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Information Program Office**

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

- NASA, NASA contractor, and NASA grantee reports;
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- Other U.S. Government agency and foreign patents and patent applications
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Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

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

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

Indexes

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

Subject Term Index
Personal Author Index

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01 Aeronautics (General) 1

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

02 Aerodynamics 2

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

03 Air Transportation and Safety 4

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

04 Aircraft Communications and Navigation 9

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

05 Aircraft Design, Testing and Performance 13

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

06 Avionics and Aircraft Instrumentation 19

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

07 Aircraft Propulsion and Power 20

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 23

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) 24

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

Subject Categories of the Division B. Astronautics

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

12 Astronautics (General) 30

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 33

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

14 Ground Support Systems and Facilities (Space) 33

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

15 Launch Vehicles and Launch Operations 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 37

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

18 Spacecraft Design, Testing and Performance 38

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

19 Spacecraft Instrumentation and Astrionics 40

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 42

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

Subject Categories of the Division C. Chemistry and Materials

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

23 Chemistry and Materials (General) 44

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 45

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

25 Inorganic, Organic, and Physical Chemistry 48

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

26 Metals and Metallic Materials 50

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

27 Nonmetallic Materials 54

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

28 Propellants and Fuels 57

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 58

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

Subject Categories of the Division D. Engineering

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

31 Engineering (General) 59

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 60

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 64

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 76

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 80

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 84

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 85

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*.

39 Structural Mechanics 87

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

Subject Categories of the Division E. Geosciences

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

42 Geosciences (General) 90

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 94

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 99

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 101

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

46 Geophysics 107

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 122

Includes weather observation forecasting and modification.

48 Oceanography 131

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

Subject Categories of the Division F. Life Sciences

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

51 Life Sciences (General) 131

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 134

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

53 Behavioral Sciences 136

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

54 Man/System Technology and Life Support 138

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

55 Exobiology 140

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

Subject Categories of the Division G. Mathematical and Computer Sciences

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

59 Mathematical and Computer Sciences (General) 141

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 142

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 151

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 153

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 156

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

65 Statistics and Probability 158

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

66 Systems Analysis and Operations Research 158

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

67 Theoretical Mathematics 160

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

Subject Categories of the Division H. Physics

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

70 Physics (General) 161

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 162

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 164

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

73 Nuclear Physics 166

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

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76 Solid-State Physics 174

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 176

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

Subject Categories of the Division I. Social and Information Sciences

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

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

81 Administration and Management 177

Includes management planning and research.

82 Documentation and Information Science 178

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 184

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

85 Technology Utilization and Surface Transportation 185

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

Subject Categories of the Division J. Space Sciences

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

88 Space Sciences (General) 185

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

89 Astronomy 186

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

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

91 Lunar and Planetary Science and Exploration 193

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 195

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

93 Space Radiation 197

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

Subject Categories of the Division K. General

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99 General 200

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 40, AUGUST 9, 2002

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.

20020060060 Society of Automotive Engineers, Inc., Warrendale, PA USA
Development of Pneumatic Aerodynamic Devices to Improve the Performance, Economics, and Safety of Heavy Vehicles
Englar, R. J.; Jun. 21, 2000; 20p; In English
Report No.(s): DE2002-770965; SAE-TP-2000-01-2208; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Under contract to the DOE Office of Heavy Vehicle Technologies, the Georgia Tech Research Institute (GTRI) is developing and evaluating pneumatic (blown) aerodynamic devices to improve the performance, economics, stability and safety of operation of Heavy Vehicles. The objective of this program is to apply the pneumatic aerodynamic aircraft technology previously developed and flight-tested by GTRI personnel to the design of an efficient blown tractor-trailer configuration. Recent experimental results obtained by GTRI using blowing have shown drag reductions of 35% on a streamlined automobile wind-tunnel model. Also measured were lift or download increases of 100-150% and the ability to control aerodynamic moments about all 3 axes without any moving control surfaces.
NTIS
Economics; Pneumatics; Motor Vehicles; Wind Tunnel Tests; Aerodynamic Characteristics

20020060746 NASA Ames Research Center, Moffett Field, CA USA
Computational Methods Development at Ames
Kwak, Dochan, NASA Ames Research Center, USA; May 29, 1998; 18p; In English
Contract(s)/Grant(s): RTOP 522-31-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation outlines the development at Ