds numbers.
Author
Axial Flow; Injection; Internal Flow; Nonuniformity; Simulation; Solid Propellant Rocket Engines; Transition Flow; Porous Walls; Turbulent Flow; Laminar Flow

20000021515 Boeing Co., Seal Beach, CA USA
Non-Toxic Reaction Control System for the Reusable First Stage Vehicle
Keith, E. L., Boeing Co., USA; Rothschild, W. J., Boeing Co., USA; [1999]; 7p; In English; Propulsion Meeting, 14-16 Dec. 1999, Tucson, AZ, USA; Sponsored by Department of the Army, USA
Contract(s)/Grant(s): NAS8-97272; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents the Boeing Reusable Space Systems vision of a Reaction Control System (RCS) for the Reusable First Stage (RFS) being considered as a replacement for the Solid Rocket Booster for the Space Shuttle. The requirement is to,achieve reliable vehicle control during the upper atmospheric portion of the RFS trajectory while enabling more efficient ground operations, unhindered by constraints caused by operating with highly toxic RCS propellants. Boeing's objective for this effort is to develop a safer, more efficient and environmentally friendly RCS design approach that is suitable for the RFS concept of operations, including a low cost, efficient turnaround cycle. The Boeing RCS concept utilizes ethanol and liquid oxygen in place of the highly toxic, suspected carcinogen, ozone- depleting mono-methyl-hydrazine and highly toxic nitrogen tetroxide. The Space Shuttle Upgrade program, under the leadership of the NASA Johnson Space Flight Center, is currently developing liquid oxygen and ethanol (ethyl alcohol) technology for use as non-toxic orbital maneuvering system (OMS) and RCS. The development of this liquid oxygen and ethanol technology for the Space Shuffle offers a significant leverage to select much of the same technology for the RFS program. There are significant design and development issues involved with bringing this liquid oxygen and ethanol technology to a state of maturity suitable for an operational RCS, The risks associated with a new LOX and Ethanol RCS are mitigated by maintaining kerosene and hydrogen peroxide RCS technology as an alternative. These issues, presented within this paper, include managing the oxygen supply and achieving reliable ignition in the short pulse mode of engine operation. Performance, reliability and operations requirements are presented along with a specific RCS design concept to satisfying these requirements. The work reported in this paper was performed under NASA Marshall Space Flight Center Contract to define Reusable First Stage design concepts for the Space Shuttle.
Author
Toxicity; Reusable Launch Vehicles; Booster Rocket Engines; Solid Propellant Rocket Engines; Rocket Engine Control; Storable Propellants

20000021551 NASA Glenn Research Center, Cleveland, OH USA
Performance Evaluation of a 50kW Hall Thruster
Jacobson, David T., DYNACS Engineering Co., Inc., USA; Jankovsky, Robert S., NASA Glenn Research Center, USA; December 1999; 18p; In English; 37th; 37th Aerospace Sciences Meeting, 11-19 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 632-1B-1B
Report No.(s): NASA/TM-1999-209447; NAS 1.15:209447; E-11939; AIAA Paper 99-0457; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental investigation was conducted on a laboratory model Hall thruster designed to operate at power levels up to 50 kW. During this investigation the engine's performance was characterized over a range of discharge currents from 10 to 36 A and a range of discharge voltages from 200 to 800 V Operating on the Russian cathode a maximum thrust of 966 mN was measured at 35.6 A and 713.0 V. This corresponded to a specific impulse of 3325 s and an efficiency of 62%. The maximum power the engine was operated at was 25 kW. Additional testing was conducted using a NASA cathode designed for higher current operation. During this testing, thrust over 1 N was measured at 40.2 A and 548.9 V. Several issues related to operation of Hall thrusters at these high powers were encountered.
Author
Thrust; Models; Performance Tests; Hall Accelerators

20000023191 NASA Glenn Research Center, Cleveland, OH USA
Titanium Optics for Ion Thrusters
Soulas, George C., DYNACS Engineering Co., Inc., USA; Haag, Thomas W., NASA Glenn Research Center, USA; Patterson, Michael J., NASA Glenn Research Center, USA; Rawlin, Vincent K., NASA Glenn Research Center, USA; December 1999; 20p;

In English; 26th; 26th International Electric Propulsion Conference, 17-21 Oct. 1999, Kitakyushu, Japan; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 632-1B-1B
Report No.(s): NASA/TM-1999-209650; NAS 1.15:209650; IEPC-99-149; E-12004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ion thruster total impulse capability is limited, in part, by accelerator grid sputter erosion. A development effort was initiated to identify a material with a lower accelerator grid volumetric sputter erosion rate than molybdenum, but that could utilize the present NSTAR thruster grid design and fabrication techniques to keep development costs low, and perform as well as molybdenum optics. After comparing the sputter erosion rates of several atomic materials to that of molybdenum at accelerator voltages, titanium was found to offer a 45% reduction in volumetric erosion rates. to ensure that screen grid sputter erosion rates are not higher at discharge chamber potentials, titanium and molybdenum sputter erosion rates were measured at these potentials. Preliminary results showed only a slightly higher volumetric erosion rate for titanium, so that screen grid erosion is insignificant. A number of material, thermal, and mechanical properties were also examined to identify any fabrication, launch environment, and thruster operation issues. Several titanium grid sets were successfully fabricated. A titanium grid set was mounted onto an NSTAR 30 cm engineering model ion thruster and tested to determine optics performance. The titanium optics operated successfully over the entire NSTAR power range of 0.5 to 2.3 kW. Differences in impingement-limited perveances and electron backstreaming limits were found to be due to a larger cold gap for the titanium optics. Discharge losses for titanium grids were lower than those for molybdenum, likely due to a slightly larger titanium screen grid open area fraction. Radial distributions of beam current density with titanium optics were very similar to those with molybdenum optics at all power levels. Temporal electron backstreaming limit measurements showed that titanium optics achieved thermal equilibrium faster than molybdenum optics.
Author
Titanium; Ion Optics; Ion Engines

20000023237 NASA Glenn Research Center, Cleveland, OH USA
Test Results of a 200 W Class Hall Thruster
Jacobson, David, DYNACS Engineering Co., Inc., USA; Jankovsky, Robert S., NASA Glenn Research Center, USA; December 1999; 14p; In English; Joint Propulsion Conference, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 632-1B-1B
Report No.(s): NASA/TM-1999-209449; NAS 1.15:209449; AIAA Paper 98-3792; E-11941; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The performance of a 200 W class Hall thruster was evaluated. Performance measurements were taken at power levels between 90 W and 250 W. At the nominal 200 W design point, the measured thrust was 11.3 mN. and the specific impulse was 1170 s excluding cathode flow in the calculation. A laboratory model 3 mm diameter hollow cathode was used for all testing. The engine was operated on laboratory power supplies in addition to a breadboard power processing unit fabricated from commercially available DC to DC converters.
Author
Design Analysis; Rocket Engines; Rocket Thrust

20000024853 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Characterization of a Direct Gain Solar Thermal Engine
Alexander, Reginald A., NASA Marshall Space Flight Center, USA; Coleman, Hugh W., Alabama Univ., USA; October 1999; 19p; In English; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A thermal/fluids analysis of a direct gain solar thermal upper stage engine is presented and the results are discussed. The engine was designed and constructed at the NASA Marshall Space Flight Center for ground testing in a facility that can provide about 10 kilowatts of concentrated solar energy to the engine. The engine transfers energy to a coolant (hydrogen) that is heated and accelerated through a nozzle to produce thrust. For the nominal design values and a hydrogen flowrate of 2 lb./hr., the results of the analysis show that the hydrogen temperature in the chamber (nozzle entrance) reaches about 3800 F after 30 minutes of heating and about 3850 F at steady-state (slightly below the desired design temperature of about 4100 F. Sensitivity analyses showed these results to be relatively insensitive to the values used for the absorber surface infrared emissivity and the convection

coefficient within the cooling ducts but very sensitive to the hydrogen flowrate. Decreasing the hydrogen flowrate to 1 lb./hr. increases the hydrogen steady-state chamber temperature to about 4700 F, but also of course causes a decrease in thrust.
Author
Thermal Analysis; Solar Energy; Upper Stage Rocket Engines; Design Analysis; Mathematical Models

20000024922 NASA Glenn Research Center, Cleveland, OH USA
Testing of the Engineering Model Electrical Power Control Unit for the Fluids and Combustion Facility
Kimnach, Greg L., NASA Glenn Research Center, USA; Lebron, Ramon C., NASA Glenn Research Center, USA; Fox, David A., Sundstrand Aerospace, USA; December 1999; 14p; In English; 34th; Intersociety Energy Conversion Engineering, 2-6 Aug. 1997, Vancouver, British Columbia, Canada; Sponsored by Society of Automotive Engineers, Unknown
Contract(s)/Grant(s): RTOP 398-20-0C
Report No.(s): NASA/TM-1999-209637; E-11967; NAS 1.15:209637; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The John H. Glenn Research Center at Lewis Field (GRC) in Cleveland, OH and the Sundstrand Corporation in Rockford, IL have designed and developed an Engineering Model (EM) Electrical Power Control Unit (EPCU) for the Fluids Combustion Facility, (FCF) experiments to be flown on the International Space Station (ISS). The EPCU will be used as the power interface to the ISS power distribution system for the FCF's space experiments'test and telemetry hardware. Furthermore. it is proposed to be the common power interface for all experiments. The EPCU is a three kilowatt 12OVdc-to-28Vdc converter utilizing three independent Power Converter Units (PCUs), each rated at 1kWe (36Adc @ 28Vdc) which are paralleled and synchronized. Each converter may be fed from one of two ISS power channels. The 28Vdc loads are connected to the EPCU output via 48 solid-state and current-limiting switches, rated at 4Adc each. These switches may be paralleled to supply any given load up to the 108Adc normal operational limit of the paralleled converters. The EPCU was designed in this manner to maximize allocated-power utilization. to shed loads autonomously, to provide fault tolerance. and to provide a flexible power converter and control module to meet various ISS load demands. Tests of the EPCU in the Power Systems Facility testbed at GRC reveal that the overall converted-power efficiency, is approximately 89% with a nominal-input voltage of 12OVdc and a total load in the range of 4O% to 110% rated 28Vdc load. (The PCUs alone have an efficiency of approximately 94.5%). Furthermore, the EM unit passed all flight-qualification level (and beyond) vibration tests, passed ISS EMI (conducted, radiated. and susceptibility) requirements. successfully operated for extended periods in a thermal/vacuum chamber, was integrated with a proto-flight experiment and passed all stability and functional requirements.
Author
Electric Potential; Control Equipment; Functional Design Specifications; Power Converters

20000025040 DYNACS Engineering Co., Inc., Brook Park, OH USA
Scenario for Hollow Cathode End-Of-Life
Sarver-Verhey, Timothy R., DYNACS Engineering Co., Inc., USA; January 2000; 16p; In English; 26th; 26th International Electric Propulsion Conference, 17-21 Oct. 1999, Kitakyushu, Japan; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-98008; RTOP 477-72-10
Report No.(s): NASA/CR-2000-209420; NAS 1.26:209420; E-12063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent successful hollow cathode life tests have demonstrated that lifetimes can meet the requirements of several space applications. However, there are no methods for assessing cathode lifetime short of demonstrating the requirement. Previous attempts to estimate or predict cathode lifetime were based on relatively simple chemical depletion models derived from the dispenser cathode community. to address this lack of predicative capability, a scenario for hollow cathode lifetime under steady-state operating conditions is proposed. This scenario has been derived primarily from the operating behavior and post-test condition of a hollow cathode that was operated for 28,000 hours. In this scenario, the insert chemistry evolves through three relatively distinct phases over the course of the cathode lifetime. These phases are believed to correspond to demonstrable changes in cathode operation. The implications for cathode lifetime limits resulting from this scenario are examined, including methods to assess cathode lifetime without operating to End-of- Life and methods to extend the cathode lifetime.
Author
Hollow Cathodes; Life (Durability); Durability; Performance Tests

20000025199 Engineering Sciences, Inc., Huntsville, AL USA

Laser Lightcraft Performance ***Final Report, Mar. 1999 - Feb. 2000***

Chen, Yen-Sen, Engineering Sciences, Inc., USA; Liu, Jiwen, Engineering Sciences, Inc., USA; Wei, Hong, Engineering Sciences, Inc., USA; Mar. 02, 2000; 37p; In English; Original contains color illustrations

Contract(s)/Grant(s): NASA Order H-30951-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to establish the technical ground for modeling the physics of laser powered pulse detonation phenomenon. The principle of the laser power propulsion is that when high-powered laser is focused at a small area near the surface of a thruster, the intense energy causes the electrical breakdown of the working fluid (e.g. air) and forming high speed plasma (known as the inverse Bremsstrahlung, IB, effect). The intense heat and high pressure created in the plasma consequently causes the surrounding to heat up and expand until the thrust producing shock waves are formed. This complex process of gas ionization, increase in radiation absorption and the forming of plasma and shock waves will be investigated in the development of the present numerical model. In the first phase of this study, laser light focusing, radiation absorption and shock wave propagation over the entire pulsed cycle are modeled. The model geometry and test conditions of known benchmark experiments such as those in Myrabo's experiment will be employed in the numerical model validation simulations. The calculated performance data will be compared to the test data.

Author

Laser Outputs; Pulsed Lasers; Pulsed Radiation; Pulse Duration; Laser Propulsion; Computational Fluid Dynamics; Radiative Heat Transfer

20000025230 NASA Goddard Space Flight Center, Greenbelt, MD USA

Applying Contamination Modelling to Spacecraft Propulsion Systems Designs and Operations

Chen, Philip T., NASA Goddard Space Flight Center, USA; Thomson, Shaun, NASA Goddard Space Flight Center, USA; Woronowicz, Michael S., Swales Aerospace, USA; [2000]; 9p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2000-0461; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Molecular and particulate contaminants generated from the operations of a propulsion system may impinge on spacecraft critical surfaces. Plume depositions or clouds may hinder the spacecraft and instruments from performing normal operations. Firing thrusters will generate both molecular and particulate contaminants. How to minimize the contamination impact from the plume becomes very critical for a successful mission. The resulting effect from either molecular or particulate contamination of the thruster firing is very distinct. This paper will discuss the interconnection between the functions of spacecraft contamination modeling and propulsion system implementation. The paper will address an innovative contamination engineering approach implemented from the spacecraft concept design, manufacturing, integration and test (I&T), launch, to on- orbit operations. This paper will also summarize the implementation on several successful missions. Despite other contamination sources, only molecular contamination will be considered here.

Author

Propulsion; Propulsion System Configurations; Spacecraft Design; Spacecraft Propulsion; Spacecraft Contamination; Models; Rocket Engines

23
CHEMISTRY AND MATERIALS (GENERAL)

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

20000021090 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Water-Dispersible Polyurethane Coating Test Protocol ***Final Report, Oct. 1995 - Sep. 1997***

Miller, Christopher; Escarsega, John; Sep. 1999; 22p; In English

Report No.(s): AD-A369669; ARL-TR-2048; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Coatings Technology Team of the Polymers Research Branch has developed a water-reducible 180-g/L volatile organic compound (VOC) formulation that is also a chemical agent resistant coating (CARC). This report describes the substrates,

pretreatments, and primers to be used in comparative testing of the new formulation vs. current CARC. The tests and evaluation criteria will also be introduced. This report will be used as a reference for the data presentation reports that follow.
DTIC
Polyurethane Resins; Protective Coatings

20000021120 Swedish National Testing and Research Inst., Polymer Technology, Boras, Sweden
Durability of Poly (Vinyl Chloride)-Based Geomembranes in Aggressive Liquid Media
Jakubowicz, I., Swedish National Testing and Research Inst., Sweden; Johansson, U., Swedish National Testing and Research Inst., Sweden; Yarahmadi, N., Swedish National Testing and Research Inst., Sweden; 1999; 48p; In English
Report No.(s): PB99-174229; NORDTEST-TR-393; SP-RAPP-1997:31; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Mechanically unstressed PVC-based geomembranes, including welds, were immersed in three different test liquids which simulated common chemicals in transportation and waste deposit environments. The exposure were performed at three controlled temperatures in order to achieve an acceleration of degradation processes. The samples were characterized using tensile test, residual stability, infrared spectroscopy (FTIR), and determination of change in weight and dimensions.
NTIS
Polyvinyl Chloride; Liquids; Durability; Membranes

20000021268 Swedish Defence Research Establishment, Dept. of Guidance and Control, Materials and Underwater Sensors, Stockholm, Sweden
Conducting Polymers for Radar Absorbing Composites ***Topical Report***
Huu Duc, Julian Do, Swedish Defence Research Establishment, Sweden; Aug. 1998; ISSN 1104-9154; 52p; In English
Report No.(s): PB99-174799; FOA-R-98-00841-615-SE; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Polypyrrole (PPy) was deposited on glass fibre by oxidation (using FeCl3) in water. The influence of synthesis conditions on the conductivity of the fabrics, structure of the deposited layer, ageing, infrared and electromagnetic absorption of the fabrics was studied. Depending on synthetic conditions, the thickness of PPy-layers varied between 50 nm and microgram. The surface resistance ranged from 20 to 150,000 ohms per square. The use of 9,10-anthraquinone-2sulfonic acid as doping agent improved the adhesion between the layer and the glass fibre, conductivity and stability. Glass fibre fabrics were also coated with a new conducting polymer, PEDT/PSS simply by dipping it in a polymer solution. The IR reflectance of the coated fabrics with PPy and PEDT varied between 0.05 and 0.2 in the range 5000-500 cm(sup -1). The coated fabrics showed a very flat microwave absorption between 6-18 GHz with an attenuation down to -20 dB in transmission.
NTIS
Conducting Polymers; Anthraquinones; Polypyrroles; Electromagnetic Absorption; Reflectance

20000021313 National Inst. of Standards and Technology, Physical and Chemical Properties Div., Boulder, CO USA
Experimental Thermal Conductivity and Thermal Diffusivity Values for Neon and Mixtures of Neon and Nitrogen ***Final Report***
Perkins, R. A.; Roder, H. M.; Nov. 1999; 50p; In English
Report No.(s): PB2000-101379; NISTIR-5088; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The authors report new measurements of thermal conductivity and thermal diffusivity, obtained with a transient hot-wire apparatus, for neon and two mixtures of neon with nitrogen. The measurements were made at temperatures between 58 K and 303 K (ITS 90) with pressures between 0.1 MPa and 70 MPa. The data cover only the supercritical gas phase. The number of points reported for pure neon is 829, for the 75 mol % neon - 25 mol % nitrogen mixture, 204, and for the 50 mol % neon - 50 mol % nitrogen mixture, 188. Empirical thermal conductivity correlations are provided for neon and the two neon-nitrogen mixtures.
NTIS
Thermal Conductivity; Thermal Diffusivity; Nitrogen; Neon; Gas Mixtures

20000024890 NASA Glenn Research Center, Cleveland, OH USA
The Influence of Honing on the Wear of Ceramic Coated Piston Rings and Cylinder Liners
Radil, Kevin C., Army Research Lab., USA; February 2000; 12p; In English
Contract(s)/Grant(s): RTOP 523-18-13; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2000-209794; NAS 1.15:209794; ARL-TR-2089; E-12084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Reciprocating wear tests were performed to investigate the effects of honing on the wear of ceramic coated piston rings and cylinder liners. The baseline or control cases consisted of testing ceramic coated rings against ceramic coated liner specimens whose surfaces were ground and lapped smooth. A second series of tests were performed with liner specimens with base and plateau honed surfaces. Test conditions were chosen to simulate the temperatures, pressures, and boundary lubricated conditions present at top ring reversal in a conventional diesel engine. Wear factor comparisons between the baseline cases and the tests with the honed liner specimens indicate that honing alone is not sufficient to ensure an improvement in ring and liner wear.
Author
Honing; Ceramic Coatings

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COMPOSITE MATERIALS

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

20000021288 Lockheed Martin Vought Systems, Dallas, TX USA
Thermal Control Coatings for High Thermal Conductivity (K) Substrates ***Final Report, 9 Sep. 1995 - 30 Apr. 1999***
Reed, C. K.; Wright, J. M.; Jan. 1999; 286p; In English
Contract(s)/Grant(s): F33615-95-C-5028; AF Proj. 3946
Report No.(s): AD-A371604; AFRL-ML-WP-TR-1999-4031; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy
This program demonstrated and qualified the production and application of plasma sprayed thermal control oxide coatings onto high thermal conductivity substrates for spacecraft use. Ultrahigh purity oxide powders were successfully reproduced and transitioned to industry. Both an ultrahigh purity aluminum oxide (99.99%) and 86wt % aluminum oxide, 13 wt % zirconium oxide, 1 wt % yttrium oxide were produced. Plasma coatings were successfully applied to three substrates; K1100 graphite/carbon-carbon, K1100 graphite/cyanate ester, and 6061. The application of the ultrahigh purity oxide powders was optimized for minimum solar absorptance and for reproducibility. Standard Operating Procedures were prepared for plasma powder production and for plasma spray application. Beginning of life solar absorptance values of 0.14 to 0.19 were obtained by using blended oxide powders from multiple vendors. End of life solar absorptance values of .30 to .31 at 1000 ESH were obtained. A beginning of life solar absorptance value of 0.10 was obtained for the ultrahigh purity aluminum oxide. End of life solar absorptance values of 0.21 to 0.23 at 1000 ESH were obtained. Normal emittance values for the ultrahigh purity aluminum oxide was 0.833 and 0.829 for the blended oxide powders.
DTIC
Thermal Control Coatings; Thermal Conductivity; Substrates

20000021380 Clemson Univ., Center for Advanced Engineering Fibers and Films, SC USA
The Effect of Processing on the Structure and Properties of Carbon Fibers
Edie, D. D., Clemson Univ., USA; Carbon; 1998; ISSN 0008-6223; Volume 36, No. 4, pp. 345-362; In English
Contract(s)/Grant(s): N00014-95-1-1345; NSF OSR-91-08772; DAAG55-98-1-0023
Report No.(s): AD-A369950; ARO-37779.2-MS-DPS; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
Even though the same three process steps (fiber formation, stabilization, and carbonization) an used to produce both polyacrylonitrile-based (PAN-based) and pitch-based carbon fibers, their final properties differ significantly. This is a direct result of the precursors used to produce these two types of carbon fibers (polymeric versus liquid-crystalline). Liquid-crystalline materials readily orient during fiber formation, creating fibers with a high degree of molecular orientation, whereas polymers form fibers with less ordered, fibrillar structures. Carbon fibers with high degrees of molecular orientation exhibit high moduli and thermal conductivities. by contrast, carbon fibers with more discontinuous and less ordered, fibrillar structures tend to develop higher tensile strengths. Thus, it is not surprising that PAN-based carbon fibers have become the preferred reinforcement for high-strength composites. However, recent studies have proven that, by disrupting molecular orientation during fiber formation, the strengths of pitch-based carbon fibers can be improved significantly. Alternatively, linearizing the molecular orientation during fiber formation can yield pitch-based fibers with enhanced thermal conductivities. Researchers now realize that understanding and controlling structure during the fiber formation step is critical if the properties or carbon fibers are to be optimized. Controlling the structure during fiber formation can also permit milder conditions to be used during subsequent process steps. As a result, research into precursor fiber formation offers the best opportunity for improving properties and reducing production costs for both PAN-based and pitch-based carbon fibers.
Author
Carbon Fibers; Synthetic Fibers; Polyacrylonitrile

20000021517 Kentucky Univ., Dept. of Chemical and Materials Engineering, Lexington, KY USA
Carbon Nanotubules: Building Blocks for Nanometer-Scale Engineering ***Final Report, 1 Jan. 1997 - 31 Dec. 1999***
Sinnott, Susan B., Kentucky Univ., USA; [1999]; 7p; In English
Contract(s)/Grant(s): NAG2-1121; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The proposed work consisted of two projects: the investigation of fluid permeation and diffusion through ultrafiltration membranes composed of carbon nanotubules and the design and study of molecular transistors composed of nanotubules. I will outline the progress made on each project and also discuss additional projects, one of which is a continuation of work supported by an 1995-1996 NASA Ames Computer grant.
Author
Nanostructures (Devices); Mechanical Properties; Molecular Dynamics; Permeating; Diffusion; Carbon

20000021555 Institute of Industrial Technology TNO, Apeldoorn, Netherlands
Inventory of Possibility of a Laminate of Steel with Fibre Reinforced Composites for use in Marine Ships ***Final Report Inventarisatie Mogelijkheden van een Laminaat van Staal met Vezel Versterkte Kunstostof voor toepassing in Marineschepen***
Vuik, J., Institute of Industrial Technology TNO, Netherlands; Long, M. A., Institute of Industrial Technology TNO, Netherlands; Nov. 09, 1998; 16p; In Dutch
Contract(s)/Grant(s): A98/KM/102; TNO Proj. 24187-3069
Report No.(s): TD99-0382; TNO-MI-98-00590/VUI/VIS; Copyright; Avail: Issuing Activity

From discussion with the Netherlands Navy it appears there is a need for knowledge about the possibility of a laminate of steel with fibre reinforced composites for use in marine surface ships. This laminate is about 2 mm thick steel coated with a layer of fibre reinforced composites with a thickness of about 15 mm. In the sonar dome the strong deformation capacity of the steel can be used for energy absorption, in contrary to the present used fibre reinforced composites. From several consulted experts the following opinion about a double curved laminate of steel and fibre reinforced composites emerges: It may be possible to produce; It can withstand static loading due to differences in thermal expansion; Due to dynamic loading on the boundary of steel - fibre reinforced composites a problem can arise; De-lamination can occur at dynamic loading as in a sonar dome; Only visible inspection will be possible; and A limited damage can be repaired. An additional point in seawater is diffusion of water into the fibre reinforced composites to the boundary. This can cause corrosion, which can lead to de-lamination again.
Author
Fiber Composites; Reinforcing Fibers; Metal Fibers; Composite Materials; Laminates; Steels

20000021580 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Non-Polluting Composites Repair and Remanufacturing for Military Applications: An Environmental and Cost-Savings Analysis ***Final Report, Jan.-Dec. 1998***
Fink, Bruce K.; McKnight, Steven H.; Newton, Crystal H.; Gillespie, John W., Jr.; Palmese, Giuseppe R.; Dec. 1999; 103p; In English
Report No.(s): AD-A372539; ARL-TR-2139; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Polymer-matrix composite material and structural adhesive repair and manufacturing have significant environmental costs for Department of Defense (DOD) use. 'The principal issues for reducing environmental costs are (1) reducing hazardous waste by eliminating shelf-life limitations; (2) reducing nitrogen oxides (NOx) by replacing global heating of the part with localized heating; (3) reducing volatile organic compound (VOC) emissions by accelerated curing and containment; and (4) reducing production debris hazardous waste through processing step management Due to the wide range of applications and material systems, as well as scenarios spanning manufacturing and depot and field repair, a family of solutions is described that is expected to meet these needs. An environmental baseline is established by identifying hazardous materials from composite repair and manufacturing operations and estimating usage and waste The predicted reduction in hazardous waste is 78% for composite materials and 95% for adhesives. NOx and VOC emissions can be reduced by 100% and 50% by using the proposed techniques. Conservative environmental cost-savings estimates are developed for several potential DOD applications. These estimates indicate that the use of the proposed technologies for DOD systems would provide an annual savings of $15 billion (1997) for the year 2028.
DTIC
Matrix Materials; Polymer Matrix Composites; Hazardous Materials; Hazardous Wastes; Environment Management; Waste Management

20000024889 North Carolina Univ., Dept. of Physics and Astronomy, Chapel Hill, NC USA
Carbon Nanotubes Based Quantum Devices ***Final Report, 15 Aug. 1998 - 14 Aug. 1999***
Lu, Jian-Ping, North Carolina Univ., USA; [1999]; 1p; In English
Contract(s)/Grant(s): NCC2-5291; No Copyright; Avail: Issuing Activity; Abstract Only

This document represents the final report for the NASA cooperative agreement which studied the application of carbon nanotubes. The accomplishments are reviewed: (1) Wrote a review article on carbon nanotubes and its potentials for applications in nanoscale quantum devices. (2) Extensive studies on the effects of structure deformation on nanotube electronic structure and energy band gaps. (3) Calculated the vibrational spectrum of nanotube rope and the effect of pressure. and (4) Investigate the properties of Li intercalated nanotube ropes and explore their potential for energy storage materials and battery applications. These studies have lead to four publications and seven abstracts in international conferences.
CASI
Carbon; Electronic Structure; Vibrational Spectra; Nanostructures (Devices)

20000025066 NASA Langley Research Center, Hampton, VA USA
Parametric Study of the Behavior of Graphite/Epoxy Panels with Stiffener Terminations
Jegley, Dawn C., NASA Langley Research Center, USA; Journal of Aircraft; Nov. - Dec. 1999; Volume 36, No. 6, pp. 1048-1054; In English; 40th; Structures, Structural Dynamics and Materials, 12-15 Apr. 1999, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 99-1407; Copyright; Avail: Issuing Activity

The results of a parametric study examining six types of stiffener terminations for stiffened graphite/epoxy panels are presented. Stiffener blades are terminated by attaching to another blade, by tapering the stiffener height, by tapering the stiffener thickness, or by a combination of these methods. Stiffener flanges are also terminated abruptly or by tapering their thickness. Flange length is also varied. Both thin-skin panels and thick-skin panels re considered. Panels were analyzed with a nonlinear finite element analysis code to determine panel response and failure modes. Midplane axial and shear strains, surface strains, interlaminar strains, and failure predictions for the panels are discussed. These results indicate that the mechanism initiating failure is dependent on the stringer configuration of the panel. Interlaminar stresses and bending must be considered to predict the failure of thin-skin panels, and interlaminar stress, in-plane shear strains, and axial strains must be considered to predict the failure of thick-skin panels.
Author
Graphite-Epoxy Composites; Panels; Stiffening

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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.

20000021203 Army Chemical Center, Research and Technology Directorate, Edgewood Arsenal, MD USA
Vapor Pressure of VX ***Final Report, Jan.-Aug. 1999***
Buchanan, James H.; Buettner, Leonard C.; Butrow, Ann B.; Tevault, David E.; Nov. 1999; 21p; In English
Report No.(s): AD-A371297; ECBC-TR-088; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

O-ethyl-S-(diisopropylaminoethly) methyl phosphonothiolate (VX) vapor pressure has been measured using a modified ASTM method in which a carrier gas was slowly passed over the liquid phase, and the saturated effluent was analyzed. Data measured in the current work has extended the low end of the range of measured VX vapor pressures from 30 to -13 deg C, which represents well over two orders of magnitude lower VX vapor pressure than previously documented and provides a direct assessment of VX volatility over a majority of the ambient range for the first time.
DTIC
Vapor Pressure; Methyl Compounds

20000021217 NASA Glenn Research Center, Cleveland, OH USA
A Sectored-One-Dimensional Model for Simulating Combustion Instabilities in Premix Combustors
Paxson, Daniel E., NASA Glenn Research Center, USA; December 1999; 18p; In English; 38th; 38th Aerospace Sciences Meeting and Exhibit, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 523-26-13
Report No.(s): NASA/TM-1999-209771; NAS 1.15:209771; AIAA Paper 2000-0313; E-12051; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A one-dimensional, CFD based combustor simulation has been developed that exhibits self-excited, thermoacoustic oscillations in premixed combustor geometries that typically have large, abrupt changes in cross sectional area. The combustor geometry is approximated by dividing it into a finite number of one-dimensional sectors. Within each sector, the equations of motion are integrated numerically, along with a species transport and a reaction equation. Across the sectors, mass and energy are conserved, and momentum loss is prescribed using appropriately compatible boundary conditions that account for the area change. The resulting simulation and associated boundary conditions essentially represent a one-dimensional, multi-block technique. Details of the simulation code are presented herein. Results are then shown comparing experimentally observed and simulated operation of a particular combustor rig that exhibited different instabilities at different operating points. It will be shown that the simulation closely matched the rig data in oscillation amplitudes, frequencies, and operating points at which the instabilities occurred. Finally, advantages and limitations of the simulation technique are discussed.
Author
Computational Fluid Dynamics; Equations of Motion; Combustion Chambers; Combustion Stability; Thermal Instability; Premixed Flames

20000021218 Purdue Univ., West Lafayette, IN USA
Laser-Induced Fluorescence Measurements and Modeling of Nitric Oxide in Counterflow Diffusion Flames ***Final Report***
Ravikrishna, Rayavarapu V., Purdue Univ., USA; February 2000; 202p; In English
Contract(s)/Grant(s): NAG3-1782; NAG3-2251; RTOP 538-17-10
Report No.(s): NASA/CR-2000-209805; NAS 1.26:209805; E-12111; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The feasibility of making quantitative nonintrusive NO concentration ([NO]) measurements in nonpremixed flames has been assessed by obtaining laser-induced fluorescence (LIF) measurements of [NO] in counterflow diffusion flames at atmospheric and higher pressures. Comparisons at atmospheric pressure between laser-saturated fluorescence (LSF) and linear LIF measurements in four diluted ethane-air counterflow diffusion flames with strain rates from 5 to 48/s yielded excellent agreement from fuel-lean to moderately fuel-rich conditions, thus indicating the utility of a model-based quenching correction technique, which was then extended to higher pressures. Quantitative LIF measurements of [NO] in three diluted methane-air counterflow diffusion flames with strain rates from 5 to 35/s were compared with OPPDIF model predictions using the GRI (version 2.11) chemical kinetic mechanism. The comparisons revealed that the GRI mechanism underpredicts prompt-NO by 30-50% at atmospheric pressure. Based on these measurements, a modified reaction rate coefficient for the prompt-NO initiation reaction was proposed which causes the predictions to match experimental data. Temperature measurements using thin filament pyrometry (TFP) in conjunction with a new calibration method utilizing a near-adiabatic H2-air Hencken burner gave very good comparisons with model predictions in these counterflow diffusion flames. Quantitative LIF measurements of [NO] were also obtained in four methane-air counterflow partially-premixed flames with fuel-side equivalence ratios (phi(sub B)) of 1.45, 1.6, 1.8 and 2.0. The measurements were in excellent agreement with model predictions when accounting for radiative heat loss. Spatial separation between regions dominated by the prompt and thermal NO mechanisms was observed in the phi(sub B) = 1.45 flame. The modified rate coefficient proposed earlier for the prompt-NO initiation reaction improved agreement between code predictions and measurements in the region where prompt-NO dominates. Finally, LIF measurements of NO were obtained in counterflow diffusion flames at 2 to 5 atm. Comparisons between [NO] measurements and predictions show that the GRI mechanism underpredicts prompt-NO by a factor of two to three at all pressures. In general, the results indicate a need for refinement of the CH chemistry, especially the pressure-dependent CH formation and destruction reactions.
Author
Laser Induced Fluorescence; Nitric Oxide; Models; Measure and Integration; Counterflow; Diffusion Flames; Temperature Measurement

20000021314 Maryland Univ., Dept. of Fire Protection Engineering, College Park, MD USA
Flame Spread Model Progress: Enhancements and User Interface
Spearpoint, M. J.; Dillon, S. E.; Nov. 1999; 60p; In English
Report No.(s): PB2000-101376; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This report describes the enhancements made to the Quintiere's flame spread model (QFSM) based on worked published in the literature by other researchers. The height of the ignition source flame, its extension under a horizontal ceiling and the incident heat flux to a target material have been addressed. The results from the enhanced version of the model have been compared with

those obtained from an earlier version of the model and with experimental data. This report also briefly describes a user-friendly windows based front-end that has been developed for the enhanced version of the models. The interface can be used to read in existing model input files, create new input files, execute the main QFSM program and create simple on screen plots of the results. The front-end also includes an online help file that describes the various input parameters.
NTIS
Flame Propagation; Human-Computer Interface

20000021321 California Univ., San Diego, Center for Energy and Combustion Research, La Jolla, CA USA
Rate-Ratio Asymptotic Analysis of Non-Premixed Methane Flames
Bai, X. S., Lund Inst. of Tech., Sweden; Seshadri, K., California Univ., San Diego, USA; Combustion Theory Modeling; 1999; ISSN 1364-7830; Volume 3, pp. 51-75; In English
Contract(s)/Grant(s): DAAH04-95-1-0108
Report No.(s): AD-A369973; ARO-33896.6-EG; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

The asymptotic structure of laminar, non-premixed methane flames is analysed using a reduced four-step chemical-kinetic mechanism. Chemical reactions are presumed to take place in two layers: the inner layer and the oxidation layer. In the inner layer the fuel the fuel reacts with radicals and the main compounds formed are the intermediate species CO and H2. These intermediate species are oxidized in the oxidation layer. The structure of the oxidation layer is described by two second-order differential equations: one for CO and the other for H2. Two limiting cases are considered. At one limit the global step CO + H2O yields CO2 + H2 is presumed to maintain partial equilibrium everywhere in the oxidation layer except in a thin layer adjacent to the inner layer. At the other limit the steady-state approximation is introduced for H2 everywhere in the oxidation layer except in a thin layer adjacent to the inner layer. This limit, called 'slow CO oxidation', has not been analyzed previously. The structure of the inner layer is described by two second-order differential equations: one for the fuel and the other for the H radicals. This is a significant improvement over previous models in which either a steady-state approximation is introduced for the H radicals in the inner layer, or the reaction between the fuel and radicals is presumed to be very fast. The chainbreaking elementary reaction CH3 + H + M yields CH4 + M is found to have a significant influence on the structure of the inner layer and on the scalar dissipation rates at extinction. The influence of this reaction was either neglected in previous models or was included as a perturbation to the principal elementary reactions taking place to the leading order in the inner layer. Using the results of the asymptotic analysis the scalar dissipation runs at extinction are calculated at a pressure of 1 bar. They are found to agree well with those calculated numerically using a chemical-kinetic mechanism made up of elementary reactions.
Author
Asymptotes; Asymptotic Properties; Methane; Premixed Flames; Turbulent Flames

20000021381 California Univ., San Diego, Center for Energy and Combustion Research, La Jolla, CA USA
Structure and Extinction of Non-Premixed n-Heptane Flames
Seiser, R., California Univ., San Diego, USA; Truett, L., California Univ., San Diego, USA; Trees, D., California Univ., San Diego, USA; Seshadri, K., California Univ., San Diego, USA; Twenty-Seventh Symposium (International) on Combustion; 1998, pp. 649-657; In English; 27th; Combustion, 1998, Unknown; Sponsored by Combustion Inst., USA
Contract(s)/Grant(s): DAAH04-95-1-0108
Report No.(s): AD-A369955; ARO-33896.5-EG; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

An experimental and numerical study is performed to elucidate the structure and mechanisms of extinction of non-premixed n-heptane flames. Experiments are conducted on flames stabilized between two counterflowing streams. The fuel stream is a mixture of prevaporized n-heptane and nitrogen, and the oxidizer stream is a mixture of air and nitrogen. Concentration profiles of C7H16, O2, N2, CO2, CO, H2, CH4, C2H2, C2H4, C2H6, C3H8, C4-hydrocarbons, C5-hydrocarbons, and C6-hydrocarbons are measured. The measurements are made by removing gas samples from the flame using a quartz microprobe and analyzing the samples using gas chromatographs. The identity of the species is established using a mom selective detector. Temperature profiles am measured using a thermocouple. In addition, critical conditions of extinction am measured, giving the mass fraction of reactants as a function of the strain rate. Numerical calculations are performed using detailed chemistry to determine the flame structure and critical conditions of extinction at conditions identical to those used in the experiments. Calculated and measured flame structures am found to agree reasonably well; however, a small shift is observed between the calculated and measured temperature and concentration profiles. In general, the measured profiles am broader than the calculated profiles. At given values of the mass fraction of oxygen in the oxidizer stream, the calculated strain rates at extinction am noticeably higher than those measured. Experiments are also performed on non-premixed flames stabilized in the counterflowing configuration over a liquid pool of n-heptane. Critical conditions of extinction are measured. Numerical calculations are performed at conditions used in these experiments, and critical condition of extinction are obtained. At given values of the mass fraction of oxygen in the oxidizer

stream, the calculated strain rates at extinction are noticeably higher than those measured. The differences between the calculated and measured strain rates at extinction for the liquid pool flame are higher than for n-heptane-vapor flames.
Author
Extinction; Extinguishing; Premixed Flames; Turbulent Flames; Heptanes

20000021424 Florida Univ., Quantum Theory Project, Gainesville, FL USA
The Journal of Physical Chemistry A. Time-Dependent Quantum Molecular Dynamics Workshop, Brian Head, Utah, March 13-17, 1999. Volume 103, Number 47
Ohrn, Y.; Krause, J. L.; Nov. 25, 1999; 195p; In English
Contract(s)/Grant(s): N00014-99-1-0128
Report No.(s): AD-A372629; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
The proceedings of the workshop on Time Dependent Quantum Molecular Dynamics is presented.
DTIC
Time Dependence; Physical Chemistry; Molecular Dynamics

20000021474 Emory Univ., Dept. of Chemistry, Atlanta, GA USA
Carbon Powder and Fiber-Supported Polyoxometalate Catalytic Materials. Preparation, Characterization, and Catalytic Oxidation of Dialkyl Sulfides as Mustard (HD) Analogues
Gall, Robin Damico, Emory Univ., USA; Hill, Craig L., Emory Univ., USA; Walker, John E., Emory Univ., USA; Chemistry of Materials; 1996; ISSN 0897-4756; Volume 8, pp. 2523-2527; In English
Contract(s)/Grant(s): DAAH04-94-G-0419
Report No.(s): AD-A369864; ARO-32928.7-CH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
We report here a prototype material for the sustained catalytic decontamination of mustard analogues with the ultimate goal being the fabrication of self-decontaminating clothing. H5PV2Mo10O40 (1) can be supported on carbon cloths as well as powders, with 1/Ambersorb 572 being the best material (high catalytic activity and low desorption of 1). Evaluation of the desorption of 1 from six carbon supports indicates that the PPAN (pyrolyzed polyacrylonitrile) and Ambersorb 572 materials are highly effective at retaining the immobilized 1 even under catalytic conditions (oxidation of tetrahydrothiophene, THT, by tert-butyl hydroperoxide, TBHP). The products of THT oxidation, tetrahydrothiophene oxide (THTO) and tert-butyl alcohol (TBA), inhibit the reaction at high conversions; however, the catalytic activity can be restored by heating in a vacuum oven to 80 C. The reactivity for oxidation of four different thioethers by TBHP catalyzed by 1 supported on hydrophobic (Ambersorb 563) and hydrophilic (Ambersorb 572) carbon powders indicates that while the steric and electronic characteristics of the thioether substrates are a factor in reactivity, the hydrophobicity of the carbon support is not.
Author
Carbon Fibers; Polyacrylonitrile; Powder (Particles); Catalytic Activity; Catalysis

20000021563 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Capillary Electrophoresis of Mid-Spectrum Agents and Related Compounds *Final Report*
Degenhardt-Langelaan, C. E. A. M., Prins Maurits Lab. TNO, Netherlands; Kientz, Ch. E., Prins Maurits Lab. TNO, Netherlands; Wils, E. R. J., Prins Maurits Lab. TNO, Netherlands; August 1999; 43p; In English
Contract(s)/Grant(s): A93/KL/424; TNO Proj. 014.11024
Report No.(s): TD99-0143; PML-1999-A48; Copyright; Avail: Issuing Activity
The analysis of several toxins and bioregulators by capillary electrophoresis (CE) was investigated in order to explore the possibilities of this technique for the identification of mid-spectrum agents at the TNO Prins Maurits Laboratory. The toxins Staphylococcus Enterotoxin B (SEB) and its tryptic digest, Cholera toxin and two mu-Conotoxins were studied in addition to the bioregulators Substance P, Neurokinin A and Endothelin 1. The separation of a DNA marker sample was examined as an example. The effect of several experimental CE parameters such as buffer depletion, capillary cleaning, and dynamical coating of capillaries with polyethylene oxide (PEO) was determined. On-column concentration of analytes by electrostacking was carried out and sample preparation procedures such as desalting of solutions by molecular weight cut off ultrafiltration were investigated. As a result of the investigations, a good insight into the scope and limitations of CE is obtained. CE is considered useful for monitoring the processes of enzymatic digestion of large toxins and for the quality control of synthesized or commercially available peptides and proteins.
Author
Capillaries (Anatomy); Electrophoresis; Bioprocessing; Electroplating; Spectra

20000024839 NASA Marshall Space Flight Center, Huntsville, AL USA

Combustion Device Technology Development at Marshall Space Center

Hutt, John J., NASA Marshall Space Flight Center, USA; [1999]; 23p; In English; 49th; 49th Joint Propulsion Meeting, 14-16 Dec. 1999, Tucson, AZ, USA; Sponsored by Department of the Army, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA's plan for the next generation of launch vehicles requires enabling combustion devices technology Technology funding in recent years has been weak and scattered Strong complementary capability exists in other organizations. examples include: AFRL, GRC, academia, rocketdyne, and aerojet. MSFC would like to serve a key role in coordinating and industry wide plan MSFC in-house efforts will focus on "filling holes" that are appropriate for our capabilities and charter.

Author

Technology Utilization; Combustion

20000024919 Universities Space Research Association, Huntsville, AL USA

Physical Vapor Transport of Lead Telluride

Palosz, W., Universities Space Research Association, USA; [1997]; 17p; In English

Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mass transport properties of physical vapor transport of PbTe are investigated. Thermochemical analysis of the system and its implications for the growth conditions are discussed. The effect of the material preparation and pre-processing on the stoichiometry and residual gas pressure and composition, and on related mass flux is shown. A procedure leading to high mass transport rates is presented.

Author

Vapors; Transport Properties; Lead Tellurides; Lead Alloys

20000024929 NASA Glenn Research Center, Cleveland, OH USA

Solid Phase Luminescence of Several Rare Earth Ions on Ion-Exchange Films

Tanner, Stephen P., University of West Florida, USA; Street, Kenneth W., Jr., NASA Glenn Research Center, USA; December 1999; 18p; In English

Contract(s)/Grant(s): RTOP 910-30-11

Report No.(s): NASA/TM-1999-208838; E-11450; NAS 1.15:208838; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development and characterization of a novel ion-exchange film for solid-phase fluorometry and phosphorimetry is reported. This new cation-exchange material is suitable for spectroscopic applications in the ultraviolet and visible regions. It is advantageous because it, as a single entity, is easily recovered from solution and mounted in the spectrofluorometers. After preconcentration on the film, the luminescence intensity of lanthanide ions is several orders of magnitude greater than that of the corresponding solution, depending on the volume of solution and the amount of film. This procedure allows emission spectral measurements and determination of lanthanide ions at solution concentrations of is less than 5 (micro)g/L. The film may be stored for subsequent reuse or as a permanent record of the analysis. The major drawback to the use of the film is slow uptake of analyte due to diffusion limitations.

Author

Luminescence; Metal Ions; Ion Exchanging; Metal Films

20000025042 California Inst. of Tech., Keck Lab. of Engineering Materials, Pasadena, CA USA

AC Calorimetry and Thermophysical Properties of Bulk Glass-Forming Metallic Liquids ***Final Report***

Johnson, William L., California Inst. of Tech., USA; [2000]; 11p; In English

Contract(s)/Grant(s): NAG8-1182; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Thermo-physical properties of two bulk metallic glass forming alloys, Ti34Zr11Cu47Ni8 (VIT 101) and Zr57Nb5Ni12.6Al10CU15.4 (VIT 106), were investigated in the stable and undercooled melt. Our investigation focused on measurements of the specific heat in the stable and undercooled liquid using the method of AC modulation calorimetry. The VIT 106 exhibited a maximum undercooling of 140 K in free radiative cooling. Specific heat measurements could be performed in stable melt down to an undercooling of 80 K. Analysis of the specific heat data indicate an anomaly near the equilibrium liquidus temperature. This anomaly is also observed in y the temperature dependencies of the external relaxation time, the specific volume, and the surface tension; it is tentatively attributed to a phase separation in the liquid state. The VIT 101 specimen exhibited a small undercooling of about 50 K. Specific heat measurements were performed in the stable and undercooled melt. These various results

will be combined with ground based work such as the measurement of T-T-T curves in the electrostatic levitator and low temperature viscosity and specific heat measurements for modeling the nucleation kinetics of these alloys.
Author
Melts (Crystal Growth); Metallic Glasses; Supercooling; Thermophysical Properties; Microgravity; Crystal Growth; Spaceborne Experiments

20000025227 Naval Research Lab., Chemistry Div., Washington, DC USA
Thermal Insult Produced by the Residual Liquid Fuel in a Missile Hit Scenario ***Final Report***
Back, G. G., III; Burns, R. E.; Quellette, R. J.; Darwin, R. L.; Williams, F. W.; Dec. 23, 1999; 43p; In English; Prepared in collaboration with Hughes Associates, Inc., Baltimore, MD and GEO Centers, Inc., Rockville, MD.
Report No.(s): AD-A371880; NRL/MR/6180-99-8423; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Shipboard fires that result from residual liquid missile propellant were studied in this collaborative work with the Italian Navy. Penetration of a ship compartment by a shaped charge jet by itself, i.e., in the absence of entrained missile propellant, will not cause ignition of Class A materials due to the extremely short duration of the thermal pulse. However, hot fragments generated by the warhead could result in ignition if the fragments happened to land on easily ignited Class A material. If the shaped charge jet entrains missile propellant, there is a potential for a serious fire or explosion depending on the quantity of propellant ingested into the compartment and the volume of air available.
DTIC
Entrainment; Fragments; Liquid Fuels; Liquid Rocket Propellants; Guidance (Motion); Residues

26
METALS AND METALLIC MATERIALS

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

20000021159 Case Western Reserve Univ., Materials Science and Engineering, Cleveland, OH USA
Monolithic Cu-Cr-Nb Alloys for High Temperature, High Heat Flux Applications, ***1 Nov. 1999 - 31 Oct. 2000***
Ellis, David L., Case Western Reserve Univ., USA; Locci, Ivan E., Case Western Reserve Univ., USA; Michal, Gary M., Case Western Reserve Univ., USA; Humphrey, Derek M., Case Western Reserve Univ., USA; October 1999; 6p; In English
Contract(s)/Grant(s): NCC3-463; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Work during the prior four years of this grant has resulted in significant advances in the development of Cu-8 Cr4 Nb and related Cu-Cr-Nb alloys. The alloys are nearing commercial use in the Reusable Launch Vehicle (RLV) where they are candidate materials for the thrust cell liners of the aerospike engines being developed by Rocketdyne. During the fifth and final year of the grant, it is proposed to complete development of the design level database of mechanical and thermophysical properties and transfer it to NASA Glenn Research Center and Rocketdyne. The database development work will be divided into three main areas: Thermophysical Database Augmentation, Mechanical Testing and Metallography and Fractography. In addition to the database development, work will continue that is focussed on the production of alternatives to the powder metallurgy alloys currently used. Exploration of alternative alloys will be aimed at both the development of lower cost materials and higher performance materials. A key element of this effort will be the use of Thermo-Calc software to survey the solubility behavior of a wide range of alloying elements in a copper matrix. The ultimate goals would be to define suitable alloy compositions and processing routes to produce thin sheets of the material at either a lower cost, or, with improved mechanical and thermal properties compared to the current Cu-Cr-Nb powder metallurgy alloys.
Author
Product Development; Powder Metallurgy; Mechanical Properties; Cost Reduction; Copper; Augmentation; Alloying; Chromium; Niobium

20000021204 Nebraska Univ., Lincoln, NE USA
Size and Shape Effects in Shrinking Submicron Magnetic Memory and Logic ***Final Report, 15 Jun. 1996-30 Nov. 1999***
Robertson, Brian W.; Dowben, Peter A.; Nov. 30, 1999; 12p; In English
Contract(s)/Grant(s): N00014-96-1-0967; Proj-96PR06441-00
Report No.(s): AD-A371285; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research is based on radiation-induced selective area fabrication (using metallocenes) of large arrays of micrometer sub-micrometer scale ferromagnetic features and on magnetic characterization as a function of size and shape. With 100 keV electrons we fabricated highly uniform 8nm features. With light we fabricated many sizes and shapes of identical

micrometer-scale magnetic features (Ni, Fe, Co, CrO2, and Co/Pd multilayers) in large arrays, quickly, cleanly and at ambient temperatures. We used alternating gradient force magnetometry, MFM and MOKE and showed that in-plane magnetization depends on feature size and shape. Coercivities are higher for bar-shaped Ni features than for 4-fold or nearly circularly symmetric ones, but less than predicted. Pinning contributes little to coercivity in multidomain Ni features with low remanence. Growth conditions affect microstructure substantially but influence coercivity much less than patterning does, even on the micrometer-scale. We are now modeling Co/Pd multilayer arrays, characterizing reversal dynamics, and mapping magnetic features.
DTIC
Magnetic Fields; Ferromagnetic Materials; Ferrocenes; Magnetic Storage; Research; Mathematical Logic; Shapes; Microstructure

20000021284 Carnegie-Mellon Univ., Pittsburgh, PA USA
Titanium Carbosulfides and the Fracture Toughness of Ultra High Strength Steels ***Final Report***
Garrison, Warren M., Jr.; Nov. 1999; 64p; In English
Contract(s)/Grant(s): DAAH04-93-G-0083
Report No.(s): AD-A371454; ARO-30912.1-MS; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The objectives of this work were to calculate from first principles the work of adhesion associated with the steel-MnS and steel-Ti2CS interfaces and to examine with transmission electron microscopy void nucleation at particles of MnS and particles of Ti2CS in steel. The motivation for this work was the observation that gettering sulfur as Ti2CS rather than as MnS leads to doubling and even tripling of the fracture toughness of some ultra-high strength steels and that these improvements in toughness were believed to be due to particles of Ti2CS being much more resistant to void nucleation than particles of MnS. The results are as follows. Using the LKKR approach the bulk properties and surface energies of MnS and F.C.C. iron were calculated as was the interface energy of a MnS-steel interface. With these the results the work of adhesion for this interface was determined. The bulk properties of Ti2CS were determined but we were unable to obtain reasonable results for a Ti2CS-steel interface. The investigations of void nucleation at particles of MnS and Ti2CS in two different heats of an austenitic 0.07/30Ni steel were surprising. In this material it was found that voids were first nucleated at both inclusion types at strains as low as 0.20. It had been expected that voids would be first nucleated at the particles of MnS at these low strains but that voids would not be observed at the particles of Ti2CS until the strains had exceeded at least one.
DTIC
Titanium; High Strength Steels; Fracture Strength

20000021324 University of Southern California, Dept. of Materials Science, Los Angeles, CA USA
An Examination of a Substructure-Invariant Model for the Creep of Metal Matrix Composites
Li, Yong, University of Southern California, USA; Langdon, Terence G., University of Southern California, USA; Materials Science and Engineering. A: Structural Materials: Properties, Microstructure and Processing; 1999; ISSN 0921-5093; Volume A265, pp. 276-284; In English
Contract(s)/Grant(s): DAAH04-96-1-0332
Report No.(s): AD-A370100; ARO-3439.37-MS; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
The creep behavior of metal matrix composites may be analyzed using two different approaches: (1) by assuming flow is controlled by creep of the matrix material so that the true stress exponent, n, is approx. 3 or approx. 5, or (2) by invoking a substructure-invariant model requiring that n = 8. A detailed analysis of published creep data for aluminum-based composites suggests that the substructure-invariant model is untenable because it leads consistently to activation energies for creep which are higher than the value anticipated for lattice self-diffusion in aluminum.
Author
Creep Analysis; Metal Matrix Composites; Mathematical Models; Substructures; Creep Properties

20000021426 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA
Recommendations and Requirements for Welding and Inspection of Titanium Piping for U.S. Navy Surface Ship Applications
Wells, Michael E.; Richardson, Jim; Sep. 1999; 68p; In English
Report No.(s): AD-A372669; CARDIVNSWC-TR-61-98-18; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The information contained in this report is intended to assist both Navy and shipyard/contractor personnel engaged in the welding and inspection of commercially pure titanium seawater piping systems for U.S. Navy surface ships. This report provides recommendations, requirements and guidance information on quality control, materials, welding and inspection for fabrication

of titanium pipe welds. The fabrication requirements contained in this report are taken from NAVSEA technical publication S9074-AR-GIB-010/278 Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels. The mandatory requirements, as indicated by the word ”shall,” are considered to be the minimum acceptable for first quality workmanship. Recommendations and guidance information is not mandatory. The contents of this report are drawn from many sources and have been selected to complement numerous NAVSEA publications without in any way modifying those documents.
DTIC
Gas Tungsten Arc Welding; Heat Affected Zone; Temperature Effects; Titanium; Pipes (Tubes)

20000021529 University of Southern California, Dept. of Materials Science, Los Angeles, CA USA
Creep Properties of Metal Matrix Composites: An Examination of Recent Developments
Li, Yong, University of Southern California, USA; Langdon, Terence G., University of Southern California, USA; Recent Research Developments in Materials Science; 1998; Volume 1, pp. 235-242; In English
Contract(s)/Grant(s): DAAH04-96-1-0332
Report No.(s): AD-A370064; ARO-34391.31-MS; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
Recent developments in interpreting the creep of metal matrix composites are summarized. These developments are associated primarily with the presence of a threshold stress and the interpretation of the rate-controlling creep process. The analysis demonstrates that creep in controlled by the deformation occurring in the matrix material.
Author
Creep Properties; Metal Matrix Composites

20000025222 California Univ., Dept. of Chemical Engineering and Materials Science, Davis, CA USA
Effects of Thermal and Mechanical Processing on Microstructures and Desired Properties of Particle-Strengthened Cu-Cr-Nb Alloys
Anderson, Kenneth Reed, California Univ., USA; February 2000; 194p; In English
Contract(s)/Grant(s): RTOP 523-61-13
Report No.(s): NASA/CR-2000-209812; NAS 1.26:209812; E-12121; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
Ternary Cu-Cr-Nb alloys, particularly Cu-8 Cr-4 Nb (in at.%), have demonstrated good thermal stability as well as high strength and conductivity at elevated temperatures. The initial powder material has a bimodal size distribution of Cr2Nb precipitates. Primary Cr2Nb precipitates are approx. 1 micron, and secondary Cr2Nb particles are 30-200 nm. The particle coarsening was analyzed and found to follow LSW-type behavior, This study provides a detailed examination of the stability and strengthening effects of Cr2Nb particles. This investigation also revealed that the primary particles provide direct grain boundary pinning and indirect grain boundary strengthening but virtually no Orowan strengthening. The secondary particles found within grains do provide Orowan strengthening. For extruded material, grain bound-ary strengthening (Hall-Petch effect) accounts for two-thirds of the strength with Orowan effects contributing the remainder. The proven advantages of Cu-Cr-Nb were the motivation to improve these attributes via microstructural refinement. Mechanical milling (MM) of Cu- 4 Cr-2 Nb and Cu-8 Cr-2 Nb produced an increase in hot pressed Vickers hardness of 122% and 96%, respectively. The increase in hardness was more due to Cu grain-size refinement than to Cr,,Nb refinement. This study also demonstrated enhanced stability of MM Cu-4 Cr-2 Nb. Hot pressed 4 h milled Cu-4 Cr-2 Nb experienced only a 22% drop in hardness when annealed at 1273 K for 50 h versus a 30% drop for extruded Cu-8 Cr-4 Nb. The goal of improving the strength and stability of Cu-4 Cr-2 Nb to better than such properties for as- extruded Cu-8 Cr-4 Nb has been met. In addition, a figure-of-merit (FOM) coupling hardness and thermal conductivity was maximized for the case of 4 h milled Cu-4 Cr-2 Nb material. Overall, Cu-Cr-Nb alloys not only possess high strength, conductivity and thermal stability but also can be further developed to improve strength and stability.
Author
Microstructure; Thermal Stability; Thermal Conductivity; Mechanical Properties; Copper; Chromium; Niobium; Ternary Alloys; Hall Effect

20000025251 Florida State Dept. of Transportation, Gainesville, FL USA
Time to Corrosion of Reinforcing Steel in Concrete Containing Calcium Nitrite ***Final Report, Jun. 1996 - Feb. 1998***
Powers, R. G.; Sagues, A. A.; Cerlanek, W. D.; Kasper, C. A.; Li, L.; Oct. 1999; 50p; In English
Report No.(s): PB2000-102363; No Copyright; Avail: National Technical Information Service (NTIS)
In 1996, the Florida Department of Transportation received 18 slabs from the Federal Highway Administration. These slabs were cast in 1980 using predetermined amounts of calcium nitrite in chloride-contaminated reinforced concrete. These specimens

were compared to reinforced slabs with no admixed calcium nitrite. The upper and lower steel mats were connected and remained connected until 1996. Various tests were conducted on these slabs until June 1987, after which all testing terminated and the slabs remained outdoors. In 1996, the upper and lower reinforcing mats were disconnected. Prior to commencement of testing, the slabs were conditioned with water daily for two weeks. At the conclusion of testing, the slabs were conditioned with water daily for two weeks. At the conclusion of all nondestructive testing, the slabs were autopsied to assess the condition of the reinforcing steel. The findings of the study seem to indicate that calcium nitrite is effective in slowing the onset of corrosion in chloride-contaminated reinforced concrete as long was the ration of chloride to nitrite does not exceed 0.9.
NTIS
Corrosion; Reinforcing Materials; Steels; Concretes; Slabs; Calcium Chlorides; Nitrites; Nondestructive Tests

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NONMETALLIC MATERIALS

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

20000021151 Rochester Univ., Dept. of Chemical Engineering, NY USA
Self-Assembly of Rod-Coil Block Copolymers
Jenekhe, S. A., Rochester Univ., USA; Chen, X. L., Rochester Univ., USA; Aug. 16, 1999; 4p; In English
Contract(s)/Grant(s): N00014-94-1-0540
Report No.(s): AD-A366979; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Block copolymer architectures containing both rigid-rod and flexible-coil blocks have novel self-organizing features and functional properties not possible with coil-coil architectures, We describe the self-assembly of new rod-coil diblock, rod- coil-rod triblock, and coil-rod-coil triblock copolymers from solution and the resulting discrete and periodic mesostmctares with sizes in the 100 nanometer to 200 micrometer range. For example, hollow microspheres, cylindrical microtubules, disc- like lamellae, and doughnut shaped discrete objects self-organized from polyquinoline-b-polystyrene diblocks in a selective solvent for the polyquinolineLA. However, the same rod-coil diblock copolymers in a selective solvent for the polystyrene form hollow spheres which self-order into periodic mesoporous materials B.
DTIC
Block Copolymers; Cylindrical Bodies; Microballoons; Rods

20000021154 Rochester Univ., Dept. of Chemical Engineering, NY USA
Tunable Multicolor Electroluminescent Polymer Devices for Full Color Displays
Jenekhe, Samson A., Rochester Univ., USA; Zhang, Xuejun, Rochester Univ., USA; Aug. 16, 1999; 4p; In English
Contract(s)/Grant(s): N00014-94-1-0540
Report No.(s): AD-A366990; TR-49; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Efficient light emitting diodes (LEDs) of various colors and suitable methods of their pixelation are essential to incorporating polymer LEDs into full color display systems. We have developed polymer/polymer heterojunction LEDs that exhibit multicolor emission which is tunable by the bias voltage. These LEDs are based on poly(p-phenylenevinylene) (PPV)/n-type polymer structures. ITO/PPV/polyquinoiine/Al diodes fabricated under ambient air environment had a turn-on voltage of 3.5 V, luminance levels of over 800 cd/sq m, and efficiencies of up to 1%. Such devices, for example, reversibly switch colors (red -- yellow --green) in the 5-12 V range, facilitating easy pixelation. Origin of the color tunability will be discussed.
DTIC
Electroluminescence; Light Emitting Diodes; Heterojunctions; Fabrication; Quinoline; Display Devices

20000021155 Rochester Univ., Dept. of Chemical Engineering, NY USA
Electroluminescence and Photophysical Properties of Polyquinolines
Zhang, Xuejun, Rochester Univ., USA; Shetty, Ashok S., Rochester Univ., USA; Jenekhe, Samson A., Rochester Univ., USA; Aug. 16, 1999; 39p; In English
Contract(s)/Grant(s): N00014-94-1-0540
Report No.(s): AD-A366991; TR-48; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The electroluminescence and photophysical properties of a series of eleven polyquinolines were investigated and used to explore the effects of molecular and supramolecular structures on the light-emitting properties of polymers. Thin films of the polyquinolines have photoluminescence quantum yields between 2 and 30% and unusually long excited state lifetimes of 2.4 to

5.2 ns. Electroluminescence colors spanning blue, green, yellow, orange, and red were obtained through regulation of the molecular and supramolecular structures of the excimer- and aggregate-forming polyquinolines. ITO/hole transport layer/polyquinoline/Al light-emitting diodes fabricated and evaluated in air had electroluminescence quantum efficiencies between 0.02 and 1% and luminance levels of up to 280 cd/sq m at a current density of 100 mA/sq cm. The electroluminescence efficiency approximately scaled linearly with the photoluminescence quantum yield. Favorable reaction at the aluminum/polyquinoline interface is proposed to account for the efficient election injection and device performance in spite of the large (1.5-1.9 eV) energetic barrier to electron injection. These results provide new insights into the design of efficient light-emitting polymer materials and devices for optoelectronic applications.
DTIC
Electroluminescence; Quinoline; Physical Properties; Thin Films; Light Emitting Diodes; Fabrication; Polymers

20000021224 NASA Glenn Research Center, Cleveland, OH USA
Modeling the Oxidation Kinetics of Continuous Carbon Fibers in a Ceramic Matrix
Halbig, Michael C., Army Research Lab., USA; Cawley, James D., Case Western Reserve Univ., USA; January 2000; 12p; In English; 23rd; Composites, Advanced Ceramics, Materials and Structures, 25-29 Jan. 1999, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA
Contract(s)/Grant(s): RTOP 242-82-77; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2000-209651; NAS 1.15:209651; ARL-TR-2095; E-12005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A finite difference model has been developed and was used to study the oxidation kinetics of carbon fibers exposed by the presence of a through-thickness matrix crack in a ceramic matrix composite. Air was the environment of interest so that the model could be compared to experimental testing. The limiting steps of diffusion controlled and reaction controlled kinetics were investigated by changing the value of the simulated temperature which, in turn corresponds to a change in the diffusion coefficient and reaction rate constant. The reaction rates for the oxidation of carbon fibers were compared to theoretical values and oxidation trends predicted by the model were compared to experimental trends.
Author
Carbon Fibers; Ceramic Matrix Composites; Oxidation; Reaction Kinetics; Mathematical Models

20000021226 NASA Glenn Research Center, Cleveland, OH USA
The Effect of Interface Roughness and Oxide Film Thickness on the Inelastic Response of Thermal Barrier Coatings to Thermal Cycling
Pindera, Marek-Jerzy, Virginia Univ., USA; Aboudi, Jacob, Tel-Aviv Univ., Ramat-Aviv, Israel; Arnold, Steven M., NASA Glenn Research Center, USA; December 1999; 40p; In English
Contract(s)/Grant(s): NAG3-1377; NAG3-2252; RTOP 523-31-13
Report No.(s): NASA/TM-1999-209770; NAS 1.15:209770; E-12026; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of interfacial roughness and oxide film thickness on thermally-induced stresses in plasma-sprayed thermal barrier coatings subjected to thermal cycling are investigated using the recently developed higher-order theory for functionally graded materials. The higher-order theory is shown to be a viable alternative to the finite-element approach, capable of modeling different interfacial roughness architectures in the presence of an aluminum oxide layer and capturing the high stress gradients that occur at the top coat/bond coat interface. The oxide layer thickness is demonstrated to have a substantially greater effect on the evolution of residual stresses than local variations in interfacial roughness. Further, the location of delamination initiation in the top coat is predicted to change with increasing oxide layer thickness. This result can be used to optimize the thickness of a pre-oxidized layer introduced at the top coat/bond coat interface in order to enhance TBC durability as suggested by some researchers. The results of our investigation also support a recently proposed hypothesis regarding delamination initiation and propagation in the presence of an evolving bond coat oxidation, while pointing to the importance of interfacial roughness details and specimen geometry in modeling this phenomenon.
Author
Interfaces; Oxide Films; Thickness; Surface Roughness; Temperature Effects; Stress Distribution; Film Thickness

20000021273 NASA Glenn Research Center, Cleveland, OH USA
Durability of Ceramic Matrix Composites in Combustion Environments
Robinson, Raymond C., DYNACS Engineering Co., Inc., USA; Smialek, James L., NASA Glenn Research Center, USA; [1999]; 2p; In English; 196th, 17-22 Oct. 1999, HI, USA; Sponsored by Electrochemical Society, USA

Contract(s)/Grant(s): RTOP 537-04-22; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

SiO2 scale volatility and the resulting recession of SiC has been previously identified for CVD, as well as sintered, SiC and Si3N4 materials. Linear weight loss and surface recession of SiC was observed as a result of SiO2 volatility for both fuel-lean and fuel-rich gas mixtures. A strong Arrhenius temperature dependence exist and parametric studies using multiple linear regression were used to develop recession relationships as a function of e(sup -Q/RT) central dot P(sup X)V(sup y) for both lean and rich combustion conditions. Recession of 0.2 - 2.0 micron/hr is predicted for typical combustion conditions at 1200 - 1400 C, with a somewhat higher absolute recession rate and activation energy for rich combustion versus lean.

Author

Durability; Ceramic Matrix Composites; Combustion; Silicon Dioxide

20000021285 Indian Inst. of Science, Dept. of Metallurgy, Bangalore India

The Synthesis, Processing, Deformation and Failure of Superplastic Nanocrystalline Ceramic Composites ***Final Report, 1 Dec. 1995 - 30 Nov. 1997***

Chokshi, Atul H.; Jayaram, Vikram; Dec. 14, 1999; 23p; In English

Contract(s)/Grant(s): F49620-96-1-0022

Report No.(s): AD-A371595; AOARD-954003; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Commercially available nanocrystalline 3 mol% yttria stabilized tetragonal zirconia powders with a crystallite size of is less than 40 nm were processed using a colloidal technique. Essentially, the powders were dispersed in de-ionized water, and the pH of the solution was adjusted to approx. 2 to disperse the powders. The solution was ultrasonicated and then pressure filtered to produce a green body with a relative density of approx. 50%. The densification and grain growth characteristics of zirconia were examined during the free sintering and sinter-forging (sintering with the application of a compressive uniaxial stress without any lateral constraints) at temperatures in the range of approx. 1600 to 1750 K. It was demonstrated that it is possible to produce fully dense compacts with a grain size of approx. 175 nm using this technique. During sinter-forging, both densification and creep processes occur simultaneously; the measurement of density and axial strain enable to separation of the kinetics of the two processes. It was shown that deformation during densification occurs by an identical process as in fully dense materials (mainly grain boundary sliding). Furthermore, the differences in the stress exponents for creep and densification indicated that densification was not controlled directly by deformation.

DTIC

Ceramic Matrix Composites; Synthesis (Chemistry); Deformation; Failure

20000021418 Emory and Henry Coll., Dept. of Chemistry, Emory, VA USA

HPLC Characterization of Phenol-Formaldehyde Resole Resin Used in Fabrication of Shuttle Booster Nozzles ***Final Report, 5 Jun. 1997 - 4 Jun. 1998***

Young, Philip R., Emory and Henry Coll., USA; Jul. 26, 1999; 26p; In English

Contract(s)/Grant(s): NAG1-1943; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A reverse phase High Performance Liquid Chromatographic method was developed to rapidly fingerprint a phenol-formaldehyde resole resin similar to Durite(R) SC-1008. This resin is used in the fabrication of carbon-carbon composite materials from which Space Shuttle Solid Rocket Booster nozzles are manufactured. A knowledge of resin chemistry is essential to successful composite processing and performance. The results indicate that a high quality separation of over 35 peaks in 25 minutes were obtained using a 15 cm Phenomenex LUNA C8 bonded reverse phase column, a three-way water-acetonitrile-methanol nonlinear gradient, and LTV detection at 280 nm.

Author

Liquid Chromatography; Phenolic Resins; Characterization

20000021435 Drexel Univ., Dept. of Materials Engineering, Philadelphia, PA USA

Structure Property Relationships in Ti3SiC2 ***Final Report, 1 Mar. 1998-30 Nov. 1998***

Barwoum, M. W.; Farber, L.; Levin, I.; Nov. 1999; 23p; In English

Contract(s)/Grant(s): F49620-98-1-0314; AF Proj. 2306

Report No.(s): AD-A372428; AFRL-SR-BL-TR-00-0012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The dislocation structure of a typical low angle boundary associated with a kink band in a sample of Ti3SiC2 deformed at room temperature was studied by HRTEM. The boundary had both tilt and twist components. to account for both, the boundary was interpreted to be composed of parallel, alternating, mixed perfect dislocations with two different Burger's vectors lying in the basal plane at an angle of 120 degrees relative to one another. The boundary twist was provided by having an excess of one

type of dislocation. The hitherto unreported structure of a low-angle boundary is attributed to the fact that all dislocations are confined to the basal planes.
DTIC
Polycrystals; Plastic Deformation; Titanium Compounds; Silicon Carbides

20000021436 California Univ., Dept. of Mechanical Engineering, Berkeley, CA USA
Determination of the Mechanical Properties of Polycrystalline Silicon for MEMS ***Final Report, 1 Mar. 1997-31 Mar. 1998***
Johnson, George C.; Dec. 1999; 7p; In English
Contract(s)/Grant(s): F49620-97-1-0364; AF Proj. 2302
Report No.(s): AD-A372431; AFRL-SR-BL-TR-00-0010; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research supported under this grant was part of a multi-institution round-robin experiment to determine the elastic modulus and fracture strength of a common material used in microelectromechanical systems (MEMS). Research teams at four institution - Johns Hopkins University, California Institute of Technology, Experiment/Failure Analysis Associates and the University of California, Berkeley - designed unique devices for determining the material properties of interest. All four designs were then fabricated on using the Multi-User MEMS Processes (MUMPs) at MCNC, Research Triangle Park, NC. MUMPs is regularly scheduled polysilicons surface micromachining fabrication service. Specimens were produced on centimeter-square dies at adjacent locations on the wafers. The specimens tested were from the MUMPs 19 and MUMPs 21 runs. Following fabrication, the structures were released and tested at each individual facility. Results were compared at the Spring, 1998 meeting of the Materials Research Society, with the paper published in the MRS Proceedings Volume 518.
DTIC
Mechanical Properties; Microelectromechanical Systems; Polycrystals; Silicon

20000021502 Universities Space Research Association, Huntsville, AL USA
Surface Texture and Structure of ZnO Films Synthesized by Off-Axis Sputtering Deposition
Zhu, Shen, Universities Space Research Association, USA; Su, Ching-Hua, Alabama Univ., USA; Lehoczky, Sandor L., Alabama Univ., USA; George, M. A., Alabama Univ., USA; Lowndes, D. H., Oak Ridge National Lab., USA; [1999]; 1p; In English
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Morphology and structure of ZnO films deposited on (0001) sapphire and glass substrates by off-axis sputtering are investigated at various temperatures and pressures. All films show highly textured structures on glass substrates and epitaxial growth on sapphire substrates. The full width at half maximum of theta rocking curves for epitaxial films is less than 0.5 degrees. In textured films, it rises to several degrees. The trend of surface textures in films grown at low pressures is similar to those grown at high temperatures. A morphology transition from large well-defined hexagonal grains to flat surface was observed at a pressure of 50 mtorr and temperature of 550 C. The experiment results are explained by the transport behavior of depositing species.
Author
Morphology; Sputtering; Substrates; Zinc Oxides; Thin Films

20000021531 State Univ. of New York, Dept. of Chemistry, Stony Brook, NY USA
Nanostructures of Polyelectrolyte Gel-Surfactant Complexes
Zhou, Shui-Qin, State Univ. of New York, USA; Yeh, Feng-Ji, State Univ. of New York, USA; Burger, Christian, Max-Planck-Inst. fuer Kolloid- und Grenzflaechenforschung, Germany; Chu, Benjamin, State Univ. of New York, USA; Journal of Polymer Science. Part B: Polymer Physics; 1999; ISSN 0887-6266; Volume 37, pp. 2165-2172; In English
Contract(s)/Grant(s): DAAG55-97-1-0022; NSF DMR-96-12386
Report No.(s): AD-A370047; ARO-36485.4-CH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Small-angle X-ray scattering was used to investigate the nanostructures of complexes formed by slightly crosslinked anionic copolymer gels of poly(sodium methacrylate-co-N-isopropylacrylamide) [P(MAA/NICPAM)] with cetyltrimethylammonium bromide (CTAB), and didodecyldimethylammonium bromide (DDAB), respectively, at room temperature (approx. 23 C). Several highly ordered supramolecular structures were observed in the polyelectrolyte gel-surfactant complexes. In P(MAA/NIPAM)-CTA systems, in sequence with decreasing charge density of the P(MAA/NIPAM) copolymer chains, structures of the Pm3n space group cubic, face-centered cubic close packing of spheres, and hexagonal close packing of spheres were determined at a charge content of greater than 75, 67, and 50%, respectively. The spheres and rods in these structures were the spherical and cylindrical micelles formed by the self-assembly of CTA cations with their paraffin chains inside. Both the aggregation number and the size of the micelles decreased with a decreasing charge-density of the copolymer chains. in the P(MAA/ NIPAM)-DDA systems, the bilayer lamellar structures formed at charge contents less than or equal to 75% transferred to bicontinuous cubic structures of the Ia3d space group at charge contents of 50-67%. The rods in the Ia3d cubic structures were

formed by the self-assembly of double-tailed DDA cations with polar moieties inside. The formation of these highly ordered structures were driven by both electrostatic and hydrophobic interactions of the charged copolymer chains/surfactants and the surfactants/surfactants inside the charged gels. The structures became less ordered by further decreasing the charge content of the P(NAA/NIPAM) chains.
Author
Nanostructures (Devices); Copolymers; X Ray Scattering; Molecular Structure; Cylindrical Bodies; Crosslinking

20000021574 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Accelerated Adhesive Curing for Induction-Based Repair of Composites
McKnight, Steven H.; Fink, Bruce K.; Wells, Sean; Yarlagadda, Shridhar; Gillespie, John W., Jr; Oct. 1999; 37p; In English; Prepared in collaboration with Delaware Univ., Newark, DE.
Report No.(s): AD-A372440; ARL-TR-2103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A methodology for accelerated curing of commercially available room-temperature curing paste adhesives is outlined. Cure kinetics of the adhesive were studied by thermochemical analysis, and degree of cure was related to processing parameters and cure cycles. Increasing the cure temperature to 100 C reduced the cure time from 16 hr to approximately 15 min. for 98% cure. Induction-heating techniques were used to demonstrate rapid heating of adhesives at the bondline for lap shear specimens.
DTIC
Composite Materials; Adhesives; Adhesive Bonding; Bonded Joints; Curing

20000023190 NASA Glenn Research Center, Cleveland, OH USA
Degradation of Continuous Fiber Ceramic Matrix Composites Under Constant-Load Conditions
Halbig, Michael C., Army Research Lab., USA; Brewer, David N., Army Research Lab., USA; Eckel, Andrew J., NASA Glenn Research Center, USA; January 2000; 20p; In English; Environmental, Mechanical, and Thermal Properties and Performance of Continuous Fiber Ceramic Composite (CFCC) Materials and Components, 18 May 1999, Seattle, WA, USA
Contract(s)/Grant(s): RTOP 242-82-77; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2000-209681; NAS 1.15:209681; ARL-TR-2094; E-12035; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ten different ceramic matrix composite (CMC) materials were subjected to a constant load and temperature in an air environment. Tests conducted under these conditions are often referred to as stressed oxidation or creep rupture tests. The stressed oxidation tests were conducted at a temperature of 1454 C at stresses of 69 MPa, 172 MPa and 50% of each material's ultimate tensile strength. The ten materials included such CMCs as C/SiC, SiC/C, SiC/SiC, SiC/SiNC and CIC. The time to failure results of the stressed oxidation tests will be presented. Much of the discussion regarding material degradation under stressed oxidation conditions will focus on C/SiC composites. Thermogravimetric analysis of the oxidation of fully exposed carbon fiber (T300) and of C/SiC coupons will be presented as well as a model that predicts the oxidation patterns and kinetics of carbon fiber tows oxidizing in a nonreactive matrix.
Author
Degradation; Ceramic Matrix Composites; Fiber Composites; Ceramic Fibers; Oxidation

20000024794 Naval Facilities Engineering Service Center, Port Hueneme, CA USA
Floor Coating Specification for Interior Aircraft Maintenance Shops ***Final Report, May - Oct. 1999***
Gaughen, C. D.; Nov. 1999; 26p; In English
Report No.(s): AD-A372495; SP-2059-SHR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Special Publication was developed for use with the Naval Facilities Engineering Service Center's (NFESC) Users Guide titled "Concrete Floor Condition Assessment (UG-2038-SHR)." A condition assessment in accordance to the Users Guide is required prior to specifying the coating system enclosed in Appendix A. Appendix A contains a four- coat, thick film (1/4"), non-conductive, chemically resistant interior coating system designed to protect the following aircraft maintenance shop floors: 1) Engine maintenance, 2) Airframes, 3) Avionics, and 4) Aviation armament. Presented within the publication are the following sections: A) Condition assessment requirements, B) Coating system, C) Photographs showing the sequential installation, D) Quality control, and E) Cleaning coating system.
DTIC
Coating; Aircraft Maintenance; Floors; Protective Coatings; Quality Control

20000024795 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Effects of Coatings on Moisture Absorption in Composite Materials ***Final Report, Sep. 1998 - Sep. 1999***
Newill, James R.; McKnight, Steven H.; Hoppel, Christopher P.; Cooper, Gene R.; Oct. 1999; 47p; In English
Contract(s)/Grant(s): Proj-1L1622618AH80
Report No.(s): AD-A372503; ARL-TR-2099; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polymeric coatings can he used to slow the ingress of moisture in composite materials. The effectiveness of these coatings is limited by the quality and thickness, as well as the moisture diffusivity and solubility. The present study investigates the long-term effectiveness of coatings for thick composite laminates, as well as traditional thin laminates. The results are compared for static and fluctuating boundary conditions, with comparisons showing how theoretical predictions can be used to define the coating performance characteristics for protecting composite structures. The theoretical approach is used to determine important attributes for moisture protection of polymer-matrix composite structures provided by polymeric coatings. Developed solutions are used to evaluate a range of coating materials and thicknesses for thin and thick substrates. The diffusion constants and the saturation levels for the coating material were obtained from the range of available coating materials. The results include typical diffusion patterns for coating materials, saturation of the coating layer, development of moisture through time, and effects of the material properties for the various substrate thickness. Moisture diffusion behavior at the substrate-coating interface is also presented. For relatively thick coating layers, the results show that the diffusion constant and the saturation level of the coating must both be low to significantly affect the diffusion process.
DTIC
Coating; Moisture; Composite Structures; Protective Coatings

20000024806 North Carolina Univ., Charlotte, NC USA
In Search of Luminescence in Silicon ***Final Report, 1 May 1995 - 30 Mar. 1999***
Tsu, Raphael, North Carolina Univ., USA; Nov. 18, 1999; 9p; In English
Contract(s)/Grant(s): N00014-95-1-0873
Report No.(s): AD-A371446; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Two schemes were studied (1) IAG superlatices (Interface-Adsorbed-Gas) were fabricated in a silicon MBE system capable of exposure of oxygen at 10(exp -7) Torr for adsorption. Si deposition is between 5 to 20 nm at room temperature with annealing temperature between 800 to 950C, forming 3nm Si nano-particles. Photoluminescence shows two peaks located at 1.7eV and 2.35eV. The former originates from the interior, whereas the latter from the surface regions of the silicon nano-particles. (2) Si/O superlattices were fabricated with silicon epitaxial growth (1.1 nm) at 550-600C, followed by oxygen adsorption at room temperature. High resolution TEM shows epitaxy, and Plane view TEM shows defect densities, dislocations, and stacking faults, below 10(exp 9)/sq cm. The process is repeated up to 9 periods for photoluminescence, PL, and electroluminescence, EL, measurements. A broad peak located at 1.8eV, originates from quantum confinement in silicon thin layers, and a sharp peak located at 2.2eV, originates from the Si/O complexes. EL is particularly impressive. Greenish light output is stable in a life-test of more than one year of continuous operation. Our results stimulate new views and surfaces: ” the overall control and resulting stability allow such devices to be ready for applications.”
DTIC
Electroluminescence; Fabrication; Photoluminescence; Silicon; Silicates; Superlattices

20000024924 Academy of Sciences (USSR), Keldysh Research Center, Moscow, USSR
Experimental Verification of Material Flammability in Space
Ivanov, A. V., Academy of Sciences (USSR), USSR; Balashov, Y. V., RSC-Energia, Russia; Andreeva, T. V., RSC-Energia, Russia; Melikhov, A. S., All-Russian Inst. for Fire Safety, Russia; November 1999; 60p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-97160; RTOP 398-95-0F
Report No.(s): NASA/CR-1999-209405; E-11932; NAS 1.26:209405; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The flammability in microgravity of three US-furnished materials, Delrin, polymethylmethacrylate (PMMA), and high-density polyethylene, was determined using a Russian-developed combustion tunnel on Mir. Four 4.5-mm-diameter cylindrical samples of each plastic were ignited under concurrent airflow (in the direction of flame spread) with velocities from no flow to 8.5 cm/s. The test results identify a limiting air-flow velocity V(sub lim) for each material, below which combustion ceases. Nominal values are V(sub lim) is less than 0.3 cm/s for Delrin, 0.5 cm/s for PMMA, and 0.3 to 0.5 cm/s for polyethylene. These values are lower than those obtained in prior ground testing. Nevertheless, they demonstrate that flow shutoff is effective for extinguishment in the microgravity environment of spacecraft. Microgravity test results also show that the plastic materials

maintain a stable melt ball within the spreading flame zone. In general, as the concurrent flow velocity V decreases, the flame-spread rate V(sub F) decreases, from an average (for all three materials) of V(sub F)= 0.5-0.75 mm/s at V = 8.5 cm/s to V(sub F)= 0.05-0.01 mm/s at V = 0.3-0.5 cm/s. Also, as V decreases, the flames become less visible but expand, increasing the probability of igniting an adjacent surface.
Author
Flammability; Delrin (Trademark); Polymethyl Methacrylate; Polyethylenes; Microgravity

20000025204 NASA Glenn Research Center, Cleveland, OH USA
Microgravity Effects on Combustion of Polymers
Hirsch, David B., Allied-Signal Technical Services Corp., USA; Beeson, Harold D., White Sands Test Facility, USA; Friedman, Robert, NASA Glenn Research Center, USA; January 2000; 40p; In English
Report No.(s): NASA/TM-2000-209900; NAS 1.15:209900; S-855; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA Glenn Research Center conducted a cooperative program with the Russian Space Agency Keldysh Research Center, with technical support provided by NASA Johnson Space Center White Sands Test Facility, to investigate polymer combustion in ventilated microgravity in a small combustion tunnel operated on the orbital station Mir. Reported here are ground test results on flammability characteristics of the test materials for verification of the data and conclusions of the space measurements. It was found that very low forced convective flows can sustain polymer combustion in microgravity. Shutoff of the flow, however, is likely to suppress the combustion, particularly if the fire is in the incipient phase and the oxygen concentration is sufficiently low. Relative flammability rankings obtained in ground tests focusing on limiting oxygen index and cone calorimeter heat-release tests would not apply to microgravity environments if the ranking criterion is the minimum forced-flow velocity required for sustained combustion. Convective flows caused by buoyancy in the ground NASA STD 6001 Test 1 far exceeded the minimum forced convective flows required to sustain microgravity combustion. Results indicate that this test provided conservative results for the materials tested in microgravity by sustaining their combustion in less severe oxygen concentration and total pressure conditions than those in which extinguishment occurred in quiescent microgravity environments.
Author
Microgravity; Gravitational Effects; Combustion; Polymers; Mir Space Station

20000025253 Naval Facilities Engineering Service Center, Port Hueneme, CA USA
Hangar Floor Coating Specifications: Thin Film, Thick Film, and Overcoating Sound Coating Systems ***Final Report, May-Sep 1999***
Gaughen, C. D.; Oct. 1999; 56p; In English
Report No.(s): AD-A372511; NFESC-SP-2057-SHR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Special Publication was developed for use with the Naval Facilities Engineering Service Center's (NFESC) Users Guide titled "Condition Assessment and Coating Recommendations for Aircraft Maintenance Hangars (UG-2036-SHR)." A condition assessment in accordance to the Users Guide is required prior to specifying one of three hangar floor coating systems: (1) Thin film coating system (16 mils: 1 mil = 0.001"), (2) Thick film coating system (250 mils), and (3) Overcoating sound coating systems. Coating specifications based upon the above coating systems are enclosed in the Appendices. Presented within the publication are the following sections: (A) Coating system requirements, (B) Quality control, (C) Chemical resistance of topcoat, (D) Cleaning coating systems, and (E) Conductive coating system.
DTIC
Hangars; Floors; Coating

28
PROPELLANTS AND FUELS

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

20000021198 Huddersfield Univ., Huddersfield, UK
Proceedings of the Workshop on the Microcalorimetry of Energetic Materials ***Final Report***
Griffiths, Trevor; May 19, 1999; 257p; In English; Microcalorimetry of Energetic Materials, 17-19th May 1999, Leeds, UK
Report No.(s): AD-A371343; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Eighteen papers were presented at the workshop about uses of microcalorimetry as a tool to study service life of gun propellants, aging, stability, heat generation, thermal decomposition of energetic plastisizers, modelling, absorbent surfaces, absolute calibration, corrosion rate, DSC studies, compatibility of energetic materials, sample preparations and measuring conditions.
DTIC
Conferences; Composite Materials; Heat Measurement; Calorimeters

20000021271 Energy Information Administration, Washington, DC USA
Short Term Energy Outlook, January 2000
Jan. 2000; 50p; In English
Report No.(s): PB2000-102269; No Copyright; Avail: Issuing Activity
The paper discusses outlook assumptions; US energy prices; international oil demand and supply; world oil stocks, capacity, and net trade; US oil demand and supply; US natural gas demand and supply; US coal demand and supply; US electricity demand and supply; US renewable energy demand; and US energy demand and supply sensitivities.
NTIS
Forecasting; Supplying; Cost Analysis; Crude Oil

20000021307 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Accelerating Long Rod Projectiles Using Sabots. An Overview of Experience Picked up During Experiments with the 29 mm and 78mm Smooth Bore Laboratory Guns ***Final Report Het Versnellen van 'Lange-Staaf' Projectielen met Behulp van Sabots (Overzicht van Ervarigen die Opgedaan Zijn Tijdens Experimenten met het 29 mm- en het 78 mm-Laboratoriumwapen***
Koopmans, E. W., Prins Maurits Lab. TNO, Netherlands; Lans, M., Prins Maurits Lab. TNO, Netherlands; December 1999; 71p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): B96/KL/498; TNO Proj. 014.10451
Report No.(s): TD99-0164; PML-199-A69; Copyright; Avail: Issuing Activity, Hardcopy
The acceleration of penetrators causes complex interactions of the projectile, the sabot, the gunpowder and the weapon. The Laboratory for Ballistic Research (LBO) wants to have closer look at this interactions. For this purpose an inventory of experiences of the last few years is necessarily. Diagnoses have lead to recommendations for a better production of the projectiles and the sabots, the choice of the type of gunpowder and the weapon handling. In addition to this recommendations an overview is given of measuring techniques that are helpful in the forming of a value judgement of the quality of each shot. The main conclusion concerning long rod penetrators, is that TNO should define an acceptation check. The main conclusion concerning the sabots, is that the sabots from the Ernst Mach Institute as well as South West Research Institute give much better results than sabots from Physics Application. The main conclusion concerning the gunpowder is that the choice of type of gunpowder should depend on the mass of the sabot and the desired projectile-velocity. Furthermore, the use of the "seven holes gunpowder, causes dangerous situations from a inner ballistic point of view. The main conclusion concerning the weapon is that it's condition needs much more attention. The maintenance should focus on prevention. With the acquisition of new sabots, the temporary condition of the gunbarrel must be taken into account.
Author
Cavities; Diagnosis; Gun Propellants; Inventories; Sabot Projectiles; Data Acquisition

20000021346 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Gun Propellants Stability Research 1998 ***Final Report Stabiliteit Kruiten 1998***
vanderMeer, B. J., Prins Maurits Lab. TNO, Netherlands; Boers, M. N., Prins Maurits Lab. TNO, Netherlands; deKlerk, W. P. C., Prins Maurits Lab. TNO, Netherlands; December 1999; 60p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A96/KL/446; TNO Proj. 014.10232
Report No.(s): TD99-0187; PML-1999-A94; Copyright; Avail: Issuing Activity, Hardcopy
The results of investigations into the improvement of the gun propellant surveillance are presented in this report. In the project (A96KL446), observations were investigated that cannot be investigated in the standard surveillance project (A98KL414). A need for this was felt, as no change had been taken place in the surveillance for twenty years, while from time to time interesting results have been observed from time to time. Firstly, attention was focused on the heat generation apparatus and the measurement principle. Although, the principle of heat generation and the resulting signal in a thermo-element is known, there was no good visualisation of the physical process of heat generation and the resulting signal. Changes to the test procedure were applied to investigate the sensitivity of the mode of operation (calibration procedure, degree of filling, thermal pre-treatment of the test

vessel). Subsequently, the atmosphere in the test vessel was varied; mainly the relative humidity of the air. The gun propellant was wetted by direct application of water. Measurements were conducted also in a very dry environment. It proves that for SB-propellants the heat production is the highest when the propellant is directly wetted. This was not observed for DB-and DEGDN-propellants. For those propellants the highest heat production was measured in a dry atmosphere. It is almost sure that this is not a result of a higher propellant decomposition rate, but what the origin is, is not known yet. Finally, work that has been performed through participation in the NATO 'Life Assessment Expert Working Party' will be reported. This party developed several STANAGs. In the last year, attention has been given to STANAG 4542, the Heat Flux Calorimetry STANAG and a STANAG concerning composite propellants.
Author
Gun Propellants; Surveillance; Improvement; Propellant Decomposition; Heat Measurement; Composite Propellants

20000021441 Conservation of Clean Air and Water-Europe, Brussels, Belgium
Environmental Exposure to Benzene
Claydon, M.; Evans, M.; Gennart, J. P.; Roythorne, C.; Simpson, B.; Oct. 1999; 44p; In English
Report No.(s): PB2000-102527; CONCAWE-2/99; Copyright; Avail: National Technical Information Service (NTIS)
A review is provided of the health risks from environmental exposure to benzene. Sources and levels of benzene exposure of the general public have been identified from literature. Model calculations are presented of the daily absorbed dose of benzene for different activity patterns. The possible influence of changing benzene levels due to legislative measures on the daily adsorbed dose is estimated.
NTIS
Benzene; Indoor Air Pollution; Health; Risk; Air Quality; Exposure

20000025051 Battelle Ocean Sciences, Duxbury, MA USA
Predicting the Behavior of Orimulsion Spilled on Water. Volume 2, Appendix 1-6, Volume 2, Appendices 1-6 ***Final Report***
Stout, Scott A.; Jul. 1999; 111p; In English
Contract(s)/Grant(s): DTRS-57-95-G-00063
Report No.(s): AD-A371844; CG-D-24-99; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Orimulsion is a fuel that is a bitumen-in-water emulsion made of approximately approx. 70% natural bitumen and approx. 30% fresh water. Orimulsion is of great interest to electric power utilities because of its competitive cost and pricing structure. Previous work on Orimulsion has determined it may largely float, remain suspended, or settle depending on the spill conditions. In this study, the mechanisms at work and the relative importance of different spill conditions (e.g., salinity, temperature, energy, Orimulsion concentration, particulate load, and particulate type) are investigated by: (1) forty-seven benchtop scale (3L) experiments conducted and evaluated using design of experiment principles, and (2) five flume scale (4000L) experiments. The insight gained from these laboratory experiments is interpreted in light of the limitations inherent in laboratory spills into confined vessels (e.g., vessel wall effects and absence of dilution) in order to predict the gross behavior that might be anticipated if Orimulsion were spilled in a 'real world', open water setting. The most important environmental parameters identified, probably listed in order of their descending importance, were determined to be the receiving water salininty, receiving water energy, and presence/absence of suspended mineral matter. Interactions between these parameters determine whether most bitumen will ultimately float on or near the surface, remain suspended within the water column, or settle through the water column. The gross behavior of Orimulsion under different combinations of these parameters is predicted. These predictions provide the best available guidance to contingency planners and spill responders. Appendices I through VI are included in Volume II of this report, and are available from the USCG Research and Development Center upon request.
DTIC
Emulsions; Water Pollution; Fresh Water; Bitumens

29
SPACE PROCESSING

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

20000021499 Alabama Univ., Huntsville, AL USA
Spacelab Science Results Study, Volume 3, Microgravity Science ***Final Report***
Naumann, Robert J., Editor, Alabama Univ., USA; Lewis, Marian L., Editor, Alabama Univ., USA; Murphy, Karen L., Compiler, Alabama Univ., USA; Aug. 18, 1999; 446p; In English
Contract(s)/Grant(s): NAS8-97095; NASA Order H-30194-D; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Beginning with OSTA-1 in November 1981, and ending with Neurolab in March 1998, thirty-six shuttle missions are considered Spacelab missions because they carried various Spacelab components such as the Spacelab module, the pallet, the Instrument Pointing System (IPS), or the MPESS. The experiments carried out during these flights included astrophysics, solar physics, plasma physics, atmospheric science, Earth observations, and a wide range of microgravity experiments in life sciences, biotechnology, materials science, and fluid physics which includes combustion and critical point phenomena. In all, some 764 experiments were conducted by investigators from the USA, Europe, and Japan. These experiments resulted in several thousand papers published in refereed journals, and thousands more in conference proceedings, chapters in books, and other publications. The purpose of this Spacelab Science Results Study is to document the contributions made in each of the major research areas by giving a brief synopsis of the more significant experiments and an extensive list of the publications that were produced. We have also endeavored to show how these results impacted the existing body of knowledge, where they have spawned new fields, and, if appropriate, where the knowledge they produced has been applied.
Author
Spacelab; Space Transportation System; Spaceborne Experiments; Osta-1 Payload; Space Shuttle Missions; Pointing Control Systems; Spacecraft Modules

20000021512 NASA Marshall Space Flight Center, Huntsville, AL USA
Reduction of Effective Acceleration to Microgravity Levels
Downey, James P., NASA Marshall Space Flight Center, USA; [2000]; 2p; In English, 25-31 Mar. 2000, San Francisco, CA, USA; Sponsored by American Chemical Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Acceleration due to earth's gravity causes buoyancy driven convection and sedimentation in solutions. In addition. pressure gradients occur as a function of the height within a liquid column. Hence gravity effects both equilbria conditions and phase transitions as a result of hydrostatic pressure gradients. The affect of gravity on the rate of heat and man transfer in solutal processes can be particularly important in polymer processing due to the high sensitivity of polymeric materials to processing conditions. The term microgravity has been coined to describe an environment in which the affects of gravitational acceleration am greatly reduced. It may seem odd to talk in term of reducing the effects of gravitational acceleration since gravitational attraction is a basic property of matter. However, die presence of gravity on in situ processing or measurements can be negated by achieving conditions in which the laboratory, or more specifically the container of the experimental materials, a subjected to the same acceleration as the materials themselves. With regard to the laboratory reference frame, there is virtually no force on the experimental solutions. This is difficult to achieve but can be done. A short review of Newtonian physics provides an explanation on both how processes we affected by gravity and how microgravity conditions are achieved. The fact that fluids deform when subject to a force bid solids do not indicates that solids have a structure able to exert an opposing force that negates an externally applied force. Liquids deform when a force is applied, indicating that a liquid structure cannot completely negate an applied force. Just how easily a liquid resists deformation is related to its viscosity. Spaceflight provides an environment in which the laboratory reference frame i.e. the spacecraft and all the equipment therein an experiencing virtually identical forces. There is no solid foundation underneath such a laboratory, so the laboratory accelerates according to the force of gravity as do the experimental fluids within the lab. Hence, the magnitude of the form excited by the laboratory on the experimental solutions within are greatly reduced. When compared with a laboratory on the ground and averaged over time, the fluids in a spaceflight laboratory experience approximately a 10 (sup -6)decrease in acceleration relative to their laboratory reference frame hence the term microgravity.
Author
Microgravity; Earth Gravitation; Space Flight; Acceleration (Physics)

20000024787 Sverdrup Technology, Inc., Huntsville, AL USA

The Life Cycle Application of Intelligent Software Modeling for the First Materials Science Research Rack

Rice, Amanda, Raytheon Information and Scientific Services, USA; Parris, Frank, Sverdrup Technology, Inc., USA; Nerren, Philip, Sverdrup Technology, Inc., USA; [2000]; 2p; In English; Modeling and Simulation, 14-17 Aug. 2000, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS8-40836; No Copyright; Avail: Issuing Activity; Abstract Only

Marshall Space Flight Center (MSFC) has been funding development of intelligent software models to benefit payload ground operations for nearly a decade. Experience gained from simulator development and real-time monitoring and control is being applied to engineering design, testing, and operation of the First Material Science Research Rack (MSRR-1). MSRR-1 is the first rack in a suite of three racks comprising the Materials Science Research Facility (MSRF) which will operate on the International Space Station (ISS). The MSRF will accommodate advanced microgravity investigations in areas such as the fields of solidification of metals and alloys, thermo-physical properties of polymers, crystal growth studies of semiconductor materials, and research in ceramics and glasses. The MSRR-1 is a joint venture between NASA and the European Space Agency (ESA) to study the behavior of different materials during high temperature processing in a low gravity environment. The planned MSRR-1 mission duration is five (5) years on-orbit and the total design life is ten (IO) years. The MSRR-1 launch is scheduled on the third Utilization Flight (UF-3) to ISS, currently in February of 2003). The objective of MSRR-1 is to provide an early capability on the ISS to conduct material science, materials technology, and space product research investigations in microgravity. It will provide a modular, multi-user facility for microgravity research in materials crystal growth and solidification. An intelligent software model of MSRR-1 is under development and will serve multiple purposes to support the engineering analysis, testing, training, and operational phases of the MSRR-1 life cycle development. The G2 real-time expert system software environment developed by Gensym Corporation was selected as the intelligent system shell for this development work based on past experience gained and the effectiveness of the programming environment. Our approach of multi- uses of the simulation model and its intuitive graphics capabilities is providing a concurrent engineering environment for rapid prototyping and development. Operational schematics of the MSRR-1 electrical, thermal control, vacuum access, and gas supply systems, and furnace inserts are represented graphically in the environment. Logic to represent first order engineering calculations is coded into the knowledge base to simulate the operational behavior of the MSRR-1 systems. An example of engineering data provided includes electrical currents, voltages, operational power, temperatures, thermal fluid flow rates. pressures, and component status indications. These type of data are calculated and displayed at appropriate instrumentation points, and the schematics are animated to reflect the simulated operational status of the MSRR-1. The software control functions are also simulated to represent appropriate operational behavior based on automated control and response to commands received by the crew or ground controllers. The first benefit of this simulation environment is being realized in the high fidelity engineering analysis results from the electrical power system G2 model. Secondly, the MSRR-1 simulation model will be embedded with a hardware mock-up of the MSRR-1 to provide crew training on MSRR-1 integrated payload operations. G2 gateway code will output the simulated instrumentation values, termed as telemetry, in a flight-like data stream so that the crew has realistic and accurate simulated MSRR-1 data on the flight displays which will be designed for crew use. The simulation will also respond appropriately to crew or ground initiated commands, which will be part of normal facility operations. A third use of the G2 model is being planned; the MSRR-1 simulation will be integrated with additional software code as part of the test configuration of the primary onboard computer, or Master Controller, for MSRR-1. We will take advantage of the G2 capability to simulate the flight like data stream to test flight software responses and behavior. A fourth use of the G2 model will be to train the Ground Support Personnel that will monitor the MSRR-1 systems and payloads while they are operating aboard the ISS. The intuitive, schematic based environment will provide an excellent foundation for personnel to understand the integrated configuration and operation of the MSRR-1, and the anticipated telemetry feedback based on operational modes of the equipment. Expert monitoring features will be enhanced to provide a smart monitoring environment for the operators. These features include: (1) Animated, intuitive schematic-based displays which reflect telemetry values, (1) Real-time plotting of simulated or incoming sensor values, (3) High/Low exception monitoring for analog data, (4) Expected state monitoring for discrete data, (5) Data trending, (6) Automated malfunction procedure execution to diagnose problems, (7) Look ahead capability to planned MSRR-1 activities in the onboard timeline. And finally, the logic to calculate telemetry values will be deactivated, and the same environment will interface to the incoming data for the real-time telemetry stream to schematically represent the onboard hardware configuration. G2 will be the foundation for the real-time monitoring and control environment. In summary, our MSRR-1 simulation model spans many elements of the life cycle development of this project: Engineering Analysis, Test and Checkout, Training of Crew and Ground Personnel, and Real-time monitoring and control. by utilizing the unique features afforded by an expert system development environment, we have been able to synergize a powerful tool capable of addressing our project needs at every phase of project development.

Author

Microgravity; Payloads; Research Facilities; Test Facilities; Space Laboratories; Computerized Simulation; Materials; Expert Systems

20000025037 NASA, Washington, DC USA
Microgravity: A Teacher's Guide with Activities in Science, Mathematics, and Technology
Rogers, Melissa J.B., Tal-Cut Co., USA; Vogt, Gregory L., NASA Johnson Space Center, USA; Wargo, Michael J., NASA, USA; 1997; 176p; In English
Report No.(s): NASA-TM-113022; NASA-EG-1997-08-110-HQ; NAS 1.15:113022; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Microgravity is the subject of this teacher's guide. This publication identifies the underlying mathematics, physics, and technology principles that apply to microgravity. The topics included in this publication are: 1) Microgravity Science Primer; 2) The Microgravity Environment of Orbiting Spacecraft; 3) Biotechnology; 4) Combustion Science; 5) Fluid Physics; 6) Fundamental Physics; and 7) Materials Science; 8) Microgravity Research and Exploration; and 9) Microgravity Science Space Flights. This publication also contains a glossary of selected terms.
CASI
Microgravity; Mathematics; Fluid Dynamics; Space Flight; Combustion; Biotechnology; Instructors

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.

20000021234 D. N. American, Fairmont, WV USA
Office of Safety and Mission Assurance Review Report
Jan. 03, 2000; 16p; In English
Contract(s)/Grant(s): NAS2-98028
Report No.(s): Rept-8521.04.12.05.991215revA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document summarizes questions and concerns raised during the 1999 IV&V Facility's Annual Review Presentation to the Office of Safety and Mission Assurance (OSMA). Recommendations are provided for issues and action items identified.
Author
Research and Development; Research Facilities; Project Management

20000021319 Building and Construction Research TNO, Centre for Mechanical Engineering, Delft, Netherlands
Shock Testing of a Diesel Generator Control Panel, Part No: 970A157P01. Manufacturer Alstom Paxman Division
vanBragt, F. J., Building and Construction Research TNO, Netherlands; Nov. 22, 1999; 31p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/KM/102; TNO Proj. 006.93299/01.01
Report No.(s): TD99-0390; TNO-1999-CMC-R053; Copyright; Avail: Issuing Activity

Shock tests have been performed on a resiliently mounted diesel generator control panel. The function of the control panel has been monitored during the tests. No malfunction or damage has been ascertained. The diesel generator control panel meets the shock requirements.
Author
Shock Tests; Function Generators; Control Boards; Consoles

20000021369 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
The Human Powered Submarine Team of Virginia Tech Propulsion System Design Final Report ***Final Report***
An, Eric, Virginia Polytechnic Inst. and State Univ., USA; Bennett, Matt, Virginia Polytechnic Inst. and State Univ., USA; Callis, Ron, Virginia Polytechnic Inst. and State Univ., USA; Chen, Chester, Virginia Polytechnic Inst. and State Univ., USA; Lee, John, Virginia Polytechnic Inst. and State Univ., USA; Milan-Williams, Kristy, Virginia Polytechnic Inst. and State Univ., USA; Dec. 06, 1999; 16p; In English
Contract(s)/Grant(s): NAG1-2053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Human Powered Submarine Team has been in existence at Virginia Tech since its conception in 1993. Since then, it has served as a way for engineering students from many different disciplines to implement design conception and realization. The first submarine built was Phantom 1, a two-man submarine made of fiberglass. After construction was complete, Phantom 1 was ready for racing, but, unfortunately, suffered fatal problems come race time. The submarine team slowed down a bit after experiencing racing problems, but was revived in 1995 when design efforts for a new two-man submarine, the Phantom 2

commence. The propulsion system consisted of a chain and gear drive system using an ultra-light helicopter tail rotor for a propeller. Although the team learned valuable lessons as a result of Phantom 1's problems, Phantom 2 still experiences problems at races. After various parts of Phantom 2 are redesigned, it is once again ready for racing and proves that the redesign was well worth the time and effort. In 1997, Phantom 2 not only finishes its first race, held in San Diego, California, but comes in third. This success sparks yet another revival of the submarine team and design for the team's current project, the Phantom 3, a one-man submarine, is started. In 1998, the plug for Phantom 3 is built and the hull is constructed. With so many past problems from which to learn, Phantom 3 promises to be the fastest and best-designed submarine the team has developed thus far. The current speed world-record is 7 knots.
Author
Glass Fibers; Hulls (Structures); Submarines; Construction

20000021386 Defense Systems Management School, Fort Belvoir, VA USA
Systems Engineering Fundamentals
Leonard, John, Defense Systems Management School, USA; October 1999; 200p; In English
Report No.(s): AD-A370132; No Copyright; Avail: CASI; A03, Microfiche; A09, Hardcopy

This book provides a basic, conceptual-level description of engineering management disciplines that relate to the development and life cycle management of a system. For the non-engineer it provides an overview of how a system is developed. For the engineer an project manager it provides a basic framework for planning and assessing system development.
Author
Engineering Management; Systems Engineering

20000025030 NASA Goddard Space Flight Center, Greenbelt, MD USA
Superpolishing and Precision Metrology on a Metal Mandrel and Replicated Segments for Constellation-X
Content, D., NASA Goddard Space Flight Center, USA; Lyons, J., NASA Goddard Space Flight Center, USA; Saha, T., NASA Goddard Space Flight Center, USA; Wright, G., NASA Goddard Space Flight Center, USA; Zaniewski, J., NASA Goddard Space Flight Center, USA; Petre, R., NASA Goddard Space Flight Center, USA; Chan, K. W., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; SPIE Conference, Jul. 1999, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We have superpolished a diamond-turned aluminum mandrel (coated with electroless Ni) to an axial roughness of 0.34 nm rms. The mandrel is made to the Astro-E secondary mirror design for the 81st shell. Precision metrology at 100 mm to submicron scales has established the power spectral density of the mandrel and ultralightweight gold coated replicated segments. Predicted image quality of a set of optimally aligned replicated segments of this and a matching primary is substantially improved as compared to the flight mirrors for Astro-E. This approach using metal mandrels, superpolishing, and replicated ultralightweight foil mirrors, may represent a cost-effective approach to meeting the 15 arcsec half-energy width and weight requirements for the Constellation-X mission. Descriptions of the polishing apparatus, the precision metrology instruments, and the surface data analysis are presented. The general methods described are applicable to precision optics for both normal incidence and grazing incidence optics.
Author
Metrology; Mandrels; Replicas; Metal Polishing

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.

20000021091 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Visualization and Data Analysis Techniques for Ultra-Wideband Wide-Angle Synthetic Aperture Radar Data ***Final Report, Sep. 1997 - 1998***
Nguyen, Lam; Sep. 1999; 51p; In English
Contract(s)/Grant(s): Proj-AH16
Report No.(s): AD-A369660; ARL-TR-1959; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The US Army Research Laboratory (ARL) has designed, developed, and constructed an ultra-wideband synthetic aperture (UWB SAR) imaging radar to detect obscured targets, such as vehicles concealed by foliage and objects buried underground. As

part of this effort, ARL has developed the software called UWBView to support the study of this imaging radar. The software can be employed in both field test and laboratory situations. In a field test, it provides a tool to perform certain signal processing tasks and to quickly assess radar data quality. In the research environment, it provides analysts with data visualization and analysis capabilities to support the phenomenological studies of targets and clutter. In a data processing environment, the software performs data and signal processing tasks. This report discusses the current software features and sample studies of UWB radar data using the software.
DTIC
Scientific Visualization; Data Processing; Broadband; Synthetic Aperture Radar

20000021092 National Science Council, Taipei, Taiwan, Province of China
Proceedings of the National Science Council, Republic of China, Part A, Physical Science and Engineering
Peng, S. M.; Jul. 1999; ISSN 0255-6588; Volume 23, No. 4; 128p; In English
Report No.(s): PB2000-100600; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

Contents include the following: Electrochemical Oxidation of 1,2-Disubstituted Azuelenes; Study of Symmetric and Asymmetric V-groove Guides Using the Finite Element Method; Content-based Video Data Retrieval (Invited Review Paper); A Review Paper on the Kinetic Study of the Pressure-Jump Method (Invited Review Paper); The Scalable KTV System Design and Performance Analysis (Scientific Note); Use of Prosodic Information for Mandarin Word Verification (Scientific Note); Specifying and Executing Interactive Multimedia Presentations Using the Formal Approach; The Use of Neural Networks in Radiometric Studies of Land Surface Parameters; Structural Synthesis of Bevel-Gear Robotic Wrist Mechanisms; A Method for Vehicle Routing Problem with Multiple Vehicle Types and Time Windows; Deep X-ray Lithography; Leaky Mode Perspective on Printed Antenna (Scientific Note); Broadband Operation of a Slot-coupled Compact Rectangular Microstrip Antenna with a Chip-resistor Loading.
NTIS
Conferences; Physical Sciences; Systems Engineering; Research and Development

20000021108 Electronics Research Lab., Salisbury Australia
Advanced Jindalee Tracker: Probabilistic Data Association Multiple Model Initiation Filter
Colegrove, S. B., Electronics Research Lab., Australia; Jun. 1999; 54p; In English
Report No.(s): AD-A367163; DSTO-TR-0659; DODA-AR-010-520; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This paper presents the theory and examples of performance for a new algorithm that initiates tracks using a multiple model Probabilistic Data Association (PDA) filter. The analysis is generalized for the case of multiple non-uniform clutter regions within the measurement data that updates the filter. The algorithm starts multiple parallel PDA filters from a single sensor measurement. Each filter is assigned one of a range of possible target model parameters. to reduce the possibility of clutter measurements forming established tracks, the solution includes a model for a visible target. That is, a target that gives sensor measurements that satisfy one of the target models. Other features included in the algorithm are the selection of a fixed number of nearest measurements and the addition of signal amplitude to the target state vector. The inclusion of signal amplitude is one coordinate that is applicable to the non-uniform clutter model developed in this a paper.
DTIC
Target Acquisition; Radar Tracking; Clutter; Signal Processing; Algorithms

20000021157 Department of Defense, Office of Inspector General, Arlington, VA USA
Year 2000 Issues Within the U.S. Pacific Command's Area of Responsibility: Strategic Communications
Apr. 06, 1999; 25p; In English
Contract(s)/Grant(s): Proj. 8CC-0049.03
Report No.(s): AD-A367102; IG/DOD-99-126; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This is one in a series of reports being issued by the Inspector General, DoD, in accordance with an informal partnership with the Chief Information Officer, DoD, to monitor DoD efforts to address the year 2000 computing challenge. For a list of audit projects addressing the issue, see the year 2000 web page on the IGnet at http: //www. ignet. gov. The Naval Computer and Telecommunications Area Master Station-Pacific located in Wahiawa, Hawaii, provides operational direction and management to all Naval Computer and Telecommunications System assets in the Pacific area of responsibility. The Naval Computer and Telecommunications Area Master Station-Pacific satellite earth station is the primary DoD communications installation in the Pacific and is the Navy's largest communication station providing fleet and joint support. U.S.S. Blue Ridge (LCC-19), home ported in Yokosuka, Japan, is the flagship of the U.S. Seventh Fleet. Blue Ridge functions as a Joint Task Force command ship

whose mission is to serve as a command, control, communications, computers, and intelligence platform. The 58% Signal Battalion located on the island of Okinawa, Japan, provides global command, control, communications, information technology, and logistics support to joint Service warfighters. Under the control of the Joint Chiefs of Staff, the Battalion operates and maintains control of the Joint Chiefs of Staff-Pacific contingency satellite earth station and two fixed satellite earth terminals.
DTIC
Software Reliability; Program Verification (Computers); Systems Management; Computer Information Security; Information Systems; Command and Control; Logistics; Telecommunication

20000021225 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA
A Simulation Study of Paced TCP *Final Report*
Kulik, Joanna, Bolt, Beranek, and Newman, Inc., USA; Coulter, Robert, Bolt, Beranek, and Newman, Inc., USA; Rockwell, Dennis, Bolt, Beranek, and Newman, Inc., USA; Partridge, Craig, Bolt, Beranek, and Newman, Inc., USA; January 2000; 26p; In English
Contract(s)/Grant(s): N00600-92-C-3377; RTOP 632-50-51
Report No.(s): NASA/CR-2000-209416; NAS 1.26:209416; E-12041; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, we study the performance of paced TCP, a modified version of TCP designed especially for high delay-bandwidth networks. In typical networks, TCP optimizes its send-rate by transmitting increasingly large bursts, or windows, of packets, one burst per round-trip time, until it reaches a maximum window-size, which corresponds to the full capacity of the network. In a network with a high delay-bandwidth product, however, Transmission Control Protocol's (TCPs) maximum window-size may be larger than the queue size of the intermediate routers, and routers will begin to drop packets as soon as the windows become too large for the router queues. The TCP sender then concludes that the bottleneck capacity of the network has been reached, and it limits its send-rate accordingly. Partridge proposed paced TCP as a means of solving the problem of queueing bottlenecks. A sender using paced TCP would release packets in multiple, small bursts during a round-trip time in which ordinary TCP would release a single, large burst of packets. This approach allows the sender to increase its send-rate to the maximum window size without encountering queueing bottlenecks. This paper describes the performance of paced TCP in a simulated network and discusses implementation details that can affect the performance of paced TCP.
Author
Protocol (Computers); Performance Tests; Bandwidth; Networks

20000021343 Industrial Technology Research Inst., Advanced Technology Center, Hsinchu, Taiwan, Province of China
Towards a Pure Chinese Spoken Dialogue System
Chiang, Tung-Hui, Industrial Technology Research Inst., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 581-591; In English
Contract(s)/Grant(s): Proj. 3P11200; Proj. 3SH2100; Copyright; Avail: Issuing Activity, Hardcopy

This paper gives an overview of our spoken dialogue system, which is designed to meet four objectives, Portability, Usability, Robustness. and Extensibility (PURE). First, an integrated scoring function is proposed so that all components of the spoken dialogue system can be properly integrated, and information from all components can be considered jointly to resolve ambiguities. Moreover. instead of shallow analysis or simply key word/key-phrase matching, deeper analysis is conducted by incorporating robust parsing, error recovery and semantic analysis to improve discrimination and robustness of the language understanding component. to achieve PURE design of dialogue management, a domain transparent framework is also proposed in this paper. Results and experiences we got from building systems of various domains showed very encouraging results.
Author
China; Speech; Transparence; Words (Language); Robustness (Mathematics)

20000021344 Academia Sinica, Inst. of Information Science, Taipei, Taiwan, Province of China
On Phoneme-to-Character Conversion Systems in Chinese Processing
Hsu, Wen-Lian, Academia Sinica, Taiwan, Province of China; Chen, Yi-Shiou, Academia Sinica, Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 573-579; In English; Copyright; Avail: Issuing Activity, Hardcopy

We propose a new goal for constructing a Chinese phoneme-to-character automatic conversion system. Instead of trying to get the largest number of correct characters converted, this goal strives for extracting the correct events from a given sentence. We believe this objective is more fruitful in that the extracted events can be better utilized in other applications such as information

retrieval, extraction and dialogue systems. Furthermore, it would motivate researchers to work on the more challenging problem of natural language understanding. An information map is proposed for knowledge representation. These maps give very concise summary of different aspects of an object. They also provide more convenient ways to implement semantic template matching. Author

Phonemes; Character Recognition; Information Retrieval; China

20000021370 Academia Sinica, Inst. of Information Science, Taipei, Taiwan, Province of China

Lexical Analysis for Chinese: Difficulties and Possible Solutions

Chen, Keh-Jiann, Academia Sinica, Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 561-571; In English; Copyright; Avail: Issuing Activity, Hardcopy

Chinese sentences are composed with strings of characters without blanks to mark word boundaries. However, the basic processing unit for sentence processing is the word. It is the smallest meaningful, freely used unit for any natural language. Therefore lexical analysis became the first step in processing Chinese sentences. Usually a lexicon is utilized to match words and provide their syntactic and semantic information in the process of lexical analysis. During the word matching process, problems of segmentation ambiguity and occurrences of unknown words will occur. In this paper. both statistical methods and rule-based methods are discussed for their advantages and disad'vantages in solving segmentation ambiguities. For unknown word identification, off-line word extraction methods and on-line unknown word identification strategies are surveyed. Both methods complement each other in solving the problem. The strategies and knowledge sources for implementing a practical system are also discussed.

Author

Natural Language (Computers); Statistical Analysis; Strings; Sentences; Blanks

20000021371 National Cheng Kung Univ., Dept. of Electrical Engineering, Tainan, Taiwan, Province of China

Wavelet Transforms for Speech Signal Processing

Wang, Jhing-Fa, National Cheng Kung Univ., Taiwan, Province of China; Chen, Shi-Huang, National Cheng Kung Univ., Taiwan, Province of China; Shyuu, Jhy-Shing, National Cheng Kung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 549-560; In English; Copyright; Avail: Issuing Activity, Hardcopy

The wavelet transform and its theory is one of the most exciting developments of the last decade. In fact, the wavelet transform has been developed independently for various different fields such as signal processing, image processing, audio and speech processing, communication, and mathematics. Due to the efficient time-frequency localization and the multiresolution characteristics of the wavelet representations, the wavelet transforms are quite suitable for processing non-stationary signals such as speech. In this paper, the wavelet transform and its theory will be first introduced, then comparisons between the wavelet transform and the classical short-time Fourier transform approach to signal analysis will be provided. In addition, applying wavelet transforms in determining pitch, and segmenting consonant/ vowel (C/V) parts as well as speech recognition will be discussed in this paper.

Author

Wavelet Analysis; Speech Recognition; Auditory Signals; Fourier Transformation; Vowels

20000021372 National Chiao Tung Univ., Dept. of Communication Engineering, Hsinchu, Taiwan, Province of China

An Overview of RNN-Based Mandarin Speech Recongnition Approaches

Liao, Yuan-Fu, National Chiao Tung Univ., Taiwan, Province of China; Hong, Wei-Tyng, National Chiao Tung Univ., Taiwan, Province of China; Wang, Wern-Jun, National Chiao Tung Univ., Taiwan, Province of China; Wang, Yih-Ru, National Chiao Tung Univ., Taiwan, Province of China; Chen, Sin-Horng, National Chiao Tung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 535-547; In English; Copyright; Avail: Issuing Activity, Hardcopy

The Artificial Neural network (ANN)-based approach is an alternate to the Hidden Markov Model (HMM) method which is the currently dominant technology in the field of speech recognition. This paper is an overview of the Recurrent Neural Network (RNN)-based approaches to Mandarin speech recognition. Some RNN-based approaches proposed previously: syllable-boundary pre-segmentation, broad-class pre-classification, prosodic phrase boundary detection, and isolated and continuous syllable

recognitions are discussed. We find from the survey that these approaches are all effective. So the RNN technology is comparable to the conventional HMM method on Mandarin speech recognition.
Author
Neural Nets; Speech Recognition; Surveys

20000021433 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Navy Collaborative Integrated Information Technology Initiative ***Annual Report, 14 Nov. 1998-13 Nov. 1999***
Reifsnider, Kenneth; Jan. 11, 2000; 44p; In English
Contract(s)/Grant(s): N00014-99-1-0158
Report No.(s): AD-A372399; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The long-term objective of the NAVCIITI program is to provide strong, integrated research capabilities in broad user communications testbeds, systems engineering, fiber optic sensors and transmission devices, secure and reliable wireless communications, effective user-friendly human computer interfaces, and scientific visualization to the Navy community. This initiative will improve the Navy's capabilities to support distributed computing, integrated services training, education, information dissemination, and simulation. The multiyear program will establish a Navy Collaborative Integrated Information Technology Initiative (NAVCIITI, pronounced "NAV city") by creating an Advanced Communication and Information Technology Center (ACITC), on campus at Virginia Tech, integrating and leveraging the efforts of more than 60 investigators currently under contract to the Navy by providing equipment and facilities for their effort, and using the collective capabilities of NAVCIITI to support Navy initiatives in distributed computing, integrated services training, education, information dissemination, and simulation, especially for purposes of network-centric battle management, managing and maintaining C4ISR attributes, and enhancement of the Naval intranet. The scope of the proposed program was developed as a result of discussions, and briefings with a group of Navy unit leaders.
DTIC
Information Systems; Computer Networks; Telecommunication; Systems Engineering

20000021482 Oxford Univ., Dept. of Physics, Astrophysics, Oxford, UK
The Spectra and Energies of Classical Double Radio Lobes
Blundell, Katherine M., Oxford Univ., UK; Rawlings, Steve, Oxford Univ., UK; January 2000; 22p; In English
Report No.(s): OUAST/00/1; Copyright; Avail: Issuing Activity

We compare two temporal properties of classical double radio sources: i) radiative lifetimes of synchrotron-emitting particles and ii) dynamical source ages. We discuss how these can be quite discrepant from one another, rendering use of the traditional spectral ageing method inappropriate: we contend that spectral ages give meaningful estimates of dynamical ages only when these ages are is much less than 10(exp 7) years. In juxtaposing the fleeting radiative lifetimes with source ages which are significantly longer, a refinement of the paradigm for radio source evolution is required. We move beyond the traditional bulk backflow picture and consider alternative means of the transport of high Lorentz factor (gamma) particles, which are particularly relevant within the lobes of low luminosity classical double radio sources. The changing spectra along lobes are explained, not predominantly by synchrotron ageing but, by gentle gradients in a magnetic field mediated by a, low-gamma matrix which illuminates an energy-distribution of particles, N(gamma), controlled largely by classical synchrotron loss in the high magnetic field of the hotspot. A model of magnetic field whose strength lowers with increasing distance from the hotspot, and in so doing becomes increasingly different from the equipartition value in the head of the lobe, is substantiated by constraints from different types of inverse-Compton scattered X-rays. The energy in the particles is an order of magnitude higher than that inferred from the minimum-energy estimate, implying that the jet-power is of the same order as the accretion luminosity produced by the quasar central engine. This refined paradigm points to a resolution of the findings of Rudnick et al (1994) and Katz-Stone & Rudnick (1994) that both the Jaffe-Perola and Kardashev-Pacholczyk model spectra are invariably poor descriptions of the curved spectral shape of lobe emission, and indeed that for Cygnus A all regions of the lobes are characterized by a 'universal spectrum'.
Author
Luminosity; Spectra; Spectral Emission; Emittance; Radio Astronomy; Quasars; Galactic Evolution

20000021560 Physics and Electronics Lab. TNO, The Hague, Netherlands
Visual Interpretation of SAR Images ***Final Report Visuele Interpretatie van SAR Beelden***
Smith, A. J. E., Physics and Electronics Lab. TNO, Netherlands; Lourens, T., Physics and Electronics Lab. TNO, Netherlands; vandenBroek, A. C., Physics and Electronics Lab. TNO, Netherlands; Toet, A., Physics and Electronics Lab. TNO, Netherlands; November 1999; 73p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/CO/315; TNO Proj. 60401

Report No.(s): TD99-0272; TNO-TM-99-A078/FEL-99-A211; Copyright; Avail: Issuing Activity

SAR images are difficult to interpret for non-trained persons because these images are fundamentally different from optical images. The goal of the project was to find out how SAR images should be displayed in order to facilitate the interpretation of these images for terrain interpretation and target acquisition. This project was a combined effort by TNO-FEL and TNO-TM. In the project polarimetric PHARUS images and high resolution RAMSES images were used for two experiments where people were tested for their ability to find targets and to interpret the terrain. The PHARUS data were displayed in grey tones and false colors. The false colors were obtained by displaying two or more polarisation channels in the color channels of the screen. In this way a single, two and three channel presentation was obtained. The experiments showed that the two-channel presentation is more effective than the single channel presentation for visual interpretation of the images. The three-channel presentation did not improve the scores of the experiments significantly. This result is important when a SAR is used on a UAV, since it is clearly easier to mount a two-channel than a three-channel SAR on a UAV.

Author

Synthetic Aperture Radar; Imaging Radar; Radar Imagery; Radar Maps; Target Acquisition; Terrain Analysis

20000021564 Computer Networks and Software, Inc., Springfield, VA USA

Trade-Off Analysis Report ***Final Report***

Dhas, Chris, Computer Networks and Software, Inc., USA; January 2000; 76p; In English

Contract(s)/Grant(s): NAS3-99165; RTOP 632-50-51

Report No.(s): NASA/CR-2000-209785; E-12071; NAS 1.26:209785; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

NASAs Glenn Research Center (GRC) defines and develops advanced technology for high priority national needs in communications technologies for application to aeronautics and space. GRC tasked Computer Networks and Software Inc. (CNS) to examine protocols and architectures for an In-Space Internet Node. CNS has developed a methodology for network reference models to support NASAs four mission areas: Earth Science, Space Science, Human Exploration and Development of Space (REDS), Aerospace Technology. CNS previously developed a report which applied the methodology, to three space Internet-based communications scenarios for future missions. CNS conceptualized, designed, and developed space Internet-based communications protocols and architectures for each of the independent scenarios. GRC selected for further analysis the scenario that involved unicast communications between a Low-Earth-Orbit (LEO) International Space Station (ISS) and a ground terminal Internet node via a Tracking and Data Relay Satellite (TDRS) transfer. This report contains a tradeoff analysis on the selected scenario. The analysis examines the performance characteristics of the various protocols and architectures. The tradeoff analysis incorporates the results of a CNS developed analytical model that examined performance parameters.

Author

Computer Networks; Protocol (Computers); Tradeoffs; Space Communication; Mathematical Models; Aerospace Engineering; Internets

20000021566 NASA Glenn Research Center, Cleveland, OH USA

Design of a K-Band Transmit Phased Array For Low Earth Orbit Satellite Communications

Watson, Thomas, Raytheon Systems Co., USA; Miller, Stephen, Raytheon Systems Co., USA; Kershner, Dennis, Raytheon Systems Co., USA; Anzic, Godfrey, NASA Glenn Research Center, USA; January 2000; 10p; In English; Phased Array Systems and Technology, 20-26 May 2000, Dana Point, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): NCC3-497; RTOP 632-50-51

Report No.(s): NASA/TM-2000-209779; E-12064; NAS 1.15:209779; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The design of a light weight, low cost phased array antenna is presented. Multilayer printed wiring board (PWB) technology is utilized for Radio Frequencies (RF) and DC/Logic manifold distribution. Transmit modules are soldered on one side and patch antenna elements are on the other, allowing the use of automated assembly processes. The 19 GHz antenna has two independently steerable beams, each capable of transferring data at 622 Mbps. A passive, self-contained phase change thermal management system is also presented.

Author

Phased Arrays; Satellite Communication; Antenna Arrays; Microwave Antennas

20000021570 Computer Networks and Software, Inc., Springfield, VA USA
Protocol Architecture Model Report ***Final Report***
Dhas, Chris, Computer Networks and Software, Inc., USA; January 2000; 142p; In English
Contract(s)/Grant(s): NAS3-99165; RTOP 632-50-51
Report No.(s): NASA/CR-20000-209781; E-12065; NAS 1.26:209781; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

NASA's Glenn Research Center (GRC) defines and develops advanced technology for high priority national needs in communications technologies for application to aeronautics and space. GRC tasked Computer Networks and Software Inc. (CNS) to examine protocols and architectures for an In-Space Internet Node. CNS has developed a methodology for network reference models to support NASA's four mission areas: Earth Science, Space Science, Human Exploration and Development of Space (REDS), Aerospace Technology. This report applies the methodology to three space Internet-based communications scenarios for future missions. CNS has conceptualized, designed, and developed space Internet-based communications protocols and architectures for each of the independent scenarios. The scenarios are: Scenario 1: Unicast communications between a Low-Earth-Orbit (LEO) spacecraft inspace Internet node and a ground terminal Internet node via a Tracking and Data Rela Satellite (TDRS) transfer; Scenario 2: Unicast communications between a Low-Earth-Orbit (LEO) International Space Station and a ground terminal Internet node via a TDRS transfer; Scenario 3: Multicast Communications (or "Multicasting"), 1 Spacecraft to N Ground Receivers, N Ground Transmitters to 1 Ground Receiver via a Spacecraft.
Author
Computer Networks; Protocol (Computers); Internets; Architecture (Computers); Space Communication; Aerospace Engineering

20000021573 Computer Networks and Software, Inc., Springfield, VA USA
Architectural Methodology Report ***Final Report***
Dhas, Chris, Computer Networks and Software, Inc., USA; January 2000; 64p; In English
Contract(s)/Grant(s): NAS3-99165; RTOP 632-50-51
Report No.(s): NASA/CR-2000-209783; NAS 1.26:209783; E-12068; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The establishment of conventions between two communicating entities in the end systems is essential for communications. Examples of the kind of decisions that need to be made in establishing a protocol convention include the nature of the data representation, the for-mat and the speed of the date representation over the communications path, and the sequence of control messages (if any) which are sent. One of the main functions of a protocol is to establish a standard path between the communicating entities. This is necessary to create a virtual communications medium with certain desirable characteristics. In essence, it is the function of the protocol to transform the characteristics of the physical communications environment into a more useful virtual communications model. The final function of a protocol is to establish standard data elements for communications over the path; that is, the protocol serves to create a virtual data element for exchange. Other systems may be constructed in which the transferred element is a program or a job. Finally, there are special purpose applications in which the element to be transferred may be a complex structure such as all or part of a graphic display. NASA's Glenn Research Center (GRC) defines and develops advanced technology for high priority national needs in communications technologies for application to aeronautics and space. GRC tasked Computer Networks and Software Inc. (CNS) to describe the methodologies used in developing a protocol architecture for an in-space Internet node. The node would support NASA:s four mission areas: Earth Science; Space Science; Human Exploration and Development of Space (HEDS); Aerospace Technology. This report presents the methodology for developing the protocol architecture. The methodology addresses the architecture for a computer communications environment. It does not address an analog voice architecture.
Author
Communicating; Protocol (Computers); Telecommunication; Communication Networks; Computer Networks; Interprocessor Communication

20000023212 New Mexico State Univ., Klipsch School of Electrical and Computer Engineering, Las Cruces, NM USA
Toward the Near-Earth Standard
Ryan, William E., Arizona Univ., USA; October 1998; 15p; In English
Report No.(s): NMSU-ECE-99-011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report discusses the requirements for communication in the Near-Earth environment. Attention is paid to requirements for the power and bandwidth efficiency, low decoding latency for voice applications, high data rates for data/image video applications. Other requirements are that the system have a relatively low complexity decoder, that it may have to operate in the

presence of RFI, and that it may have to be operational in quasi-transparency. Binary phase shift keying (BPSK), and Quadrature Phase Shift Keying (QPSK) are two communication techniques for which further specifications are given in the report.
CASI
Binary Phase Shift Keying; Quadrature Phase Shift Keying; Satellite Transmission; Data Transmission; Requirements

20000023213 New Mexico State Univ., Klipsch School of Electrical and Computer Engineering, Las Cruces, NM USA
Bandwidth-Efficient Parallel and Serial Concatenated Codes for QPSK Modulation: Consideration for the CCSDS Near-Earth Standard
Ryan, William E., Arizona Univ., USA; Acikel, Omer, New Mexico State Univ., USA; Oct. 06, 1999; 26p; In English
Report No.(s): NMSU-ECE-99-014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document reviews bandwidth-efficient signaling with M-ary phase shift keying (MPSK). The proposed codes - parallel and serial concatenations convolutional codes are diagrammed with various encoders, and the performance results of each are also discussed. Some of the practical issues for each of the various modes are reviewed.
CASI
Bandwidth; Concatenated Codes; Phase Shift Keying; Data Transmission; Information Theory; Satellite Transmission

20000023222 Arizona State Univ., Coll. of Engineering and Applied Sciences, Tempe, AZ USA
Advanced Electromagnetic Methods for Aerospace Vehicles ***Final Report, 1 Jan. 1990 - 31 Dec. 1999***
Balanis, Constantine A., Arizona State Univ., USA; Polycarpou, Anastasis, Arizona State Univ., USA; Birtcher, Craig R., Arizona State Univ., USA; Georgakopoulos, Stavros, Arizona State Univ., USA; Han, Dong-Ho, Arizona State Univ., USA; Ballas, Gerasimos, Arizona State Univ., USA; [1999]; 133p; In English
Contract(s)/Grant(s): NAG1-1082
Report No.(s): TRC-EM-CAB-0001; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The imminent destructive threats of Lightning on helicopters and other airborne systems has always been a topic of great interest to this research grant. Previously, the lightning induced currents on the surface of the fuselage and its interior were predicted using the finite-difference time-domain (FDTD) method as well as the NEC code. The limitations of both methods, as applied to lightning, were identified and extensively discussed in the last meeting. After a thorough investigation of the capabilities of the FDTD, it was decided to incorporate into the numerical method a subcell model to accurately represent current diffusion through conducting materials of high conductivity and finite thickness. Because of the complexity of the model, its validity will be first tested for a one-dimensional FDTD problem. Although results are not available yet, the theory and formulation of the subcell model are presented and discussed here to a certain degree. Besides lightning induced currents in the interior of an aircraft, penetration of electromagnetic fields through apertures (e.g., windows and cracks) could also be devastating for the navigation equipment, electronics, and communications systems in general. The main focus of this study is understanding and quantifying field penetration through apertures. The simulation is done using the FDTD method and the predictions are compared with measurements and moment method solutions obtained from the NASA Langley Research Center. Cavity-backed slot (CBS) antennas or slot antennas in general have many applications in aircraft-satellite type of communications. These can be flushmounted on the surface of the fuselage and, therefore, they retain the aerodynamic shape of the aircraft. In the past, input impedance and radiation patterns of CBS antennas were computed using a hybrid FEM/MoM code. The analysis is now extended to coupling between two identical slot antennas mounted on the same structure. The predictions are performed using both the hybrid FEM/MoM and the FDTD NEWS code. The results are compared with each other as well as with measurements performed in the ElectroMagnetic Anechoic Chamber (EMAC) of ASU. In addition to self and mutual impedances versus frequency, the comparisons include mutual coupling S(sub 12) as a function of distance for various slot orientations.
Derived from text
Electromagnetic Fields; Lightning; Aerospace Vehicles; Helicopters; Fuselages; Mathematical Models; Method of Moments; Simulation; Slot Antennas

20000023231 National Defence Research Establishment, Stockholm, Sweden
Travel Report from 1999 Command and Control Research and Technology Symposium ***Reserapport fran 1999 Command and Control Research and Technology Symposium***
Isacson, T.; Lagerloef, J.; Lundgren, L.; Pallin, K.; Soederqvist, O.; Sep. 1999; 32p; In Swedish
Report No.(s): PB2000-101495; FOA-R-99-01218-201-SE; No Copyright; Avail: Issuing Activity

The symposium was sponsored by the C4ISR Cooperative Research Program (CCRP), which is managed by DoD. The CCPR pursues a broad program of research and analysis in command and control (C2). The symposium clearly demonstrated the US ability to formulate challenging visions and to raise funds in order to achieve them. Substantial progresses have been made both

conceptually and technologically, but there are still great many problems to overcome. The presentations covered a wide range of problems from the conditions for the man in the system to C2 for coalition forces in different types of conflicts.
NTIS
Command and Control; Research

20000023234 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
SAT/mark (HKC) ***Final Report Slutrapport Studiegrupp Krav (Sg Krav)***
Bohman, L.; Sep. 1998; 28p; In Swedish
Report No.(s): PB2000-101482; FOA-R-98-00874-615-SE; No Copyright; Avail: Issuing Activity

This report is a summary of the work done by the group 'Sg Krav' (Requirements) during project SAT/mark AO1. The group started with an investigation on existing ways of putting requirements on signatures in optical and radar regions. A major part of the time was spent on discussions to establish a common perspective on the key issues and the links to the sensor threat. The work was focused on possibilities to find over-all system requirements on signatures. Finally, a proposal has been submitted on a generalized structure for a FMV standard concerning signature requirements.
NTIS
Signatures; Optical Radar; Radar Signatures; Signature Analysis

20000023242 Commerce Dept., Economics and Statistics Administration, Washington, DC USA
Economic Census 1997. Power and Communication Transmission Line Construction. Construction Industry Series
Nov. 1999; 48p; In English
Report No.(s): PB2000-102289; EC97C-2349B; No Copyright; Avail: Issuing Activity

The economic census is the major source of facts about the structure and functioning of the Nation's economy. It provides essential information for government, business, industry, and the general public. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. Specific uses of economic census data include the following: Policymaking agencies of the Federal Government use the data to monitor economic activity and assess the effectiveness of policies; State and local governments use the data to assess business activities; Trade associations study trends in their own and competing industries and individual businesses use the data to locate potential market. Data from the 1997 Economic Census are published primarily on the basis of the North American Industry Classification System (NAICS). These reports include statistics such as establishments, employment, payroll, value added, cost of materials, value of business done, and capital expenditures. Explanations of these and other terms may be found in Appendix A. The industry reports also include selected statistics for states.
NTIS
Economic Analysis; Transmission Lines; Construction; Communication Cables; Commerce; Census

20000024914 Air Force Research Lab., Human Effectiveness Directorate, Brooks AFB, TX USA
Wideband Pulse Propagation in Linear Dispersive Bio-dielectrics Using Fourier Transforms ***Final Report, Jul.-Dec. 1995***
Franzen, John P.; Feb. 1999; 67p; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A371944; AFRL-HE-BR-TR-1999-0149; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We describe calculations of a plane-wave pulse train of finite duration in a linear lossy dispersive dielectric half-space by means of Fourier integral transforms. The polarization response of Debye and Lorentz media to a finite number of sinewave pulses and the response of a Lorentz medium to a single Gaussian modulated sinewave pulse are given. These solutions are formulated for the case of normal incidence to the planar boundary of a dielectric half-space. Our results show that the Fourier transform accurately reproduces precursor phenomena previously observed for infinitely periodic pulse trains using the Fourier series method extending the analysis to a periodic waveforms. These results can be computed to arbitrary accuracy because the Fourier integral representation of the propagated pulse is exact, i.e. no analytical or physical approximations are used to arrive at the time-domain solution. We believe that this numerical tool will be useful in developing physical intuition about the dynamics of pulse propagation in bio-tissue which is now made possible by the availability of high-speed computer hardware.
DTIC
Fourier Transformation; Dielectrics; Broadband; Aerospace Medicine; Pulse Modulation; Mathematical Models

20000024997 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

Development of a Portable High-Frequency Radar

Wilson, Harold, Defence Research Establishment Ottawa, Canada; Oct. 1999; 61p; In English

Report No.(s): AD-A372153; DREO-TR-1999-108; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Surface Radar Section of DREO is developing a portable HF radar. The report presents an overview of the radar and analysis of a series of tests done in 1998. The equipment including antennas and electronics is described. A series of electronics problems was encountered, but none of them have a significant effect on the operation of the system. The receiver system was calibrated using loopback runs, source measurements and meteor reflections. Measurements of interference, meteors and environmental clutter at 24.5 MHz are presented. The results of the tests are used to estimate the performance of the portable radar in Line-of-Sight mode against theatre ballistic missiles.

DTIC

Radar; Portable Equipment; Radar Equipment; High Frequencies

20000025018 Air Force Research Lab., Rome, NY USA

Simultaneous Adaptive Co-Channel Speaker Separation, *Jan. 1994 - Jan. 1998*

Benincasa, Daniel S., Air Force Research Lab., USA; Nov. 1999; 210p; In English

Contract(s)/Grant(s): AF Proj. 4594

Report No.(s): AD-A372110; AFRL-IF-RS-TR-1999-162; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

In this research, we have developed several unique techniques used in the separation of a speech signal corrupted by another talker's speech recorded over a single channel. Historically, this has been referred to as the cocktail party problem. Our work is useful in such applications as separating the speech signals recorded onto an in-flight voice data recording box from the cockpit of an airplane, enhancing the quality of speech transmitted through a hearing aid, and in the enhancement of speech transmitted over a noisy communication channel. We have made significant contributions to the field of speaker separation. We have developed and tested an adaptive co-channel speaker separation system which can simultaneously estimate the speech of two speakers recorded onto a single channel. We have developed and tested several methods to estimate the voicing state of a co-channel speech segment. We have developed and tested a technique to estimate the fundamental frequency and pitch contour of each speaker. This technique is based on the maximum likelihood pitch estimator and harmonic magnitude suppression. Using the estimate of the fundamental frequency, we have developed a technique to estimate the harmonic parameters of overlapping voice speech segments. Finally, we have developed and tested an innovative technique to simultaneously estimate overlapping voiced speech segments using a constrained nonlinear least squared optimization algorithm. These techniques have been integrated into end to end speaker separation system to separate co-channel speech.

DTIC

Cockpits; Voice Communication; Statistical Analysis; Multichannel Communication; Speech Recognition

20000025019 Rensselaer Polytechnic Inst., Troy, NY USA

Spread Spectrum Interference Mitigation with Variable Processing Gain *Final Report, Feb. - Nov. 1998*

Saulnier, Gary J., Rensselaer Polytechnic Inst., USA; Ye, Zhong, Rensselaer Polytechnic Inst., USA; Oct. 1999; 115p; In English

Contract(s)/Grant(s): F30602-98-1-0054; AF Proj. 2304

Report No.(s): AD-A372117; AFRL-IF-RS-TR-1999-222; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Designing a spread spectrum signal for the worst case channel conditions can be wasteful of system resources such as bandwidth and network throughput capacity. This report focuses on the performance of spread spectrum system based on multi-carrier modulation, also known as Orthogonal Frequency Division Multiplexing (OFDM), which provides variable processing gain by adjusting the redundancy in the signal in response to the channel conditions. A signal structure based on OFDM is defined and a technique for adapting the signal properties, including the data rate, in response to channel conditions and/or transmission requirements, is developed. Analytical and simulation results demonstrate that the signaling format can maintain a desired error rate performance over a wide range of channel conditions. The report also considers the impact of this variable signaling scheme on the upper layers of the network and, in particular, the data link layer. Classic throughput analysis for fixed and random access schemes is extended for this proposed adaptive packet radio network. The focus in on pure-ALOHA and non-persistent CSMA (NP-CSMA) systems. A large improvement in throughput is demonstrated for the adaptive system, as compared to a conventional fixed rate system, for various mobile user population profiles and radio propagation path loss models.

DTIC

Frequency Division Multiplexing; Multipath Transmission; Spread Spectrum Transmission; Signal Processing

20000025046 Air Force Space Battlelab, Schriever AFB, CO USA

Space Environment Network Display (SEND)

Jaeger, Edward; Jul. 1999; 17p; In English

Report No.(s): AD-A371862; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

SEND is an integrated system designed to incorporate information from three separate sensor systems and to create products, which describe two space environment problems: Ultra High Frequency Satellite Communication (UHF SATCOM) outages and High Frequency (HF) communication degradation. The overall objective of the campaign concept was to integrate new and existing space environment sensor data with models to provide graphical, web page space environment displays to warfighters via the Secret Internet Protocol Router Network (SIPRNET). The displays enable operators to see if there are scintillation effects over their region of interest and to adjust their communication systems operations accordingly.

DTIC

Aerospace Environments; Satellite Communication; Communication Networks; Internets; Computer Programs

20000025192 Norwegian Defence Research Establishment, Kjeller, Norway

Signature and Atmospheric Models for Use in the Infrared Region ***Signatur- og Atmosfaeremodeller for Bruk i det Infrarode Spektralomradet***

Stark, Espen, Norwegian Defence Research Establishment, Norway; Nov. 01, 1999; 32p; In Norwegian

Contract(s)/Grant(s): FFIE Proj. 762/113

Report No.(s): FFI/RAPPORT-99/05417; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective for the project: electronic warfare for the air force, protection against IR-guided missiles, is to develop concepts for protection based on tactic, flares and ir-jammers. to obtain this, missiles, targets and flares must be analysed. A part of this evaluation will be models for signatures and the atmosphere. This report gives an overview over models for calculation of signatures of aircraft and models for atmospheric calculation. The models described in the report are valid in the infrared region, typical 0.2 - 20 microns. The report will also give examples from the different models.

Author

Atmospheric Models; Electronic Warfare; Infrared Radiation; Signatures

20000025256 Institute for Human Factors TNO, Soesterberg, Netherlands

SQUIRE: Man-Portability and Operation of a Field Radar System ***Final Report SQUIRE: Draagbaarheid en Gebruik van een Gevechtsveldcontrole-Radar***

Hin, A. J. S., Institute for Human Factors TNO, Netherlands; Ruysendaal, M., Institute for Human Factors TNO, Netherlands; Weitenberg, A. I. M., Institute for Human Factors TNO, Netherlands; Sep. 03, 1999; 64p; In English

Contract(s)/Grant(s): A99/KM/306; TNO Proj. 789.1

Report No.(s): TD99-0337; TNO-TM-99-A059; Copyright; Avail: Issuing Activity

A man-portable field radar system, called SQUIRE, has been developed by Hollandse Signaalapparaten BV by order of the Royal Netherlands Navy. The system was evaluated on man-portability, (de)installing the system, and operation of the user interface. The results achieved with the SQUIRE are compared to a similar system, called MSTAR. This system is already in use by the marines. A functional evaluation, a field experiment with marines, air mobile forces and cavalry personnel, and an evaluation with these users provided information on how to improve the system. With regard to the SQUIRE backpacks it is recommended to reduce the weight to achieve a minimal level of discomfort, and to simplify the system of straps for carrying. Batteries have the largest contribution (36%) to the total weight, are incompatible with other energy resources and exposes personnel to enemy fire in case a new battery must be installed at the radar site. It is recommended to redesign the radar unit backpack to carry the batteries more conveniently and to reduce the load on the radar protection shell. The operator unit backpack must be redesigned to prevent rain from entering, to exclude zip fasteners and to make working during rain and sunshine possible. The construction for mounting the radar unit on the tripod must be simplified for ease of installation by daylight and in the dark. The main recommendations on the operational use of the SQUIRE system are that the menu structure is modified to improve navigation to specific functions, the number of interaction techniques must be reduced and information presentation is improved. A redesign of the operator unit may solve problems like pressing function key labels, sudden closing of the cover and limited opening angles. The use of the joystick must be reconsidered. Delays in control signals and light emission of the rosette must be reduced.

Author

Electric Batteries; Personnel; Portable Equipment; Radar; Radar Equipment; Military Technology

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

20000021197 Southampton Univ., UK
Ultrafast Optical Processing *Final Report*
Grudinin, Anatoly; Oct. 1999; 18p; In English
Contract(s)/Grant(s): F61775-98-W-E055
Report No.(s): AD-A371348; EOARD-SPC98-4029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking University of Southampton as follows: The contractor will demonstrate data header erasure at 500 gigabits per second and investigate the ultimate speed of the nonlinear intensity modulator based on the Raman effect. Two approaches will be considered to study the ultimate performance of the Raman intensity modulator. First, to study the nonlinear and photorefractive properties of recently developed optical glass materials. Second, to study a complex structure comprising a D-shaped silica fiber with a thin lay of highly nonlinear semiconductor deposited on the flat surface of the fiber. The research will consider optical loss, polarization, and photorefractive sensitivity of the structure.
DTIC
Optical Materials; Glass; Optoelectronic Devices

20000021286 Institute of Electrical and Electronics Engineers, Laser and Electro-Optics Society, Piscataway, NJ USA
10TH Annual Workshop on Interconnections Within High Speed Digital Systems
May 12, 1999; 118p; In English, 9-12 May 1999, Santa Fe, NM, USA
Contract(s)/Grant(s): F49620-99-1-0300
Report No.(s): AD-A371596; AFRL-SR-BL-TR-99-0299; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

10th Annual Workshop on Interconnections within High Speed Digital Systems.
DTIC
Digital Systems; Optical Communication; Optical Interconnects; Pulse Communication

20000021330 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Evaluation of Coherent Laser Radar Systems Based on 1.55 microns Semiconductor Lasers in Defence Applications *Utvaerdering av Koherenta Laserradarsystem Baserade pa 1,55 mu m Halvledarlasrar i Foersvarstillaempningar*
Karlsson, C.; Letalick, D.; Oct. 1998; 32p; In Swedish
Report No.(s): PB2000-101470; FOA-R-98-00917-408-SE; No Copyright; Avail: Issuing Activity

FOA has developed and evaluated covert coherent semiconductor laser systems (FMCW) for ranging, velocimetry and vibrometry. In particular, noise, signal-to-noise ratio, frequency modulation and the implication of limited coherence length have been studied experimentally. In this report, evaluations of semiconductor laser based FMCW systems, considering limitations such as output power and coherent length, in a number of applications are presented. Essentially, the authors have concentrated on applications where the range at ground is about 2 km, which requires a laser power of 1 W for an integrated time of 0.1 s. In the applications, the covert (whispering) characteristic is of great value. Examples of applications are range finding for anti-aircraft defense and anti-tank weapons, and vibrometry for target recognition. Also, application specific needs, such as, e.g., range resolution, update frequency, and its implications of FMCW systems regarding laser output power etc., are presented in the report.
NTIS
Semiconductor Lasers; Lasers; Proving; Fabrication; Optical Equipment; Military Technology; Coherent Radar; Performance Tests

20000021383 Michigan Univ., Solid-State Electronics Lab., Ann Arbor, MI USA
Enhanced Transmission Line Model Structure for Accurate Resistance Evaluation of Small-Size Contacts and for More Reliable Fabrication
Sawdai, Donald, Michigan Univ., USA; Pavlidis, Dimitris, Michigan Univ., USA; Cui, Delong, Michigan Univ., USA; IEEE Transactions on Electron Devices; July 1999; ISSN 0018-9383; Volume 46, No. 7, pp. 1302-1311; In English
Contract(s)/Grant(s): DAAH04-96-1-0001; DAAL03-92-G-0109
Report No.(s): AD-A369963; ARO-35003.54-EL-MUR; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Two new transmission line model (TLM) techniques are presented. The first structure, L(sub T)-TLM, provides very accurate determination of the transfer length L(sub T) (within 5%) and the contact resistivity rho(sub C) (within 12%) of lateral contacts, as compared to typical errors of 30 and 50%, respectively, for conventional TLM patterns. Accurate determination of these quantities is important for the optimal design of small lateral contacts in high-performance devices, much as heterojunction bipolar transistors (HBT's). The second structure, a modified concentric TLM pattern, provides the same results as conventional TLM patterns; however, they do not require mesa isolation, and they can be fabricated extremely reliably. In contrast, conventional concentric TLM patterns am often shorted together or distorted by lift-off metallization processes. Both theoretical analysis and experimental verification with analysis of the accuracy of the extracted data is presented for each technique, demonstrating the advantages of these approaches.
Author
Transmission Lines; Models; Electrical Resistivity; Electric Contacts; Contact Resistance; Ohmic Dissipation

20000021519 NASA Goddard Space Flight Center, Greenbelt, MD USA
Small Explorer WIRE Failure Investigation Report
Katz, Richard B., NASA Goddard Space Flight Center, USA; May 27, 1999; 40p; In English, Aug. 2000, Surrey, UK; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents the Small Explorer WIRE Failure Investigation Report in viewgraph form. Some of the diagrams include: 1) Overview of the Pyro Box and key interfaces; 2) Schematic Diagram of the A1020 FPGA (Field Programmable Gate Array) inputs; 3) Three critical FPGA reset signals shown in detail; 4) State machines for firing the cover pyrotechnic devices; 5) Oscillator Overview; and 6) General Crystal Oscillator Startup Characteristics.
CASI
Explorer Satellites; Failure Analysis; Design Analysis

20000021577 Pennsylvania State Univ., Materials Research Lab., University Park, PA USA
The Ninth U.S. - Japan Seminar on Dielectric and Piezoelectric Ceramics. Program and Evaluations ***Final Report, 1 Jan. 1999-31 Mar. 00***
Shrout, THomas R.; Nov. 05, 1999; 50p; In English
Contract(s)/Grant(s): N00014-99-1-0138
Report No.(s): AD-A372459; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Ninth U.S.-Japan Seminar on Dielectric and Piezoelectric Ceramics was held on Okinawa, Japan, through November 2-5, 1999. The local organization was from the Science University of Tokyo and the Tokyo Institute of Technology. The total number of papers was 106: 69 Japanese and 37 U.S.; 40% of the papers were from industry. The principal technical topics were: (1) Piezoelectric Ceramics (bulk), (2) Multilayer Capacitors, and (3) Thin Film Dielectrics. The emphasis on multilayer capacitors was on base metal electrodes (BME) with ultra thin layers (less than 3 microns) and the search for non-PbO based piezoelectrics a major thrust area in Japan. Novel pyrochlore and quantum ferroelectric materials and improved understanding of polarization fatigue in thin films were highlighted.
DTIC
Dielectrics; Piezoelectric Ceramics; Ferroelectric Materials; Thin Films

20000023228 NASA Marshall Space Flight Center, Huntsville, AL USA
Unmanned Vehicle Guidance Using Video Camera/Vehicle Model (MSFC Center Director's Discretionary Fund) ***Final Report***
Sutherland, T., NASA Marshall Space Flight Center, USA; December 1999; 4p; In English
Contract(s)/Grant(s): Proj. 97-23
Report No.(s): NASA/TM-1999-209788; NAS 1.15:209788; M-956; No Copyright; Avail: Issuing Activity; Abstract Only
A video guidance sensor (VGS) system has flown on both STS-87 and STS-95 to validate a single camera/target concept for vehicle navigation. The main part of the image algorithm was the subtraction of two consecutive images using software. For a nominal size image of 256 x 256 pixels this subtraction can take a large portion of the time beta,een successive frames in standard rate video, leaving very little time for other computations. The purpose of this project was to integrate the software subtraction into hardware to speed up the subtraction process and allow for more complex algorithms to be performed, both in hardware and software.
Author
Guidance Sensors; Space Transportation System; Video Communication; Computer Programs; Cameras; Pilotless Aircraft

20000023233 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Millimeter wave Technique. System Survey ***Millimetervagsteknik. Systemoeversikt***
Nilsson, S.; Mar. 1999; 28p; In Swedish
Report No.(s): PB2000-101487; FOA-R-99-01194-408-SE; No Copyright; Avail: Issuing Activity

This report gives a summary of various applications and systems based on millimeter wave technique (seeker applications or systems are not included). The study points out applications where millimeter waves are especially interesting compared with other technical solutions, due to environmental conditions, weight, volume, price etc.

NTIS

Radar; Homing Devices; Millimeter Waves

20000024875 Academy of Sciences of the Ukraine, Inst. of Radiophysics and Electronics, Kharkov, Ukraine
International Conference on Antenna Theory and Techniques
Dec. 03, 1999; 596p; In English; Antenna Theory and Techniques, 13-15 Sep. 1999, Sevastopil, Ukraine
Contract(s)/Grant(s): F61775-99-WF071
Report No.(s): AD-A372388; EOARD-CSP-99-5071; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

This is an interdisciplinary conference. This includes: (1) general antenna theory (analysis and synthesis); (2) reflector lens and hybrid antennas; (3) antenna arrays including adaptive, conformal and active arrays; (4) numerical methods in antenna modeling; (5) mobile communication antennas; (6) radomes and absorbing coatings; (7) antenna measurements; (8) microwave components and feeders; (9) industrial and biomedical applications; (10) antenna and microwave education; (11) Omindirectoral antennas; (12) Printed antennas; and (13) Antenna and microwave fabrication.

DTIC

Antenna Arrays; Antenna Design; Antenna Components; Mathematical Models; Conferences

20000024878 Royal Military Coll. of Canada, Kingston, Ontario Canada
Design and Optimization of a Wideband Printed-Dipole Array
Duffley, B. G.; Morin, G. A.; Antar, Y. M. M.; Nov. 1999; 120p; In English
Report No.(s): AD-A372450; DREO-TR-1999-122; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Modern satellite and mobile communications systems continue to push the bandwidth requirement of antenna subsystems. Printed microstrip architectures have been widely investigated and are attractive for their conformability, small size and cost effectiveness. While vigorous research activity over the past two decades has improved the bandwidth of microstrip elements to upwards of 30%, this may not be adequate for the future system demands of multipurpose antennas. In this report, printed dipole arrays are investigated. They have the advantage of large bandwidths, up to 100%. Arrays of this type were described in the literature, however, no detailed analysis or measurements were provided. For this report, a 32 element wideband printed dipole array was fabricated, analyzed from 4 to 20 Ghz and successfully optimized for improved bandwidth performance in excess of an octave. The important design parameters were extracted and their effect on performance were demonstrated.

DTIC

Communication Satellites; Dipole Antennas; Antenna Design; Broadband; Antenna Arrays

20000024910 Naval Research Lab., Washington, DC USA
An Introduction to ARRSTATS - A Computer Program for Simulating the Effects of Errors in Time- and Phase- Steered Planar Array Antennas ***Final Report***
West, C. Stan; Nov. 22, 1999; 52p; In English
Report No.(s): AD-A371886; NRL/MR/5653--99-8419; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A computer program is described that simulates time and phase steered array antennas subject to deterministic and random errors. The modeled array comprises a planar, rectangular grid of phase steered elements grouped hierarchically into time steered subarrays and time steered subapertures. Random phase, time, and amplitude errors may be assigned, and the phases and times may be quantized. The simulation frequency may differ from the design frequency. The program assesses the antenna's performance by computing and analyzing the far field radiation pattern or an ensemble of statistically identical patterns. It determines the location and power density of the main beam peak, the pointing error, the major and minor beam widths, the directivity, the ratio of main beam and sidelobe powers, and other measures. The program can tabulate measures as functions of a user specified independent variable such as the operating frequency, a steering angle, an error parameter, a quantization

specification, or a parameter of the array geometry. Results may be displayed as textual output of the performance measures, plots of radiation patterns, and plots of performance measures versus the independent variable.
DTIC
Computer Programs; Antenna Arrays; Computerized Simulation; Random Errors; Mathematical Models

20000024911 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1998, Department of Electrical and Computer Engineering, ***1 Jan.-31 Dec. 1998***
Knorr, Jeffrey B.; Tummala, Murali; Aug. 1999; 101p; In English
Report No.(s): AD-A371905; NPS-09-99-006; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report contains summaries of research projects in the Department of Electrical and Computer Engineering. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts.
DTIC
Electrical Engineering; Computer Aided Design; Antenna Arrays; Signal Processing

20000024975 Materials Research Source, LLC, Pasadena, CA USA
Quantum Dot Array Formation through Biomolecular Nanopatterning ***Final Report, 18 Aug. - 17 Dec. 1999***
Gillis, H. P., Materials Research Source, LLC, USA; Dec. 30, 1999; 17p; In English
Contract(s)/Grant(s): DAAD19-99-C-0019
Report No.(s): AD-A372318; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Report developed under SBIR contract for Topic A98-028: The objective is to demonstrate the feasibility of forming precisely ordered and precisely located arrays of semiconductor quantum dots by using biomolecular templates and Low Energy Electron Enhanced Etching (LE4) to define in a substrate an array of holes with diameters comparable to the size of quantum dots sought, and then growing one quantum dot in each ”nanohole’, by self-assembly of deposited adatoms. In Phase I, key methodology was developed: (1) depositing the biomolecular templates on clean(hydrophobic) Si(100) surfaces; (2) identifying LE4 process conditions for etching the nano-pattern; (3) stripping the template-generated masks after LE4 by wet chemical methods. Phase I Option emphasized: (1) removal of the oxide left on the nano-patterned substrate by the stripping process; (2) preliminary efforts to deposit Ce and GaAs quantum dots; (3) scaling the nano-patterning and deposition processes to cover 1-in. diameter substrates. These quantum dot arrays have potential applications in optical emitters and detectors, single electron transistors, and high-density memory arrays.
DTIC
Quantum Dots; Arrays; Semiconductor Devices; Optical Measuring Instruments

20000024978 NASA Langley Research Center, Hampton, VA USA
Characterization of a 16-Bit Digitizer for Lidar Data Acquisition
Williamson, Cynthia K., NASA Langley Research Center, USA; DeYoung, Russell J., NASA Langley Research Center, USA; February 2000; 17p; In English
Contract(s)/Grant(s): RTOP 274-00-99-24
Report No.(s): NASA/TM-2000-209860; NAS 1.15:209860; L-17888; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A 6-MHz 16-bit waveform digitizer was evaluated for use in atmospheric differential absorption lidar (DIAL) measurements of ozone. The digitizer noise characteristics were evaluated, and actual ozone DIAL atmospheric returns were digitized. This digitizer could replace computer-automated measurement and control (CAMAC)-based commercial digitizers and improve voltage accuracy.
Author
Data Acquisition; Differential Absorption Lidar; Analog to Digital Converters; Computer Programs; Waveforms

20000025003 North Carolina State Univ., Dept. of Electrical and Computer Engineering, Raleigh, NC USA
SiC Discrete Power Devices ***Annual Report, 1 Jan. - 31 Dec. 1999***
Baliga, B. J., North Carolina State Univ., USA; Chilukuri, R. K., North Carolina State Univ., USA; Jan. 01, 2000; 40p; In English
Contract(s)/Grant(s): N00014-96-1-0363
Report No.(s): AD-A372200; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
A novel planar vertical MOSFET structure (called ACCUFET), which eliminates both the problems of premature oxide breakdown and low inversion layer mobility, has been demonstrated. Here, the studies done at the Power Semiconductor Research

Center for design and development of ACCUFETs are documented. The characteristics of ACCUFETs fabricated from 6H-SiC and 4H-SiC polytypes with measured breakdown voltages of 350-450 V, are compared. The 6H-SiC ACCUFETs exhibited excellent electrical characteristics, while the performance of 4H-SiC ACCUFETs was worse than expected. The investigation of the poor performance of the 4H-SiC ACCUFETs provided insights for changes in device design and process flow, for improving their breakdown voltage and specific on-resistance. Further, characteristics of Ni/4H-SiC Schottky rectifiers operating at 1.5 to 2.5 kV using low energy Ar implants for edge termination are reported. Apart from being a detailed study of the performance of 4H-SiC high voltage Schottky barrier diodes, the characterization of these diodes also provided insights on the quality of the starting material, the barrier heights and the edge termination, that contributed to the proposed new ACCUFET fabrication run. In addition, the effect of key device design parameters on device characteristics have been studied with the help of two-dimensional simulations.
DTIC
Silicon Carbides; Field Effect Transistors; Planar Structures; Schottky Diodes; Fabrication; Design Analysis

20000025027 NASA Goddard Space Flight Center, Greenbelt, MD USA
In-Orbit Earth Radiation Budget Satellite (ERBS) Battery Switch
Ahmad, Anisa, NASA Goddard Space Flight Center, USA; Enciso, Marlon, NASA Goddard Space Flight Center, USA; Rao, Gopalakrishna, NASA Goddard Space Flight Center, USA; [1999]; 19p; In English; 1999 Aerospace Battery Workshop, 16-18 Nov. 1999, Huntsville, AL, USA; Sponsored by NASA Marshall Space Flight Center, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation reviews the history of the Earth Radiation Budget Satellite (ERBS) and the problems which were experienced with the batteries. After two cells shorted on the first Battery, the decision was made to take battery 1 of line in late 1992. This left the second battery supporting all loads. The second battery began to experience problems in 1998 into 1999. The decision was made to bring the first battery on line and take the second battery off line. The steps to switching the batteries are reviewed, and the results are discussed.
CASI
Electric Batteries; Switching; Spacecraft Power Supplies; Electrical Faults

20000025065 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: AMSU-A1 Antenna Drive Subsystem, P/N 1331720-2, S/N 107
Luu, D., Aerojet-General Corp., USA; Mar. 09, 1999; 150p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209506; NAS 1.26:209506; Rept-11421; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This is the Performance Verification Report, AMSU-A I Antenna Drive Subsystem, S/N 107, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).
Author
Advanced Microwave Sounding Unit; Microwave Sounding; Satellite Sounding; Earth Observing System (EOS); Remote Sensing

20000025209 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A) ***Monthly Report, 1-31 Mar. 1999***
Nieto, A., Aerojet-General Corp., USA; April 1999; 240p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209508; NAS 1.26:209508; Rept-10300-67; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This is the 75th Monthly Report for the Advanced Microwave Sounding Unit-A (AMSU-A).
Author
Advanced Microwave Sounding Unit; Earth Observing System (EOS); Microwave Sounding; Remote Sensing

20000025212 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: Initial Comprehensive Performance Test Report, P/N 1331200-2-IT, S/N 105/A2
Platt, R., Aerojet-General Corp., USA; Feb. 24, 1999; 552p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-1999-209497; NAS 1.26:209497; Rept-11409; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

This is the Performance Verification Report, Initial Comprehensive Performance Test Report, P/N 1331200-2-IT, S/N 105/A2, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A). The specification establishes the requirements for the Comprehensive Performance Test (CPT) and Limited Performance Test (LPT) of the Advanced Microwave Sounding, Unit-A2 (AMSU-A2), referred to herein as the unit. The unit is defined on Drawing 1331200. 1.2 Test procedure sequence. The sequence in which the several phases of this test procedure shall take place is shown in Figure 1, but the sequence can be in any order.
Derived from text
Advanced Microwave Sounding Unit; Performance Tests; Specifications

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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.

20000021168 NASA Goddard Space Flight Center, Greenbelt, MD USA
Particle Acceleration by CME-Driven Shock Waves
Reames, Donald V., NASA Goddard Space Flight Center, USA; [1999]; 16p; In English; 26th; International Cosmic Ray Conference, 17-25 Aug. 1999, Salt Lake City, UT, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the largest solar energetic particle (SEP) events, acceleration occurs at shock waves driven out from the Sun by coronal mass ejections (CMEs). Peak particle intensities are a strong function of CME speed, although the intensities, spectra, and angular distributions of particles escaping the shock are highly modified by scattering on Alfven waves produced by the streaming particles themselves. Element abundances vary in complex ways because ions with different values of Q/A resonate with different parts of the wave spectrum, which varies with space and time. Just recently, we have begun to model these systematic variations theoretically and to explore other consequences of proton-generated waves.
Author
Energetic Particles; Particle Acceleration; Coronal Mass Ejection; Shock Waves; Sun

20000021238 NASA Ames Research Center, Moffett Field, CA USA
Slender Vortex Filament with Slowly Varying Core Structure *Final Report*
Ting, Lu, New York Univ., USA; Tung, Chee, NASA Ames Research Center, USA; Jan. 14, 2000; 10p; In English
Contract(s)/Grant(s): NAG2-1322; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We give a brief review of the asymptotic theory of slender vortex filaments with emphases on the choices of scalings characterizing the physical problems and the corresponding assumptions and/or restrictions introduced in the formation of the asymptotic theory of Callegari and Ting (1978) and its extension by Klein and Ting (1992). In particular, the slender filaments considered are assumed to be forming loops or tori. Because of this restriction, the theory is not applicable to the trailing vortex system of a rotorcraft. We describe the multiple length scales characterizing the vortex system, formulate the expansion scheme, derive the governing equations and then identify the assumptions or restrictions inherent in the multi-scale analysis and needed for the validity of the asymptotic theory of the trailing vortex system.
Author
Vortex Filaments; Vortices; Biot-Savart Law; Asymptotic Series

20000021249 Helsinki Univ. of Technology, Lab. of Computational Engineering, Espoo, Finland
Electorheological and Magnetorheological Fluids
Lukkarinen, A.; Oct. 09, 1999; ISSN 1455-0474; 206p; In English
Report No.(s): PB2000-102639; ISBN 951-22-4702-X; Copyright; Avail: National Technical Information Service (NTIS)

In this thesis, physical properties of electrorheological (ER) and magnetorheological (MR) fluids are discussed. From the theoretical point of view, the basic elements of ER or MR phenomena are electrostatic or magnetostatic and hydrodynamic interactions between suspension particles. In this thesis, numerical simulation methods are used to study the physical properties of ER and MR systems under various external conditions. These simulations are based on numerical models or techniques, specifically point dipole model or finite elements method, which have been used to study some static and dynamic properties of these fluids.
NTIS
Electrorheological Fluids; Rheology

20000021280 Colorado Univ., Boulder, CO USA
An Experimental Data Base for the Evaluation of Theories for UpScaling in Modeling of Groundwater Flow, Solute Transport and Multiphase Fluid Flow in Aquifers ***Final Report, 1 Jul. 1995 - 31 Dec. 1998***
Illangasekare, T. H.; Rajaram, H.; Dec. 31, 1998; 33p; In English
Contract(s)/Grant(s): DAAH04-95-1-0399
Report No.(s): AD-A371362; ARO-34573.1-EV; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
SUMMARY OF THE MOST IMPORTANT RESULTS Our investigation focused on a few selected fundamental processes. The underlying groundwater flow and transport properties at a given contamination site are common to a wide range of chemical and chemical mixtures. Thus, issues related to up-scaling arise in modeling transport and transformation of any contaminant. Rather than focus on many contaminants, our study has focused on fundamental processes that can be investigated with a high degree of precision and control in our intermediate-scale experiments. The understanding of up-scaling issues gained from our study can be abstracted for application to a wider range of contaminants. Our study provides a valuable database for validation of up-scaling theories and understanding the complexities of entrapment of non-aqueous phase liquids (NAPLs) in heterogeneous media. The specific issues addressed in our investigation are: 1. Entrapment of NAPLs in heterogeneous formations, sensitivity of solute transport to entrapped NAPLs and prospects for detecting NAPL spills using tracer tests. 2. Solute transport in heterogeneous porous media, including the behavior under radial flow conditions. 3. Adsorption of dissolved chemicals in chemically heterogeneous aquifers
DTIC
Data Bases; Ground Water; Flow Characteristics; Multiphase Flow; Scaling Laws; Water Flow; Solutes

20000021283 Utah Univ., Salt Lake City, UT USA
Condensation in Microchannels ***Final Report, 16 Mar. 1998 - 15 Mar. 1999***
Ameel, Timothy A.; Nov. 10, 1999; 9p; In English
Contract(s)/Grant(s): DAAG55-98-1-0205
Report No.(s): AD-A371452; ARO-38757.2-PH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Design of meso-scale energy systems, either for power production or heating/cooling, will require understanding of the thermodynamics of the proposed system as well as knowledge of the heat transfer and fluid dynamic characteristics associated with flow in microchannels. These proposed thermal energy systems require the exchange of significant amounts of heat and most take advantage of the large heat transfer rates accompanying phase change. Evaporators and condensers for meso-scale energy systems will most likely be constructed of microchannels due to the microfabrication constraints that limit most structures to two-dimensional planar geometries. Thus, forced convection boiling and condensation in horizontal microchannels will provide the mechanisms for heat exchange. Unfortunately, little is known about these two processes in microchannels. No work on condensation in microchannels has yet to be reported. For single-phase and phase-change heat transfer processes, knowledge of the heat transfer rates and pressure drops in microchannels is vitally important for the future design of complete meso-scale energy systems. Thus, design tools, such as analytical and numerical models and experimental correlations, that account for microscale effects must be available to engineers as they consider complete system design. This report summarizes the first steps taken to assess convection heat transfer in horizontal microchannels.
DTIC
Microchannels; Systems Engineering; Fluid Dynamics; Liquefaction

20000021328 Illinois Univ. at Urbana-Champaign, Dept. of Mechanical and Industrial Engineering, Urbana, IL USA
Evolution and Convection of Large-Scale Structures in Supersonic Reattaching Shear Flows
Smith, K. M., Illinois Univ. at Urbana-Champaign, USA; Dutton, J. C., Illinois Univ. at Urbana-Champaign, USA; Physics of Fluids; August 1999; ISSN 1070-6631; Volume 11, No. 8, pp. 2127-2138; In English

Contract(s)/Grant(s): DAAL03-92-G-0129
Report No.(s): AD-A370051; ARO-36425.6-EG; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Double-pulsed Mie scattering studies were performed to characterize the evolution of large-scale structures embedded within a planar supersonic base flow. Images were obtained at several streamwise stations along the shear layers, at reattachment, and in the near-wake regions. From time time-correlated images, the evolution characteristics of the Large-scale structures were examined over a range of nondimensional time delays, as defined by local integral length and velocity scales. The double-pulsed images indicated that for short time delays (i.e., less than the representative eddy rollover time), the structures exhibited a simple translation in the streamwise direction. As the time delay was increased, rotation and elongation of the structures were observed in addition to the translation feature. Time delays that appreciably exceeded the local eddy rollover time generally resulted in a dramatic loss of structure identity. No eddy interactions, such as pairing, were observed at any of the imaging locations. Images obtained near reattachment provided evidence of shocklets moving in concert with the local eddies. In the initial portions of the shear layers, the mean convection velocity was measured to be significantly higher than the isentropic estimate, winch is consistent with the results of previous convection velocity studies using mixing layers composed of supersonic/subsonic freestream combinations. The eddies decelerate trough the . and reattachment regions, presumably due to the influence of the adverse pressure gradient Downstream of reattachment, the large-scale structures accelerate as the wake develops.
Author
Evolution (Development); Convection; Large Scale Integration; Imaging Techniques; Mie Scattering; Shear Layers; Supersonic Flow

20000021338 National Taiwan Univ., Hydrotech Research Inst., Taipei, Taiwan, Province of China
Note on Eddy Formation for Stokes Flows in Circular Cavities
Hwu, Tzong-Yih, National Taiwan Univ., Taiwan, Province of China; Young, Der-Liang, National Taiwan Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 649-652; In English
Contract(s)/Grant(s): NSC-87-2211-E-002-055; Copyright; Avail: Issuing Activity, Hardcopy

In this note, a simple model of a circular cavity with two arcs rotated in opposite directions on the boundary is employed to demonstrate flow patterns of recirculation. A particular streamline ”cutting” the domain into two separating eddies is formed as a circular arc. When the rotating angular speed of the arc is proportional to the length of the arc, the streamline degenerates to a straight line.
Author
Cavities; Circulation; Flow Distribution; Vortices

20000021339 Academia Sinica, Inst. of Physics, Taipei, Taiwan, Province of China
A Numerical Study on Turbulent Vortex-Shedding Flows around a Cubical Form
Peng, Yih-Ferng, Academia Sinica, Taiwan, Province of China; Hwang, Robert R., Academia Sinica, Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 639-648; In English; Copyright; Avail: Issuing Activity, Hardcopy

The turbulent vortex shedding flow behind a square cube is numerically analyzed by the LES approach. The eddy viscosity and Smagorinsky models have been used to simulate the SGS Reynolds stress and eddy viscosity, respectively. The performance of the computations is evaluated by comparing with available measurements, as well as with those results obtained from RANS. It is found that the LES approach predicts the Strouhal number and the mean stream-wise velocity profiles with a better accuracy than RANS. The present computational results reveal that the vortex shedding flow behind the square cube is quite three-dimensional. Williamson’s experimental observation of mode B three-dimensional instability in the turbulent cylinder wake is numerically reproduced. The primary K,irman vortices are found to be distributed along the full span of the channel in the near wake region, and are broken down quickly in the far wake region. Secondary vortices exist in pairs and are distributed along the span-wise direction with a wave-length of 2.4 D. With the secondary vortices taking the form of waviness of the primary Karman vortices, the three-dimensional sheddin vortices behind the cube are clearly illustrated.
Author
Numerical Analysis; Turbulent Flow; Flow Velocity; Turbulent Wakes; Vortex Shedding

20000021431 Naval Surface Warfare Center, Dahlgren Div., Dahlgren, VA USA
Zeus++ - A GUI-Based Flowfield Analysis Tool, Version 1.0, User’s Manual
Robinson, David F.; Feb. 1999; 95p; In English
Report No.(s): AD-A372392; NSWCDD/TR-98/147; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A User's Manual for the Zeus(++) Flowfield Analysis tool is provided along with a tutorial for setting up and executing a missile geometry with control surfaces. The tool solves the three-dimensional Euler equations to calculate the inviscid flowfield about the geometry. This inviscid solution is then supplied as input to an integral boundary layer solver which calculates the effects of viscosity on the body. Finally, if a more in-depth solution is desired, Zeus(++) can be used to generate a computational domain for use in a full Navier-Stokes solver. by applying the Zeus(++) tool, computational analyses of complex three-dimensional missile geometries can be performed on a personal computer in a matter of minutes. In addition, a computational grid suitable for a full Navier-Stokes solver can be generated in approximately 10 min. This represents significant savings in both manpower and computational costs typically associated with computational fluid dynamics.
DTIC
Flow Distribution; User Manuals (Computer Programs); Missiles; Control Surfaces; Computer Programs

20000021479 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Soot and PAH Concentrations in Engine Rooms of DPO at Pernis (Rotterdam) ***Final Report Roet-en PAK-concentraties in Motorkamers DPO te Pernis***
Groeneveld, F. R., Prins Maurits Lab. TNO, Netherlands; August 1999; 14p; In Dutch
Contract(s)/Grant(s): A99/KLu/434; TNO Proj. 014.11372
Report No.(s): TD99-0147; PML-1999-A52; Copyright; Avail: Issuing Activity
By the transport of liquid fuel through pipelines, high-pressure fuel pumps were used. These pumps are being driven by diesel engines. The exhaust of the engines was transported outside the building, although hazardously combustion products can be still emitted by leaks of the engines. During three days over an eight-hour period, soot and polycyclic aromatic hydrocarbons (PAH) concentrations were measured. The measured concentrations were far below the TWA-value of 3.5 mg/cubic m of soot and 0.2 mg/cubic m for PAH for an eight-hour exposure.
Author
Polycyclic Aromatic Hydrocarbons; Soot; Combustion Products

20000021527 Iowa Univ., Iowa City, IA USA
Normal Vortex Interaction with a Circular Cylinder
Kishnamoorthy, S., Iowa Univ., USA; Kishnamoorthy, S., Iowa Univ., USA; AIAA Journal; January 1999; Volume 37, No. 1, pp. 50-57; In English
Contract(s)/Grant(s): DAAH04-96-1-0081
Report No.(s): AD-A370061; ARO-34934.5-EG; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
Interaction of a columnar vortex with along circular cylinder translated normal to the vortex axis is examined for the cast where the cylinder diameter Is much larger than the vortex care radius. The study focuses on understanding and quantifying the limitations of traditional vortex filament models arising from vortex-induced separation of the cylinder boundary layer and vortex core shape deformation. These limitations are examined over a wide range of values of the impact parameter, defined as the ratio of the ambient normal velocity past the cylinder to the maximum vortex azimuthal velocity. Filament model predictions of vortex displacement are compared to experimental data both before and after vortex-induced boundary-layer separation. Experimental data are presented showing the Importance or the ambient normal velocity to the cylinder in delaying vortex-induced boundary-layer separation, so that for cases with high impact parameter the flow is governed by inviscid effects even as the vortex moves quite dose to the cylinder surface. The inviscid shape deformation of the vortex care Is modest in the cam examined. even for dose vortex-cylinder interaction, and is shown to have small effect on the surfs" pressure. The topology of secondary vorticity structures ejected from the cylinder boundary layer is examined using a two-color laser-induced fluorescence technique and is found to be qualitatively different for cases with high and low values of the impact parameter.
Author
Vortex Filaments; Circular Cylinders; Boundary Layer Separation; Inviscid Flow; Radii

20000021550 Sverdrup Technology, Inc., Huntsville, AL USA
An Unsteady Long Bearing Squeeze Film Damper Model, Part 1, Circular Centered Orbits
Schallhorn, P. A., Sverdrup Technology, Inc., USA; Elrod, D. A., Sverdrup Technology, Inc., USA; Goggin, D. G., Sverdrup Technology, Inc., USA; Majumdar, A. K., Sverdrup Technology, Inc., USA; [2000]; 31p; In English; 38th; 38th Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-40386; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper, the first of a two-part series, presents results of an unsteady rotordynamic analysis of a long-bearing squeeze film damper executing circular centered orbits using a fluid circuit approach. A series of nodes and branches represent the geometry

of the flow circuit. The mass and momentum conservation equations are solved to predict the pressure distribution in the squeeze film. The motion of the bearing is simulated by the variation of geometry within the flow path. The modeling methodology is benchmarked against published experimental long-bearing squeeze film damper test results. The model provides good agreement with the experimental damping coefficient.
Author
Unsteady State; Squeeze Films; Damping; Circular Orbits; Models

20000021568 NASA Glenn Research Center, Cleveland, OH USA
Experimental Heat Transfer and Bulk Air Temperature Measurements for a Multipass Internal Cooling Model with Ribs and Bleed
Thurman, Douglas, Army Research Lab., USA; Poinsatte, Philip, NASA Glenn Research Center, USA; January 2000; 18p; In English; 45th; 45th International Gas Turbine Institute, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 523-26-13; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/TM-2000-209772; NAS 1.15:209772; ARL-MR-471; E-12042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental study was made to obtain heat transfer and air temperature data for a simple 3-leg serpentine test section that simulates a turbine blade internal cooling passage with trip strips and bleed holes. The objectives were to investigate the interaction of ribs and various bleed conditions on internal cooling and to gain a better understanding of bulk air temperature in an internal passage. Steady state heat transfer measurements were obtained using a transient technique with thermochromic liquid crystals. Trip strips were attached to one wall of the test section and were located either between or near the bleed holes. The bleed holes, used for film cooling, were metered to simulate the effect of external pressure on the turbine blade. Heat transfer enhancement was found to be greater for ribs near bleed holes compared to ribs between holes, and both configurations were affected slightly by bleed rates upstream. Air temperature measurements were taken at discreet locations along one leg of the model. Average bulk air temperatures were found to remain fairly constant along one leg of the model.
Author
Heat Transfer; Temperature Measurement; Film Cooling; Ribs (Supports); Turbine Blades; Bleeding

20000021575 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
Rayleigh Imaging of Mach 8 Boundary Layer Flow Around an Elliptic Cone Body ***Final Report, 1 Mar. 1997-31 Dec. 1999***
Miles, Richard B.; Smits, Alexander J.; Jan. 04, 2000; 16p; In English
Contract(s)/Grant(s): F49620-97-1-0181
Report No.(s): AD-A372445; AFRL-SR-BL-TR-00-0008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is the Final Technical Report on AFOSR Grant #F49620-97-1-0181. Work on this project has focused on three areas: (1) Pulse-burst laser system upgrade. (2) The development and characterization of CO2-enhanced Filtered Rayleigh Scattering. (3) Transition studies on flat plates and elliptic cones at Mach 8. The pulse-burst laser has been shown to be an effective illumination source for capturing high-speed boundary layer and high-speed shock wave/boundary layer images. That laser system was upgraded in association with a DURIP equipment grant (#F49620-97-1-0373) in order to produce a high-power, fully integrated laser system that could be used in the Mach 8 facility for the study of the transition dynamics on the 4:1 elliptic cones. Visualizations have been made using single-, double- and multiple-shot Rayleigh scattering, and the key results are summarized in this report.
DTIC
Boundary Layer Flow; Hypersonic Flow; Turbulence; Rayleigh Scattering; Boundary Layer Transition; Conical Bodies; Imaging Techniques; Flat Plates

20000021579 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Vortex Ring Generator: Mechanical Engineering Design for 100-kpsi Operating Pressures ***Final Report***
Lucey, George K., Jr; Jan. 2000; 52p; In English
Report No.(s): AD-A372518; ARL-TR-2096; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents engineering design guidelines used to construct an explosive gas generator (100 kpsi maximum) and an adjustable area ratio (2844 maximum) nozzle. The equipment enables ring vortices to be generated using jet streams with significantly higher Mach numbers than previously reported in the literature. Studies are planned of the risks, limits, and

capabilities of ring vortices for nonlethal crowd control applications. The focus is limited to 40-mm weapons, so this report is written to facilitate technology transfer to investigators interested in other applications and launch platforms.
DTIC
Vortex Rings; Vortices

20000023220 Purdue Univ., West Lafayette, IN USA
Measurements and Modeling of Nitric Oxide Formation in Counterflow, Premixed CH4/O2/N2 Flames
Thomsen, D. Douglas, Purdue Univ., USA; Laurendeau, Normand M., Purdue Univ., USA; February 2000; 286p; In English
Contract(s)/Grant(s): NAG3-1782; NAG3-2251; RTOP 714-02-40
Report No.(s): NASA/CR-2000-209804; E-12110; NAS 1.26:209804; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Laser-induced fluorescence (LIF) measurements of NO concentration in a variety of CH4/O2/N2 flames are used to evaluate the chemical kinetics of NO formation. The analysis begins with previous measurements in flat, laminar, premixed CH4/O2/N2 flames stabilized on a water-cooled McKenna burner at pressures ranging from 1 to 14.6 atm, equivalence ratios from 0.5 to 1.6, and volumetric nitrogen/oxygen dilution ratios of 2.2, 3.1 and 3.76. These measured results are compared to predictions to determine the capabilities and limitations of the comprehensive kinetic mechanism developed by the Gas Research Institute (GRI), version 2.11. The model is shown to predict well the qualitative trends of NO formation in lean-premixed flames, while quantitatively underpredicting NO concentration by 30-50%. For rich flames, the model is unable to even qualitatively match the experimental results. These flames were found to be limited by low temperatures and an inability to separate the flame from the burner surface. In response to these limitations, a counterflow burner was designed for use in opposed premixed flame studies. A new LIF calibration technique was developed and applied to obtain quantitative measurements of NO concentration in laminar, counterflow premixed, CH4/O2/N2 flames at pressures ranging from 1 to 5.1 atm, equivalence ratios of 0.6 to 1.5, and an N2/O2 dilution ratio of 3.76. The counterflow premixed flame measurements are combined with measurements in burner-stabilized premixed flames and counterflow diffusion flames to build a comprehensive database for analysis of the GRI kinetic mechanism. Pathways, quantitative reaction path and sensitivity analyses are applied to the GRI mechanism for these flame conditions. The prompt NO mechanism is found to severely underpredict the amount of NO formed in rich premixed and nitrogen-diluted diffusion flames. This underprediction is traced to uncertainties in the CH kinetics as well as in the nitrogen oxidation chemistry. Suggestions are made which significantly improve the predictive capability of the GRI mechanism in near-stoichiometric, rich, premixed flames and in atmospheric-pressure, diffusion flames. However, the modified reaction mechanism is unable to model the formation of NO in ultra-rich, premixed or in high-pressure, nonpremixed flames, thus indicating the need for additional study under these conditions.
Author
Nitric Oxide; Counterflow; Measure and Integration; Mathematical Models; Laser Induced Fluorescence; Calibrating; Reaction Kinetics; Premixed Flames; Fuel Combustion

20000024846 Texas A&M Univ., Aerospace Engineering Dept., College Station, TX USA
A Robust Locally Preconditioned Semi-Coarsening Multigrid Algorithm for the 2-D Navier-Stokes Equations
Cain, Michael D., Texas A&M Univ., USA; August 1999; 4p; In English
Contract(s)/Grant(s): NGT2-52226
Report No.(s): Rept-32525-52470-801; No Copyright; Avail: Issuing Activity; Abstract Only

The goal of this thesis is to develop an efficient and robust locally preconditioned semi-coarsening multigrid algorithm for the two-dimensional Navier-Stokes equations. This thesis examines the performance of the multigrid algorithm with local preconditioning for an upwind-discretization of the Navier-Stokes equations. A block Jacobi iterative scheme is used because of its high frequency error mode damping ability. At low Mach numbers, the performance of a flux preconditioner is investigated. The flux preconditioner utilizes a new limiting technique based on local information that was developed by Siu. Full-coarsening and-semi-coarsening are examined as well as the multigrid V-cycle and full multigrid. The numerical tests were performed on a NACA 0012 airfoil at a range of Mach numbers. The tests show that semi-coarsening with flux preconditioning is the most efficient and robust combination of coarsening strategy, and iterative scheme - especially at low Mach numbers.
Author
Airfoils; Navier-Stokes Equation; Multigrid Methods; Computational Fluid Dynamics; Upwind Schemes (Mathematics)

20000025194 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Non-Ideal Gas Effects on Shock Waves in Weakly Ionized Gases ***Final Report***
Rubinstein, Robert, Institute for Computer Applications in Science and Engineering, USA; Auslender, Aaron H., NASA Langley Research Center, USA; January 2000; 14p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-209839; NAS 1.26:209839; ICASE-2000-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A shock wave in a weakly ionized gas can be preceeded by a charge separation region if the Debye length is larger than the shock width. It has been proposed that electrostatic contributions to pressure in the charge separation region can increase the sound speed ahead of the shock well above the sound speed in a neutral gas at the same temperature and therefore increase the shock propagation speed. This proposal is investigated numerically and theoretically. It is concluded that although the ion gas becomes strongly non-ideal in the charge separation region, there is no appreciable effect on the neutral shock.
Author
Gas Ionization; Ionized Gases; Neutral Gases; Shock Waves

20000025218 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA
Active Control of Aeroelasticity and Internal Flows in Turbomachinery ***Final Report, 1 Jan. 1996-30 Sep. 1999***
Paduano, J. D.; Epstein, A. H.; Greitzer, E. M.; Cesnik, C. E.; Nov. 1999; 108p; In English
Contract(s)/Grant(s): F49620-96-1-0407
Report No.(s): AD-A372234; AFRL-SR-BL-TR-2000-0003; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes work carried out at the Gas Turbine Laboratory at MIT during the period 1/1/96 - 9/30/99, in the area of active control of turbomachinery. Within the overall project, three main research areas were pursued. These are, in brief: (1) Active control of rotating stall with inlet distortion; (2) Injectors as actuators for rotating stall control; and (3) Active stabilization of surge in an aeroengine; and (4) Development of an active rotor for aeroelasticity diagnostics, system identification, and control.
DTIC
Active Control; Aeroelasticity; Internal Flow; Turbomachinery

20000025232 Sverdrup Technology, Inc., Huntsville, AL USA
Numerical Modeling of Pressurization of a Propellant Tank
Majumdar, Alok, Sverdrup Technology, Inc., USA; Steadman, Todd, Sverdrup Technology, Inc., USA; [1999]; 8p; In English; 38th; 38th Aerospace Sciences Meeting, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-40836; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An unsteady finite volume procedure has been developed to predict the history o pressure, temperature and mass flow rate of the pressurant and propellant during the expulsion of the propellant from a tan. The time dependent mass, momentum and energy conservation equations are solved at the ullage space. The model accounts for the change in the ullage volume due to expulsion of the propellant. It also accounts for the heat transfer from the tank wall and propellant to the ullage gas. The procedure was incorporated in the Generalized Fluid System Simulation Program (GFSSP). The results of several test cases were then compared with a published correlation of pressurant requirements for a given displacement of propellant. The agreement between the predictions and the correlation was found to be satisfactory.
Author
Fuel Tank Pressurization; Propellant Tanks; Mathematical Models

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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.

20000021143 NASA Ames Research Center, Moffett Field, CA USA
Miniature Laser Spectrometer for Stable Isotope Measurements ***Final Report, Aug. 1997 - Jul. 1999***
Becker, J. F., San Jose State Univ., USA; Kojiro, D. R., NASA Ames Research Center, USA; Jul. 29, 1999; 7p; In English
Contract(s)/Grant(s): NCC2-5234; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

As a first step in successfully measuring carbon isotopes optically we have previously demonstrated the measurement of C-13/C-12 to a precision of 0.1% using a tunable diode laser and CO2 spectral lines in the 2300/cm spectral region. This precision of 0.1% (1 per mil) for carbon isotopes is a value sufficiently precise to provide important isotopic data of interest to astrobiologists. The precision presently attainable in gases is sufficient to permit our instrument to be used in the measurement of isotopic ratios of interest to astrobiologists as well as geologists and planetary scientists.
Derived from text
Laser Spectrometers; Miniaturization; Line Spectra; Carbon Isotopes; Measuring Instruments

20000021223 NASA Glenn Research Center, Cleveland, OH USA
SiC-Based Gas Sensor Development
Hunter, G. W., NASA Glenn Research Center, USA; Neudeck, P. G., NASA Glenn Research Center, USA; Gray, M., NASA Glenn Research Center, USA; Androjna, D., Cortez 3 Service Corp., USA; Chen, L.-Y., AYT Corp., USA; Hoffman, R. W., Jr., Ohio Aerospace Inst., USA; Liu, C. C., Case Western Reserve Univ., USA; Wu, Q. H., Case Western Reserve Univ., USA; January 2000; 10p; In English; Silicon Carbide and Related Materials, 10-15 Oct. 1999, Raleigh, NC, USA; Sponsored by North Carolina State Univ., USA
Contract(s)/Grant(s): RTOP 242-82-62
Report No.(s): NASA/TM-2000-209653; E-12009; NAS 1.15:209653; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Silicon carbide based Schottky diode gas sensors are being developed for applications such as emission measurements and leak detection. The effects of the geometry of the tin oxide film in a Pd/SnO2/SiC structure will be discussed as well as improvements in packaging SiC-based sensors. It is concluded that there is considerable versatility in the formation of SiC-based Schottky diode gas sensing structures which will potentially allow the fabrication of a SiC-based gas sensor array for a variety of gases and temperatures.
Author
Silicon Carbides; Gas Detectors; Leakage; Schottky Diodes; Palladium; Tin Oxides; Design Analysis

20000021230 NASA Ames Research Center, Moffett Field, CA USA
Development of a Mirror Pointing Mechanism for an Atmospheric Gas Measurement Instrument
Graham, Michael, Sverdrup Technology, Inc., USA; Belous, Adel, Sverdrup Technology, Inc., USA; Brown, Jeffrey, NASA Ames Research Center, USA; Podolske, James, NASA Ames Research Center, USA; Feb. 20, 1998; 15p; In English; 32nd; 32nd Aerospace Mechanisms Symposium, 13-15 May 1998, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 538-08-12-31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Development of the Open Path Tunable Infrared Monitor of the Atmosphere (OPTIMA) instrument involved designing a pair of motion systems that could maintain a precise alignment and spatial distance between two mirrors installed on the NASA DC-8 research laboratory aircraft. This is the first airborne optical instrument that allows direct measurement of the gases in the freestream airflow on the exterior of the aircraft. One mirror is mounted within a specially constructed open port cavity in the cabin of the aircraft and the second is mounted 6 meters away on top of the inboard port side (number 2) engine pylon. Three co-aligned laser beams are reflected between the two mirrors 64 times in a Herriott pattern. The resulting sample path length of 384 meters is used to perform a spectral absorption analysis of the airflow between the mirrors. to compensate for normal wing movement and engine oscillations both mirrors were designed as continuously driven mechanisms to maintain alignment within allowable limits. The motion systems of the two mirror assemblies provide five degrees of freedom and are designed to maintain a pointing accuracy within seven arc-sec with a response frequency in 6xcess of 10 Hz. The pylon motion system incorporates controlled pitch and yaw movement. The fuselage motion system compensates for pitch variation as well as linear translation for focal length and vertical aiming of the laser beam via a controlled beam guidance mechanism.
Author
Mirror Point; Atmospheric Chemistry; Atmospheric Composition; Gas Analysis; Measuring Instruments; Research Aircraft

20000021329 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Graphical Method for Calculating the Relative IR Target Area on JAS 39 ***Grafisk Metod foer Beraekning av Relativ IR-Malyta pa JAS 39***
Ahlberg, S.; Nov. 1998; 24p; In Swedish
Report No.(s): PB2000-101471; FOA-R-98-00924-408-SE; No Copyright; Avail: Issuing Activity

When measuring the IR signature of JAS 39 Gripen, signal fluctuations have been noticed, fluctuations which cannot be connected to the plume. One theory that has emerged is that changes in the area displayed by the aircraft facing a sensor can cause

the signal variations. This report introduces a graphical method for simulating how the projected target area of an aircraft varies when nutating around its trajectory. by calculating the area projected on a plane from a 3D model, it is possible to draw conclusions as to how area changes affect the signal. Studies have shown that an area variation of up to 10% is of interest. The calculations made with the method presented in this report show that a deviation of approximately 5 deg is sufficient for such an area variation. NTIS

Infrared Signatures; Graphical User Interface; Computation; Procedures; Gert; Tracking (Position)

20000021336 National Optical Astronomy Observatories, Tucson, AZ USA

CCD Detector Performance for NOAO's Wide-Field Mosaic Cameras

Wolfe, Thomas, National Optical Astronomy Observatories, USA; Armadroff, Taft, National Optical Astronomy Observatories, USA; Blouke, Morley, Scientific Imaging Technologies, Inc., USA; Rector, Travis, National Optical Astronomy Observatories, USA; Reed, Rich, National Optical Astronomy Observatories, USA; Saha, Abhijit, National Optical Astronomy Observatories, USA; Schommer, Robert, Cerro Tololo Inter-American Observatory, Chile; Smith, Chris, Cerro Tololo Inter-American Observatory, Chile; Smith, Roger, Cerro Tololo Inter-American Observatory, Chile; Walker, Alistair, Cerro Tololo Inter-American Observatory, Chile; January 2000; 13p; In English

Report No.(s): NOAO-Preprint-864; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In July of 1998 the National Optical Astronomy Observatories (NOAO) successfully upgraded MOSAIC I, an 8192 by 8192 pixel array using eight Scientific Imaging Technologies, Inc. (SITe) ST-002A thinned backside 2k by 4k charge coupled devices (CCDs). in July of 1999 MOSAIC II, a clone of MOSAIC I was commissioned also using eight SITe ST-002A CCDs. Additionally in December of 1998 NOAO implemented Mini-MOSAIC a 4096 by 4096 pixel array using two SITe ST-002A thinned CCDs. This report will discuss the performance, characterization and capabilities of the three wide field imagers now in operation at NOAO's Kitt Peak National Observatory (KPNO), Cerro Tololo Inter-American Observatory (CTIO) and at the WIYN Consortium 3.5-Meter telescope on Kitt Peak.

Author

Charge Coupled Devices; Imaging Techniques; Cameras

20000021384 Texas A&M Univ., Biochemistry and Biophysics Dept., College Station, TX USA

Investigation of Stochastic Fluctuations in the Signal Formation of Microbiosensors

Arakelian, V. B., Academy of Sciences of the Armenian SSR, Armenia; Wild, J. R., Texas A&M Univ., USA; Simonian, A. L., Academy of Sciences of the Armenian SSR, Armenia; Biosensors and Bioelectronics; 1998; ISSN 0956-5663; Volume 13, No. 1, pp. 55-59; In English; Sponsored in part by Ministry of Industry and International Science Foundation

Contract(s)/Grant(s): DAAL03-92-G-0171; 94-692; ISF-RYV000; NATO-941411

Report No.(s): AD-A369969; ARO-30371.26-LS-URI; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

With a decrease in the dimensions of microbiosensors, the stochastic variation in the number of substrate complexes with the molecular recognition elements of biosensors (enzymes, receptors, antibodies, etc.) can lead to significant fluctuations in the output signal. In this theoretical analysis, the mean current, as well as its dispersion and correlation functions, am determined.

Author

Stochastic Processes; Bioinstrumentation; Enzymes; Antibodies; Receptors (Physiology); Sense Organs

20000021452 National Optical Astronomy Observatories, Tucson, AZ USA

Volume-Phase Holographic Gratings and the Efficiency of Three Simple VPH Gratings

Barden, Samuel C., National Optical Astronomy Observatories, USA; Arns, James A., Kaiser Optical Systems, Inc., USA; Colburn, Willis S., Kaiser Optical Systems, Inc., USA; Williams, Joel B., National Optical Astronomy Observatories, USA; February 2000; 36p; In English

Contract(s)/Grant(s): NSF AST-96-13615

Report No.(s): NOAO-Preprint-869; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Volume-phase holographic (VPH) gratings show great potential as an alternative dispersing element to the classical surface-relief (SR) gratings presently used in most astronomical spectrographs. We present an introduction to this technology and give the results of an evaluation of three different VPH gratings: a 300 l/mm grating optimized at 1064 nm; a 1200 l/mm grating optimized at 532 nm; and a 2400 l/mm grating optimized for operation at 532 nm.

Author

Holography; Gratings (Spectra); Holographic Spectroscopy; Spectrum Analysis; Astronomy

20000024844 Search for Extraterrestrial Intelligence Inst., Mountain View, CA USA

The Extraction of the NIRS Point Source Catalogs ***Final Report, 1 May 1997 - 30 Sep. 1999***

Freund, Minoru M., Search for Extraterrestrial Intelligence Inst., USA; [1999]; 4p; In English

Contract(s)/Grant(s): NCC2-989; No Copyright; Avail: Issuing Activity; Abstract Only

The Near Infrared Spectrometer (NIRS) on the Infrared Telescope in Space, IRTS (a Japanese-US collaboration project), surveyed about 7% of the sky during its one month mission. In this work we extracted spectro-photometric point source (PS) data between 1.4 and 4 micron of high quality absolutely calibrated (2% flux uncertainties) and unbiased PS spectra in the near-IR. This database facilitates the study and understanding of a variety of science objectives, including stellar evolution of late type stars, determination of the Cosmic Infrared Background (CIB), and provides unprecedented faint stellar spectral calibrators. The objective of this work was to provide the community with a series of absolutely calibrated NIRS point source catalogs (PSC), with classification and association files. The catalogs will be archived at IRSA/IPAC.

Author

Calibrating; Point Sources; Infrared Telescopes

20000024923 NASA Glenn Research Center, Cleveland, OH USA

Comparison of Liquid Water Content Measurement Techniques in an Icing Wind Tunnel

Ide, Robert F., Army Research Lab., USA; December 1999; 24p; In English

Contract(s)/Grant(s): RTOP 523-91-13; DA Proj. 1L1-62211-A-47-A

Report No.(s): NASA/TM-1999-209643; E-11975; NAS 1.15:209643; ARL-TR-2134; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper compares the results of liquid water content measurements by various means in an icing wind tunnel. The techniques/instruments tested are the icing blade, a single rotating cylinder, the Johnson-Williams and CSIRO-King hot-wire probes, the Nevzorov LWC/TWC probe and the liquid water content calculated from the combined droplet distributions of two droplet sizing probes - the Forward Scattering Spectrometer probe and the Optical Affay probe. A large range of icing conditions was used for this study. The liquid water content ranged from 0.1 to 1.25 g/cu m and the median volumetric droplet diameters (MVD) ranged from 10 to 270 micrometers. Airspeeds of 50 to 250 mph (22 to 112 m/s) were used. This study shows the degree of agreement between the various liquid water content measurement methods over the normal cloud MVD range of 10 to 50 micrometers and over several supercooled large droplet (SLD) conditions. It shows that the Nevzorov LWC/TWC instrument has the potential for measuring the LWC in SLD clouds as well as normal droplet size cloud conditions. It reveals a large disagreement between the droplet sizing probe results and the other methods. The implications and possible causes of this disagreement are discussed. Recommendations for additional investigations to resolve disagreements are included.

Author

Ice Formation; Moisture Content; Drops (Liquids)

20000024974 Cyberdynamics, Inc., Palo Alto, CA USA

ARTUS Preliminary Development ***Final Report, 2 Aug. - 30 Nov. 1999***

Wells, Barton S., Cyberdynamics, Inc., USA; Beckner, Frederick L., Cyberdynamics, Inc., USA; Jan. 07, 2000; 22p; In English

Contract(s)/Grant(s): DAAH01-99-C-R077

Report No.(s): AD-A372326; CYB-0001; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Work directed towards transitioning research conducted on the feasibility of an automatic rapid target updating system (ARTUS) to the implementation of system software is described, Implementation of one component of the ARTUS system, the ability to find features in terms of line intersections within infrared images, is performed. Methods of edge detection, target filtering, line finding, segmentation of the lines, and segment intersection is implemented into a GUI based software application. A new method of edge detection is implemented using a Canny edge detector combined with a second derivative gradient. An algorithm for filtering non-target data from target data in infrared images is created. Line finding is done using an algorithm taking the best lines from a histogram of all possible lines within an image. The lines are segmented using a technique searching for gaps in the lines, and then the intersections of these segments are found. This initial implementation of a portion of the ARTUS system is explained in this report.

DTIC

Target Recognition; Pattern Recognition; Infrared Tracking; Infrared Imagery

20000025020 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

Buy and Try Testing of MGP DMC 2000S and NRC UDR-13A Dosimeters

Haslip, Dean S., Defence Research Establishment Ottawa, Canada; Cousins, Tom, Defence Research Establishment Ottawa, Canada; Estan, Diego, Defence Research Establishment Ottawa, Canada; Jones, Trevor A., Defence Research Establishment Ottawa, Canada; Hoffarth, Bernie E., Defence Research Establishment Ottawa, Canada; Nov. 1999; 23p; In English

Report No.(s): AD-A372204; DREO-TM-1999-109; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The MGP DMC 20008 and the NRC UDR-13A electronic dosimeters have been tested by DREO for acquisition project G2199 ”Nuclear Detection, Identification and Dosimetry”. These tests were carried out with the wide array of radioactive sources available at DREO, with the X-ray facility available at the National Research Council, and with one of the environmental chambers available at the Quality Engineering Test Establishment (QETE). Both meters are capable devices, suitable for the electronic dosimetry role. However, DND must be aware of the following shortcomings: (a) Their energy response is not constant. This is not a critical problem since personal dosimetry will be carried out with TLDs. (b) When placed on certain parts of the reader, the MGP dosimeters will register high levels of radiation in the absence of such a field. This shortcoming must be discussed with MGP. (c) The MGP dosimeter, due to the small size of the detector, is not suitable for an expanded role including tasks suited to a radiation survey meter. (d) Neither meter is operable following long-term (2-hour) exposure to temperatures below -20 deg C. However a dosimeter worn under a coat should be operable without problems.

DTIC

Dosimeters; Radiation Measurement; Radioactivity; Performance Tests

20000025025 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

Multi-Spectral QWIP-LED Devices: A Feasibility Study

Chiu, S., Defence Research Establishment Ottawa, Canada; Liu, H. C., National Research Council of Canada, Canada; Dupont, E., National Research Council of Canada, Canada; Buchanan, M., Defence Research Establishment Ottawa, Canada; Song, C. Y., National Research Council of Canada, Canada; Oct. 1999; 38p; In English

Report No.(s): AD-A372293; DREO-TM-1999-090; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The recent advances in infrared sensing technology has made it possible to use infrared sensors to support environmental observations, surveillance, threat detection, tracking, and target identification. For space-based ballistic missile defense (BMD) related applications, the most important detector requirements are: high sensitivity, high uniformity, large format, and multicolor capabilities. Quantum well infrared photodetectors (QWIPs) are a relatively new candidate technology for BMD applications. The current Canadian QWIP technology is based on integration of the QWIP with a light emitting diode (QWIP-LED). As the infrared technology continues to advance, there is a growing demand for multispectral (or multicolor) detectors with better target discrimination and identification. The objects of this study are first to identify the current QWIP multi-spectral implementation techniques and then to adapt them to the new QWIP-LED imaging scheme. The scheme has its unique design constraints associated with the QWIP-LED architecture. Some inherent limitations of the QWIP-LED scheme to achieving simultaneous multispectral registration are also discussed. Several multicolor QWIP-LED implementations are described, including two-leads pixelless QWIP-LED devices with sequential multicolor registration and multi-leads bicolor QWIP-LED focal plane array with near 100% fill factor.

DTIC

Infrared Detectors; Light Emitting Diodes; Quantum Theory; Focal Plane Devices; Imaging Techniques

20000025047 SACLANT Undersea Research Centre, San Bartolomeo, Italy

Distributions of Magnetic Field Variations, Differences and Residuals

Watermann, J.; Lam, J.; Feb. 1999; 84p; In English

Report No.(s): AD-A371860; SACLANTCEN-SR-304; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Temporal and spatial variations of the geomagnetic field were recorded in different geographic areas, using arrays of seven tri-axial magnetometers which resided on the sea bottom in 50-150 m depth for periods up to 16 days. The different geographic areas are characterized by different levels of the mean ambient magnetic noise. We discuss briefly data from a magnetically quiet area and then focus on a coastal zone highly disturbed by anthropogenic magnetic fields, in particular by noise from a busy coastal electrified railway line. In the latter area, the spatial uniformity of the ambient magnetic field is rather poor and the correlation between adjacent sites lower than in the former one. Simultaneous magnetic field observations from pairs of neighbouring magnetometers are analysed and compared in detail. We compute first vector differences of the magnetic variations measured at neighbouring sites, and subsequently vector residuals. The residuals are those contributions to the magnetic field variations which are not correlated between adjacent sites and which can not be represented through a linear trivariate model. In the magnetically quiet area, we find that the magnetic field residuals are of the order of the system noise for magnetometers with about 1 km spacing

and slightly higher for those with 12 km spacing. The area leads support to the application of a Remote Reference Technique, i.e., a technique in which the ambient magnetic field is compensated for by using measurements from a remotely operated reference sensor. ”Remote” means that the reference sensor is sufficiently far away so that it is not influenced by the magnetic field of a ship navigating in the vicinity of the surveillance magnetometers. Although the magnetic field variations in the highly disturbed coastal zone are several times larger than typical magnetic field variations of natural origin, and also spatially non-uniform, we find good linear correlation between adjacent sites.
DTIC
Magnetic Fields; Magnetic Variations; Geomagnetism; Magnetometers

20000025073 NASA Goddard Space Flight Center, Greenbelt, MD USA
Alignment Measurements of the Microwave Anisotropy Probe (MAP) Instrument in a Thermal/Vacuum Chamber
Hill, Michael D., NASA Goddard Space Flight Center, USA; Herrera, Acey A., Swales Aerospace, USA; Crane, J. Allen, Swales Aerospace, USA; Packard, Edward A., NASA Goddard Space Flight Center, USA; Aviado, Carlos, ManTech, Inc., USA; Sampler, Henry P., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 30 Jul. - 2 Aug. 2000, Unknown; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Microwave Anisotropy Probe (MAP) Observatory, scheduled for a fall 2000 launch, is designed to measure temperature fluctuations (anisotropy) and produce a high sensitivity and high spatial resolution (approximately 0.2 degree) map of the cosmic microwave background (CMB) radiation over the entire sky between 22 and 90 GHz. MAP utilizes back-to-back Gregorian telescopes to focus the microwave signals into 10 differential microwave receivers, via 20 feed horns. Proper alignment of the telescope reflectors and the feed horns at the operating temperature of 90 K is a critical element to ensure mission success. We describe the hardware and methods used to validate the displacement/deformation predictions of the reflectors and the microwave feed horns during thermal/vacuum testing of the reflectors and the microwave instrument. The smallest deformation predictions to be measured were on the order of +/- 0.030 inches (+/- 0.762 mm). Performance of these alignment measurements inside a thermal/vacuum chamber with conventional alignment equipment posed several limitations. The most troublesome limitation was the inability to send personnel into the chamber to perform the measurements during the test due to vacuum and the temperature extremes. The photogrammetry (PG) system was chosen to perform the measurements since it is a non- contact measurement system, the measurements can be made relatively quickly and accurately, and the photogrammetric camera can be operated remotely. The hardware and methods developed to perform the MAP alignment measurements using PG proved to be highly successful. The measurements met the desired requirements, for the metal structures enabling the desired distortions to be measured resolving deformations an order of magnitude smaller than the imposed requirements. Viable data were provided to the MAP Project for a full analysis of the on-orbit performance of the Instrument’s microwave system.
Author
Microwave Probes; Alignment; Anisotropy; Microwave Sensors

20000025243 Japan Broadcasting Corp., Multimedia Services Research Div., Tokyo, Japan
Study of a Measurement Method of Zooming by a Cameraman
Ishikawa, Akio, Japan Broadcasting Corp., Japan; Kato, Daiichiro, Japan Broadcasting Corp., Japan; Tsuda, Takao, Japan Broadcasting Corp., Japan; Fukushima, Hiroshi, Japan Broadcasting Corp., Japan; Shimoda, Shigeru, Japan Broadcasting Corp., Japan; October 1999; ISSN 0027-657X; 14p; In English; Copyright; Avail: Issuing Activity, Hardcopy

We are developing an intelligent robot camera that is capable of automatically shooting images like those taken by broadcasting cameraman. In order to elucidate the zooming techniques of broadcasting cameraman, we developed the new measurement tool of zooming works which is able to be attached to or detached from broadcasting cameras easily. Then we measured the zooming works of broadcasting cameraman in shooting the images of still object with this tool, and analyzed them. We confirmed that it is possible to reproduce faithfully the subtle zooming techniques of broadcasting cameraman. It was also established that when a cameraman shoots the same scene repeatedly in an improvised manner, the velocity of the operation rod follows almost the same velocity curve each time. This has led us to believe that the cameraman conduct zooming on the basis of a method acquired through individual experience. The frequency components of the operation rod’s subtle velocity changes are from 5 to 10 Hz and the frequency levels of less than 5 Hz are especially large. The peak of variation of the object’s size is observed at the timing of 0.53 to 0.66 (the second half) during zoom-in operation and at the timing of 0.38 to 0.47 (the first half) during zoom-out operation, with both measured in terms of normalized zooming time.
Author
Research; Zoom Lenses; Product Development; Cameras; Robots

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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.

20000025080 NASA Ames Research Center, Moffett Field, CA USA

Interchange for Joint Research Entitled: Miniature Laser Spectrometer for Stable Isotope Measurements ***Final Report, Aug. 1997 - Jul. 1999***

Becker, J. F., San Jose State Univ., USA; Kojiro, D. R., NASA Ames Research Center, USA; Nov. 29, 1999; 7p; In English
Contract(s)/Grant(s): NCC2-5234; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

As a first step in successfully measuring carbon isotopes optically we have previously demonstrated the measurement of C-13/C-12 to a precision of 0.1% using a tunable diode laser and CO2 spectral lines in the 2300/cm spectral region. This precision of 0.1% (1 per mil) for carbon isotopes is a value sufficiently precise to provide important isotopic data of interest to astrobiologists. The precision presently attainable in gases is sufficient to permit our instrument to be used in the measurement of isotopic ratios of interest to astrobiologists as well as geologists and planetary scientists. A small stable isotope laser spectrometer with a 10 cm path gas cell was designed and constructed. The cell was integrated with a liquid nitrogen cooled tunable diode laser and indium antimonide detector for evaluation. Using the small gas cell, preliminary measurements of 13C/12C in CO2 were made employing single-beam sequential acquisitions of the required spectral data. The results indicate an accuracy of 0.1% which is sufficiently high to make meaningful measurements of martian samples. In addition, improvements in the spectrometer gas handling system have been made to markedly reduce C-13/C-12 isotopic fractionation during sample gas cell loading which we expect will lead to further improvements in precision and accuracy. An important part of making isotopic ratio measurements in solid samples using diode lasers is the conversion of the elements of interest to molecules that have absorption spectra in the mid-ir spectral range accessible by tunable diode lasers. In this project we have investigated the necessary sample preparation procedures to extract carbon, an element of astrobiological importance, from model soil compounds and to convert it to CO2, a molecule with appropriate optical absorption characteristics for reliable laser spectrometer isotopic ratio measurements of 13C/12C. We have considered calcium carbonate as a model for a component of the martian regolith, and we have formulated a simple heating protocol for extracting carbon in the form of CO2.
Derived from text

Laser Applications; Laser Spectrometers; Planetary Geology; Semiconductor Lasers; Tunable Lasers; Carbon Isotopes

20000025205 NASA Kennedy Space Center, Cocoa Beach, FL USA

The Practical Implementation of Non-Contacting Laser Strain Measurements Systems

Yunis, Isam, NASA Kennedy Space Center, USA; Quinn, roger D., Case Western Reserve Univ., USA; Kadambi, Jaikrishnan R., Case Western Reserve Univ., USA; [2000]; 11p; In English; 41st; Structures, Structural Dynamics, and Materials Conference, 3-6 Apr. 2000, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): NASA/TM-2000-208563; NAS 1.15:208563; AIAA Paper 2000-1696; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Measurement of stress and strain in rotating turbomachinery is critical to many industries. The search for a non-contacting, non-interfering, non-degrading measurement system is on going and extensive. While several methods seem promising in theory, implementation has proven troublesome. This work uncovers and quantifies these implementation issues in the context of a laser measurement system. Both a Laser Doppler Velocimeter system and a displacement laser system are utilized. It is found that the key issues are signal to noise ratio, rigid body compensation, measurement location, and conversion of intermittent measurements to a continuous signal. Accounting for these factors leads to successful measurements. These results should lead to better ideas and more practical solutions to the non-contacting, non-degrading, non-interfering strain measurement system problem.
Author

Laser Applications; Laser Doppler Velocimeters; Strain Measurement; Stress Measurement; Stress-Strain Relationships; Turbomachinery

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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.

20000021220 NASA Glenn Research Center, Cleveland, OH USA
Wave Fluid Film Bearing Tests for an Aviation Gearbox
Dimofte, Florin, Toledo Univ., USA; Proctor, Margaret P., NASA Glenn Research Center, USA; Fleming, David P., NASA Glenn Research Center, USA; Keith, Theo G., Jr., Toledo Univ., USA; January 2000; 12p; In English; 8th; Transport Phenomena and Dynamics of rotating Machinery, 26-30 Mar. 2000, Honolulu, HI, USA; Sponsored by Pacific Center for Thermal Fluids Engineering, USA
Contract(s)/Grant(s): RTOP 523-12-13
Report No.(s): NASA/TM-2000-209766; NAS 1.15:209766; E-12034; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An oil-lubricated wave journal-thrust bearing assembly was successfully tested at conditions found in general aviation engine gearboxes. The bearing performed well at both steady state conditions and in start-stop tests. It ran stably under all loading conditions, including zero load, at all speeds up to 16 000 rpm. The bearing carried 25 percent more load than required for the gearbox application, supporting 8900 N (94 bars average pressure), and showed very good thermal stability. 450 start-stop cycles were also performed, including 350 cycles without oil supply during starting and stopping. Test results and numerical predictions were in good agreement.
Author
Lubricating Oils; Performance Tests; Thermal Stability; Numerical Analysis; Journal Bearings

20000021382 Colorado School of Mines, Center for Welding, Joining and Coatings Research, Golden, CO USA
Exothermically Assisted Shielded Metal Arc Welding
Allen, J. W., Colorado School of Mines, USA; Olson, D. L., Colorado School of Mines, USA; Frost, R. H., Colorado School of Mines, USA; Welding Research Supplement; July 1998, pp. 277s-285s; In English
Contract(s)/Grant(s): DAAH04-95-I-0135
Report No.(s): AD-A370034; ARO-34040.1-MS; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Exothermic flux additions to SMAW electrodes can assist in the generation of heat and increase the rate of electrode melting. The exothermic additions consisted of various combinations and concentrations of aluminum and magnesium powders in a mixture with hematite. Aluminum reactive additions were significantly more effective than magnesium-rich additions at melting the electrode melting the weld bead and penetrating the base plate. Magnesium was less effective at supplying heat because its reaction rate was too fast with respect to the electrode melting rate. This magnesium ”exothemic meltback” prevented effective transfer of the chemically generated heat to the base plate. The rate at which the exothermic reaction occurs with respect to the melting rate of the electrode determines the efficiency with which the exothermic heat is used for welding. Exothermic reactions can produce as much as 25-30% of the total heat necessary to produce a shielded metal arc weld.
Author
Exothermic Reactions; Heat Shielding; Arc Welding

20000021553 Aerojet-General Corp., Azusa, CA USA
Integrated Advanced Microwave Sounding Unit-A (AMSU-A). Performance Verification Report: AMSU-A1 Antenna Drive Subsystem, PN 1331720-2, S/N 106
Luu, D., Aerojet-General Corp., USA; February 1999; 160p; In English
Contract(s)/Grant(s): NAS5-32314
Report No.(s): NASA/CR-119-209500; NAS 1.26:209500; Rept-11406; CDRL-208; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This is the Performance Verification Report, AMSU-A1 Antenna Drive Subsystem, P/N 1331720-2, S/N 106, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A). The antenna drive subsystem of the METSAT AMSU-A1, S/N 106, P/N 1331720-2, completed acceptance testing per A-ES Test Procedure AE-26002/lD. The test included: Scan Motion and Jitter, Pulse Load Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin. The drive motors and electronic circuitry were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic

circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356941-1) test.
Derived from text
Performance Tests; Antenna Components; Mechanical Drives; Load Tests; Advanced Microwave Sounding Unit; Acceptability; Proving

20000024856 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1998, Department of Mechanical Engineering, ***1 Jan.-31 Dec. 1998***
Aug. 1999; 77p; In English
Report No.(s): AD-A371876; NPS-09-99-009; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report contains summaries of research projects in the Department of Mechanical Engineering. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts. Research at the Naval Postgraduate School is carried out by faculty in the School's eleven academic departments, seven interdisciplinary groups, and the School of Aviation Safety. This volume contains research summaries for the projects undertaken by faculty in the Department of Mechanical Engineering during 1998. Also included is an overview of the department, faculty listing, a compilation of publications/presentations, and abstracts from theses directed by the department faculty.
DTIC
Mechanical Engineering; Navy; Research and Development

20000025017 Gupta (Pradeep K.), Inc., Clifton Park, NY USA
Tribological Modeling ***Final Report, 1 Sep. 1992 - 31 Oct. 1998***
Gupta, Pradeep K.; Oct. 1998; 138p; In English
Contract(s)/Grant(s): F33615-92-C-5916; AF Proj. 2421
Report No.(s): AD-A372092; AFRL-ML-WP-TR-1999-4019; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Analytical modeling of tribological behavior of interacting bodies is undertaken in three parts: modeling stresses at the surface and in the coatings of a coated solid, friction or traction at the interface between two contacting solids, and modeling of wear under given conditions of operation. Stress modeling of coated solids is accomplished by plane strain numerical solutions for line contact problems and finite element solutions of the more complex elliptical contacts. Both mechanical and thermal stresses in the solid are modeled. Semi-empirical relations are derived by regression analysis of experimental traction-slip data for several solid lubricants. The traction equations are readily applicable for the design and performance simulation of mechanical components. Wear is modeled as a multi-process phenomena. A generalized wear equation is developed such that one of the terms consists of Archard-type sliding wear while others represent thermally activated phenomena with varying activation energies. The model thus provides wear prediction as a function of load, speed and temperature. Similar to the traction model, coefficients of the wear equations are derived by fitting the model to experimental data. Good correlations of the model are demonstrated with two sets of experimental wear data.
DTIC
Traction; Thermal Stresses; Tribology; Sliding Friction; Mathematical Models; Numerical Analysis

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QUALITY ASSURANCE AND RELIABILITY

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

20000021158 DACCO SCI, Inc., Columbia, MD USA
Electrochemical Sensors for Nondestructive Evaluation of Adhesive Bonds ***Final Report, 1 Sep. 1998 - 30 Jun. 1999***
Davis, G. D., DACCO SCI, Inc., USA; Krebs, L. A., DACCO SCI, Inc., USA; Drzal, L. T., DACCO SCI, Inc., USA; Rich, M. J., DACCO SCI, Inc., USA; Askeland, P., DACCO SCI, Inc., USA; Aug. 23, 1999; 19p; In English
Contract(s)/Grant(s): F49620-98-C-0072
Report No.(s): AD-A367106; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
An in-situ corrosion sensor based on electrochemical impedance spectroscopy (EIS) has been used to detect moisture ingress into aluminum-aluminum and aluminum-composite adhesive bonds. Both wedge tests and tensile button tests (aluminum-aluminum bonds only) were performed. Upon moisture absorption, the impedance spectra change shape with the low-frequency region becoming resistive. The low-frequency impedance decreases by several orders of magnitude, depending

on the adhesive and the experimental conditions. For bonds with stable interfaces, such as phosphoric acid anodized (PAA) aluminum, the absorbed moisture causes an initial weakening of the adhesive resulting in reduced strength or small crack propagation. A substantial incubation time prior to substrate hydration and bond degradation allows warning of potential joint deterioration and enables condition-based maintenance. For bonds with smooth interfaces with little or no physical bonding (mechanical interlocking), crack propagation can proceed inter-facially with minimal moisture absorption. A comparison of the incubation times for Forest Products Laboratory (FPL) surfaces both bonded to epoxy adhesives and freely exposed to water or humidity at different temperatures shows that hydration occurs with the same activation energy, independent of whether or not the surface is covered with adhesive. However, the pre-exponential factor in the rate constant is dependent on the concentration of free moisture at the interface' so that the hydration rate varies by several orders of magnitude. The results of this study demonstrate that the electrochemical sensor technology can detect the ingress of moisture into an adhesive bond and should be further developed to provide a means to warn of potential degradation of adhesive joints and enable condition-based maintenance.
DTIC
Nondestructive Tests; Adhesive Bonding; Detectors; Spectroscopy; Aluminum; Moisture; Impedance

20000024893 Institute of Space Medico-Engineering, Beijing, China
A Reliability Growth Assessment Method and Its Application in the Development of Equipment in Space Cabin
Chen, Jin-Dun, Institute of Space Medico-Engineering, China; Sun, Hai-Long, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 116-120; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was too assess and predict reliability of an equipment dynamically by making full use of various test information in the development of products. A new reliability growth assessment method based on the army material system analysis activity(AMSAA) model was developed. The method is composed of the AMSAA model and test data conversion technology. The assessment and prediction results of a space-borne equipment conform to its expectations. It is suggested that this method should be further researched and popularized.
Author
Reliability; Systems Analysis; Performance Prediction; Space Flight

20000025132 Condition Monitoring and Diagnostic Engineering Management International, Birmingham, UK
International Journal of COMADEM, Volume 3
Rao, Raj B. K., Editor, Condition Monitoring and Diagnostic Engineering Management International, UK; Al-Najjar, B., Editor, Scandinavian Centre for Maintenance Management, Sweden; Alexandru, Adriana, Editor, Research Inst. for Informatics, Romania; Andrews, John D., Loughborough Univ. of Technology, UK; Au, Joe, Editor, Brunel Univ., UK; Barschdorff, D., Editor, Paderborn Univ., Germany; Ball, A. D., Editor, Manchester Univ., UK; Bartelmus, W., Editor, Wroclaw Univ., Poland; Badi, M. N. M., Editor, Hertfordshire Univ., UK; Blanchard, Ben S., Editor, Virginia Polytechnic Inst. and State Univ., USA; January 2000; ISSN 1363-7681; 48p; In English; See also 20000025133 through 20000025136; Copyright; Avail: Issuing Activity, Hardcopy

This document presents the International Journal of COMADEM (Condition Monitoring and Diagnostic Engineering Management). The topics covered are: 1) Using Short-Time Fourier Transforms in Machinery Fault Diagnosis; 2) Fault Diagnosis Using Three-valued Based Non-monotonic Logic; 3) Forecasting of Vibrational Signals for Machine Condition Monitoring using Non-parametric Kernal Based Approximation Techniques- Part I: Theory; and 4) Competitive Supervised Learning Algorithms in Machine Condition Monitoring.
CASI
Engineering Management; Fourier Transformation; Algorithms

20000025133 Ecole Polytechnique, Dept. de Genie Mecanique, Montreal, Quebec Canada
Using Short-Time Fourier Transforms in Machinery Fault Diagnosis
Safizadeh, Mir-Saeed S., Ecole Polytechnique, Canada; Lakis, Aouni A., Ecole Polytechnique, Canada; Thomas, Marc, Quebec Univ., Canada; International Journal of COMADEM; January 2000; Volume 3, No. 1, pp. 5-16; In English; See also 20000025132; Copyright; Avail: Issuing Activity, Hardcopy

The detection of faults in machinery is based on the verification of classical vibration parameters, including both time domain and frequency domain parameters. There are several methods by which one can estimate these parameters and each of the methods has advantages and disadvantages. In certain cases, such as transient events in machinery or varying speed rotating machinery, traditional methods of vibration analysis either in time or in frequency are incapable of reflecting changes in the operating conditions. The use of time frequency methods is one step towards a solution of some of the problems and the Short-Time Fourier Transform (STFT) is the simplest method of time-frequency analysis. This paper proposes the application of the STFT as a

time-frequency method which can provide more information about a signal both in time and in frequency, and give a better representation of the signal than the conventional methods used in machinery diagnosis. In this paper, we review the traditional vibration analysis techniques which are widely used in practice. Secondly, we discuss the necessity of time-frequency analysis in the field of machinery diagnostics. Thirdly, the theory of the Short-Time Fourier Transform is briefly explained. Some practical examples of defective bearings and defective gearboxes are analyzed by the STFT method and, in conclusion, the effectiveness and advantages of the STFT are demonstrated.
Author
Fourier Transformation; Fault Detection; Machinery

20000025134 Royal Scientific Society, Princess Sumaya Univ. Coll. for Technology, Jubaiha, Jordan
Fault Diagnosis Using Three-Valued Based Non-Monotonic Logic
Obeid, Nadim, Royal Scientific Society, Jordan; International Journal of COMADEM; January 2000; Volume 3, No. 1, pp. 17-28; In English; See also 20000025132; Copyright; Avail: Issuing Activity, Hardcopy

In this paper we present a three-valued based nonmonotonic logic, L3, for representing and reasoning about diagnostic knowledge. In addition to rule-based diagnosis that is naturally capturable in L3 we show that the description of a system and the reasoning employed in consistency-based diagnostic reasoning can be captured in L3. We show that system is both sound and complete. We give a proof method for the logic L3 that has been successfully implemented as an automatic theorem prover for L3. We also show that the implemented system can be employed as a model of knowledge acquisition.
Author
Fault Detection; Logic Programming; Knowledge Bases (Artificial Intelligence)

20000025135 Bosch (Robert) G.m.b.H., Dept. FV/FLI, Stuttgart, Germany
Forecasting of Vibrational Signals for Machine Condition Monitoring using Non-Parametic Kernel Based Approximation Techniques, Pt. 1, Theory
Jauch, Thomas W., Bosch (Robert) G.m.b.H., Germany; International Journal of COMADEM; January 2000; Volume 3, No. 1, pp. 29-38; In English; See also 20000025132; Copyright; Avail: Issuing Activity, Hardcopy

In this paper a novel approach for kernel design is presented. The technique will be called 'Optimal Subspace Kernel Design' (OSKD). One of the main drawbacks of many distance based parametric and nonparametric approaches is that they do not use a metric which has a certain kind of orientation, which suits best the given application. In the approach presented here a kernel based technique with a full covariance metric is used. The need for an optimal, task dependent covariance structure is important for the mapping performance. A technique based on Householder reflections is derived, which allows modelling of the covariance structure in an optimization procedure. The number of parameters used is only linearly dependent on the input dimension. It is possible to model a singular metric to obtain a subspace approach. Both the orientation and the kernel widths in each orthogonal dimension of the metric are adapted. To optimize the metric an error function based on the leave one out cross-validation technique is derived. The model is trained in a supervised manner, via the extended Kalman filter technique, and is able to handle both classification and regression tasks. Results are shown using an artificial classification and a real world regression example in the second part of this work.
Author
Approximation; Kernel Functions; Covariance; Vibration; Optimization; Artificial Intelligence; Forecasting

20000025136 Shanghai Jiao Tong Univ., State Key Lab. for Vibration Shock and Noise, China
Competitive Supervised Learning Algorithms in Machine Condition Monitoring
Liang, Feng-Gang, Shanghai Jiao Tong Univ., China; Xu, Min, Shanghai Jiao Tong Univ., China; Shun, Qui-Qing, Shanghai Jiao Tong Univ., China; International Journal of COMADEM; January 2000; Volume 3, No. 1, pp. 39-46; In English; See also 20000025132; Sponsored in part by China's National Key Research Project
Contract(s)/Grant(s): 85-720-07-10/4; Copyright; Avail: Issuing Activity, Hardcopy

Two of the most important issues for supervised learning are specifying back-propagation algorithm as the modeling problem and generalization of performance and efficiency. This paper is intended to solve these two important issues. Firstly, a formal mathematical proof for determining the hidden nodes in the multilayer perceptrons network (MLP) is given. The related optimal subset technique for the selection of the sample set for learning the available training set is introduced. Then, the concept, structure, and algorithms of competitive supervised learning neural network (CSL) are proposed in this paper, based on the MLP. The proposed CSL network is intended to improve the generalization performance and time- and space-complexity for supervised

learning in machine condition monitoring. Experiments have been conducted to test the efficacy of the proposed methods. The results show that the proposed CSL network has a good performance with faster training process.
Author
Algorithms; Machine Learning; Neural Nets; Fault Detection; Artificial Intelligence

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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.

20000021119 Norwegian Defence Research Establishment, Kjeller, Norway
Review of Analytical Penetration Mechanics
Teland, Jan Arild, Norwegian Defence Research Establishment, Norway; Mar. 15, 1999; 182p; In English
Report No.(s): PB99-174708; FFI/RAPPORT-99/01264; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

The report gives a complete review of the field of analytical penetration modelling. The authors first give an introduction to the theory of continuum mechanics. This theory is then applied to some simple problems as an illustration of various physical effects which arise during the penetration of a projectile into a target. by making various approximations, it is possible to create analytical models which describe the penetration process. There are basically two types of analytical models, hydrodynamical and those based on cavity expansion. Many of these analytical penetration models are discussed and compared, some in detail and others more briefly.
NTIS
Hydrodynamics; Penetration; Projectiles; Continuum Mechanics

20000021202 Defence Science and Technology Organisation, Information Technology Div., Canberra Australia
Cold Expansion Tests for Plates Containing Elongated Holes
Heller, M.; Evans, R. L.; Allan, R. B.; Oct. 1999; 45p; In English
Report No.(s): AD-A371310; DSTO-TN-0233; DODA-AR-011-113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cold-expansion testing of D6ac plates containing an elongated (non-circular) hole, of 2:1 aspect ratio, has been undertaken using an AMRL designed interference fit plug/sleeve arrangement. The aim has been to determine the practical viability of the process as an option for addressing the cracking problem at the non-circular fuel flow vent hole number 13 in the wing pivot fitting of the F-111C aircraft in service with the RAAF. The key issue being that in the open literature, only cold expansion to circular holes has been reported, and application to non-circular holes would represent a significant new development. In the testing, three nominally identical plate specimens were cold expanded with sleeves of two different material types (i.e., high strength tool steel (D2) and stainless steel) being assessed. Strain gauge readings around the elongated hole boundary were recorded at various stages of the cold-expansion process, as well as some typical full-field qualitative photoelastic strain distributions. In all cases nominal expansion levels greater than 2.5% were achieved, along with maximum peak strains of more than 10,000 micro-strain and maximum residual strains greater than 1600 micro-strain. These results indicate that highly effective cold expansion has been achieved. It was also demonstrated that subsequent to cold expansion, effective interference fitting could be achieved, without the need for post cold-expansion machining. The particular advantages available by using stainless steel sleeves have been identified, and an improved surface finish at the holes in the plug is also recommended. Fatigue testing of the existing design, (with minor amendments) is now proposed to confirm its anticipated suitability as an effective fatigue life extension option.
DTIC
Expansion; Holes (Mechanics); Plates (Structural Members); Cold Working

20000021355 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Mechanical Properties of Stiffened GRP Panels, Phase 3
vanderWaal, A., Institute of Industrial Technology TNO, Netherlands; Breen, J., Institute of Industrial Technology TNO, Netherlands; Nov. 09, 1999; 81p; In English
Contract(s)/Grant(s): A95/KM/105; TNO Proj. 431874052
Report No.(s): TD99-0416; TNO-Div499.1133; Copyright; Avail: Issuing Activity

This report describes and explains measurements and results obtained using representative specimens. The specimens were cut from full scale panels when possible. The panels consist of a GRP (glass fibre reinforced) base plate which a GRP stiffener is bonded. Shock absorbing materials have been applied to increase the shock resistance of the panel. These materials are Crestomer (a Polyurethane adhesive/filler) and PVC foam. The critical mechanical properties, that were quantified for the full scale panel, are the critical energy release rate of the laminate, the secondary bond, the Crestomer and the PVC foam, When possible the critical energy release rate was determined in mode I and mode H. Tensile strength, shear strength and bonding strength were determined for different Crestomer types. Moreover, some fracture surface and failure analysis is presented based on microscopic (light and electron) observations.
Author
Mechanical Properties; Glass Fibers; Reinforcing Fibers; Fiber Composites; Reinforced Plates; Panels

20000021562 Building and Construction Research TNO, Centre for Mechanical Engineering, Delft, Netherlands
Non-Linear Shock Response of Naval Piping Systems ***Final Report***
Meijer, G. J., Building and Construction Research TNO, Netherlands; Hovenga, P. E., Building and Construction Research TNO, Netherlands; October 1999; 84p; In English; Original contains color illustrations
Contract(s)/Grant(s): A99/KM/102; TNO Proj. 006.93291.01.01
Report No.(s): TD99-0095; TNO-1999-CMC-R048; Copyright; Avail: Issuing Activity
Numerical analyses of the shock response of potential pipe systems on board the LC-frigate. The stiffness of the mounting brackets and the span of the pipes are based on rules of thumb. These rules give rise to serious doubts with the sponsor. The investigation is not sufficiently thorough to be able to provide conclusive evidence in negative or positive sense. However, the calculations reveal a number of uncertainties and potential problems, which need further investigations. In the mean time it is advised to reduce the spans.
Author
Nonlinearity; Dynamic Response; Pipelines; Pipes (Tubes); Ships; Navy

20000023166 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Equivalent Skin Analysis of Wing Structures Using Neural Networks ***Final Report***
Liu, Youhua, Virginia Polytechnic Inst. and State Univ., USA; Kapania, Rakesh K., Virginia Polytechnic Inst. and State Univ., USA; [2000]; 35p; In English
Contract(s)/Grant(s): NAG1-1884; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An efficient method of modeling trapezoidal built-up wing structures is developed by coupling. in an indirect way, an Equivalent Plate Analysis (EPA) with Neural Networks (NN). Being assumed to behave like a Mindlin-plate, the wing is solved using the Ritz method with Legendre polynomials employed as the trial functions. This analysis method can be made more efficient by avoiding most of the computational effort spent on calculating contributions to the stiffness and mass matrices from each spar and rib. This is accomplished by replacing the wing inner-structure with an ”equivalent” material that combines to the skin and whose properties are simulated by neural networks. The constitutive matrix, which relates the stress vector to the strain vector, and the density of the equivalent material are obtained by enforcing mass and stiffness matrix equities with rec,ard to the EPA in a least-square sense. Neural networks for the material properties are trained in terms of the design variables of the wing structure. Examples show that the present method, which can be called an Equivalent Skin Analysis (ESA) of the wing structure, is more efficient than the EPA and still fairly good results can be obtained. The present ESA is very promising to be used at the early stages of wing structure design.
Author
Aircraft Design; Design Analysis; Legendre Functions; Mindlin Plates; Neural Nets; Stiffness Matrix; Trapezoidal Wings; Skin (Structural Member)

20000023204 General Electric Co., Aircraft Engines, Cincinnati, OH USA
CSTEM User Manual
Hartle, M., General Electric Co., USA; McKnight, R. L., General Electric Co., USA; January 2000; 464p; In English
Contract(s)/Grant(s): NAS3-26617; RTOP 523-22-13
Report No.(s): NASA/CR-2000-209308; E-11858; NAS 1.26:209308; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche
This manual is a combination of a user manual, theory manual, and programmer manual. The reader is assumed to have some previous exposure to the finite element method. This manual is written with the idea that the CSTEM (Coupled Structural Thermal Electromagnetic-Computer Code) user needs to have a basic understanding of what the code is actually doing in order to properly

use the code. For that reason, the underlying theory and methods used in the code are described to a basic level of detail. The manual gives an overview of the CSTEM code: how the code came into existence, a basic description of what the code does, and the order in which it happens (a flowchart). Appendices provide a listing and very brief description of every file used by the CSTEM code, including the type of file it is, what routine regularly accesses the file, and what routine opens the file, as well as special features included in CSTEM.
Author
Computer Programs; Finite Element Method; User Manuals (Computer Programs); Electromagnetism; Composite Structures; Thermal Analysis; Structural Analysis

20000023226 Alpha Star Corp., Long Beach, CA USA
Development of GENOA Progressive Failure Parallel Processing Software Systems ***Final Report***
Abdi, Frank, Alpha Star Corp., USA; Minnetyan, Levon, Clarkson Univ., USA; December 1999; 250p; In English
Contract(s)/Grant(s): NAS3-97041; RTOP 523-22-13
Report No.(s): NASA/CR-1999-209404; NAS 1.26:209404; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
A capability consisting of software development and experimental techniques has been developed and is described. The capability is integrated into GENOA-PFA to model polymer matrix composite (PMC) structures. The capability considers the physics and mechanics of composite materials and structure by integration of a hierarchical multilevel macro-scale (lamina, laminate, and structure) and micro scale (fiber, matrix, and interface) simulation analyses. The modeling involves (1) ply layering methodology utilizing FEM elements with through-the-thickness representation, (2) simulation of effects of material defects and conditions (e.g., voids, fiber waviness, and residual stress) on global static and cyclic fatigue strengths, (3) including material nonlinearities (by updating properties periodically) and geometrical nonlinearities (by Lagrangian updating), (4) simulating crack initiation. and growth to failure under static, cyclic, creep, and impact loads. (5) progressive fracture analysis to determine durability and damage tolerance. (6) identifying the percent contribution of various possible composite failure modes involved in critical damage events. and (7) determining sensitivities of failure modes to design parameters (e.g., fiber volume fraction, ply thickness, fiber orientation. and adhesive-bond thickness). GENOA-PFA progressive failure analysis is now ready for use to investigate the effects on structural responses to PMC material degradation from damage induced by static, cyclic (fatigue). creep, and impact loading in 2D/3D PMC structures subjected to hygrothermal environments. Its use will significantly facilitate targeting design parameter changes that will be most effective in reducing the probability of a given failure mode occurring.
Author
Parallel Processing (Computers); Software Engineering; Composite Structures; Computer Programming; Failure Modes; Creep Properties

20000023232 National Defence Research Establishment, Avd. foer Vapen och Skydd, Tumba, Sweden
Full Scale Test with Steel Reinforced Concrete Slabs in Moraine Subjected to Ground Shock from Detonated Bomb ***Fullskalefoersoek med Armerade Betongplattor i Moraen Belastade med Markstoetvag fran Detonerande Bomber***
Balazs, P.; Sep. 1999; 64p; In Swedish
Report No.(s): PB2000-101491; FOA-R-01208-311-SE; No Copyright; Avail: Issuing Activity
In this report, results from full scale experimental investigation of ground shock loading on concrete slabs are presented. Steel reinforced concrete slabs with nominal compressive strength of 30 MPa were subjected to ground shock from buried bombs. Both the free field behavior and the interaction with the structure have been studied. Simple equations were used to analyze results from experiments, considering deformations and velocity of concrete slabs as well as pressure and impulse loading on the structure. These expressions are based on Drake-Little's semi-empirical equations of the behavior of free field ground shock propagation. A comparison between the measured and the calculated values for the free field pressure shows a poor agreement. The experimental behavioral of the structure shows good agreement with the calculations.
NTIS
Reinforcement (Structures); Concrete Structures; Explosions; Full Scale Tests; Concretes

20000024873 NASA Langley Research Center, Hampton, VA USA
On-Line Database of Vibration-Based Damage Detection Experiments
Pappa, Richard S., NASA Langley Research Center, USA; Doebling, Scott W., Los Alamos National Lab., USA; Kholwad, Tina D., New Mexico Univ., USA; January 2000; 12p; In English; 18th; 18th International Modal Analysis Conference, 7-10 Feb. 2000, San Antonio, TX, USA
Contract(s)/Grant(s): RTOP 706-12-21-02

Report No.(s): NASA/TM-2000-209840; NAS 1.15:209840; L-17930; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a new, on-line bibliographic database of vibration-based damage detection experiments. Publications in the database discuss experiments conducted on actual structures as well as those conducted with simulated data. The database can be searched and sorted in many ways, and it provides photographs of test structures when available. It currently contains 100 publications, which is estimated to be about 5-10% of the number of papers written to date on this subject. Additional entries are forthcoming. This database is available for public use on the Internet at the following address: http://sdbpappa-mac.larc.nasa.gov. Click on the link named ”dd_experiments.fp3” and then type ”guest” as the password. No user name is required.

Author

Bibliographies; Vibration Tests; Structural Vibration; Data Bases; On-Line Systems

20000024921 NASA Glenn Research Center, Cleveland, OH USA

Flutter and Forced Response Analyses of Cascades using a Two-Dimensional Linearized Euler Solver

Reddy, T. S. R., Toledo Univ., USA; Srivastava, R., Toledo Univ., USA; Mehmed, O., NASA Glenn Research Center, USA; November 1999; 32p; In English

Contract(s)/Grant(s): RTOP 523-26-13

Report No.(s): NASA/TM-1999-209633; E-11960; NAS 1.15:209633; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flutter and forced response analyses for a cascade of blades in subsonic and transonic flow is presented. The structural model for each blade is a typical section with bending and torsion degrees of freedom. The unsteady aerodynamic forces due to bending and torsion motions. and due to a vortical gust disturbance are obtained by solving unsteady linearized Euler equations. The unsteady linearized equations are obtained by linearizing the unsteady nonlinear equations about the steady flow. The predicted unsteady aerodynamic forces include the effect of steady aerodynamic loading due to airfoil shape, thickness and angle of attack. The aeroelastic equations are solved in the frequency domain by coupling the un- steady aerodynamic forces to the aeroelastic solver MISER. The present unsteady aerodynamic solver showed good correlation with published results for both flutter and forced response predictions. Further improvements are required to use the unsteady aerodynamic solver in a design cycle.

Author

Euler Equations of Motion; Cascade Flow; Flutter Analysis; Aeroelasticity; Nonlinear Equations

20000025050 Naval Postgraduate School, Monterey, CA USA

Efficient Nonlinear Transient Dynamic Analysis of Structural Optimization Using an Exact Integral Equation Formulation ***Progress Report, Jul. 1998 - Nov. 1999***

Gordis, Joshua H.; Neta, Beny; May 1999; 81p; In English

Report No.(s): AD-A371849; NPS-ME-99-009; NSF-97-13481; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report serves to document progress made to date on the National Science Foundation Project #97-13481, Earthquake Hazard Mitigation Program. The focus of this phase of the project is the development of an improved solution algorithm for fast transient analysis of large, locally nonlinear structures using time domain structural synthesis. The report documents the development of several algorithms intended to improve upon the original algorithm developed by the first author. The last algorithm developed meets the stated goals of the project. This algorithm is a newly developed recursive, block by block convolution solution to the governing nonlinear integral equation. As is demonstrated with a realistically large nonlinear base excitation problem (51,300 DOF finite element model), the new algorithm provides a 78% reduction in time required for the nonlinear transient base excitation solution, as compared with traditional direct integration. The new algorithm provides an even greater reduction in computer time for subsequent analysis. The nonlinear base isolation solutions calculated using the new algorithm take approximately 7 seconds, as compared with the direct integration solution which takes approximately 30 minutes. The rapid reanalysis capability will facilitate the development of numerical optimization for the design of nonlinear isolation. The theory of transient synthesis is documented, along with a new proof of the exponential convergence properties of an iterative solution to the governing nonlinear integral equation.

DTIC

Mathematical Models; Nonlinear Equations; Algorithms; Structural Analysis; Earthquakes; Computerized Simulation

20000025237 NASA Marshall Space Flight Center, Huntsville, AL USA

Degradation Factor Approach for Impacted Composite Structural Assessment: MSFC Center Director's Discretionary Fund Final Report, Project No. 96-17

Ortega, R., NASA Marshall Space Flight Center, USA; Price, J. M., NASA Marshall Space Flight Center, USA; Fox, D., NASA Marshall Space Flight Center, USA; February 2000; 30p; In English

Report No.(s): NASA/TM-2000-210014; NAS 1.15:210014; M-967; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical memorandum documents the results of the research to develop a concept for assessing the structural integrity of impacted composite structures using the strength degradation factor in conjunction with available finite element tools. For this purpose, a literature search was conducted, a plan for conducting impact testing on two laminates was developed, and a finite element model of the impact process was created. Specimens for the impact testing were fabricated to support the impact testing plan.

Derived from text

Degradation; Composite Structures

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GEOSCIENCES (GENERAL)

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.

20000021245 Geological Survey, Water Resources Div., Middleton, WI USA

Hydrogeological, Geomorphological, and Vegetative Investigations of Select Wetland Creation and Restoration Projects *Final Report, Oct. 1989 - Oct. 1998*

Hunt, R. J.; Jackson, J. O.; Running, G. L.; Krabbenhoft, D. P.; Krohelski, J. T.; Feb. 15, 1999; 334p; In English

Report No.(s): PB2000-102764; No Copyright; Avail: CASI; A03, Microfiche; A15, Hardcopy

The objective of the study was to conduct research on the groundwater hydrology and geochemistry of wetland restoration and creation sites to gain a better understanding of the processes that are important for successful wetland establishment. Major project findings include: (1) Traditional hydrologic methods can be ill-suited for wetland investigations; (2) Stable isotopes were shown to be powerful tools for investigating sources of water and mineral weathering environments in natural and constructed wetlands; (3) Hydrologic characterizations of the natural and construct4ed wetlands showed differing degrees of similarity between the sites as a result of different sediment mineralogy and design considerations; and (4) Implications of Driftless Area geomorphology for wetland compensation are reviewed and a procedure for organizing available soil and geomorphical data is provided for identification of potential wetland compensation sites.

NTIS

Geomorphology; Hydrogeology; Vegetation; Geochemistry; Ground Water; Structural Properties (Geology)

20000021393 Geological Survey, Biological Resources Div., Fort Collins, CO USA

Quality of Life on the Colorado Plateau: A Report to Camera-Survey Collaborators in Southeast Utah

Taylor, J. G.; Reis-Ruehrwein, J. B.; Sexton, N. R.; Blahna, D. J.; Apr. 1999; 38p; In English; Original contains color illustrations

Report No.(s): PB2000-102311; No Copyright; Avail: National Technical Information Service (NTIS)

One of the most difficult issues for planners and natural resource managers is trying to determine how their decisions will affect local residents, especially the residents life styles. A frequent admonition to federal, state, and local land and resource managers is, We know things are changing, but don't ruin our quality of life. to provide some tangible evidence of what local residents mean by this expression, we administered a Resident-Employed Photography survey. This involved giving 12-exposure, single-use cameras to residents of Carbon, Emery, Grand, San Juan, and Wayne counties in Southeast Utah, and asking them to show us what places and features of their communities and surrounding landscapes were essential to their quality of life. That exercise was followed up with a short mail-back questionnaire.

NTIS

Surveys; Cameras

20000025238 Geological Survey, Resources Div., Honolulu, HI USA

Ground-Water Resources in Kaloko-Honokohau National Historical Park, Island of Hawaii, and Numerical Simulation of the Effects of Ground-Water Withdrawals

Oki, D. S.; Tribble, G. W.; Souza, W. R.; Bolke, E. L.; 1999; 60p; In English

Report No.(s): PB2000-102357; USGS/WRI-99-4070; No Copyright; Avail: Issuing Activity

The purpose of the report is to describe (1) the occurrence of ground water in the Park, (2) a reconnaissance of salinity levels of water from three wells in the Pak, and in the Park's fishponds, anchialine ponds, and the ocean, (3) concentrations of trace metals and organic contaminants from three wells in the park and one well upgradient of the Park, and (4) estimates of changes in the amount of ground-water flow through the park caused by withdrawing water at rate sin excess of those that existed in 1978, when the Park was established.

NTIS

Simulation; Ground Water; Water Resources; Trace Contaminants; Hawaii; National Parks

20000025239 Bureau of Reclamation, Denver, CO USA

Framework for Characterizing Extreme Floods for Safety Risk Assessment

Nov. 1999; 84p; In English; Prepared in cooperation with Utah Water Research Lab.

Report No.(s): PB2000-102350; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Bureau of Reclamation is now making extensive use of quantitative risk assessment in support of dam safety decisionmaking. This report proposes a practical, robust, consistent, and credible framework for characterizing extreme floods for dam safety risk assessment. A group of approximately 20 professionals from the USA, Europe, Australia, and Canada reviewed current Reclamation practices and evaluated various advances in hydrology and hydrometeorology for their potential role in the needed framework. A smaller core group developed details of the framework and formulated recommendations to Reclamation.

NTIS

Safety; Risk; Assessments; Floods; Forecasting; Flow Characteristics

20000025240 Geological Survey, Water Resources Div., Austin, TX USA

Characteristics of Water-Quality Data for Lake Houston, Selected Tributary Inflows to Lake Houston, and the Trinity River near Lake Houston (a Potential Source of Interbasin Transfer)*, Aug. 1983 - Sep. 1990*

Liscum, F.; Goss, R. L.; Rast, W.; 1999; 66p; In English

Report No.(s): PB2000-102348; USGS/WRI-99-4129; No Copyright; Avail: Issuing Activity

This report deals only with phase I of the investigation and is a summary of water-quality data collected August 1983--September 1990 in Lake Houston, its major tributaries, and the Trinity River. Summary statistics of water-quality data collected are presented. Longitudinal profiles through Lake Houston of six selected physical properties and chemical constituents illustrate how water quality varied vertically and along the length of the lake. Seventeen of 59 properties and constituents collected in the sampling program were selected as important factors affecting biological, physical, and chemical processes in water. The 17 properties and constituents were grouped on the basis of six locations representing the study area (the lake nearest the dam, East Fork of the lake, West Fork of the lake, the eastern and western tributaries, and the Trinity River), statistically summarized, and compared to available drinking water standards established by the U.S. Environmental Protection Agency (EPA). The 17 properties and constituent concentrations are presented in boxplots and subsets of 13 to 15 properties and constituent concentrations statistically tested for differences on the basis of combinations of season, depth, location, and streamflow.

NTIS

Tributaries; Water Quality; Lakes; Houston (TX); Rivers; Environment Protection

20000025241 Geological Survey, Water Resources Div., Honolulu, HI USA

Storage Capacity and Water Quality of Lake Ngardok, Babeldaob Island, Republic of Palau, 1996-98*, 1996-1998*

Yeung, C. W.; Wang, M. F.; 1999; 36p; In English; Prepared in cooperation with Republic of Palau, Koror (Trust Territory of the Pacific Islands)

Report No.(s): PB2000-102346; USGS/WRI-99-4118; No Copyright; Avail: Issuing Activity

The report describes storage capacity and water quality of Lake Ngardok. A bathymetric survey of Lake Ngardok was done to estimate storage capacity in relation to lake water-surface elevation. Samples were collected in late March and early April 1996, and November 1997, from the lake outflow for water-quality analyses. At selected lake cross sections, samples were collected at depth for analysis of water-quality properties and constituents.

NTIS

Water Quality; Lakes; Storage Stability

20000025252 Geological Survey, Resources Div., Middleton, WI USA

Simulation of Stage and Hydrologic Budget for Shell Lake, Washburn County, Wisconsin

Krohelski, J. T.; Feinstein, D. T.; Lenz, B. N.; 1999; 34p; In English; Prepared in cooperation with City of Shell Lake, WI
Report No.(s): PB2000-102359; USGS/WRI-99-4209; No Copyright; Avail: Issuing Activity

A model that simulates lake stage was developed to test the current understanding of the hydrology of Shell Lake, Wisconsin and to provide a tool for predicting the effects of withdrawing lake water on future lake stages. The model code is written in FORTRAN and simulates daily lake stage by summing estimates of hydrologic-budget components--precipitation falling on the lake surface, water evaporating from the lake surface, runoff (consisting of overland flow to the lake and intermittent streams flowing into the lake), and ground-water flow out of the lake. The model was calibrated to intermittent lake stage measurements for the period 1948-98. The hydrologic budget model was coupled to UCODE, a parameter estimation model, to aid in estimating runoff coefficients. Trends in stage simulated by the calibrated model compare reasonably well with historical stage trends.
NTIS

Simulation; Lakes; Hydrology Models; Wisconsin; Water Flow; Surface Water; Budgets

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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.

20000021236 NASA Goddard Space Flight Center, Greenbelt, MD USA

Short-Term Retrospective Land Data Assimilation Schemes

Houser, P. R., NASA Goddard Space Flight Center, USA; Cosgrove, B. A., NASA Goddard Space Flight Center, USA; Entin, J. K., NASA Goddard Space Flight Center, USA; Lettenmaier, D., Washington Univ., USA; ODonnell, G., Washington Univ., USA; Mitchell, K., National Oceanic and Atmospheric Administration, USA; Marshall, C., National Oceanic and Atmospheric Administration, USA; Lohmann, D., National Oceanic and Atmospheric Administration, USA; Schaake, J. C., National Weather Service, USA; Duan, Q., National Weather Service, USA; Wood, E., Princeton Univ., USA; Habets, F., Princeton Univ., USA; [2000]; 4p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Subsurface moisture and temperature and snow/ice stores exhibit persistence on various time scales that has important implications for the extended prediction of climatic and hydrologic extremes. Hence, to improve their specification of the land surface, many numerical weather prediction (NWP) centers have incorporated complex land surface schemes in their forecast models. However, because land storages are integrated states, errors in NWP forcing accumulates in these stores, which leads to incorrect surface water and energy partitioning. This has motivated the development of Land Data Assimilation Schemes (LDAS) that can be used to constrain NWP surface storages. An LDAS is an uncoupled land surface scheme that is forced primarily by observations, and is therefore less affected by NWP forcing biases. The implementation of an LDAS also provides the opportunity to correct the model's trajectory using remotely-sensed observations of soil temperature, soil moisture, and snow using data assimilation methods. The inclusion of data assimilation in LDAS will greatly increase its predictive capacity, as well as provide high-quality land surface assimilated data.
Author

Numerical Weather Forecasting; Remote Sensing; Assimilation; Earth Surface; Climatology

20000021335 NASA Goddard Space Flight Center, Greenbelt, MD USA

Lidar Altimeter Measurements of Canopy Structure: Methods and Validation for Closed Canopy, Broadleaf Forests

Harding, D. J., NASA Goddard Space Flight Center, USA; Lefsky, M. A., Forest Service, USA; Parker, G. G., Smithsonian Institution, USA; Blair, J. B., NASA Goddard Space Flight Center, USA; [1999]; 65p; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Lidar altimeter observations of vegetated landscapes provide a time-resolved measure of laser pulse backscatter energy from canopy surfaces and the underlying ground. Airborne lidar altimeter data was acquired using the Scanning Lidar Imager of Canopies by Echo Recovery (SLICER) for a successional sequence of four, closed-canopy, deciduous forest stands in eastern Maryland. The four stands were selected so as to include a range of canopy structures of importance to forest ecosystem function, including variation in the height and roughness of the outer-most canopy surface and the vertical organization of canopy stories and gaps. The character of the SLICER backscatter signal is described and a method is developed that accounts for occlusion of

the laser energy by canopy surfaces, transforming the backscatter signal to a canopy height profile (CHP) that quantitatively represents the relative vertical distribution of canopy surface area. The transformation applies an increased weighting to the backscatter amplitude as a function of closure through the canopy and assumes a horizontally random distribution of the canopy components. SLICER CHPs, averaged over areas of overlap where lidar ground tracks intersect, are shown to be highly reproducible. CHP transects across the four stands reveal spatial variations in vegetation, at the scale of the individual 10 m diameter laser footprints, within and between stands. Averaged SLICER CHPs are compared to analogous height profile results derived from ground-based sightings to plant intercepts measured on plots within the four stands. Tbe plots were located on the segments of the lidar ground tracks from which averaged SLICER CHPs were derived, and the ground observations were acquired within two weeks of the SLICER data acquisition to minimize temporal change. The differences in canopy structure between the four stands is similarly described by the SLICER and ground-based CHP results, however a Chi-square test of similarity documents differences that are statistically significant. The differences are discussed in terms of measurement properties that define the smoothness of the resulting CHPs and Lidar Altimeter Measurements of Canopy Structure - Harding et al. canopy properties that may vertically bias the CHP representations of canopy structure. The statistical differences are most likely due to the more noisy character of the ground-based CHPs, especially high in the canopy where ground-based sightings are rare resulting in an underestimate of canopy surface area and height, and to departures from the assumption of horizontal randomness which bias the CHPs toward the observer (upward for SLICER and downward for ground-based CHPs). The results demonstrate that the SLICER observations reliably provide a measure of canopy structure that reveals ecologically interesting structural variations such as those characterizing a successional sequence of closed-canopy, broadleaf forest stands.
Author
Canopies (Vegetation); Forests; Pulsed Lasers; Radar Measurement; Altimeters; Laser Outputs

20000021490 NASA Goddard Space Flight Center, Greenbelt, MD USA
First Look at LANDSAT-7 Mission Performance: Technical and Operational Results to Date
Williams, Darrel L., NASA Goddard Space Flight Center, USA; Irons, James R., NASA Goddard Space Flight Center, USA; Barker, John L., NASA Goddard Space Flight Center, USA; Markham, Brian, NASA Goddard Space Flight Center, USA; Pedelty, Jeffrey A., NASA Goddard Space Flight Center, USA; [1999]; 2p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA
Report No.(s): Paper 2689; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

A primary goal of the current LANDSAT-7 mission, launched on April 15, 1999, is to acquire and refresh on a seasonal basis, calibrated ata sets of multispectral digital imagery of the landmass of the Earth The Enhanced Thematic Mapper Plus (ETM+) imager flown on LANDSAT-7 provides ground spatial resolutions in the panchromatic, reflective and emissive bands of 15, 30 and 60 meters, respectively, for a nominal scene 183 km wide by 170 km long. This mission not only builds on the invaluable 27-year continuous archive of thematic images of the Earth provided by previous LANDSAT satellites, it also inaugurates a new era of robust data acquisition with an emphasis on global change science. The newly developed Long Term Acquisition Plan (LTAP) is being used to optimize the systematic collection of data from all parts of the globe, populating the U.S.-held archive at the USGS EROS Data Center (EDC) with over 90,000 LANDSAT scene per year . An additional 73,000 Images are expected to be acquired each year by several international ground stations, for a total downlink of LANDSAT7 data in excess of 100 terabytes per year. Nearly 20,000 scan of LANDSAT-7 ETM+ data have already been acquired in the first 100 days of the mission. Early results derived from assessments of the ETM+ instrument, the spacecraft, and the ground processing systems indicate that the image quality is outstanding, clearly the best ever provided by any LANDSAT mission. Sensor radiometric background stability after the first 100 days in orbit is approximately 0.1 percent. Stability of the Full Aperture Solar Calibrator is approximately 0.3 percent, and mid-scale per pixel noise is approximately 0.6 percent. A ground processing system has been implemented at EDC which is capable of capturing, processing and archiving 250 LANDSAT scenes 9 per day, and delivering 100 scene products to seems each day. The cost of a systematically-processed Level 1 product has been dropped dramatically to $600, end there is no longer any copyright protection an the data. The net result is that the use of LANDSAT ETM+ data is expected to grow dramatically, and this growth is expected to benefit all facets of the land remote sensing community.
Author
Image Resolution; LANDSAT 7; Remote Sensing; Satellite Imagery; Thematic Mappers (LANDSAT)

20000021495 NASA Goddard Space Flight Center, Greenbelt, MD USA
Validation of the AMSU-B Bias Corrections Based on Satellite Measurements from SSM/T-2
Kolodner, Marc A., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 10th; Satellite Meteorology and Oceanography, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA
Report No.(s): Paper 5999; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The NOAA-15 Advanced Microwave Sounding Unit-B (AMSU-B) was designed in the same spirit as the Special Sensor Microwave Water Vapor Profiler (SSM/T-2) on board the DMSP F11-14 satellites, to perform remote sensing of spatial and temporal variations in mid and upper troposphere humidity. While the SSM/T-2 instruments have a 48 km spatial resolution at nadir and 28 beam positions per scan, AMSU-B provides an improvement with a 16 km spatial resolution at nadir and 90 beam positions per scan. The AMSU-B instrument, though, has been experiencing radio frequency interference (RFI) contamination from the NOAA-15 transmitters whose effect is dependent upon channel, geographic location, and current spacecraft antenna configuration. This has lead to large cross-track biases reaching as high as 100 Kelvin for channel 17 (150 GHz) and 50 Kelvin for channel 19 (183 +/-3 GHz). NOAA-NESDIS has recently provided a series of bias corrections for AMSU-B data starting from March, 1999. These corrections are available for each of the five channels, for every third field of view, and for three cycles within an eight second period. There is also a quality indicator in each data record to indicate whether or not the bias corrections should be applied. As a precursor to performing retrievals of mid and upper troposphere humidity, a validation study is performed by statistically analyzing the differences between the F14 SSM/T-2 and the bias corrected AMSU-B brightness temperatures for three months in the spring of 1999.
Author
Bias; Remote Sensing; Spatial Distribution; Temporal Distribution; Troposphere; Water Vapor

20000024918 NASA Goddard Space Flight Center, Greenbelt, MD USA
Landscape-Scale Canopy Complexity in and Near Braulio Carillo National Park, Costa Rica
Knox, Robert G., NASA Goddard Space Flight Center, USA; Blair, J. B., NASA Goddard Space Flight Center, USA; Weishampel, J. F., University of Central Florida, USA; Clark, D. B., Missouri Univ., USA; Hofton, M. A., Maryland Univ., USA; Dubayah, R., Maryland Univ., USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Using medium-large footprint lidar sampling of approximately 500 square km of Costa Rica, we assessed the vertical and horizontal complexity of a forest-dominated tropical landscape. As expected, vertical extents of structure and canopy heights estimated from lidar waveforms were smaller in high elevation forests than in forests at lower elevations. In areas of the park and long-protected areas of La Selva Biological Station, forests typically had more consistent ratios of median height to total height than areas with other types of recent land use. Areas outside the park exhibited both stronger and weaker spatial correlations in canopy properties than most areas within the park. We also simulated the effects of these differences on data products gridded from lidar transects, like those produced by the Vegetation Canopy Lidar (VCL) Mission.
Author
Canopies (Vegetation); Costa Rica; Tropical Regions; Rain Forests; Environment Simulation; Land Use

20000024927 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Geoscience Laser Altimeter System (GLAS) for the ICESAT Mission
Abshire, James B., NASA Goddard Space Flight Center, USA; Sun, Xiao-Li, NASA Goddard Space Flight Center, USA; Ketchum, Eleanor A., NASA Goddard Space Flight Center, USA; Afzal, Robert S., NASA Goddard Space Flight Center, USA; Millar, Pamela S., NASA Goddard Space Flight Center, USA; [1999]; 2p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Accurate measurements of surface heights and atmospheric backscatter have been demonstrated with the SLA, MOLA and LITE space lidar. Recent MOLA measurements of the Mars surface have 40 cm resolution and have reduced the global uncertainty in Mars topography from a few km to approx. 10 m. GLAS is a next generation lidar being developed as part of NASA's Icesat Mission for Earth orbit . The GLAS design combines a 10 cm precision surface lidar with a sensitive dual wavelength cloud and aerosol lidar. GLAS will precisely measure the heights of the Earth's polar ice sheets, determine the height profiles of the Earth's land topography, and profile the vertical backscatter of clouds and aerosols on a global scale. GLAS will fly on a small dedicated spacecraft in a polar orbit at 598 km altitude with an inclination of 94 degrees. GLAS is scheduled to launch in summer 2001 and to operate continuously for a minimum of 3 years with a goal of 5 years. The primary mission for GLAS is to measure the seasonal and annual changes in the heights of the Greenland and Antarctic ice sheets. GLAS will measure the vertical distance to the ice sheet from orbit with 1064 nm pulses from a Nd:YAG laser at 40 Hz. Each 5 nsec wide laser pulse is used for a single range measurement. When over land GLAS will profile the heights of the topography and vegetation. The GLAS receiver uses a I m diameter telescope and a Si APD detector. The detector signal is sampled by an all digital receiver which records each surface echo waveform with I nsec resolution and a stored echo record lengths of either 200, 400, or 600 samples. Analysis of the echo waveforms within the instrument permits discrimination between cloud and surface echoes. Ground based echo analysis permits precise ranging, determining the roughness or slopes of the surface as well as the vertical distributions of vegetation illuminated by the laser, Errors in knowledge of the laser beam pointing angle can bias height measurements of sloped surfaces. For surfaces

with 2 deg. slopes, knowledge of pointing angle of the beam centroid to about 8 urad is required to achieve 10 cm height accuracy. GLAS uses a stellar reference system (SRS) to determine the pointing angle of each laser firing relative to inertial space. The SRS uses a high precision star camera oriented toward local zenith whose measurements are combined with a gyroscope to determine the inertial orientation of the SRS optical bench. The far field pattern of each laser pulse is measured with a laser reference system (LRS). Optically measuring each laser far field pattern relative to the star camera and gyroscope permits the angular offsets of each laser pulse to be determined. GLAS will also determine the vertical distributions of clouds and aerosols by measuring atmospheric backscatter profiles at both 1064 and 532 nm. The 1064 nm measurements use an analog detector and profile the height and vertical structure of thicker clouds. Measurements at 532 nm use new highly sensitive photon counting detectors, and measure the height distributions of very thin clouds and aerosol layers. With averaging these can be used to determine the height of the planetary boundary layer. The instrument design and expected performance will be discussed.
Author
Altimeters; Height; Ice; Laser Altimeters; Neodymium Lasers; Optical Radar

20000025031 NASA Goddard Space Flight Center, Greenbelt, MD USA
Remote Sensing of Smoke and its Direct Radiative Forcing in South-America
Kaufman, Yoram, NASA Goddard Space Flight Center, USA; [1999[; 2p; In English; Mineral Dust, 9-11 Jun. 1999, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Smoke aerosol, organic and black carbon particles suspended in the air, are capable to absorb and reflect solar radiation to space - direct radiative forcing. Depending on the ratio of scattering to absorption, and on the surface spectral properties, the net smoke effect can be warming or cooling of the climate system. Data from the AVIRIS spectrometer flown on the ER-2 at altitude of 20 km, and of the AERONET ground based sun/sky radiometers are used to assess the smoke aerosol optical thickness over the land and the direct radiative forcing at the top of the atmosphere and at ground level, respectively. The data are collected during the SCAR-B experiment in Brazil. In contrast to model results of the smoke effect, we show using the AVIRIS data, that even though the surface albedo is high (0.17 - average on the solar spectrum) and the smoke single scattering albedo is low (0.88), smoke does increase the instantaneous reflectance of sunlight to space by 30-40 W/m(exp 2) for an increase in the smoke optical thickness of 0.5. The AERONET data are used to derive, simultaneously, the effect of smoke on the downward radiation. Models using spectrally averaged smoke optical properties and averaged surface reflectance, predicted very small smoke forcing. The reason is that smoke is mainly opaque in short wavelengths (e.g.is less than 0.7 micron) while the surface is mainly bright in longer wavelengths (> 0.7 micron). Modeling the effect of smoke on climate forcing cannot be done using the spectrally average properties. It requires the knowledge of the smoke and surface spectral properties.
Author
Smoke; Remote Sensing; Solar Radiation

20000025041 State Univ. of New York, Buffalo, NY USA
Landscape Evolution, A Comparison of Form and Process ***Final Report, 15 Nov. 1995 - 14 Nov. 1999***
Bursik, Marcus I., State Univ. of New York, USA; Jan. 31, 2000; 4p; In English
Contract(s)/Grant(s): NAG5-3142; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This project's goals were to collect, analyze and interpret 3-dimensional physiographic data for understanding the processes responsible for landscape modification. The primary landforms to be studied were Neogene cinder cones in Arizona (San Francisco Volcanic Field (SFVF), Coconino and Kaibab National Forests, Arizona). We also obtained and are still analyzing digital topographic data for the Long Valley-White Mountains area of California, which display Quaternary normal fault scarps, as well as extensive evidence of degradation. The work resulted in a large database of measured rates of downslope transport of slope debris. It was hypothesized that the work would increase our understanding of process-response models of hillslope degradation, and of the effects of climate change and other parameters on degradation rates. In greater detail, our primary goal was to compare evolutionary sequences of hillslopes, as exemplified by the topography of landforms of the same type but of different ages, with measurements of the surficial processes active on the landforms. Assuming that other parameters, such as hillslope materials and vegetation are held constant, and that the effects of changing climate are negligible, then the sediment transport rates measured today on the landforms should be the same as those calculated from the inversion of landform topography by use of a diffusion-type model. However, if the effects of changing climate or other factors are not negligible, then the observed transport rates would differ from those which must be invoked to explain the current topography. We hypothesized in fact that because degradation on the event scale is highly transient and localized, we would find a wide divergence between modern, measured transport rates, and rates calculated by global landform inversion or modeling. Because of the length of time involved in collection of sufficient data on current degradation rates, we are still continuing to analyse and interpret the data. Completion of the work will increase our understanding of the potential effects of anthropogenic climate and surficial change on the Earth's

solid surface, and possibly allow us to constrain paths of hill-slope evolution following anthropogenic modifications, as well as compare the short-term with the long-term rates of hillslope degradation.
Derived from text
Degradation; Landforms; Man Environment Interactions; Mountains; Terrain; Topography; Slopes

20000025074 NASA Goddard Space Flight Center, Greenbelt, MD USA
Timescales of Soil Moisture Anomalies: Results from Two GCMs
Koster, Randal D., NASA Goddard Space Flight Center, USA; Milly, P. C. D., Geological Survey, USA; Schlosser, C. Adam, Maryland Univ., USA; Suarez, Max J., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 9-14 Jan. 1999, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Soil moisture anomalies dissipate over timescales that may span weeks to months. Characterizing the geographical and seasonal variations in these timescales can have important practical benefit; significant soil moisture ”memory” allows long-lead forecasts of soil moisture, which have been found in recent studies to be essential for useful Ion--lead forecasts of precipitation in many regions. In this talk, we will present and compare the soil moisture timescales derived in two separate general circulation model (GCM) studies. Both studies employ multiple ensembles of short-term climate simulations. Timescales at a given point are effectively estimated by determining how quickly the soil moisture distribution generated in one ensemble of simulations (characterized by a unique set of initial soil moisture conditions) approaches that produced by another ensemble (characterized by a different set of initial soil moisture conditions). The talk will include a discussion of why the timescales produced by the two GCMs differ in some regions, and it will also describe the impact of soil moisture memory on simulated precipitation.
Author
Soil Moisture; Anomalies; Atmospheric General Circulation Models

44
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.

20000021582 Institute of Environmental Sciences, Energy Research and Process Innovation TNO, Apeldoorn Netherlands
Energy Sources for Soldier Modernisation Programme Systems ***Interim Report, May - Dec. 1999 Overzicht van Ontwikkelingen op het Gebied van Draagbare Energieopslag en Energieopwekking***
Raadschelders, J. W.; Schmal, D.; Dec. 1999; 53p; In Dutch
Report No.(s): AD-A372686; TNO-MEP-R,99/490; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

In this report an overview is given of the energy sources and their properties which might be implemented in a future soldier system. In chapter 3 the general specifications for the energy source are given. They are based on data from the Royal Netherlands Army and the US Army. From these data it results that a potential energy source has to be able to generate a minimum of 10 W and a maximum of 35 W and to deliver a total of 400 Wh in 24 hours. Little is yet known about the energy consumption of the systems currently under development at the TNO-Defence research institutes. It is clear that the energy consumption of a future system so far has not been a major point of consideration. In chapter 4 a global overview is given of the possible energy sources which might be applied in the future soldier systems. A subdivision has been made between four different energy sources: (1) Systems which store electrical energy; (2) Systems which convert fuel into electrical energy; (3) Human powered systems; and (4) Systems powered by external forces. For these four the specific properties, advantages and disadvantages are treated of the available systems. Also the systems which are currently under development and expected to become available in reasonable time are mentioned. An overview of the developments for soldier modernization in the USA referred to as ”The dismounted soldier” is given in Annex A. In chapter 5 a first selection of energy sources which might be applied in the future soldier systems based on the general specifications given in chapter 3, has been made. A subdivision has been made between the short term and long term options. Long term options are expected to become available for large scale consumption only after more than 5 years from now. From this first selection it has turned out that, for the short term batteries are the most viable option.
DTIC
Energy Storage; Electric Batteries; Potential Energy; Systems Engineering

20000024796 Army Research Lab., Sensors Directorate, Adelphi, MD USA
An Overview of Hydrogen Generation and Storage for Low-Temperature PEM Fuel Cells ***Final Report, Jun. - Aug. 1999***
Walker, Charles W., Jr.; Jiang, Rhongzhong; Chu, Deryn; Nov. 1999; 25p; In English
Report No.(s): AD-A372504; ARL-TR-2091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Successful deployment of man portable, low temperature proton exchange membrane (PEM) fuel cells depends on finding a suitable hydrogen fuel that is easily stored and transported, inexpensive, readily available, safe, and practical for use in light and compact vessels. Because storage of hydrogen as a compressed gas in metal cylinders is inefficient and heavy, many alternative methods to store hydrogen have been investigated. This report lists several technologies for the storage and generation of hydrogen and provides brief descriptions.
DTIC
Fuel Cells; Jet Engine Fuels

20000025002 Aberdeen Proving Ground, MD USA
Third Partial Report for the First Article Test (FAT) of the Tactical Quiet Generator (TQG) Sets (3-KW)
Antonetti, Jose, Aberdeen Proving Ground, USA; Nov. 1999; 133p; In English
Report No.(s): AD-A372184; ATC-8219; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

A First Article Test (FAT) was conducted on 14 3-kW Tactical Quiet Generator (TQG) sets by the U.S. Army Aberdeen Test Center (ATC), Aberdeen Proving Ground (APG), Maryland, from November 1998 through March 1999. The FAT was conducted to determine the degree to which the 3-kW sets complied with the requirements of the Purchase Description (PD) for the tests conducted. The tests covered by this report are as follows: Human Factors Engineering (HFE), Voltage and Frequency Performance, Rail Impact, Road Transportability, Static Lift, and High-Altitude Electromagnetic Pulse (HAEMP) Environment.
DTIC
Electric Generators; Noise (Sound); Human Factors Engineering

45
ENVIRONMENT POLLUTION

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

20000021169 NASA Goddard Space Flight Center, Greenbelt, MD USA
Moderate-Resolution Imaging Spectroradiometer (MODIS): Data from the Goddard DAAC
April 1999; 4p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This century, especially in the last few decades, Earth's history was marked by intense study and concern about our environment and how we affect it. Scientific studies show that the level of carbon dioxide in the atmosphere is rising, the ocean's productivity is changing, and the average global temperatures have risen by 0.511. What we do not completely understand is: What fraction of this variation is due to human interference with the environment? What fraction is due to natural phenomena? How do these changes correlate with each other? In order to obtain a better understanding of how land, atmosphere and ocean interact to produce changes on Earth's climate and how human intervention affects these changes, NASA started planning for the Earth Observing System (EOS) in the early 1980's. As a result, a series of satellites will be sent into orbit to monitor the Earth for the next 18 years, providing scientists with necessary data to help them answer these questions.
Author
Earth Observing System (EOS); Imaging Techniques; Spectroradiometers

20000021215 Louisiana State Univ., Coastal Marine Inst., Baton Rouge, LA USA
Effect of Produced-Water Discharge on Bottom Sediment Chemistry ***Final Report***
DeLaune, R. D.; Lindau, C. W.; Gambrell, R. P.; Nov. 1999; 70p; In English
Report No.(s): PB2000-102392; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objectives of the project were to study the sequester, adsorption/release, and degradation of toxic organics, metals and radionuclides of sediment in vicinity of oil production facilities located in Louisiana coastal region. The effect of sediment redox conditions on specification and solubility of metals was determined. Solubility of barium and radium in sediment collected from a produced water discharge site was also measured. The influenced of sediment redox and pH on hydrocarbon degradation was quantified. Heavy metal solubility was shown to be low in anaerobic and neutral pH estuarine sediment. Solubility of Ba found in barite was low under alkaline and either anaerobic or aerobic sediment conditions. Over 95% of radium found in contaminated sediment existed as an unavailable form which could be extracted only with strong acids. Typical heavy metal pollution levels

found in surface sediment environment at produced water discharge sites would not impact microbial degradation of petroleum hydrocarbons in sediment. Oxidized sediment conditions resulted in faster rate of petroleum hydrocarbon degradation as compared to reducing sediment conditions.
NTIS
Sediments; Sediment Transport; Environment Effects; Waste Water; Water Treatment

20000021237 NASA Goddard Space Flight Center, Greenbelt, MD USA
Insolation and the Precession Index
Rubincam, David Parry, NASA Goddard Space Flight Center, USA; [2000]; 33p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Simple nonlinear climate models yield a precession index-like term in the temperature. Despite its importance in the geologic record, the precession index e sin omega, where e is the Earth's orbital eccentricity and omega is the Sun's perigee in the geocentric frame, is not present in the insolation at the top of the atmosphere. Hence there is no one-for-one mapping of 23,000 and 19,000 year periodicities from the insolation to the paleoclimate record; a nonlinear climate model is needed to produce these periods. Two such models, a grey body and an energy balance climate model with an added quadratic term, produce e sin omega terms in temperature. These terms, which without feedback mechanisms achieve extreme values of about plus or minus 0.48 K for the grey body and plus or minus 0.64 K for the energy balance model, simultaneously cool one hemisphere while they warm the other. Moreover, they produce long-term cooling in the northern hemisphere when the Sun's perigee is near northern solstice and long-term warming in the northern hemisphere when the perigee is near southern solstice. Thus this seemingly paradoxical mechanism works against the standard model which requires cool northern summers (Sun far from Earth in northern summer) to build up northern ice sheets, so that if the standard model is correct it may be more efficient than previously thought. Alternatively, the new mechanism could possibly be dominant and indicate southern hemisphere control of the northern ice sheets, wherein the southern oceans undergo a long-term cooling when the Sun is close to the Earth during southern summer. The cold water eventually flows north, cooling the northern hemisphere. This might explain why the northern oceans lag the southern ones when it comes to orbital forcing.
Author
Insolation; Precession; Periodic Variations; Climate Models; Mathematical Models; Atmospheric Temperature; Earth Orientation

20000021258 National Inst. of Polar Research, Tokyo, Japan
Evaluation of SO2 Emission from the 1982 Eruption of El Chichon by Glaciological and Satellite Methods
Kohno, Mika, Okayama Univ., Japan; Kusakabe, Minoru, Okayama Univ., Japan; Fujii, Yoshiyuki, National Inst. of Polar Research, Japan; Antarctic Record; July 1998; ISSN 0085-7289; Volume 42, No. 2, pp. 121-130; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The SO2 emission at the time of the 1982 eruption of El Chichon in Mexico was estimated by a glaciological method based on sulfate ion concentration and bomb-produced total beta activity in snow collected in Antarctica. The glaciological estimate of the SO2 emission is 17 +/- 1 Mt SO2, somewhat greater than the spectroscopic estimate (7 Mt SO2) measured by a satellite-carried total ozone mapping system. We conclude that the glaciological method is useful to estimate SO2 emissions of past explosive volcanic eruptions in the equatorial region.
Author
Sulfur Dioxides; Emission; Volcanology; Volcanoes

20000021334 NASA Goddard Space Flight Center, Greenbelt, MD USA
Airborne Spectral Measurements of Surface-Atmosphere Anisotropy for Arctic Sea Ice and Tundra
Arnold, G. Thomas, SM and A Corp., USA; Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; King, Michael D., NASA Goddard Space Flight Center, USA; Li, Jason Y., SM and A Corp., USA; Soulen, Peter F., NASA Goddard Space Flight Center, USA; 1999; 37p; In English; Original contains color illustrations
Contract(s)/Grant(s): NSF DPP-91-16371; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Angular distributions of spectral reflectance for four common arctic surfaces: snow-covered sea ice, melt-season sea ice, snow-covered tundra, and tundra shortly after snowmelt were measured using an aircraft based, high angular resolution (1-degree) multispectral radiometer. Results indicate bidirectional reflectance is higher for snow-covered sea ice than melt-season sea ice at all wavelengths between 0.47 and 2.3 pm, with the difference increasing with wavelength. Bidirectional reflectance of snow-covered tundra is higher than for snow-free tundra for measurements less than 1.64 pm, with the difference decreasing with wavelength. Bidirectional reflectance patterns of all measured surfaces show maximum reflectance in the forward scattering

direction of the principal plane, with identifiable specular reflection for the melt-season sea ice and snow-free tundra cases. The snow-free tundra had the most significant backscatter, and the melt-season sea ice the least. For sea ice, bidirectional reflectance changes due to snowmelt were more significant than differences among the different types of melt-season sea ice. Also the spectral-hemispherical (plane) albedo of each measured arctic surface was computed. Comparing measured nadir reflectance to albedo for sea ice and snow-covered tundra shows albedo underestimated 5-40%, with the largest bias at wavelengths beyond 1 pm. For snow-free tundra, nadir reflectance underestimates plane albedo by about 30-50%.
Author
Spectral Reflectance; Airborne Equipment; Bidirectional Reflectance; Tundra; Sea Ice; Arctic Regions; Angular Distribution

20000021347 Prins Maurits Lab. TNO, Rijswijk, Netherlands
'ARBO' Investigation EOCKL *Final Report ARBO-onderzoek EOCKL*
vanHam, N. H. A., Prins Maurits Lab. TNO, Netherlands; Groeneveld, F. R., Prins Maurits Lab. TNO, Netherlands; December 1999; 74p; In Dutch; Sponsored in part by EOCKL, Netherlands
Contract(s)/Grant(s): A87/KL/070; TNO Proj. 014.10105
Report No.(s): TD99-0182; PML-1999-A89; Copyright; Avail: Issuing Activity, Hardcopy

This report describes the measurement of harmfull emissions from open pit burning and open air detonation of munitions. The emissions were measured with the aid of fixed samplers and mobile samplers connected to the personal involved in the destruction of munitions. Also samples of the soil nearby the destruction area were taken. Analyses of these samples proved the formation of carcinogenic compounds and heavy metals. Advise was given to perform these destructions only with full protective clothing of the personnel. The destruction of munition better be performed in a closed facility to protect the environment.
Author
Protective Clothing; Detonation; Carcinogens

20000021352 NASA Goddard Space Flight Center, Greenbelt, MD USA
Tropical Tropospheric Ozone: New Insights from Remote Sensing and Field Studies
Thompson, Anne, NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 11 Nov. 1999, Charlottesville, VA, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

This talk will summarize our recent research in tropical tropospheric ozone studies in the field and from space. New tropospheric ozone and aerosol products from the TOMS (Total Ozone Mapping Spectrometer) satellite instrument will be highlighted (Hudson and Thompson, 1998; Thompson and Hudson, 1999). These are suitable for studying processes like ozone pollution resulting from biomass fires, seasonal and interannual variations and trends. Archived maps of tropospheric ozone over the tropics, from the Nimbus 7 observing period (1979-1992) are available in digital form at our website. Real-time processing of TOMS data has produced images of tropical tropospheric ozone (TTO) since early 1997, using Earth-Probe TOMS; these maps are also available on the homepage.
Author
Tropical Regions; Troposphere; Ozone; Aerosols; Air Pollution; Annual Variations; Fires

20000021362 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Simple Stratosphere-Mesosphere Extension of the Held-Suarez Forcing for Dynamical Cores
Lin, S.-J., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 8th; Solution of Partial Differential Equations on the Sphere, 30 Nov. - 3 Dec. 1999, San Francisco, CA, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

A simple extension of the Held-Suarez (H-S) forcing that is capable of producing a realistic general circulation not only in the troposphere but also the stratosphere and the mesosphere will be presented. Similar to the original H-S forcing, an annual-mean like radiative equilibrium temperature is used. This extension is an ideal test bed for gravity wave drag parameterizations. It is also an inexpensive test bed for studying the mechanism of the Quasi-Biannual oscillations (QBO) and the "age spectrum" of the dynamical core formulation. The "mean climate" as well as the natural variability of the middle atmosphere as simulated by the NASA Data Assimilation Office finite-volume dynamical core under this forcing will be shown.
Author
Stratosphere; Mesosphere; Atmospheric General Circulation Models; Atmospheric Circulation

20000021363 NASA Goddard Space Flight Center, Greenbelt, MD USA

TRMM and Its Connection to the Global Water Cycle

Kummerow, Christian, NASA Goddard Space Flight Center, USA; Hong, Ye, NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The importance of quantitative knowledge of tropical rainfall, its associated latent heating and variability is summarized in the context of the global hydrologic cycle. Much of the tropics is covered by oceans. What land exists, is covered largely by rainforests that are only thinly populated. The only way to adequately measure the global tropical rainfall for climate and general circulation models is from space. The TRMM orbit is inclined 35' leading to good sampling in the tropics and a rapid precession to study the diurnal cycle of precipitation. The precipitation instrument complement consists of the first rain radar to be flown in space (PR), a multi-channel passive microwave sensor (TMI) and a five-channel VIS/IR (VIRS) sensor. The precipitation radar operates at a frequency of 13.6 GHz. The swath width is 220 km, with a horizontal resolution of 4 km and the vertical resolution of 250 in. The minimum detectable signal from the precipitation radar has been measured at 17 dBZ. The TMI instrument is designed similar to the SSM/I with two important changes. The 22.235 GHz water vapor absorption channel of the SSM/I was moved to 21.3 GHz in order to avoid saturation in the tropics and 10.7 GHz V&H polarized channels were added to expand the dynamic range of rainfall estimates. The resolution of the TMI varies from 4.6 km at 85 GHz to 36 km at 10.7 GHz. The visible and infrared sensor (VIRS) measures radiation at 0.63, 1.6, 3.75, 10.8 and 12.0 microns. The spatial resolution of all five VIRS channels is 2 km at nadir. In addition to the three primary rainfall instruments, TRMM will also carry a Lightning Imaging Sensor (LIS) and a Clouds and the Earth's Radiant Energy System (CERES) instrument.

Author

Trmm Satellite; Tropical Meteorology; Climate Models; Climatology; Atmospheric General Circulation Models; Precipitation (Meteorology); Hydrological Cycle

20000021391 California Univ., Dept. of Atmospheric Sciences, Los Angeles, CA USA

Total Non-Methane Organic Carbon: Development and Validation of a New Instrument and Measurements of Total Non-Methane Organic Carbon and C2-C10 Hydrocarbons in the South Coast Air Basin *Final Report*

Paulson, S.; Meller, R.; Chung, M.; Kramp, F.; Jun. 1999; 96p; In English

Contract(s)/Grant(s): CARB-95-335

Report No.(s): PB2000-102429; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The report details the development of an instrument, which measures total non-methane organic carbon (NMOC), by cryogenic separation of reactive carbon from CO, CO2 and CH4. After separation, the NMOC is oxidized to Cos, then reduced to CH4 and finally quantified with a flame ionization detector (FID). The instrument was tested and validated with the light oxygenates formaldehyde, acetaldehyde, acetone, methanol, and ethanol, as well as heavy aromatics, and exhibited 100% trapping and conversion in all cases. The instrument does not appear to be affected by water. Preliminary results indicate that the analyzer detects is greater than 95% of carbon in smog changes hydrocarbon oxidation experiments. The instrument was deployed at Pico Rivera and Azusa during SCOS-NARSTO-97. At Azusa, the total NMOC loading was an average of 30% greater than the sum of the speciated NOC measured by standard GC/FID. The ration of total NMOC to sum of speciated NMOC did not correlate with time of day or photochemical processing. The nature of the 30% difference is still to be determined.

NTIS

Air Quality; Pollution Monitoring; Hydrocarbons; Carbon; Air Pollution

20000021420 NASA Goddard Space Flight Center, Greenbelt, MD USA

Simulation of Anomalous Regional Climate Events with a Variable Resolution Stretched Grid GCM

Fox-Rabinovitz, Michael S., NASA Goddard Space Flight Center, USA; December 1999; 22p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The stretched-grid approach provides an efficient down-scaling and consistent interactions between global and regional scales due to using one variable-resolution model for integrations. It is a workable alternative to the widely used nested-grid approach introduced over a decade ago as a pioneering step in regional climate modeling. A variable-resolution General Circulation Model (GCM) employing a stretched grid, with enhanced resolution over the US as the area of interest, is used for simulating two anomalous regional climate events, the US summer drought of 1988 and flood of 1993. The special mode of integration using a stretched-grid GCM and data assimilation system is developed that allows for imitating the nested-grid framework. The mode is useful for inter-comparison purposes and for underlining the differences between these two approaches. The 1988 and 1993 integrations are performed for the two month period starting from mid May. Regional resolutions used in most of the experiments is 60 km. The major goal and the result of the study is obtaining the efficient down-scaling over the area of

interest. The monthly mean prognostic regional fields for the stretched-grid integrations are remarkably close to those of the verifying analyses. Simulated precipitation patterns are successfully verified against gauge precipitation observations. The impact of finer 40 km regional resolution is investigated for the 1993 integration and an example of recovering subregional precipitation is presented. The obtained results show that the global variable-resolution stretched-grid approach is a viable candidate for regional and subregional climate studies and applications.
Author
Climate Models; Atmospheric General Circulation Models; Climatology

20000021497 NASA Goddard Space Flight Center, Greenbelt, MD USA
The New 20-Year Global Precipitation Climatology Project (GPCP) Merged Satellite and Rainguage Monthly Analysis
Adler, Robert, NASA Goddard Space Flight Center, USA; Huffman, George, NASA Goddard Space Flight Center, USA; Xie, Ping Ping, National Oceanic and Atmospheric Administration, USA; Rudolf, Bruno, Deutscher Wetterdienst, Germany; Gruber, Arnold, National Environmental Satellite Service, USA; Janowiak, John, National Oceanic and Atmospheric Administration, USA; [1999]; 2p; In English; 11th; Global Change Studies, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA
Report No.(s): Paper 6704; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

A new 20-year, monthly, globally complete precipitation analysis has been completed as part of the World Climate Research Program's (WCRP/GEWEX) Global Precipitation Climatology Project (GPCP). This Version 2 of the community generated data set is a result of combining the procedures and data sets as described. The global, monthly, 2.5x 2.5 degree latitude-longitude product utilizes precipitation estimates from low-orbit microwave sensors (SSM/1) and geosynchronous IR sensors and raingauge information over land. The low-orbit microwave estimates are used to adjust or correct the geosynchronous IR estimates, thereby maximizing the utility of the more physically-based microwave estimates and the finer time sampling of the geosynchronous observations. Information from raingauges is blended into the analyses over land. In the 1986-present period TOVS-based precipitation estimates are adjusted to GPCP fields and used in polar regions to produce globally-complete results. The extension back to 1979 utilizes the procedures of Xie and Arkin and their OLR Precipitation Index (OPI). The 20-year climatology of the Version 2 GPCP analysis indicates the expected features of a very strong Pacific Ocean ITCZ and SPCZ with maximum 20-year means approaching 10 mm/day. A similar strength maximum over land is evident over Borneo. Weaker maxima in the tropics occur in the Atlantic ITCZ and over South America and Africa. In mid-latitudes of the Northern Hemisphere the Western Pacific and Western Atlantic maxima have values of approximately 7 mm/day, while in the Southern Hemisphere the mid-latitude maxima are located southeast of Africa, in mid-Pacific as an extension of the SPCZ and southeast of South America. In terms of global totals the GPCP analysis shows 2.7 mm/day (3.0 mm/day over ocean; 2.1 mm/day over land), similar to the Jaeger climatology, but not other climatologies. Zonal averages peak at 6 mm/day at 7*N with mid-latitude peaks of about 3 mm/day at 40-45* latitude. Poleward of 45* the GPCP analysis shows larger zonally-averaged values than most previous satellite-based estimates, although the values are similar to tl,ie Jaeger climatology. Over both ocean areas and at high latitudes the analysis requires additional validation and comparison with special, independent data sets from field experiments and from the Tropical Rain Measuring Mission (TRMM) to confirm the absolute magnitude and variations of precipitation seen in the analysis. Interannual and other variations of the global fields will be shown focusing on the recent ('97-'99) ENSO event compared with previous events, including teleconnections at mid and high latitudes. An ENSO Precipitation Index (ESPI) calculated using the new data set will be described and related to the evolution of the ENSO events during the 20-year period.
Author
Atmospheric Sounding; Climatology; Northern Hemisphere; Pacific Ocean; Polar Regions; Precipitation (Meteorology); Rain; Tropical Regions

20000023156 Connecticut Univ., Connecticut Transportation Inst., Storrs, CT USA
Field Treatment of Soils Contaminated with Lead *Final Report*
Long, Richard P., Connecticut Univ., USA; Nikolaidis, Nikolaos P., Connecticut Univ., USA; Bruell, Rony, Connecticut Univ., USA; Sep. 1999; 80p; In English
Contract(s)/Grant(s): Proj. 96-1
Report No.(s): PB2000-102555; JHR-99-271; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Previous research used the mineral Apatite to treat a Connecticut soil contaminated with lead. The Apatite reduced the mobility of the heavy metal through precipitation, the soil was then solidified to prevent ingestion. A soil contaminated with lead, removed from a former skeet shooting area, appeared to be ideal for this research; it was within DEP limits for total lead but failed the TCLP test, indicating that the lead is mobile. This soil however proved difficult to treat with the techniques used in the previous research. Three remediation techniques were investigated to reduce lead mobility below the Connecticut Remediation Standard

Regulations. The first technique involved stabilization of Pb with apatite; the second was heating of soil at 400 C and the third was solidification of the soil with Portland cement. Reduction of lead mobility to acceptable levels was achieved only by heat treatment.
NTIS
Soil Pollution; Contamination; Lead (Metal); Pollution Control

20000023225 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Retrieval of Ozone Profiles from Limb Scatter Measurements: Theory
Flittner, D. E., Arizona Univ., USA; Herman, B. M., Arizona Univ., USA; Bhartia, P. K., NASA Goddard Space Flight Center, USA; McPeters, R. D., NASA Goddard Space Flight Center, USA; Hilsenrath, E., NASA Goddard Space Flight Center, USA; [1999]; 13p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An algorithm is presented for retrieving vertical profiles of O3 concentration using measurements of UV and visible light scattered from the limb of the atmosphere. The UV measurements provide information about the O3 profile in the upper and middle stratosphere, while only visible wavelengths are capable of probing the lower stratospheric O3 profile. Sensitivity to the underlying scene reflectance is greatly reduced by normalizing measurements at a tangent height high in the atmosphere (approximately 55 km), and relating measurements taken at lower altitudes to this normalization point. to decrease the effect of scattering by thin aerosols/clouds that may be present in the field of view, these normalized measurements are then combined by pairing wavelengths with strong and weak O3 absorption. We conclude that limb scatter can be used to measure O3 between 15 km and 50 km with 2-3 km vertical resolution and better than 10% accuracy.
Author
Ozone; Sensitivity; Earth Limb; Scattering; Radiance; Algorithms

20000023241 Korea Energy Economics Inst., Seoul, Republic of Korea
Developing Countries and Global Climate Change: Electric Power Options in Korea
Oh, J. G.; Logan, J.; Chandler, W.; Kim, J.; Jo, S. B.; Oct. 1999; 52p; In English; Original contains color illustrations; Prepared in cooperation with Battelle Pacific Northwest Labs., Washington, DC, Advanced International Studies Unit
Report No.(s): PB2000-102210; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The energy choices Korea makes may influence the global response to climate change out of proportion to Koreas geographic size. Whether Korea chooses coal, gas, nuclear, or renewable energy will directly affect the economic competitiveness of the nation and consumer pocketbooks. Koreas choices will also affect the local and global environment. Depending on the energy technologies it chooses, doubling power supply could leave the power sectors greenhouse gas emissions unchanged, or more than double them. Further, control of the power system is being shifted from state-owned monopolies to competing private electricity supply companies. How this mix of policy, growth, and technology will affect investment costs and the local and global environment is the subject of this report.
NTIS
Climate Change; Greenhouse Effect; Climatology; Coal Derived Gases; Developing Nations; Energy Technology; Exhaust Emission; Electricity

20000024740 NASA Goddard Space Flight Center, Greenbelt, MD USA
Model Experiments and Model Descriptions
Jackman, Charles H., NASA Goddard Space Flight Center, USA; Ko, Malcolm K. W., Atmospheric and Environmental Research, Inc., USA; Weisenstein, Debra, Atmospheric and Environmental Research, Inc., USA; Scott, Courtney J., Atmospheric and Environmental Research, Inc., USA; Shia, Run-Lie, Atmospheric and Environmental Research, Inc., USA; Rodriguez, Jose, Atmospheric and Environmental Research, Inc., USA; Sze, N. D., Atmospheric and Environmental Research, Inc., USA; Vohralik, Peter, Commonwealth Scientific and Industrial Research Organization, Australia; Randeniya, Lakshman, Commonwealth Scientific and Industrial Research Organization, Australia; Plumb, Ian, Commonwealth Scientific and Industrial Research Organization, Australia; Models and Measurements Intercomparison 2; September 1999, pp. 10-109; In English; See also 20000024739; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

The Second Workshop on Stratospheric Models and Measurements Workshop (M&M II) is the continuation of the effort previously started in the first Workshop (M&M I, Prather and Remsberg [1993]) held in 1992. As originally stated, the aim of M&M is to provide a foundation for establishing the credibility of stratospheric models used in environmental assessments of the ozone response to chlorofluorocarbons, aircraft emissions, and other climate-chemistry interactions. to accomplish this, a set of measurements of the present day atmosphere was selected. The intent was that successful simulations of the set of measurements should become the prerequisite for the acceptance of these models as having a reliable prediction for future ozone behavior. This

section is divided into two: model experiment and model descriptions. In the model experiment, participant were given the charge to design a number of experiments that would use observations to test whether models are using the correct mechanisms to simulate the distributions of ozone and other trace gases in the atmosphere. The purpose is closely tied to the needs to reduce the uncertainties in the model predicted responses of stratospheric ozone to perturbations. The specifications for the experiments were sent out to the modeling community in June 1997. Twenty eight modeling groups responded to the requests for input. The first part of this section discusses the different modeling group, along with the experiments performed. Part two of this section, gives brief descriptions of each model as provided by the individual modeling groups.
Author
Atmospheric Models; Computerized Simulation; Atmospheric Chemistry; Experiment Design; Atmospheric Sounding; Ozone; Stratosphere

20000024743 NASA Goddard Space Flight Center, Greenbelt, MD USA
Ozone Climatology
Logan, Jennifer A., Harvard Univ., USA; McPeters, Richard D., NASA Goddard Space Flight Center, USA; Models and Measurements Intercomparison 2; September 1999, pp. 307-362; In English; See also 20000024739; No Copyright; Avail: CASI; A04, Hardcopy; A04, Microfiche

The primary role of models in the assessment process is to predict changes to ozone. It is crucial therefore that the ability of the models to reproduce the actual distribution of ozone be tested. Historically, maps of the ozone column (latitude by month) have been used for this purpose. In MM I a climatology was developed for the vertical distribution of ozone for 15-60 km, based on SBUV data for 1979-80. SBUV profiles are reported with vertical resolution of approx. 5 km, but the true resolution is lower, approx. 8 km above the ozone maximum and approx. 15 km for 10-25 km. The climatology was considered valid to about 20-30% at 20 km and to 50% at 15 km. Comparisons were made with models in mixing ratio (ppm), which emphasizes the middle and upper stratosphere. A new ozone climatology was developed for the vertical distribution of ozone for MM II. Our goal was to develop a product that could be used to evaluate models in the lower stratosphere, the region where most of the ozone column resides and where most of the ozone loss is occurring, as well as the middle and upper stratosphere.
Derived from text
Vertical Distribution; Stratosphere; Climatology; Ozone; Atmospheric Sounding; Atmospheric Models; Transport Properties; Atmospheric Chemistry

20000024797 Army Construction Engineering Research Lab., Champaign, IL USA
The Environmental Compliance Assessment and Management Program (ECAMP). Supplement for the Environmental Assessment and Management (TEAM) Guide. Revised September 1999 ***Final Report***
Schell, Donna J.; Sep. 1999; 485p; In English
Contract(s)/Grant(s): FQ7624-99-0-9018
Report No.(s): AD-A372505; USACERL-SR-97/60; No Copyright; Avail: CASI; A04, Microfiche; A21, Hardcopy

The numbers of environmental laws and regulations have continued to grow in the USA, making compliance with these regulations increasingly difficult. Environmental assessments became a way to determine operational consistency and compliance with current environmental regulations. Beginning in 1984, the US Army Construction Engineering Research Laboratory (USACERL), in cooperation with the US Air Force, began the research that led to the publication of the Environmental Compliance Assessment and Management Program (ECAMP). In Fiscal Year 1994, the US Air Force became a participant in the efforts to create a single compliance assessment manual for use by all members of DOD. The resultant manual is The Environmental Assessment and Management (TEAM) Guide. to examine Air Force Instructions, Air Force Manuals, and Air Force Policies, the ECAMP supplement was developed to use in conjunction with the TEAM Guide.
DTIC
Environment Management; Environment Protection

20000024869 NASA Goddard Space Flight Center, Greenbelt, MD USA
Land-Atmosphere Interactions: Successes, Problems and Prospects
Sud, Y. C., NASA Goddard Space Flight Center, USA; Mocko, D. M., General Sciences Corp., USA; [1999]; 2p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; Original contains color illustrations
Report No.(s): Paper J1.12; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

After two decades of active research, a much better understanding of the broader role of biospheric processes on the local climate has emerged. A surface-albedo increase, particularly in desert border regions of the subtropics (as well as the deforested tropical regions), leads to a net surface energy deficit, which in turn leads to a relative sinking and reduced rainfall. On the other

hand, studies of the influence of altered ratios of evapotranspiration and sensible fluxes, in situations where the net solar income is unchanged, show that evapotranspiration is a more desirable flux for increased precipitation and vitality of the biosphere. Besides providing water vapor and convective available potential energy (CAPE) to the lower troposphere, evapotranspiration helps in building larger CAPE before ”turning on” the moist-convection. Larger CAPE in the lower troposphere enables convection to reach into the deeper atmosphere thereby heating the upper troposphere; indeed, moist-convection is also accompanied by the evaporation of falling precipitation that cools and moistens the lower atmosphere. While convective, as opposed to stratiform, precipitation reduces the fractional cloud cover; it also allows more solar radiation to reach the surface thereby invigorating surface fluxes. These, together with moist convection and associated downdrafts help to maintain the characteristic upper temperature limit(s) of the moist-land as well as oceanic regions. Regardless of the above understanding, several important problems continue to hinder the accurate simulation of a realistic land atmosphere interaction in a numerical model (both GCM and/or Meso-scale models). Among the unsolved problems are parameterization of sub-grid scale land processes that include small-scale variability of soil moisture, snow-cover and snow-physics, the biodiversity of the biosphere, orography, local drainage characteristics under natural conditions, and surface flow over the natural terrain. A well-known non-linear response of surface fluxes to these variations makes the problem of parameterizing land-atmosphere interaction processes hard-to-address and simulate, particularly in a GCM. In our presentation, we will discuss how orographic, snow-cover, and water table interactions can be included into a Simple Biosphere Model such as SiB/SSiB. Figure I shows how, in the Russian region, spring snowmelt affects the soil moisture profile. Corresponding figure 2 shows how interaction with the water table decreases the natural evapotranspiration in the Sahel region simulation. While these simulations need better validation with data, the simulations reveal that surface processes are sensitive to these parameterizations. With these developments, we continue to advance our understanding of the interaction of land with the atmosphere aloft, but the intrinsic variability of the newer parameters, e. g., hydraulic properties of the soil, diminish the positive influences of these advances on the improved climate simulation with GCMs.

Author

Climate; Evapotranspiration; Snow Cover; Soil Moisture; Air Land Interactions; Atmospheric Models; Biosphere; Water Tables; Atmospheric Circulation

20000024912 Naval Research Lab., Ocean Sciences Branch, Bay Saint Louis, MS USA

Fungal Influenced Corrosion of Metals in Humid Environments

Little, Brenda; Ray, Richard; Oct. 1999; 7p; In English

Report No.(s): AD-A371921; NRL/PP/7303--99-0005; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Case studies of atmospheric corrosion will be reviewed in which fungi produced localized corrosion of bare metals and disbonding of coatings. In relative humidities of 65% or greater with adequate nutrients, fungi can thrive and produce acidic by-products, including oxalic, lactic, acetic, and citric acids. Fungi can derive nutrients from soil; cellulosic materials (grains, paper, composition board, and wood); hydrocarbons (crude oil, fuel oil, jet fuel, kerosene, greases, waves, lubricants, and adhesives); organic coatings and numerous other sources. Case studies will identify causative organisms, sources of nutrients, corrosion mechanisms, and possible remedies.

DTIC

Fungi; Corrosion; Microbiology; Metals; Humidity

20000024928 NASA Goddard Space Flight Center, Greenbelt, MD USA

Satellite Remote Sensing of Aerosol Forcing

Remer, Lorraine, NASA Goddard Space Flight Center, USA; Kaufman, Yoram, NASA Goddard Space Flight Center, USA; Ramaprasad, Jaya, NASA Goddard Space Flight Center, USA; Procopio, Aline, NASA Goddard Space Flight Center, USA; Levin, Zev, NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; Aerosol-Cloud, 1-3 Dec. 1999, Kyoto, Japan; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The role of aerosol forcing remains one of the largest uncertainties in estimating man’s impact on the global climate system. One school of thought suggests that remote sensing by satellite sensors will provide the data necessary to narrow these uncertainties. While satellite measurements of direct aerosol forcing appear to be straightforward, satellite measurements of aerosol indirect forcing will be more complicated. Pioneering studies identified indirect aerosol forcing using AVHRR data in the biomass burning regions of Brazil. We have expanded this analysis with AVHRR to include an additional year of data and assimilated water vapor fields. The results show similar latitudinal dependence as reported by Kaufman and Fraser, but by using water vapor observations we conclude that latitude is not a proxy for water vapor and the strength of the indirect effect is not correlated to water vapor amounts. In addition to the AVHRR study we have identified indirect aerosol forcing in Brazil at much smaller spatial scales using the MODIS Airborne Simulator. The strength of the indirect effect appears to be related to cloud type

and cloud dynamics. There is a suggestion that some of the cloud dynamics may be influenced by smoke destabilization of the atmospheric column. Finally, this study attempts to quantify remote sensing limitations due to the accuracy limits of the retrieval algorithms. We use a combination of numerical aerosol transport models, ground-based AERONET data and ISCCP cloud climatology to determine how much of the forcing occurs in regions too clean to determine from satellite retrievals.
Author
Aerosols; Brazil; Mathematical Models; Remote Sensing; Satellite Observation; Water Vapor; Atmospheric Effects

20000024972 Florida Agricultural and Mechanical Univ., Dept. of Chemical Engineering, Tallahassee, FL USA
Reticulated Vitreous Carbon Electrodes for Gas Phase Pulsed Corona Reactors
Locke, B. R., Florida Agricultural and Mechanical Univ., USA; Kirkpatrick, M., Florida Agricultural and Mechanical Univ., USA; Hanson, H., Florida Agricultural and Mechanical Univ., USA; Finney, W. C., Florida Agricultural and Mechanical Univ., USA; Jan. 1999; 8p; In English
Contract(s)/Grant(s): F08635-93-C-0020
Report No.(s): AD-A372344; AFRL-ML-TY-TP-1999-4546; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

A new design for gas phase pulsed corona reactors incorporating reticulated vitreous carbon electrodes is demonstrated to be effective for the removal of nitrogen oxides from synthetic air mixtures. The reactor consists of a plexiglass tube with porous reticulated carbon disk electrodes placed perpendicularly to the cylinder axis. Streamers propagate between the reticulated carbon disks providing a uniform exposure of the flowing gas stream to the electrical discharge. This mode of operation allows for convenient reactor scale-up and staging while maintaining the inter-electrode spacing in a moderate range, thus precluding the need for higher voltage power supplies. It is futher envisioned that the reactor can be operated with multiple sets of electrodes placed in series down the length of the reactor in order to facilitate high efficiency removal of air pollutants. Initial experiments with nitrogen oxide (NO) mixed in dry synthetic air at room temperature and pressure shows that the NO, as expected in an oxidizing environment, is convened to nitrogen dioxide with pulsed corona treatment. Most remarkable, however, is that for the higher operating voltages (55 and 61 kV) and longer residence times (above 24 sec.) the nitrogen dioxide and total NO2, even in dry air, was reduced.
DTIC
Carbon; Gas Flow; Electrodes; Electric Reactors; Cylindrical Bodies

20000025007 Army Construction Engineering Research Lab., Champaign, IL USA
Pollution Reduction and Emission Prevention Automated Rule-based Expert (PREPARE) System for Operation and Maintenance of Pollution Control Equipment *Final Report*
Northrup, Jearldine I.; Baird, Joyce C.; Chan, Nona Y.; Johnson, James H.; Maase, Hannon; Nov. 1999; 64p; In English
Contract(s)/Grant(s): DA Proj. 4A1-62720-D-048
Report No.(s): AD-A371877; IOC-TR-99/59; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The maintenance of pollution control equipment (PCE) at Army installations is of critical importance. If PCE breaks down, hazardous materials may be introduced into the environment. This may lead to unfavorable health and safety consequences for workers and people living in the area, and may also incur heavy fines on the installation responsible for the emissions. This study provided an expert system (PREPARE) for the operation and maintenance (O&M) of PCE. PREPARE helps combine the expertise of on-site personnel to information collected by researchers to help optimize decision making on how O&M dollars can be spent most effectively.
DTIC
Pollution Control; Expert Systems; Hazardous Materials; Maintenance

20000025023 Tennessee Valley Authority, Muscle Shoals, AL USA
Demonstration Results of Phytoremediation of Explosives-Contaminated Groundwater Using Constructed Wetlands at the Milan Army Ammunition Plant, Milan, Tennessee, Volume 1, Demonstration Results *Final Report*
Sikora, F. J., Tennessee Valley Authority, USA; Almond, R. A., Tennessee Valley Authority, USA; Behrends, L. L., Tennessee Valley Authority, USA; Hoagland, J. J., Tennessee Valley Authority, USA; Kelly, D. A., Tennessee Valley Authority, USA; Dec. 1998; 287p; In English
Report No.(s): AD-A372286; SFIM-AEC-ET-CR-97059; SFIM-AEC-ET-CR-97059; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

This report describes a demonstration of phytoremediation methods to remediate explosives-contaminated groundwater. The demonstration was conducted at the Milan Army Ammunition Plant near Milan, Tennessee, using a gravel-based subsurface flow wetland and a lagoon-based surface flow wetland. The report provides demonstration results as they are related to the effectiveness

of the wetlands; and provides cost and other information necessary for the transfer of the technology to the user community. The report concludes that gravel-based wetlands could be used to remediate groundwater contaminated with a variety of explosives including TNT and RDX and that, based on the demonstration results, the use of lagoon-based wetlands could not be recommended.
DTIC
Explosives; Water Pollution; Ground Water; Contamination; Ammunition

20000025024 Tennessee Valley Authority, Muscle Shoals, AL USA
Demonstration Results of Phytoremediation of Explosives-Contaminated Groundwater Using Constructed Wetlands at the Milan Army Ammunition Plant, Milan, Tennessee, Volume 2, Demonstration Results ***Final Report***
Sikora, F. J., Tennessee Valley Authority, USA; Almond, R. A., Tennessee Valley Authority, USA; Behrends, L. L., Tennessee Valley Authority, USA; Hoagland, J. J., Tennessee Valley Authority, USA; Kelly, D. A., Tennessee Valley Authority, USA; Dec. 1998; 81p; In English
Contract(s)/Grant(s): TVA-TV-88826V
Report No.(s): AD-A372287; SFIM-AEC-ET-CR-97059; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy
This report describes a demonstration of phytoremediation methods to remediate explosives-contaminated groundwater. The demonstration was conducted at the Milan Army Ammunition Plant near Milan, Tennessee, using a gravel-based subsurface flow wetland and a lagoon-based surface flow wetland. The report provides demonstration results as they are related to the effectiveness of the wetlands; and provides cost and other information necessary for the transfer of the technology to the user community. The report concludes that gravel-based wetlands could be used to remediate groundwater contaminated with a variety of explosives including TNT and RDX and that, based on the demonstration results, the use of lagoon-based wetlands could not be recommended.
DTIC
Ammunition; Contamination; Explosives; Ground Water; Water Pollution

20000025032 NASA Goddard Space Flight Center, Greenbelt, MD USA
A View From Space: Evolution of the 1997-1998 El Nino and La Nina
Busalacchi, Antonio, NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; IAI Meeting, 11-14 Jul. 1999, FL, USA; Sponsored by Intelligent Automation Systems, Inc., USA; No Copyright; Avail: Issuing Activity; Abstract Only
After the last extreme El Nino in 1982-1983, an extensive in situ observing system was deployed in the tropical Pacific Ocean in support of monitoring and predicting El Nino. Within the past ten years a series of ocean and atmosphere remote sensing satellites have been launched that serve to supplement and enhance the observations being taken at the surface, and at depth, in the equatorial Pacific Ocean. The 1997-1998 ”El Nino Event of the Century” has been the best monitored El Nino on record. The 1997-1998 El Nino will be the first time a major El Nino event and subsequent La Nina will have been observed from start to finish from a combination of remotely-sensed measurements of sea surface temperature, sea surface topography, sea surface wind, ocean color, and precipitation, Among some of the lessons learned to date from the 1997-1998 event have been the need for global observation in addition to just those in the equatorial Pacific Ocean. In this presentation the evolution of the 1997-1998 El Nino will be depicted from the unique vantage point provided by these space-based observations as analyzed separately, and together as a representation of the coupled system. Comparisons and contrasts with the evolution 1982-1983 El Nino and how the in situ and space-based observations complement each other will be discussed.
Author
El Nino; Remote Sensing

20000025064 Rutherford Appleton Lab., Chilton, UK
Uncertainty in Forecasts of Anthropogenic Climate Change
Allen, Myles R., Rutherford Appleton Lab., UK; Stott, Peter A., Hadley Centre for Climate Prediction and Research, UK; Mitchell, John F. B., Hadley Centre for Climate Prediction and Research, UK; Schnur, Reiner, Max-Planck-Inst. fuer Meteorologie, Germany; Delworth, Thomas L., National Oceanic and Atmospheric Administration, USA; Jan. 17, 2000; ISSN 1358-6254; 12p; In English
Report No.(s): RAL-TR-1999-084; Copyright; Avail: Issuing Activity
We assess the range of anthropogenic warming rates over the coming 50 years which are consistent with the simulations of several climate models and the emerging signal of climate change in the observations. Reconciling the models with the observed signal improves agreement amongst the simulations and provides an objective estimate of uncertainty in each prediction. The use of pattern-based signals allows separate estimates of the contributions to forecast uncertainty from greenhouse warming and

sulphate aerosol cooling. Since aerosol cooling has opposed greenhouse warming in the past, any reduction in sulphate emissions over the coming 50 years not only increases the ”best guess” rate of global warming, but also significantly increases the uncertainty range because a wider range of future warming rates would then be consistent with the signal observed to date. The observed surface temperature signal is still too weak to place useful bounds on long-term equilibrium warming without additional information on the timescale of the climate response.
Author
Aerosols; Atmospheric Heating; Climate Change; Global Warming; Greenhouse Effect; Climate Models

20000025068 NASA Goddard Inst. for Space Studies, New York, NY USA
Two-Channel Satellite Retrievals of Aerosol Properties: An Overview
Mishchenko, Michael I., NASA Goddard Inst. for Space Studies, USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In order to reduce current uncertainties in the evaluation of the direct and indirect effects of tropospheric aerosols on climate on the global scale, it has been suggested to apply multi-channel retrieval algorithms to the full period of existing satellite data. This talk will outline the methodology of interpreting two-channel satellite radiance data over the ocean and describe a detailed analysis of the sensitivity of retrieved aerosol parameters to the assumptions made in different retrieval algorithms. We will specifically address the calibration and cloud screening issues, consider the suitability of existing satellite data sets to detecting short- and long-term regional and global changes, compare preliminary results obtained by several research groups, and discuss the prospects of creating an advanced retroactive climatology of aerosol optical thickness and size over the oceans.
Author
Aerosols; Channels (Data Transmission)

20000025069 NASA Goddard Inst. for Space Studies, New York, NY USA
Rapid Vegetational Charge in Coastal North America: The Response to Climate Since the LGM
Peteet, Dorothy, NASA Goddard Inst. for Space Studies, USA; Kneller, Margaret, Columbia Univ., USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union; No Copyright; Avail: Issuing Activity; Abstract Only

The late-glacial interval provided rapid shifts in climate which are mirrored by dramatic vegetational changes in North America. Through a transect of lake and mire sites from Connecticut to Virginia on the east coast and Kodiak Island on the western coast, we trace the warming following the LGM with the response of forests and tundra. A brief cold reversal in Virginia is seen from 12,260 to 12,200. The subsequent longer and extreme Younger Dryas event is marked in the southern New England - New Jersey region by dramatic boreal and deciduous forest changes. In the southeastern US, forests also change rapidly, with hemlock forest expansion suggesting increased moisture. In Kodiak Island, the warm, moist tundra of the Bolling/Allerod is replaced by colder, windswept Empetrum-dominated tundra during the Younger Dryas. The Pleistocene/Holocene shift in vegetation is remarkably pronounced in eastern North America as well as the Alaskan coastline. Response time of vegetation to climate change appears to be on the order of decades throughout these coastal locations, probably because of the proximity of sites to important ecotonal boundaries, and the magnitude of the events. Even in Virginia’s Holocene record, a cold reversal inferred from increases in spruce and fir is noted at 7500 C14 yr BP. This response of the forests to a short-lived cooling shows the sensitivity of the biosphere to a rapid climate shifts.
Author
Glaciers; Vegetation; Climate Change; Paleoclimatology

20000025075 NASA Goddard Space Flight Center, Greenbelt, MD USA
Glaciers and Global Climate
Hall, Dorothy K., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 13 Dec. 1999, Rockville, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Glaciers are important indicators of global climate. Glacier recession, as observed from space and in the field, has been occurring for about 100 years. The present extent of glaciers and glaciers in the last Ice Age will be discussed. I will show slides of field work on glaciers and show instruments used to measure ice and snow. I will discuss reasons for studying glaciers and why remote sensing is important for glacier studies.
Author
Climatology; Glaciers; Climate Change; Glaciology

20000025081 SRI International Corp., Menlo Park, CA USA

Case Study Analyses of the SUCCESS DC-8 Scanning Lidar Database ***Final Report***

Uthe, Edward E., SRI International Corp., USA; January 2000; 36p; In English

Contract(s)/Grant(s): NAG2-1235; SRI Proj. ESU-3268; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under project SUCCESS (Subsonic Aircraft Contrail and Cloud Effects Special Study) funded by the Atmospheric Effects of Aviation Program, SRI International (SRI) developed an angular scanning backscatter lidar for operation on the NASA DC-8 research aircraft and deployed the scanning lidar during the SUCCESS field campaign. The primary purpose of the lidar was to generate real-time video displays of clouds and contrails above, ahead of, and below the DC-8 as a means to help position the aircraft for optimum cloud and contrail sampling by onboard in situ sensors, and to help extend the geometrical domain of the in situ sampling records. A large, relatively complex lidar database was collected and several data examples were processed to illustrate the value of the lidar data for interpreting the other data records collected during SUCCESS. These data examples were used to develop a journal publication for the special SUCCESS Geophysical Research Letters issue. The data examples justified data analyses of a larger part of the DC-8 lidar database and is the objective of the current study. Efficient processing of the SUCCESS DC-8 scanning lidar database required substantial effort to enhance hardware and software components of the data system that was used for the initial analyses. MATLAB instructions are used to generate altitude and distance color-coded lidar displays corrected for effects introduced by aircraft pitch and forward movement during an angular scan time interval. Onboard in situ sensor atmospheric measurements are propagated to distances ahead of the DC-8 using recorded aircraft velocity so that they can be plotted on the lidar displays for comparison with lidar remotely observed aerosol distributions. Resulting lidar and in situ sensor polar scan displays over extended sampling intervals are integrated into a time series movie format for 36 case studies. Contrails and clouds were detected to ranges of 15 km by the forward-viewing angular scanning lidar and were progressively mapped as the aircraft approached and penetrated them. Near aircraft lidar observations were much better correlated with in situ sensor observations than lidar observations at greater distances ahead of the aircraft. The major cause of this difference was thought to be the about 2 deg. offset of the lidar viewing direction from the flight direction. Contrail spatial distributions were not of the quality obtainable from ground-based lidar observations. This results because contrails tend to become horizontally stratified, vertical distance between angular lidar observations increases with increased distance from the aircraft, and erratic aircraft motions during an angular scan. The most useful lidar observations were made with lidar viewing directions of vertically upward or vertically downward. These provided real-time information on aircraft altitudes to achieve optimum in situ cloud and contrail sampling. At sampling altitudes, the forward viewing angular scanning observations were useful for fine-tuning the aircraft altitude for cloud and contrail penetration. Best information on cloud and contrail properties were obtained from vertically directed lidar observations as the aircraft performed a series of upward and downward penetrations of contrails. This operational mode was especially well suited for lidar and radiometric evaluation of cloud and contrail optical and radiative properties. The vertical viewing lidar detected ice crystals thought to be precipitating from an aircraft contrail and their scavenging by a cirrus cloud layer. The lidar display indicates that the crystals are effective for increasing cirrus cloud density. Vertical angular scanning observations can evaluate the sharp decrease in lidar backscatter for small off-vertical viewing directions that result from horizontally aligned ice crystals and perhaps can provide additional information on crystal shapes. The about 2 deg. offset of the lidar viewing direction from the flight direction is thought to have greatly degraded the forward-viewing angular scanning observations and this mode of operation was not fully evaluated. However, the reasoning for this capability remains valid and the angular scan presentations collected during this program justifies modification of the lidar pod for true forward direction lidar viewing during future cloud and contrail studies.

Author

Cirrus Clouds; Cloud Cover; Contrails; Data Bases; Optical Radar

20000025190 Scripps Institution of Oceanography, La Jolla, CA USA

A Study of Cloud Radiative Forcing and Feedback ***Final Report, 1 Jan. 1991 - 31 Mar. 2000***

Ramanathan, Veerabhadran, Scripps Institution of Oceanography, USA; [2000]; 22p; In English

Contract(s)/Grant(s): NAG1-1259; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main objective of the grant proposal was to participate in the CERES (Cloud and Earth's Radiant Energy System) Satellite experiment and perform interdisciplinary investigation of NASA's Earth Observing System (EOS). During the grant period, massive amounts of scientific data from diverse platforms have been accessed, processed and archived for continuing use; several software packages have been developed for integration of different data streams for performing scientific evaluation; extensive validation studies planned have been completed culminating in the development of important algorithms that are being used presently in the operational production of data from the CERES. Contributions to the inter-disciplinary science investigations have

been significantly more than originally envisioned. The results of these studies have appeared in several refereed journals and conference proceedings. They are listed at the end of this report.
Author
Earth Radiation Budget Experiment; Earth Radiation Budget; Earth Observing System (EOS); EOS Data and Information System; Earth Observations (From Space)

20000025242 National Defence Research Establishment, Avedelningen foer NBC Skydd, Umea, Sweden
KEMSEK: A Decision Support at Chemical Accidents. Pilot Study ***KEMSEK: Ett Beslutsstoed vid Kemikalieolyckor. Forerstudie***
Johanson, J.; Liljedahl, B.; Sjoestroem, J.; Sep. 1999; 38p; In Swedish
Report No.(s): PB2000-101484; FOA-R-98-01082-222-SE; No Copyright; Avail: Issuing Activity

By order of the Rescue Service Board, FOA has presented a proposal for a model based on GIS, describing the spreading of pollution in the ground at accidents. This model was a result from a co-operation with the Geological Survey of Sweden (SGU) and the model is called KEMSEK (Spreading-Effect-Consequences of Chemicals). As a first step, a pilot study has been made to show the actual level of knowledge in this field, national as well as international. There is no developed system such as KEMSEK on the market today. The development of KEMSEK should be focused on putting the spreading models together with the existing chemical computer bases and maps based on GIS. Digital information about different types of soil, topography, and sensitive interests in nature is already available in many municipalities. There are also specifications of transportation routes of hazardous chemicals and of different industries handling chemicals. The pilot study shows that there are many different spreading models of varying purposes and quality. Most of the models can be sorted out, since they do not meet with the requirements of KEMSEK. Finally, recommended software is presented and discussed, i.e. distribution models, data bases and graphic software.
NTIS
Accidents; Decision Support Systems; Spilling; Soils; Geological Surveys; Digital Data; Chemical Effects

20000025248 Army Construction Engineering Research Lab., Champaign, IL USA
Removal and Recovery of Methyl Ethyl Ketone (MEK) Vapor Emissions by Carbon Fiber Adsorber-Cryogenic Condenser ***Final Report***
Rood, Mark J.; Sullivan, Patrick D.; Lordgooei, Mehrdad; Qi, Shaoying; Hay, K. J.; Nov. 1999; 39p; In English
Report No.(s): AD-A372690; CERL-TR-99/90; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Clean Air Act Amendments of 1990 mandate the reduction of emissions of hazardous air pollutants (HAP). Activated carbon fiber-cloth (ACFC) offers promise as a superior adsorbent to remove and recover organic HAP from gas streams. This study designed, built, and tested a second-generation system with an improved adsorber using methyl ethyl ketone (MEK) as the organic pollutant. Total flow rate of the bench-scale system was 5 Lpm with the gas stream containing 1000 ppmv MEK. Breakthrough times ranged between 11.9 and 12.9 hr. Throughput ratios of 86.9 percent were achieved. Electrothermal regeneration times were approximately 1 hr at 100W. It was shown that increasing the adsorption bed's dry-bulb temperature by 10 degrees C can cut adverse effects of treating high humidity gas streams in half. The system was automated to demonstrate continuous MEK adsorption, desorption, condensation, and recovery. Overall removal efficiency during continuous operation was 99.9 percent by mass. The study's preliminary design and cost analysis for a pilot-scale system estimates a cost of $60,000 for a flow rate of 0.5 m3/min and a concentration of 1000 ppmv. An economic analysis of a proposed full-scale system shows that a process recovery cost of $2/kg of MEK is achievable.
DTIC
Activated Carbon; Carbon Fibers; Contaminants; Hazardous Materials; Air Pollution; Air Quality; Pollution Control

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.

20000021211 California Univ., IGPP Space Plasma Simulation Group, Los Angeles, CA USA
UCLA IGPP Space Plasma Simulation Group ***Final Report, 1 Nov. 1988 - 31 Jan. 1998***
[1998]; 26p; In English
Contract(s)/Grant(s): NAG5-1100; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the past 10 years the UCLA IGPP Space Plasma Simulation Group has pursued its theoretical effort to develop a Mission Oriented Theory (MOT) for the International Solar Terrestrial Physics (ISTP) program. This effort has been based on a combination of approaches: analytical theory, large scale kinetic (LSK) calculations, global magnetohydrodynamic (MHD) simulations and self-consistent plasma kinetic (SCK) simulations. These models have been used to formulate a global interpretation of local measurements made by the ISTP spacecraft. The regions of applications of the MOT cover most of the magnetosphere: the solar wind, the low- and high-latitude magnetospheric boundary, the near-Earth and distant magnetotail, and the auroral region. Most recent investigations include: plasma processes in the electron foreshock, response of the magnetospheric cusp, particle entry in the magnetosphere, sources of observed distribution functions in the magnetotail, transport of oxygen ions, self-consistent evolution of the magnetotail, substorm studies, effects of explosive reconnection, and auroral acceleration simulations.
Author
Numerical Analysis; Magnetohydrodynamics; Simulation; Solar Wind; Space Plasmas

20000021254 National Inst. of Polar Research, Tokyo, Japan
A Great Earthquake in the Antarctic Plate on 25 March 1998
Tono, Yoko, Kyoto Univ., Japan; Kaminuma, Katsutada, National Inst. of Polar Research, Japan; Antarctic Record; July 1998; issn 0085-7289; Volume 42, No. 2, pp. 190-195; In Japanese; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A great earthquake occurred in the Antarctic Plate at 03 h 12 m 24.7 s (UT) on 25 March 1998. The location and magnitude of the earthquake determined by USA Geological Survey are as follows: 62.876 S, 149.712 E, 10 km depth m(sub b) 6.8, M(sub s) 8.0. In response to a request for earthquake information from Syowa Station (69 deg 00 min S, 39 deg 35 min E) to Dumont d'Urville Station of France (66 deg 40 min S, 140 deg 01 min E), the station leader reported that all wintering members in the station felt a quake and something on the shelf in the building fell down. The intensity at the station was estimated to be III-IV by the intensity scale of Japanese Meteorological Agency. This earthquake is the first great earthquake of magnitude 8 recorded in the Antarctic Plate since International Geophysical Year (IGY) of 1957 and the first earthquake felt in Antarctica except for volcanic earthquakes.
Author
Geological Faults; Earthquakes; Plates (Tectonics)

20000021255 National Inst. of Polar Research, Tokyo, Japan
Field Seismic Observations by Portable Broadband Seismometers in the Luetzow-Holm Bay Region, East Antarctica
Negishi, Hiroaki, Kyoto Univ., Japan; Kanao, Masaki, National Inst. of Polar Research, Japan; Antarctic Record; July 1998; ISSN 0085-7289; Volume 42, No. 2, pp. 179-189; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Field seismological observations were carried out at five points around the Luetzow-Holm Bay region in East Antarctica to clarify the heterogeneous structure of the crust and the upper mantle during the 37th Japanese Antarctic Research Expedition (JARE-37) and JARE-38 in 1996-97. The seismological recording system is composed of a portable broadband seismometer, a recording unit with MO disk drive and a solar power battery supply. Expect for power supply trouble, the observations went well and waveforms of some teleseismic events were recorded. Based on spectral analysis, the spectrum amplitude of the field observation data is very large at frequency higher than about 0.5 Hz. On the other hand,the amplitude is almost the same as that at Syowa Station at frequencies from about 5 mHz to 0.5 Hz. These data are of good enough quality to be used for various waveform analyses by applying suitable band pass filters.
Author
Seismology; Broadband; Earth Sciences

20000021256 National Inst. of Polar Research, Tokyo, Japan
Preliminary Report on Rock Glacier at the Foot of Mt. Riiser-Larsen in Enderby Land, East Antarctica
Saigusa, Shigeru, Graduate Univ. for Advanced Studies, Japan; Miura, Hideki, National Inst. of Polar Research, Japan; Maemoku, Hideaki, Yamaguchi Univ., Japan; Hirakawa, Kazuomi, Hokkaido Univ., Japan; Antarctic Record; July 1998; ISSN 0085-7289; Volume 42, No. 2, pp. 168-178; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Part of the debris slopes previously defined as alpine moraines at the foot of Mt. Riiser-Larsen were considered to be active rock glaciers in terms of longitudinal profiles, degree of weathering, Size of surface boulders and morphological similarities with active rock glaciers in other regions. Possible rock glaciers tend to occur at the foot of talus, the bottom of cirques and the tips of moraines below snow patches and/ or alpine glaciers. Descriptions of rock glaciers in Antarctica have so far been few.

Continuous monitoring of the movement and thermal regime of rock glaciers will be necessary to understand geomorphic environments and processes in the Antarctic coastal regions.
Author
Rocks; Glaciers

20000021257 National Inst. of Polar Research, Tokyo, Japan
Radiocarbon Dates of Fossil Shells from Raised Beach Sediments along the Soya Coast, East Antarctica: A Report an a Geomorphological Survey during JARE-35 (1993-94)
Hirakawa, Kazuomi, Hokkaido Univ., Japan; Sawagaki, Takanobu, National Inst. of Polar Research, Japan; Antarctic Record; July 1998; ISSN 0085-7289; Volume 42, No. 2, pp. 151-167; In Japanese; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

40 Radiocarbon ages are obtained from fossil shells collected from raised beach deposits along the Soya Coast, East Antarctica during the summer season of JARE-35, 1994. They are clearly classified into younger Holocene dates of 3 ka to 8 ka and dates older than 35 ka. The older dates are restricted to shells from the Ongul Islands, while the younger ones were found in all outcropped areas, although older dates had been reported from Langhovde in previous studies. Older shells in the Ongul Islands are distributed at higher elevation up to 20 m above present sea level than younger shells. The highest elevation of a Holocene raised beach attains 26 m above sea level in Skarvsnes. This is the first report of radiocarbon dates from Skallevikhalsen and Rundvdgshetta.
Author
Fossils; Geomorphology; Carbon 14; Geological Surveys

20000021290 Kiel Univ., Institut fuer Meereskunde, Germany
Annual Review of the World Climate Research Programme and Report of the Twentieth Session of the Joint Scientific Committee
Lemke, P., Kiel Univ., Germany; August 1999; 134p; In English; 20th, 15-19 Mar. 1999, Kiel, Germany; Sponsored by International Council for Science
Report No.(s): WMO/TD-976; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The principal task of the annual session of the WMO/ICSU/IOC Joint Scientific Committee (JSC) for the World Climate Research Programme (WCRP) is to review the scientific progress in the programme during the preceding year. At the kind invitation of the Institut fur Meereskunde of the University of Kiel, the 1999 session of the JSC, the twentieth, took place in the Kunsthalle, Kiel, Germany. The session was opened by the (acting) Chairman' of the JSC, Dr. W.L. Gates at 0900 hours on 15 March 1999. The list of participants is given in Appendix A. This report summarizes the information presented to the JSC on the progress in the WCRP during the preceding year and records the recommendations by the JSC for the further development of the Programme (these recommendations are compiled for convenience in Appendix B). Professor P. Lemke, Officer of the JSC and local host, welcomed all participants on behalf of the Institut fur Meereskunde and expressed his pleasure at the opportunity to host this session of the JSC in Kiel. Although the surrounding (North and Baltic) Seas were cold at this time of the year, he nevertheless hoped that the weather would be agreeable and that all would enjoy their stay in the city of Kiel in Schleswig-Holstein. Professor R. Haensel, Rector of the University of Kiel added his welcome. He urged participants to find time to look round the Kunsthalle which was an important public window for the University. Professor Haensel noted that the University had been founded in 1665, and now comprised nine faculties and 22 500 students. A number of notable Institutes (marine research; marine geology; world economy) were also very closely connected with the University. Professor Haensel referred to the significance of the work of the JSC session in forming the basis for the long- term assessment of potential climate change. It was essential that the public and politicians, the latter mainly concerned with short-term questions, be aware of the issues and the efforts being made to achieve a better understanding.
Derived from text
Progress; Climate Change; Geology; Ocean Bottom

20000021305 Boston Univ., Dept. of Geography, Boston, MA USA
Documenting, Understanding, and Predicting the Aggregate Surface Radiation Fluxes for SHEBA ***Final Report, 15 Jun. 1997 - 31 Aug. 1999***
Key, Jeffrey R., Boston Univ., USA; Curry, Judith, Colorado Univ., USA; Evans, Frank, Colorado Univ., USA; Pinto, James, Colorado Univ., USA; Maslanik, James, Colorado Univ., USA; Steffen, Konrad, Colorado Univ., USA; Feb. 10, 2000; 8p; In English
Contract(s)/Grant(s): NAG5-4903; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This document serves as a final report for NASA grant NAG5-4903 at Boston University. The report covers the first two years of the three-year project. The third year's funding and tasks have been transferred to the University of Wisconsin-Madison (UW) where the Principal Investigator (J. Key) is now stationed. The new UW grant number is NAG5-8625. Plans for the final project year at UW were detailed in the Request to Transfer document, submitted to NASA in July 1999. This is a group project with the University of Colorado (CU) as the lead institution, where Judith Curry is the Principal Investigator. The overall project is jointly funded by NASA and NSF. The progress reported herein is that specific to Boston University, but no attempt has been made to separate NASA and NSF activities.
Author
Predictions; Prediction Recording; Documentation; Aggregates; Radiation Belts; Radiative Transfer; Three Dimensional Models

20000021333 NASA Goddard Space Flight Center, Greenbelt, MD USA
Crustal Uplift in the Southcentral Alaska Subduction Zones: A New Analysis and Interpretation of Tide Gauge Observations
Cohen, Steven C., NASA Goddard Space Flight Center, USA; Freymueller, Jeffrey T., Alaska Univ., USA; [1999]; 29p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have examined the sea level height tide records at seven tide gauge sites in the region of southcentral Alaska that were affected by the 1964 Prince William Sound earthquake to determine the history of crustal uplift subsequent to the earthquake. There is considerable variation in the behavior depending on the location of the site relative to the 1964 rupture. At Seward, on the eastern side of the Kenai Peninsula we find a slow uplift that is consistent with elastic strain accumulation while at Seldovia and Nikiski on the western side of the Kenai we find a persistent rapid uplift of about 1 cm/yr that most likely represents a long term transient response to the earthquake, but which cannot be sustained over the expected recurrence interval for a great earthquake of several hundred years. Further to the southwest, at Kodiak, we find evidence that the rate of uplift, which is still several mm/yr, has slowed significantly over the past three and a half decades. to the east of the Kenai Peninsula we find subsidence at Cordova and an uncertain behavior at Valdez. At both of these sites there is a mathematically significant time-dependence to the uplift behavior, but the data confirming this time dependence are not as convincing as at Kodiak. At Anchorage, to the north there is little evidence of vertical motion since the earthquake. We compare these long term tide gauge records to recent GPS observations. In general there is reasonable consistency except at Anchorage and Cordova where the GPS measurement indicate somewhat more rapid uplift and subsidence, respectively.
Author
Tides; Earthquakes; Sea Level; Alaska; Crusts

20000021368 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cloud and Aerosol Retrieval for the 2001 GLAS Satellite Lidar Mission
Hart, William D., NASA Goddard Space Flight Center, USA; Palm, Stephen P., Science Systems and Applications, Inc., USA; Spinhirne, James D., NASA Goddard Space Flight Center, USA; [2000]; 4p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Geoscience Laser Altimeter System (GLAS) is scheduled for launch in July of 2001 aboard the Ice, Cloud and Land Elevation Satellite (ICESAT). In addition to being a precision altimeter for mapping the height of the Earth's icesheets, GLAS will be an atmospheric lidar, sensitive enough to detect gaseous, aerosol, and cloud backscatter signals, at horizontal and vertical resolutions of 175 and 75m, respectively. GLAS will be the first lidar to produce temporally continuous atmospheric backscatter profiles with nearly global coverage (94-degree orbital inclination). With a projected operational lifetime of five years, GLAS will collect approximately six billion lidar return profiles. The large volume of data dictates that operational analysis algorithms, which need to keep pace with the data yield of the instrument, must be efficient. So, we need to evaluate the ability of operational algorithms to detect atmospheric constituents that affect global climate. We have to quantify, in a statistical manner, the accuracy and precision of GLAS cloud and aerosol observations. Our poster presentation will show the results of modeling studies that are designed to reveal the effectiveness and sensitivity of GLAS in detecting various atmospheric cloud and aerosol features. The studies consist of analyzing simulated lidar returns. Simulation cases are constructed either from idealized renditions of atmospheric cloud and aerosol layers or from data obtained by the NASA ER-2 Cloud Lidar System (CLS). The fabricated renditions permit quantitative evaluations of operational algorithms to retrieve cloud and aerosol parameters. The use of observational data permits the evaluations of performance for actual atmospheric conditions. The intended outcome of the

presentation is that climatology community will be able to use the results of these studies to evaluate and quantify the impact of GLAS data upon atmospheric modeling efforts.
Author
Aerosols; Atmospheric Composition; Atmospheric Models; Cloud Cover; Clouds (Meteorology); Detection; Ice Clouds; Visual Observation; Simulation

20000021445 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Budget and Partitioning of Stratospheric Chlorine During the 1997 Arctic Summer
Sen, B., Jet Propulsion Lab., California Inst. of Tech., USA; Osterman, G. B., Jet Propulsion Lab., California Inst. of Tech., USA; Salawitch, R. J., Jet Propulsion Lab., California Inst. of Tech., USA; Toon, G. C., Jet Propulsion Lab., California Inst. of Tech., USA; Marigitan, J. J., Jet Propulsion Lab., California Inst. of Tech., USA; Blavier, J.-F., Jet Propulsion Lab., California Inst. of Tech., USA; Chang, A. Y., Jet Propulsion Lab., California Inst. of Tech., USA; May, R. D., Jet Propulsion Lab., California Inst. of Tech., USA; Webster, C. R., Jet Propulsion Lab., California Inst. of Tech., USA; Stimpfle, R. M., Harvard Univ., USA; Journal of Geophysical Research; Nov. 20, 1999; ISSN 0148-0227; Volume 104, No. D21, pp. 26,653-26,665; In English
Report No.(s): Paper-1999JD900245; Copyright; Avail: Issuing Activity

Volume mixing ratio profiles of HCl, HOCl, ClNO3, CH3Cl, CFC-12, and CFC-11, CCl4, HCFC-22, and CFC-113 were measured simultaneously from 9 to 38 km by the Jet Propulsion Laboratory MkIV Fourier Transform Infrared solar absorption spectrometer during two balloon flights from Fairbanks, Alaska (64.8 N), on May 8 and July 8, 1997. The altitude variation of total organic chlorine (CCl(sub y)), total inorganic chlorine (Cl(sub y)), and the nearly constant value (3.7 +/- 0.2 ppbv) of their sum (Cl(sub TOT)) demonstrates that the stratospheric chlorine species available to react with O3 are supplied by the decomposition of organic chlorinated compounds whose abundances are well quantified. Measured profiles of HCl and ClNO3 agree well with profiles found by photochemical model (differences is less than 10% for altitudes below 35 km) constrained by various other constituents measured by MkIV. The production of HCl by ClO + OH plays a relatively small role in the partitioning of HCl and ClNO3 for the sampled air masses. However, better agreement with the measured profiles of HCl and ClNO3 is obtained when this source of HCl is included in the model. Both the measured and calculated [ClNO3]/[HCl] ratios exhibit the expected near linear variation with [O3](sup 2)/[CH4] over a broad range of altitudes. MkIV measurements of HCl, ClNO3, and CCl(sub y) agree well with ER-2 in situ observations of these quantities for directly comparable air masses. These results demonstrate good understanding of the budget of stratospheric chlorine and that the partitioning of inorganic chlorine is accurately described by photochemical models that employ JPL97 reaction rates and production of HCl from ClO + OH for the environmental conditions encountered: relatively warm temperatures, long periods of solar illumination, and relatively low aerosol surface areas.
Author
Stratosphere; Arctic Regions; Atmospheric Composition; In Situ Measurement; Air Masses; Photochemical Reactions; Reaction Kinetics

20000021484 Boston Univ., Dept. of Geography, Boston, MA USA
Polar-Wide Geophysical Products Derived from AVHRR ***Final Report, 1 Jul. 1997 - 31 Mar. 1999***
Key, Jeffrey R., Boston Univ., USA; Maslanik, James, Colorado Univ., USA; Jul. 01, 1999; 4p; In English
Contract(s)/Grant(s): NAG5-4850; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This is the final report for the AVHRR Polar Pathfinder (APP) project activities at Boston University (BU). The grant to J. Key is part of a group proposal with the University of Colorado (CU) as the lead institution (J. Masianik, PI). The report is a summary of accomplishments over the three-year BU project, although the NASA grant to BU was only for the third year. For the first two years funding at BU was obtained via a subcontract from CU. The overall project report will be provided by the investigators at the University of Colorado this fall, when their no-cost extension period is completed. That report will also contain the information given here. As per NASA guidelines, this report is limited to three pages.
Author
Advanced Very High Resolution Radiometer; Infrared Instruments; Remote Sensors

20000021491 NASA Goddard Space Flight Center, Greenbelt, MD USA
Stratospheric Impact of 1D-Variation Assimilation of TOVS/ATOVS Data
Rokke, Laurie, NASA Goddard Space Flight Center, USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 80th, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

This paper will present an assessment of the impact to the stratospheric circulation of the DAO-GEOS2 (Data Assimilation Office -Goddard Earth Observing System) attributable to an improved 1D-Variational retrieval of heights. The assimilated heights

are retrieved from both the TOVS (TIROS Operational Vertical Sounder) and the ATOVS (Advanced TOVS) sounders. Each sounder's sensitivity to temperature changes in the stratosphere will be addressed and its relationship to the model's background flow evaluated. Also detailed are the steps to ensure the quality of the data being assimilated. Finally the temporal and spatial scales, important to the stratospheric mean flow, will be evaluated in terms of the DAO-GEOS2 response to the assimilated heights.
Author
Atmospheric Circulation; Earth Observing System (EOS); Stratosphere; Atmospheric Models; Climate Models

20000021533 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
Nocturnal Boundary-Layer Regimes
Mahrt, L., Oregon State Univ., USA; Sun, Jie-Lun, Colorado Univ., USA; Blumen, William, Colorado Univ., USA; Delaney, Tony, National Center for Atmospheric Research, USA; Oncley, Steve, National Center for Atmospheric Research, USA; Boundary-Layer Meteorology; 1998; Volume 88, pp. 255-278; In English
Contract(s)/Grant(s): DAAH04-96-1-0037; NSF ATM-93-10576; NSF ATM-96-27792
Report No.(s): AD-A370054; ARO-34983.5-EV; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

This study analyzes turbulence data collected ever a grassland site in the nocturnal boundary layer. Examination of the dependence of the nocturnal boundary layer on stability suggests three regimes: a) the weakly stable case, b) a transition stability regime where many of the variables change rapidly with increasing stability and c) the very stable case. The value of z/L where the downward beat flux is a maximum defines the stability boundary between the weakly stable and transition regimes, where L is the Obukhov length. In the present analysis, the downward beat flux reaches a maximum at z/L approximately equal to 0.05 for 10 m, although comparison with other data indicates that this is not a universal value, For weaker stability, the but flux decreases with decreasing z/L due to weaker temperature fluctuations. In the transition stability regime, the beat flux decreases rapidly with increasing stability due to restriction of vertical velocity fluctuations by the increasing stratification. For weakly stable conditions, the variances scale according to Monin-Obukhov similarity theory. For very stable conditions, the variances am contaminated by non-turbulent horizontal motions and do not follow the scaling laws. An alternative length scale based an variances is developed which explain more of the variance of the transfer coefficients compared to die Obukhov length.
Author
Boundary Layer Stability; Turbulence; Data Processing; Stability; Nocturnal Variations; Grasslands

20000023161 NASA Goddard Space Flight Center, Greenbelt, MD USA
Extremely Low Ionospheric Peak Altitudes in the Polar-Hole Region
Benson, Robert F., NASA Goddard Space Flight Center, USA; Grebowsky, Joseph M., NASA Goddard Space Flight Center, USA; [1999]; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Vertical electron-density (N (sub e)) profiles, deduced from newly-available ISIS-II digital ionospheric topside-sounder data, are used to investigate the "polar-hole" region within the winter, nighttime polar cap ionosphere during solar minimum. The hole region is located around 0200 MLT near the poleward side of the auroral oval. Earlier investigations had revealed very low N (sub e) values in this region (down to 200/cu cm near 300 km). In the present study, such low N, values (approx. 100/cu cm) were only found near the ISIS (International Satellite for Ionospheric Study)-II altitude of 1400 km. The peak ionospheric concentration below the spacecraft remained fairly constant (approx. 10 (exp 5)/cu cm across the hole region but the altitude of the peak dropped dramatically. This peak dropped, surprisingly, to the vicinity of 100 km. These observations suggest that the earlier satellite in situ measurements, interpreted as deep holes in the ionospheric F-region concentration, could have been made during conditions of an extreme decrease in the altitude of the ionospheric N (sub e) peak. The observations, in combination with other data, indicate that the absence of an F-layer peak may be a frequent occurrence at high latitudes.
Author
ISIS Satellites; Satellite Observation; Low Altitude; Polar Regions; Ionospheres; Electron Density Profiles

20000024739 NASA Langley Research Center, Hampton, VA USA
Models and Measurements Intercomparison 2
Park, Jae H., Editor, NASA Langley Research Center, USA; Ko, Malcolm K. W., Editor, Atmospheric and Environmental Research, Inc., USA; Jackman, Charles H., Editor, NASA Goddard Space Flight Center, USA; Plumb, R. Alan, Editor, Massachusetts Inst. of Tech., USA; Kaye, Jack A., Editor, NASA, USA; Sage, Karen H., Editor, Science Applications International Corp., USA; September 1999; 506p; In English; 2nd, 1996-1999, USA; See also 20000024740 through 20000024745; Original contains color illustrations
Contract(s)/Grant(s): RTOP 622-57-72-70

Report No.(s): NASA/TM-1999-209554; L-17895; NAS 1.15:209554; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

Models and Measurement Intercomparison II (MM II) summarizes the intercomparison of results from model simulations and observations of stratospheric species. Representatives from twenty-three modeling groups using twenty-nine models participated in these MM II exercises between 1996 and 1999. Twelve of the models were two- dimensional zonal-mean models while seventeen were three-dimensional models. This was an international effort as seven were from outside the USA. Six transport experiments and five chemistry experiments were designed for various models. Models participating in the transport experiments performed simulations of chemically inert tracers providing diagnostics for transport. The chemistry experiments involved simulating the distributions of chemically active trace cases including ozone. The model run conditions for dynamics and chemistry were prescribed in order to minimize the factors that caused differences in the models. The report includes a critical review of the results by the participants and a discussion of the causes of differences between modeled and measured results as well as between results from different models, A sizable effort went into preparation of the database of the observations. This included a new climatology for ozone. The report should help in evaluating the results from various predictive models for assessing humankind perturbations of the stratosphere.

Author

Atmospheric Models; Climatology; Ozone; Atmospheric Sounding; Stratosphere; Atmospheric Chemistry

20000024741 NASA Goddard Inst. for Space Studies, New York, NY USA

Transport Experiments

Hall, Timothy M., NASA Goddard Inst. for Space Studies, USA; Wuebbles, Donald J., Illinois Univ., USA; Boering, Kristie A., California Univ., USA; Eckman, Richard S., NASA Langley Research Center, USA; Lerner, Jean, NASA Goddard Inst. for Space Studies, USA; Plumb, R. Alan, Massachusetts Inst. of Tech., USA; Rind, David H., NASA Goddard Inst. for Space Studies, USA; Rinsland, Curtis P., NASA Langley Research Center, USA; Waugh, Darryn W., Johns Hopkins Univ., USA; Wei, Chu-Feng, Illinois Univ. at Urbana-Champaign, USA; Models and Measurements Intercomparison 2; September 1999, pp. 110-189; In English; See also 20000024739; Original contains color illustrations; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

MM II defined a series of experiments to better understand and characterize model transport and to assess the realism of this transport by comparison to observations. Measurements from aircraft, balloon, and satellite, not yet available at the time of MM I [Prather and Remsberg, 1993], provide new and stringent constraints on model transport, and address the limits of our transport modeling abilities. Simulations of the idealized tracers the age spectrum, and propagating boundary conditions, and conserved HSCT-like emissions probe the relative roles of different model transport mechanisms, while simulations of SF6 and C02 make the connection to observations. Some of the tracers are related, and transport diagnostics such as the mean age can be derived from more than one of the experiments for comparison to observations. The goals of the transport experiments are: (1) to isolate the effects of transport in models from other processes; (2) to assess model transport for realistic tracers (such as SF6 and C02) for comparison to observations; (3) To use certain idealized tracers to isolate model mechanisms and relationships to atmospheric chemical perturbations; (4) to identify strengths and weaknesses of the treatment of transport processes in the models; (5) to relate evaluated shortcomings to aspects of model formulation. The following section are included:Executive Summary, Introduction, Age Spectrum, Observation, Tropical Transport in Models, Global Mean Age in Models, Source-Transport Covariance, HSCT ”ANOY” Tracer Distributions, and Summary and Conclusions.

Derived from text

Atmospheric Sounding; Atmospheric Models; Transport Properties; Computerized Simulation; Stratosphere; Atmospheric Chemistry; Troposphere; Emission; Environment Simulation

20000024742 NASA Langley Research Center, Hampton, VA USA

Chemistry Experiments

Brasseur, Guy, National Center for Atmospheric Research, USA; Remsberg, Ellis, NASA Langley Research Center, USA; Purcell, Patrick, Science Applications International Corp., USA; Bhatt, Praful, Science Applications International Corp., USA; Sage, Karen H., Science Applications International Corp., USA; Brown, Donald E., Science Applications International Corp., USA; Scott, Courtney J., Atmospheric and Environmental Research, Inc., USA; Ko, Malcolm K. W., Atmospheric and Environmental Research, Inc., USA; Tie, Xue-Xi, National Center for Atmospheric Research, USA; Huang, Theresa, National Center for Atmospheric Research, USA; Models and Measurements Intercomparison 2; September 1999, pp. 190-306; In English; See also 20000024739; Original contains color illustrations; No Copyright; Avail: CASI; A06, Hardcopy; A04, Microfiche

The purpose of the chemistry component of the model comparison is to assess to what extent differences in the formulation of chemical processes explain the variance between model results. Observed concentrations of chemical compounds are used to

estimate to what degree the various models represent realistic situations. For readability, the materials for the chemistry experiment are reported in three separate sections. This section discussed the data used to evaluate the models in their simulation of the source gases and the Nitrogen compounds (NO(y)) and Chlorine compounds (Cl(y)) species.
Derived from text
Atmospheric Sounding; In Situ Measurement; Atmospheric Models; Comparison; Atmospheric Chemistry; Chlorine Compounds; Nitrogen Compounds; Stratosphere

20000024744 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Special Diagnostics
Ko, Malcolm K. W., Atmospheric and Environmental Research, Inc., USA; Salawitch, Ross J., Jet Propulsion Lab., California Inst. of Tech., USA; Jackman, Charles H., NASA Goddard Space Flight Center, USA; Considine, David B., Maryland Univ., USA; Douglass, Anne R., NASA Goddard Space Flight Center, USA; Models and Measurements Intercomparison 2; September 1999, pp. 363-448; In English; See also 20000024739; No Copyright; Avail: CASI; A05, Hardcopy; A04, Microfiche

This section contains a number of special diagnostics that are designed to examine certain mechanisms. Section 1 reports on the method used to test the photochemical partitioning in the models. Sections 2 and 3 represent efforts to examine the model calculated production and removal rates for ozone and how the values are combined with transport rates in the models to produce the simulated ozone distributions. Sections 4 and 5 concentrate on polar processes including the dynamics aspect of vortex confinement and the chemical aspects of chlorine activation.
Derived from text
Photochemical Reactions; Ozone; Transport Properties; Atmospheric Models; Atmospheric Sounding; Ozonometry; Atmospheric Chemistry

20000024745 Illinois Univ., Urbana, IL USA
Future Atmospheric Perturbation from NO(x) Injection in the Lower Stratosphere
Wuebbles, Donald, Illinois Univ., USA; Models and Measurements Intercomparison 2; September 1999, pp. 449-491; In English; See also 20000024739; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The High Speed Civil Transport (HSCT) aircraft emissions studies provide a means to evaluate how the models being compared respond to a perturbation. The standard scenario of 500 HSCTS (Baughcum and Henderson, 1998) is used, but with a limited representation of the emissions so as to simplify the interpretation of the model results for the intercomparison. Emissions of nitrogen oxides corresponding to an Emissions Index of 10 are used in addition to two different assumptions about the effects of sulfur emissions. The first case assumes the background level of sulfuric aerosols (SAO) is left unchanged. The second case (SA1) assumes that the distribution of sulfuric aerosols have been modified by the aircraft sulfur emissions, with the distribution of aerosol surface area based on the AER model (Weisenstein et al., 1997). In this case, 50 % of the SO2 emitted by the aircraft is assumed to be immediately converted to sulfate particles in the plume. Neither case assumes any H2O aircraft emission. Figures of the zonal average of the HSCT NOx emissions used and the ratio of the aerosol surface area density for SA1 relative to SAO are included. All HSCT calculations were done relative to a ”2015” background atmosphere assuming SAO sulfuric aerosol surface area. Nine models participated in the HSCT runs, including seven 2-D models and two 3-D models. The 3-D ECHAM3/CHEM model was only used for the SA1 case while the other eight models ran both cases.
Derived from text
Atmospheric Models; Nitrogen Oxides; Stratosphere; Perturbation; Exhaust Emission; Supersonic Transports; Plumes; Atmospheric Chemistry

20000024775 University of Mining and Technology, Sofia, Bulgaria
Equivalences Between Traveltimes of Seismic Waves and a Gravity Potential
Stavrev, P., University of Mining and Technology, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 100-103; In English; Copyright; Avail: Issuing Activity

The traveltime of reflected waves in a seismic model with one reflector and the gravity potential of a point mass have some common formal properties. They possess the property of Euler homogeneity as functions of the coordinates of observation points and the sourcepoint. The reciprocal traveltime of reflected waves has the distribution of a gravity potential caused by a point source in the image sourcepoint of the waves. The equivalences shown can be useful in an exchange of analytical expressions and interpretation techniques between gravity and seismic methods in geophysics.
Derived from text
Gravitation; Seismic Waves; Earthquakes; Seismology; Mathematical Models

20000024777 Bulgarian Academy of Sciences, Sofia, Bulgaria

Preliminary Data of the Seismic Events Recorded by NOTSSI for January-June 1997

Botev, E., Bulgarian Academy of Sciences, Bulgaria; Babachkova, B., Bulgarian Academy of Sciences, Bulgaria; Donkova, K., Bulgarian Academy of Sciences, Bulgaria; Tsoncheva, I., Bulgarian Academy of Sciences, Bulgaria; Genov, K., Bulgarian Academy of Sciences, Bulgaria; Toteva, T., Bulgarian Academy of Sciences, Bulgaria; Dimitrov, B., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 132-143; In Bulgarian; Copyright; Avail: Issuing Activity

Generalized information on the results of the collection, processing and analysis of data about more than 1000 earthquakes and explosions recorded in NOTSSI for the first half of 1997 is given. An epicentral map with 507 earthquakes for the central part of the Balkan Peninsula (phi = 37 deg N - 47 deg N and lambda = 18 deg -32 deg E) is presented. The seismic activity on the territory on the territory of Bulgaria and adjacent land is analyzed in more details (302 events in the region (phi =4l deg-45 deg N and lambda = 22 deg -29 deg E)).

Author

Bulgaria; Earthquakes; Seismology

20000024778 Bulgarian Academy of Sciences, Sofia, Bulgaria

Investigation of the Geomagnetic Field in the Region of Geomagnetic Obsevatory: Panagjurishte

Cholakov, I., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 125-131; In Bulgarian; Copyright; Avail: Issuing Activity

From the maps of the anomalous geomagnetic field of Bulgaria it is established that Geomagnetic Observatory Panagjurishte falls in the end of the Pazardjik geomagnetic anomaly. Because of this in connection with the construction of a second 66 absolute house" geomagnetic measurements have been carried out a few times in the region of the Observatory. A weak geomagnetic anomaly has been established which has an amplitude about -20 nT for the horizontal component H, 40 nT for the vertical component Z and 30 nT for the total intensity F. Maps of the anomalous field of H, Z and Fare presented. A conclusion is drawn that the local anomaly is small, and it can be suggested with confidence it does not have an effect on the results of the measurements in the observatory.

Author

Geomagnetism; Magnetic Anomalies; Nonuniform Magnetic Fields

20000024779 Bulgarian Academy of Sciences, Sofia, Bulgaria

A Spectral Analysis of the Variations of Gravity in Sofia in a Frequency Range 0.114 to 0.175 Cycles/Hour

Romanov, D., Bulgarian Academy of Sciences, Bulgaria; Stanchev, V., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 121-124; In Bulgarian; Copyright; Avail: Issuing Activity

The results of the spectral analysis by Hann window of the tidal variations of gravity in a frequency range 0.114-0.175 cycles/hour for station "Sofia" are discussed in this work.

Author

Cycles; Earth Gravitation; Gravitational Fields; Variations

20000024780 Bulgarian Academy of Sciences, Sofia, Bulgaria

Anomalous Geomagnetic Field of the Hurd Peninsula, the Island of Livingston, The Antarctic

Stanchev, V., Bulgarian Academy of Sciences, Bulgaria; Dimov, D., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 115-120; In Bulgarian; Copyright; Avail: Issuing Activity

A map of the anomalous geomagnetic field of the Hurd Peninsula (the island of Livingston, the Antarctic), has been compiled in a scale - 1:100 000 on the basis of geomagnetic investigations carried out by a proton magnetometer in 1996 and 1997. A brief geologo-geophysical interpretation of the different magnetic anomalies has been made.

Author

Antarctic Regions; Geomagnetism; Magnetic Anomalies; Nonuniform Magnetic Fields

20000024781 Bulgarian Academy of Sciences, Sofia, Bulgaria

On the Dependence between the Magnitude and the Epicentral Intensity for Bulgarian Earthquakes

Glavcheva, R., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 93-99; In Bulgarian; Copyright; Avail: Issuing Activity

On the basis of data of 57 felt Bulgarian earthquakes with instrumentally determined magnitude (MLH between 3.4 and 7.8) the epicentral coefficients are evaluated in a linear dependence between the epicentral intensity and the magnitude - with and

without apparent taking into account the influence of the earthquake source depth. The regression equations have been solved both for the territory of the whole country and the three seismic regions in it. A comparison of the results has been made concerning the application to earthquakes in Bulgaria of all suggested so far empirical expressions of the functional dependence M=F(I(sub delta), logh). The expressions obtained can be applied to macroseismic evaluation of the magnitude at historical earthquakes, too.
Author
Bulgaria; Earthquakes; Seismology; Earth Movements

20000024782 Bulgarian Academy of Sciences, Sofia, Bulgaria
An Analysis of the Contemporary Seismicity in the Sofia Zone
Christoskov, L., Bulgarian Academy of Sciences, Bulgaria; Simeonova, S., Bulgarian Academy of Sciences, Bulgaria; Solakov, D., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 78-92; In Bulgarian; Copyright; Avail: Issuing Activity

The space-time and energy distribution of the small seismicity in the Sofia zone for the period 1980-1994 is analyzed in the present work. The investigation carried out is based on a representative data sample including 165 events with M is greater than 2.0, located according to data from NOTSSI, in this zone during the time interval under investigation. The concentration of the small seismicity in the eastern part of the Sofia zone is observed. The zone is along the valley of the river of Iskar where the strongest, for the period, earthquakes have occurred. Variations of the seismicity in the time are established.
Author
Seismology; Bulgaria; Earth Movements; Geophysics; Earthquakes; Time Series Analysis

20000024789 Bulgarian Academy of Sciences, Geophysical Inst., Sofia, Bulgaria
Spatial and Temporal Modelling of the Ionospheric Storms
Kutiev, I., Bulgarian Academy of Sciences, Bulgaria; Mukhtarov, P., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 49-55; In English
Contract(s)/Grant(s): NZ-401/1994; Copyright; Avail: Issuing Activity

Ionosondes have recorded the ionospheric response to geomagnetic storms for more than 50 years. Unraveling what appears to be chaotic reaction of the ionosphere at midlatitudes has been a challenge for many decades, largely due to the complex interactions between the plasma and neutral atmosphere. Recent numerical simulations with physically-based models have begun to shed light on the causes of these responses. Prolss suggested that negative storm effects are due to regions in which the neutral gas composition is changed - the ratio of molecular gas concentration (N2+02) is increased. Fuller-Rowell et al., who extended this theory, offered a whole scenario of the response of the thermosphere-ionosphere system to magnetospheric energy input. The magnetospheric forcing of the model is based on the maps of auroral particle precipitation and cross-cap electric field taken from statistical models, and are keyed to the auroral Power Index (PI) from the TIROS/NOAA satellite particle measurements. In the ”driven phase” of the storm, e.g. the period of strong magnetospheric input, the upwelling of the molecule reach gas at auroral latitudes is strongest at midnight sector, in the region of the ”auroral surge”. This region, where the gas mean atomic mass number is highest is called ”composition bulge”. Once created, this bulge is driven by the prevailing winds in postmidnight sector toward midlatitudes. After reaching midiatitudes in the early morning hours local time, the composition bulge is dragged to dayside remaining at the same geographic region. Dayside winds blowing from the subsolar pressure bulge towards poles constrain its further equatorward movement. Being driven by the wind field through the dayside, the bulge dissipates and changes its original shape. It usually expands zonally, comprising a larger local time sector. At the time when its forward edge enters nightside again, the bulge, depending on the energy input, can occupy the entire driven path causing ”negative storm” at all longitudes at midlatitudes. The filling up of this negative disturbance starts from daytime sector due to the photoionization. If no further pulses of magnetospheric energy occur, the considered disturbance disappears as its parts consequently are exposed to the Sun. But this happens rarely, most often new energy pulses superimpose new generated bulges one over the other and make the simple picture much more sophisticated. Other work added seasonal peculiarities on this storm development. Prevailing summer-to-winter circulation at solstice transports the composition bulge through the equator, striking the conjugate bulge at winter midlatitudes and causing a downwelling of the molecule reach gas. In this region the recombination rate decreases and a ”positive storm” takes place. According to this scenario, negative storms occur mainly in summer hemisphere, while in winter hemisphere positive storms prevail. This conclusion is supported by the data. Regarding midlatitudes, the occurrence of a storm depends on the location of the equatorial edge of the bulge. The equatorward and poleward excursion of this edge during the development of the composition bulge can produce at a given location a number of positive and negative disturbances.
Author
Earth Ionosphere; Geomagnetism; Ionospheric Storms; Magnetic Storms; Mathematical Models; Earth Magnetosphere; Auroras

20000024790 Bulgarian Academy of Sciences, Sofia, Bulgaria

Determination of Total Ion Content and the Effective Collision Frequency in the Low-Altitude Thermosphere

Nenovski, P., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 33-42; In Bulgarian; Copyright; Avail: Issuing Activity

A new model of determination of the electrodynamical characteristics of the low altitude thermosphere such as total ion content and effective ion collision frequency is suggested. This method uses ground-based observations of geomagnetic pulsations (GP). It shows analytically and numerically that the GP polarization axis tilt and ellipticity are sensitive to the changes of the ionization in the low-altitude ionosphere. Using the standard models (IRI 90 and MSIS 86) the reponses of some GP to the ionization conditions are quantified. The ionospheric polarization effects are essential for fast magnetosonic ULF waves. In this case the polarizable effects of the ionosphere are quantitatively greater at higher frequencies (e.g. in the vicinity of the ion cyclotron frequency and slightly below it). The polarization ellipse tilt reaches the well-known pi/2 degree only for special cases (e.g. for long-period GP) and this result should be taken into account for the analysis of the geomagnetic pulsations observed on the ground.

Author

Geomagnetic Pulsations; Low Altitude; Thermosphere; Atmospheric Ionization; Ion Density (Concentration)

20000024809 Bulgarian Academy of Sciences, Sofia, Bulgaria

A Geodetic Study of Three Seismotectonic Characteristics of the Seismogenic Zone Chlef in North Algeria

Dimitrov, D., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 68-77; In Bulgarian; Copyright; Avail: Issuing Activity

The results of the seismotectonic characteristics study of the seismogenic zone Chlef in North Algeria, determined by an ”inverse problem” on data of geodetic measurements for coseismic deformations are presented. The investigation established a connection between the faults that had become activated during the earthquakes of 09.09.1954 and 10. 10. 1980. In 1954 a slipping along a ”hidden fault” (which remained in depth at about 5 km under the earth surface) has caused the earthquake. Ruptures have appeared on the surface only in the zone of the village of Beni Rashed, which are the result of gravitation and the weak geological situations. The main fault, because it has been blocked in depth, has not completely released the accumulated strains, but has accumulated new ones and became reactivated in 1980, coming into on the surface and causing important tectonic ruptures. The obtained seismotectonic characteristics are in a good agreement with the results of the geological, tectonic, seismologic and geophysical investigations carried out in the region.

Author

Algeria; Earthquakes; Geodetic Surveys; Seismology; Tectonics; Earth Movements; Crustal Fractures

20000024814 Bulgarian Academy of Sciences, Geophysical Inst., Sofia, Bulgaria

A Single-Station Model of the Monthly Median E-Region Critical Frequency

Pancheva, Dora, Bulgarian Academy of Sciences, Bulgaria; Mukhtarov, Plamen, Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 24-32; In English; Copyright; Avail: Issuing Activity

Empirical modelling of the basic ionospheric parameters from a single ionosonde station has been emphasized by many authors because of the possibility to be applied to other stations, as well as to use the proposed method for long- and/or short-term prediction purposes. The simple station measurements can represent the condition in the ionosphere over the region, which is described with the ellipse of semi-axes 250 km in the geographical latitude direction and 250 km in the longitude direction. These models give more accurate results than the global ones and they are very easy to be updated by continuous measurements. The Chapman theory for the formation of a simple ionosphere layer had a strong influence on the present empirical E-region models. In the most of them, including IRI 90, the daily course of the E-region critical frequency f(sub 0) of E is performed as a power function of the cosine of the solar zenith angle [1]. This method of approach has to solve in addition the problem related to the f(sub 0) of E values around sunrise and sunset. In IRI 90 an artificial value for f(sub 0) of E about 0.4 Mhz was introduced with a weaker solar cycle variations, describing night, sunrise and sunset conditions. The seasonal variations of f(sub 0) of E are usually described by very complicated power functions of the cosine of the solar zenith angle in the local noon-time and solar activity dependence - by a linear function of some solar index. A standard approach of representing the monthly median values of the E-region critical frequency is the linear regression from twelve months running mean of the sunspot number R12 for every month of the year and every hour of the day. This approach however needs a separate treatment of a rising and a failing part of the solar cycle, and the suggested method is more accurate if more of the data could be used.

Author

Critical Frequencies; E Region; Earth Ionosphere; Mathematical Models; Atmospheric Models; Climate Models; Climatology; F Region

20000024836 Mission Research Corp., Santa Barbara, CA USA

Energy Coupling Between the Ionosphere and Inner Magnetosphere Related to Substorm Onset ***Final Report, Jun. 1996 - Dec. 1999***

Maynard, Nelson C., Mission Research Corp., USA; Dec. 15, 1999; 12p; In English

Contract(s)/Grant(s): NASW-96007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The investigation of substorm effects in the inner magnetosphere with CRRES data looked in detail at over 50 substorms relative to signatures of onset and early expansion phases. The accomplishments of the project are: Determined perpendicular Poynting flux at CRRES in the inner magnetosphere at substorm onset, including primary direction is azimuthal, not radial, indicating a local source, no obvious signal from the magnetotail to trigger onset, strongly supports substorm onset location near the inner edge of the plasma sheet and process is local and a strong function of Magnetosphere-ionosphere (MI) coupling. We also developed near geosynchronous onset (NGO) model for substorm onset and expansion.

CASI

Magnetic Storms; Sudden Ionospheric Disturbances; Magnetosphere-Ionosphere Coupling; Magnetospheric Instability; Geomagnetic Tail; Earth Ionosphere; Earth Magnetosphere; Space Plasmas

20000024881 Steedman (R. Scott), Reading, UK

Earthquake Engineering Support ***Final Report***

Steedman, R. S.; Nov. 1999; 78p; In English

Contract(s)/Grant(s): N68171-99-C-9021

Report No.(s): AD-A372475; RSS-J9601R01-REV-0; R/D-8713-EN-01; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A large experimental study has been undertaken at the USAE Waterways Experiment Station (WES) as part of the ongoing U.S. Army Engineer Earthquake Engineering Research Program (EQEN) to investigate the behavior of liquefying soil materials. In this study, experiments have addressed the development of excess pore pressure and the onset of liquefaction within a deep soil column using the new large geotechnical centrifuge and earthquake shaker. The approach adopted was to use standard procedures for the assessment of liquefaction resistance to derive values of the strength reduction factor K(delta) from the experimental results, with the object of confirming the validity of the simplified K(delta) approach under high effective overburden stresses. Data of excess pore pressures from the experiments showed the soil column reaching a state of initial liquefaction over a range of depths up to around 20 m (65 ft) under moderate levels of base input shaking, and from this data values of Ka could be derived. As expected, these showed considerable variability, being sensitive to initial assumptions. More significantly, at greater depths, the development of excess pore pressure was capped and despite continued shaking at similar amplitude, the development of excess pore pressure did not reach a sufficient level to cause initial liquefaction. Similar observations have been found in the literature from torsional shear tests. It is concluded that the effects of confining stress and the strain boundary conditions which exist in the soil column in the field are significant in controlling the development of excess pore pressure. In the absence of initial liquefaction, the use of the Ka factor to assess the cyclic resistance of the soil is not considered appropriate.

DTIC

Earthquakes; Geotechnical Engineering; Liquefaction

20000024891 Bulgarian Academy of Sciences, Geophysical Inst., Sofia, Bulgaria

Trends and Long-Period Fluctuations in the TCO Over Central Europe

Pancheva, D., Bulgarian Academy of Sciences, Bulgaria; Mukhtarov, P., Bulgarian Academy of Sciences, Bulgaria; Tododrova, M., Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 56-67; Copyright; Avail: Issuing Activity

Though ozone constitutes less than one-billionth of the mass of the atmosphere, it plays an important role in heating the stratosphere and in this way strongly influences the processes in the middle atmosphere. The energetic and dynamic processes within the stratosphere, as well as their mutual coupling are of growing concern. A long-series of atmospheric and mesospheric measurements of ozone and radio-wave absorption in the ionospheric D-region arc available and the similarity of their behaviour suggests a coupling between an aeronomical and dynamical condition. The ozone molecules concentrated mainly between altitudes 15 and 35 km and by absorbing the harmful ultraviolet radiation have safe guarded life on our planet. The maximum columnar amounts are observed at high latitudes and in spring, although the primary production mechanism for ozone begins with the dissociation of molecular oxygen by sunlight to produce atomic oxygen, so it should be at the low latitudes. Consequently, the poleward transport of ozone by atmospheric motions is clearly very important. On the other hand, the ozone layer still seems to be the most probable link for a solar-weather relationship, and its association with the solar cycle must therefore be studied. There are papers where a measurable solar cycle variation of total ozone (1.2%) is indicated, however it is only weakly significant.

Also, the long record of st. Arosa (60 years) sheds some doubt on the reality of the effect, because it suggests that good correlations obtained from relatively short series may be accidental, the predominant period of ozone variation being close to but different from that of the solar cycle. We have to mention also that the negative temperature feedback tends to strongly reduce the solar cycle effect in mid-latitudes, and if it exists, it seems to be predominantly produced by variations in the ozone transport.The observed weak solar cycle dependence of the total ozone is a reason because of which the developed approach for creating the monthly median models of different upper atmosphere parameters can be applied however without a significant success. Another approach to build up the monthly median model of total ozone at a single station is connected with the detailed study of the trends and long period fluctuations of given time series. That is precisely the basic aim of this paper: to study in detail the trends and fluctuations in the monthly median values of TCO at typical Central European stations as Hradec Kralove and Potsdam during the interval 1964-1992.
Author
Central Europe; Ozone; Ozonosphere; Solar Cycles; Stratosphere; Time Series Analysis; Trends; Atmospheric Composition

20000024926 NASA Goddard Space Flight Center, Greenbelt, MD USA
Three Dimensional Model Simulation of Constituent Transport in the Lowermost Stratosphere
Douglass, Anne R., NASA Goddard Space Flight Center, USA; Strahan, Susan E., NASA Goddard Space Flight Center, USA; Jackman, Charles H., NASA Goddard Space Flight Center, USA; Rood, Richard B., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The composition, transport and photochemistry of the lowermost stratosphere, i.e., that part of the atmosphere which is above the tropopause, poleward of the tropics, and at potential temperature lower than the potential temperature of the tropical tropopause (about 380K) are of practical interest for understanding global ozone behavior. Because this region is a transition between transport regimes characterized by different scales of dynamics, it is especially difficult to model realistically. Through comparisons of observations of ozone, carbon dioxide and water vapor with results from a chemistry and transport model using winds from a global meteorological assimilation system, we have established that the model provides a good representation of several important aspects of constituent behavior. These include the constituent gradients near the tropopause as well as the annual cycle of constituents and the altitude dependence of the annual cycle from the tropopause into the middle stratosphere. This talk draws together these results to form a unified picture of transport into the lowermost extratropical stratosphere. In particular, the importance of convective transport to the distribution of both short-lived, and long-lived constituents in the lowermost stratosphere will be evaluated.
Author
Simulation; Stratosphere; Three Dimensional Models; Atmospheric Circulation; Ozone; Atmospheric Composition; Atmospheric Models

20000025071 NASA Goddard Space Flight Center, Greenbelt, MD USA
Co-Seismic Mass Dislocation and Its Effect on Earth's Rotation and Gravity
Chao, Benjamin F., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Mantle processes often involve large-scale mass transport, ranging from mantle convection, tectonic motions, glacial isostatic adjustment, to tides, atmospheric and oceanic loadings, volcanism and seismicity. On very short time scale of less than an hour, co-seismic event, apart from the "shaking" that is the earthquake, leaves behind permanent (step-function-like) dislocations in the crust and mantle. This redistribution of mass changes the Earth's inertia tensor (and hence Earth's rotation in both length-of-day and polar motion), and the gravity field (in terms of spherical harmonic Stokes coefficients). The question is whether these effects are large enough to be of any significance. In this paper we report updated calculation results. The calculation uses the normal mode summation scheme, applied to 15,814 major earthquakes that occurred during 1976-1998, according to source mechanism solutions given by the Harvard Central Moment Tensor catalog. Compared to the truly large ones earlier in the century, the earthquakes we study are individually all too small to have left any discernible signature in geodetic records of Earth rotation or global gravity field. However, their collective effects continue to exhibit an extremely strong statistical tendencies. For example, earthquakes conspire to decrease J(sub 2) and J(sub 22) while shortening LOD, resulting in a rounder and more compact Earth. Strong tendency is also seen in the earthquakes trying to "nudge" the Earth rotation pole towards about 140 degree E, roughly opposite to the observed polar drift direction. The geophysical significance and implications will be further studied.
Author
Earth Rotation; Seismology; Earth Gravitation; Mass Transfer

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20000021364 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Combined Infrared and Microwave Technique for Studying the Diurnal Variation of Rainfall Over Amazonia
Negri, Andrew J., NASA Goddard Space Flight Center, USA; Xu, L., Arizona Univ., USA; Adler, R. F., NASA Goddard Space Flight Center, USA; Anagnostou, E., Connecticut Univ., USA; Rickenbach, T. M., NASA Goddard Space Flight Center, USA; [1999]; 2p; In English, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA
Report No.(s): JP3.12; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

In this paper we present results from the application of a satellite infrared (IR) technique for estimating rainfall over northern South America. Our main objectives are to examine the diurnal variability of rainfall and to investigate the relative contributions from the convective and stratiform components. Additional information is contained in the original.
Derived from text
Infrared Radiation; Microwaves; Diurnal Variations; Rain

20000021365 NASA Goddard Space Flight Center, Greenbelt, MD USA
Variability of Convective Precipitation from TRMM Microwave Imager (TMI)
Hong, Ye, Caelum Research Corp., USA; Kummerow, Chris, NASA Goddard Space Flight Center, USA; Olson, William, Maryland Univ. Baltimore County, USA; [1999]; 1p; In English; 10th; Satellite Meteorology and Oceanography, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorology Society, USA
Report No.(s): Paper 6104; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Tropical precipitation generally occurs in two distinguishable forms: convective and stratiform. The two different types of precipitation systems have considerably different vertical profiles of latent heat release that has a crucial role in driving the circulation of the atmosphere. Thus, it is very important to study the variability of convective and stratiform precipitation. This paper presents variability of convective precipitation estimated from TRMM Microwave Imager (TMI). The convective/stratiform precipitation areas are classified using a combined texture-based and polarization-based algorithm. Surface rainfall rates are retrieved using the Goddard Profiling algorithm (Gprof). We will examine the spatial and temporal variability of convective precipitation for 1998. In addition, convective precipitation computed from TMI will be compared with those from the space borne Precipitation Radar (PR) and the ground-based radars for several cases.
Author
Variability; Convection; Precipitation (Meteorology); Trmm Satellite

20000021366 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Global Precipitation Perspective on Persistent Extratropical Flow Anomalies
Huffman, George J., NASA Goddard Space Flight Center, USA; Adler, Robert F., NASA Goddard Space Flight Center, USA; Bolvin, David T., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 10th; Satellite Meteorology and Oceanography, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Two globally-complete, observation-only precipitation datasets have recently been developed for the Global Precipitation Climatology Project (GPCP). Both depend heavily on a variety of satellite input, as well as gauge data over land. The first, Version 2 x 79, provides monthly estimates on a 2.5 deg x 2.5 deg lat/long grid for the period 1979 through late 1999 (by the time of the conference). The second, the One-Degree Daily (1DD), provides daily estimates on a 1 deg x 1 deg grid for the period 1997 through late 1999 (by the time of the conference). Both are in beta test preparatory to release as official GPCP products. These datasets provide a unique perspective on the hydrological effects of the various atmospheric flow anomalies that have been identified by meteorologists. In this paper we discuss the regional precipitation effects that result from persistent extratropical flow anomalies. We will focus on the Pacific-North America (PNA) and North Atlantic Oscillation (NAO) patterns. Each characteristically becomes established on synoptic time scales, but then persists for periods that can exceed a month. The onset phase of each appears to have systematic mobile features, while the mature phase tend to be more stationary. Accordingly, composites of monthly data for outstanding positive and negative events (separately) contained in the 20-year record reveal the climatological structure of the precipitation during the mature phase. The climatological anomalies of the positive, negative, and (positive-negative) composites show the expected storm-track-related shifts in precipitation, and provide the advantage of putting the known precipitation effects over land in the context of the total pattern over land and ocean. As well, this global perspective points out some unexpected areas of correlation. Day-by-day composites of daily data anchored to the onset date demonstrate the systematic

features during the onset. Although the 1DD has a fairly short record, some preliminary results are shown and compared to previous work with numerical weather prediction models.
Author
Climatology; Precipitation (Meteorology); Numerical Weather Forecasting; Atmospheric Models; Atmospheric General Circulation Models

20000021367 NASA Goddard Space Flight Center, Greenbelt, MD USA
Incorporating TRMM and Other High-Quality Estimates into the One-Degree Daily (1DD) Global Precipitation Product
Huffman, George J., NASA Goddard Space Flight Center, USA; Adler, Robert F., NASA Goddard Space Flight Center, USA; Bolvin, David T., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 15th; Hydrology, 9-14 Jan. 2000, Long Beach, CA, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The One-Degree Daily (1DD) precipitation dataset was recently developed for the Global Precipitation Climatology Project (GPCP). The IDD provides a globally-complete, observation-only estimate of precipitation on a daily 1 deg x 1 deg grid for the period 1997 through late 1999 (by the time of the conference). In the latitude band 40 N - 40 S the IDD uses the Threshold-Matched Precipitation Index (TMPI), a GPI-like IR product with the T(sub b) threshold and (single) conditional rain rate determined locally for each month by the frequency of precipitation in the GPROF SSNU product and by the precipitation amount in the GPCP satellite-gauge (SG) combination. Outside 40 N - 40 S the 1DD uses a scaled TOVS precipitation estimate that has adjustments based on the TMPI and the SG. This first-generation 1DD has been in beta test preparatory to release as an official GPCP product. In this paper we discuss further development of the 1DD framework to allow the direct incorporation of TRMM and other high-quality precipitation estimates. First, these data are generally sparse (typically from low-orbit satellites), so a fair amount of work was devoted to data boundaries. Second, these data are not the same as the original 1DD estimates, so we had to give careful consideration to the best scheme for forcing the 1DD to sum to the SG for the month. Finally, the non-sun-synchronous, low-inclination orbit occupied by TRMM creates interesting variations against the sun-synchronous, high-inclination orbits occupied by the Defense Meteorological Satellite Program satellites that carry the SSM/I. Examples will be given of each of the development issues, then comparisons will be made to daily raingauge analyses.
Author
Trmm Satellite; Rain; Tropical Meteorology

20000021399 NASA Goddard Space Flight Center, Greenbelt, MD USA
A TRMM Microwave Radiometer Rain Rate Estimation Method with Convective and Stratiform Discrimination
Prabhakara, C., NASA Goddard Space Flight Center, USA; Iacovazzi, R., Jr., Raytheon Corp., USA; Weinman, J. A., NASA Goddard Space Flight Center, USA; Dalu, G., Consiglio Nazionale delle Ricerche, Italy; [1999]; 79p; In English; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI) radiometer brightness temperature data in the 85 GHz channel (T85) reveal distinct local minima (T85min) in a regional map containing a Mesoscale Convective System (MCS). This is because of relatively small footprint size (approximately 5.5 km) and strong extinction properties in this channel of the TMI. A map of surface rain rate for that region, deduced from simultaneous measurements made by the Precipitation Radar (PR) on board the TRMM satellite, reveals that these T85(sub min), produced by scattering, correspond to local PR rain maxima. Utilizing the PR rain rate map as a guide, we infer empirically from TMI data the presence of three different kinds of thunderstorms or Cbs. These Cbs are classified as young, mature, and decaying types, and are assumed to have a scale of about 20 km on the average. Two parameters are used to classify these three kinds of Cbs based on the T85 data: a) the magnitude of scattering depression deduced from local T85(sub min) and b) the mean horizontal gradient of T85 around such minima. Knowing the category of a given Cb, we can estimate the rain rate associated with it. Such estimation is done with the help of relationships linking T85min to rain rate in each Cb type. Similarly, a weak background rain rate in all the areas where T85 is less than 260 K is deduced with another relationship linking T85 to rain rate. In our rain retrieval model, this background rain constitutes stratiform rain where the Cbs are absent. Initially, these relationships are optimized or tuned utilizing the PR and TMI data of a few MCS events. After such tuning, the model is applied to independent MCS cases. The areal distribution of light (1-10 mm/hr), moderate (10-20 mm/hr), and intense (is greater than or equal to 20 mm/hr) rain rates are retrieved satisfactorily. Accuracy in the estimates of the light, moderate, and intense rain areas and the mean rain rates associated with such areas in these independent MCS cases is on the average about 15 %. Taking advantage of this ability of our retrieval method, one could derive the latent heat input into the atmosphere over the 760 km wide swath of the TMI radiometer in the tropics.
Author
Trmm Satellite; Rain; Tropical Meteorology; Microwave Radiometers; Microwave Imagery; Mesoscale Phenomena

20000021437 Norwegian Defence Research Establishment, Kjeller, Norway

Rocket-Borne Rayleigh Lidar Experiment for In situ Measurements of Neutral Number Density in the Middle Atmosphere

Eriksen, Torkild, Norwegian Defence Research Establishment, Norway; 1999; 172p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 768/172

Report No.(s): PB2000-102585; FFI/RAPPORT-99/04151; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

The TROLL (Transmitter and Receiver of Laser Light) instrument is, to our knowledge, the first lidar instrument developed for in situ measurements of neutral number density in the mesosphere and lower thermosphere. The aims of the campaigns were to study the dynamics of the neutral atmosphere and its influence upon the composition and photochemistry of the middle atmosphere. In this report, the design of the instrument is presented in detail. A simulation model of the bistatic lidar configuration was developed to study the performance and optimize the instrument geometry. State-of-the-art electro-optical devices were used to miniaturize the lidar instrument for integration in the sounding rocket payload. A high-power laser diode array with a pulsed output power of 1 kW was used as transmitter. The instrument was optimized for measurement of Rayleigh scattering outside the shock front surrounding the payload traveling at Mach 2-3.

NTIS

Atmospheric Sounding; Rayleigh Scattering; Mesosphere; Light Beams; Optical Radar; Neutral Atmospheres; Sounding Rockets

20000021492 NASA Goddard Space Flight Center, Greenbelt, MD USA

Assimilation of SeaWinds Scatterometer Data in the GEOS Data Assimilation System

Atlas, Robert, NASA Goddard Space Flight Center, USA; Brin, E., NASA Goddard Space Flight Center, USA; Bloom, S. C., NASA Goddard Space Flight Center, USA; Ardizzone, J., NASA Goddard Space Flight Center, USA; Terry, J., NASA Goddard Space Flight Center, USA; Jusem, J. C., NASA Goddard Space Flight Center, USA; Bungato, D., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The first SeaWinds scatterometer was launched in to space aboard the Quikscat satellite on June 19, 1999 at 7:15 p.m. PDT. Flying in a near polar orbit 800 km above the earth's surface, SeaWinds uses an advanced scatterometer design to measure surface wind velocity over 90 percent of the ice free oceans ever 24 hours. This first SeaWinds mission is designed to replace the NASA Scatterometer (NSCAT) which ceased providing wind velocity data when the ADEOS I satellite failed. A second SeaWinds is scheduled to be launched late in 2000 aboard ADEOS II. Previous scatterometer assimilation experiments conducted by the NASA Data Assimilation Office, using both ERS and NSCAT wind observations, have demonstrated considerable potential for this type of data to improve both atmospheric analyses and forecasts, however much of the smaller scale information content of the scatterometer data could not be taken into account in the early coarse resolution versions of the Goddard (GEOS) Data Assimilation System (DAS) or in operational data assimilation systems. In this paper, we will describe data assimilation experiments in which the new higher resolution versions of the GOES DAS are used to assimilate SeaWinds scatterometer winds. Following a brief discussion of the SeaWinds design and the methodology used to assimilate scatterometer data in the GOES DAS, the quality of the SeaWinds data and the impact of SeaWinds on GOES analyses and forecasts at different resolutions will be presented.

Author

Data Systems; Ground Wind; Scatterometers; Wind Velocity; Meteorological Parameters

20000021493 NASA Goddard Space Flight Center, Greenbelt, MD USA

1D Variational Assimilation of TOVS/ATOVS Level 1b Data

Joiner, J., NASA Goddard Space Flight Center, USA; Rokke, L., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 80th, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Recently, it has been shown that the use of observations from satellite-borne microwave and infrared radiometers in data assimilation systems consistently increases forecast skill. Considerable effort has been expended over the past two decades, particularly with the TIROS Operational Vertical Sounder (TOVS), to achieve this result. The positive impact on forecast skill has resulted from improvements in quality control algorithms, systematic error correction schemes, and data assimilation systems. Despite these recent advances, there are still many issues regarding the use of satellite data in data assimilation systems that remain unresolved. For example, at several centers, much of the TOVS data are not assimilated over land as a result of the difficulty in specifying the surface emissivity. In this study, we add the microwave surface emissivity to the state vector so that it is retrieved rather than specified by a model. The LDVAR temperature and humidity information is then assimilated interactively into the

Goddard Earth Observing System - Data Assimilation System (GEOS-DAS). Results of 1DVAR assimilations with both TOVS and ATOVS will be shown. We will compare the results obtained with HIRS/MSU/SSU and HIRS/AMSU-A2.
Author
Atmospheric Sounding; Atmospheric Temperature; Humidity; Microwave Emission

20000021494 NASA Goddard Space Flight Center, Greenbelt, MD USA
Precipitation Recycling in the NASA GEOS Data Assimilation System
Bosilovich, Michael G., NASA Goddard Space Flight Center, USA; Schubert, Siegfried, NASA Goddard Space Flight Center, USA; Molod, Andrea, NASA Goddard Space Flight Center, USA; Takacs, Lawrence L., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; 80th, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Analysis of precipitation recycling can improve the understanding of regional hydrologic anomalies, especially their evolution and maintenance. Diagnostic models of the recycling of precipitation and are applied to 15 years of the NASA Goddard Earth Observing System (GEOS) Data Assimilation System (DAS). Recycled precipitation is defined as the fraction of precipitation within a given region that originated as surface evaporation from the same region. The focus of the present work is on the interannual variability of the central USA hydrologic cycle and precipitation recycling. The extreme years of 1988 (drought) and 1993 (flood) are compared with the 15 year base period mean annual cycle. The results indicate that recycling ratio (the amount of precipitation with a local source relative to the total precipitation) is greater in 1988 than both the base period mean and the 1993 season (with 1993 recycling ratio less than the mean). On the other hand, both the summers of 1988 and 1993 show less total recycled precipitation than the mean. The results also show that precipitation recycling may have been more important in the spring of 1993, when the region was primed for flooding, than the summer, when the sever flooding occurred. The diagnostic approaches to precipitation recycling suffer from some weaknesses. Numerical simulations and assimilation using passive tracers have the potential to provide more accurate calculations of precipitation recycling and the remote sources of water. This ability is being incorporated into the latest GEOS data assimilation system, and some preliminary results will be presented.
Author
Evaporation; Hydrological Cycle; Recycling; Hydrology Models; Precipitation (Meteorology); Rain; Climatology; Hydrology; Climate Models

20000021496 NASA Goddard Space Flight Center, Greenbelt, MD USA
TRMM-Based Merged Precipitation Analyses
Adler, Robert, NASA Goddard Space Flight Center, USA; Huffman, George, NASA Goddard Space Flight Center, USA; Bolvin, David, NASA Goddard Space Flight Center, USA; Nelkin, Eric, NASA Goddard Space Flight Center, USA; Curtis, Scott, NASA Goddard Space Flight Center, USA; [1999]; 2p; In English; 10th; Satellite Meteorology and Oceanography, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA
Report No.(s): Paper 6691; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

This paper describes results of using Tropical Rainfall Measuring Mission (TRMM) information as the key calibration tool in a merged analysis on a 1X1 latitude/longitude monthly scale based on multiple satellite sources and raingauge analyses. The TRMM-based product is compared with surface-based validation data sets and the community-based 20-year Global Precipitation Climatology Project (GPCP)monthly analyses. The TRMM-based merged analysis uses the TRMM information to calibrate the estimates from SSM/I and geosynchronous IR observations and merges those estimates together with the TRMM and gauge information to produce accurate rainfall estimates with the increased sampling provided by the combined satellite information. This TRMM merged analysis uses the combined instrument (Precipitation Radar [PR] and TRMM Microwave Imager [TMI]) retrieval of Haddad as the TRMM estimate with which to calibrate the other satellite estimates. This TRMM Combined instrument (TCI) estimate is shown to produce very similar absolute values to the other main TRMM products. The TRMM and other satellites merged analysis compares favorably to the atoll data set of Morrissey for the months of 1998 with a very small positive bias of 2%. However, comparison with the preliminary results from the TRMM ground validation radar information at Kwajalein atoll in the western Pacific Ocean shows a 26% positive bias. Therefore, absolute magnitudes from TRMM and/or the ground validation need to be treated with care at this point. A month by month comparison of the TRMM merged analysis and the GPCP analysis indicates very similar patterns, but with subtle differences in magnitude. Focusing on the Pacific Ocean ITCZ one can see the TRMM-based estimates having higher peak values and lower values in the ITCZ periphery. These attributes also show up in the statistics, where GPCP>TRMM at low values (below 10 mm/d) and TRMM>GPCP at high values (greater than 15 mm/d). Integrated over the 37N-37S belt for all of 1998 the TRMM value is 3.1 mm/day compared to 2.9 mm/day for GPCP, with the results when confined to ocean being 3.3 and 3.0, respectively. Therefore, TRMM has approximately 10% higher tropical oceanic precipitation than GPCP. Examples of TRMM monthly fields in analysis of geographic and temporal variations will also be

discussed. Results for 1998 indicate that TRMM has a different ratio of western Pacific to eastern Pacific rainfall than GPCP, perhaps indicating that TRMM's ability to discern the vertical structure of the rain may lead to better estimates in the eastern Pacific. In addition the rainfall anomalies associated with the '98-'99 ENSO event are shown to be larger with the TRMM results as compared to the GPCP analyses.
Author
Climatology; Pacific Ocean; Precipitation (Meteorology); Rain; Tropical Regions; Tropical Meteorology

20000023203 Gerber Scientific, Inc., Reston, VA USA
Laboratory Investigation of Direct Measurement of Ice Water Content, Ice Surface Area, and Effective Radius of Ice Crystals Using a Laser-Diffraction Instrument ***Final Report, 15 May - 31 Oct. 1995***
Gerber, H., Gerber Scientific, Inc., USA; DeMott, P. J., Colorado State Univ., USA; Rogers, D. C., Colorado State Univ., USA; Dec. 28, 1995; 143p; In English
Contract(s)/Grant(s): NAS2-1426; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The aircraft microphysics probe, PVM-100A, was tested in the Colorado State University dynamic cloud chamber to establish its ability to measure ice water content (IWC), PSA, and Re in ice clouds. Its response was compared to other means of measuring those ice-cloud parameters that included using FSSP-100 and 230-X 1-D optical probes for ice-crystal concentrations, a film-loop microscope for ice-crystal habits and dimensions, and an in-situ microscope for determining ice-crystal orientation. Intercomparisons were made in ice clouds containing ice crystals ranging in size from about 10 microns to 150 microns diameter, and ice crystals with plate, columnar, dendritic, and spherical shapes. It was not possible to determine conclusively that the PVM accurately measures IWC, PSA, and Re of ice crystals, because heat from the PVM evaporated in part the crystals in its vicinity in the chamber thus affecting its measurements. Similarities in the operating principle of the FSSP and PVM, and a comparison between Re measured by both instruments, suggest, however, that the PVM can make those measurements. The resolution limit of the PVM for IWC measurements was found to be on the order of 0.001 g/cubic m. Algorithms for correcting IWC measured by FSSP and PVM were developed.
Author
Ice Clouds; Ice; Crystals; Moisture Content; Cloud Chambers; Cirrus Clouds; Crystal Structure

20000024812 Sofia Univ., Faculty of Physics, Bulgaria
Numerical Study of Cloud Microphysics with Three One-Dimensional Dynamics Approaches
Mitzeva, Rumjana, Sofia Univ., Bulgaria; Gerova, Gergana, Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 5-13; In English
Contract(s)/Grant(s): NZ-610; Copyright; Avail: Issuing Activity
Cloud models apply various approximations for description of cloud microphysics and dynamics. The validation of a particular cloud model is tested principally by comparison between model results and observations for appropriate study case. The intercomparison between different cloud models is however also desirable. One of the main topics of the IV Cloud Modelling Workshop held in Clermont Ferrand, France (12 - 16 Aug. 1996) was the comparison of model-generated distributions of water substance as produced by different microphysical approximations used in cloud models. It was suggested to run a highly idealised dynamic cloud model for particular cloud cases. of course it is also interesting to compare the results of different dynamic models using the same microphysical package. In this paper the numerical simulations of 24 June 1992 Colorado hailstorm, using different one-dimensional models, are presented. The differences in the models concern only cloud dynamics and cloud structure. Identical bulk water parametrization of microphysical processes was used in the models. A brief description of the models is given in section 2. Information about the study case is given in section 3. The results from numerical simulations with the models as well as the comparison with field observations are presented in section 4.
Author
Atmospheric Models; Cloud Physics; Clouds (Meteorology); Dynamic Models; Mathematical Models; Climatology; Atmospheric Moisture

20000024813 Bulgarian Academy of Sciences, National Inst. of Meteorology and Hydrology, Sofia, Bulgaria
Two-Dimensional Model of Convective Cloud, Pt. 1, Governing Equations
Stoyanov, S. G., Bulgarian Academy of Sciences, Bulgaria; Christov, C. I., Bulgarian Academy of Sciences, Bulgaria; Todorov, M. D., Technical Univ. of Sofia, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 15-23; In English; Copyright; Avail: Issuing Activity
In this study a two-dimensional time-dependent model is presented as development of several approaches of a convective cloud simulation. Through one-dimensional steady-state model criteria for an assessment of the degree of hail danger of the

convective clouds have been obtained. With later stationary models, two- and three- dimensional, Microphysical conditions of hailstone formation and growth have been studied. Satisfactory results yield the comparative analysis obtained by means of model computations and data from crystalline, bubble and isotope analysis of hailstones. The development of a convective cloud by one-dimensional time-dependent model has been adequately reproduced. The complete joint analysis of the results of measurements and numerical experiments confirms the possibilities of the created models of a successful simulation of the inside cloud processes. The new model development aims to enlarge the numerical models application in convective clouds studying and the connected with them phenomena. Furthermore, the two-dimensional time-dependent model contributes to solving one important task - evaluation of the diffusion of dispersal particles during the artificial transformation of the convective cloud.
Author
Atmospheric Models; Cloud Physics; Clouds (Meteorology); Hail; Mathematical Models; Climate Models; Convection Clouds; Climatology

20000024870 NASA Goddard Space Flight Center, Greenbelt, MD USA
Optimal Scales for Comparing Satellite and Rain-Gauge Rainfall Estimates for Verification Purposes
Bell, Thomas L., NASA Goddard Space Flight Center, USA; Kundu, Prasun K., SM and A Corp., USA; [1999]; 1p; In English; 10th; Satellite Meteorology and Oceanography, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

In spite of all their problems, rain gauges measure rainfall in such a direct way when compared with other methods of estimating rainfall that comparing their totals to satellite estimates remains an essential tool in the validation of satellite products. Some disagreement between averages of satellite data and rain-gauge data is expected because of the very different sampling patterns of the two systems--the satellite provides only occasional snapshots of large areas, whereas rain gauges provide continuous measurements over very small areas. The comparison of the two requires that some quantitative measure be supplied for the amount of disagreement that can be tolerated due to the differences in sampling. As part of an effort to determine the sampling error of satellite averages, a space-time model for rainfall statistics was developed and its parameters fit to radar data from a field experiment conducted near the Inter-Tropical Convergence Zone (ITCZ) in the eastern Atlantic (GATE). Although the model was intended to represent the statistics of relatively large scale fluctuations of rain, it is surprisingly consistent with the very different scales on which rain gauges observe. It can therefore be used to study some of the issues involved with comparing rain-gauge averages to satellite averages. Its implications for the best time and space scales for comparing the two will be discussed.
Author
Estimating; Rain; Rain Gages; Satellite Observation; Variability

20000024892 NASA Goddard Space Flight Center, Greenbelt, MD USA
Further Evaluation of an Emperical Equation for Annual Total Evaporation
Choudhury, Bhaskar J., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

An empirical equation for annual total evaporation based on annual precipitation and net radiation was found to provide evaporation within 10% of the observed values at seven locations within temperate and tropical regions, but it overestimated evaporation by 90% at one location within the tundra region. A synthesis of observations at two other locations within the tundra region gives overestimates of about 65%. A general analysis of observed precipitation, net radiation, and runoff within the tundra region shows that the empirical equation is generally biased to overestimate annual evaporation within the tundra region. A theoretical analysis is being done to understand the reason behind this bias.
Author
Evaporation; Tundra; Hydrology Models; Climate Models; Estimating

20000024909 Naval Postgraduate School, Monterey, CA USA
Summary of Research 1998, Department of Meteorology
Aug. 1999; 51p; In English
Report No.(s): AD-A371881; NPS-09-99-010; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains summaries of research projects in the Department of Meteorology. A list of recent publications is also included which consists of conference presentations and publications, books, contributions to books, published journal papers, technical reports, and thesis abstracts. Research at the Naval Postgraduate School is carried out by faculty in the School's eleven academic departments, seven interdisciplinary groups, and the School of Aviation Safety. This volume contains research summaries for the projects undertaken by faculty in the Department of Meteorology during 1998. Also included is an overview

of the department, faculty listing, a compilation of publications/presentations, and abstracts from theses directed by the department faculty.
DTIC
Meteorology; Research and Development; Navy

20000024925 NASA Goddard Space Flight Center, Greenbelt, MD USA
Improved Algorithm to Estimate Convective and Stratiform Rain from TRMM Microwave Radiometer Data
Prabhakara, C., NASA Goddard Space Flight Center, USA; Iacovazzi, Robert, Jr., Raytheon STX Corp., USA; [1999]; 1p; In English; 80th, 9-14 Jan. 2000, Long Beach, CA, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The rain rates associated with Mesoscale Convective Systems (MCSS) deduced from the Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar (PR) follow the well known log-normal type frequency distribution characteristic of conventional radars and rain gauges. On the other hand, the current microwave radiometer rain retrieval algorithms cannot give good representations of convective and stratiform precipitation. Thus they capture poorly this log-normal character. In particular, this is noticed clearly over land areas. The objective of the present study is to improve TRMM Microwave Imager (TMI) retrievals of convective and stratiform rain to a level comparable to the PR. For this purpose, we have developed a TMI rain retrieval algorithm that depends primarily on the 85 GHz brightness temperatures (Tbs) and their spatial distribution. We emphasize the 85 GHz channel because of its fine footprint size (about 5.5 km) and strong extinction property. The other spectral channels, because they are poorer in these respects, are given less importance. The brightness temperatures and spatial distribution information in the 85 GHz allows us to detect thunderstorms, or cumulonimbus clouds (Cbs), that are in different stages of development, as well as stratiform rain outside of these Cbs. Utilizing our retrieval technique, we have produced maps of convective and stratiform rain for several MCS events over land and ocean that agree well with those given by the PR. On average, the convective and stratiform rain rates given by our technique have an accuracy of about 15 % with respect to those given by the PR.
Author
Algorithms; Mesoscale Phenomena; Rain; Trmm Satellite; Meteorology

20000024932 ENSCO, Inc., Applied Meterology Unit, Cocoa Beach, FL USA
Simulation of a Real-Time Local Data Integration System over East-Central Florida
Case, Jonathan, ENSCO, Inc., USA; November 1999; 60p; In English; Original contains color illustrations
Report No.(s): NASA/CR-1999-208558; NAS 1.26:208558; Rept-99-003; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Applied Meteorology Unit (AMU) simulated a real-time configuration of a Local Data Integration System (LDIS) using data from 15-28 February 1999. The objectives were to assess the utility of a simulated real-time LDIS, evaluate and extrapolate system performance to identify the hardware necessary to run a real-time LDIS, and determine the sensitivities of LDIS. The ultimate goal for running LDIS is to generate analysis products that enhance short-range (less than 6 h) weather forecasts issued in support of the 45th Weather Squadron, Spaceflight Meteorology Group, and Melbourne National Weather Service operational requirements. The simulation used the Advanced Regional Prediction System (ARPS) Data Analysis System (ADAS) software on an IBM RS/6000 workstation with a 67-MHz processor. This configuration ran in real-time, but not sufficiently fast for operational requirements. Thus, the AMU recommends a workstation with a 200-MHz processor and 512 megabytes of memory to run the AMU's configuration of LDIS in real-time. This report presents results from two case studies and several data sensitivity experiments. ADAS demonstrates utility through its ability to depict high-resolution cloud and wind features in a variety of weather situations. The sensitivity experiments illustrate the influence of disparate data on the resulting ADAS analyses.
Derived from text
Real Time Operation; Numerical Weather Forecasting; Data Integration; Computerized Simulation; Meteorology

20000025053 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Solar Reflectance Method for Retrieving Cloud Optical Thickness and Droplet Size Over Snow and Ice Surfaces
Platnick, S., NASA Goddard Space Flight Center, USA; Li, J. Y., NASA Goddard Space Flight Center, USA; King, M. D., NASA Goddard Space Flight Center, USA; Gerber, H., Gerber Scientific, Inc., USA; Hobbs, P. V., Washington Univ., USA; 1999; 33p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cloud optical thickness and effective radius retrievals from solar reflectance measurements are traditionally implemented using a combination of spectral channels that are absorbing and non-absorbing for water particles. Reflectances in non-absorbing channels (e.g., 0.67, 0.86, 1.2 micron spectral window bands) are largely dependent on cloud optical thickness, while longer

wavelength absorbing channels (1.6, 2. 1, and 3.7 micron window bands) provide cloud particle size information. Cloud retrievals over ice and snow surfaces present serious difficulties. At the shorter wavelengths, ice is bright and highly variable, both characteristics acting to significantly increase cloud retrieval uncertainty. In contrast, reflectances at the longer wavelengths are relatively small and may be comparable to that of dark open water. A modification to the traditional cloud retrieval technique is devised. The new algorithm uses only a combination of absorbing spectral channels for which the snow/ice albedo is relatively small. Using this approach, retrievals have been made with the MODIS Airborne Simulator (MAS) imager flown aboard the NASA ER-2 from May - June 1998 during the Arctic FIRE-ACE field deployment. Data from several coordinated ER-2 and University of Washington CV-580 in situ aircraft observations of liquid water stratus clouds are examined. MAS retrievals of optical thickness, droplet effective radius, and liquid water path are shown to be in good agreement with the in situ measurements. The initial success of the technique has implications for future operational satellite cloud retrieval algorithms in polar and wintertime regions.
Author
Arctic Regions; Optical Thickness; Polar Regions; Cloud Cover; Satellite Observation; Clouds (Meteorology); Ice; Snow

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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.

20000021323 Naval Research Lab., Stennis Space Center, MS USA
Effects of Eddy Variability on the Circulation of the Japan/East Sea
Jacobs, G. A., Naval Research Lab., USA; Hogan, P. J., Naval Research Lab., USA; Whitmer, K. R., Sverdrup Technology, Inc., USA; Journal of Oceanography; 1999; Volume 55, pp. 247-256; In English
Report No.(s): AD-A366283; NRL/JA/7323-98-0059; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

The effect of mesoscale eddy variability on the Japan/East Sea mean circulation is examined from satellite altimeter data and results from the Naval Research Laboratory Layered Ocean Model (NLOM). Sea surface height variations from the Geosat-Exact Repeat Mission and TOPEX/POSEIDON altimeter satellites Imply geostrophic velocities. At the satellite crossover points, the total velocity and the Reynolds stress due to geostrophic mesoscale turbulence are calculated. After spatial Interpolation the momentum flux and effect on geostrophic balance Indicates that the eddy variability aids in the transport of the Polar Front and the separation of the East Korean Warm Current (EKWC). The NLOM results elucidate the Impact of eddy variability on the EKWC separation from the Korean coast. Eddy variability is suppressed by either Increasing the model viscosity or decreasing the model resolution. The simulations with decreased eddy variability indicate a northward overshoot of the EKWC. Only the model simulation with sufficient eddy variability depicts the EKWC separating from the Korean coast at the observed latitude. The NLOM simulations Indicate mesoscale Influence through upper ocean-topographic coupling.
Author
Mesoscale Phenomena; Turbulence; Vortices; Variability

20000021389 National Museum of Natural History, Washington, DC USA
Atoll Research Bulletin, Nos. 459-465
Aug. 1999; 252p; In English
Report No.(s): PB2000-102482; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy

Contents include the following: Species Richness of Recent Scleractinia; Atolls as Settlement Landscapes: UJAE, Marshall Islands; Report on Fish Collections From the Pitcairn Islands; Fish Names in Languages of Tonga and Fiji; The Non-Native Vascular Plants of Henderson Island, South Central Pacific Ocean; Revised Vegetation Classification of Turneffe Atoll, Belize; A Microbialite/Algal Ridge Fringing Reef Complex, Highborne Cay, Bahamas.
NTIS
Atolls; Marine Biology

20000021444 California State Water Resources Control Board, Sacramento, CA USA
Review of Single Species Toxicity Tests: Are the Tests Reliable Predictors of Aquatic Ecosystem Community Responses
deVlaming, V.; Norberg-King, T. J.; July 1999; 72p; In English
Report No.(s): PB2000-102378; No Copyright; Avail: National Technical Information Service (NTIS)

This document provides a comprehensive review to evaluate the reliability of single species (also referred to as indicator species) toxicity test results in predicting aquatic ecosystem impacts, also known as the ecological relevance of laboratory single species toxicity tests. Since aquatic ecosystem biological assessments have been performed to determine whether toxicity test results are predictive of biological community impacts, the strengths and limitations of these validation tools have been assessed. Ecological relevance has been analyzed in studies on ambient waters, effluents, and other types of aqueous media. Furthermore, the effectiveness of laboratory single species toxicity tests with individual chemicals in predicting biological community impacts and/or environmental adverse effect concentrations is evaluated. Merits of published criticisms of the predictive effectiveness of single species used in laboratory toxicity tests are analyzed. Also, the question of whether single species used in laboratory toxicity tests are more sensitive than most natural populations is discussed. Alternatives to single species toxicity tests are explored.
NTIS
Toxicity; Predictions; Ecosystems

20000021498 NASA Goddard Space Flight Center, Greenbelt, MD USA
Geodynamic Effects of Ocean Tides: Progress and Problems
Richard, Ray, NASA Goddard Space Flight Center, USA; 1999; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Satellite altimetry, particularly TOPEX/Poseidon, has markedly improved our knowledge of global tides, thereby allowing significant progress on some longstanding problems in geodynamics. This paper reviews some of that progress. Emphasis is given to global-scale problems, particularly those falling within the mandate of the new IERS Special Bureau for Tides: angular momentum, gravitational field, geocenter motion. For this discussion I use primarily the new ocean tide solutions GOT99.2, CSR4.0, and TPXO.4 (for which G. Egbert has computed inverse-theoretic error estimates), and I concentrate on new results in angular momentum and gravity and their solid-earth implications. One example is a new estimate of the effective tidal Q at the M_2 frequency, based on combining these ocean models with tidal estimates from satellite laser ranging. Three especially intractable problems are also addressed: (1) determining long-period tides in the Arctic [large unknown effect on the inertia tensor, particularly for Mf]; (2) determining the global psi_l tide [large unknown effect on interpretations of gravimetry for the near-diurnal free wobble]; and (3) determining radiational tides [large unknown temporal variations at important frequencies]. Problems (2) and (3) are related.
Author
Arctic Regions; Diurnal Variations; Gravitational Fields; Earth Tides; Ocean Currents; Oceanography; Geopotential; Earth Gravitation

20000023224 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mechanism for Surface Warming in the Equatorial Pacific during 1994-95, *1994-1995*
Rienecker, Michele M., NASA Goddard Space Flight Center, USA; Borovikov, Anna, NASA Goddard Space Flight Center, USA; Schopf, Paul S., NASA Goddard Space Flight Center, USA; [1999]; 43p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 622-24-48; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mechanisms controlling the variation in sea surface temperature warm event in the equatorial Pacific were investigated through ocean model simulations. In addition, the mechanisms of the climatological SST cycle were investigated. The dominant mechanisms governing the seasonal cycle of SST vary significantly across the basin. In the western Pacific the annual cycle of SST is primarily in response to external heat flux. In the central basin the magnitude of zonal advection is comparable to that of the external heat flux. In the eastern basin the role of zonal advection is reduced and the vertical mixing is more important. In the easternmost equatorial Pacific the vertical entrainment contribution is as large as that of vertical diffusion. The model estimate of the vertical mixing contribution to the mixed layer heat budget compared well with estimates obtained by analysis of observations using the same diagnostic vertical mixing scheme. During 1994- 1995 the largest positive SST anomaly was observed in the mid-basin and was related to reduced latent heat flux due to weak surface winds. In the western basin the initial warming was related to enhanced external heating and reduced cooling effects of both vertical mixing and horizontal advection associated with weaker than usual wind stress. In the eastern Pacific where winds were not significantly anomalous throughout 1994-1995, only a moderate warm surface anomaly was detected. This is in contrast to strong El Nino events where the SST anomaly is largest in the eastern basin and, as shown by previous studies, the anomaly is due to zonal advection rather than anomalous surface heat flux. The end of the warm event was marked by cooling in July 1995 everywhere across the equatorial Pacific.
Author
Sea Surface Temperature; Air Water Interactions; Ocean Surface; Ocean Models; Ground Wind; El Nino; Anomalies

20000024999 Natural Energy Lab. of Hawaii, Ke-ahole, HI USA

National Defense Center of Excellence for Research in Ocean Sciences ***Final Report***

Sep. 1999; 286p; In English

Contract(s)/Grant(s): MDA972-94-1-0010

Report No.(s): AD-A372156; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

In February 1993, DoD technical needs, combined with ocean technology capability in Hawaii, yielded the National Defense Center of Excellence for Research in Ocean Sciences (CEROS). CEROS was established through a grant from the Defense Advanced Research Projects Agency (DARPA) to the High Technology Development Corporation (HTDC), an agency of the State of Hawaii attached to the Department of Business, Economic Development and Tourism (DEBDT). CEROS was funded. for the purpose of conducting research and development activities of interest to the Department of Defense . . . and . . . to support and stimulate a broad spectrum of research in ocean science in the State of Hawaii." DARPA awarded MDA 972-94-1-0010 for $5,000,000 to HTDC for CEROS in May 1994. Total funding to CEROS for Grant No. MDA 972-94-1-0010 was approximately $18,738,000. This grant supported a core program of thirty-nine projects involving nineteen prime contractors during CEROS FY94, FY95, and FY96. All contracts were complete by the end of June 1999. This report describes the work done under the 1994 grant. Following is an outline of individual projects in the core program, and more detailed information is available in chapters 2 through 27 of this report.

DTIC

Research Management; Oceanography; Marine Environments

20000025026 NASA Goddard Space Flight Center, Greenbelt, MD USA

Ocean Color Data at the Goddard DAAC

March 1999; 4p; In English; Original contains color illustrations

Report No.(s): NASA/NP-1999-03-023-GSFC; NAS 1.83:03-023-GSFC; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The apparent color of the ocean is determined by the interactions of incident light with substances or particles present in the water. The most significant constituents are free-floating photosynthetic organisms (phytoplankton) and inorganic particulates. Phytoplankton contain chlorophyll, which absorbs light at blue and red wavelengths and transmits in the green. Particulate matter can reflect and absorb light, which reduces the clarity (light transmission) of the water. Substances dissolved in water can also affect its color. Observations of ocean color from space, utilizing sensors specially designed to detect the small amount of light radiating from the sea surface, provide a global picture of the patterns of biological productivity in the world's oceans. For that reason, ocean color remote sensing data is a vital resource for biological oceanography. Unlike the limited area of the ocean that can be investigated from a research ship, data from a satellite sensor covers a large region and provides a comprehensive view of the marine environment.

Derived from text

Ocean Surface; Remote Sensing; Satellite Observation; Water Color

20000025048 SACLANT Undersea Research Centre, San Bartolomeo, Italy

A Neutral-Network-Fusion Architecture for Automatic Extraction of Oceanographic Features from Satellite Remote Sensing Imagery

Askari, Farid; Zerr, Benoit; Jun. 1999; 36p; In English

Report No.(s): AD-A371859; SACLANTCEN-SR-306; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes an approach for automatic feature detection from fusion of remote sensing imagery using a combination of neural network architecture and the Dempster-Shafer (DS) theory of evidence. Deterministic or idealized shapes are used to characterize surface signatures of oceanic and atmospheric fronts manifested in satellite remote sensing imagery. Raw satellite images are processed by a bank of radial basis function (RBF) neural networks trained on idealized shapes. The final classification results from the fusion of the outputs of the separate RBF. The fusion mechanism is based on DS evidential reasoning theory. The approach is initially tested for detecting different features on a single sensor and extended to classifying features observed by multiple sensors.

DTIC

Remote Sensing; Neural Nets; Oceanography; Satellite Imagery; Architecture (Computers)

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.

20000021349 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Characterisation of Bacteria by Matrix-Assisted Laser Desorption/Ionisation and Electrospray Mass Spectrometry ***Final Report***
vanBaar, B. L. M., Prins Maurits Lab. TNO, Netherlands; December 1999; 122p; In English
Contract(s)/Grant(s): A98/D/420; TNO Proj. 014.11019
Report No.(s): TD99-0176; PML-1999-A83; Copyright; Avail: Issuing Activity, Hardcopy

Chemical analysis for the characterisation of micro-organisms is rapidly evolving, after the recent advent of new ionisation methods in mass spectrometry: electrospray (ES) and matrix-assisted laser desorption/ionisation (MALDI). These methods allow quick characterisation of micro-organisms, either directly or after minimum sample preparation. This report provides a brief introduction to ES and MALDI mass spectrometry and a discussion of micro-organism characterisation capabilities. Some attention is devoted to the analysis of mixtures of proteins, lipids and other compounds, to the combination of polymerase chain reaction technology and mass spectrometry, and to the analysis of whole bacteria and their lysate. The review of results produced hitherto is concluded with an outlook on future developments.
Author
Chemical Analysis; Bacteria; Microorganisms; Ionization; Procedures

20000021578 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA
Use of Fourier Transform Infrared Spectroscopy in the Detection of Bacteria ***Final Report, Jun. - Oct. 1998***
Lochner, J. M., Edgewood Research Development and Engineering Center, USA; Samuels, Alan P., Edgewood Research Development and Engineering Center, USA; Paterno, Dorothea A., Edgewood Research Development and Engineering Center, USA; Dec. 1999; 21p; In English
Report No.(s): AD-A372492; ECBC-TR-069; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In recent years, analytical techniques such as Fourier Transform Infrared Spectroscopy (FTIR) and Mass Spectrometry hyphenated techniques such as GC/MS and HPLC/MS have been used to characterize microbiological materials. Instrumentation has improved over the years, because W. W. Coblentz initiated the use of IR for these types of studies around 1911. Recently, we have investigated the use of a Nicolet/Spectra Tech accessory called the ”Thunderdome(TM)” to characterize/ differentiate various biological media. We discuss the utility of this data in assessing the applicability of active and passive FTIR as a detection and discrimination tool for the remote sensing of hazardous biological materials. The Thunderdome(TM) is a single reflectance Horizontal Attenuated Total Internal Reflectance (HATR) accessory that has a spherical sampling surface, usually a Germanium crystal, and is perfect for strong absorbers or ”rugged” sampling surfaces. Time consuming sample preparation processes are eliminated. Samples were grown on nutrient agar media and cultured for 2 days. Samples were applied directly to the Thunderdome(TM) with a sterile cotton swab. The FTIR spectra was generated on the following bacteria: Agar (blank); Bacillus subtilis (vegetative); Bacillus subtilis (spores); Ochrobactrum anthropi (a gram negative organism); and Staphylococcus aureus (a gram positive organism). A Nicolet 800 FTIR instrument with a 680 Workstation was used. The Thunderdome(TM) is found to be a quick, forgiving accessory that allows samples to be applied with minimal effort and spectra to be generated in less than 1 min.
DTIC
Infrared Spectroscopy; Fourier Transformation; Liquid Chromatography; Microbiology; Remote Sensing; Gas Chromatography

20000024842 Colorado Univ., Boulder, CO USA
Effects of Space Flight, Clinorotation, and Centrifugation on the Growth and Metabolism of Escherichia coli
Brown, Robert B.; Jul. 28, 1999; 218p; In English
Report No.(s): AD-A372320; FY99-545; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Previous experiments have shown that space flight stimulates bacterial growth and metabolism. An explanation for these results is proposed, which may eventually lead to improved terrestrial pharmaceutical production efficiency. It is hypothesized that inertial acceleration affects bacterial growth and metabolism by altering the transport phenomena in the cells external fluid environment. It is believed that this occurs indirectly through changes in the sedimentation rate acting on the bacteria and buoyancy-driven convection acting on their excreted by-products. Experiments over a broad range of accelerations consistently

supported this theory. Experiments at I g indicated that higher concentrations of excreted by products surrounding bacterial cells result in a shorter lag phase. Nineteen additional experiments simulated 0 g and 0.5 g using a clinostat, and achieved 50 g, 180 g, and 400 g using a centrifuge. These experiments showed that final cell density is inversely related to the level of acceleration. The experiments also consistently showed that acceleration affects the length of the lag phase in a non-monotonic, yet predictable, manner. Additional data indicated that E. coli metabolize glucose less efficiently at hypergravity, and more efficiently at hypogravity. A space-flight experiment was also performed. Samples on orbit had a statistically significant higher final cell density and more efficient metabolism than did ground controls. These results. which were similar to simulations of 0 g using a clinostat, support the theory that gravity only affects bacterial growth and metabolism indirectly, through changes in the bacteria's fluid environment.
DTIC
Centrifuging; Metabolism; Escherichia

20000024847 Yale Univ., Dept. of Molecular Biophysics, New Haven, CT USA
Archaea: From Genomics to Physiology and the Origin of Life
Vothknecht, Ute C., Yale Univ., USA; Tumbula, Debra L., Yale Univ., USA; Trends in Cell Biology; April 1999; ISSN 0962-8924; Volume 9, pp. 159-161; In English; Bridging the Gap Between Bacteria and Eukarya, 9-14 Jan. 1999, Taos, NM, USA
Contract(s)/Grant(s): NAG2-6024; Copyright; Avail: Issuing Activity

This document represents a report on a meeting about Archaea. The meeting had an unusually diversified mix of topics all related to Archaea highlighting their differences and similarities with other kingdoms of life. Thus, a large number of scientists from others areas of biology participated in this conference. One-third of the speakers (11 of 33) represented laboratories whose main interests have not been archaea and who have not previously participated in similar symposia or workshops. Thus, this symposium provided a unique opportunity for archaeal researchers to interact in a wider forum. Because of the broad range of topics covered, the conference also introduced many of the participants to new areas of archaeal research. The discussions of genomics, molecular mechanisms of transcription, metabolic pathways and evolution were at a very high level. Talks and posters provided detailed discussions of the state of the current knowledge in RNA processing, transcriptional initiation, chromatin structure, aminoacyl-tRNA synthetases, autotrophic CO2 fixation, Upid biosynthesis and a wide range of other topics. In addition to providing overviews, major areas of scientific argument were clearly delineated, particularly in the discussions of genomics and evolution. Some of the questions raised included: how representative are individual gene trees of organismal evolution, how prevalent is horizontal evolution, how reliable are functional assignments in genomics? On these topics, the different points of view were well represented. The future of any field depends on the enthusiasm and intellectual engagement of young scientists working in the area. Therefore, the participation of 29 graduate and postdoctoral students (out of about 135 participants) was a highlight of the meeting. This was the consequence of funding contributions by NSF and NASA.
Author
Biological Evolution; Ribonucleic Acids; Archaebacteria

20000024888 Marquette Univ., Milwaukee, WI USA
Bion 11 Spaceflight Project: Effect of Weightlessness on Single Muscle Fiber Function in Rhesus Monkeys ***Final Report***
Fitts, Robert H., Marquette Univ., USA; Romatowski, Janell G., Marquette Univ., USA; Widrick, Jeffrey J., Marquette Univ., USA; DeLaCruz, Lourdes, Marquette Univ., USA; [1999]; 2p; In English
Contract(s)/Grant(s): NAG2-636; No Copyright; Avail: Issuing Activity; Abstract Only

Although it is well known that microgravity induces considerable limb muscle atrophy, little is known about how weightlessness alters cell function. In this study, we investigated how weightlessness altered the functional properties of single fast and slow striated muscle fibers. Physiological studies were carried out to test the hypothesis that microgravity causes fiber atrophy, a decreased peak force (Newtons), tension (Newtons/cross-sectional area) and power, an elevated peak rate of tension development (dp/dt), and an increased maximal shortening velocity (V(sub o)) in the slow type I fiber, while changes in the fast-twitch fiber are restricted to atrophy and a reduced peak force. For each fiber, we determined the peak force (P(sub o)), V(sub o), dp/dt, the force-velocity relationship, peak power, the power-force relationship, the force-pCa relationship, and fiber stiffness. Biochemical studies were carried out to assess the effects of weightlessness on the enzyme and substrate profile of the fast- and slow-twitch fibers. We predicted that microgravity would increase resting muscle glycogen and glycolytic metabolism in the slow fiber type, while the fast-twitch fiber enzyme profile would be unaltered. The increased muscle glycogen would in part result from an elevated hexokinase and glycogen synthase. The enzymes selected for study represent markers for mitochondrial function (citrate synthase and 0-hydroxyacyl-CoA dehydrogenase), glycolysis (Phosphofructokinase and lactate dehydrogenase), and

fatty acid transport (Carnitine acetyl transferase). The substrates analyzed will include glycogen, lactate, adenosine triphosphate, and phosphocreatine.
Author
Biochemistry; Microgravity; Muscles; Muscular Function; Physiology; Weightlessness; Twitching; Bioastronautics

20000024898 Fourth Military Medical Univ., Dept. of Aerospace Philosophy, Xi'an, China
Differentiated Remodeling Changes of Medium-Sized Arteries from Different Body Parts in Tail-Suspended Rats and Their Reversibility
Mao, Qin-Wen, Fourth Military Medical Univ., China; Zhang, Li-Fan, Fourth Military Medical Univ., China; Ma, Jin, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 92-96; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The aim of the present study was to test whether medium-sized arteries in different body parts are differentially directed to achieve stimulus-specific remodeling to adapt local hemodynamic changes induced by tail-suspension, and to examine whether these structural changes are reversible. Morphological changes of femoral, anterior tibial, common carotid, and basilar arteries from 4 weeks tail-suspended (SUS-4), 1 week recovered (REC-1), and control (CON) rats were studied using van Gieson-Orcein staining method. For the hindquarter arteries, like the femoral and anterior tibial arteries, the lumen diameter (d) and medial tissue area (A) of SUS-4 group were significantly decreased (P is less than 0. 05, P is less than 0. 01) as compared with that of CON group, and that of REC-1 group were not fully recovered though the differences were not significant. With respect to arteries in the neck region and the brain, the remodeling changes were just in an opposite direction. In SUS-4 group, the d and A of both common carotid and basilar arteries were significantly increased (P is less than 0. 05, Pis less than 0. 01) as compared with that of CON, and not fully restored after 1 week recovery. The structures of medium-sized arteries in different body parts remodel differentially in response to local hemodynamic changes during simulated weightlessness and these changes were reversible.
Author
Arteries; Cardiovascular System; Hemodynamic Responses; Rats; Bioastronautics; Aerospace Medicine; Weightlessness Simulation

20000024899 Fourth Military Medical Univ., Dept. of Aerospace Physiology, Xi'an, China
Echocardiographic Assessment of Left Ventricular Structure and Function After Simulated Weightlessness in Rats
Bao, Jun-Xiang, Fourth Military Medical Univ., China; Zhang, Li-Fan, Fourth Military Medical Univ., China; Shang, Hui-Hua, Fourth Military Medical Univ., China; Yu, Zhi-Bin, Fourth Military Medical Univ., China; Qian, Yun-Qiu, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 88-91; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective was to investigate whether the changes in rat after simulated weightlessness are similar to those in astronauts after flight. The effects of 4 weeks tail-suspension on left ventricular structure and function in rats were examined by echocardiography. After 4 weeks of simulated weightlessness, the thickness of both the anterior and posterior wall in left ventricle (LV) showed a general trend of decrease, but these changes were not statistically significant; the end-systolic and enddiastolic internal dimensions (ESD and EDD respectively) of LV decreased significantly) and the endsystolic volume, end-diastolic volume and stroke volume (ESV, EDV and SV respectively) were all reduced; so did the relevant indices of them. There were no significant differences in ejection fraction (EF) and fractional shortening (FS) between the tail-suspended and control groups. The left ventricular mass (LVM) and its index (LVMI) were decreased. The peak velocities of blood flow of aorta, pulmonary artery and mitral valve did not show any significant change after simulated weightlessness. Medium-term simulated weightlessness may lead to a significant decrease in left ventricular internal dimension, ventricular volume, and mass, and a trend of decrease in mean left ventricular wall thickness. These changes in rats are similar to those observed in astronauts postflight.
Author
Aorta; Arteries; Astronauts; Heart Function; Heart Valves; Rats; Weightlessness Simulation; Aerospace Medicine

20000024900 Institute of Aviation Medicine, Beijing, China
Effects of Tea Polyphenols on Cardiac Function and Myocardial Ultrastructure in Rats after Repeated +Gz Stress
Zhan, Hao, Institute of Aviation Medicine, China; Dong, Hua-Jin, Academy of Military Medical Sciences, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 79-83; In English
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To observe the effects of tea polyphenols (TP) on cardiac function and myocardial ultrastructure in rats after repeated +10 Gz stress. In this study twenty four male Wistar rats were randomly divided into three groups (n = 8 each): group A (control), group B (+10 Gz), group C (+Gz with TP). Group B and C were repeatedly exposed to +10 Gz (each for 30 s, onset rate about 0.5 G/s, 3 times/day with +1 Gz 1 min intervals, 3 days/week, 4 weeks in total), but group A was only submitted to +1 Gz. TP (200 mg./kg(exp -1)) was given orally to group C about 1 hour prior to the +Gz experiment, and distilled water was given to group A and B. The function of the isolated rat working hearts and myocardial ultrastructure were observed. The results were that a significant decrease of left ventricular systolic pressure (LVSP) and injury of myocardial structure in rats were demonstrated after repeated +10 Gz stress. But TP could remarkably elevate the LVSP and improve myocardial ultrastructural injury in +10 Gz stressed rats. These results indicated that repeated high G exposure may produce cardiac structural and functional injuries in rats which might be partly related to free radical metabolism; and antioxidant TP had significant protective effects on the hearts of +Gz stressed rats.
Author
Acceleration Stresses (Physiology); Antioxidants; Heart Function; Myocardium; Phenols

20000025052 Ohio State Univ., Dept. of Plant Biology, Columbus, OH USA
Development of Gravity Sensitive Plant Cells (Ceratodon) in Microgravity ***Final Report, 1 May 1998 - 31 Aug. 1999***
Sack, Fred D., Ohio State Univ., USA; [1999]; 6p; In English
Contract(s)/Grant(s): NAG2-1217; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Protonemata of the moss Ceratodon are tip-growing cells that grow up in the dark. This cell type is unique compared to cells in almost any other organism, since the growth of the plant cell itself is completely oriented by gravity. Thus, both the processes of gravity sensing and the gravity response occur in the same cell. Gravity sensing appears to rely upon amyloplasts (starch-filled plastids) that sediment. This sedimentation occurs in specific zones and plastid zonation is complex with respect to plastid morphology, distribution, and gravity. Microtubules restrict the extent of plastid sedimentation (i.e., they are load-bearing). Light also is important since apical cells have a phytochrome-based positive phototropism, light quality influences plastid zonation and sedimentation (photomorphogenesis), and red light suppresses gravitropism at higher but not lower light intensities. Many of these processes were examined in a 16 day spaceflight experiment, ”SPM-A” space moss” or ”SPAM)) on STS-87 that landed in December, 1997. The work described here involves the definition of a second flight experiment that builds upon the data and questions arising from STS-87. Effort was directed towards further definition of an experiment for the Shuttle (dubbed ”SOS” for ”Son of SPAM”). Our current target is STS 107 that is scheduled to fly in January 2001. This definition addressed two goals of the STS107 experiment. The goals of the current experiment were to determine whether the cytoskeleton plays a role in maintaining and generating an apical (non-random) plastid distribution in microgravity and to determine the development and extent of clockwise spiral tip-growth in microgravity.
Derived from text
Gravitropism; Microgravity; Phototropism; Bryophytes; Gravitational Effects; Cells (Biology); Vegetation Growth; Exobiology

20000025187 NASA Langley Research Center, Hampton, VA USA
Dynamics of Active Separation Control at High Reynolds Numbers
Pack, LaTunia G., NASA Langley Research Center, USA; Seifert, Avi, Tel-Aviv Univ., Ramat-Aviv, Israel; [2000]; 16p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0409; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of active flow control experiments were recently conducted at high Reynolds numbers on a generic separated configuration. The model simulates the upper surface of a 20% thick Glauert-Goldschmied type airfoil at zero angle of attack. The flow is fully turbulent since the tunnel sidewall boundary layer flows over the model. The main motivation for the experiments is to generate a comprehensive data base for validation of unsteady numerical simulation as a first step in the development of a CFD design tool, without which it would not be possible to effectively utilize the great potential of unsteady flow control. This paper focuses on the dynamics of several key features of the baseline as well as the controlled flow. It was found that the thickness of the upstream boundary layer has a negligible effect on the flow dynamics. It is speculated that separation is caused mainly by the highly convex surface while viscous effects are less important. The two-dimensional separated flow contains unsteady waves centered on a reduced frequency of 0.9, while in the three dimensional separated flow, frequencies around a reduced frequency of 0.3 and 1 are active. Several scenarios of resonant wave interaction take place at the separated shear-layer and in the pressure recovery region. The unstable reduced frequency bands for periodic excitation are centered on 1.5 and 5, but these reduced frequencies are based on the length of the baseline bubble that shortens due to the excitation. The conventional works well for

the coherent wave features. Reproduction of these dynamic effects by a numerical simulation would provide benchmark validation.
Author
Active Control; Airfoils; Boundary Layer Flow; Fluid Dynamics; High Reynolds Number; Three Dimensional Flow; Turbulence; Zero Angle of Attack

20000025201 Idaho Univ., Dept. of Biological Sciences, Moscow, ID USA
Rat Gestation During Space Flight: Outcomes for Dams and Their Offspring Born After Return to Earth
Wong, Andre M., Idaho Univ., USA; DeSantis, Mark, Idaho Univ., USA; Integrative Physiological and Behavioral Science; Oct.-Dec. 1997; Volume 32, No. 4, pp. 322-342; In English
Contract(s)/Grant(s): NCC3-862; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Sprague-Dawley rats were studied to learn whether gestation in the near-zero gravity, high radiation environment of space impacts selected mammalian postnatal events. Ten rats spent days nine to twenty of pregnancy aboard the space shuttle orbiter Atlantis (STS-66). Their movement was studied shortly after return to Earth; subsequently, several of their offspring were cross-fostered and examined through postnatal day 81 (P81) for whole body growth and somatic motor development. Values for the flight animals were compared to ground-based control groups. Relative to controls, the pregnant flight rats showed a marked paucity of locomotion during the first few hours after returning to Earth. There was greater likelihood of perinatal morbidity for the offspring of flight dams when compared to the control groups. Whole body weight of surviving offspring, averaged for each group separately, showed typical sigmoidal growth curves when plotted against postnatal age. The flight group for our study had a larger ratio of female to male pups, and that was sufficient to account for the lower average daily weight gained by the flight animals when compared to the control groups. Walking was universally achieved by P13 and preceded eye opening, which was complete in all pups by P17. Thus, both of these developmental horizons were attained on schedule in the flight as well as the control rats. Characteristic changes were observed in hind limb step length and gait width as the pups grew. These patterns occurred at the same time in each group of rats. Therefore, prenatal space flight from days nine to twenty of gestation did not interfere with the establishment of normal patterns for hind paw placement during walking.
Author
Embryology; Microgravity; Weightlessness; Ontogeny; Biogeny; Bioastronautics

52
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.

20000021105 Washington Univ., Grant and Contract Services, Seattle, WA USA
Telemedical Portable Ultrasound ***Final Report, 1 Jul. 1997-30 Sep. 1999***
Carter, Stephen J.; Stewart, Brent K.; Oct. 1999; 161p; In English
Contract(s)/Grant(s): DAMD17-97-1-7258
Report No.(s): AD-A371318; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of this project has been to develop a small hand-held self-contained battery powered diagnostic ultrasound (US) unit that would be highly transportable and relatively easy to use in the context of combat casualty care. The primary goal is to decrease the incidence of exsanguination on the battlefield secondary to intra-abdominal bleeding (hemoperitoneum) from blunt abdominal trauma (BAT). The scope includes telemedicine capability allowing remote diagnosis and direction as needed by a medic in the field using a variety of transmission modes (satellite to Internet). This has resulted in the development of a DARPA prototype unit, and a commercially available hand-held self- contained diagnostic ultrasound unit (SonoSite 180) weighing about 5 lb. and having telemedicine capability. Evaluations by experts have rated the unit to have good diagnostic image quality similar to a mid-range clinical diagnostic unit. The ability to get a good quality sophisticated portable US unit to the soldier/patient in a remote setting regardless of location, and to be able to transmit the image to an expert for remote diagnosis as needed, is of major significance in triage evaluation.
DTIC
Medical Services; Telemedicine; Portable Equipment; Clinical Medicine; Hemorrhages; Image Resolution

20000021161 American Coll. of Sports Medicine, Indianapolis, IN USA

Conference Support: Physical Activity in the Prevention and Treatment of Obesity and its Co-Morbidities ***Final Report, 15 Jun. 1999-14 Nov. 1999***

Kuiper, Sandra; Nov. 1999; 182p; In English

Contract(s)/Grant(s): DAMD17-99-1-9476

Report No.(s): AD-A371316; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Partial Contents: Physical Activity and Obesity: American College of Sports Medicine Consensus Conference, Introductory comments to the consensus on physical activity and obesity, Physical activity in the prevention and treatment of obesity and its co-morbidities: evidence report of independent panel to assess the role of physical activity in the treatment of obesity and its co-morbidities, The obesity epidemic in children and adults: current evidence and research issues, Overview of the determinants of overweight and obesity: current evidence and research issues, Assessment of physical activity level in relation to obesity: current evidence and research issues, Levels of physical activity and inactivity in children and adults in the USA: current evidence an research issues, Contribution of a sedentary lifestyle and inactivity to the etiology of overweight and obesity: current evil research issues, Physical activity in the prevention of obesity: current evidence and research issues.

DTIC

Obesity; Etiology; Human Beings; Physical Exercise

20000021201 Colorado Univ., Health Science Center, Denver, CO USA

Women at Altitude: Effects of Menstrual Cycle Phase and Alpha-Adrenergic Blockade on High Altitude Acclimatization ***Final Report, 22 Sep. 1995 - 21 Sep. 1999***

Moore, Loma G.; Oct. 1999; 71p; In English

Contract(s)/Grant(s): DAMD17-95-C-5110

Report No.(s): AD-A371312; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Three field studies were conducted under the award. The purpose of the first year's studies was to examine the effect of the menstrual cycle on acclimatization to high altitude (4300 m) in healthy, normally menstruating women. Twenty women were studied in the follicular and luteal phases of the menstrual cycle while residing at sea level and again in either the follicular or the luteal phase during the course of a sojourn in the US Army Research institute of Environmental Medicine (USARIEM) laboratory on the summit of Pikes Peak, CO (4300 m). The second year's studies were conducted at USARIEM to determine the role of alpha-I adrenergic activity and its interaction with menstrual cycle phase in early altitude acclimatization. Fifteen women were exposed to an effective altitude of 4300 m in a hypobaric chamber for 52 hr on two occasions, once while being treated with an alpha -1 blocker (prazosin) and once while taking a placebo. Cycle phase was the same (follicular or luteal) during the blocked and unblocked studies for each subject. Sea level studies were performed prior to the altitude exposure. In year three, the purpose of the study was to determine the role of alpha-I adrenergic activity and its interaction with cycle phase during altitude acclimatization. Sixteen women were divided into two groups, half treated with an alpha-I blocker (prazosin) and the remaining half with placebo.

DTIC

Aerospace Medicine; Menstruation; Altitude Acclimatization; Antiadrenergics; Sympathetic Nervous System

20000021213 Institute of Space Medico-Engineering, Beijing China

Space Medicine and Medical Engineering (Hangtian Yixue yu Yixue Gongcheng), Volume 12, No. 4, August 1999

Wei, J.; Aug. 1999; 88p; In Mixed

Report No.(s): PB2000-102517; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Partial Contents: Biochemical Changes of Plasma in Paratroops after Parachuting: A Preliminary Investigation; Ultrastructural Changes of Arterial Wall from Different Body Parts of Rats during Simulated Weightlessness; Computer Simulation of Cardiovascular Response to Lower Body Negative Pressure; Effects of Acute Mild and Moderate Hypoxia on Human Short Memory; Development of a Multi-channel Physiological Telemetry System; Thermodynamic Analysis of Saturation Degree of O2 in Myoglobin and Hemoglobin; Telemedicine--Technology, Application, Evaluation and Prospect.

NTIS

Aerospace Medicine; Telemedicine; Biotelemetry

20000021240 Old Dominion Univ., Dept. of Mechanical Engineering, Norfolk, VA USA

Thermodynamic Modeling and Analysis of Human Stress Response ***Final Report, period ending 21 Oct. 1999***

Boregowda, S. C., Old Dominion Univ., USA; Tiwari, S. N., Old Dominion Univ., USA; February 2000; 204p; In English

Contract(s)/Grant(s): NCC1-254; NAG1-363

Report No.(s): ODURF-163621; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

A novel approach based on the second law of thermodynamics is developed to investigate the psychophysiology and quantify human stress level. Two types of stresses (thermal and mental) are examined. A Unified Stress Response Theory (USRT) is developed under the new proposed field of study called Engineering Psychophysiology. The USRT is used to investigate both thermal and mental stresses from a holistic (human body as a whole) and thermodynamic viewpoint. The original concepts and definitions are established as postulates which form the basis for thermodynamic approach to quantify human stress level. An Objective Thermal Stress Index (OTSI) is developed by applying the second law of thermodynamics to the human thermal system to quantify thermal stress or dis- comfort in the human body. The human thermal model based on finite element method is implemented. It is utilized as a ”Computational Environmental Chamber” to conduct series of simulations to examine the human thermal stress responses under different environmental conditions. An innovative hybrid technique is developed to analyze human thermal behavior based on series of human-environment interaction simulations. Continuous monitoring of thermal stress is demonstrated with the help of OTSI. It is well established that the human thermal system obeys the second law of thermodynamics. Further, the OTSI is validated against the experimental data. Regarding mental stress, an Objective Mental Stress Index (OMSI) is developed by applying the Maxwell relations of thermodynamics to the combined thermal and cardiovascular system in the human body. The OMSI is utilized to demonstrate the technique of monitoring mental stress continuously and is validated with the help of series of experimental studies. Although the OMSI indicates the level of mental stress, it provides a strong thermodynamic and mathematical relationship between activities of thermal and cardiovascular systems of the human body.

Author

Thermal Stresses; Models; Stress Analysis; Stress (Psychology); Stress (Physiology); Human Behavior; Environment Simulation

20000021264 Academy of Sciences of the Ukraine, Cybermetycy Center, Kiev, Ukraine

Development of a Hemodynamics Computer Model of Human Tolerance to +Gz Accelerations

Grygoryan, R. D., Academy of Sciences of the Ukraine, Ukraine; Oct. 21, 1999; 64p; In English

Contract(s)/Grant(s): F61708-97-W-0253

Report No.(s): AD-A370016; SPC-97-4058; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The work presented in this report related to the last class of models. The exclusive side of this development is that in fact it is the first attempt in World practice when was aimed to create both a special problem-oriented mathematical model complex and a special software oriented to physiologist-researcher to solve by theoretically way practically all of problems which might be arise during development and test of new methods of human protection under rapid and gradual accelerations. This report describes developed original mathematical models and also gives the information necessary for user (physiologist) to let him to be able to do computer simulation experiments. As to inside structure of computational algorithms and software, they are not described here because of such an information was not required in contract by customers of development.

Derived from text

Hemodynamics; Blood Circulation; Computerized Simulation; Algorithms; Computer Programs; Mathematical Models; Human Tolerances

20000021272 Naval Health Research Center, Human Performance Dept., San Diego, CA USA

Organizational Influences on Gender Differences in Stress and Strain Aboard US Navy Ships ***Final Report, Dec. 1994 - Dec. 1997***

Vickers, Ross R., Jr., Naval Health Research Center, USA; Martin, James A., Bryn Mawr Coll., USA; November 1998; 46p; In English

Report No.(s): AD-A370130; Rept-98-33; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Previous research has shown that women assigned to shipboard duty in the U.S. Navy generally report only slightly higher psychological stress and strain than their male shipmates. However, average trends might mask substantial gender differences between selected groups of and women. The present study investigated whether ship assignment, Navy rating, or previous deployment experience was related to the magnitude of gender differences in stress.

Author

Stress (Psychology); Females; Males; Navy

20000021278 Pennsylvania State Univ., University Park, PA USA

Strategies for Optimizing Strength, Power, and Muscle Hypertrophy in Women: Contribution of Upper Body Resistance Training ***Final Report, 21 Aug. 1995-1 Oct. 1999***

Kraemer, William J.; Nov. 1999; 184p; In English

Contract(s)/Grant(s): DAMD17-95-C-5069

Report No.(s): AD-A371349; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

To determine the performance and physiological effects of various physical conditioning programs in women, total body, upper-body resistance training groups, field training and aerobic training groups (n = 11 to 21) were examined over 6 months. A normative group of men (n=100) were also tested. Adaptations in muscular strength, size, endocrine function, and immune cell changes can be seen in three months of training. Training responses are very specific to the type of program used, the movements trained, and the way exercises are performed in the training session (e.g., slow versus explosive). It appears that a periodized resistance training program using loads from is less than or equal to8 RM and performs explosive exercises is the most effective in eliciting gains in all fitness and military task tests. An aggressive field training program utilizing explosive plyometrics and partner exercises would be effective maintenance program in the field. Load carriage capabilities in resistance trained women equaled the men's. Aerobic training alone is not effective in making gains in any of the military performance tasks. A total training program is effective to enhance physical performance in military tasks without any direct practice of the task (e.g., box lift, ruck sack carriage) reducing risk of injury.

DTIC

Physiological Effects; Physical Fitness; Muscular Strength; Endocrinology; Human Beings

20000021306 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Zeist, Netherlands

Literature Study on the Influence of Exhaustive Exercise on Gastrointestinal Symptoms and Immune Response ***Final Report Literatuuronderzoek Naar de Invloed van Zware Inspanning op Maagdarmklachten en Immuunstatus***

Welten, D. C., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; November 1999; 19p; In Dutch

Contract(s)/Grant(s): A97/D/148; DO-13504; TNO Proj. 20240.01.01

Report No.(s): TD99-0417; TNO-V99.1005; Copyright; Avail: Issuing Activity, Hardcopy

An orientating literature search was carried out to study the influence of exhaustive exercise on gastrointestinal symptoms and immuno-suppression. Besides, the influence of nutrition on gastrointestinal problems and increased risk of infection was examined, as well as the effect of duration and intensity of the exercise on these physiological problems. In addition, based on existing literature, it was studied whether military personnel of the Royal Land Force conduct the same type of activities regarding duration and intensity.

Author

Gastrointestinal System; Immunity; Infectious Diseases; Physiological Responses; Literature; Bibliographies

20000021322 Army Research Inst. of Environmental Medicine, Military Nutrition and Biochemistry Div., Natick, MA USA

Artificial Human Skin: Cytokine, Prostaglandin, Hsp70 and Histological Responses to Heat Exposure

Bowers, Wilbert, Army Research Inst. of Environmental Medicine, USA; Blaha, Michael, Army Research Inst. of Environmental Medicine, USA; Alkhyyat, Ahmad, Army Research Inst. of Environmental Medicine, USA; Sankovich, James, Army Research Inst. of Environmental Medicine, USA; Kohl, John, Army Research Inst. of Environmental Medicine, USA; Wong, Geraldine, StressGen Biotechnologies Corp., Canada; Patterson, Donna, Army Research Inst. of Environmental Medicine, USA; Journal of Dermatological Science; 1999; ISSN 0923-1811; Volume 20, pp. 172-182; In English

Report No.(s): AD-A366226; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Artificial human skin, Skin (keratinocytes and fibroblasts) and EpiDerm (keratinocytes), was used to determine heat-induced release/accumulation of mediators of injury and repair. Skin was exposed to 37 or 41-45 C for 90 min, followed by 37 C for 22.5 h. Media were analyzed for interluekin-1alpha (IL-1alpha), prostaglandin-E2 (PGE2), thromboxane-B2 (TXB2) and nuclear matrix apparatus protein (NMAP, viability). Specimens were taken for microscopy. Media and lysates from Skin and EpiDerm (37 and 45 C) were analyzed for IL-1alpha, its soluble receptor (sIL-1RII), receptor antagonist (IL-1Ra), interleukin-6 (IL-6) and heat shock protein-70A (lysates only). Significant release of IL-1alpha and PGE2 was detected only above 43 C, where viability deteriorated and histological damage (especially to keratinocytes) was observed. With both skin products, sIL-1RII release was heat-depressed. IL-1alpha and IL-1Ra were elevated in media and IL-1Ra appeared to lower the bioactivity of IL-1alpha Heat depressed IL-6 release from Skin fibroblasts. IL-6 production and release were negligible with EpiDerm. Heat increased Hsp-70A in both products. We conclude keratinocytes and fibroblasts are not primary cytokine and prostaglandin sources in heatstroke (

is less than 44 C) but could be in evaporative cooling failure. focal hot spots, or systemic responses. Levels of IL-1Ra, PGE2 and Hsp70A may be important markers of cell status.
Author
Epidermis; Fibroblasts; Tissues (Biology); Temperature Effects; Thermal Shock

20000021354 Aeromedical Inst., Soesterberg, Netherlands
Ear Pulse Waveform Parameters during the Gradual Onset Centrifuge Training Profile ***Interim Report***
Holewijn, M., Aeromedical Inst., Netherlands; vanderBurgt, J., Aeromedical Inst., Netherlands; Kuijper, A., Aeromedical Inst., Netherlands; June 1999; 34p; In English
Contract(s)/Grant(s): A98/KLu/03
Report No.(s): TD99-0418; AMI-1999-K2; Copyright; Avail: Issuing Activity

During regular centrifuge training at the Aeromedical Institute the ear photoplethysmogram and the ECG of 15 (candidate) pilots were measured. The main goal of present study was to evaluate the use of the ear pulse waveform (ear pulse) as a potential feedback parameter of a pilot's head level blood pressure during accelerations. From the ear pulse waveform, the amplitude of the pulse and the pulse transit time (FM of each pulse were determined. The results showed clearly that the amplitude of the ear pulse waveform decreased and the PTT increased with increasing acceleration level during a centrifuge run. On basis of the results of this study it is concluded that the ear pulse can be implemented as a feedback parameter for PLL onset. In order to implement the ear pulse waveform as a standard feedback signal during centrifuge training the reliability of the signal must be evaluated under different G-onset rates and with pilots performing an anti-G straining maneuver. Specially, the delay between the changes in the ear pulse waveform and changes in head level blood pressure must investigated under higher G-onset rates. So, the ear pulse wave form changes will have to be correlated with continuously measured blood pressure.
Author
Antigravity; Ear; Feedback; Pressure Heads; Transit Time; Pulse Duration; Waveforms

20000021359 Institute for Human Factors TNO, Soesterberg, Netherlands
The Influence of Inspiration Resistance on Performance during Graded Exercise Tests ***Final Report De Invloed van (In)Ademweerstand op de Preststie Tijdens Maximale Inspanningstests***
Heus, R., Institute for Human Factors TNO, Netherlands; denHartog, E. A., Institute for Human Factors TNO, Netherlands; Kistemaker, J. A., Institute for Human Factors TNO, Netherlands; vanDijk, W. J., Institute for Human Factors TNO, Netherlands; Aug. 26, 1999; 24p; In English
Contract(s)/Grant(s): A98/KL/335; TNO Proj. 789.2
Report No.(s): TD99-0336; TM-99-A058; Copyright; Avail: Issuing Activity

Due to more stringent requirements to protect military personnel against hazardous gases, the inspiration resistance of the present generation of gas masks tends to increase. A former study with a new type of industrial canister proved that these canisters do not give problems during short-term heavy exercise and not during long-term moderate exercise. However the question remains how much the inspiration resistance may increase without giving problems during military operations. That is why a study has been carried out to test the effects of three levels (0, 24; 1,4 en 8,3 kPa.s /l) of inspiration resistance. Subjects performed a graded exercise test with and without these three levels of inspiration resistance on a cycle ergometer. Measured were e.g. oxygen consumption, heart rate, time to exhaustion and external power. The results of these experiments showed that inspiration resistance led to a reduction of time to exhaustion (TTE): without inspiration resistance the mean TTE was 11.9 min, the three levels of resistance gave the following mean TTE's (10.7, 7.8 and 2.7 min). Time to exhaustion can be predicted very well when physical fitness (V(sub O(sub 2))-max) of the subject and inspiration resistance are known parameters. Energy expenditure was higher with breathing resistance, but that there was no difference between the three selected resistance levels. Other breathing parameters as ventilation, tidal volume, expiration time and breathing frequency showed no er minor significant differences due to inspiration resistance. Some of the results are not in agreement with the literature. Ventilation has been reported to decrease while wearing respiratory protection. However the protocols of most of these studies are not comparable to this study. The most important conclusions of these experiments are that workload increases when respiratory protection devices are worn, leading to an increase in inspiration resistance. An increased inspiratory resistance led to significant shorter times to exhaustion.
Author
Inspiration; Mental Performance; Respiration; Expiration; Ventilation; Masks

20000021401 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Development of a Method for Biological Dosimetry of Radiation Injury in Blood Samples Collected More Than One Hour After Exposure ***Final Report Ontwikkeling van een Methode voor Biologische Dosimetrie van Stralingsschade in Bloedmonsters Die Meer Dan Eeen Uur Na De Blootstelling Zijn Afgenomen***

vanderSchans, G. P., Prins Maurits Lab. TNO, Netherlands; Timmerman, A. J., Prins Maurits Lab. TNO, Netherlands; vanDijk-Knijnenburg, W. C. M., Prins Maurits Lab. TNO, Netherlands; Bruijnzeel, P. L. B., Prins Maurits Lab. TNO, Netherlands; August 1999; 60p; In English

Contract(s)/Grant(s): A96/M/429; TNO Proj. 215496155

Report No.(s): TD99-0132; PML-1999-A37; Copyright; Avail: Issuing Activity

In this report the results are described of the development of immunochemical assays for the detection of persistent base damage induced by ionizing radiation and attempts to develop a method for detection of damage on the single-cell level by quantitative immunofluorescence microscopy. It appeared that radiation-induced base damage can be detected in human blood lymphocytes in a dose range of 1 - 20 Gy . During the first 4 h no significant repair was observed both with Micrococcus luteus extract as well as endonuclease III. Damage induced by UV-C is only recognized by the Micrococcus luteus extract. In conclusion, this makes base damage detection a very promising biological indicator for radiation injury at perPiods between 1 h and longer (at least 4 h) after exposure. Together with the earlier developed biological radiation dosimeter, methods are available to detect radiation injury in blood samples collected from radiation casualties which can be applied in the time-frame immediately after radiation exposure up to possibly one day. These methods are therefore complementary to other methods which can be applied or are producing data at a later stage.

Author

Radiation Injuries; Blood; Lymphocytes; Dosimeters; Radiation Dosage; Radiation Damage; Ionizing Radiation; Exposure

20000021428 National Aeromedical Center, Soesterberg, Netherlands

Ear Pulse Waveform Parameters During the Gradual Onset Centrifuge Training Profile ***Interim Report***

Holewijn, M.; van der Burgt, J.; Kuijper, A.; Jun. 1999; 34p; In English

Contract(s)/Grant(s): A08/KLu/03

Report No.(s): AD-A372680; AMI-1999-K2; TDCK-TD-99-0418; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

During regular centrifuge training at the Aeromedical Institute the ear photoplethysmogram and the ECG of 15 (candidate) pilots were measured. The main goal of present study was to evaluate the use of the ear pulse waveform (ear pulse) as a potential feedback parameter of a pilot's head level blood pressure during accelerations. From the ear pulse waveform, the amplitude of the pulse and the pulse transit time (HT) of each pulse were determined. The results showed clearly that the amplitude of the ear pulse waveform decreased and the FIT increased with increasing acceleration level during a centrifuge run. On basis of the results of this study it is concluded that the ear pulse can be implemented as a feedback parameter for PLL onset. In order to implement the ear pulse waveform as a standard feedback signal during centrifuge training the reliability of the signal must be evaluated under different G-onset rates and with pilots performing an anti-G straining maneuver. Specially, the delay between the changes in the ear pulse waveform and changes in head level blood pressure must investigated under higher G-onset rates. So, the ear pulse wave form changes will have to be correlated with continuously measured blood pressure.

DTIC

Acceleration Tolerance; Aerospace Medicine; Ear; Gravitational Effects; Centrifuging Stress

20000021460 Institute for Human Factors TNO, Soesterberg, Netherlands

Maximum Oxygen Uptake Measured During a Graded Exercise Test at Sea and Ashore ***Final Report Maximale Zuurstofopname Tijdens een Maximaaltest Gemeten op zee en aan Land***

Wetheim, A. H., Institute for Human Factors TNO, Netherlands; Heus, R., Institute for Human Factors TNO, Netherlands; denHartog, E. A., Institute for Human Factors TNO, Netherlands; Nov. 08, 1999; 23p; In English

Contract(s)/Grant(s): A98/KM/332; TNO Proj. 789.3

Report No.(s): TD99-0361; TM-99-A072; Copyright; Avail: Issuing Activity

Time to Exhaustion (TTE) - the total amount of time a person is able to carry out a particular physical task - can be used as an index of fatigue associated with that task. The TTE fatigue index is calculated from relative workload, which is defined as: oxygen uptake (VO2) during physical work, expressed as percentage of the maximum oxygen uptake (VO(2-max)) measured during a Graded Exercise Test (GXT) in standard circumstances (i.e. in a separate session). In past experiments we calculated TTE during work in a ship motion simulator in which the VO2 measurement took place. We calculated the extra fatigue caused by this motion (Motion Induced Fatigue, MIF). However, the obvious tiredness of subjects after experimentation suggested that with this

TTE fatigue index MIF is underestimated. It was proposed that to calculate TTE we should not use VO(2-max), but VO(2-peak), which is maximum oxygen uptake during a GXT carried out in the same (moving) environment as in which VO2 is measured. In two follow up experiments VO(2-peak) appeared indeed to be lower than VO(2-max) measured in standard (stationary) conditions. Consequently TTE doubled. However, performance on the GXT was not significantly reduced in the moving simulator (which would have implied reduced muscle activity). Thus an explanation for the difference between VO(2-max) and VO(2.peak) was lacking. The present study, aboard a ship at sea, was designed to see if the difference was somehow an artefact of the simulator, and if not, to find out if its magnitude corresponds to the magnitude of the environmental motions. The results replicate the earlier findings: at sea VO(2-peak) was less than VO(2-max) measured ashore. Although the ship movements were much stronger than the simulator movements, the effect was only slightly, and not significantly, larger than in the earlier two studies. Thus there was no evidence that VO(2-peak) depends on the magnitude of environmental movements. At sea performance on the GXT was again not significantly reduced, but the reduction became significant when the data from all three studies were pooled. It seems the three separate studies had too few subjects each for this effect to reach significance. However, this lower level of maximum performance may, at best, explain only a very small part of the reduced level of maximum oxygen uptake in a moving environment.
Author
Gas Exchange; Oxygen Production; Oxygen Consumption; Oxygen; Ships; Seas

20000021576 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Efficacy of 1 and 5 mg Doses of Melatonin on Heat Tolerance While Wearing NBC Protective Clothing
McLellan, T. M.; Oct. 1999; 20p; In English
Report No.(s): AD-A372446; DCIEM-TR-1999-108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarises the findings from 2 studies which examined whether the reported hypothermic effect of melatonin ingestion increased tolerance to the heat stress of wearing NBC protective clothing. In the first study, trials were conducted either in the morning or afternoon, 2 each in the morning (0930 h) and afternoon (1330 h) following the double-blind ingestion of either two placebo or two 1 mg capsules of melatonin. The heat stress test consisted of intermittent walking and seated rest at 40 deg C and 30% relative humidity while wearing NBC protective clothing. In the second study, subjects performed 4 trials which involved 2h of rest in combat clothing at either 23 C or 40 C followed by exercise at 40 C while wearing the NBC ensemble. A single 5 mg dose of melatonin was ingested following 30-min of rest. In the first study, rectal temperature (T(re)) was not affected by melatonin ingestion but T(re) was increased during the afternoon trials by 0.3 C compared with the morning exposures and these differences remained throughout the heat stress such that final T(re) was also increased for the afternoon (39.2 C) versus the morning (39.0 C) trials. Since the rate of heat storage was similar, tolerance times (108, 111, 110, and 107 min for the morning melatonin and placebo trials, and the afternoon melatonin and placebo trials, respectively) were not different among the trials. During the second study, T(re) during rest at 23 C decreased significantly from 36.8 C to 36.7 C following the ingestion of the drug, whereas values during the placebo trial did not change. The lower T(re) response during the melatonin trial at rest remained during the exercise in the heat while wearing the NBC protective clothing. However, since the T(re) tolerated at exhaustion also was significantly lower for the melatonin (39.0 C) compared with the placebo (39.1 C) trial, tolerance times approximated 95 min in both conditions.
DTIC
Protective Clothing; Heat Tolerance; Exhaustion; Stress (Physiology)

20000024832 Institute of Space Medico-Engineering, Beijing, China
Effect of 7 d Head Down Tilt on Cardiopulmonary Circulation During Orthostasis
Wang, De-Sheng, Institute of Space Medico-Engineering, China; Xiang, Qiu-Lu, Institute of Space Medico-Engineering, China; Shen, Xian-Yun, Institute of Space Medico-Engineering, China; Meng, Jing-Rui, Institute of Space Medico-Engineering, China; Dong, Qi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 125-129; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to accumulate data for further studies on the mechanisms of the decrease of cardiovascular function after weightlessness. Cardiopulmonary circulatory function was monitored using a XXH- 2000 lesser (pulmonary) circulation and cardiac function instrument for 6 healthy adults who aged 19 to 21 who were under supine position and head up tilting (HUT) for 20 minutes before and after exposure to 7 day 6 degree head down tilt (HDT). Result The 7 day HDT resulted in orthostatic intolerance of the subjects; the reduction of RVET - (j-z) and the elevation of RPEP[RVET (Q - j)/(j - z)] indicated a decrease of the right heart function. An obvious decrease of the right heart reserves was also observed under HUT after HDT. The hc and hc/hz measurements were demonstrated to be useful parameters to evaluate orthostatic tolerance or to forecast

orthostatic syncope. The lesser (pulmonary) circulation and cardiac function testing methods are valuable in evaluating the cardiopulmonary circulatory function during HUT.
Author
Cardiovascular System; Head Down Tilt; Heart; Heart Function; Orthostatic Tolerance; Pulmonary Circulation; Aerospace Medicine; Bioastronautics; Physiological Effects; Blood Pressure

20000024833 Institute of Space Medico-Engineering, Beijing, China
Variations of EGG in Subjects Under Vestibular Stimulation
Liu, Zhi-Qiang, Institute of Space Medico-Engineering, China; Pei, Jing-Chen, Institute of Space Medico-Engineering, China; Sun, Ruo-Liang, Institute of Space Medico-Engineering, China; Chang, Lei, Institute of Space Medico-Engineering, China; Zhang, Hua, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 134-137; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The objective of this study was to investigate the patterns of electrogastrogragm(EGG) before, during and after vestibular stimulation. Twenty five subjects were stimulated by Coriolis acceleration and 28 by Coriolis stimulation. Dysrhythmia of EGG and increase of tachygastria were recorded in all subjects during the stimulation. The period dominant frequency(PDF) of EGG shifted from 2.40 to about 3.70 cpm to 3.70; to about 10. 00 cpm during Coriolis stimulus in subjects with nausea. This study suggests that PDF could be a parameter in reflecting the level of motion sickness.
Author
Coriolis Effect; Motion Sickness; Nausea; Vestibular Tests; Acceleration Stresses (Physiology); Aerospace Medicine

20000024834 Institute of Space Medico-Engineering, Beijing, China
Comparison Between Two Anti-Motion Sickness Drugs
Wang, Jing, Institute of Space Medico-Engineering, China; Qian, Jin-Kang, Institute of Space Medico-Engineering, China; Wang, Bao-Zhen, Institute of Space Medico-Engineering, China; Gao, Jian-Yi, Institute of Space Medico-Engineering, China; Shi, Hong-Zhi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 138-140; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The objective of this study was to test the validity of an animal model in selecting anti-motion sickness drugs, and compare the effects of two drugs. Anti-motion sickness effects of two drugs (Cyclizine and Scopolamin-d-amphetamin compound) were observed in rats with motion sickness (MS) induced by rotatory stimulation and the amount of Kaolin ate by rats was taken as an evaluation criterion. The consumption of Kaolin by the rats decreased significantly after administration of both drugs, and the effect of Scopolamin-d-amphetamin compound was better than those of Cyclizine under the same condition. This study suggests that the rat model of motion sickness is practical and useful in studying anti-motion sickness drugs.
Author
Antiemetics and Antinauseants; Motion Sickness; Motion Sickness Drugs; Pharmacology; Aerospace Medicine

20000024835 Beijing Medical Univ., Occupational Dept., Beijing, China
A Method of Detecting Respiratory Rate with a High-Sensitivity Capacitance Transducer
Ge, Wei-Qing, Beijing Medical Univ., China; Wang, Sheng, Beijing Medical Univ., China; Liu, Shi-Jie, Beijing Medical Univ., China; Luo, Zhi-Cheng, Beijing Medical Univ., China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 141-143; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The objective of this study was to introduce a simple and low cost respiratory rate detection method. A high-sensitivity capacitance transducer and corresponding detecting system were used in the system. Satisfactory signals were obtained at the upper portion of the right thorax with the method. This mechanism could be used widely, to comprise the respiratory module in multi-parameter patient monitoring, or be used alone to detect respiratory rate.
Author
Capacitance; Detection; Respiratory Rate; Transducers; Respiratory Physiology

20000024894 Tsinghua Univ., Dept. of Electrical Engineering, Bejing, China
HRV Analysis System Based on Windows 95 and Its Preliminary Application
Shen, Yong-Lin, Tsinghua Univ., China; Chen, Wen-Hui, Tsinghua Univ., China; Jiang, Ke, Tsinghua Univ., China; Liang, Yu-Hou, Tsinghua Univ., China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp.

111-115; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to provide a real useful application system for the Heart Rate Variability (HRV) research. The acquisition, detection and analysis system of HRV signal was set up using Windows 95. The system analyzes the HRV signal with statistical methods in the time domain and the power spectrum in the frequency domain. The power spectrum array was also introduced into the analysis. HRV signals of some healthy persons and some patients were detected and analyzed. The HRV characteristic is much more obvious in the diabetics patients. The system is useful in HRV signal analysis and cardiovascular research.

Author

Cardiovascular System; Heart Rate; Variability; Windows (Computer Programs)

20000024896 Institute of Space Medico-Engineering, Beijing, China

Star Figure in Medical Monitoring During Lower Body Negative Pressure Test

Zhao, Guo-Xuan, Institute of Space Medico-Engineering, China; Yang, Jing-Sheng, Institute of Space Medico-Engineering, China; Zhong, Chong-Fa, Institute of Space Medico-Engineering, China; Lu, Li-Li, Institute of Space Medico-Engineering, China; Hu, Zhi-Hong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 101-105; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to find a real - time, quick and audio - visual method to evaluate the subject's physiological function condition and possible development. The Star figure technique was adopted to analyse multiple physiological indices during lower body negative pressure test(LBNP). Based on the character and stability of the stars figure, the steadiness of the subjects physiological function can be judged. Physiological function can be accurately assessed only when the model of stress response of an individual is formed. The changes of star figure can indicate the possible development of the physiological function stage.

Author

Lower Body Negative Pressure; Physiology; Stability; Stress (Physiology)

20000024897 Fourth Military Medical Univ., Dept. of Aerospace Medicine, Xi'an, China

Countermeasuring Effect of Lower Body Negative Pressure Against Orthostatic Intolerance Induced by 21 d - 6 Deg Head Down Tilt in Humans

Yao, Yong-Jie, Fourth Military Medical Univ., China; Wu, Xing-Yu, Fourth Military Medical Univ., China; Sun, Xi-Qing, Fourth Military Medical Univ., China; Hao, Wei-Ya, Fourth Military Medical Univ., China; Qiao, Zong-Lin, Fourth Military Medical Univ., China; Jiang, Shi-Zhong, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Apr. 1999; Volume 12, No. 2, pp. 97-100; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to investigate whether Lower Body Negative Pressure (LBNP) during 21 days of 6 degree head-down tilt(HDT) would modify orthostatic tolerance. Twelve healthy males, age 23.7 +/- 5.0, were exposed to - 6 degree HDT for 21 days 6 of them received - 4.0 kPa LBNP sessions for l hour/day from the 15th day to the 21st day of HDT. The other 6 served as control. Head-up Tilt (HUT) +75 degree, for 20 minutes of orthostatic tolerance test were done before, on day 10 and on day 21 of HDT. During HUT +75 degree, 20 min orthostatic tolerance test on day 10 of HDT, 5 subjects of the control group and 4 of the LBNP group presented presyncopal or syncopal signs and symptoms, the average standing time of both groups were shorter than those of the pre-HDT (P is less than 0.05) . During HUT +75 degree, 20 min orthostatic tolerance test on day 21 of HDT, 5 subjects of the control group and one subject of the LBNP group presented presyncopal or syncopal signs and symptoms, the average standing time of control group reduced significantly as compared with those of pre-HDT (P is less than 0.05), also significantly shorter than those of LBNP group (P is less than 0.05). The present study clearly shows that the use of LBNP could alleviate the bed rest-induced orthostatic intolerance.

Author

Head Down Tilt; Lower Body Negative Pressure; Orthostatic Tolerance; Aerospace Medicine; Bioastronautics; Blood Pressure; Weightlessness Simulation

20000024935 Institute of Space Medico-Engineering, Beijing, China

The Effect of Weightlessness and Simulated Weightlessness on the Expression of Genes

Li, Ying-Xian, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 154-156; In Chinese

Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The research results of the relationship between gene expression and weightlessness or simulated weightlessness were studied. The influence of weight on the expression of genes in central nervous system were summarized in three aspects. It can be concluded that the expression of genes in central nervous system were precisely regulated by weight. It was important to study the effects of microweight on central nervous system in the molecular level.

Author

Central Nervous System; Gene Expression; Weightlessness; Weightlessness Simulation; Molecular Biology; Bioastronautics

20000025083 Civil Aeromedical Inst., Oklahoma City, OK USA

The FAA Health Awareness Program: Results of the 1998 Customer Service Assessment Survey ***Final Report***

Hilton, Thomas F., Civil Aeromedical Inst., USA; Hart, I. Sam, Federal Aviation Administration, USA; Farmer, William L., Civil Aeromedical Inst., USA; Thompson, Jennifer J., Oklahoma Univ. Health Sciences Center, USA; Behn, Lydia D., Environmental Protection Agency, USA; February 2000; 46p; In English

Contract(s)/Grant(s): AAM-A-98-HRR-500

Report No.(s): DOT/FAA/AM-00/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of an agency-wide survey of employee health and wellness to determine workforce involvement in and satisfaction with the Federal Aviation Administration's Health Awareness Program (HAP). Surveys were received from 3,262 employees, representing a 45% response rate. Results indicated that about half the workforce had heard about HAP and that about half the workforce had participated in one or more HAP events (even if they did not realize that the event was HAP-sponsored). In terms of attendance, the most popular HAP information programs were health fairs, health awareness lectures, and stress management awareness programs. Likewise, annual flu shots, cholesterol screening, blood chemistry screening, and blood pressure screening were the most popular HAP service programs. Analyses found a consistent relationship between HAP participation and employee exercise rates, involvement in healthy lifestyle behaviors, and overall wellness. These findings may have been influenced to some extent by respondent characteristics, which were somewhat disproportionately over age 45, female, and managerial. However, the respondents' backgrounds matched previous study results, indicating that Federal Aviation Administration respondents accurately represent the HAP customer base -- that segment of the workforce most interested in health and wellness.

Author

Health; Personnel; Surveys

53
BEHAVIORAL SCIENCES

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

20000021104 Logicon Technical Services, Inc., Dayton, OH USA

Information Dissonance, Shared Mental Models and Shared Displays: An Empirical Evaluation of Information Dominance Techniques ***Interim Report, 1 Jun. 1997-31 Dec. 1998***

Bolstad, Cheryl A.; Endsley, Mica R.; Dec. 1998; 51p; In English; Prepared in cooperation with SA Technologies, Marietta, GA.

Contract(s)/Grant(s): F41624-94-D-6000; AF Proj. 7184

Report No.(s): AD-A371330; AFRL-HE-WP-TR-1999-0213; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study experimentally tested the use of shared mental models and shared displays as a means of enhancing team situation awareness (SA). Teams were tested using a simulation of an aircraft defense task that incorporated features of a distributed team architecture. As hypothesized, the presence of shared displays and shared mental models improved team performance. However, the mechanism whereby the shared displays aided performance was not direct as expected. Teams were initially slower when first given a shared display, but a residual effect was seen in later trials where it aided performance. While shared displays initially slowed team performance in this task, most likely due to extra attention demands, they also provided for the development of shared mental models that greatly enhanced performance after they were removed. The combination of non-shared displays and no mental model was highly detrimental to performance. Teams who experienced this condition first were unable to ever develop very good performance. Overall, we found that effective team performance could be enhanced by providing teams with sufficient

information to build a shared mental model of each other's tasks and goals, either through direct instruction, or through provision of shared displays.
DTIC
Numerical Analysis; Command and Control; Mental Performance; Performance Prediction; Human Performance

20000021387 Institute for Human Factors TNO, Soesterberg, Netherlands
Task Performance Under Fatigue: Effects of Immediate and Delayed Feedback on Individual and Team Tasks *Final Report Taakprestatie bij Vermoeidheid: Effecten van Directe en Uitgestelde Feedback op Individuelle en Team-Taken*
vanderVegt, G. S., Institute for Human Factors TNO, Netherlands; Hoeksema-vanOrden, C. Y. D., Institute for Human Factors TNO, Netherlands; Langefeld, J. J., Institute for Human Factors TNO, Netherlands; Gaillard, A. W. K., Institute for Human Factors TNO, Netherlands; Nov. 19, 1999; 27p; In English
Contract(s)/Grant(s): A96/KL/303; TNO Proj. 731.2
Report No.(s): TD99-0367; TM-99-A076; Copyright; Avail: Issuing Activity
This is the seventh experiment in a series of studies on the effects of fatigue and sleep deprivation on task performance. Participants worked on two different individual tasks and a team task for 20 hours without sleep, in five sessions of four hours each. The tasks started in the early evening. In the current experiment, the main research question concerned feedback on the team task: which type of group feedback motivates people best when they have to work such long hours without sleep? Two types of feedback were tested: (1) 'immediate group feedback', provided after every block of ten trials; (2) 'delayed group feedback', provided at the end of the experiment. An interaction between feedback and fatigue was expected, in the sense that immediate feedback was expected to be a better motivator over time than delayed feedback. In contrast to our expectations, only a main effect of fatigue appeared. Neither a main effect of feedback nor an interaction between feedback and fatigue emerged. A significant interaction between task and fatigue revealed that more simple and monotonous individual tasks were more sensitive to fatigue than more complex and demanding individual or team tasks, which confirms earlier findings.
Author
Human Performance; Mental Performance; Tasks; Fatigue (Biology); Work-Rest Cycle; Sleep Deprivation

20000021456 College of William and Mary, Williamsburg, VA USA
Incongruity, Incongruity Resolution, and Mental States: The Measure and Modification of Situational Awareness and Control *Final Report, 1 Jan. 1994 - 31 Dec. 1997*
Derks, Peter L., College of William and Mary, USA; Gillikin, Lynn S., College of William and Mary, USA; 1997; 51p; In English; Original contains color illustrations.
Contract(s)/Grant(s): NCC1-160
Report No.(s): NASA/CR-97-207631; NAS 1.26:207631; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Cognition and emotion combine to define mental states. Situational awareness depends on both knowledge of the environment and the mood of the individual. Cognitive scientists from William James and Sigmond Freud to contemporary theorists in artificial intelligence and neuropsychology have acknowledged the critical role of subjective state in determining the efficiency and flexibility of information processing. One of the most explicit computational models of mental states to incorporate both knowledge and arousal has been described. Knowledge is carried in a typical neural net with categorical nodes and probabilistic links. Arousal determines the focus among these nodes and links. High arousal results in a restricted range of activation. Low arousal causes a wider range of stimulation and a broader linking of categories or "ideas." From this model Gerlernter generates "creativity" in problem solving from a network that is widely active and the possibility of "fixation" from a highly aroused system.
Derived from text
Human Factors Engineering; Psychological Effects; Artificial Intelligence; Cognition; Mathematical Models; Mental Health

20000021561 Institute for Human Factors TNO, Soesterberg, Netherlands
Task Factors Influencing Fascination *Final Report Taakfactoren van Invloed op Fascinatie*
Boer, L. C., Institute for Human Factors TNO, Netherlands; vanSchie, C. C., Institute for Human Factors TNO, Netherlands; Nov. 18, 1999; 24p; In Dutch
Contract(s)/Grant(s): B98-021; TNO Proj. 787.1
Report No.(s): TD99-0366; TNO-TM-B012; Copyright; Avail: Issuing Activity
Fascination occurs when an operator gets preoccupied with a part task, then forgets execution of another task. In the introduction related concepts are discussed such as "cognitive lockup", "narrowing of attention", "simple vs. flexible decomposition", "serial attention", and the general concept of situation awareness. This review shows that no task factors have

been identified to explain fascination. In an investigation with 48 volunteers, a test was made whether or not disturbing the perception of time would stimulate fascination. In a role as operator of a space station, the participant was responsible for two tasks: a permanent and an incidental task. The first manipulation was a change in the presentation speed of the incidental task; the second was a ”failure” in the equipment. Incident fascination (forgetting the permanent task) turned out to be slightly more frequent during equipment failure (p is less than .05, one-tailed test). Learning effects and a mild SWAT workload were observed. The discussion considers the possibility that equipment error stimulated task forgetting because operators were distracted from their normal duties. Distractions are really dangerous if they ”invite” the operator to look for further information.
Author
Human Factors Engineering; Human Performance; Errors; Workloads (Psychophysiology)

20000024895 Fourth Military Medical Univ., Dept. of Aerospace Physiology, Xi’an, China
Comparison of Sensitivity of Mental Load Assessment Indexes
Dong, Ming-Qing, Fourth Military Medical Univ., China; Ma, Rui-Shan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 106-110; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this study was to compare the sensitivities of indexes used in the assessment of mental load. Twenty five indexes belonging to primary task performance, additional task performance, subjective rate and psychophysiological measure were recorded during performance of 11 different difficult tasks. The tests showed that tracking error (ER), reaction time (RT), correct rate (C.R), category scale (CS), multistage evaluation scale (MES), multi-dimensional scale (MDS), latency of P3 (I AT), inter beat interval (IBI), inter respiration interval (IRI) and blink rate (BR) were significantly different among the various tasks. CS, MES and MDS were more sensitive to the total load; ER, LAT, IBI and IRI were more sensitive to the load of primary task, while RT and CR to that of additional task and BR to the visual load. It was demonstrated that the sensitivities of the various indexes are different and the information are limited. multi-indexes may be preferred for mental load assessment .
Author
Human Performance; Mental Performance; Psychophysiology; Reaction Time; Workloads (Psychophysiology); Stress (Psychology)

20000024933 Institute of Space Medico-Engineering, Beijing, China
Psychological Issues in Manned Spaceflight
Zhang, Qi-Ji, Institute of Space Medico-Engineering, China; Bai, Yan-Qiang, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 144-148; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

As the duration. of manned spaceflight becomes longer and as crews become more heterogeneous, psychological and interpersonal factors will be more important in affecting the safety of crew and flight mission. In space environment there are four types of stressors: physical, physiological, psychological and interpersonal. Psychological issues include ”Asthenia”, alteration in time sense, transcendent experiences, sleep problem, career motivation, psychosomatic symptoms and psychiatric issues. Interpersonal issues include interpersonal tension, interpersonal relationships decreased cohesiveness and deprivation, displacement of anger to outside personnel over time.
Author
Astronauts; Manned Space Flight; Physiology; Psychological Factors; Psychology; Psychosomatics; Signs and Symptoms; Space Psychology; Astronaut Performance; Stress (Psychology); Space Flight Stress; Psychological Effects

20000024979 Army Research Inst. for the Behavioral and Social Sciences, Armored Forces Research Unit, Fort Knox, KY USA
A Review and Annotated Bibliography of the Literature Pertaining to Team and Small Group Performance (1989 to 1999)
Final Report, Jan. - Sep. 1999
LaJoie, Andrew S.; Sterling, Bruce S.; Dec. 1999; 89p; In English
Contract(s)/Grant(s): DA Proj. 2O2-62785-A-790
Report No.(s): AD-A371864; ARI-RP-2000-01; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The military, along with private industry, is relying more on small teams of specialized individuals who work together to achieve a common goal. Examples of these teams include emergency medical teams, aircrews, decision-making teams, industrial project teams, Special Forces teams, weapon system crews and everyday work teams. Training and military doctrine has been evolving to reflect this emphasis on teamwork. The purpose of this annotated bibliography is to review literature published over the last ten years concerning team and small group performance. Specifically, the articles reviewed in this report represent a sampling of the research published in the social sciences, including psychology, sociology, and business. The team and small group

literature reviewed includes examples of the many types of teams mentioned earlier. A summary and integration of this work is provided. In general, the research suggests that there are several components which contribute to the successful performance of teams, and that some of these components can be explicitly trained. Several training models are discussed.
DTIC
Bibliographies; Annotations; Teams; Education; Group Dynamics; Human Performance

20000025082 Civil Aeromedical Inst., Oklahoma City, OK USA
Measuring Air Traffic Controller Performance in a High-Fidelity Simulation ***Final Report***
Manning, Carol A., Editor, Civil Aeromedical Inst., USA; January 2000; 42p; In English
Contract(s)/Grant(s): AM-B-00-HRR-509
Report No.(s): DOT/FAA/AM-00/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the summer of 1997, the Air Traffic Selection and Training (AT-SAT) High Fidelity Simulation Study was conducted at the FAA Academy in Oklahoma City, OK. The purpose of the study was to test the performance of 107 operational en route controllers during 21/2 days of simulations. The performance of these controllers during the high-fidelity simulations was compared with their performance on two medium-fidelity performance measures to assess the construct validity of the latter measures to serve as criteria against which to validate a set of selection tests. The reports included in this document describe the high-fidelity simulation exercise, the development of performance measures utilized during the exercise, and the interrelationships between the performance measures. The first report describes the development of a work sample approach to capturing air traffic controller performance, and establishes that high fidelity performance measures can adequately reflect the performance of the controller. The work sample was developed in an environment that simulated as nearly as possible the actual conditions existing in the controller's job, but was conducted in a "generic" airspace. Scenario development included the most important tasks from the task-based 'ob analysis developed for the AT-SAT project. Sufficient time was provided for participating controllers to learn the airspace and procedures and demonstrate their knowledge through 1) a multiple choice test of airspace knowledge and 2) running 8 practice scenarios. Performance was measured by 1) an over-the-shoulder (OTS) rating scale, 2) counts of mistakes, 3) counts of actions that would be required to move aircraft from the sector at the end of the scenario, and 4) statistics derived from aircraft positions and controller/pilot data entries recorded for the simulation. The second report used measures collected during the high-fidelity simulation study to predict the overall OTS performance rating. It was found that a model that included both counts of mistakes and the computer-derived performance measures predicted the OTS rating reasonably well, while a model containing only the computer-derived measures did not. Remaining actions did not contribute to the prediction of the OTS rating in addition to the contribution provided by the other types of measures.
Author
Air Traffic Control; Air Traffic Controllers (Personnel); Simulation; Performance Tests; Human Performance

20000025224 Institute for Human Factors TNO, Soesterberg, Netherlands
The Influence of Cross-Training on Teams with Changing Team-Members ***Interim Report De Invloed van Cross-Training op Teams Die van Samenstelling Veranderen***
Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Bots, M. J., Institute for Human Factors TNO, Netherlands; Dinnessen, M., Institute for Human Factors TNO, Netherlands; Nov. 16, 1999; 50p; In Dutch
Contract(s)/Grant(s): B99-052; TNO Proj. 730.2
Report No.(s): TD99-0363; TNO-TM-99-B011; Copyright; Avail: Issuing Activity

Earlier research by Schaafstal and Bots has shown that 'explicit instruction', directed at the interdependencies between the tasks of the various team members, is an efficient method for team training. The question is whether this cross- training method also leads to a relatively good performance in situations where there is a change in team composition in between training and testing, compared to a method for cross-training geared towards the complete task of other team members. The results show that it is not possible to show that 'explicit instruction' leads to better performance than instruction geared towards the complete task of other team members. It is concluded that the currently used team performance and team process measures are possibly not sensitive enough to pick up differences between conditions and between teams. Therefore, it is recommended to add other process measures in future experiments, such as various teamwork dimensions (e.g. team initiative/leadership, backup behaviour, feedback, situation awareness). Also, the role of team learning capabilities, such as team self-correction, could be of more importance than assumed in the experimental research so far. It is recommended to study these factors explicitly in future experiments, In addition, the report contains recommendations for diminishing the variance between teams.
Author
Education; Human Performance; Teams

20000025226 Institute for Human Factors TNO, Soesterberg, Netherlands

Measurement of Appreciation by the Personnel": A Basis for a Questionnaire ***Final Report Meten van "Waardering door het Personeel": Aanzet Tot en Vragenlijst***

Hoeksema-van Orden, C. Y. D., Institute for Human Factors TNO, Netherlands; Nov. 11, 1999; 58p; In Dutch

Contract(s)/Grant(s): A97/KLu/320; TNO Proj. 731.2

Report No.(s): TD99-0362; TNO-TM-99-A073; Copyright; Avail: Issuing Activity

The section of Behavioural Sciences (SGW) of the Dutch Air Force intends to come to an integration of ail questionnaires on work stress, work satisfaction and other related topics that have been used in the last couple of years in the Air Force. These questionnaires partly overlap and the risk of the personnel becoming 'tired of questionnaires' is real. Besides, a newly developed questionnaire should fit within the framework of the INK-model (institute Netherlands Quality), a system that the Air Force has currently adopted to enhance integral quality in the organization. On request of SGW, the TNO Human Factors Research Institute has gathered existing questionnaires on well being, satisfaction and work stress, as well as more detailed information on the INK-model. All constructs from the existing questionnaires have been clustered around five themes from the INK-model, completed with a sixth: i 1) leadership; (2) policy and strategy; (3) personnel management: (4) management of means; @5) management of processes: (6) motivation. A 'gross list' of items that belong with each theme is attached to the report. Furthermore, one chapter is devoted to questionnaire construction theory, in which a few directives are given that SGW can use when developing the actual questionnaire,

Author

Human Factors Engineering; Personnel Management; Management Planning; Employee Relations

54
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..

20000021263 Naval Health Research Center, San Diego, CA USA

Comparison of Circumference-and Skinfold-Based Body Fat Estimation Equations ***Final Report, Oct. 1993 - Jul. 1998***

Kujawa, K., Naval Health Research Center, USA; Hodgdon, J. A., Naval Health Research Center, USA; November 1998; 17p; In English

Report No.(s): AD-A370117; Rept-98-34; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The U. S. Navy employs equations that use height and body circumferences to estimate percent body fat However, many sailors question the accuracy of the Navy's body fat estimation equations. The Health and Physical Fitness Branch (Pers 601) of the Naval Bureau of Personnel frequently receive; requests to substitute a percent body fat obtained with skinfold- or bioimpedance-based body fat estimation equations (Pets 601, personal communication). There may be a perception that skinfold-bioimpedance-based equations are more accurate than circumference-based equations since the fon= equations are more commonly used in settings such as hub clubs. The purpose of this study was to compare the accuracy of the Navy's circumference-based equations to the accuracy of three well-known skinfolf- and bioimpedance-based equations. Skinfold equations were those of Behnke and Wilmore, Durnin and Womersley, and Jackson and Pollock. Bioimpedance equations were those of Segal et al. and Lohman. Accuracy was compared for both Caucasian and African-American sailors. The criterion for accuracy was percent body fat determined by hydrostatic weighing.

Derived from text

Adipose Tissues; Health; Physical Fitness; Skin (Anatomy); Fat Embolisms

20000021287 School of Aerospace Medicine, Brooks AFB, TX USA

The 1995 Aircrew Operational Vision Survey: Results, Analysis, and Recommendations ***Final Report, Oct. 1995 - May 1999***

Baldwin, J. B.; Dennis, Richard J.; Ivan, Douglas J.; Miller, Robert E., II; Belihar, Robert P.; May 04, 1999; 147p; In English

Contract(s)/Grant(s): Proj-7755

Report No.(s): AD-A371597; SAM-AF-BR-TR-1999-0003; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The Visual Enhancement and Eye Protection, Integrated Product Team (VEEP-IPT) designed and distributed in early fiscal year 1996 the "1995 Aircrew Operational Vision Survey." This comprehensive, operationally relevant survey with 161 questions was sent to all 31,205 total force, rated, US Air Force aircrew members (Active Duty, Air National Guard, Reserve). The survey included sections on general information, aircrew spectacles, contact lenses, clinic support, sunglasses, aircrew clear, sun, and

high contrast visors, laser eye protection, night vision goggles, ballistic protective dust/wind goggles, vision standards, and a section for written comments. The total force return rate was over 55% with 60% of Active Duty aircrew returning their surveys. Data from the 17,282 returned surveys are being used to define aircrew vision problems, prioritize mission deficiencies, validate user requirements, modify aeromedical policy, and establish valid research requirements. Included in this initial report are the results and analysis of responses from the returned surveys. Survey questions and the raw question by question results are included as Appendices 1 and 2. Selected data have been compiled and cross-correlated, and are found in Appendix 3. The data provide a cross-section of aircrew demographics and opinions, and highlight critical vision and safety issues. Each section has a summary of VEEP-IPT recommendations and recognition of safety of flight issues. Data are maintained in an accessible database at the Ophthalmology Branch at Brooks AFB, and efforts are under way to continue analysis and cross-correlation of the data, including 3400 hand written comments.
DTIC
Surveys; Flight Crews; Eye Protection; Aerospace Medicine

20000021348 Institute for Human Factors TNO, Technische Menskunde, Soesterberg, Netherlands
Fit of the Gentex Jet Helmet with Viper and ITT Night Vision Goggles ***Final Report Pasvorm van de Gentex Jachtvliegerhelm met het Viper en ITT Nachtzichtsysteem***
Daanen, H. A. M., Institute for Human Factors TNO, Netherlands; Dec. 27, 1999; 32p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A99/KLu/354; TNO Proj. 789.2
Report No.(s): TD99-0374; TM-99-A084; Copyright; Avail: Issuing Activity, Hardcopy

The Royal Netherlands Air Force has the intention to acquire night vision goggles for F-16 pilots. Two systems are considered: the Viper of Delft Instruments and ITT from the US. Both test pilots experienced serious headaches when using the Viper system. It is investigated if improper fit of the helmet with the Viper system is a possible explanation for this problem. Therefore, the two test pilots were scanned with and without helmets with the ITT and Viper night vision goggles using 3D scans. After proper alignment of the scans, the positioning of the helmets on the head can be visualized and investigated. The position of the helmet remained unchanged when an ITT system was added to the helmet. The Gentex helmet, however, rotated forward by about 5 degrees when a Viper system was connected to it. Adding a counter weight did not change the helmet position as compared to the situation without counter weight. Possible explanations for the different position of the Gentex helmet with Viper system on the head are: poor optic adjustability leading to helmet adjustments, differences in the head connection system of the Gentex with Viper system and the Gentex with or without ITT system. the increased weight and moment of the Viper compared to ITT, leading to forward rotation. The latter argument is less likely since a counter weight did not change the position of the helmet @vith the Viper system. Probably, the forward rotation of the helmet with Viper system resulted in an increased pressure on the forehead and may partially explain the occurrence of head aches.
Author
Scanners; Goggles; Forehead; Alignment; Helmets

20000021356 Institute for Human Factors TNO, Soesterberg, Netherlands
Human Modelling Systems in Ship Design, Phase 1, Ship Design and Human Factors ***Interim Report Mensmodellen in Het Scheepsontwerpproces, Fase 1, Scheepsontwerp en Ergonomie***
Punte, P. A. J., Institute for Human Factors TNO, Netherlands; Hin, A. J. S., Institute for Human Factors TNO, Netherlands; Dec. 02, 1999; 90p; In Dutch
Contract(s)/Grant(s): A98/KM/352; TNO Proj. 789.1
Report No.(s): TD99-0369; TM-99-A079; Copyright; Avail: Issuing Activity

As a part of the project, the possibilities for the application of human modelling systems at the department MARTECH of the Royal Netherlands Navy were investigated. The aim of this project is to investigate which human modelling systems can be integrated into the design process of ships. The systems should have an added value to the existing ergonomic analysis tools which are used during the design process at the Royal Netherlands Navy. For each phase in this design process of ships, a list of ergonomic aspects has been made which are of importance during that part of the design process. Furthermore, an overview of ergonomic analysis tools has been made, i.e. design drawings and models, handbooks and norms, human modelling systems, mock-ups, virtual environments and hybrid mock-ups. For each phase in the design processes of ships, the most useful and efficient tools are selected. It is concluded that human modelling systems have an added value to the design process of ship as performed by MARTECH, especially during the design of layouts of rooms and the design of workstations. Human modelling systems offer the designer ergonomic information during the design process which makes it possible to base design decisions on technical as well as ergonomical requirements. This decreases the chance of making design mistakes which are hard to correct in a later phase

of the design process. Human modelling systems are not able to replace other ergonomic tools completely. to evaluate a design using scenarios in which several operators play their role, the application of mock-ups is the best alternative. to evaluate outside views, for instance from a ship bridge, virtual environments or hybrid mock-ups are to be preferred. For part two of the project 'Human modelling systems for ship design processes', it is recommended to compare existing human modelling systems within the framework of their application in the design process of ships at MARTECH.
Author
Human Factors Engineering; Models; Ships; Design Analysis

20000021357 Institute for Human Factors TNO, Soesterberg, Netherlands
Workstation Design, Lighting Conditions/ Visual Information Presentation, and Indoor Climate at CAWCS: Bottlenecks and Recommendations ***Final Report Werkplekinrichting, Verlichting/Visuele Informatiepresentatic en Binnenklimaat Bij CAWCS: Knelpunten en Aanbevelingen***
Delleman, N. J., Institute for Human Factors TNO, Netherlands; vanBergem, P. M., Institute for Human Factors TNO, Netherlands; Varkevisser, J., Institute for Human Factors TNO, Netherlands; denHartog, E. A., Institute for Human Factors TNO, Netherlands; Nov. 04, 1999; 40p; In Dutch
Contract(s)/Grant(s): A99/KM329; TNO Proj. 789.1
Report No.(s): TD99-0360; TM-99-A071; Copyright; Avail: Issuing Activity

Within the framework of the obligatory risk assessment on working conditions the Centre for Automation of Weapon and Command Systems JCAWCS) of the Royal Netherlands Navy asked TNO Human Factors Research Institute to assess the bottlenecks concerning workstation design, lighting conditions / visual information presentation, and indoor climate at CAWCS, as well as to give recommendations for improvement if necessary. The bottlenecks on the above mentioned areas were determined by means of a questionnaire that was filled out by the employees, followed by dedicated data acquisition during worksite visits. On the basis of the musculoskeletal complaints mentioned by the employees it is recommended to replace the current 'mixed' workstations each gradually by two workstations, i.e. one for the VDU (video display unit), and one for other deskwork (reading, writing, phoning, etcetera). Besides purchasing document holders and proper supports for the VDU screens, it is strongly recommended to search for significantly less wide keyboards (with functions and numerics on the upper rows). On the basis of the bottlenecks concerning lighting conditions and visual information presentation, it is recommended to provide the rooms at the front side of the building with sunshades, and to position the workstations in the rooms such that the viewing direction of a VDU user is parallel to the windows. On the basis of the climate problems in the building it is recommended to build in a climate control system. As the employees are most dissatisfied with the indoor climate, it is recommended to give priority to the climate control system if the recommendations above have to be carried out one after the other.
Author
Design Analysis; Workstations; Illuminating; Visual Perception; Indoor Air Pollution; Climate; Human Factors Engineering; Display Devices

20000021358 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Evaluation of Eight Kinds of Decontamination Suits ***Final Report Evaluatie van Acht Soorten Ontsmetterskleding***
Oudmayer, H. F. G., Prins Maurits Lab. TNO, Netherlands; November 1999; 25p; In Dutch
Contract(s)/Grant(s): TNO Proj. 014.11404
Report No.(s): TD99-0149; PML-1999-A54; Copyright; Avail: Issuing Activity

At the request of a section of the Dutch army (LBBKL KPU), eight kinds of decontamination suits meant for single use have been evaluated. It was assessed whether the suits would meet the most important demands as posed by the the KPU department. The tests were split up roughly into three categories: ergonomical evaluation of the suits as a whole (performed by TNO Human Factors) and chemical and physical - mechanical evaluation of the material and its interconnections (performed by TNO Prins Maurits Laboratory and TNO Industry). None of the types met all the requirements. Based on the burst-, pull and tear strength and the adhesion of the coating, the Geomet suit and the Boye suit qualify positively compared to the other suits. Both suits are thicker; with the Geomet suit just exceeding the demand on the thickness with, at the same time, a little more weight compared to the other suits (weight just within the demand). The CGF suit, qualified best by TNO Human Factors, shows good protection against chemical warfare agents but is not strong enough. The suit qualified 3rd by TNO Human Factors, also is not strong enough and additionally shows penetration by Lewisite. The Geomet suit is recommended based on the investigated technical aspects. The protection offered by the suit was decisive for this recommendation.
Author
Decontamination; Suits; Protective Clothing; Human Factors Engineering

20000021430 Institute for Human Factors TNO, Soesterberg, Netherlands

The Feasibility of a Three-Crew Concept for the NFH90: Exploring Workload Bottlenecks (TNO-HFRI Part of Study)

Final Report De Haalbaarheid van een Drie-Mans Concept voor de NFH90: Onderzoek Naar Werkbelastingsproblemen (TNO-TM-Deel)

Veltman, J. A., Institute for Human Factors TNO, Netherlands; Nov. 18, 1999; 28p; In English

Contract(s)/Grant(s): A96/KM/327; TNO Proj. 788.1

Report No.(s): TD99-0365; TNO-TM-99-A075; Copyright; Avail: Issuing Activity

An experiment was conducted by the TNO Human Factors Research Institute and the National Aerospace Laboratory (NLR) in the tactical trainer of the Orion in order to get insight into the tasks and the workload of tactical coordinators (TACCOs). This report presents the results of the TNO part of the study only. The Lynx helicopter will be replaced by the NFH90 within a few years. To determine the feasibility of a three crew concept, similar to the Lynx helicopter, several studies commissioned by the Royal Netherlands Navy are (and will be) conducted to get insight into the workload of the future crew. The TACCO in the Orion works with a display for tactical information. Because the TACCO in the NFH90 will also work with information displays, the present study focuses on the workload and tasks of an Orion TACCO. During an anti submarine warfare (ASW) and anti surface warfare (ASUW) mission the workload was measured of an experienced and inexperienced TACCO with physiological measures (heart rate, respiration and eye blinks). The missions were recorded on videotape. After the missions the TACCOs analysed the mission by means of a special purpose computer program. They indicated the moments during which tasks were executed and gave ratings of the workload and the amount of routine handling each minute. Together with the physiological recordings, this provided time lines of tasks and workload. The data indicated that the TACCOs had the highest workload before and directly after an attack in an ASW mission. The joining segment of the ASW mission and an ASUW mission were far less demanding. The attack during an ASW mission was demanding because this situation is always unique and therefore, no standard procedures can be obtained. Further- more, the TACCOs have to interpret a lot of information with a high level of uncertainty. The work of the TACCO in the NFH90 will change from actively controlling instruments and retrieving information to managing large amounts of information. The workload of the TACCO in the NFH90 will depend on the level of equipment automation that can be obtained and the level of management that is required for adequate task performance. Future studies will address these issues.
Author

Helicopters; Human Factors Engineering; Physiology; Workloads (Psychophysiology)

20000021487 NASA Ames Research Center, Moffett Field, CA USA

NASA Task Load Index (TLX), Volume 1.0, Computerized Version

Hart, Sandra G., NASA Ames Research Center, USA; 1986; 26p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This booklet and the accompanying diskette contain the materials necessary to collect subjective workload assessments with the NASA Task Load Index on IBM PC compatible microcomputers. This procedure for collecting workload ratings was developed by the Human Performance Group at NASA Ames Research Center during a three year research effort that involved more than 40 laboratory, simulation, and inflight experiments Although the technique is still undergoing evaluation, this package is being distributed to allow other researchers to use it in their own experiments Comments or suggestions about the procedure would be greatly appreciated This package is intended to fill a ”nuts and bolts” function of describing the procedure. A bibliography provides background information about previous empirical findings and the logic that supports the procedure.
Author

Workloads (Psychophysiology); Human Performance; Bibliographies

20000021488 NASA Ames Research Center, Moffett Field, CA USA

NASA Task Load Index (TLX), Volume 1.0, Paper and Pencil Package

Hart, Sandra G., NASA Ames Research Center, USA; 1986; 26p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This booklet contains the materials necessary to collect subjective workload assessments with the NASA Task Load Index. This procedure for collecting workload ratings was developed by the Human Performance Group at NASA Ames Research Center during a three year research effort that involved more than 40 laboratory. simulation. and inflight experiments. Although the technique is still undergoing evaluation. this booklet is being distributed to allow other researchers to use it in their own experiments. Comments or suggestions about the procedure would be greatly appreciated. This package is intended to fill a ”nuts

and bolts" function of describing the procedure. A bibliography provides background information about previous empirical findings and the logic that supports the procedure.
Author
Workloads (Psychophysiology); Human Performance; Bibliographies

20000024872 Institute of Space Medico-Engineering, Beijing, China
An Experimental Study of the Sabatier CO2 Reduction Subsystem for Space Station
Li, Jun, Institute of Space Medico-Engineering, China; Ai, Shang-Kun, Institute of Space Medico-Engineering, China; Zhou, Kang-Han, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 121-124; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The objective of this study was too develop and fabricate a prototype Sabatier CO2 reduction subsystem for long duration manned space missions. The rationale, equipment and function of the CO2 reduction subsystem were introduced. Groundbased experiments with CO2 flows equivalent to a crew size of 3 persons were conducted to verify the operation performance of the prototype. The start-up temperature is less than 165 C when the start-up time is 14 minutes; the lean component H2/CO2 conversion efficiency is over 95 percent when H2/CO2 molar ratios is 1.9 to about 5.0. The water produced is nearly colorless and neutral. The prototype Sabatier CO2 reduction subsystem is simple in operation and the test results showed that design goals were achieved.
Author
Carbon Dioxide; Manned Space Flight; Space Stations; Bioprocessing; Life Support Systems; Spacecraft Environments; Bioastronautics; Decontamination; Carbon Dioxide Removal; Air Purification

20000024934 Beijing Univ. of Aeronautics and Astronautics, Beijing, China
The Present Status and Development of Thermal Control System of Spacesuits for Extravehicular Activity
Zhao, Chao-Yi, Beijing Univ. of Aeronautics and Astronautics, China; Sun, Jin-Biao, Beijing Univ. of Aeronautics and Astronautics, China; Yuan, Xiu-Gan, Beijing Univ. of Aeronautics and Astronautics, China; Space Medicine and Medical Engineering; Apr. 1999; ISSN 1002-0837; Volume 12, No. 2, pp. 149-153; In Chinese
Report No.(s): CN-11-2774/R; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
With the extension of extravehicular activity(EVA) duration, the need for more effective thermal control of EVA spacesuits is required. The specific schemes investigated in heat sink system for EVA are discussed, including radiator, ice storage, metal hydride heat pump, phase-change storage/radiator and sublimator. The importance and requirements of automatic thermal control for EVA are also discussed. Existing automatic thermal control for EVA are reviewed. Prospects of further developments of thermal control of spacesuits for EVA are proposed.
Author
Extravehicular Activity; Space Suits; Temperature Control; Cooling Systems; Heat Sinks; Thermal Absorption

20000025225 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Bureau for Biotechnology, Zeist, Netherlands
Modernization Military Rations, Part 5, Nutritional Need Under Hot Environments during Military Field Operations *Final Report Modernisering Ratsoenen, Deel 5, Voeding Bij Militaire Operaties Onder Warme Klimatologische Omstandigheden*
vanErp-Baart, A. M. J., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; November 1999; 45p; In Dutch
Contract(s)/Grant(s): A97/KL/105; TNO Proj. 70155.01.03
Report No.(s): TD99-0352; TNO-Voeding-V99.886; Copyright; Avail: Issuing Activity
Information on Dutch military actions in hot climates is limited. Therefore the handbook 'Nutritional needs in hot environments' edited by Marriot is used as the primary source for formulating the nutritional requirements of military rations in hot climates. Information about Dutch military action, held yearly in Spain in July, forms the basis for the establishment of level of energy expenditure in hot weather conditions. These figures are compared to values from the literature. The need for water is briefly discussed, because of its importance and its influence on the composition of the military rations. Finally a model is introduced to calculate risks for heat injuries whilst planning military actions.
Author
Hot Weather; Nutritional Requirements; Rations; Nutrition

20000025228 Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Salisbury, Australia
Protocol Analysis as a Tool in Function and Task Analysis
Lees, Catherine; Manton, Jeremy; Triggs, Tom; Oct. 1999; 50p; In English
Report No.(s): AD-A371883; DSTO-TR-0883; DODA-AR-011-105; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A protocol is a record of procedural steps undertaken in a process. In studying human-machine systems, observations of human operators obtained from sources such as videotapes are coded to create a descriptive protocol of behaviours, task elements, goals, etc. This record is essentially sequential in nature, but methods for analysing sequential data are relatively new. The kinds of information that protocol analysis can provide, that might be useful in function/task analysis, are examined. Methods for analysing sequences are surveyed, and recent developments in using minimum message length methods for producing probabilistic finite state automaton models of sequential behaviour are discussed.
DTIC
Man Machine Systems; Functional Analysis; Operators (Personnel); Functions (Mathematics)

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL

20000021246 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Non-Existence of Local Smoothing for Oscillatory Integrals with Concave Phase
Walther, B. G.; Jul. 1999; ISSN 1401-2278; 12p; In English
Report No.(s): PB2000-102713; TRITA-MAT-1999-16; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In this note we prove the non-existence of local smoothing in the sense of L to the second power for oscillatory integrals with concave phase. We use integration by parts to control remainder terms and use the oscillation at infinity of Bessel functions to reduce the higher dimensional problem to the one-dimensional.
NTIS
Oscillations; Smoothing

20000021247 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Hardy and Hardy PDO Type Inequalities in Domains, Part 1
Wannebo, A.; Jul. 1999; ISSN 1401-2278; 32p; In English
Report No.(s): PB2000-102711; TRITA-MAT-1999-15; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Here is given mainly an extensive treatment of Hardy inequalities in domains in R(N). Part II will continue on this theme and furthermore also treat Hardy PDO inequalities. The latter are Hardy inequalities involving Partial Differential Operators instead of gradients in the inequalities. General subsets of the function space are also treated. Examples are nonnegative cones and are given a special treatment. A part of the material is given in an encyclopedic fashion. This in order to get better overview and also be helpful in cases of outside applications. These papers are a continuation of (WAN5), which should be regarded a prerequisite. Part II will contain more about Hardy inquealities and will treat Hardy PDO type inequalities in domains.
NTIS
Inequalities; Domains

20000021251 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Topological Invariants of Dynamical Systems and Spaces of Holomorphic Maps. Part 1
Gromov, M.; Sep. 30, 1999; 118p
Report No.(s): PB2000-102531; IHES/M/99/80; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This paper focuses on elementary properties of the mean dimension and on illustrative examples.
NTIS
Topology; Mapping; Dynamical Systems; Analytic Functions

20000021440 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Scenery Flow for Hyperbolic Julia Sets
Bedford, Tim, Technische Univ., Netherlands; Fisher, Albert M., Technische Univ., Netherlands; Urbanski, Mariusz, Technische Univ., Netherlands; Sep. 1999; 36p; In English
Report No.(s): PB2000-102533; IHES/M/99/71; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We prove that, for hyperbolic rational maps, except for a few exceptional cases listed below, the scenery flow is ergodic. We also prove ergodicity for almost all conformal mixing repellors; here the statement is that the scenery flow is ergodic for the repellors which are not linear nor contained in a finite union of real-analytic curves, and furthermore that for the collection of such maps based on a fixed open set U, the ergodic cases form a dense open subset of that collection.
NTIS
Set Theory; Ergodic Process

20000021442 Rutherford Appleton Lab., Chilton, UK
Design of a Parallel Frontal Solver
Scott, Jennifer A., Rutherford Appleton Lab., UK; Dec. 03, 1999; ISSN 1358-6254; 50p; In English
Report No.(s): PB2000-102526; RAL-TR-1999-075; Copyright; Avail: National Technical Information Service (NTIS)

In a previous report (Rutherford Technical Report RAL-94-040), Duff and Scott looked at extending the frontal method for finite-element problems to the multiple front method. This generalization of the frontal method permits coarse-grained parallelism to be exploited in the solution process. In this report, we discuss the design and development of a general purpose software package HSL-MP42 that implements the multiple front algorithm. HSL-MP42 solves unsymmetric systems of finite-element equations on distributed or shared memory parallel computers. The code is written in FORTRAN 90 and uses MPI for message passing. A key design feature is a user interface that is straightforward to use while offering flexibility through a number of options. Numerical results for both a model problem and a practical problem arising from groundwater flow calculations illustrate the efficiency of the code and the advantages of the multiple front approach.
NTIS
Finite Element Method; Applications Programs (Computers); Parallel Processing (Computers)

20000023240 National Inst. of Standards and Technology, Electricity Div., Gaithersburg, MD USA
Algebraic Constraints Implying Monotonicity for Cubics
Fenimore, C.; Libert, J.; Brill, M.; Jan. 2000; 16p; In English
Report No.(s): PB2000-101784; NISTIR-6453; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

While it is straightforward to formulate constraints, which ensure a cubic polynomial is monotonic on an interval, such constraints may not be in a form which is suitable for use with standard optimization techniques and software. The MATLAB package is typical: the required constraints are a series of simultaneous inequalities. In what follows, two simultaneous algebraic inequalities on the coefficients of a cubic polynomial are shown to be necessary and sufficient to assure monotonicity on an interval. This transformation of interval constraints to simultaneous algebraic constraints requires the application of basic logic and analysis. The constraints are applied to a problem arising in analyzing the performance of several video quality measurement models.
NTIS
Polynomials; Monotone Functions; Inequalities

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.

20000021200 Naval Postgraduate School, Monterey, CA USA
A Functional Analysis of DOD Implementation of Seat Management
Rasmussen, David N.; Ruegger, Keith L.; Sep. 1999; 105p; In English
Report No.(s): AD-A371340; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study explores the use of seat management as a method of overcoming the difficulty of procuring, managing and maintaining information technology. Seat management, also known as desktop outsourcing, involves the acquisition and management of all hardware and software, desktop and network management, operations management, support services and technology refreshment into one concise contract managed by a vendor who specializes in IT. The findings of this functional analysis, focusing on seat management, total cost of ownership and asset management, are reported. These findings show that seat

management is not a panacea. But, when used in conjunction with sound management practices it can provide benefits to an organization.
DTIC
Functional Analysis; Management Systems; Information Systems

20000021316 NASA Langley Research Center, Hampton, VA USA
Multidisciplinary Design Optimisation (MDO) Methods: Their Synergy with Computer Technology in the Design Process
Sobieszczanski-Sobieski, Jaroslaw, NASA Langley Research Center, USA; Aeronautical Journal of the Royal Aeronautical Society; August 1999, No. 2451, pp. 373-382; In English; Copyright; Avail: Issuing Activity

The paper identifies speed, agility, human interface, generation of sensitivity information, task decomposition, and data transmission (including storage) as important attributes for a computer environment to have in order to support engineering design effectively. It is argued that when examined in terms of these attributes the presently available environment can be shown to be inadequate. A radical improvement is needed, and it may be achieved by combining new methods that have recently emerged from multidisciplinary design optimisation (MDO) with massively parallel processing computer technology. The caveat is that, for successful use of that technology in engineering computing, new paradigms for computing will have to be developed - specifically, innovative algorithms that are intrinsically parallel so that their performance scales up linearly with the number of processors. It may be speculated that the idea of simulating a complex behaviour by interaction of a large number of very simple models may be an inspiration for the above algorithms; the cellular automata are an example. Because of the long lead time needed to develop and mature new paradigms, development should begin now, even though the widespread availability of massively parallel processing is still a few years away.
Author
Optimization; Design Analysis; Procedures; Computer Systems Design; Data Transmission

20000021351 Rutherford Appleton Lab., ISIS Facility, Chilton, UK
GUIDE: IRIS Data Analysis, 1st Edition
Telling, M.T.F., Rutherford Appleton Lab., UK; Jan. 28, 2000; ISSN 1358-6254; 82p; In English
Report No.(s): RAL-TR-2000-004; Copyright; Avail: Issuing Activity, Hardcopy

This report provides a single, comprehensive point of reference to the suite of software available for the analysis of neutron scattering data collected on the IRIS spectrometer at the ISIS facility, UK. It supersedes ”IDA Iris Data Analysis, W.S.Howells, 1996, RAL-TR-96-006” and incorporates ”IGIS A Graphical User Interface, W.S.Howells et al, 1997, RAL-TR-97-074”. Historically, many of the programs used for Iris Data Analysis (IDA) have existed for decades. In fact, many evolved from packages originally used at the Institut Laue Langevin (ILL), Grenoble, France, having been adapted, and improved, for use at ISIS. However, as new routines and ideas are developed, such as the technique of Bayesian analysis, so the IDA package, and therefore this manual, will be updated and modified.
Author
Langevin Formula; Iris Satellites; Bayes Theorem; Data Processing

20000021422 Massachusetts Inst. of Tech., Cambridge, MA USA
Workshop: Future Directions in Systems and Control Theory. Viewgraphs - Volume 1
Jun. 1999; 141p; In English
Report No.(s): AD-A372584; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The objective of this workshop is to define a research agenda for the next decade and beyond, and to survey research needs for theories, methodologies, and algorithms in: system theoretic issues for deterministic and stochastic systems; linear and nonlinear robust control; system identification; robust adaptive control; fault tolerant and reconfigurable systems; hybrid control; hierarchical, decentralized, and disturbed large scale systems; intelligent systems; chaotic and complex systems; and novel concepts.
CASI
Adaptive Control; Control Theory

20000021427 Michigan State Univ., Dept. of Computer Science, East Lansing, MI USA

Parallel Very High Speed Integrated Circuits (VHSIC) Hardware Description Language (VHDL) Simulation for Performance Modeling ***Final Report, 1 Jul. 1996-28 Feb. 1999***

Chung, Moon Jung; Mar. 1999; 131p; In English

Contract(s)/Grant(s): F33615-96-C-1913; AF Proj. 6096

Report No.(s): AD-A372678; AFRL-IF-WP-TR-1999-1507; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

As the complexity of microelectronic systems continuously increases, it becomes critical to develop effective tools that can cut the design time and improve the quality of design. DoD needs to develop new tools to be able to simulate large complex systems, and to fully maximize the rapid progress in high performance computing technology occurring today. The goal of this project was to develop and implement efficient paradigms for VHDL simulation on massively parallel processor machines so that we can achieve speed up of up to a hundred times compared to sequential simulation. Our research focus was on performance and behavioral level simulation. The performance model allows us to find the trade off between various hardware components and architectures. Behavioral simulations are used to prove the functional correctness of the system. The research issues involved in the project were: processor communications, synchronization, and event queue manipulation, deadlock handling, communication latency hiding, and granularity of computation. We have measured the performance of the proposed techniques on various platforms such as the IBM SP2 and SGI Origin 2000, and achieved speed ups of 31 times.

DTIC

VHSIC (Circuits); Large Scale Integration; Hardware Description Languages; Computer Systems Simulation; Computerized Simulation

20000021504 NASA Marshall Space Flight Center, Huntsville, AL USA

A Collaborative Analysis Tool for Integrated Hypersonic Aerodynamics, Thermal Protection Systems, and RBCC Engine Performance for Single Stage to Orbit Vehicles

Stanley, Thomas Troy, International Space Systems, Inc., USA; Alexander, Reginald, NASA Marshall Space Flight Center, USA; Landrum, Brian, Alabama Univ., USA; [2000]; 2p; In English; Joint Propulsion, 16-19 Jul. 2000, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Presented is a computer-based tool that connects several disciplines that are needed in the complex and integrated design of high performance reusable single stage to orbit (SSTO) vehicles. Every system is linked to every other system, as is the case of SSTO vehicles with air breathing propulsion, which is currently being studied by NASA. An RBCC propulsion system integrates airbreathing and rocket propulsion into a single engine assembly enclosed within a cowl or duct. A typical RBCC propulsion system operates as a ducted rocket up to approximately Mach 3. Then there is a transition to a ramjet mode for supersonic-to-hypersonic acceleration. Around Mach 8 the engine transitions to a scramjet mode. During the ramjet and scramjet modes, the integral rockets operate as fuel injectors. Around Mach 10-12 (the actual value depends on vehicle and mission requirements), the inlet is physically closed and the engine transitions to an integral rocket mode for orbit insertion. A common feature of RBCC propelled vehicles is the high degree of integration between the propulsion system and airframe. At high speeds the vehicle forebody is fundamentally part of the engine inlet, providing a compression surface for air flowing into the engine. The compressed air is mixed with fuel and burned. The combusted mixture must be expanded to an area larger than the incoming stream to provide thrust. Since a conventional nozzle would be too large, the entire lower after body of the vehicle is used as an expansion surface. Because of the high external temperatures seen during atmospheric flight, the design of an airbreathing SSTO vehicle requires delicate tradeoffs between engine design, vehicle shape, and thermal protection system (TPS) sizing in order to produce an optimum system in terms of weight (and cost) and maximum performance. to adequately determine the performance of the engine/vehicle, the Hypersonic Flight Inlet Model (HYFIM) module was designed to interface with the RBCC engine model. HYFIM performs the aerodynamic analysis of forebodies and inlet characteristics of RBCC powered SSTO launch vehicles. HYFIM is applicable to the analysis of the ramjet/scramjet engine operations modes (Mach 3-12), and provides estimates of parameters such as air capture area, shock-on-lip Mach number, design Mach number, compression ratio, etc., based on a basic geometry routine for modeling axisymmetric cones, 2-D wedge geometries. HYFIM also estimates the variation of shock layer properties normal to the forebody surface. The thermal protection system (TPS) is directly linked to determination of the vehicle moldline and the shaping of the trajectory. Thermal protection systems to maintain the structural integrity of the vehicle must be able to mitigate the heat transfer to the structure and be lightweight. Herein lies the interdependency, in that as the vehicle's speed increases, the TPS requirements are increased. and as TPS masses increase the effect on the propulsion system and all other systems is compounded. The need to analyze vehicle forebody and engine inlet is critical to be able to design the RBCC vehicle. to adequately determine insulation masses for an RBCC vehicle, the hypersonic aerodynamic environment and aeroheating loads must be calculated and the TPS thicknesses must be calculated for the entire vehicle. to accomplish this an ascent or reentry trajectory is obtained using the computer code Program to Optimize Simulated Trajectories (POST). The trajectory is then used

to calculate the convective heat rates on several locations on the vehicles using the Miniature Version of the JA70 Aerodynamic Heating Computer Program (MINIVER). Once the heat rates are defined for each body point on the vehicle, then insulation thicknesses that are required to maintain the vehicle within structural limits are calculated using Systems Improved Numerical Differencing Analyzer (SINDA) models. If the TPS masses are too heavy for the performance of the vehicle the process may be repeated altering the trajectory or some other input to reduce the TPS mass. E-PSURBCC is an ”engine performance” model and requires the specification of inlet air static temperature and pressure as well as Mach number (which it pulls from the HYFIM and POST trajectory files), and calculates the corresponding stagnation properties. The engine air flow path geometry includes inlet, a constant area section where the rocket is positioned, a subsonic diffuser, a constant area afterburner, and either a converging nozzle or a converging-diverging nozzle. The current capabilities of E-PSURBCC ejector and ramjet mode treatment indicated that various complex flow phenomena including multiple choking and internal shocks can occur for combinations of geometry/flow conditions. For a given input deck defining geometry/flow conditions, the program first goes through a series of checks to establish whether the input parameters are sound in terms of a solution path. If the vehicle/engine performance fails mission goals, the engineer is able to collaboratively alter the vehicle moldline to change aerodynamics, or trajectory, or some other input to achieve orbit. The problem described is an example of the need for collaborative design and analysis. RECIPE is a cross-platform application capable of hosting a number of engineers and designers across the Internet for distributed and collaborative engineering environments. Such integrated system design environments allow for collaborative team design analysis for performing individual or reduced team studies. To facilitate the larger number of potential runs that may need to be made, RECIPE connects the computer codes that calculate the trajectory data, aerodynamic data based on vehicle geometry, heat rate data, TPS masses, and vehicle and engine performance, so that the output from each tool is easily transferred to the model input files that need it.
Author
Air Breathing Engines; Computer Programs; Computer Techniques; Mathematical Models; Ramjet Engines; Single Stage to Orbit Vehicles; Supersonic Combustion Ramjet Engines; Systems Engineering; Thermal Analysis; Design Analysis

20000023235 NASA Goddard Space Flight Center, Greenbelt, MD USA
One GigaSample Per Second Data Acquisition using Available Gate Array Technology
Wagner, K.W., NASA Goddard Space Flight Center, USA; [1999]; 4p; In English; Military and Aerospace Applications of Programmable Devices and Technologies, 28-30 Sep. 1999, Laurel, MD, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A new National Aeronautics and Space Administration instrument forced demanding requirements upon its altimeter digitizer system. Eight-bit data would be generated at a rate of one billion samples per second. NASA had never before attempted to capture such high-speed data in the radiation, low-power, no-convective-cooling, limited-board-area environment of space. This presentation describes how the gate array technology available at the time of the design was used to implement this one gigasample per second data acquisition system
Author
Data Acquisition; NASA Programs; Altimeters; Analog to Digital Converters; Aerospace Environments; Laser Arrays

20000024845 Kestrel Inst., Palo Alto, CA USA
Inference System Integration Via Logic Morphisms
Bjorner, Nikolaj S., Kestrel Inst., USA; Espinosa, David, Kestrel Inst., USA; Feb. 07, 2000; 5p; In English
Contract(s)/Grant(s): NAG2-1227; No Copyright; Avail: Issuing Activity; Abstract Only

This is a final report on the accomplishments during the period of the NASA grant. The work on inference servers accomplished the integration of the SLANG logic (Specware’s default specification logic) with a number of inference servers in order to make their complementary strengths available. These inverence servers are (1) SNARK. (2) Gandalf, Setheo, and Spass, (3) the Prototype Verification System (PVS) from SRI. (4) HOL98. We designed and implemented MetaSlang, an ML-like language, which we are using to specify and implement all our logic morphisms.
CASI
Systems Integration; Computer Programming; Computer Programs; Programming Environments; Software Development Tools; Software Engineering

20000024876 Reading Univ., UK

Evaluation of Geostatistics and Wavelets for Identifying Relations Between Imagery and Different Spatial Resolutions and for Data Compression ***Final Report, Jul. 1998 - Sep. 1999***

Oliver, Margaret A.; Sep. 1999; 145p; In English

Contract(s)/Grant(s): N68171-98-M-5311

Report No.(s): AD-A372443; RSSUA-4/3; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This is the final report of the project to apply geostatistics and wavelet analysis to part of the area chosen at Fort A. P. Hill in northeastern Virginia. This report embraces several facets of the collaborative work starting with a summary of time spent at the U.S. Topographic Engineering Center and of time spent by TEC personnel at the University of Reading. An analysis of cokriging of Korean temperature data with elevation has been done to assess whether the accuracy of estimates could he improved. The improvement was small compared with the temperature estimates for the USA done previously. A comparison between geostatistics and wavelet analysis has been undertaken. It seems that wavelets provide a more accurate method for data reconstruction, but geostatistics is more appropriate for exploring different resolutions of spatial variation that have been identified by the variogram. A detailed analysis of ground cover at A. P. Hill has been done for three surveys (one was done in a previous report). The results show a relation between the scales of variation in certain ground cover attributes and the SPOT data. Cross variograms suggest that there are spatial relations among variables and the image data. The analysis of elevation data shows that the patterns in its variation correspond closely with those for the NIR waveband. Visually the relation is very strong, but statistically it is weaker.

DTIC

Wavelet Analysis; Data Compression; Spatial Distribution; Geology; Statistical Analysis

20000025220 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

A Data Collection and Representation Framework for Software and Human-Computer Interaction Measurements

Mathias, Karl S.; Jan. 04, 2000; 182p; In English

Report No.(s): AD-A372271; AFIT-FY99-633; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This dissertation presents a framework for capturing, storing, and correlating human-computer interaction measures and software attribute measures. Discovering how computer programmers comprehend software has long been a problem in the field of computer science. Researchers want to understand what strategies programmers take as they look at software so that superior strategies can be investigated and documented. This involves collecting interaction and comprehension measures. Industry wants to determine when software will cause the greatest problems in comprehension, and if the software can be changed to ease this learning curve. This involves the collection of software attribute measures. A framework for the collection and correlation of both measures was developed based upon a straight-forward mathematical model. In this model, a user action is combined with the state of the software being manipulated at a specific point in time. This combination of action, software state, and time forms a unique tuple. This tuple is then the core element of analysis procedures which determine how software state affects user actions. From a mathematical standpoint, the framework components maintain sets of these tuples, organized by user session.

DTIC

Computer Programs; Human-Computer Interface; Data Acquisition

20000025246 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA

A Numerical Simulation of a Carbon Black Suspension Cell Via a Time-Reversed, Double Layer Compute Algorithm

Anderson, Gregg T.; Dec. 1999; 99p; In English

Report No.(s): AD-A372533; AFIT/GAM/ENC/99D-01; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

A numerical simulation of a carbon black suspension cell is explored which models a laser-induced plasma within a liquid ethanol medium of approximately 1 mm thickness. The simulation model assumes a laser pulse with a pulse width of approximately 9 nsecs propagating in the left-to-right direction striking the front surface of the medium and focusing to a spot within the liquid volume. When the energy density within a given irradiated volume is sufficiently high, it ignites the carbon particles and generates a large number of free electrons, i.e., a plasma. The plasma couples with the in-coming laser energy on a picosecond timescale, thereby attenuating the intensity of the remaining pulse as it traverses the medium. The simulation divides the sample into discrete layers and models the propagation of the plasma through the course of a single laser pulse containing a total fluence of 1 Joule/sq cm. A new double layer, time-reversed algorithm is employed which modifies and extends the capabilities of the existing code. The older version is used as a baseline for comparison with the new program.

DTIC

Laser Beams; Computerized Simulation; Plasmas (Physics)

20000025258 Electrotechnical Lab., Ibaraki, Japan

Science of Programming: Toward Secure Development of Software

Kinoshita, Kazuki, Electrotechnical Lab., Japan; Takahashi, Koichi, Electrotechnical Lab., Japan; April 1999; ISSN 0366-9084; 42p; In Japanese

Report No.(s): UDC:519.618,681.3; Copyright; Avail: Issuing Activity

Programs are intended to work for some purposes. But they frequently do not work correctly. They are called ”The program has bugs”. The Science of Programming is a study from mathematical science to obtain programs without bugs. There are three main parts of science of programming: program semantics, program verification and program languages. We report the present status and the future of science of programming.

Author

Computer Programming; Program Verification (Computers); Computer Program Integrity; Software Reliability; Computer Systems Performance; Software Engineering

20000025259 NASA Glenn Research Center, Cleveland, OH USA

SmaggIce User Guide, 1.0

Baez, Marivell, NASA Glenn Research Center, USA; Vickerman, Mary, NASA Glenn Research Center, USA; Choo, Yung, NASA Glenn Research Center, USA; February 2000; 50p; In English

Contract(s)/Grant(s): RTOP 548-20-23

Report No.(s): NASA/TM-2000-209793; NAS 1.15:209793; E-12083; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

SmaggIce (Surface Modeling and Grid Generation for Iced Airfoils) is one of NASNs aircraft icing research codes developed at the Glenn Research Center. It is a software toolkit used in the process of aerodynamic performance prediction of iced airfoils. It includes tools which complement the 2D grid-based Computational Fluid Dynamics (CFD) process: geometry probing; surface preparation for gridding: smoothing and re-discretization of geometry. Future releases will also include support for all aspects of gridding: domain decomposition; perimeter discretization; grid generation and modification.

Derived from text

Software Development Tools; Computational Fluid Dynamics; User Manuals (Computer Programs); Aircraft Icing; Grid Generation (Mathematics); Airfoils

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.

20000021106 Department of Defense, Office of Inspector General, Arlington, VA USA

DOD Efforts to Implement Year 2000 Compliance for Electronic Data Interchange

Mar. 05, 1999; 21p; In English

Contract(s)/Grant(s): Proj. 8CC-0047

Report No.(s): AD-A367159; AR-99-103; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The primary audit objective was to determine whether the DoD electronic data interchange program complies with year 2000 requirements. The Military Services, the Defense Information Systems Agency, and the Defense Logistics Agency have made generally satisfactory progress in ensuring year 2000 compliance for their electronic data interchange systems. Twenty of 27 electronic data interchange systems identified by the Military Services, the Defense Information Systems Agency, and the Defense Logistics Agency were year 2000 compliant and one system, believed to be compliant, was being tested. Four of the non-compliant systems were expected to be compliant in February 1999, one in March 1999, and two in May 1999. One of the seven non-compliant systems was a mission critical Defense Logistics Agency system. The Joint Electronic Commerce Program Office and the Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) co-chaired electronic commerce/electronic data interface assessment workshops to identify DoD electronic commerce/electronic data interface Y2K implementation issues and to facilitate resolution among the Military Components. Additionally, all 25 currently approved value added network providers had signed modified license agreements certifying that their systems were Y2K compliant.

DTIC

Command and Control; Information Systems; Logistics; Computer Program Integrity; Program Verification (Computers)

20000021107 Department of Defense, Office of Inspector General, Arlington, VA USA
Year 2000 Coomputing Issues: Defense Logistics Agency Distribution Standard System
Mar. 02, 1999; 44p; In English
Contract(s)/Grant(s): Proj. 8LD-9021
Report No.(s): AD-A367161; AR-99-100; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The overall audit objective was to evaluate whether the Defense Logistics Agency (DLA) was adequately planning for and managing year 2000 risks to avoid undue disruption to its supply mission. This audit, the first in a series on the DLA supply mission, focused on the core DLA supply system, the Distribution Standard System.
DTIC
Logistics Management; Computer Program Integrity; Program Verification (Computers)

20000021156 Department of Defense, Office of Inspector General, Arlington, VA USA
Year 2000 Issues Within the U.S. Pacific Command's Area of Responsibility: U.S. Forces Korea
Apr. 07, 1999; 31p; In English
Contract(s)/Grant(s): Proj. 8CC-0049.02
Report No.(s): AD-A366997; IG/DOD-99-125; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The overall audit objective was to evaluate whether DoD adequately planned for and managed year 2000 risks to avoid disruptions to the U.S. Pacific Command's mission. Specifically, we reviewed year 2000 risk assessments contingency plans for mission critical systems, and continuity of operations plans to perform core mission requirements. The review included major DoD communications systems operating within the U.S. Pacific Command's area of responsibility.
DTIC
Computer Program Integrity; Systems Management; Computer Information Security; Program Verification (Computers)

20000021214 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Crisis: State Department Needs to Make Fundamental Improvements to Its Year 2000 Program
Aug. 28, 1998; 34p
Report No.(s): PB2000-102489; GAO/AIMD-98-162; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The report responds to your request that we review the Department of State's progress in solving its Year 2000 computer systems problem. The Department of State relies on a variety of information systems and networks to help it carry out its responsibilities and support business functions, such as financial management, medical assistance, visa and passport issuance, diplomatic agreements and communications, and personnel. We assessed (1) the overall status of State's efforts to identify and correct its date-sensitive systems and (2) the appropriateness of State's strategy and actions to correct its Year 2000 problems.
NTIS
Information Systems; Management Systems

20000024976 Houston Univ., TX USA
The Legal Limitations on Defending the National Information Infrastructure Against a Cyber Attack
Dhillon, Joe, Houston Univ., USA; May 27, 1999; 89p; In English
Report No.(s): AD-A372298; AFIT-FY99-436; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy
The purpose of this paper is to examine the selected domestic and international legal limitations the ability and authority of the USA Air Force to carry out its unique role in ensuring the security of this country against cyber attacks upon our critical information infrastructures.
DTIC
Computer Information Security; Access Control; Computer Networks

20000025021 Object Services and Consulting, Inc., Baltimore, MD USA
Survivability in Object Service Architectures (OSA) ***Final Report, Jul 1996- May 1999***
Wells, David, Object Services and Consulting, Inc., USA; Ford, Steve, Object Services and Consulting, Inc., USA; Langworthy, David, Object Services and Consulting, Inc., USA; Bannon, Thomas, Object Services and Consulting, Inc., USA; Wells, Nancy, Object Services and Consulting, Inc., USA; Oct. 1999; 167p; In English
Contract(s)/Grant(s): F30602-96-C-0330; AF Proj. E017
Report No.(s): AD-A372229; AFRL-IF-RS-TR-1999-236; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy
The military of the future will increasingly rely upon information superiority to dominate the battlespace. The size and complexity of the software systems necessary to achieve this goal makes them highly vulnerable to the loss or degradation of hosts,

networks, or processed due to physical and information warfare attacks, hardware and infrastructure failures, and software errors. This report summaries the goals and results of a project that developed an architecture and software mechanisms to make military and commercial software applications based on the popular Object Services Architecture (e.g., OMG's CORBA) model far more survivable than is currently possible, while at the same time maintaining the flexibility and ease of construction that characterizes OSA based applications.
DTIC
Distributed Processing; Architecture (Computers); Computer Networks; Computer Programs; Software Engineering

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.

20000021167 OR Applications, Huntsville, AL USA
Systems Engineering Programmatic Estimation Using Technology Variance
Mog, Robert A., OR Applications, USA; February 2000; 14p; In English; Original contains color illustrations
Contract(s)/Grant(s): NASA Order H-32236-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Unique and innovative system programmatic estimation is conducted using the variance of the packaged technologies. Covariance analysis is performed on the subsystems and components comprising the system of interest. Technological "return" and "variation" parameters are estimated. These parameters are combined with the model error to arrive at a measure of system development stability. The resulting estimates provide valuable information concerning the potential cost growth of the system under development.
Author
Systems Engineering; Estimating; Estimates; Covariance; Regression Analysis; Risk

20000021337 National Taiwan Ocean Univ., Dept. of Electrical Engineering, Keelung, Taiwan, Province of China
State-Space Characterization of all Solutions to a Positive Real Control Problem
Yung, Chee-Fai, National Taiwan Ocean Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 653-659; In English
Contract(s)/Grant(s): NSC-87-2218-E-019-001; Copyright; Avail: Issuing Activity, Hardcopy

The purpose of this paper is to give a state-space characterization of all internally stabilizing finite-dimensional linear time-invariant output feedback controllers for a given finite-dimensional linear time-invariant plant which ensure that the resulting closed-loop transfer function is extended strictly positive real(ESPR). All such controllers are parameterized by a fixed linear fractional transformation with an ESPR, stable free parameter. The parameterized controllers have a state dimension not less than that of the open-loop plant. The development uses only elementarily algebraic ideas beginning with a change of variables, an extended version of Kalman-Yacubovich-Popov positive real lemma, and Youla parameterization, thus the proofs given are simple and clear.
Author
Feedback Control; Linear Transformations; Parameterization; Transfer Functions

20000021340 National Taiwan Univ., Dept. of Mechanical Engineering, Taipei, Taiwan, Province of China
A Self-Tuning Run-By-Run Process Controller for Processes Subject to Random Disturbances
Guo, Ruey-Shan, National Taiwan Univ., Taiwan, Province of China; Chen, Jin-Jung, National Taiwan Univ., Taiwan, Province of China; Chen, Argon, National Taiwan Univ., Taiwan, Province of China; Lu, Shui-Shong, National Taiwan Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 627-638; In English; Copyright; Avail: Issuing Activity, Hardcopy

In this paper a self-tuning run-by-run process controller is presented. The controller has the capability of choosing a control parameter dynamically in response to the underlying process disturbances. There are two modules in this controller: a self-tuning loop trigger module and a run-by-run feedback control module. In the self-tuning loop trigger module, two Exponentially Weighted Moving Average (EWMA) control charts are used sequentially to determine if there is a large or medium shift in the process output and to trigger a new self-tuning loop accordingly. In the run-by-run feedback control module, the control parameter and control model are re-tuned sequentially and a new process recipe is generated, on a run- by-run basis, to compensate for the

process output's deviation from the target. Monte Carlo simulation results show that the self-tuning run-by-run process controller is superior to the current run-by-run process controller with a fixed control parameter.
Author
Random Processes; Feedback Control; Tuning

20000021341 National Yun-Lin Univ. of Science and Technology, Dept. of Electrical Engineering, Touliu, Taiwan, Province of China
Quasi Time-Optimal PID Control of Multivariable Systems: A Seesaw Example
Wu, Chia-Ju, National Yun-Lin Univ. of Science and Technology, Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 617-625; In English
Contract(s)/Grant(s): NSC-88-2213-E-224-037; Copyright; Avail: Issuing Activity, Hardcopy

A numerical approach is proposed to design PID controllers for multivariable (multi-input or multi-output) systems. Different from traditional tuning methods, the Proportional Integral Derivative (PID) parameters in the proposed method are determined by solving a nonlinear programming (NLP) problem. Since the objective function of the NLP problem is the traveling time between two states, the PID controller will drive the system from a given initial state to the desired final state in a quasi time-optimal manner. The reason why the PID controller cannot generate truly time-optimal movement will also be given. A seesaw system that has one input and two outputs will be used for simulation and practical implementation to illustrate the validity of the proposed method.
Author
Nonlinear Programming; Numerical Analysis; Time Optimal Control

20000021421 California Univ., Los Angeles, CA USA
Evaluation of CIT for Over-the-Horizon Radar Enhancement ***Final Report, 1 Nov. 1996-31 Oct. 1999***
Na, Helen; Jan. 14, 2000; 4p; In English
Contract(s)/Grant(s): N00014-97-1-0159
Report No.(s): AD-A372565; HN-ONRYI; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Research has focused on the development, characterization, and implementation of algorithms for time varying ionospheric imaging. Several techniques were used including neural network based approaches for imaging localized time varying events, an iterative volumetric approach for three dimensional imaging that enables localized incorporation of a priori information, and a technique that utilizes both TEC data as well as information from the WSBI system. Considerable effort was made to analyze the strengths and weaknesses of the various approaches and their inherent limitations. Tests were made using both real and simulated data.
DTIC
Over-The-Horizon Radar; Tomography; Computer Aided Tomography; Computer Graphics

20000021432 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Adaptive Wavelet Transforms via Lifting
Claypoole, Roger L., Jr; Oct. 1999; 91p; In English
Report No.(s): AD-A372394; AFIT-FY99-441; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Wavelet transforms have proven very useful for a variety of signal and image processing tasks. The wedgelet transform also shows promise for certain edge-dominated images. However, in many applications we desire to introduce adaptivity and nonlinearities into the transforms. These are powerful extensions, but difficult to control within the wavelet framework. The lifting scheme provides a new, spatial intuition into the wavelet transform that simplifies the introduction of adaptivity. In this thesis, we develop several new adaptive wavelet transforms and adaptive multiresolution wedgelet transforms. The lifting construction permits control over the multiresolution properties of these transforms despite the adaptivity. We demonstrate the power of our new adaptive lifted transforms with successful applications to signal denoising and compression problems.
DTIC
Wavelet Analysis; Signal Processing; Data Compression; Transformations (Mathematics); Images

20000024879 Amsterdam Univ., Netherlands

Unsupervised Spatial Feature and Change Detection in RS Imaging ***Interim Report, Jul. - Oct. 1999***

Mokken, R. J.; Nov. 01, 1999; 9p; In English

Contract(s)/Grant(s): N68171-98-C-9012

Report No.(s): AD-A372455; BAA-RM-IV-5; ARDSG-R/D-8444-EN-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Most of our work since the last interim report was spent on studying necessary adaptations of the software to various operational requirements, assisted by data runs to suggest their use, and studying and assessing recent statistical and neural theoretical developments for possible application. Main activities continued: (1) requirements analysis for development of prototype into a system for operational use; (2) re-designing the basic methodology implemented by the system, involving a clear separation of the main methodological elements; (3) differentiating project pursuit classification and pixel blending within classes; (4) conserving inspection mode to facilitate selecting (sub) classes and regions in a; (5) classified image for further analysis; and (6) continue study of spectral de-mixing, within (sub) classes, using RBF neural network technology.

DTIC

Remote Sensing; Change Detection; Imaging Techniques; Software Engineering

20000024977 Washington Univ., Dept. of Electrical Engineering, Seattle, WA USA

Decision-Based Design of a Low Vision Aid

Kloeckner, Kyle Warren, Washington Univ., USA; Dec. 05, 1999; 137p; In English

Report No.(s): AD-A372297; AFIT-FY99-437; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

A probabilistic, decision based, computer design model based on the techniques described in Systems Engineering: An Approach to Information Based Design was developed for the design of a low vision aid using a scanned laser display system called the Virtual Retinal Display. An empirical color performance and preference study with 7 low vision subjects was also conducted to verify some of the model assumptions and refine the model data. The model yielded an optimal design that uses a blue light source, has a minimum contrast of 47.4% and uses reversed contrast (light on dark) text. The maximum allowable cost of any design evaluated by the model is determined to be the most sensitive cost parameter in the model. The decision based process is concluded as useful but requires large amounts of accurate numerical data for the model parameters. Furthermore, a significant tradeoff exists between model complexity and the required computation time to eliminate the random noise experienced from the probabilistic aspects of the decision based design process.

DTIC

Computer Aided Design; Computer Vision; Visual Aids; Systems Engineering

20000024996 Boston Univ., Boston, MA USA

Real-Time Simulation Technologies for Complex Systems ***Final Report, May 1997 - Apr. 1999***

Cassandras, Christos G., Boston Univ., USA; Gong, Wei-Bo, Boston Univ., USA; Nov. 1999; 127p; In English; Prepared in cooperation with Massachusetts Univ., Dept. of Electrical and Computer Engineering, Amherst, MA.

Contract(s)/Grant(s): F30602-97-C-0125; AF Proj. 459S

Report No.(s): AD-A372150; AFRL-IF-RS-TR-1999-245; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

This report summarizes the work performed for Real Time Simulation Technologies for Complex Systems. The objective of the effort was to develop and study three novel complimentary directions that may be summarized as follows: (1) Speed up the inherently slow simulation process of complex systems by exploiting new concurrent simulation techniques. (2) Exploit the hierarchical nature of multi-resolution simulation models by decomposing them in ways which preserve statistical fidelity. (3) Explore new ways to extract metamodels for complex systems simulations, using neural networks.

DTIC

Complex Systems; Computerized Simulation; Neural Nets; Systems Analysis; Real Time Operation

64
NUMERICAL ANALYSIS

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

20000024883 Morgan State Univ., Baltimore, MD USA
Finite Differences and Collocation Methods for the Solution of the Two Dimensional Heat Equation
Kouatchou, Jules, NASA Goddard Space Flight Center, USA; [1999]; 13p; In English
Contract(s)/Grant(s): NAG5-3508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we combine finite difference approximations (for spatial derivatives) and collocation techniques (for the time component) to numerically solve the two dimensional heat equation. We employ respectively a second-order and a fourth-order schemes for the spatial derivatives and the discretization method gives rise to a linear system of equations. We show that the matrix of the system is non-singular. Numerical experiments carried out on serial computers, show the unconditional stability of the proposed method and the high accuracy achieved by the fourth-order scheme.
Author
Finite Difference Theory; Collocation; Thermodynamics

20000025193 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
A Model for Asymmetric Hysteresis in Piezoceramic Materials ***Final Report***
Smith, Ralph C ., North Carolina State Univ., USA; Ounaies, Zoubeida, Institute for Computer Applications in Science and Engineering, USA; January 2000; 12p; In English
Contract(s)/Grant(s): NAS1-97046; F49620-98-1-0180; RTOP 505-90-52-01
Report No.(s): NASA/CR-2000-209837; NAS 1.26:209837; ICASE-2000-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper focuses on the characterization of hysteresis exhibited by piezoelectric materials at moderate to high field levels. For soft materials in which dipoles are easily reconfigured, the hysteresis loop is observed to be rotationally symmetric about the zero field, zero polarization point and symmetric models can be employed. In harder materials, however, the loops are no longer rotationally symmetric which necessitates the development of commensurate characterization techniques. The model considered here is based upon the quantification of reversible and irreversible changes in polarization due to bending and translation of domain walls pinned at inclusions inherent to the materials. The performance of the model is illustrated through comparison with PZT4 data.
Author
Hysteresis; Piezoelectric Ceramics; Piezoelectricity

65
STATISTICS AND PROBABILITY

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

20000021282 Old Dominion Univ., Norfolk, VA USA
Large Deviations for Resampling Methods and Simulations ***Final Report, 1 May 1996 - 30 Oct. 1999***
Chaganty, N. R.; Oct. 31, 1999; 129p; In English
Contract(s)/Grant(s): DAAH04-96-1-0070
Report No.(s): AD-A371375; Rept-241601; ARO-32886.11-MA; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In this research project we studied two important problems in probability and statistics. First, we have established the large deviation principle for a sequence of probability measures defined on a product space, when the marginal and the conditional distributions possess the large deviation property. We have used the result to study the large deviation behavior of the bootstrap resampling procedure and robustness of location parameter tests in contaminated normal populations via Bahadur slopes and efficiencies. The second problem is concerned with the statistical analysis of longitudinal data. In recent years the GEE method has become a popular tool for analyzing discrete longitudinal data. The method uses a generalized quasi-score function to estimate the regression parameter, and moment estimates for the correlation parameter. Despite the popularity, the GEE method has some inherent pitfalls. In this research we have developed an alternative estimation procedure which overcomes those pitfalls. This

alternative method is known as the Quasi-least squares (QLS), since it uses a partial minimization based on the principle of (generalized) least squares. We have shown that the QLS estimates are feasible, consistent and asymptotically normal.
DTIC
Statistical Analysis; Deviation; Simulation; Sampling

20000021475 Purdue Univ., Dept. of Statistics, West Lafayette, IN USA
On Empirical Bayes Simultaneous Selection Procedures for Comparing Normal Populations with a Standard
Gupta, Shanti S., Purdue Univ., USA; Liang, TaChen, Wayne State Univ., USA; Journal of Statistical Planning and Inference; 1999; ISSN 0378-3758; Volume 77, pp. 73-88; In English
Contract(s)/Grant(s): DAAH04-95-I-0165
Report No.(s): AD-A369983; ARO-32922-20-MA; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

In this paper, we derive statistical selection procedures to partition k normal populations into 'good' or 'bad' ones, respectively, using the nonparametric empirical Bayes approach. The relative regret risk of a selection procedure is used as a measure of its performance. We establish the asymptotic optimality of the proposed empirical Bayes selection procedures and investigate the associated rates of convergence. Under a very mild condition, the proposed empirical Bayes selection procedures are shown to have rates of convergence of order close to O(k(sup -1/2)) where k is the number of populations involved in the selection problem. With further strong assumptions, the empirical Bayes selection procedures have rates of convergence of order O(k(sup -alpha(r-1)/(2r+1)), where 1 is less than alpha is less than 2 and r is an integer greater than 2.
Author
Bayes Theorem; Selection; Sampling

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20000024884 NASA Goddard Space Flight Center, Greenbelt, MD USA
Flight Dynamics Analysis Branch End of Fiscal Year 1999 Report
Stengle, Thomas, NASA Goddard Space Flight Center, USA; Flores-Amaya, Felipe, NASA Goddard Space Flight Center, USA; October 1999; 37p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document summarizes the major activities and accomplishments carried out by the Goddard Space Flight Center (GSFC)'s Flight Dynamics Analysis Branch (FDAB), Code 572, in support of flight projects and technology development initiatives in Fiscal Year (FY) 1999. The document is intended to serve as both an introduction to the type of support carried out by the FDAB (Flight Dynamics Analysis Branch), as well as a concise reference summarizing key analysis results and mission experience derived from the various mission support roles assumed over the past year. The major accomplishments in the FDAB in FY99 were: 1) Provided flight dynamics support to the Lunar Prospector and TRIANA missions among a variety of spacecraft missions; 2) Sponsored the Flight Mechanics Symposium; 3) Supported the Consultative Committee for Space Data Systems (CCSDS) workshops; 4) Performed numerous analyses and studies for future missions; 5) Started the Flight Dynamics Analysis Branch Lab for in-house mission analysis and support; and 6) Complied with all requirements in support of GSFC IS09000 certification.
Derived from text
Aerodynamics; Earth Observing System (EOS); Flight Mechanics; Dynamical Systems

20000025012 Air Force Operational Test and Evaluation Center, Detachment 1, Kirtland AFB, NM USA
Space Environment Network Display (SEND): Limited Military Utility Assessment ***Final Report, 1 Aug. 1998 - 1 Jul. 1999***
Alvarex, Robert; Jul. 1999; 54p; In English
Report No.(s): AD-A371978; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The U.S. Air Force Space Battlelab designated the Detachment 1 to conduct the military utility assessment of the Space Environment Network Display (SEND) initiative. Sensors were placed at Ascension Island from 1 April through 17 April 1999 in support of this assessment. Based upon the performance demonstrated during the Limited Military Utility Assessment, Detachment 1 concludes that the SEND system and concept both have military utility.
DTIC
Aerospace Environments; Detachment; Ionospheric Disturbances; Satellite Communication; Scientific Visualization

20000025045 Air Force Space Battlelab, Schriever AFB, CO USA
Commercial Application for Combat Effectiveness (CACE)
Oran, Tim; Jun. 1999; 16p; In English
Report No.(s): AD-A371863; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This after initiative report is a summary of extensive data gathered by the Air Force Space Battlelab during the evaluation of the Iridium Satellite System. For this evaluation, the Air Force Space Battlelab interviewed Commander in Chief (CINC) J6 staffs and warfighters in the field. The Air Force Space Battlelab also reviewed current Joint Operations Requirements, Joint and Services Concepts of Operations, and future military communication needs. This global evaluation used over 21,000 minutes of airtime on the Iridium system in 40 days.
DTIC
Command and Control; Satellite Communication; Combat

20000025058 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA
Research Highlights
November - December 1999; 4p; In English
Report No.(s): AD-A371842; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Research Highlights is published every two months by the Air Force Office of Scientific Research. This newsletter provides brief descriptions of AFOSR basic research activities including topics such as research accomplishments, examples of technology transitions and technology transfer notable peer recognition awards and honors, and other research program achievements. The purpose is to provide Air Force, DoD, government, industry and university communities with brief accounts to illustrate AFOSR support of the Air Force mission.
DTIC
Research and Development; Defense Program; Military Technology; Industries

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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.

20000021301 Tokyo Univ., Inst. for Solid State Physics, Japan
Universal Critical Temperature for Kosterlitz-Thouless Transitions in Bilayer Quantum Magnets
Troyer, Matthias, Tokyo Univ., Japan; Sachdev, Subir, Yale Univ., USA; August 1998; ISSN 0082-4798; 6p; In English
Contract(s)/Grant(s): NSF DMR-96-23181; Copyright; Avail: Issuing Activity, Hardcopy

Recent experiments show that double layer quantum Hall systems may have a ground state with canted antiferromagnetic order. In the experimentally accessible vicinity of a quantum critical point, the order vanishes at a temperature T(sub KT) = kappa.H, where H is the magnetic field and kappa is a universal number determined by the interactions and Berry phases of the thermal excitations. We present quantum Monte Carlo simulations on a model spin system which support the universality of kappa and determine its numerical value. This allows experimental tests of an intrinsically quantum-mechanical universal quantity, which is not also a property of a higher dimensional classical critical point.
Author
Critical Temperature; Hall Effect; Magnetic Fields

20000021485 NASA Langley Research Center, Hampton, VA USA
Thermal Nondestructive Characterization of Corrosion in Boiler Tubes by Application fo a Moving Line Heat Source
Cramer, K. Elliott, NASA Langley Research Center, USA; Winfree, William P., NASA Langley Research Center, USA; January 2000; 16p; In English
Contract(s)/Grant(s): RTOP 522-18-11-03
Report No.(s): NASA/TM-2000-209685; NAS 1.15:209685; L-17859; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wall thinning in utility boiler waterwall tubing is a significant inspection concern for boiler operators. Historically, conventional ultrasonics has been used lor inspection of these tubes. This technique has proved to be very labor intensive and slow. This has resulted in a ”spot check” approach to inspections, making thickness measurements over a relatively small percentage

of the total boiler wall area. NASA Langley Research Center has developed a thermal NDE technique designed to image and quantitatively characterize the amount of material thinning present in steel tubing. The technique involves the movement of a thermal line source across the outer surface of the tubing followed by an infrared imager at a fixed distance behind the line source. Quantitative images of the material loss due to corrosion are reconstructed from measurements of the induced surface temperature variations. This paper will present a discussion of the development of the thermal imaging system as well as the techniques used to reconstruct images of flaws. The application of the thermal line source, coupled with this analysis technique, represents a significant improvement in the inspection speed for large structures such as boiler waterwalls while still providing high-resolution thickness measurements. A theoretical basis for the technique will be presented thus demonstrating the quantitative nature of the technique. Further, results of laboratory experiments on flat Panel specimens with fabricated material loss regions will be presented.
Author
Nondestructive Tests; Inspection; Corrosion; Boilers; Pipes (Tubes); Thermography; Infrared Imagery

20000025008 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne Australia
Extra Low Frequency (ELF) Coils for the Marine Environment Data Acquisition System (MEDAS)
Clarke, David; Sep. 1999; 35p; In English
Report No.(s): AD-A371885; DSTO-TR-0876; DODA-AR-011-084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These Extra Low Frequency (ELF) coils for measuring low frequency magnetic signatures were designed and built for use with the Marine Environment Data Acquisition System (MEDAS) concept demonstrator. This report details the tests conducted to determine the performance of these coils. A circuit model of the ELF coils is developed so the output of the coils may be related to the incident magnetic field. The values for the resistance, inductance and capacitance are measured and calculated from details of the construction. The effect of incorporating a calibration winding for checking the in-situ underwater response of the ELF coils are also examined.
DTIC
Magnetic Fields; Data Acquisition; Frequency Measurement; Electric Coils; Extremely Low Frequencies

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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.

20000021145 Rhode Island Univ., Dept. of Electrical and Computer Engineering, Kingston, RI USA
1999 Underwater Acoustic Signal Processing Workshop ***Final Report, Aug. - Oct. 1999***
Vaccaro, Richard J.; Oct. 08, 1999; 35p; In English
Contract(s)/Grant(s): N00014-99-1-0451
Report No.(s): AD-A370148; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contains abstracts for 22 talks given at the 1999. Underwater Acoustic Signal Processing Workshop. The workshop included a special session on the detection; classification, and localization of marine mammals.
DTIC
Underwater Acoustics; Signal Processing

20000021199 Washington Univ., Applied Physics Lab., Seattle, WA USA
High-Frequency Acoustic Volume Scattering from Biologically Active Marine Sediments
Jones, Christopher D.; Oct. 1999; 196p; In English
Contract(s)/Grant(s): N00014-98-1-0040
Report No.(s): AD-A371341; APL-UW-TR-9903; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

A thesis on high-frequency acoustic volume scattering from marine sediments with application to remote sensing of benthic biological activity is presented. Small perturbation theory is used to describe bistatic volume scattering in a sediment half-space. The sediment is modeled as an acoustic fluid with random fluctuations in density and compressibility. Insight into determining whether single or multiple scattering is significant in the medium is gained by using the bilocal approximation to Dyson's equation. An alternative analysis of volume scattering is made using exact numerical simulations, and a numerical method for two-dimensional volume scattering using the method of moments is presented. Both periodic and nonperiodic random media are

considered. Scattering theory is compared with numerical Monte Carlo simulations, and the validity of the small perturbation method is discussed. The effects of the half-space scattering geometry on the coherent field within the sediment and on the bistatic scattering cross section are investigated. Benthic biological activity creates temporal and spatial variations in the sediment physical properties that result in temporal and spatial variations in sediment volume scattering. This acoustic variability is used as a remote sensing tool to infer parameters of biological activity, or bioturbation. to develop a forward model that relates bioturbation to density fluctuations in the sediment and, therefore, to acoustic scattering, a new stochastic model of bioturbation is presented that describes biological mixing as an inhomogeneous (two scale) biodiffusion process. Nonlocal mixing (due to macrofauna) is described as a filtered Poisson process, and local mixing (due to meiofauna) is described as diffusive. Modeling issues such as the spatial stationarity of bioturbation are discussed. The bioturbation and acoustic scattering models are then combined to produce a model for the decorrelation in time of acoustic backscatter.
DTIC
Acoustic Scattering; Sediments; High Frequencies; Backscattering; Scattering Cross Sections

20000021244 Sikorsky Aircraft, Stratford, CT USA
Rotorcraft Noise Abatement Flight Path Modeling
Murty, Hema, Sikorsky Aircraft, USA; Berezin, Charles R., Sikorsky Aircraft, USA; February 2000; 78p; In English
Contract(s)/Grant(s): NAS1-20097; RTOP 581-20-31-01
Report No.(s): NASA/CR-2000-209353; NAS 1.26:209353; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report addresses development of a rotor state/trim modeling capability for noise modeling of decelerating rotorcraft approaches. The resulting technique employs discretization of the descent trajectory as multiple steady state segments for input to CAMRAD.Mod 1 to predict rotor states for acoustic analysis. Deceleration is included by modifying the CAMRAD.Mod 1 free flight trim options to allow trim to the specified acceleration/deceleration components.
Author
Noise Reduction; Flight Paths; Applications Programs (Computers); Mathematical Models; Sikorsky Whirlwind Helicopter; Flight Tests

20000021434 California Univ., San Diego, La Jolla, CA USA
Fundamentals of Acoustic Instabilities in Liquid Propellant Rockets Under Transcritical Conditions ***Final Report, 1 Sep. 1997-31 Aug. 1999***
Williams, Forman A.; Dec. 29, 1999; 9p; In English
Contract(s)/Grant(s): F49620-97-1-0098
Report No.(s): AD-A372407; AFRL-SR-BL-TR-00-0011; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The objective of this research was to improve understanding of the mechanisms by which flow, mixing and combustion processes are coupled to acoustic fields in liquid-propellant rocket motors. Particular attention was focused on analyses of amplification mechanisms coupled with finite-rate chemical reactions by use of numerical and analytical methods. Special attention was focused on LOX/GH2 systems and suggested a possible explanation of threshold phenomena found in liquid-propellant rockets. Reduced chemistry was developed for describing LOX combustion in GH2. and approaches towards explaining droplet burning-time minima in the transcritical regime were completed. The results can be helpful in improving knowledge of combustion mechanisms and combustion instability in liquid-propellant rocket motors at high pressures.
DTIC
Acoustic Instability; Liquid Propellant Rocket Engines; Liquid Rocket Propellants; Liquid Oxygen; Rocket Engines

20000021438 Norwegian Defence Research Establishment, Kjeller, Norway
Investigation of Pressure to Acceleration Responsivity of Fiber-Optic Hydrophones
Waagaard, Ole Henrik, Norwegian Defence Research Establishment, Norway; Sep. 1999; 130p; In English; \
Contract(s)/Grant(s): FFIE proj. 685/116
Report No.(s): PB2000-102584; FFI/RAPPORT-99/01153; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
The purpose of this work is to investigate the acceleration responsivity of fiber-optic air-backed mandrel hydrophones. An experimental arrangement is constructed for measuring the acceleration responsivity of fiber-optic hydrophones. Several hydrophones are designed and tested. The hydrophones are made either single section, with one active compliant shell, or double section, with two shells and mounting point in the center of the hydrophone. The experimental results show that the acceleration

responsivity is caused by deformation of the supporting cylinder at the supporting areas of the compliant shell. The results also show a responsivity caused by deformation of the core in which the interferometer is molded.
NTIS
Hydrophones; Fiber Optics; Pressure Sensors; Cylindrical Shells

20000021451 Institute TNO of Applied Physics, Delft, Netherlands
Sound Transmission of Four Water Filled Reiflexa 1S PN16 Bellows Configurations (Inner Diameter 200 Millimeter) ***Constructiegeluidoverdracht van Diverse Reiflexa 1S PN16 Balgconfiguraties (Inwendige Diameter 200 mm)***
Vermeulen, R. C. N., Institute TNO of Applied Physics, Netherlands; Nov. 11, 1999; 45p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A97/KM/152; TNO Proj. 008.00649/01.01
Report No.(s): TPD-HAG-RPT-990188; Copyright; Avail: Issuing Activity
In order to be able predict sound transfer through piping systems it is necessary to know the acoustical transfer functions in different directions. Measurements of these functions have been performed on four water filled Reiflexa 1S PN16 bellow configurations (inner diameter: 200 mm) at different pressures. The results will be used for the calculation of the underwater sound radiation of resiliently mounted machinery.
Author
Sound Transmission; Wave Propagation; Bellows; Noise Reduction

20000024915 Naval Research Lab., Acoustics Systems Branch, Washington, DC USA
Space-Frequency Correlations in Multistatic Acoustic Reverberation Due to a Wind-Driven Sea Surface: Theoretical Results at Low Frequency ***Final Report***
Gragg, R. F.; Nov. 26, 1999; 55p; In English
Report No.(s): AD-A371982; NRL/FR/7140--99-9923; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Analytic methods are used to assess the impact of the two-dimensional (2-D) wave spectrum of a wind-driven sea on multistatic low-frequency surface reverberation. The problem is initially posed with a narrowband source beneath a time-dependent sea surface in an ocean that can have depth dependence and bottom layering. The propagated signal interacts with the slower moving surface waves to produce a narrowband scattered field. The small-waveheight approximation is applied to a deterministic sea surface to express the scattered field in terms of the surface elevation and the Green's function for a perfectly calm sea. Randomness is then incorporated into the surface description, and its impact is formulated for an arbitrarily placed pair of receivers. The three-dimensional (3-D) cross-spectral density (CSD) of the reverberation is reduced to a sum of baseband and sideband terms formulated as multiple mean-sea-surface integrals. The sideband result is identified as an active scattering generalization of the van Cittert-Zernike theorem from partial coherence theory. The focus is then narrowed to shallow deployment in a homogeneous ocean, and stationary-phase estimates are used to produce analytic expressions for the CSD. The zero-Doppler component and Bragg-Doppler sidebands are expressed in terms of the power spectrum of the source, the power spectrum and directionality of the surface waves, and the multistatic source/receiver geometry. Sample sideband calculations are provided to illustrate the results, and system implications are considered.
DTIC
Reverberation; Surface Waves; Low Frequencies; Acoustic Scattering; Mathematical Models; Wind (Meteorology)

20000025049 SACLANT Undersea Research Centre, San Bartolomeo, Italy
Single Ping Clutter Reduction: Segmentation Using Markov Random Fields
Laterveer, R.; Mar. 1999; 37p; In English
Report No.(s): AD-A371858; SACLANTCEN-SR-307; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The use of low frequency active sonar in shallow water leads to large numbers of clutter detections. This high false alarm rate can overload automatic tracking and classification algorithms. Traditional detection algorithms operate on each beam output individually searching for targets at all ranges. However, the target echo and bottom features may extend over several beams, either because a reflector is extended over space or because of the sidelobe structure of the beamformer. This suggests to associate detections over bearing, e.g., apply image processing to the range-bearing sonar data. This reports describes an automatic method of image segmentation based on a Markov random field model to reduce clutter. The segmentation is treated as a labelling problem, i.e., assign to each range-bearing cell either a target or background label. It removes small objects which do not exhibit the right signature over beams. Separate detections corresponding to one large reflector are clumped together to form one single object. Objects too large to be a submarine can then be removed. The Markov random field model uses a priori physical and probabilistic knowledge of the range-bearing sonar picture. It assumes that the background is Rayleigh distributed, a target has, on average,

a large signal to noise ratio (SNR) and that the label at each range-bearing cell is influenced by its neighbouring cells. An iterative algorithm is used to produce a maximum a posteriori estimate for the labelling. The model parameters are tuned to remove as much clutter as possible without substantially reducing the probability of detection. The algorithm was tested over a large number of sonar images. The performance is determined using several measures of performance including probability of detection and number of false alarm objects, i.e., connected detections. The number of false alarm objects was reduced by almost an order of magnitude while retaining more than 90% of the target detections. to test the influence of target SNR on the segmentation, simulated sonar pictures, containing a target of known SNR, were produced. The algorithm performs well for high SNR targets but those with low SNR have lower detection probability. This is not a big problem as usually targets have sufficient SNR.
DTIC
Sonar; Automatic Control; Markov Processes; Clutter; Segments; Tracking (Position)

20000025213 Pennsylvania State Univ., Dept. of Aerospace Engineering, University Park, PA USA
Summary of Research Report
Long, Lyle N., Pennsylvania State Univ., USA; Dec. 15, 1999; 12p; In English
Contract(s)/Grant(s): NAG1-2093; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes a project to predict ducted fan noise using massively parallel computers. The investigators are part of a larger team of researchers, most of whom are working at NASA Langley Research Center. The portion of the project described below not only stands alone as an individual research project, it also compliments the NASA Langley work. The write-up included in this report is relatively brief, since the details are described in technical papers.
Derived from text
Ducted Fans; Fan Blades; Aerodynamic Noise; Noise Prediction; Noise Measurement; Aircraft Noise

20000025236 NASA Glenn Research Center, Cleveland, OH USA
Noise Computation of a Shock-Containing Supersonic Axisymmetric Jet by the CE/SE Method
Loh, Ching Y., Taitech, Inc., USA; Hultgren, Lennart S., NASA Glenn Research Center, USA; Chang, Sin-Chung, NASA Glenn Research Center, USA; Jorgenson, Philip C. E., NASA Glenn Research Center, USA; December 1999; 24p; In English; 38th; 38th Aerospace Sciences Meeting, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 522-81-11
Report No.(s): NASA/TM-1999-209658; NAS 1.15:209658; AIAA Paper 2000-0475; E-12029; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
The space-time conservation element solution element (CE/SE) method is employed to numerically study the near-field of a typical under-expanded jet. For the computed case-a circular jet with Mach number M(j) = 1.19-the shock-cell structure is in good agreement with experimental results. The computed noise field is in general agreement with the experiment, although further work is needed to properly close the screech feedback loop.
Author
Supersonic Jet Flow; Aeroacoustics; Jet Aircraft Noise; Mechanical Shock; Noise Measurement

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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.

20000021469 California Univ., Dept. of Chemistry and Biochemistry, Los Angeles, CA USA
Spin-Dependent Pseudopotentials
Watson, S. C., California Univ., USA; Carter, E. A., California Univ., USA; Physical Review B (Condensed Matter and Materials Physics; Nov. 15, 1998; ISSN 0163-1829; Volume 58, No. 20, pp. 309-313; In English
Contract(s)/Grant(s): DAAH04-96-1-0058
Report No.(s): AD-A370057; ARO-34448.4-CH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy
Near degeneracies and strong spin polarization am characteristics of transition metals that offer challenges to the pseudopotential approximation. Here we investigate the spin dependence of pseudopotentials generated from atomic, all-electron density-functional calculations. Different spins we found to require different pseudopotentials for any spin-polarized atom Ignoring this leads to significant errors in the representation of all but the nonmagnetic configurations. Including a correction that

is linear in the local spin polarization results in a spin-dependent expression. which dramatically improves the transferability of the atomic pseudopotential beyond previous nonlinear core corrections.
Author
Spin Dynamics; Electron Density (Concentration); Nonlinearity; Pseudopotentials; Transition Metals

20000021472 Duke Univ., Physics Dept., Durham, NC USA
Dynamics of Noise-Induced Heating on Atom Traps
Gehm, M. E., Duke Univ., USA; OHara, K. M., Duke Univ., USA; Savard, T. A., Duke Univ., USA; Thomas, J. E., Duke Univ., USA; Physical Review A; November 1998; ISSN 1050-2947; Volume 58, No. 5, pp. 3914-3921; In English
Contract(s)/Grant(s): DAAH04-96-I-0265
Report No.(s): AD-A369858; ARO-35169.I.PH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

A Fokker-Planck equation is derived for the energy distribution of atoms in a three-dimensional harmonic trap with fluctuations in the spring constant and the equilibrium position. Using this model, we predict trap lifetimes based on the measurable noise spectra of the fluctuations. The energy distributions evolve into a single eigenmode where the apparent temperature of the distribution remain constant while the population decays as a consequence of the energy input. The method of analysis and the corresponding results am applicable to any optical, magnetic, or ion trap that is approximately harmonic, and offer useful insights into both noise-induced and optical beating processes.
Author
Fokker-Planck Equation; Energy Distribution; Quantum Optics; Bose-Einstein Condensates

20000021473 Oklahoma State Univ., Dept. of Chemistry, Stillwater, OK USA
Molecular Packing and Molecular Dynamics Study of the Transferability of a Generalized Nitramine Intermolecular Potential to Non-Nitramine Crystals
Sorescu, Dan C., Oklahoma State Univ., USA; Rice, Betsy M., Army Research Office, USA; Thompson, Donald L., Oklahoma State Univ., USA; Journal of Physical Chemistry A; 1999; Volume 103, No. 8, pp. 989-998; In English
Contract(s)/Grant(s): DAAG55-98-I-0089; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

We have analyzed the transferability of a previously proposed intermolecular potential for nitramine crystals to reproduce the experimentally determined crystal structures (within the approximation of rigid molecules) of 51 nitro compounds. These compounds include different types of acyclic, monocyclic, and polycyclic molecules. It is shown that this potential model accurately reproduces the experimentally determined crystallographic structures and lattice energies for the majority of these crystals. The best agreement with experimental structural and energetic data is obtained when the electrostatic charges have been determined using ab initio methods that include electron correlation effects, namely MP2 and B3LYP. The use of the electrostatic charges calculated at the Hartree-Fock level results in large differences between the predicted and the experimental values of the lattice energies. This difference can be significantly decreased by scaling the electrostatic charges with a general factor without introducing significant variations of the predicted crystallographic parameters. Further testing of the proposed intermolecular potential has been done by performing isothermal--isobaric molecular dynamics (MD) simulations over the temperature range 100-450 K, at atmospheric pressure, for the monoclinic phase of the 2,4,6-trinitrotoluene (TNT) crystal and for the polymorphic phase I of the pentaerythritol tetranitrate (PETN I) crystal. In each case the results show that throughout the MD simulations the average structures of the crystals maintain the same space group symmetry as the one determined experimentally and there is a good agreement between the calculated crystallographic parameters and the experimental values. The thermal expansion coefficients calculated using the present model indicate an overall anisotropic behavior for both TNT and PETN I, with a thermal isotropy for PETN I along cell directions a and b.
Author
Molecular Dynamics; Simulation; Intermolecular Forces; Molecular Structure; Crystal Structure; Crystal Lattices; Crystallography; Crystals

20000021528 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA
Search for Off-Diagonal Density Matrix Elements for Atoms in a Supersonic Beam
Rubenstein, Richard A., Massachusetts Inst. of Tech., USA; Dhirani, Al-Amin, Massachusetts Inst. of Tech., USA; Kokorowski, David A., Massachusetts Inst. of Tech., USA; Roberts, Tony D., Massachusetts Inst. of Tech., USA; Smith, Edward T., Massachusetts Inst. of Tech., USA; Smith, Winthrop W., Massachusetts Inst. of Tech., USA; Bernstein, Herbert J., Massachusetts Inst. of Tech., USA; Lehner, Jana, Massachusetts Inst. of Tech., USA; Gupta, Subhadeep, Massachusetts Inst. of Tech., USA; Pritchard, David E., Massachusetts Inst. of Tech., USA; Physical Review Letters; Mar. 08, 1999; ISSN 0031-9007; Volume 82, No. 10, pp. 2018-2021; In English

Contract(s)/Grant(s): DAAH04-94-G-0170; DAAH04-95-1-0533; N00014-96-1-0432; DAAH04-95-1-0038; DAAG55-97-1-0236; DAAG55-98-1-0429; DAAG05-98-1-0080; NSF PHY-95-14795; NSF PHY-97-22614
Report No.(s): AD-A370063; ARO-37400.1-EL-JSEA; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

We demonstrate the absence of off-diagonal elements for the density matrix of a supersonic Na atomic beam, thus showing that there are no coherent wave packets emerging from this source. We used a differentially detuned separated oscillatory field longitudinal interferometer to search for off-diagonal density matrix elements in the longitudinal energy/momentum basis. Our study places a stringent lower bound on their possible size over an off-diagonal energy range from 0 to 100 kHz.
Author
Matrix Materials; Wave Packets; Supersonic Speed; Beams (Radiation); Flux Density

20000021530 Oklahoma State Univ., Dept. of Chemistry, Stillwater, OK USA
Predicting Nonstatistical Unimolecular Reaction Rates using Kramer's Theory
Guo, Yin, Oklahoma State Univ., USA; Shalashilin, Dmitrii V., Oklahoma State Univ., USA; Krouse, Justin A., Oklahoma State Univ., USA; Thompson, Donald L., Oklahoma State Univ., USA; Journal of Chemical Physics; Mar. 22, 1999; ISSN 0021-9606; Volume 110, No. 12, pp. 5514-5520; In English
Contract(s)/Grant(s): DAAG55-98-1-0089
Report No.(s): AD-A370068; ARO-37404.5-CH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

A method for computing unimolecular reaction rate constants in the IVR-limited regime is presented. It is based on Kramers' energy diffusion theory, with the reaction coordinate taken as the subsystem and the rest of the vibrational modes as the bath. Applications to some bond fission reactions demonstrate that the method accurately predicts the rate constants for wide range of energies by using the result of a dynamical calculation of the reaction rate at a single energy to determine the friction coefficient. Examination of the energy exchange in the reaction coordinate provides a qualitative understanding of the validity of the approach for treating unimolecular reactions. Thus, the method provides a practical means of calculating reaction rates in the IVR-limited regime at considerable savings of computer time than that required by standard classical trajectory calculations.
Author
Computation; Molecular Dynamics; Coefficient of Friction; Diffusion Theory; Reaction Kinetics

20000023205 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA
Longitudinal Atom Optics using Localized Oscillating Fields: A Fully Quantum-Mechanical Treatment
Pritchard, D. E., Massachusetts Inst. of Tech., USA; Rubenstein, R. A., Massachusetts Inst. of Tech., USA; Dhirani, A., Massachusetts Inst. of Tech., USA; Kokorowski, A., Massachusetts Inst. of Tech., USA; Smith, E. T., Massachusetts Inst. of Tech., USA; Hammond, T. D., Massachusetts Inst. of Tech., USA; Rohwedder, B., Massachusetts Inst. of Tech., USA; Physical Review A; June 1999; ISSN 1050-2947; Volume 59, No. 6, pp. 4641-4652; In English
Contract(s)/Grant(s): DAAG55-98-1-0429; DAAH04-94-G-0170; DAAH04-95-I-0533; N00014-89-J-1207; N00014-96-I-0432; DAAH04-95-I-0038; NSG PHY-95-14795; FONDECYT-2950068
Report No.(s): AD-A369819; ARO-38931.1-PH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

We provide a fully quantal treatment of a beam of two-state particles interacting with temporally oscillating potentials, and propose a number of longitudinal atom optics devices. A single oscillatory potential, in coupling the two internal states, generally entangles each with a different longitudinal momentum. An oscillatory potential can also act as an amplitude modulator, creating momentum coherenced within a single internal state. Two successive oscillatory fields (DSOFs). if differentially detuned. can couple an initially monochromatic state to a coherent momentum superposition, or alternatively may be used to detect a pre-existing momentum superposition. DSOFs can create amplitude modulation which. despite the presence of a broad velocity distribution, rephases; at a selected distance downstream of the device, Phase modulation generates coherent momentum sidebands which can evolve into amplitude modulation at a particular location downstream.
Author
Beam Interactions; Particle Interactions; Amplitude Modulation; Phase Modulation

20000024810 Rutherford Appleton Lab., Chilton, UK
Neutron Compton Scattering by Proton and Deuteron Systems with Entangled Spatial and Spin Degrees of Freedom
Karlsson, E. B., Uppsala Univ., Sweden; Lovesey, S. W., Rutherford Appleton Lab., UK; Dec. 16, 1999; ISSN 1358-6254; 22p; In English
Report No.(s): RAL-TR-1999-081; Copyright; Avail: Issuing Activity, Hardcopy

Several recent experiments on liquid and solid samples containing protons or deuterons have shown an interesting anomaly, which is apparently absent when the hydrogen isotopes are replaced by heavier particles. The anomaly is a shortfall in the intensity

of energetic neutrons scattered by the samples; specifically, the intensity per hydrogen isotope in bulk samples is smaller than the intensity for total scattering by an isolated hydrogen isotope. Short-lived correlations in the spatial and spin degrees of freedom of the hydrogen isotopes have been proposed as an explanation of the anomaly. The correlations involve entanglements of the degrees of freedom created by the requirements of quantum mechanics applied to identical particles. by using energetic neutrons to perform Compton scattering experiments on the hydrogen isotopes the time-scale of the experimental probe covers the region of 10(exp -16) - 10(exp -15) s where entangled states might still be expected to survive. The proposed explanation is pursued here by reporting the cross-section for Compton scattering, also known as deep inelastic-scattering, by two identical nuclei occupying non-equivalent states. The model reproduces the observed dependence of the cross-section on energy transfer, in which intensity accumulates at the recoil energy of a single nucleus. Several features of the model demand that the intensity at the recoil energy is indeed less than the intensity for total scattering by an isolated nucleus. Although the pair approximation used here is unquestionably a first approximation to real many-body entanglements it is a compelling explanation of all the observations, including the restoration of the normal cross-section at longer observation-times achieved by moving to longer scattering-times. Author

Neutron Scattering; Compton Effect; Protons; Deuterium Compounds; Degrees of Freedom

20000025055 Kentucky Univ., Dept. of Chemical and Materials Engineering, Lexington, KY USA

Carbon Nanotubules: Building Blocks for Nanometer-Scale Engineering ***Final Report, 1 Jan. 1997 - 31 Dec. 1999***

Sinnott, Susan B., Kentucky Univ., USA; [1999]; 7p; In English

Contract(s)/Grant(s): NAG2-1121; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The proposed work consisted of two projects: the investigation of fluid permeation and diffusion through ultrafiltration membranes composed of carbon nanotubules and the design and study of molecular transistors composed of nanotubules. The progress made on each project is summarized and also discussion about additional projects, one of which is a continuation of work supported by another grant, is included. The first project was Liquid Interactions within a Nanotubule Membrane. The second was the design of nanometer-scale hydrocarbon electronic devices. The third was the investigation of Mechanical properties of Nanotubules and Nanotubule bundles. The fourth project was to investigate the growth mechanisms of Carbon Nanotubules. Derived from text

Nanostructure (Characteristics); Nanostructures (Devices); Tubes; Filtration; Transistors

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OPTICS

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

20000021172 Colorado Univ., Center for Aerospace Structures, Boulder, CO USA

Nanomechanics of Actively Controlled Deployable Optics ***Interim Report, 11 Mar. 1998 - 31 Dec. 1999***

Peterson, Lee D., Colorado Univ., USA; January 2000; 15p; In English

Contract(s)/Grant(s): NCC1-281; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is the interim, annual report for the research grant entitled ”Nanomechanics of Actively Controlled Deployed Optics.” It is supported by NASA Langley Research Center Cooperative Agreement NCC-1 -281. Dr. Mark S. Lake is the technical monitor of the research program. This document reports activities for the year 1998, beginning 3/11/1998, and for the year 1999. The objective of this report is to summarize the results and the status of this research. This summary appears in Section 2.0. Complete details of the results of this research have been reported in several papers, publications and theses. Section 3.0 lists these publications and, when available, presents their abstracts. Each publication is available in electronic form from a web site identified in Section 3.0.

Derived from text

Active Control; Deployment; Adaptive Optics

20000021327 Rowland Inst. for Science, Cambridge, MA USA

Light Speed Reduction to 17 Metres Per Second in an Ultracold Atomic Gas

Vestergaard, Lene, Rowland Inst. for Science, USA; Harris, S. E., Stanford Univ., USA; Dutton, Zachary, Rowland Inst. for Science, USA; Behroozi, Cyrus H., Rowland Inst. for Science, USA; Nature; Feb. 18, 1999; Volume 397, pp. 594-598; In English

Contract(s)/Grant(s): DAAG55-98-1-0031

Report No.(s): AD-A370048; ARO-37331.5-PH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Techniques that use quantum interference effects we being actively investigated to manipulate the optical properties of quantum systems One such example is electromagnetically induced transparency, a quantum effect that permits the propagation of light pulses through an otherwise opaque medium. Here we report in experimental demonstration of electromagnetically induced transparency in an ultracold gas of sodium atoms, in which the optical pulses propagate at twenty million times slower than the speed of light in a vacuum. The gas is cooled to nanokelvin temperatures by law and evaporative cooling. The quantum interference controlling the optical properties of the medium is set up by a ”coupling” laser beam propagating at a right angle to the pulsed probe beam. At nanokelvin temperatures, the variation of refractive index with probe frequency can be made very steep. In conjunction with the high atomic density, this results in the exceptionally low light speeds observed.
Author
Light Speed; Quantum Electrodynamics; Evaporative Cooling; Laser Beams; Monatomic Gases

20000021350 Institute for Human Factors TNO, Soesterberg, Netherlands
Visual Measurement Set-Up in the Field during Observer Experiments ***Final Report Luminantiemetingen Tijdens Waarnemigsproeven te Velde***
Varkevisser, J., Institute for Human Factors TNO, Netherlands; Dec. 27, 1999; 38p; In Dutch
Contract(s)/Grant(s): A99/KL/303; TNO Proj. 786.1
Report No.(s): TD99-0376; TNO-TM-99-A086; Copyright; Avail: Issuing Activity, Hardcopy

The ’Afdeling Beproevingen Wapensystemen en Munitie (ABWM)’ of the RNL Army needs to record the light and visibility conditions during observer experiments in the field. For that purpose the Naval Electronics and Optics Establishment of the RNL Navy (MEOB) has to advise a total measurement set-up. TNO-HFRI is consulted for a partial advice to describe light circumstances and needed measuring instruments. In this report recommendations are given on the use of a luminance camera for measuring the relevant parameters. An example is given of the application of such a camera in an observer experiment.
Author
Measuring Instruments; Luminance; Visibility; Controlled Atmospheres; Light Transmission

20000021397 Institute for Human Factors TNO, Soesterberg, Netherlands
The Effects of Monocular and Binocular Nightvision Devices on Driving Behaviour and Comfort ***Interim Report De Effecten van Monoculaire en Binoculaire Helderheidsversterkers op het Rigedrag en Comfort***
vanWinsum, W., Institute for Human Factors TNO, Netherlands; Kooi, F. L., Institute for Human Factors TNO, Netherlands; Nov. 22, 1999; 31p; In English
Contract(s)/Grant(s): A99/KL/337; TNO Proj. 788.2
Report No.(s): TD99-0368; TNO-TM-99-A077; Copyright; Avail: Issuing Activity

Under contract of the Royal Dutch Army, a field experiment was conducted in which night- time driving with monocular and binocular night vision goggles (NVGs) was tested in rough terrain. The effects of the NVGs was tested on driving behaviour and on various aspects of comfort. The results give answer to a number of questions that were raised concerning the optimal configuration of NVGs while driving at night. Drivers are able to drive safely at night with binocular night vision devices, also with a binocular alignment error. No serious problems related to a lack of wearing comfort or visual comfort were found. Driving with a monocular NVG results in equally good performance. However, some of the drivers were not able to complete the two hour session, implying that binocular devices are more suitable for prolonged driving. Also, the visual comfort was rated lower for the monocular NVG. The most common reason given for stopping before the end of the session with a monocular NVG is that ’they would not have continued driving under operational conditions’ implying that the monocular NVG would be insufficient in unknown terrain. The binocular devices are rated positively by the drivers.
Author
Monocular Vision; Binocular Vision; Night Vision; Goggles; Display Devices; Visual Aids; Pilots (Personnel)

20000021423 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Optical Coherence Tomographic Imaging and Delivery for Surgical Guidance ***Annual Report, Oct. 1998-Nov. 1999***
Fujimoto, James G.; Jan. 19, 2000; 9p; In English
Contract(s)/Grant(s): N00014-97-1-1066
Report No.(s): AD-A372590; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this program is to develop and supply optical coherence tomography (OCT) for biomedical applications. OCT is a new technology for performing in situ, real time imaging of cross sectional tissue microstructure. This program explores OCT technology and its applications for surgical guidance and optical biopsy.
DTIC
Optical Properties; Images; Imaging Techniques; Tomography; Surgical Instruments

20000021507 NASA Marshall Space Flight Center, Huntsville, AL USA
Recent Enhancements of the Phased Array Mirror Extendible Large Aperture (PAMELA) Telescope Testbed at MSFC
Rakoczy, John, NASA Marshall Space Flight Center, USA; Montgomery, Edward E., NASA Marshall Space Flight Center, USA; Lindner, Jeff, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Astronomical Telescopes and Instrumentation, 27-31 Mar. 2000, Munich, Germany; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Recent incremental upgrades to the Phased Array Mirror Extendible Large Aperture (PAMELA) telescope testbed have enabled the demonstration of phasing (with a monochromatic source) of clusters of primary mirror segments down to the diffraction limit. PAMELA upgrades include an improved Shack-Hartmann wavefront sensor, passive viscoelastic damping treatments for the voice-coil actuators, mechanical improvement of mirror surface figures, and optical bench baffling. This report summarizes the recent PAMELA upgrades, discusses the lessons learned, and presents a status of this unique testbed for wavefront sensing and control. The Marshall Space Flight Center acquired the Phased Array Mirror Extendible Large Aperture (PAMELA) telescope in 1993 after Kaman Aerospace was unable to complete integration and testing under the limited SDIO and DARPA funding. The PAMELA is a 36-segment, half-meter aperture, adaptive telescope which utilizes a Shack-Hartmann wavefront sensor, inductive coil edge sensors, voice coil actuators, imaging CCD cameras and interferometry for figure alignment, wavefront sensing and control. MSFC originally obtained the PAMELA to supplement its research in the interactions of control systems with flexible structures. In August 1994, complete tip, tilt and piston control was successfully demonstrated using the Shack-Hartmann wavefront sensor and the inductive edge sensors.
Author
Apertures; Augmentation; Imaging Techniques; Mirrors; Optical Equipment; Phased Arrays; Segmented Mirrors; Telescopes; Wave Fronts

20000021508 NASA Marshall Space Flight Center, Huntsville, AL USA
Interferometry in the Extreme Ultraviolet and X-Ray
Cash, W., NASA Marshall Space Flight Center, USA; Shipley, A., NASA Marshall Space Flight Center, USA; Osterman, S., NASA Marshall Space Flight Center, USA; Joy, M. K., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

We report on demonstration of an x-ray interferometer that uses plane mirrors at grazing incidence to create interference fringes in the extreme ultraviolet and soft x-ray portions of the spectrum. X-ray interferometry has historically been implemented through narrow band, diffractive systems that split the wavefront. Our system, by using two separate optical channels to create interference from two areas of the wavefront, has broad band response and much higher efficiency. We discuss some applications of this technique to astronomy and microscopy including the possibility of eventually capturing a micro-arcsecond image of a black hole.
Author
Interferometers; Interferometry; Extreme Ultraviolet Radiation; X Ray Spectra; Grazing Incidence; X Ray Optics; X Ray Imagery

20000023163 Norwegian Defence Research Establishment, Kjeller, Norway
Forward Observer Instrument Functional Model: User Trials at Alvdalen, Sweden, *12-17 Nov. 1998*
Groder, Torbjorn, Norwegian Defence Research Establishment, Norway; Kandola, Ornulf, Norwegian Defence Research Establishment, Norway; Nov. 01, 1999; 150p; In English; Original contains color illustrations
Contract(s)/Grant(s): FFIE Proj. 697/134
Report No.(s): FFI/RAPPORT-99/05414; ISBN 82-464-0381-8; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report presents the results of user trials carried out in Alvdalen in Sweden with a functional model of a forward observer instrument. The modular functional model is made up of a main module developed in co-operation by FFI and Simrad Optronics ASA, a gyro compass with a fiberoptic gyro, developed by FFI, and a goniometer developed by Leica Geosystems AG. The main module includes an eyesafe laser rangefinder, internal digital magnetic compass and internal GPS. The report includes the results achieved both with handheld operation of the main module with bearing obtained from its built in digital magnetic compass, and

with tripod-mounted operation with bearing obtained from the more accurate gyro compass and goniometer. Also the ergonomics of the functional model are discussed.
Author
Models; Magnetic Compasses; Global Positioning System; Fiber Optics; Data Acquisition

20000025014 Woods Hole Oceanographic Inst., Biology Dept., MA USA
Response of Particulate Optical Properties to Coastal Mixing Processes: Analysis and Interpretation of Particle Light Scattering as Measured by Flow Cytometry ***Final Report, 1 May 1996 - 30 Sep. 1999***
Sosik, Heidi M.; Olson, Robert J.; Dec. 20, 1999; 6p; In English
Contract(s)/Grant(s): N00014-96-1-0965
Report No.(s): AD-A372030; WHOI-PROPOSAL-9997.1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the period of this AASERT award we successfully participated in the Coastal Mixing and Optics Research initiative with the award supporting training of Rebecca Green, a PhD candidate in the MIT/WHOI Joint Program in Oceanography and Oceanographic Engineering. Rebecca made substantial progress towards receiving her degree, participated in three program research cruises and made valuable contributions to our research objectives. These objectives included quantifying relationships between particles, bulk water optical properties (both inherent and apparent) and physical processes that are important on the continental shelf of the U.S. east coast Rebecca's primary contribution has been to develop methods for the derivation of bulk optical properties from individual particle measurements based on flow cytometric analysis. This has included separation of the particle pool into different functional classes and characterization of the size-dependent contributions to light absorption and scattering. Since particles, and especially phytoplankton, are the greatest sources of optical variability in many oceanic and coastal systems, this type of investigation is important for understanding spatial and temporal changes in bulk properties such as ocean color and visibility.
DTIC
Optical Properties; Particulates; Light Scattering; Cytometry; Coastal Water

20000025076 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cylindrical Optic Polishing Dwell Time Optimization
Waluschka, Eugene, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 30 Jul. - 4 Aug. 2000, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Constellation-X x-ray telescope consists of replicated grazing incidence optics. The polishing of the "master' mandrel is accomplished by moving a polishing tool along a helical path on the surface of this almost cylindrical surface. The measurement of the surface is, however, performed along "axial" scan lines which intercept this helical path. This approach to polishing and measuring permits a relatively simple scheme to be implemented for the determination of the optimal dwell times of the polishing tool. These optimal dwell times are determined by a deconvolution which approaches the problem as a linear programming problem and uses the simplex method. This approach maximizes the amount of material removed at any point subject to inequality constraints. The effects of using these "optimum" dwell times is to significantly improve the "tools" effectiveness at removing the higher spatial frequencies while staying (strictly) within the bounds and constraints imposed by the hardware. In addition the "ringing" at the edges of the optic, frequently present in deconvolution problems, is completely eliminated.
Author
Polishing; X Ray Telescopes; Grazing Incidence Telescopes; Dwell; X Ray Optics

20000025208 NASA Langley Research Center, Hampton, VA USA
Comparison of Three Optical Methods for Measuring Model Deformation
Burner, A. W., NASA Langley Research Center, USA; Fleming, G. A., NASA Langley Research Center, USA; Hoppe, J. C., NASA Langley Research Center, USA; 2000; 16p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2000-0835; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this paper is to compare the current state-of-the-art of the following three optical techniques under study by NASA for measuring model deformation in wind tunnels: (1) video photogrammetry, (2) projection moire interferometry, and (3) the commercially available Optotrak system. An objective comparison of these three techniques should enable the selection of the best technique for a particular test undertaken at various NASA facilities. As might be expected, no one technique is best

for all applications. The techniques are also not necessarily mutually exclusive and in some cases can be complementary to one another.
Author
Deformation; Imaging Techniques; Image Enhancement; Image Processing; Wind Tunnel Models

20000025254 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Visibility Factor and Polydispersity of the Light Scattering from Particles on Surfaces ***Final Report, Jan.-Feb. 1999***
Videen, Gorden; de la Pefia, J. L.; Saiz, J. M.; Gonzalez, F.; Valle, P. J.; Dec. 1999; 17p; In English
Report No.(s): AD-A372507; ARL-TR-2090; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed an experimental method, based on the visibility factor of the light-scattering minima, to obtain size-polydispersity information from contaminants on a flat substrate. We verify this method using double-interaction-model calculations and use this technique to experimentally examine the radial variation of a micrometer-sized fiber and the size polydispersity of spherical particles on a substrate.
DTIC
Visibility; Light Scattering; Contaminants; Substrates

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PLASMA PHYSICS

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

20000021170 NASA Goddard Space Flight Center, Greenbelt, MD USA
Inverse Bremsstrahlung in Shocked Astrophysical Plasmas
Baring, Matthew G., NASA Goddard Space Flight Center, USA; Jones, Frank C., NASA Goddard Space Flight Center, USA; Ellison, Donald C., North Carolina State Univ., USA; [2000]; 18p; In English; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

There has recently been interest in the role of inverse bremsstrahlung, the emission of photons by fast suprathermal ions in collisions with ambient electrons possessing relatively low velocities, in tenuous plasmas in various astrophysical contexts. This follows a long hiatus in the application of suprathermal ion bremsstrahlung to astrophysical models since the early 1970s. The potential importance of inverse bremsstrahlung relative to normal bremsstrahlung, i.e. where ions are at rest, hinges upon the underlying velocity distributions of the interacting species. In this paper, we identify the conditions under which the inverse bremsstrahlung emissivity is significant relative to that for normal bremsstrahlung in shocked astrophysical plasmas. We determine that, since both observational and theoretical evidence favors electron temperatures almost comparable to, and certainly not very deficient relative to proton temperatures in shocked plasmas, these environments generally render inverse bremsstrahlung at best a minor contributor to the overall emission. Hence inverse bremsstrahlung can be safely neglected in most models invoking shock acceleration in discrete sources such as supernova remnants. However, on scales approximately is greater than 100 pc distant from these sources, Coulomb collisional losses can deplete the cosmic ray electrons, rendering inverse bremsstrahlung, and perhaps bremsstrahlung from knock-on electrons, possibly detectable.
Author
Bremsstrahlung; Particle Acceleration; Space Plasmas; Cosmic Rays; Gamma Rays; Supernova Remnants

20000021222 NASA Glenn Research Center, Cleveland, OH USA
Enhanced Discharge Performance in a Ring Cusp Plasma Source
Foster, John E., NASA Glenn Research Center, USA; Patterson, Michael J., NASA Glenn Research Center, USA; January 2000; 16p; In English; 26th; Electric Propulsion, 17-21 Oct. 1999, Kitakyushu, Japan; Sponsored by Japan Society for Aeronautical and Space Sciences, Japan
Contract(s)/Grant(s): RTOP 632-1B-1B
Report No.(s): NASA/TM-2000-209765; E-12040; NAS 1.15:209765; IEPC-99-159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is a need for a lightweight, low power ion thruster for space science missions. Such an ion thruster is under development at NASA Glenn Research Center. In an effort to better understand the discharge performance of this thruster, a thruster discharge chamber with an anode containing electrically isolated electrodes at the cusps was fabricated and tested. Characteristics of this ring cusp ion discharge were measured without ion beam extraction. Discharge current was measured at collection electrodes

located at the magnetic cusps and at the anode body itself. Discharge performance and plasma properties were measured as a function of power, which was varied between 20 and 50 W. It was found that ion production costs decreased by as much as 20 percent when the two most downstream cusp electrodes were allowed to float. Floating the electrodes did not give rise to a significant increase in discharge power even though the plasma density increased markedly. The improved performance is attributed to enhanced electron containment.
Author
Plasmas (Physics); Ion Engines; Space Missions; Cusps; Electric Discharges; Ring Currents

20000021281 Academy of Sciences (Russia), Inst. of High Current Electronics, Tomsk, Russia
Increasing Microwave Output Power Pulselength in a 3 GW Backward Wave Oscillator Using Low-Energy Electron Beam-Treated Slow-Wave Structure Rings ***Final Report, 23 Nov 1998 - 22 May 1999***
Korovin, Sergei; Oct. 19, 1999; 38p; In English
Contract(s)/Grant(s): F61775-98-W-E080
Report No.(s): AD-A371363; EOARD-SPC-98-4024; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking Institute of High Current Electronics as follows: The contractor will improve existing laboratory equipment to achieve the goal of extending microwave pulse duration to 40 nanoseconds using the SINUS-7 electron beam accelerator at the Institute of High Current Electronics as described in the proposal - final paragraph of the technical description excepted.
DTIC
Pulse Duration; Wave Propagation; Microwave Oscillators; Backward Waves

20000021388 Swedish Inst. of Space Physics, Uppsala, Sweden
Analysis of Freja Charging Events: Statistical Occurrence of Charging Events: WP 130 Technical Note (SPEE-WP130-TN, Version 2.0, Study of Plasma and Energetic Electron Environments and Effects ***Topical Report***
Wahlund, J. E.; Wedin, L. J.; Carrozi, T.; Eriksson, A. I.; Holback, B.; Feb. 22, 1999; ISSN 0284-1703; 42p; In English; Original contains color illustrations
Contract(s)/Grant(s): ESA 11974/96/NL/JG(SC)
Report No.(s): PB2000-102614; IRF-SR-253; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This document presents the results provided by work package WP130. This work package includes a statistical study based on all the data from the Freja spacecraft sampled within the time period October, 1992, to April, 1994 during declining solar activity conditions. It is used to establish the occurrence and intensity characteristics of surface charging events from this polar (high latitude) orbiting spacecraft in the altitude range 1000 - 1800 km. The Freja satellite had a highly advanced plasma payload package suitable for spacecraft charging studies, and it was especially designed to be as electrically clean as possible. Despite the high conductivity of the surface materials and the favorable secondary electron characteristics of the dominant Indium Tin Oxide (ITO) surface coating, numerous charging events did indeed occur with negative charging levels as large as -2000 Volts. The statistics is complemented with information on the environmental characteristics during the charging events, such as cold plasma density, energetic electron and ion distributions, light conditions, and geomagnetic location as well as geomagnetic activity. The study is complemented with a comparison with previously made spacecraft charging studies.
NTIS
Plasma Physics; Spacecraft Charging; Solar Activity Effects

20000021516 NASA Marshall Space Flight Center, Huntsville, AL USA
External Pulsed Plasma Propulsion and Its Potential for the Near Future
Bonometti, J. A., NASA Marshall Space Flight Center, USA; Morton, P. J., NASA Marshall Space Flight Center, USA; Schmidt, G. R., NASA Marshall Space Flight Center, USA; [1999]; 6p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This paper examines External Pulsed Plasma Propulsion (EPPP), a propulsion concept that derives its thrust from plasma waves generated from a series of small, supercritical fission/fusion pulses behind an object in space. For spacecraft applications, a momentum transfer mechanism translates the intense plasma wave energy into a vehicle acceleration that is tolerable to the rest of the spacecraft and its crew. This propulsion concept offers extremely high performance in terms of both specific impulse (Isp) and thrust-to-weight ratio, something that other concepts based on available technology cannot do, The political concerns that suspended work on this type of system (i.e. termination of Project ORION) may now not be as insurmountable as they were in 1965. The appeal of EPPP stems from its relatively low cost and reusability, fast interplanetary transit times, safety and reliability, and independence from major technological breakthroughs. In fact, a first generation EPPP system based on modern-day

technology (i.e., GABRIEL - an evolutionary framework- of EPPP concepts) may very well be the only form of propulsion that could realistically be developed to perform ambitious human exploration beyond Mars in the 21st century. It could also provide the most effective approach for deterrence against collision between earth and small planetary objects - a growing concern over recent years.
Author
Plasma Propulsion; Plasma Waves; Spacecraft Propulsion; Technology Utilization

20000021532 California Univ., Dept. of Chemistry and Biochemistry, Los Angeles, CA USA
Orbital-Free Kinetic-Energy Functionals for the Nearly Free Electron Gas
Wang, Yan Alexander, California Univ., USA; Govind, Niranjan, California Univ., USA; Carter, Emily A., California Univ., USA; Physical Review B; Nov. 15, 1998; ISSN 0163-1829; Volume 58, No. 20, pp. 13,465-13,471; In English
Contract(s)/Grant(s): DAAH04-96-1-0058
Report No.(s): AD-A370049; ARO-34448.3-CH; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

We present an improvement over the Wang-Teter, Perrot and Smargiassi-Madden kinetic-energy functionals without going beyond linear-response theory and without introducing a density-dependent kernel. The improved functionals were tested an bulk aluminum, and excellent results were obtained. Accurate density-functional calculations using the new functionals on systems larger than one can study by traditional Kohn-Sham methods are demonstrated.
Author
Kinetic Energy; Free Energy; Electron Gas

20000021586 NASA Glenn Research Center, Cleveland, OH USA
Inception of Snapover and Gas Induced Glow Discharges
Galofatro, J. T., NASA Glenn Research Center, USA; Vayner, B. V., Ohio Aerospace Inst., USA; Degroot, W. A., DYNACS Engineering Co., Inc., USA; Ferguson, D. C., NASA Glenn Research Center, USA; Thomson, C. D., Utah State Univ., USA; Dennison, J. R., Utah State Univ., USA; Davies, R. E., Utah State Univ., USA; January 2000; 14p; In English
Contract(s)/Grant(s): RTOP 632-1A-1L
Report No.(s): NASA/TM-2000-209645; NAS 1.15:209645; E-11991; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ground based experiments of the snapover phenomenon were conducted in the large vertical simulation chamber at the Glenn Research Center (GRC) Plasma Interaction Facility (PIF). Two Penning sources provided both argon and xenon plasmas for the experiments. The sources were used to simulate a variety of ionospheric densities pertaining to a spacecraft in a Low Earth Orbital (LEO) environment. Secondary electron emission is believed responsible for dielectric surface charging, and all subsequent snapover phenomena observed. Voltage sweeps of conductor potentials versus collected current were recorded in order to examine the specific charging history of each sample. The average time constant for sample charging was estimated between 25 and 50 seconds for all samples. It appears that current drops off by approximately a factor of 3 over the charging time of the sample. All samples charged in the forward and reverse bias directions, demonstrated hysteresis. Current jumps were only observed in the forward or positive swept voltage direction. There is large dispersion in tile critical snapover potential when repeating sweeps on any one sample. The current ratio for the first snapover region jumps between 2 and 4.6 times, with a standard deviation less than 1.6. Two of the samples showed even larger current ratios. It is believed the second large snapover region is due to sample outgassing. Under certain preset conditions, namely at the higher neutral gas background pressures, a perceptible blue-green glow was observed around the conductor. The glow is believed to be a result of secondary electrons undergoing collisions with an expelled tenuous cloud of gas, that is outgassed from the sample. Spectroscopic measurements of the glow discharge were made in an attempt to identify specific lines contributing to the observed glow.
Author
Glow Discharges; Gas Discharges; Plasma Physics

20000023162 Lockheed Martin Missiles and Space, Palo Alto, CA USA
Plasma Sheet Source and Loss Processes*, 1 Jan. - 31 Dec. 1999*
Lennartsson, O. W., Lockheed Martin Missiles and Space, USA; 2000; 20p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-7463; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Data from the TIMAS ion mass spectrometer on the Polar satellite, covering 15 ev/e to 33 keV/e in energy and essentially 4(pi) in view angles, are used to investigate the properties of earthward (sunward) field-aligned flows of ions, especially protons, in the plasma sheet-lobe transition region near local midnight. A total of 142 crossings of this region are analyzed at 12-sec time resolution, all in the northern hemisphere, at R(SM) approx. 4 - 7 R(sub E), and most (106) in the poleward (sunward) direction.

Earthward proton flows are prominent in this transition region (greater than 50% of the time), typically appearing as sudden ”blasts” with the most energetic protons (approx. 33 keV) arriving first with weak flux, followed by protons of decreasing energy and increasing flux until either: (1) a new ”blast” appears, (2) the flux ends at a sharp boundary, or (3) the flux fades away within a few minutes as the mean energy drops to a few keV. Frequent step-like changes (less than 12 sec) of the flux suggest that perpendicular gradients on the scale of proton gyroradii are common. Peak flux is similar to central plasma sheet proton flux (10(exp 5) - 10(exp 6)/[cq cm sr sec keV/e] and usually occurs at E approx. 4 - 12 keV. Only the initial phase of each ”blast” (approx. 1 min) displays pronounced field-alignment of the proton velocity distribution, consistent with the time-of-flight separation of a more or less isotropic source distribution with df/d(nu) less than 0. The dispersive signatures are often consistent with a source at R(SM) less than or equal to 30 R(sub E). No systematic latitudinal velocity dispersion is found, implying that the equatorial plasma source is itself convecting. In short, the proton ”blasts” appear as sudden local expansions of central plasma sheet particles along reconfigured (”dipolarized”) magnetic field lines.
Author
Data Acquisition; Mass Spectrometers; Ions; Protons; Velocity Distribution; Magnetic Fields; Display Devices

20000024917 NASA Goddard Space Flight Center, Greenbelt, MD USA
Electric Field Double Probe Measurements for Ionospheric Space Plasma Experiments
Pfaff, R., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; National Radio Science, 2000, Boulder, CO, USA; Sponsored by International Scientific Radio Union, Unknown; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Double probes represent a well-proven technique for gathering high quality DC and AC electric field measurements in a variety of space plasma regimes including the magnetosphere, ionosphere, and mesosphere. Such experiments have been successfully flown on a variety of spacecraft including sounding rockets and satellites. Typical instrument designs involve a series of trades, depending on the science objectives, type of platform (e.g., spinning or 3-axis stabilized), expected plasma regime where the measurements will be made, available telemetry, budget, etc. In general, ionospheric DC electric field instruments that achieve accuracies of 0.1 mV/m or better, place spherical sensors at large distances (10m or more) from the spacecraft body in order to extend well beyond the spacecraft wake and sheath and to achieve large signal-to-noise ratios for DC and long wavelength measurements. Additional sets of sensors inboard of the primary, outermost sensors provide useful additional information, both for diagnostics of the plasma contact potentials, which particularly enhance the DC electric field measurements on non-spinning spacecraft, and for wavelength and phase velocity measurements that use the spaced receiver or ”interferometer” technique. Accurate attitude knowledge enables B times V contributions to be subtracted from the measured potentials, and permits the measured components to be rotated into meaningful geophysical reference frames. We review the measurement technique for both DC and wave electric field measurements in the ionosphere discussing recent advances involving high resolution burst memories, multiple baseline double probes, new sensor surface materials, biasing techniques, and other considerations.
Author
Electric Fields; Electrical Measurement; Plasma Probes; Space Plasmas; Earth Ionosphere

20000025015 Naval Research Lab., Plasma Physics Lab., Washington, DC USA
Investigation of Power Flow from a Plasma Opening Switch to an Electron Beam Diode ***Interim Report, 1 Oct. 1997 - 1 Oct. 1998***
Black, D. C.; Boller, J. R.; Young, F. C.; Commisso, R. J.; Myers, M. C.; Dec. 13, 1999; 63p; In English; Prepared in collaboration with Jaycor Inc., Vienna, VA.
Report No.(s): AD-A372042; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A series of experiments was performed on Hawk to investigate the coupling between a plasma opening switch (POS) and an electron-beam (e-beam) diode load. The parameters that were varied independently in this set of experiments were the conduction time, the e-beam diode anode-cathode (A-K) gap (diode impedance), and the POS-to-load distance. The optimum conduction time for maximum load power was found to be roughly 400-600 ns. The optimum A-K gap for maximum load power was found to be 10 to 15 mm, corresponding to an impedance of approximately 4 to 6 omega. The maximum power measured in these experiments was 40 - 50% lower than that obtained in previous flashboard experiments. The current measurements between the POS and load in the long POS-to-load configuration suggest a picture in which the dominant processes that control the current transfer between the POS and the load change as conduction time is varied but are nearly independent of load impedance. The inferred POS gap at the time of peak load power is always approximately equal to the critical gap for magnetic insulation in both switch-limited and load-limited operation. This implies that the POS-load coupling is self-regulated to maintain saturated electron flow in the POS.
DTIC
Electrical Impedance; Research; Experimentation; Plasmas (Physics); Switches

76
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.

20000021315 NASA Ames Research Center, Moffett Field, CA USA

The Low-Lying States of AlCu and AlAg

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Langhoff, Stephen R., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; Journal of Chemical Physics; Jan. 15, 1994; Volume 100, No. 2, pp. 1219-1225; In English; Copyright; Avail: Issuing Activity

The singlet and triplet states of AlCu and AlAg below about 32 000/cm are studied using the internally contracted multireference configuration-interaction method. A more elaborate study of the X(sup 1)Sum(sup +) ground state of AlCu is undertaken using extended Gaussian basis sets, including the effect of inner-shell correlation and including a perturbational estimate of relativistic effects. Our best estimate of the spectroscopic constants (r(sub 0), DeltaG(sub 1/2), and D(sub 0)) for the X(sup 1)Sum(sup+) state with the experimental values in parentheses are: 4.416(4.420) a(sub 0), 295 (294) /cm, and 2.318 (2.315) eV. The calculations definitively assign the upper state in the observed transition at 14 892/cm to the lowest (sup 1)Prod state. The calculated spectroscopic constants and radiative lifetime for the (sup 1)Prod state are in good agreement with experiment. The calculations support the tentative assignments of Behm et al. for three band systems observed in the visible region between 25 000 and 28 000 / cm. However, the computed spectroscopic constants are in very poor agreement with those deduced from an analysis of the spectra. Analogous theoretical results for AlAg suggest that the (2)(sup 3)Prod, (3)(sup 3)Prod, and (3)(sup 1)Sum(sup +) states account for the bands observed, but not assigned, by Duncan and co-workers.

Author

Atomic Energy Levels; Ground State; Atomic Interactions; Excitation; Aluminum Compounds; Copper Compounds; Silver Compounds

20000021325 California Univ., Materials Dept., Santa Barbara, CA USA

Selective Area Epitaxy of GaN for Electron Field Emissions Devices

Kapolnek, D., California Univ., USA; Underwood, R. D., California Univ., USA; Keller, B. P., California Univ., USA; Keller, S., California Univ., USA; Denbaars, S. P., California Univ., USA; Mishra, U. K., California Univ., USA; Journal of Crystal Growth; 1997; ISSN 0022-0248; Volume 170, pp. 340-343; In English

Contract(s)/Grant(s): DAAH04-95-1-0157; NSF DMR-91-23048

Report No.(s): AD-A370111; ARO-33799.1-PH; Copyright; Avail: Issuing Activity, Hardcopy

Selective area epitaxy of GaN by MOCVD has been used to fabricate arrays of hexagonal pyramid structures for electron field emission devices. The reactor temperature and pressure have been found to strongly affect the resulting pyramid morphology. Growth at 76 Torr results in improved pyramid shape and uniformity compared to growth at atmospheric pressure. Optimized arrays of pyramids produced emission currents of 80 microns at 1100 V, when biased across 0.5 mm in UHV.

Author

Epitaxy; Gallium Nitrides; Electron Emission; Field Emission

20000021326 Wisconsin Univ., Dept. of Chemical Engineering, Madison, WI USA

Intrinsic and Oxygen-Related Deep Level Defects in In(0.5)(Al(x)Ga(1-x))(0.5)P Grown by Metal-Organic Vapor Phase Epitaxy

Cederberg, J. G., Wisconsin Univ., USA; Bieg, B., Wisconsin Univ., USA; Huang, J.-W., Hewlett-Packard Co., USA; Stockman, S. A., Hewlett-Packard Co., USA; Peanasky, M. J., Hewlett-Packard Co., USA; Kuech, T. F., Wisconsin Univ., USA; Journal of Crystal Growth; 1998; ISSN 0022-0248; Volume 195, pp. 63-68; In English

Contract(s)/Grant(s): DAAH04-95-1-0322

Report No.(s): AD-A370112; ARO-34450.34-MS; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Oxygen-related, defects in Al-containing semiconductors can degrade luminescence efficiency and reduce free carrier lifetime affecting; the performance of light emitting devices. We have used the oxygen-doping source, diethylaluminum ethoxide, (C2H5)2AlOC2H5, to intentionally incorporate oxygen-related defects during growth of In(0.5)(AI(x)Ga(1-x))(0.5)P by metal-organic vapor phase epitaxy (MOVPE). Our investigations have identified several defects which are present in nonintentionally oxygen-doped n-type ln(0.5)(Al(x)Ga(1-x))(0.5)P as well as those due to oxygen. Oxygen introduces defect

states near the middle of the band gap. Deep level transient spectroscopy and photoluminescence data obtained over the range of composition 0 less than x less than 1, are presented illustrating the trends in defect structure with alloy composition.
Author
Semiconductors (Materials); Aluminum; Carrier Lifetime; Defects; Luminescence; Oxygen; Photoluminescence

20000021375 NASA Glenn Research Center, Cleveland, OH USA
Electrical Impact of SiC Structural Crystal Defects on High Electric Field Devices
Neudeck, Philip G., NASA Glenn Research Center, USA; December 1999; 14p; In English; Silicon Carbide and Related Materials, 10-15 Oct. 1999, Raleigh, NC, USA; Sponsored by North Carolina State Univ., USA
Contract(s)/Grant(s): RTOP 505-23-1N
Report No.(s): NASA/TM-1999-209647; E-11995; NAS 1.15:209647; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Commercial epilayers are known to contain a variety of crystallographic imperfections. including micropipes, closed core screw dislocations. low-angle boundaries, basal plane dislocations, heteropolytypic inclusions, and non-ideal surface features like step bunching and pits. This paper reviews the limited present understanding of the operational impact of various crystal defects on SiC electrical devices. Aside from micropipes and triangular inclusions whose densities have been shrinking towards manageably small values in recent years, many of these defects appear to have little adverse operational and/or yield impact on SiC-based sensors, high-frequency RF, and signal conditioning electronics. However high-power switching devices used in power management and distribution circuits have historically (in silicon experience) demanded the highest material quality for prolonged safe operation, and are thus more susceptible to operational reliability problems that arise from electrical property nonuniformities likely to occur at extended crystal defects. A particular emphasis is placed on the impact of closed-core screw dislocations on high-power switching devices, because these difficult to observe defects are present in densities of thousands per cm,in commercial SiC epilayers. and their reduction to acceptable levels seems the most problematic at the present time.
Author
Crystal Defects; Silicon; Electric Fields; Electrical Properties; Switching

20000021385 North Carolina State Univ., Dept. of Electrical and Computer Engineering, Raleigh, NC USA
Calculational Approach for the Structure of Electron and Hole Levels in Quantum Dots of Varying Shape
Kiselev, A. A., North Carolina State Univ., USA; Kim, K. W., North Carolina State Univ., USA; Stroscio, M. A., Army Research Office, USA; Physical Review B; Sep. 15, 1999; ISSN 0163-1829; Volume 60, No. 11, pp. 7748-7751; In English
Contract(s)/Grant(s): DAAG55-98-D-0003
Report No.(s): AD-A369972; ARO-39108.4-EL-SR; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

Another approach to the calculation of electron and hole states in quantum dots is proposed. It benefits from the particular choice of products of powers of Cartesian coordinates as a basis, since it is possible to evaluate all required matrix elements analytically for these systems. A variety of dot shapes in the presence of external electric fields can be analyzed conveniently. This approach provides a way to calculate quantum dot ensemble averages quickly and effectively.
Author
Electronic Structure; Electron States; Quantum Dots; Quantum Wells; Quantum Wires

20000021443 Rutherford Appleton Lab., Chilton UK
Birefringence and Dichroism in X-Rays Passing through Magnetic Material
Lovesey, S. W., Rutherford Appleton Lab., UK; Collins, S. P., Daresbury Nuclear Physics Lab., UK; Dec. 08, 1999; ISSN 1358-6254; 48p; In English
Report No.(s): PB2000-102525; RAL-TR-1999-078; Copyright; Avail: National Technical Information Service (NTIS)

We present a framework for describing polarization-dependent attenuation and retardation of X-rays, by materials, which are anisotropic and/or magnetic. Classical optical calculus is employed to relate observable quantities to atomic variables of the sample. As an explicit example, we consider the case of the biaxial magnetic crystal, ferrous niobate.
NTIS
Birefringence; Magnetic Materials; Dichroism; X Rays; Crystals

20000021470 Clemson Univ., Coll. of Engineering and Sciences, SC USA
Effect of Ti Substitution on the Thermoelectric Properties of the Pentatelluride Materials M(1-x)Ti(x)Te5 (M=Hf, Zr)
Littleton, R. T., IV, Clemson Univ., USA; Tritt, Terry M., Clemson Univ., USA; Feger, C. R., Clemson Univ., USA; Kolis, J., Clemson Univ., USA; Wilson, M. L., Clemson Univ., USA; Marone, M., Clemson Univ., USA; Payne, J., South Carolina State

Univ., USA; Verebeli, D., South Carolina State Univ., USA; Levy, F., Institut De Physique Appliquee, Switzerland; Applied Physics Letters; Apr. 20, 1998; ISSN 0003-6951; Volume 72, No. 16, pp. 2056-2058; In English
Contract(s)/Grant(s): DAAG55-97-I-0267; DE-FG05-93ER-45493
Report No.(s): AD-A370094; ARO-37381.5-MS; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

The thermoelectric properties (resistivity and thermopower) of single crystals of the low dimensional pentatelluride materials, HfTe5 and ZrTe5, have been measured as a function of temperature from 10 K is less than T is less than 320 K. The effect of small amounts of Ti substitutional doping (M(1-x)Ti(x)Te5, where M = Hf, Zr) on the thermoelectric properties is reported here. A resistive transition occurs in the pentatellurides, as evidenced by a peak in the resistivity, T(sub p) approximately equal 80 K for HfTe5 and T(sub p) approximately equal 145 K for ZrTe5. Both parent materials exhibit a large positive (p-type) thermopower near room temperature which undergoes a change to negative (n-type) below the peak temperature. The thermal conductivity is relatively low (approximately equal 5 W/m K) for the MTe5 materials. The Ti substitution affects the electronic properties strongly, producing a substantial shift in the peak temperature while the large values of thermopower remain essentially unaffected. These results warrant further investigation of them materials as candidates for low temperature thermoelectric applications.
Author
Substitutes; Thermoelectricity; Thermoelectric Materials; Single Crystals; Tellurides

20000021471 Arkansas Univ., Dept. of Physics and HiDEC, Fayetteville, AR USA
New Superconducting (Y(1-x)Ho(x))Ba2Cu3O(7-8) and (Y(1-x)Li(x))Ba2Cu3O(7-8) Thin Films Deposited by the Laser Ablation Method
Yoo, S. H., Arkansas Univ., USA; Qin, S. J., Arkansas Univ., USA; Luo, W. A., Arkansas Univ., USA; Yao, H. J., Arkansas Univ., USA; Salamo, G. J., Arkansas Univ., USA; Chan, F. T., Arkansas Univ., USA; 1999; 11p; In English; 9th; 6th; Climtec-World Forum on New Materials, USA, USA; Sponsored in part by the Science and Technology Council of Guizhou Providence, China
Contract(s)/Grant(s): DARPA MDA-972-93-I-0036; DAAH04-96-I-0455; NSF DMR-93-18946; Copyright; Avail: Issuing Activity, Microfiche, Hardcopy

We report the fabrication of the (Y(1-x)Ho(x))Ba2Cu3O(7-8) and the (Y(1-x)Li(x))Ba2Cu3O(7-8) superconducting thin films with x = 0, 0.2, and 0.4 on (100) LaAlO3 using laser deposition. Our results show that the new superconducting films were mirror-like and highly c-axis oriented with respect to the substrate normal. These films have T(sub c) values of about 90 K and J(sub c) approximately 10(exp 6) A/sq cm at 77K.
Author
Superconducting Films; Superconductivity; Superconductors (Materials); YBCO Superconductors; Thin Films

20000023159 NASA Glenn Research Center, Cleveland, OH USA
Correlation of EBIC and SWBXT Imaged Defects and Epilayer Growth Pits in 6H-SiC Schottky Diodes
Schnable, C. M., Case Western Reserve Univ., USA; Tabib-Azar, M., Case Western Reserve Univ., USA; Neudeck, P. G., NASA Glenn Research Center, USA; Bailey, S. G., NASA Glenn Research Center, USA; Su, H. B., State Univ. of New York, USA; Dudley, M., State Univ. of New York, USA; Raffaelle, R. P., Rochester Inst. of Tech., USA; February 2000; 10p; In English; 1999 International Conference on Silicon Carbide and Related Materials, 10-15 Oct. 1999, Raleigh, NC, USA; Sponsored by North Carolina State Univ., USA
Contract(s)/Grant(s): NCC3-593; DAAG55-98-10392; DARPA Order-E111; RTOP 505-23-2Q
Report No.(s): NASA/TM-2000-209648; NAS 1.15:209648; E-11996; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We show the first direct experimental correlation between the presence of closed core screw dislocations in 6H-SiC epilayers with recombination centers, as well as with some of the small growth pits on the epilayer surface in lightly-doped 6H-SiC Schottky diodes. At every Synchrotron White-Beam X-ray Topography (SWBXT)-identified closed core screw dislocation, an Electron Beam Induced Current (EBIC) image showed a dark spot indicating a recombination center, and Nomarski optical microscope and Atomic Force Microscope (AFM) images showed a corresponding small growth pit with a sharp apex on the surface of the epilayer.
Author
Correlation; Synchrotrons; Topography; Beam Currents; Electron Beams; Schottky Diodes; Crystal Defects

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

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

20000021250 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Renormalization in Quantum Field Theory and the Riemann-Hilbert Problem
Connes, A.; Kreimer, D.; Sep. 1999; 114p
Report No.(s): PB2000-102532; IHES/M/99/75; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The authors show that renormalization in quantum field theory is a special instance of a general mathematical procedure of multiplicative extraction of finite values based on the Riemann-Hilbert problem. The authors show that, using dimensional regularization, the bare data in quantum field theory delivers a loop (where z is now the deviation from 4 of the complex dimension) of elements of the decorated Butcher group (obtained using the Milnor-Moore theorem from the Kreimer Hopf algebra of renormalization) and that the above general procedure delivers the renormalized physical theory in the minimal substraction scheme.
NTIS
Quantum Theory; Field Theory (Algebra); Renormalization Group Methods

20000024841 Air Force Research Lab., Sensors Directorate, Rome, NY USA
Review of Quantum Electromagnetic States, *Oct. 1996 - Oct. 1998*
Parker, Michael A.; Oct. 1999; 296p; In English
Contract(s)/Grant(s): Proj-4600
Report No.(s): AD-A372113; AFRL-SN-RS-TR-1999-201; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This program provided a review of the conceptual and mathematical apparatus to apply modern theories of electromagnetic fields. As a study in low-noise electromagnetic states, it centers on the need to transition basic physics into the engineering arena for improved systems and devices. A survey of applications and texts written during the past 10 years shows that there is a collection of common prerequisite background material; most of this material is addressed in this report. An initial chapter outlines the importance of quantum electromagnetic states to small systems of atoms or photons, to interconnects and links (communications), A-D converters, and to signal processing. All of these systems require higher speed, inner size, lower power and lower noise components, especially for space applications. The report discusses underlying concepts for Fock, coherent, and squeezed electromagnetic states. It also reviews the density operator, reservoir theory, fluctuation-dissipation theorem and Langevin sources.
DTIC
Electromagnetic Fields; Quantum Electronics; Quantum Theory

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20000021248 Helsinki Univ. of Technology, Digital Systems Lab., Espoo Finland
Digital Systems Laboratory Annual Report for the Year 1997
Honkola, J.; Aug. 1998; 32p; In English
Report No.(s): PB2000-102652; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This report describes the educational and research activities of the Digital Systems Laboratory at Helsinki University of Technology during the year 1997. The educational and research activities of the Chair and of the Laboratory have recently been concentrated upon the areas: specification, modeling, and analysis of parallel and distributed digital systems and theoretical computer science.
NTIS
Digital Systems; Research and Development; Universities; Education

20000021253 National Inst. of Polar Research, Tokyo, Japan

Logistics Activities at McMurdo, Amundsen-Scott South Pole Stations and Scott Base

Ishizawa, Kenji, National Inst. of Polar Research, Japan; Antarctic Record; July 1998; ISSN 0085-7289; Volume 42, No. 2, pp. 196-225; In Japanese; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In December of 1997 the author visited the US McMurdo and Amundsen-Scott South Pole Stations and New Zealand Scott Base as an Exchange Scientist. The author's investigation was focused on the transportation system, facilities and waste management. The author was surprised to see a working system at the US stations that involved complete division of labor. In addition, he was impressed that they made good use of aircraft and did efficient work in the summer season. There were great differences between Japan and US in management of combustible waste and sewage disposal. The utilization of native characteristics of Antarctica such as water wells, passive solar energy and wind turbines is worthy of note.

Author

Logistics; Transportation; Environment Management; Waste Disposal; Sewage Treatment

20000021377 National Science and Technology Council, Washington, DC USA

Renewing the Federal Government-University Research Partnership for the 21st Century

Apr. 1999; 50p; In English

Report No.(s): PB2000-101638; NSTC-PRD-4; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The partnership in science and technology that has evolved between the Federal government and American universities has yielded benefits that are vital to each. At the urging of the President's Committee of Advisors on Science and Technology, state governors, industry leaders, elected officials, and leaders in education, the Assistant to the President for Science and Technology issued a Presidential Review Directive in September 1996, directing the National Science and Technology Council (NSTC) to review te government-university partnership in research and associated educational activities, and to recommend ways to strengthen it. The goal was to assess and reaffirm the principles of the partnership, promote cost-effective university-based research, ensure fail allocation of research costs, and support the linkage between research and education, all while maintaining appropriate accountability for expenditure of public funds.

NTIS

Presidential Reports; University Program; Research; Governments

20000024791 Federal Committee on Statistical Methodology, Washington , DC USA

Federal Committee on Statistical Methodology Research Conference

Nov. 17, 1999; 640p; In English; Sponsored in part by National Agricultural Statistics Service, Washington, DC

Report No.(s): PB99-166795; STATISTICAL POLICY WP-29; No Copyright; Avail: CASI; A06, Microfiche; A99, Hardcopy

This report contains papers of talks and abstracts of demonstrations presented at the FCSM Research Conference held November 15-17,1999. Conference papers addressed a wide range of topics including the use of administrative data, small area estimation, metadata, statistical data analysis, improvements and alternatives to census-taking, cognitive research methods, estimation and editing, impact of the American Community Survey, record linkage, confidentiality, response issues, and new technologies. Technical demonstrations included applications for data warehousing; seasonal adjustment; matching; editing; analysis; data collection; statistical software; and display, dissemination, and integration of statistical information.

NTIS

Statistical Analysis; Conferences

20000024865 NASA Glenn Research Center, Cleveland, OH USA

NASA Glenn Research Center Experience Using DOE Midwest Region Super ESPC

Zala, Laszlo F., NASA Glenn Research Center, USA; February 2000; 14p; In English; Energy Efficiency, Energy Market and Environmental Protection at the End of the Millennium, 2-4 Jun. 1999, Eger, Hungary; Sponsored by Association of Energy Engineers, Hungary

Contract(s)/Grant(s): RTOP 022-00

Report No.(s): NASA/TP-2000-209442; NAS 1.60:209442; E-11926; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The energy crisis of 1973 prompted the Federal Government and private industry to look into alternative methods to save energy. At the same time the constant reduction of operations and maintenance funds during the last 5 years forced Glenn Research Center (GRC) to look for alternative funding sources to meet the mandate to reduce energy consumption. The Super Energy Savings Performance Contract (ESPC) was chosen as a viable source of facility improvement funding that can create larger project scope and help replace aging, inefficient equipment. This paper describes Glenn's participation in the Department of Energy

(DOE) Super ESPC program. This program provided Glenn cost savings in the performance of energy audits, preparation of documents, evaluation of proposals, and selection of energy service company (ESCO).
Derived from text
Energy Conservation; Cost Reduction; Energy Consumption

82
DOCUMENTATION AND INFORMATION SCIENCE

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

20000021270 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA
Research Highlights, *Sep. - Oct. 1999*
Oct. 26, 1999; 5p; In English
Report No.(s): AD-A371364; AFRL-SR-BL-TR-99-0293; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Research Highlights is published every two months by the Air Force Office of Scientific Research. This newsletter provides brief descriptions of AFOSR basic research activities including topics such as research accomplishments, examples of technology transitions and technology transfer, notable peer recognition awards and honors, and other research program achievements. This report includes two articles: development of the laser and the success of the Airborne Laser Program.
DTIC
Airborne Lasers; Research Management

20000021332 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden
Data Reduction in Data Fusion Systems *Datareduktion i Datafusionssystem*
Jungert, E.; Lantz, F.; Dec. 1998; 20p; In Swedish
Report No.(s): PB2000-101425; FOA-R-98-00790-408-SE; No Copyright; Avail: Issuing Activity
Information systems that handle sensor data from various types of sensors normally require methods for data fusion. The reason for this is that a specific usually collects data that can be interpreted as specialized information corresponding to, for instance, objects, their attributes or events related to the objects. to get the complete information about the objects, their attributes and events at a certain time, information from more than one sensor must be fused. A complication in this context is that the sensors quite often generates enormous amounts of data in short periods of time. As a consequence, methods for data reduction without loss of relevant information must be available. This report discusses some of the different problems that occur in connection to data reduction, including a brief discussion of some of the solutions related to this problem.
NTIS
Data Reduction; Multisensor Fusion; Information Systems

20000021342 National Cheng Kung Univ., Dept. of Computer Science and Information Engineering, Tainan, Taiwan, Province of China
Executable EFSM-Based Data Flow and Control Flow Protocol Test Sequence Generation Using Reachability Analysis
Huang, Chung-Ming, National Cheng Kung Univ., Taiwan, Province of China; Jang, Ming-Yuhe, National Cheng Kung Univ., Taiwan, Province of China; Lin, Yuan-Chuen, National Cheng Kung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 593-615; In English; Copyright; Avail: Issuing Activity, Hardcopy
This paper presents an executable Extended-Finite-State-Machine (EFSM)-based protocol test sequence generation method with specified variable bound. The proposed method overlaps data flow and control flow tests. In the data flow part, the transition paths that contain definition uses and output uses of variables in the protocol specifications need to be detected and tested. An executable data flow test path. which is called an EDO-path, contains two parts: (1) a switching transition sequence that directs to a transition T containing a definition use of a variable V, and (2) a transition sequence originated from T, such that its head transition has a definition use of V and its tail transition contains either an Output use of V. or an Output use of another variable which is affected by this definition use of V. In the control flow part, each transition must be tested as to whether it conforms to the original specification or not. An executable control flow test path, which is called an EC-path, for a transition T contains (1) a switching sequence that directs to the head state of T, (2) the transition T itself, and (3) the Unique Input/Output sequence of T's tail state, which verifies whether the tail state of T is correct or not. to shorten the length of the total test sequences, the proposed

method overlaps the control flow test Sequences with the data flow test sequences. That is, a test sequence may combine both control flow and data flow tests. The overlap is achieved as follows: when of searching EDO-paths, EC-paths are also searched in the same executable transition exploration sequences. If not all of the EC-paths are overlapped with EDO-paths, the remaining EC-paths are searched individually. Additionally, to provide flexible protocol conformance testing, protocol testers can specify some variable bound for their specific test purposes. That is, protocol testers can run tests they are interested in by specifying the associated variable bound in the protocol specification.
Author
Protocol (Computers); Data Flow Analysis; Information Flow

20000021345 Civil Aeromedical Inst., Oklahoma City, OK USA
Index to FAA Office of Aviation Medicine Reports: 1961 through 1999 ***Final Report***
Collins, William E., Civil Aeromedical Inst., USA; Wayda, Michael E., Civil Aeromedical Inst., USA; January 2000; 88p; In English
Report No.(s): DOT/FAA/AM-00/1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
An index to Federal Aviation Administration Office of Aviation Medicine Reports (1964-1999) and Civil Aeromedical Institute Reports (1961-1963) is presented for those engaged in aviation medicine and related activities. The index lists all FAA aviation medicine reports published from 1961 through 1999: chronologically, alphabetically by author, and alphabetically by subject. A foreword describes aspects of the Civil Aeromedical Institute's 38 years of service, describes the index's sections, and explains how to obtain copies of published Office of Aviation Medicine technical reports.
Author
Aerospace Medicine; Reports; Documents

20000021360 Institute for Human Factors TNO, Soesterberg, Netherlands
DocSys: A System for the Management of Knowledge of Clothing Material and Personal Equipment ***Final Report DocSys: Een Systeem voor het Beheren van Kennis Over Kledingmaterialen en Persoonlijke Uitrusting***
Post, W. M., Institute for Human Factors TNO, Netherlands; vanVerseveld, O. H., Institute for Human Factors TNO, Netherlands; Oct. 22, 1999; 54p; In Dutch
Contract(s)/Grant(s): A97/KL/355; TNO Proj. 731.1
Report No.(s): TD99-0358; TM-99-A069; Copyright; Avail: Issuing Activity
At the KPU service LBBKL (service for clothing and personal equipment of the National Need Determination Royal Netherlands Army) much expertise of materials for combat clothing and personal equipment is available. An earlier study pointed out that this expertise is not easily available because it is distributed over various work units and because it is stored in the heads of the experts (Post, 1997). This problem can be tackled well with knowledge management. Apart from knowledge, a lot of information is needed, but this information is distributed all over the department in various formats, or may even be obtained from outside the organization. Goal of the project "Documentation system clothing material and personal equipment" is an infrastructure for the whole department that should enable the storage and retrieval of various knowledge and information sources for the development of new clothing and personal equipment materials. During task performance, knowledge and experience should be easily documented and consulted. The project demonstrates a prototype system and specifies the functionality of a final documentation system. by means of task modelling, first the tasks, information flow, and knowledge blocks are identified and described. Next, the prototype system is built. With the prototype, users worked on some development projects. The experience and adaptations of the system will lead to the functionality of the documentation system to be built. A preliminary evaluation of the prototype revealed that DocSys provides a lot of functionality, but the flexibility of the system makes the use of it complex. Further, it appears that entering information is time consuming, and functional specification of clothing for knowledge storage and retrieval is both advantageous and disadvantageous. The evaluation is preliminary because the system is filled only gradually and not much knowledge could be reused.
Author
Combat; Clothing; Portable Equipment; Armed Forces (Foreign); Netherlands

20000021361 Prins Maurits Lab. TNO, Rijswijk, Netherlands
MIMNIS: A Mine In Medium Neutralization Information System. Lay-Out, Requirements, Cost ***Final Report MIMNIS: Het MIJN In Medium Neutralisatie Informatie Systeem. Globale Structure, Eisen en Randvoorwaarden, Kostenraming***
Eggen, J. B. M. M., Prins Maurits Lab. TNO, Netherlands; September 1999; 46p; In Dutch
Contract(s)/Grant(s): A95/KL/442; TNO Proj. 224095536
Report No.(s): TD99-0146; PML-1999-A51; Copyright; Avail: Issuing Activity

In this report a global layout of a new to be developed database MIMNIS (Mine In Medium Neutralization Information System) has been described. This database can be used to determine which mine clearing system can be used best against a certain mine threat. Although there are already several mine-databases available, which contain detailed information on different types of mines, there is still a lack of a database that also includes detailed information on the effectiveness of clearing tools against such mines. In this report the starting points and global structure for such a database has been described. In broad outline, it should contain; a MINE database, giving specific technical information on each type of mine; a MEDIA database, which provides information on the ground characteristics and terrain influence; a CLEARING TOOLS database, which includes information on the effectiveness of each clearing system; a DETECTION SYSTEMS database, which provides information on the detectability of the mines by a specific detection system. Because such experimental information will not be available for each combination of mine, medium, detection- and clearance-system, a central function 'EFFECTIVENESS OF COMBINATIONS' will be defined. Based on the test results included in the CLEARING TOOLS database, this component has to predict the effectiveness of a certain clearing system against a specific mine-type in a certain medium. In this report the global structure of such a database, the requirements and the benefits are described and the costs involved in developing such a database have been estimated.
Author
Data Bases; Algorithms; Computer Systems Programs; Information Systems

20000021373 National Tsing Hua Univ., Dept. of Electrical Engineering, Hsinchu, Taiwan, Province of China
A Phonetic Labeling Method for MAT Database Processing
Wang, Hsiao-Chuan, National Tsing Hua Univ., Taiwan, Province of China; Chiou, Rong-Liang, National Tsing Hua Univ., Taiwan, Province of China; Chuang, Shiang-Kai, National Tsing Hua Univ., Taiwan, Province of China; Huang, Yi-Fen, National Tsing Hua Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers. Special Issue: Chinese Speech and Language Processing; September 1999; ISSN 0253-3839; Volume 22, No. 5, pp. 529-534; In English
Contract(s)/Grant(s): NSC-87-2213-E-007--031; NSC-88-2213-E-007-048; Copyright; Avail: Issuing Activity, Hardcopy

This paper presents a semi-automatic phonetic labeling method for processing in the MAT (Mandarin across Taiwan) speech database. MAT speech data are collected through the telephone networks, Each utterance has been transcribed into Chinese characters and Pinyin symbols. The proposed phonetic labeling method will mark the syllable and sub-syllable boundaries in an utterance. Phonetic symbols are assigned to each segmented syllable. The segmentation process is accomplished by using hidden Markov modeling (HMM) and Viterbi decoding. The accuracy of syllable segmentation is detected by measuring the syllable length and the distance of a syllable from its state models. The experimental results show that the proposed labeling method can achieve segmentation accuracy around 90% for an allowed tolerance of 16 ms.
Author
Data Bases; Symbols; Syllables; Phonetics; Marking

20000021439 Connecticut Univ., Connecticut Transportation Inst., Storrs, CT USA
Enhancement of Photolog Applications and Display Environment *Final Report*
Davis, C. F.; Jun. 1999; 86p; In English
Report No.(s): PB2000-102556; JHR-99-269; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The Connecticut Department of Transportation (CONNDOT) has the responsibility of planning, constructing, and maintaining over 3800 miles of highways. As with all state departments of transportation, one of CONNDOT's greatest challenges is to maintain and efficiency organize a number of large, disparate databases. to maintain efficiency, data must be reliable and readily accessible in the appropriate format to many users. The photolog program offers one effective means of integrating the databases. The purpose of the study described was to examine how the program is currently performing this integrative function, suggest ways it might be improved, and identify potential new users. The report describes the current system and its evolution. Next, the overall procedure is described, followed by descriptions of existing uses and users. Possible new uses are then proposed for consideration. Finally, conclusions and recommendations are presented.
NTIS
Transportation; Highways; Data Bases; Data Processing

20000021489 General Accounting Office, Resources Community and Economic Development Div., Washington, DC USA
Environmental Protection: Status of EPA's Efforts to Create a Central Information Office. Statement of Record by Peter F. Guerrero, Director, Environmental Protection Issues, Resources, Community, and Economic Development Division
Apr. 29, 1999; 14p; In English
Report No.(s): PB2000-101076; GAO/T-RCED-99-177; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This statement provides information on (1) the status of EPA's efforts to create a central office responsible for information management, policy, and technology issues and (2) the major challenges that the new office needs to address in order to achieve success in collecting, using, and disseminating environment information.
NTIS
Information Management; Environment Protection; Management Systems

20000023230 Environmental Protection Agency, National Center for Environmental Assessment, Washington, DC USA
Annotated Bibliography Developed for the Graduated Level Introductory GIS Classes Taught at EPA
Taylor, J.; Jun. 1999; 156p; In English
Report No.(s): PB2000-101721; NCEA-W-0510; EPA/600/R-99/088; No Copyright; Avail: Issuing Activity
From September 1996 to December 1997, EPA's National Center for Environmental Assessment (NCEA) worked with George Mason University to present a semester long, graduate level class on 'Introduction to Geographic Information Systems (GIS)' that was taught at EPA. This document represents a compilation of the bibliographies submitted by the students. The abstracts are presented in alphabetical order, by author, and have only been edited for style, not content. References that were cited by more than one student will appear as duplicates in this document. It does provide an excellent resource on a very broad range of topics, including GIS used to study environmental impacts on land, water and air; GIS used in epidemiology studies; GIS used to study environmental justice; and GIS used to study changes in natural resources. Many references also cover issues concerning the setup of GIS systems and the collection use of data from remote sensing and aerial photography for GIS studies. Approximately 510 different articles have been cited.
NTIS
Bibliographies; Geographic Information Systems; Abstracts; Annotations; Earth Resources

20000023239 National Optical Astronomy Observatories, Tucson, AZ USA
The Number of Publications Used as a Metric of the NOAO WIYN Queue Experiment
Massey, Phililp, Kitt Peak National Observatory, USA; Guerrieri, Mary, Kitt Peak National Observatory, USA; Joyce, Richard R., Kitt Peak National Observatory, USA; February 2000; 20p; In English
Report No.(s): NOAO-Preprint-867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We use the number of papers published in 1998 and 1999 to test the hypothesis that the queue observing mode at (Wisconsin-Indiana-Yale-NOAO) WIYN leads to a significantly higher scientific throughput than classical mode observing. We use the papers published from the 4-m, and papers published from the non-queue WIYN time as controls, requiring only that the data be obtained after 1996 August 1, at which time the WIYN queue was in its third full semester of operation, and the WIYN instruments functional and stable. The number of papers published from the queue data is actually 1.5 times smaller (on a per night basis) than from the 4-m, and roughly comparable to (but lower than) the number published from non-queue WIYN time. Thus neither comparison offers any support for the hypothesis that queue leads to a higher scientific throughput. The number of papers is relatively small, but the statistics are sufficiently robust to reject the possibility that queue observing at WIYN leads to a factor of 1.5 enhancement in publication rate with a 99.3% confidence in comparison to the 4-m, and with an 89.9% confidence in comparison with non-queue WIYN time. We consider several explanations, and urge other observatories planning to employ the queue mode include some controls to provide an objective evaluation of its success.
Author
Queueing Theory; Mathematical Models; Statistical Analysis

20000025016 Massachusetts Inst. of Tech., Cambridge, MA USA
Context Interchange: Using Knowledge About Data to Integrate Disparate Sources ***Final Report, Jul. 1993 - Sep. 1998***
Madnick, Stuart; Siegel, Michael; Oct. 1999; 86p; In English
Contract(s)/Grant(s): AF Proj. A436
Report No.(s): AD-A372091; AFRL-IF-RS-TR-1999-227; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The Context Interchange Project presents a unique approach to the problem of semantic conflict resolution among multiple heterogeneous data sources. The system presents a semantically meaningful view of the data to the receivers (e.g. user applications) for all the available data sources. The semantic conflicts are automatically detected and reconciled by a Contex

Mediator using the context knowledge associated with both the data sources and the data receivers. The results are collated and presented in the receiver context. The current implementation of the system provides access to flat files, classical relational databases, on-line databases, and web services.
DTIC
Software Engineering; Artificial Intelligence; Relational Data Bases

20000025195 Colorado State Univ., Regional and Mesoscale Meteorology Team, Fort Collins, CO USA
GOES Imager and Sounder Calibration, Scaling, and Image Quality
Hillger, Donald W., Colorado State Univ., USA; June 1999; 40p; In English
Report No.(s): NOAA-NESDIS-93; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The handling of satellite data by image display systems has an impact on both how the imagery is viewed and on the quality of the imagery. Although the actual calibration of most GOES data take place before those images are sent to users, there are still many possibilities for manipulation (scaling) and display of those data. This document explains the processes in the display of both visible and infrared imagery from the GOES Imager and Sounder instruments. Many of those processes are transparent to users and can easily be overlooked. Wise users should be aware of those transformations and their advantages and disadvantages, especially relating to important image quality factors such as data precision and noise. One image display and analysis system in particular, McIDAS, has had a vast impact of the use of GOES data. Although McIDAS will continue to be widely used, there is an ongoing transition to AWIPS for operational display of satellite data. As an evolving system, AWIPS may gain from the knowledge base and lessons learned from previous methods for manipulation of imagery. Those lessons should not be ignored and can be used to improve the analysis and display of GOES imagery in future display systems. Implications are made as well about the bit-depth issue in the treatment of satellite imagery. Sample images and image products are used to quantify the increase in existing noise due to the loss of precision in the conversion of GOES Imager data from 10-bits into 8-bits for data transmission and display.
Author
GOES Satellites; Display Devices; Sounding; Calibrating; Q Factors; Image Resolution; Image Analysis

20000025197 NCI Information Systems, Inc., Hanover, MD USA
NASA Scope and Subject Category Guide
January 2000; 138p; In English; Requirements: MS Internet Explorer 4.0 or higher; or Netscape 4.0 or higher (Does not require an active Internet connection for basic functions.)
Contract(s)/Grant(s): NAS1-96010
Report No.(s): NASA/SP-2000-7603; NAS 1.21:7603; No Copyright; Avail: CASI; A25, CD-ROM; A07, Hardcopy

This guide provides a simple but effective tool to assist aerospace information analysts and database builders in the high-level subject classification of technical materials. Each of the 76 subject categories comprising the classification scheme is presented with a description of category scope, a listing of subtopics, cross references, and an indication of particular areas of NASA interest. The guide also includes an index of over 2,200 specific research topics cross referenced to the subject categories. The CD-ROM version hyperlinks this index to the subject categories. In addition to subject classification, the guide can serve as an aid to searching databases that use the classification scheme, and is also an excellent selection guide for those involved in the acquisition of aerospace literature. The CD-ROM includes the guide in PDF for printing.
Author
Classifications; Categories; Information Management; Aerospace Sciences; Aerospace Engineering; Aeronautics; Astronautics

20000025219 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Navy Collaborative Integrated Information Technology Initiative (NAVCIITI) ***Quarterly Report, Number 9, 18 Jul.-18 Oct. 1999***
Reifsnider, Kenneth; Jan. 10, 2000; 9p; In English
Contract(s)/Grant(s): N00014-99-1-0158
Report No.(s): AD-A372268; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The long-term objective of this program is to provide strong, integrated research capabilities in broad user communications testbeds, systems engineering, fiber optic sensors and transmission devices, secure and reliable wireless communications, effective user-friendly human computer interfaces, and scientific visualization to the Navy community. This initiative will improve the Navy's capabilities to support distributed computing, integrated services training, education, information dissemination, and simulation, The multi year program will establish a Navy Collaborative Integrated Information Technology Initiative (NAVCIITI, pronounced "NAV city") by creating an Advanced Communication and Information Technology Center

(ACITC), on campus at Virginia Tech, integrating the efforts of more than 60 investigators currently under contract to the Navy by providing equipment and facilities for their effort, and using the collective capabilities of NAVCIITI to support Navy initiatives in distributed computing, integrated services training, education, information dissemination, and simulation, especially for purposes of network-centric battle management, managing and maintaining C4ISR attributes, and enhancement of the Naval intranet. The scope of the proposed program was developed as a result of discussions, and briefings with a group of Navy unit leaders.
DTIC
Information Systems; Systems Engineering; Fiber Optics; Human-Computer Interface; Navy; Research Management

20000025462 NCI Information Systems, Inc., Hanover, MD USA
Aerospell Supplemental Spell Check File
January 2000; In English; 1 diskette: high density, double sided; IBM formatted
Contract(s)/Grant(s): NAS1-96010; No Copyright; Avail: CASI; A09, Diskette
Aerospell is a supplemental spell check file that can be used as a resource for researchers, writers, editors, students, and others who compose scientific and technical texts. The file extends the general spell check dictionaries of word processors by adding more than 13,000 words used in a broad range of aerospace and related disciplines.
CASI
Dictionaries; Editing; Word Processing; Words (Language); Nomenclatures; Aerospace Sciences; Astronautics; Aeronautics; Science; Engineering

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LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20000021252 Asian Productivity Organization, Tokyo Japan
Asian Productivity Organization 1998 Annual Report
1999; 110p; In English; Original contains color illustrations
Report No.(s): PB2000-102519; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The 40th Session of the APO Governing Body held in Manila, the Philippines, approved and adopted the Report of the Strategic Planning Exercise (SPEX) Study Group. With this decision, the annual meeting of the heads of NPOs will have a fundamental change of role as it will also undertake the task of strategic planning for the immediate years ahead. An executive summary of the SPEX Study Group Report is included in this annual report.
NTIS
Management Planning; Productivity; Asia

20000023165 Norwegian Defence Research Establishment, Kjeller, Norway
Intellectuals as Ideational Entrepreneurs in Russian Foreign Policy ***Intellektuelle Som Ide-Entreprenorer i Russisk Utenrikspolitikk***
Flaete, Jan, Norwegian Defence Research Establishment, Norway; Dec. 02, 1999; 42p; In Norwegian
Contract(s)/Grant(s): Proj. FFISYS/731/161.1
Report No.(s): FFI/RAPPORT-99/04212; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
It is a controversial issue in political science to what extent ideas expressed by policy-makers, academics, and others influence foreign policy decision making. This paper discusses the role of what we have chosen to call ”ideational entrepreneurs” in the formulation of Russian foreign policy. It takes account of the Soviet and Tsarist traditions, and it investigates the different manners in which ideational entrepreneurs affect present Russian foreign policy. The views of five particularly important entrepreneurs are discussed in detail: Yegor Gaidar, Alexei Arbatov, Andrei Kokoshin, Sergei Karaganov, and Gennady Zyuganov. More than 30 other such entrepreneurs are further plotted into a diagram according to their relations with the first five. This provides a rough road map of ideational entrepreneurs in Russian foreign policy. The paper concludes that these entrepreneurs have had a major impact on Russian foreign policy since the demise of the Soviet Union.
Author
Foreign Policy; Russian Federation

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ASTRONOMY

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

20000021269 Academy of Sciences of the Uzbek SSR, Astronomical Inst., Tashkent, Uzbekistan
Atmospheric Seeing Conditions at Mt. Maidanak ***Final Report***
Shevchenko, Valeri S.; Nov. 22, 1999; 24p; In English
Contract(s)/Grant(s): F61775-98-W-E104
Report No.(s): AD-A371272; EOARD-SPC-98-4059; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Science Research Institute of Precision Device Engineeriidanak as follows: The contractor will investigate and analyze atmospheric seeing data recently collected at Mt. Maidanak, and compile engineering drawings of the 110 cm telescope for possible future use in mounting sensors and other equipment.
DTIC
Atmospheric Refraction; Seeing (Astronomy)

20000021376 Hawaii Univ., Inst. for Astronomy, Honolulu, HI USA
Operation of the University of Hawaii 2.2M Telescope on Mauna Kea ***Final Report, 1 Mar. 1997 - 28 Feb. 1999***
McLaren, Robert A., Hawaii Univ., USA; [1999]; 6p; In English
Contract(s)/Grant(s): NAG5-4355; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents a final report from March 1, 1997-February 28, 1999 on the Operation of the University of Hawaii 2.2M Telescope on Mauna Kea. The topics include: 1) Telescope and Instrumentation (Newsletter and Documentation, Scheduling Periods); and 2) Scientific Highlights (The Outer Solar System-Trans-Neptunian Objects and the Kuiper Belt, Comet Hale-Bopp, Near-Earth Asteroids, Asteroid Families, and Galileo Mission Support).
CASI
Telescopes; Neptune (Planet); Asteroid Missions; Solar System

20000021447 Ball Aerospace and Technologies Corp., Boulder, CO USA
Goddard High Resolution Spectrograph SV/GTO Project ***Final Report***
Ebbets, Dennis, Ball Aerospace and Technologies Corp., USA; March 1999; 23p; In English
Contract(s)/Grant(s): NAS5-30433
Report No.(s): NASA/CR-1999-209492; NAS 1.26:209492; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contract number NAS5-30433, known at Ball Aerospace as the GHRS SV/GTO project, supported our participation in the post-launch activities of the Goddard High Resolution Spectrograph aboard the Hubble Space Telescope. The period of performance was December 1988 through December 1998. The contract supported the involvement of Dr Dennis Ebbets in the work of the GHRS Investigation Definition Team, and several of the Ball people in the documentation and publication of results. Three main categories of tasks were covered by this contract; in-orbit calibration of the GHRS, guaranteed time observations, and education and public outreach. The nature and accomplishments of these tasks are described in the report. This summary makes many references to publications in the scientific and technical literature. Appendix A is extracted from a complete bibliography, and lists those papers that are directly related to work performed under this GHRS contract. The tasks related to the in-orbit calibration of the GHRS were by far the largest responsibility during the first six years of the project. During this period Dr. Ebbets was responsible for the definition of calibration requirements, design of experiments, preparation of observing proposals, tracking their implementation and execution, and coordinating the analysis and publication of the results. Prior to the launch of HST in 1990 the observing proposals were developed in cooperation with the scientists on the GHRS DDT, engineers at Ball Aerospace, the operations staff at the STScI, and project coordinators at GSFC.
Author
Spectrographs; Calibrating; Experiment Design; Spaceborne Experiments

20000021449 Northwest Research Associates, Inc., Bellevue, WA USA
Investigation of Tropical Transport with UARS Data ***Final Report***
Dunkerton, Timothy J., Northwest Research Associates, Inc., USA; March 1999; 73p; In English
Contract(s)/Grant(s): NAS5-32862
Report No.(s): NASA/CR-1999-209493; NAS 1.26:209493; NWRA-CR-99-R195; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Measurements of trace constituents obtained by instruments aboard the Upper Atmosphere Research Satellite (UARS) have been used to study transport processes associated with the quasibiennial oscillation, laterally propagating Rossby waves, and upward propagating Kelvin waves in the tropical and subtropical upper troposphere and stratosphere. Mean vertical motions, vertical diffusivities and in-mixing rates were inferred from observations of the 'tape recorder' signal in near-equatorial stratospheric water vapor. The effect of the QBO on tracer distributions in the upper half of the stratosphere was seen in a spectacular 'staircase' pattern, predominantly in the winter hemisphere, revealing the latitudinally asymmetric nature of QBO transport due to induced mean meridional circulations and modulation of lateral mixing associated with planetary Rossby waves. The propagation of Rossby waves across the equator in the westerly phase of the QBO was seen in tracer fields and corroborating UKMO analyses; a modeling study of the effect of these waves on typical QBO wind profiles was performed. Water vapor in the upper troposphere and lower stratosphere was found to exhibit signatures of the tropical intraseasonal oscillation (TIO) and faster Kelvin waves in the two regions, respectively.
Author
Trace Elements; Tropical Regions; Temperate Regions; Upper Atmosphere Research Satellite (UARS); Meridional Flow; Atmospheric Circulation

20000021501 NASA Marshall Space Flight Center, Huntsville, AL USA
The Chandra X-Ray Observatory: Overview
Weisskopf, M. C., NASA Marshall Space Flight Center, USA; Tananbaum, H., NASA Marshall Space Flight Center, USA; Speybroeck, L. P., NASA Marshall Space Flight Center, USA; ODell, S. L., NASA Marshall Space Flight Center, USA; [1999]; 1p; In English; Astronomical Telescopes and Instrumentation, 27-31 Mar. 2000, Munich, Germany; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The Chandra X-ray Observatory, formerly, the Advanced X-ray Astrophysics Facility (AXAF), has now joined the Hubble Space Telescope and the Compton Gamma-Ray Observatory, as the third of NASA's "Great Observatories". Chandra provides unprecedented arcsecond imaging and spectrometric imaging and high-resolution dispersive spectroscopy, to address a large range of topics in x-ray astronomy and astrophysics. Here we provide an overview of the Observatory, its operation, and initial results.
Author
Astrophysics; Spectroscopy; X Ray Astronomy; X Ray Astrophysics Facility; Spectrometers; Spaceborne Astronomy

20000021503 NASA Marshall Space Flight Center, Huntsville, AL USA
Sunyaev-Zel'dovich Effect Derived Distance to the High Redshift Clusters MS 0451.6-0305 and CL 0016+16
Reese, E. D., NASA Marshall Space Flight Center, USA; Mohr, J. J., NASA Marshall Space Flight Center, USA; Carlstrom, J. E., NASA Marshall Space Flight Center, USA; Grego, L., NASA Marshall Space Flight Center, USA; Holder, G. P., NASA Marshall Space Flight Center, USA; Holzapfel, W. L., NASA Marshall Space Flight Center, USA; Hughes, J. P., NASA Marshall Space Flight Center, USA; Patel, S. K., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

We determine the distances to the z approximately equal to 0.55 galaxy clusters MS 0451.6-0305 and CL 0016+16 from a maximum likelihood joint fit to interferometric Sunyaev-Zel'dovich effect (SZE) and X-ray observations. We model the intracluster medium (ICM) using a spherical isothermal beta-model. We quantify the statistical and systematic uncertainties inherent to these direct distance measurements, and we determine constraints on the Hubble parameter for three different cosmologies. For an OmegaM = 0.3, OmegaL = 0.7 cosmology, these distances imply a Hubble constant of 63(exp 12)(sub -9)(exp +21)(sub -21) km/s/Mpc, where the uncertainties correspond to statistical followed by systematic at 68% confidence. The best fit H(sub o) is 57 km/sec/Mpc for an open OmegaM = 0.3 universe and 52 km/s/Mpc for a flat Omega = 1 universe.
Author
Cosmology; Galactic Clusters; Hubble Constant; Intergalactic Media; Red Shift

20000021513 Alabama Univ., Huntsville, AL USA
Spacelab Science Results Study, Volume 2, Microgravity Science ***Final Report***
Naumann, Robert J., Editor, Alabama Univ., USA; Lundquist, C. A., Editor, Alabama Univ., USA; Tandberg-Hanssen, E., Editor, Alabama Univ., USA; Horwitz, J. L., Editor, Alabama Univ., USA; Germany, G. A., Editor, Alabama Univ., USA; Cruise, J. F., Editor, Alabama Univ., USA; Lewis, M. L., Editor, Alabama Univ., USA; Murphy, K. L., Editor, Alabama Univ., USA; Aug. 18, 1999; 130p; In English
Contract(s)/Grant(s): NAS8-97095; NASA Order H-30194-D; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Beginning with OSTA-1 in November 1981, and ending with Neurolab n March 1998, thirty-six shuttle missions are considered Spacelab missions because they carried various Spacelab components such as the Spacelab module, the pallet, the Instrument Pointing System (IPS), or the MPESS (Mission Peculiar Experiment Support Structure). The experiments carried out during these flights included astrophysics, solar physics, plasma physics, atmospheric science, Earth observations, and a wide range of microgravity experiments in life sciences, biotechnology, materials science, and fluid physics which includes combustion and critical point phenomena. In all, some 764 experiments were conducted by investigators from the USA, Europe, and Japan. These experiments resulted in several thousand papers published in refereed journals, and thousands more in conference proceedings, chapters in books, and other publications. The purpose of this Spacelab Science Results Study is to document the contributions made in each of the major research areas by giving a brief synopsis of the more significant experiments and an extensive list of the publications that were produced. We have also endeavored to show how these results impacted the existing body of knowledge, where they have spawned new fields, and, if appropriate, where the knowledge they produced has been applied.
Author
Spacelab; Solar Physics; Plasma Physics; Microgravity; Biotechnology; Materials Science; Earth Observations (From Space)

20000024838 National Optical Astronomy Observatories, Tucson, AZ USA
The Observation of Type Ia Supernovae
Suntzeff, Nicholas B., Cerro Tololo Inter-American Observatory, Chile; January 2000; 11p; In English; 10th; Astrophysics, MD, USA
Report No.(s): NOAO-Preprint-866; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The past ten years have seen a tremendous increase in the number of Type Ia supernovae discovered and in the quality of the basic data presented. The cosmological results based on distances to Type la events have been spectacular, leading to statistically accurate values of the Hubble constant and Omega(sub M) and Omega(sub Lambda). However. in spite of the recent advances. a number of mysteries continue to remain in our understanding of these events. In this short review. I will concentrate on unresolved problems and curious correlations in the data on Type Ia SNe, whose resolution may lead to a deeper understanding of the physical mechanism of the Type la supernova explosions.
Author
Supernovae; Observation; Distance; Physical Factors

20000024863 Stanford Univ., Experimental Physics Lab., Stanford, CA USA
Development of a Broad High-Energy Gamma-Ray Telescope using Silicon Strip Detectors ***Final Report, 1 Apr. 1993 - 30 Apr. 1997***
Michelson, Peter F., Stanford Univ., USA; Jun. 20, 1998; 5p; In English
Contract(s)/Grant(s): NAGw-3489-4; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The research effort has led to the development and demonstration of technology to enable the design and construction of a next-generation high-energy gamma-ray telescope that operates in the pair-production regime (E greater than 10 MeV). In particular, the technology approach developed is based on silicon-strip detector technology. A complete instrument concept based on this technology for the pair-conversion tracker and the use of CsI(T1) crystals for the calorimeter is now the baseline instrument concept for the Gamma-ray Large Area Space Telescope (GLAST) mission. GLAST is NASA's proposed high-energy gamma-ray mission designed to operate in the energy range from 10 MeV to approximately 300 GeV. GLAST, with nearly 100 times the sensitivity of EGRET, operates through pair conversion of gamma-rays and measurement of the direction and energy of the resulting e (+) - e (-) shower. The baseline design, developed with support from NASA includes a charged particle anticoincidence shield, a tracker/converter made of thin sheets of high-Z material interspersed with Si strip detectors, a CsI calorimeter and a programmable data trigger and acquisition system. The telescope is assembled as an array of modules or towers. Each tower contains elements of the tracker, calorimeter, and anticoincidence system. As originally proposed, the telescope design had 49 modules. In the more optimized design that emerged at the end of the grant period the individual modules are larger and the total number in the GLAST array is 25. Also the calorimeter design was advanced substantially to the point that it has a self-contained imaging capability, albeit much cruder than the tracker.
Author
Gamma Ray Telescopes; Broadband; Design Analysis; Silicon; Detection

20000025057 NASA Goddard Space Flight Center, Greenbelt, MD USA

ASCA Observation of an ”X-Ray Shadow” in the Galactic Plane

Park, Sangwook, NASA Goddard Space Flight Center, USA; [2000]; 26p; In English

Contract(s)/Grant(s): NCC5-356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The diffuse X-ray background (DXB) emission near the Galactic plane (l,b about 25.6 deg., 0.78 deg.) has been observed with ASC.4. The observed re-ion is toward a Galactic molecular’cloud which was recently reported to cast a deep X-ray shadow in the 0.5 - 2.0 keV band DXB. The selection of this particular region is intended to provide a constraint on the spatial distribution of the DXB emission along the line of sight: i.e., the molecular cloud is optically thick at is less than 2 keV and so the bulk of the observed soft X-rays must originate in the foreground of the cloud, which is at about 3 kpc from the Sun. In the 0.8 - 9.0 keV band, atomic emission lines have been detected, and the observed spectrum is primarily from thermal plasmas. Although the detailed nature of the spectrum is complicated, the observed DXB emission appears to originate from the multiple components of hot plasmas including a thermal plasma of T about 10(exp 7) K, which prevails within about 3 kpc from the Sun.

Author

Diffuse Radiation; X Rays; Interstellar Matter; Extraterrestrial Radiation; Background Radiation; X Ray Astronomy; Galactic Structure

20000025072 NASA Goddard Space Flight Center, Greenbelt, MD USA

Photogrammetrically Measured Distortions of Composite Structure Microwave Reflectors at Approximately 90 K

Mule, Peter, NASA Goddard Space Flight Center, USA; Hill, Michael D., NASA Goddard Space Flight Center, USA; Sampler, Henry P., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 30 Jul. - 2 Aug. 2000, Unknown; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Microwave Anisotropy Probe (MAP) Observatory, scheduled for a fall 2000 launch, is designed to measure temperature fluctuations (anisotropy) and produce a high sensitivity and high spatial resolution (better than 0.3 deg.) map of the cosmic microwave background (CMB) radiation over the entire sky between 22 and 90 GHz. MAP utilizes back-to-back composite Gregorian telescopes supported on a composite truss structure to focus the microwave signals into 10 differential microwave receivers. Proper position and shape of the telescope reflectors at the operating temperature of approximately 90 K is a critical element to ensuring mission success. We describe the methods and analysis used to validate the in-flight position and shape predictions for the reflectors based on photogrammetric (PG) metrology data taken under vacuum with the reflectors at approximately 90 K. Contour maps showing reflector distortion analytical extrapolations were generated. The resulting reflector distortion data are shown to be crucial to the analytical assessment of the MAP instrument’s microwave system in-flight performance.

Author

Microwave Probes; Photogrammetry; Reflectors; Anisotropy; Distortion; Composite Structures; Microwave Antennas

90
ASTROPHYSICS

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

20000021232 Space Telescope Science Inst., Baltimore, MD USA

Cosmology with EMSS Clusters of Galaxies

Donahue, Megan, Space Telescope Science Inst., USA; Voit, G. Mark, Space Telescope Science Inst., USA; [1999]; 2p; In English

Contract(s)/Grant(s): NAG5-3208; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We use ASCA observations of the Extended Medium Sensitivity Survey sample of clusters of galaxies to construct the first z = 0.5 - 0.8 cluster temperature function. This distant cluster temperature function, when compared to local z approximately 0 and to a similar moderate redshift (z = 0.3 - 0.4) temperature function strongly constrains the matter density of the universe. Best fits to the distributions of temperatures and redshifts of these cluster samples results in Omega(sub M) = 0.45 +/- 0.1 if Lambda = 0 and Omega = 0.27 +/- 0.1 if Lambda + Omega(sub M) = 1. The uncertainties are 1sigma statistical. We examine the systematics of our approach and find that systematics, stemming mainly from model assumptions and not measurement errors, are about the same size as the statistical uncertainty +/- 0.1. In this poster proceedings, we clarify the issue of a8 as reported in our paper Donahue & Voit (1999), since this was a matter of discussion at the meeting.

Author

Cosmology; Galactic Evolution; Galactic Clusters

20000021557 Smithsonian Astrophysical Observatory, Cambridge, MA USA

The U.S. Spectrum X Gamma Coordination Facility ***Final Report, 11 Oct. 1994 - 30 Apr. 1999***

Forman, William R., Smithsonian Astrophysical Observatory, USA; August 1999; 156p; In English

Contract(s)/Grant(s): NAS5-32779

Report No.(s): NASA/CR-1999-209487; NAS 1.26:209487; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Spectrum-X-Gamma (SXG) provides for US participation in a first-class international x-ray mission. Despite launch delays, SXG will provide unique scientific opportunities due to its capability for all-sky monitoring, polarimetry, high resolution spectroscopy, and broad wavelength range-from the ultraviolet (TAUVEX and FUVITA), through the x-ray (SODART and JET-X), to the hard x-ray (MART), and gamma-ray burst detectors. Before describing our completed work, we review the unique properties of SXG and provide some examples of the scientific importance of SXG in the Chandra, XMM, and ASTRO-E era. Author

Gamma Ray Spectrometers; Spectrum Analysis; Coordination; Galactic Clusters; Cygnus Constellation

20000021558 National Optical Astronomy Observatories, Tucson, AZ USA

The Progenitor Masses of Wolf-Rayet Stars and Luminous Blue Variables Determined from Cluster Turn-Offs. I. Results from 19 OB Associations in the Magellanic Clouds, 1, Results from 19 OB Associations in the Magellanic Clouds

Massey, Philip, Kitt Peak National Observatory, USA; Waterhouse, Elizabeth, Arizona State Univ., USA; Degioia-Eastwood, Kathleen, Arizona State Univ., USA; February 2000; 108p; In English

Contract(s)/Grant(s): NSF 94-23921

Report No.(s): NOAO-Preprint-868; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

We combine new CCD UBV photometry and spectroscopy with that from the literature to investigate 19 Magellanic Cloud OB associations that contain Wolf-Rayet (WR) and other types of evolved massive stars. Our spectroscopy reveals a wealth of newly identified interesting objects, including early O-type supergiants, a high mass double-lined binary in the SMC, and, in the LMC, a newly confirmed LBV (R 85), a newly discovered WR star (Sk-6 deg 194), and a newly found luminous B[e] star (LH85-10). We use these data to provide precise reddening determinations and construct physical H-R diagrams for the associations. We find that about half of the associations may be highly coeval, with the massive stars having formed over a short period (Delta.tau is less than 1 Myr). The (initial) masses of the highest mass unevolved stars in the coeval clusters may be used to estimate the masses of the progenitors of WR and other evolved stars found in these clusters. Similarly the bolometric luminosities of the highest mass unevolved stars can be used to determine the bolometric corrections for the evolved stars, providing a valuable observational basis for evaluating recent models of these complicated atmospheres. What we find is the following: (1) Although their numbers are small, it appears that the WRs in the SMC come from only the highest mass (> 70 solar mass) stars. This is in accord with our expectations that at low metallicities only the most massive and luminous stars will have sufficient mass-loss to become WRs. (2) In the LMC, the early-type WN stars (WNEs) occur in clusters whose turn-off masses range from 30 to 100 solar mass or more. This suggests that possibly all stars with mass is greater than 30 solar mass pass through an WNE stage at LMC metallicities. (3) The one WC star in the SMC is found in a cluster with a turn-off mass of 70 solar mass, the same as for the SMC WNs. In the LMC, the WCs are found in clusters with turn-off masses of 45 solar mass or higher, similar to what is found for the LMC WNs. Thus we conclude that WC stars come from essentially the same mass range as do the WNs, and indeed are often found in the same clusters. This has important implications for interpreting the relationship between metallicity and the WC/WN ratio found in Local Group galaxies, which we discuss. (4) The LBVs in our sample come from very high mass stars (> 85 solar mass), similar to what is known for the Galactic LBV nu Car, suggesting that only the most massive stars go through an LBV phase. Recently, Ofpe/WN9 stars have been implicated as LBV's after one such star underwent an LBV-Iike outburst. However, our study includes two Ofpe/WN9 stars, BE 381 and Br 18, which we find in clusters with much lower turn-off masses (25 - 35 solar mass). We suggest that Ofpe/WN9 stars are unrelated to "true" LBVs: not all "LBV-like outbursts" may have the same cause. Similarly, the B[e] stars have sometimes been described as LBV-like. Yet, the two stars in our sample appear to come from a large mass range (> 30 - 60 solar mass). This is consistent with other studies suggesting that B[e] stars cover a large range in bolometric luminosities. (5) The bolometric corrections of early WN and WC stars are found to be extreme, with an average BC(WNE) = -6.0 mag, and an average BC(WC4) = -5.5 mag. These values are considerably more negative than those of even the hottest O-type stars. However, similar values have been found for WNE stars by applying Hiller's "standard model" for WR atmospheres. We find more modest BCs for the Ofpe/WN9 stars (BC = -2 to -4 mag), also consistent with recent analysis done with the standard model. Extension of these studies to the Galactic clusters will provide insight into how massive stars evolve at different metallicities.

Author

Wolf-Rayet Stars; B Stars; O Stars; Stellar Luminosity; Early Stars; Massive Stars; Star Clusters; Supergiant Stars

20000023229 New Hampshire Univ., Durham, NH USA

Broad-Band Gamma-Ray Spectra of Cygnus X-1 ***Final Report***

McConnell, Michael L., New Hampshire Univ., USA; Dec. 08, 1999; 14p; In English

Contract(s)/Grant(s): NAS5-26645; DARA-50-QV-90968; NAG5-7745; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The data collected by the COMPTEL experiment on CGRO provides an unprecedented opportunity to study the high energy spectrum of the galactic black hole candidate Cygnus X-1. A proper interpretation of the high energy spectrum, however, requires simultaneous knowledge of the spectrum at lower energies. Taken collectively, the instruments on CGRO afford the capability to study the nature of the broad band high energy spectrum of Cygnus X-1. This program is intended to more fully analyze the numerous observations of Cygnus X-1 that have been conducted during the course of the CGRO mission. In the past, these studies have been somewhat hindered by discrepancies between the spectra measured with BATSE and OSSE. We have recently been able to move beyond this problem to provide a more detailed analysis of the Cygnus X-1 spectrum and its variability at MeV energies.

Author

Black Holes (Astronomy); Energy Spectra; X Ray Binaries; Spaceborne Astronomy; Gamma Ray Astronomy

20000025028 NASA Goddard Space Flight Center, Greenbelt, MD USA

Two 1999 Dates Worth Noting

Stern, David P., American Geophysical Union, USA; [1999]; 1p; In English, 1-4 Jun. 1999, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Two dates in 1999 can serve as pivots for space-related educational outreach. On August 11 a total solar eclipse will sweep across Europe and also across the Near East, where it will come remarkably close to matching the ancient eclipse (probably in 129 BC) used by Hipparchus to estimate the distance of the Moon. Using published eclipse data, students may conduct a similar calculation for 1999 and in the process obtain insights about astronomy, history and the way scientists work. October 19, 1999 will be the 100th anniversary of the day when a teen-age Robert Goddard climbed a cherry tree near the Worcester home where his family was staying, intending to prune it. Sitting in that tree, Goddard began daydreaming about space flight, and by the time he came down he had resolved to dedicate his life to implementing that dream. He later marked that day as ”Anniversary day,” a personal holiday. Material on both subjects can be reached from http://www-spof.gsfc.nasa.gov/stargaze/Sintro.htm, sections 8a and 26. The section on Goddard includes his experiments with a ballistic pendulum and the DeLaval nozzle, which laid the essential scientific foundation of spaceflight and which is also suitable for classroom presentation.

Author

Pivots; Solar Eclipses; Space Flight; Education

20000025033 NASA Goddard Space Flight Center, Greenbelt, MD USA

A New Probe of the Molecular Gas Content in Galaxies: Application to M101

Smith, D. A., Space Telescope Science Inst., USA; Allen, R. J., Space Telescope Science Inst., USA; Bohlin, R. C., Space Telescope Science Inst., USA; Nicholson, N., McGill, USA; Stecher, T. P., NASA Goddard Space Flight Center, USA; [1999]; 1p; In English; Between the Stars II: The ISM, Galactic and Extragalactic Display (Session 71), 30 May - 3 Jun. 1999, Chicago, IL, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

Studies of nearby spiral galaxies suggest that photodissociation regions (PDRs) are capable of producing the observed large--scale distribution of HI (Allen et al.- 1997, and references therein). The column density of HI in a PDR is fundamentally linked to the amount of far--ultraviolet (FUV) emission produced by nearby young stars and the local molecular gas volume density. Measurements of the HI column density and the FUV emission associated with PDRs thus provide a new probe of the molecular gas distribution in nearby galaxies. Advantages of this method include its insensitivity to assumptions about the CO/{\rm H2} conversion factor or the gas temperature. We discuss the application of this method to M101. The HI column density and FUV emission have been measured for 35 PDRs from VLA data (Braun 1997) and Ultraviolet Imaging Telescope data (Waller et al.-1997). We derive volume densities ranging from n-100 {\rm cm(exp -3)} in the central HI--poor regions of M101 to n -3000 {\rm cm(exp -3)} in the HI--rich periphery of the galaxy.

Author

Molecular Gases; Spiral Galaxies; Astrophysics

20000025257 Space Telescope Science Inst., Baltimore, MD USA

A Very Hot, High Redshift Cluster of Galaxies: More Trouble for Omega(0) = 1

Donahue, Megan, Space Telescope Science Inst., USA; Voit, G. Mark, Space Telescope Science Inst., USA; Gioia, Isabella, Hawaii Univ., USA; Luppino, Gerry, Hawaii Univ., USA; Hughes, John P., Rutgers Univ., USA; Stocke, John T., Colorado Univ., USA; May 1998; 16p; In English

Contract(s)/Grant(s): NAG5-2021; NAG5-3432; GO-542.01-93A; ASI94-RS-10; NSF AST-95-00515

Report No.(s): PREPRINT-SERIES-1247; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have observed the most distant (= 0.829) cluster of galaxies in the Einstein Extended Medium Sensitivity Survey (EMSS), with the ASCA and ROSAT satellites. We find an X-ray temperature of 12.3 (sup +3.1) (sub -2.2)keV for this cluster, and the ROSAT map reveals significant substructure. The high temperature of MS1054-0321 is consistent with both its approximate velocity dispersion, based on the redshifts of 12 cluster members we have obtained at the Keck and the Canada-France-Hawaii telescopes, and with its weak lensing signature. The X-ray temperature of this cluster implies a virial mass approx. 7.4 x 10 (sup 14) h (sup -1) M (circle dot), if the mean matter density in the universe equals the critical value (OMEGA (sub 0) = 1), or larger if OMEGA (sub 0) is less than 1. Finding such a hot, massive cluster in the EMSS is extremely improbable if clusters grew from Gaussian perturbations in an OMEGA (sub 0) = 1 universe. Combining the assumptions that OMEGA (sub 0) = 1 and that the initial perturbations were Gaussian with the observed X-ray temperature function at low redshift, we show that this probability of this cluster occurring in the volume sampled by the EMSS is less than a few times 10 (sup -5). Nor is MS1054-0321 the only hot cluster at high redshift; the only two other z greater than 0.5 EMSS clusters already observed with ASCA also have temperatures exceeding 8 keV. Assuming again that the initial perturbations were Gaussian and OMEGA (sub 0) = 1, we find that each one is improbable at the less than 10 (sup -2) level. These observations, along with the fact that these luminosities and temperatures of the high-z clusters all agree with the low-z L (sub X) - T (sub X) relation, argue strongly that OMEGA (sub 0) less than 1. Otherwise, the initial perturbations must be non-Gaussian, if these clusters' temperatures do indeed reflect their gravitational potentials.

Author

Galactic Clusters; Red Shift; High Temperature; ROSAT Mission; Astrophysics; Cosmology; Galactic Structure

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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.

20000021095 NASA Kennedy Space Center, Cocoa Beach, FL USA

Galileo Science Update

Dec. 16, 1997; In English; Videotape: 1 hr. 14 min. 30 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2000008139; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

Live footage shows Jane Platt, JPL Public Information Office, introducing the moderator of the panel discussion. The moderator introduces the panel members include Bill O'Neil, Project Manager Galileo Primary Mission, Dr. Torrence V. Johnson Galileo Project Scientist, Prof. Ronald Greeley from Arizona State University Galileo Imaging Team, Bob Mitchell Project Manager Galileo Europa Mission, and Dr. Karen Buxbaum Galileo Science Planning Manager. The panelists give the audience information about the Galileo Mission and answers questions from the audience and from Kennedy Space Center. An animation of the Galileo Spacecraft approaching and passing Europa is presented. The panelists mentions High Resolution Images, Detail Gravity studies, Spectral Maps of non-ice materials, Jupiter studies, Callisto studies, Europa studies, and Io studies.

CASI

Galileo Spacecraft; Flyby Missions; Galileo Project; Europa; Io; Callisto; Jupiter (Planet)

20000021233 Bay Area Environmental Research Inst., San Francisco, CA USA

Fate of Earth Microbes on Mars -- UV Radiation Effects ***Final Report, 1 Jan. - 31 Dec. 1999***

Cockell, Charles, NASA Ames Research Center, USA; Feb. 15, 2000; 25p; In English

Contract(s)/Grant(s): NCC2-1087; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A radiative transfer model is used to quantitatively investigate aspects of the martian ultraviolet radiation environment. Biological action spectra for DNA inactivation are used to estimate biologically effective irradiances for the martian surface under cloudless skies. Although the present-day martian UV flux is similar to early earth and thus may not be a limitation to life in the evolutionary context, it is a constraint to an unadapted biota and will rapidly kill spacecraft-borne microbes not covered by a

martian dust layer. Here calculations for loss of microbial viability on the Pathfinder and Polar lander spacecraft are presented and the effects of martian dust on loss of viability are discussed. Details of the radiative transfer model are presented.
Author
Mars (Planet); Mars Environment; Mars Surface; Mars Atmosphere; Mars Polar Lander; Mars Exploration; Radiation Effects; Radiative Transfer; Ultraviolet Radiation

20000021446 Bay Area Environmental Research Inst., San Francisco, CA USA
Fate of Earth Microbes on Mars: UV Radiation Effects ***Final Report, 1 Jan. - 31 Dec. 1999***
Cockell, Charles, Bay Area Environmental Research Inst., USA; Feb. 15, 2000; 25p; In English
Contract(s)/Grant(s): NCC2-1087; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A radiative transfer model is used to quantitatively investigate aspects of the martian ultraviolet radiation environment. Biological action spectra for DNA inactivation are used to estimate biologically effective irradiances for the martian surface under cloudless skies. Although the present-day martian UV flux is similar to early earth and thus may not be a limitation to life in the evolutionary context, it is a constraint to an unadapted biota and will rapidly kill spacecraft-borne microbes not covered by a martian dust layer. Here calculations for loss of microbial viability on the Pathfinder and Polar lander spacecraft are presented and the effects of martian dust on loss of viability are discussed. Details of the radiative transfer model are presented.
Author
Radiative Transfer; Models; Mars Environment; Mars Surface; Microorganisms

20000024995 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mars Crustal Remanent Magnetism: An Extinct Dynamo Leaves a Record of Field Reversals in the Heavily Cratered Highlands
Connerney, John E., American Geophysical Union, USA; Acuna, Mario H., American Geophysical Union, USA; Ness, Norman F., American Geophysical Union, USA; Wasilewski, Peter J., American Geophysical Union, USA; [1999]; 1p; In English, 1-2 Jun. 1999, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Mars Global Surveyor spacecraft, in a highly elliptical polar orbit about Mars, obtained vector magnetic field measurements just above the surface of Mars (altitudes is greater than 100 kilometers). Crustal magnetization, largely confined to the most ancient, heavily cratered Mars highlands, is frequently organized in east-west trending linear features, the largest of which extends over 2000 km. A representative set of survey passes are modeled using uniformly magnetized thin plates and a generalized inverse methodology. Crustal remanent magnetization exceeds that deduced for the largest terrestrial magnetic anomalies by more than an order of magnitude. Groups of quasi-parallel linear features of alternating magnetic polarity are found. They are reminiscent of similar magnetic features associated with sea floor spreading and crustal genesis on Earth but with a much larger spatial scale.
Author
Mars Surface; Planetary Crusts; Remanence; Magnetization; Magnetic Properties; Planetary Craters

20000025029 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mars Gravity Field Model Development from Mars Global Surveyor Tracking Data
Lemoine, F. G., NASA Goddard Space Flight Center, USA; Zuber, M. T., Massachusetts Inst. of Tech., USA; [1999]; 1p; In English, 1-3 Jun. 1999, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since Feb. 99 the MGS spacecraft has been in a near circular orbit at about 400 km altitude. The MGS has been regularly tracked by the Deep Space Network (DSN) at X-band and for a 3 week period in February was tracked almost continuously for an intensive gravity modeling activity that would form the basis of the orbital computations for the rest of the mission. The data collected during this calibration period and the earlier SPO and Hiatus periods have now been used to develop a new gravity field model for Mars that is showing considerable new detail in both the northern and southern hemispheres. Until February no data at 400 km altitude or lower had been acquired on any previous mission south of about 35S and all the previous data were of significantly lower quality. Low altitude data (-170 km) were obtained over the higher latitudes of the northern hemisphere during the SPO periods but because of the high eccentricity of the orbit nothing of similar quality was obtainable for the southern hemisphere. The new models are of spherical harmonic degree and order 70 or higher and are suggesting large anomalies are often associated with the large impact features. Gravity data have also been obtained over both the northern and southern polar ice caps.

The MGS orbit quality resulting from the use of these newer models is better than any previous Mars missions and is approaching the ten's of meter level that had been hoped would be eventually realizable.
Author
Gravitational Fields; Mars Global Surveyor; Spacecraft Tracking

20000025056 Space Physics Research Inst., Sunnyvale, CA USA
Modelling Atmospheric Scatterers Using Spacecraft Observations, *1 Apr. 1990 - 30 Apr. 1999*
Rages, Kathy A., Space Physics Research Inst., USA; [1999]; 6p; In English
Contract(s)/Grant(s): NCC2-662; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project report reviews the analysis of data from the Voyager encounter with Neptune and Triton, and the primary Galileo mission to Jupiter. The project included analysis of the images from Voyager of the limb images from Neptune and Triton. Also included in the project was analysis of the Images from Galileo of Venus' and Jupiter's limb. The project work on the latitude bands and temporal variations on Uranus using the images from Voyager is summarized. Also, work on information from the Galileo Probe's Nephelometer is also covered
CASI
Jupiter (Planet); Neptune (Planet); Uranus (Planet); Venus (Planet); Planetary Limb; Triton; Satellite Atmospheres; Planetary Atmospheres

20000025059 National Academy of Sciences - National Research Council, Committee on Planetary and Lunar Exploration, Washington, DC USA
A Science Rationale for Mobility in Planetary Environments
1999; 68p; In English
Contract(s)/Grant(s): NASW-96013; ISBN 0-309-06437-6; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

For the last several decades, the Committee on Planetary and Lunar Exploration (COMPLEX) has advocated a systematic approach to exploration of the solar system; that is, the information and understanding resulting from one mission provide the scientific foundations that motivate subsequent, more elaborate investigations. COMPLEX's 1994 report, An Integrated Strategy for the Planetary Sciences: 1995-2010,1 advocated an approach to planetary studies emphasizing "hypothesizing and comprehending" rather than "cataloging and categorizing." More recently, NASA reports, including The Space Science Enterprise Strategic Plan2 and, in particular, Mission to the Solar System: Exploration and Discovery-A Mission and Technology Roadmap,3 have outlined comprehensive plans for planetary exploration during the next several decades. The missions outlined in these plans are both generally consistent with the priorities outlined in the Integrated Strategy and other NRC reports,4-5 and are replete with examples of devices embodying some degree of mobility in the form of rovers, robotic arms, and the like. Because the change in focus of planetary studies called for in the Integrated Strategy appears to require an evolutionary change in the technical means by which solar system exploration missions are conducted, the Space Studies Board charged COMPLEX to review the science that can be uniquely addressed by mobility in planetary environments. In particular, COMPLEX was asked to address the following questions: (1) What are the practical methods for achieving mobility? (2) For surface missions, what are the associated needs for sample acquisition? (3) What is the state of technology for planetary mobility in the USA and elsewhere, and what are the key requirements for technology development? (4) What terrestrial field demonstrations are required prior to spaceflight missions?
Author
Planetary Environments; Roving Vehicles; Planetary Landing; Planetary Surfaces; Research Vehicles

20000025062 National Academy of Sciences - National Research Council, Committee on Planetary and Lunar Exploration, Washington, DC USA
A Science Strategy for the Exploration of Europa
1999; 80p; In English
Contract(s)/Grant(s): NASW-96013; ISBN 0-309-06493-7; Copyright; Avail: Issuing Activity

Since its discovery in 1610, Europa--one of Jupiter's four large moons--has been an object of interest to astronomers and planetary scientists. Much of this interest stems from observations made by NASA's Voyager and Galileo spacecraft and from Earth-based telescopes indicating that Europa's surface is quite young, with very little evidence of cratering, and made principally of water ice. More recently, theoretical models of the jovian system and Europa have suggested that tidal heating may have resulted in the existence of liquid water, and perhaps an ocean, beneath Europa's surface. NASA's ongoing Galileo mission has profoundly expanded our understanding of Europa and the dynamics of the jovian system, and may allow us to constrain theoretical models of Europa's subsurface structure. Meanwhile, since the time of the Voyagers, there has been a revolution in our understanding of

the limits of life on Earth. Life has been detected thriving in environments previously thought to be untenable-around hydrothermal vent systems on the seafloor, deep underground in basaltic rocks, and within polar ice. Elsewhere in the solar system, including on Europa, environments thought to be compatible with life as we know it on Earth are now considered possible, or even probable. Spacecraft missions are being planned that may be capable of proving their existence. Against this background, the Space Studies Board charged its Committee on Planetary and Lunar Exploration (COMPLEX) to perform a comprehensive study to assess current knowledge about Europa, outline a strategy for future spacecraft missions to Europa, and identify opportunities for complementary Earth-based studies of Europa. (See the preface for a full statement of the charge.)
Author
Europa; Jupiter (Planet); Life Sciences; Solar System; Space Exploration; Europa Launch Vehicles

20000025063 NASA Goddard Space Flight Center, Greenbelt, MD USA
Preliminary Correlations of Gravity and Topography from Mars Global Surveyor
Zuber, M. T., Massachusetts Inst. of Tech., USA; Tyler, G. L., Stanford Univ., USA; Smith, D. E., NASA Goddard Space Flight Center, USA; Balmino, G. S., Centre National d'Etudes Spatiales, France; Johnson, G. L., Carnegie Institution of Washington, USA; Lemoine, F. G., NASA Goddard Space Flight Center, USA; Neumann, G. A., Massachusetts Inst. of Tech., USA; Phillips, R. J., Washington Univ., USA; Sjogren, W. L., Jet Propulsion Lab., California Inst. of Tech., USA; Solomon, S. C., Carnegie Institution of Washington, USA; [1999]; 1p; In English, 1-3 Jun. 1999, Boston, MA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Mars Global Surveyor (MGS) spacecraft is currently in a 400-km altitude polar mapping orbit and scheduled to begin global mapping of Mars in March of 1999. Doppler tracking data collected in this Gravity Calibration Orbit prior to the nominal mapping mission combined with observations from the MGS Science Phasing Orbit in Spring - Summer 1999 and the Viking and mariner 9 orbiters has led to preliminary high resolution gravity fields. Spherical harmonic expansions have been performed to degree and order 70 and are characterized by the first high spatial resolution coverage of high latitudes. Topographic mapping by the Mars Orbiter Laser Altimeter on MGS is providing measurements of the height of the martian surface with sub-meter vertical resolution and 5-30 m absolute accuracy. Data obtained during the circular mapping phase are expected to provide the first high resolution measurements of surface heights in the southern hemisphere. The combination of gravity and topography measurements provides information on the structure of the planetary interior, i.e. the rigidity and distribution of internal density. The observations can also be used to address the mechanisms of support of surface topography. Preliminary results of correlations of gravity and topography at long planetary wavelengths will be presented and the implications for internal structure will be addressed.
Author
Correlation; Topography; Planetary Gravitation

20000025067 NASA Goddard Inst. for Space Studies, New York, NY USA
Its a Wind, Its a Wave, Its Two Phenomena in One: Jerry Schubert, Superrotation, and the UV Markings on Venus
DelGenio, Anthony, NASA Goddard Inst. for Space Studies, USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In the early 1970's, ground-based astronomers had already discovered that Ultraviolet (UV) cloud markings on Venus reappeared every 4 days. When radar evidence later revealed a 243-day rotation period for the solid planet, planetary scientists were faced with a quandary: Could the Venus atmosphere really move 60 times as fast as the planet below, or were the apparent movements of the UV features just an illusion caused by propagating waves? The former explanation seemed unlikely - a planet that hardly rotates should generate only a very sluggish circulation. The historical impact of Jerry Schubert's moving flame theory was twofold: It was the forerunner of current thermal tide explanations of the cloud-level superrotation, but it was also the first plausible mechanism for explaining a seemingly inconsistent set of observations. In 1974, Mariner 10 acquired UV images of the Venus clouds at unprecedented levels of detail. Although few have noted it, this began the shift of planetary atmospheric research primarily from the domain of astronomy to that of meteorology. Jerry was among the first scientists to apply terrestrial meteorology to the analysis of planetary data. At that time a young UCLA graduate student with plans to do research on mantle convection, but having flunked the solid earth geophysics section of his departmental comprehensive exam, was gently invited by Jerry to switch to atmospheric science. Jerry suggested that the Venus UV features could be revealing both superrotating winds and planetary-scale waves at the same time, and that we could distinguish the two by looking at motions on different spatial scales. This was my first science research lesson - the complexity of real geophysical systems. Over the next couple of years I was inculcated with Jerry's philosophy of a comprehensive, rigorous approach to research, which manifested itself as a scouring of the literature and the UCLA meteorology faculty to learn about every possible type of planetary-scale wave. The resulting identification of large-scale UV features on Venus as the product of Kelvin and Rossby-type wave motions was validated by

extensive Pioneer Venus observations a decade later and remains one of the best examples of the use of terrestrial knowledge to understand other planets.
Author
Planetary Waves; Superrotation; Venus Atmosphere; Planetary Rotation; Planetary Meteorology; Kelvin Waves

20000025070 NASA Goddard Space Flight Center, Greenbelt, MD USA
Improved Gravitational Models of Mars from Radio Tracking of Mars Global Surveyor
Lemoine, Frank G., NASA Goddard Space Flight Center, USA; Rowlands, David D., NASA Goddard Space Flight Center, USA; Chinn, Douglas S., Raytheon STX Corp., USA; [1999]; 1p; In English, 13-17 Dec. 1999, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

After a long period of aerobraking, Mars Global Surveyor entered a low altitude, near-circular and polar orbit about Mars on February 4, 1999. Since that time, the spacecraft has been tracked routinely by the antennae of the Deep Space Network (DSN). The X band tracking data for the first time provide us: with uniform low-altitude coverage over the entire planet. In terms of both quality and geographic distribution, these data supersede the S Band tracking obtained by the Viking Orbiters and Mariner 9. We have used all available tracking obtained by Mars Global Surveyor to determine improved models; of the Man geopotential to 70 x 70 in spherical harmonies. The new models provide an order of magnitude improvement in both accuracy and detail. For instance, the Valles Marimeris canyon system clearly appears in the gravity anomaly maps: with the new model. In this paper, we discuss the derivation of these new models, and we evaluate their performance in terms of observed features and orbit quality. We also discuss the use of altimeter data from the Mars Orbiter Laser Altimeter (MOLA) in the form of altimeter crossovers, and how these data can contribute to the determination of geopotential models for Mars.
Author
Gravity Anomalies; Radio Tracking; Gravitational Fields; Spacecraft Tracking; Models

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SOLAR PHYSICS

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

20000021166 NASA Goddard Space Flight Center, Greenbelt, MD USA
Near-Surface Flow Fields Deduced Using Correlation Tracking and Time-Distance Analysis
DeRosa, Marc, Colorado Univ., USA; Duvall, T. L., Jr., NASA Goddard Space Flight Center, USA; Toomre, Juri, Colorado Univ., USA; 1999; 14p; In English
Contract(s)/Grant(s): NAG5-7996; NAG5-8133; NSF ATM-97-31676; NAG5-3077; Copyright; Avail: Issuing Activity, Hardcopy

Near-photospheric flow fields on the Sun are deduced using two independent methods applied to the same time series of velocity images observed by SOI-MDI on SOHO. Differences in travel times between f modes entering and leaving each pixel measured using time-distance helioseismology are used to determine sites of supergranular outflows. Alternatively, correlation tracking analysis of mesogranular scales of motion applied to the same time series is used to deduce the near-surface flow field. These two approaches provide the means to assess the patterns and evolution of horizontal flows on supergranular scales even near disk center, which is not feasible with direct line-of-sight Doppler measurements. We find that the locations of the supergranular outflows seen in flow fields generated from correlation tracking coincide well with the locations of the outflows determined from the time-distance analysis, with a mean correlation coefficient after smoothing of bar-r(sub s) = 0.840. Near-surface velocity field measurements can used to study the evolution of the supergranular network, as merging and splitting events are observed to occur in these images. The data consist of one 2048-minute time series of high-resolution (0.6” pixels) line-of-sight velocity images taken by MDI on 1997 January 16-18 at a cadence of one minute.
Author
Near Fields; Flow Distribution; Velocity Distribution; Correlation Detection; Tracking (Position); Position (Location); Time Series Analysis

20000021450 Illinois Univ., Urbana, IL USA

Vehicle/Atmosphere Interaction Glows: Far Ultraviolet, Visible, and Infrared ***Final Report***

Swenson, G., Illinois Univ., USA; October 1999; 38p; In English

Contract(s)/Grant(s): NAS8-40579

Report No.(s): NASA/CR-1999-209254; NAS 1.26:209254; M-918; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spacecraft glow information has been gathered from a number of spacecraft including Atmospheric and Dynamic satellites, and Space Shuttles (numerous flights) with dedicated pallet flow observations on STS-39 (DOD) and STS-62 (NASA). In addition, a larger number of laboratory experiments with low energy oxygen beam studies have made important contributions to glow understanding. The following report provides information on three engineering models developed for spacecraft glow including the far ultraviolet to ultraviolet (1400-4000 A), and infrared (0.9-40 microns) spectral regions. The models include effects resulting from atmospheric density/altitude, spacecraft temperature, spacecraft material, and ram angle. Glow brightness would be predicted as a function of distance from surfaces for all wavelengths.

Author

Far Ultraviolet Radiation; Space Transportation System; Models; Infrared Radiation; Spacecraft Glow; Spectral Bands

20000021483 Raytheon STX Corp., Lanham, MD USA

Acceleration of the Fast Solar Wind by Solitary Waves in Coronal Holes ***Quarterly Report, 12 Feb. 1999 - 11 Feb. 2000***

Ofman, Leon, Raytheon STX Corp., USA; [2000]; 28p; In English

Contract(s)/Grant(s): NASw-98004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this investigation is to develop a new model for the acceleration of the fast solar wind by nonlinear, time-dependent multidimensional MHD simulations of waves in solar coronal holes. Preliminary computational studies indicate that solitary-like waves are generated in coronal holes nonlinearly by torsional Alfven waves. These waves in addition to thermal conduction may contribute considerably to the accelerate the solar wind. Specific goals of this proposal are to investigate the generation of nonlinear solitary-like waves and their effect on solar wind acceleration by numerical 2.5D MHD simulation of coronal holes with a broad range of plasma and wave parameters; to study the effect of random disturbances at the base of a solar coronal hole on the fast solar wind acceleration with a more advanced 2.5D MHD model and to compare the results with the available observations; to extend the study to a full 3D MHD simulation of fast solar wind acceleration with a more realistic model of a coronal hole and solar boundary conditions. The ultimate goal of the three year study is to model the fast solar wind in a coronal hole, based on realistic boundary conditions in a coronal hole near the Sun, and the coronal hole structure (i.e., density, temperature, and magnetic field geometry) that will become available from the recently launched SOHO spacecraft.

Author

Solar Wind; Nonlinearity; Time Dependence; Magnetohydrodynamics; Simulation; Magnetohydrodynamic Waves; Wave-Particle Interactions; Two Fluid Models; Magnetohydrodynamic Flow; Two Dimensional Models; Three Dimensional Models

20000021510 Alabama Univ., Huntsville, AL USA

Corona Structure and Heating Constraints Determined from SERTS Observations

Falconer, D. A., Alabama Univ., USA; Davila, J. M., Alabama Univ., USA; [1999]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Intensities of the Extreme-ultraviolet (EUV) spectral lines were measured as a function of radius off the solar limb by two flights of the Goddard's Solar Extreme-ultraviolet Rocket Telescope and Spectrograph (SERTS) for three quiet sun regions. Density scale heights were determined for the different spectral lines. Limits on the filling factor were determined. In the one case where an upper limit was determined it was much less than unity. Coronal heating above 1.15 solar radii is required for all three regions studied. For reasonable filling factors, local heating is needed.

Author

Extreme Ultraviolet Radiation; Ultraviolet Telescopes; Spectrographs; Heating; Solar Corona; Stellar Structure

20000021511 Alabama Univ., Huntsville, AL USA

Insensitivity of Line-Ratio Diagnostics to Steady-State Non-Maxwellian Electron Distributions in Solar Corona

Falconer, D. A., Alabama Univ., USA; Davila, J. M., Alabama Univ., USA; [1999]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We examine the idea that the corona is heated by a population of nonthermal particles. An upper limit on the size of the nonthermal population is derived by assuming that all of the radiation and conduction losses in the corona are provided by the

nonthermal tail of the particle distribution. Only a very small percentage of nonthermal particles are allowed. These particles have a negligable effect on temperature sensitive line ratios typically observed in the EUV (Extreme Ultraviolet Radiation).
Author
Solar Corona; Steady State; Electron Distribution; Sensitivity; Line Spectra

20000023157 SciberNet, Inc., San Diego, CA USA
An Investigation of the Large Scale Evolution and Topology of Coronal Mass Ejections in the Solar Wind ***Final Report, 1- 29 Feb. 2000***
Riley, Peter, SciberNet, Inc., USA; Feb. 23, 2000; 106p; In English
Contract(s)/Grant(s): NASw-98007; Sci-0201-99; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This investigation is concerned with the large-scale evolution and topology of coronal mass ejections (CMEs) in the solar wind. During this reporting period we have focused on several aspects of CME properties, their identification and their evolution in the solar wind. The work included both analysis of Ulysses and ACE observations as well as fluid and magnetohydrodynamic simulations. In addition, we analyzed a series of ”density holes” observed in the solar wind, that bear many similarities with CMEs. Finally, this work was communicated to the scientific community at three meetings and has led to three scientific papers that are in various stages of review.
Author
Stellar Evolution; Topology; Coronal Mass Ejection; Solar Corona; Solar Wind

20000024807 Swedish Inst. of Space Physics, Uppsala, Sweden
The Tail Lobe Re-Visited: Magnetic Field Modeling Based on Plasma Data
Karlsson, S. B. P., Swedish Inst. of Space Physics, Sweden; Tsyganenko, N. A., NASA Goddard Space Flight Center, USA; June 1999; ISSN 0284-1703; 30p; In English; Sponsored in part by Anna Maria Lundin Scholarship
Report No.(s): IRF-SR-260; Copyright; Avail: Issuing Activity, Hardcopy

Plasma data from the ISEE-1 and -2 spacecraft during 1977-1980 have been used to determine the distribution of data points in the magnetotail in the range of distances -20 less than X(sub GSM) less than -15, i.e. which of the records that were located in the current sheet, in the tail lobe, in the magnetosheath and in the boundary layers respectively. The ISEE-1 and -2 magnetic field data for the records in the tail lobe were then used to model the tail lobe magnetic field dependence on the solar wind dynamic pressure, on the Interplanetary Magnetic Field (IMF) and on the Dst index. The tail lobe magnetic field was assumed to be dependent on the square root of the dynamic pressure based on the balance between the total magnetic pressure in the tail lobes and the dynamic pressure of the solar wind. The IMF dependent terms, added to the pressure term, were sought in many different forms while the Dst dependence of the tail lobe magnetic field was assumed to be linear. The field shows a strong dependence on.the square root of the dynamic pressure and the different IMF dependent terms all constitute a significant contribution to the total field. However, the dependence on the Dst index turned out to be very weak at those down-tail distances. The results of this study are intended to be used for parameterizing future version of the data-based models of the global magnetospheric magnetic field.
Author
Interplanetary Magnetic Fields; Plasmas (Physics); Magnetic Effects; Data Management; Data Transmission

20000024852 NASA Langley Research Center, Hampton, VA USA
Shielding from Solar Particle Event Exposures in Deep Space
Wilson, John W., NASA Langley Research Center, USA; Cucinotta, F. A., NASA Langley Research Center, USA; Shinn, J. L., NASA Langley Research Center, USA; Simonsen, L. C., NASA Langley Research Center, USA; Dubey, R. R., Old Dominion Univ., USA; Jordan, W. R., Old Dominion Univ., USA; Jones, T. D., Oak Ridge National Lab., USA; Chang, C. K., Christopher Newport Univ., USA; Kim, M. Y., National Academy of Sciences - National Research Council, USA; Radiation Measurements; 1999; ISSN 1350-4487; Volume 30, pp. 361-382; In English; Copyright; Avail: Issuing Activity

The physical composition and intensities of solar particle event exposures of sensitive astronaut tissues are examined under conditions approximating an astronaut in deep space. Response functions for conversion of particle fluence into dose and dose equivalent averaged over organ tissues are used to establish significant fluence levels and the expected dose and dose rates of the most important events from past observations. The BRYNTRN transport code is used to evaluate the local environment experienced by sensitive tissues and used to evaluate bioresponse models developed for use in tactical nuclear warfare. The present results will help to clarify the biophysical aspects of such exposure in the assessment of RBE and dose rate effects and their impact on design of protection systems for the astronauts. The use of polymers as shielding material in place of an equal mass of aluminum

would provide a large safety factor without increasing the vehicle mass. This safety factor is sufficient to provide adequate protection if a factor of two larger event than has ever been observed in fact occurs during the mission.
Author
Shielding; Solar Corpuscular Radiation; Solar Cosmic Rays; Solar Flares; Solar Storms

20000025061 Caelum Research Corp., Moffett Field, CA USA
A Simulation to Study Speed Distributions in a Solar Plasma ***Final Report***
Cheeseman, Peter, Caelum Research Corp., USA; Alvarellos, Jose Luis, San Jose State Univ., USA; [1999]; 4p; In English
Contract(s)/Grant(s): NCC2-5248; No Copyright; Avail: Issuing Activity; Abstract Only

We (Peter Cheeseman of NASA Ames/Caelum Research) & Jose Luis Alvarellos of the SJSU Physics Department/SJSU Foundation.) have carried out a numerical simulation of a plasma with characteristics similar to those found in the core of the Sun. Particular emphasis is placed on the Coulomb interaction between the ions and electrons, which could result in a relative velocity distribution different from the Maxwell-Boltzmann (MB) distribution generally assumed for a plasma. The fact that the distribution may not exactly follow the MB distribution could have very important consequences for a variety of problems in solar physics, especially the neutrino problem. Very briefly. the neutrino problem is that the observed neutrino detections from the Sun are smaller than what the standard solar theory predicts. In Section 1 we introduce the problem and in section 2 we discuss the approach to try to solve the problem: i.e., a molecular dynamics approach. In section 3 we provide details about the integration method, and any simplifications that can be applied to the problem. In section 4 (the core of this report) we state our results, first for the specific case of 1000 particles and then for other cases with different number of particles. In section 5 we summarize our findings and state our conclusions. Sections 6 and 7 provide the list of figures, reference material and acknowledgments respectively.
Author
Velocity Distribution; Computerized Simulation; Solar Physics; Plasmas (Physics); Numerical Analysis

20000025244 Maryland Univ., Astronomy Dept., College Park, MD USA
Solar Flare Physics ***Final Report, 1 Jan. - 31 Dec. 1999***
Schmahl, Edward J., Maryland Univ., USA; Kundu, Mukul R., Maryland Univ., USA; Dec. 21, 1999; 48p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-8029
Report No.(s): UMD-01-5-26587; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have continued our previous efforts in studies of fourier imaging methods applied to hard X-ray flares. We have performed physical and theoretical analysis of rotating collimator grids submitted to GSFC for the HESSI (High Energy Solar Spectroscopic Imager) mission involving the imaging of solar flares in hard X-rays. In the following pages we present analysis of several different imaging techniques, and focus on the one (The Polar Representation) that shows the greatest promise in minimizing storage requirements and maximizing the speed of map making.
Author
Imaging Techniques; Solar Flares; Collimators

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SPACE RADIATION

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

20000021209 Columbia Univ., Depts. of Astronomy and Physics, New York, NY USA
Monitoring X-Ray Emission from X-Ray Bursters ***Final Report, 1 May 1997 - 30 Apr. 1998***
Kaaret, Philip, Columbia Univ., USA; August 1998; 3p; In English
Contract(s)/Grant(s): NAG5-4425
Report No.(s): CAL-3031; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this investigation was to use the All-Sky Monitor on the Rossi X-Ray Timing Explorer (RXTE) in combination with the Burst and Transient Source Experiment on the Compton Gamma-Ray Observatory to simultaneously measure the x-ray (2-12 keV) and hard x-ray (20-100 keV) emission from x-ray bursters. The investigation was successful. We made the first simultaneous measurement of hard and soft x-ray emission and found a strong anticorrelation of hard and soft x-ray emission from the X-Ray Burster 4U 0614+091. The monitoring performed under this investigation was also important in triggering target of

opportunity observations of x-ray bursters made under the investigation hard x-ray emission of x-ray bursters approved for RXTE cycles 1 and 2. These observations lead to a number of papers on high-frequency quasi-periodic oscillations and on hard x-ray emission from the x-ray bursters 4U 0614+091 and 4U 1705-44.
Derived from text
Emission; X Rays; Gamma Ray Bursts

20000021429 Science Applications International Corp., Prospect, TN USA
Trapped Radiation Model Uncertainties: Model-Data and Model-Model Comparisons ***Final Report, Apr. 1995 - Sep. 1999***
Armstrong, T. W., Science Applications International Corp., USA; Colborn, B. L., Science Applications International Corp., USA; February 2000; 81p; In English
Contract(s)/Grant(s): NAS8-40294
Report No.(s): SAIC-TN-99030; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The standard AP8 and AE8 models for predicting trapped proton and electron environments have been compared with several sets of flight data to evaluate model uncertainties. Model comparisons are made with flux and dose measurements made on various U.S. low-Earth orbit satellites (APEX, CRRES, DMSP. LDEF, NOAA) and Space Shuttle flights, on Russian satellites (Photon-8, Cosmos-1887, Cosmos-2044), and on the Russian Mir space station. This report gives the details of the model-data comparisons -- summary results in terms of empirical model uncertainty factors that can be applied for spacecraft design applications are given in a companion report. The results of model-model comparisons are also presented from standard AP8 and AE8 model predictions compared with the European Space Agency versions of AP8 and AE8 and with Russian trapped radiation models.
Author
Radiation Trapping; Protons; Electrons; Dosage; Mathematical Models; Ionizing Radiation

20000021506 NASA Goddard Space Flight Center, Greenbelt, MD USA
Space Environment Effects: Model for Emission of Solar Protons (ESP): Cumulative and Worst Case Event Fluences
Xapsos, M. A., Naval Research Lab., USA; Barth, J. L., NASA Goddard Space Flight Center, USA; Stassinopoulos, E. G., NASA Goddard Space Flight Center, USA; Burke, E. A., Burke (Edward A.), USA; Gee, G. B., SGT, Inc., USA; December 1999; 1p; In English
Report No.(s): NASA/TP-1999-209763; M-952; NAS 1.60:209763; No Copyright; Avail: Issuing Activity, Hardcopy; Abstract Only

The effects that solar proton events have on microelectronics and solar arrays are important considerations for spacecraft in geostationary and polar orbits and for interplanetary missions. Designers of spacecraft and mission planners are required to assess the performance of microelectronic systems under a variety of conditions. A number of useful approaches exist for predicting information about solar proton event fluences and, to a lesser extent, peak fluxes. This includes the cumulative fluence over the course of a mission, the fluence of a worst-case event during a mission, the frequency distribution of event fluences, and the frequency distribution of large peak fluxes. Naval Research Laboratory (NRL) and NASA Goddard Space Flight Center, under the sponsorship of NASA's Space Environments and Effects (SEE) Program, have developed a new model for predicting cumulative solar proton fluences and worst-case solar proton events as functions of mission duration and user confidence level. This model is called the Emission of Solar Protons (ESP) model.
Author
Aerospace Environments; Mathematical Models; Predictions; Solar Protons; Spacecraft Design

20000021514 New Hampshire Univ., Durham, NH USA
SOLPOL: A Solar Polarimeter for Hard X-Rays and Gamma-Rays ***Final Report, 15 Apr. 1998 - 15 Oct. 1999***
McConnell, Michael L., New Hampshire Univ., USA; [1999]; 25p; In English
Contract(s)/Grant(s): NAG5-7294; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Th goal of this project was to continue the development of a hard X-ray polarimeter for studying solar flares. In earlier work (funded by a previous SR&T grant), we had already achieved several goals, including the following: 1) development of a means of producing a polarized radiation source in the lab that could be used for prototype development; 2) demonstrated the basic Compton scatter polarimeter concept using a simple laboratory setup; 3) used the laboratory results to verify our Monte Carlo simulations; and 4) investigated various detector technologies that could be incorporated into the polarimeter design. For the current one-year program, we wanted to fabricate and test a laboratory science model based on our SOLPOL (Solar Polarimeter) design. The long-term goal of this effort is to develop and test a prototype design that could be used to study flare emissions from either a balloon- or space-borne platform. The current program has achieved its goal of fabricating and testing a science model of the SOLPOL design, although additional testing of the design (and detailed comparison with Monte Carlo simulations) is still

desired. This one-year program was extended by six months (no-cost extension) to cover the summer of 1999, when undergraduate student support was available to complete some of the laboratory testing.
Author
Polarimeters; Solar X-Rays; Gamma Rays; Solar Flares; Mathematical Models

20000023238 NASA Goddard Space Flight Center, Greenbelt, MD USA
Modelling Hard Gamma-Ray Emission from Supernova Remnants
Baring, Matthew, Universities Space Research Association, USA; [2000]; 12p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The observation by the CANGAROO experiment of TeV emission from SN 1006, in conjunction with several instances of non-thermal X-ray emission from supernova remnants, has led to inferences of super-TeV electrons in these extended sources. While this is sufficient to propel the theoretical community in their modelling of particle acceleration and associated radiation, the anticipated emergence in the next decade of a number of new experiments probing the TeV and sub-TeV bands provides further substantial motivation for modellers. In particular, the quest for obtaining unambiguous gamma-ray signatures of cosmic ray ion acceleration defines a ”Holy Grail” for observers and theorists alike. This review summarizes theoretical developments in the prediction of MeV-TeV gamma-rays from supernova remnants over the last five years, focusing on how global properties of models can impact, and be impacted by, hard gamma-ray observational programs, thereby probing the supernova remnant environment. Properties of central consideration include the maximum energy of accelerated particles, the density of the unshocked interstellar medium, the ambient magnetic field, and the relativistic electron-to-proton ratio. Criteria for determining good candidate remnants for observability in the TeV band are identified.
Author
Gamma Rays; Thermal Emission; Supernova Remnants; Extraterrestrial Radiation

20000024776 Sofia Univ., Dept. of Meteorology and Geophysics, Bulgaria
Theoretical Study of Gamma Ray Index (I(sub gr): Shale Content (V(sub sh)) Relationship for Shaly Sands
Tenchov G. G., Sofia Univ., Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 110-114; In English; Copyright; Avail: Issuing Activity

The relationship between gamma ray index, I(sub gr) and shale content, V(sub sh), in shaly sands is a quantitative indication for shale content. It is used in well logging for oil and gas. It was shown, empirically, that the I(sub gr) - V(sub sh) relationship is nonlinear. A specified model for an explanation of the nonlinear relationship between I(sub gr) and V(sub sh) is offered. The model is not complicated. It cannot cover all possible cases but it is a startpoint model for more sophisticated theories.
Author
Gamma Rays; Nonlinearity; Shales; Mathematical Models; Geology

20000024788 Bulgarian Academy of Sciences, Inst. of Astronomy, Sofia, Bulgaria
Estimating the Course of the Solar Activity in the End of 20th and Beginning of 21st Century on Time Variations within the Zurich Series
Bonev, Boncho, Bulgarian Academy of Sciences, Bulgaria; Bulgarian Geophysical Journal; 1997; ISSN 0323-9918; Volume 13, Nos. 3-4, pp. 43-48; In English; Copyright; Avail: Issuing Activity

An important peculiarity of the twenty-two-year solar cycle is the fact that it begins with an even number, according to the Zurich numeration, 11-year cycle. This conclusion, which is known as Gnevishev-Ol’s rule, has been based on statistic subordinations between parameters of neighboring Schwabe-Wolf’s cycles where the characteristics of the even cycles play a determinative role. A corollary from the found links is the fact that in most of the cases the cycles which have an odd number are more powerful than the ones preceding them even 11-year cycles, i.e. W-2> W-1 where with W-1 and W-2 the maximum average annual values of Wolf number are marked respectively for an even and uneven cycle. As it is pointed out, if the correlation between the two parameters is effective for the now present Hale’s cycle, the 11-year cycle which is under number 23 is expected to have a very high maximum (W-2 is greater than 160), which will come about the year 2000. There is, however, a high possibility for infraction of the rule W-2> W-1, as it is in the couple of cycles having numbers 4-5 and 8-9. A reason for that gives B. Komitov’s conclusion which was drawn by means of a discriminant analysis and according to it in values of W1 which are over 125 the power of the uneven cycle in almost all cases is smaller than the preceding it even one (W-2
1). It is pointed out that within the range of the series of Schove, upon which the research was done, the link between W-1 and W-2 is reliable but weak. It is well-known that in the mentioned series the event W-2is less than W-1 is seen in 33% of the cases and in the period of organized instrumental observations (after the year 1750) - twice. As for the cycle No 22 W-1 = 158, that means that according to [2] it is possible for the next maximum of solar activity to be lower and respectively expected about 2002 - 2003. The

presence of two very different from each alternatives about the way of the solar activity in the nearest future requires the application of a separate prognostic method. The attempt of this project work is to investigate the presence of cycles with average periods of more than 20 years in the range of Zurich series which has been systematized by Waldmayer. On that basis the alteration of the put under smoothing averaging out average annual values of Wolf number (W) is simulated for a not big time interval, including the maximum of the next 11-year cycle. The purpose is to estimate whether a tendency to raise or lower the solar activity towards this which is typical for the cycles with numbers 18 and 19 (when the record values of W for the 20th century have been observed) can be expected in the beginning of the next century. This method of approach is also based on the fact that, according to a number of research works the peculiarities of Hale's cycle (including infraction of the rule W-2 is greater than W-1) are active about the ages of extremums of the quasi-century variations of active processes of the sun.

Author
Solar Activity; Solar Cycles; Solar Planetary Interactions

20000024867 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-37 The Payload bay door closing at PCR Pad B
Apr. 02, 1991; In English; Videotape: 5 min. in lengthin color with background sounds
Report No.(s): NONP-NASA-VT-2000013433; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

The primary objective of the STS-37 mission was to deploy the Gamma Ray Observatory. The mission was launched at 9:22:44 am on April 5, 1991, onboard the space shuttle Atlantis. This videotape shows the payload bay doors being closed. Included are views of the Gamma Ray Observatory in the payload bay, and the clean room operations in the Payload Changeout Room (PCR).
CASI
Bays (Structural Units); Clean Rooms; Doors; Gamma Ray Observatory; Space Transportation System

20000025054 Science Applications International Corp., Prospect, TN USA
TRAP/SEE Code Users Manual for Predicting Trapped Radiation Environments
Armstrong, T. W., Science Applications International Corp., USA; Colborn, B. L., Science Applications International Corp., USA; January 2000; 52p; In English
Contract(s)/Grant(s): NAS8-40294
Report No.(s): NASA/CR-2000-209879; M-954; NAS 1.26:209879; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

TRAP/SEE is a PC-based computer code with a user-friendly interface which predicts the ionizing radiation exposure of spacecraft having orbits in the Earth's trapped radiation belts. The code incorporates the standard AP8 and AE8 trapped proton and electron models but also allows application of an improved database interpolation method. The code treats low-Earth as well as highly-elliptical Earth orbits, taking into account trajectory perturbations due to gravitational forces from the Moon and Sun, atmospheric drag, and solar radiation pressure. Orbit-average spectra, peak spectra per orbit, and instantaneous spectra at points along the orbit trajectory are calculated. Described in this report are the features, models, model limitations and uncertainties, input and output descriptions, and example calculations and applications for the TRAP/SEE code.
Author
Ionizing Radiation; Radiation Trapping; Models; Computer Programs; User Manuals (Computer Programs)

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GENERAL

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

20000021521 NASA, Washington, DC USA
Aeronautics and Space Report of the President: Fiscal Year 1998 Activities *Annual Report, 1 Oct. 1997 - 30 Sep. 1998*
1998; 108p; In English; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This document presents an Aeronautics and Space Report of the President for Activities of Fiscal Year 1998. The topics include: 1) National Aeronautics and Space Administration; 2) Department of Defense; 3) Federal Aviation Administration; 4)

Department of Commerce; 5) Department of the Interior; 6) Federal Communications Commission; 7) Department of Agriculture; 8) National Science Foundation; 9) Department of State; 10) Department of Energy; 11) Smithsonian Institution; 12) Arms Control and Disarmament Agency; 13) Environmental Protection Agency; 14) U.S. Information Agency; and 15) Appendices.
CASI
NASA Programs; Defense Program; Environment Protection; Agriculture; Commerce

20000025079 Research and Technology Organization, Neuilly-sur-Seine, France
RTO Highlights 1999, December 1999
December 1999; 52p; In English; Original contains color illustrations
Report No.(s): RTO-HIGHLIGHTS-99/1; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document reviews the accomplishments of the RTO during the 1999 year. The 1999 von Karman medals and the Scientific achievement award recipients are announced. An article about possible alternatives to landmines, and a summary of a study about the future of land operations are included in this issue.
CASI
Defense Program; International Cooperation

20000025196 NASA, Washington, DC USA
Spinoff 1998
1998; 116p; In English; Original contains color illustrations
Report No.(s): NASA/NP-1998-09-241-HQ; NAS 1.83:09-241-HQ; ISBN 0-16-049737-X; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

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Dictionaries; Terminology; Aerospace Sciences; Astronautics; Aeronautics; Astronomy; Aerospace Engineering

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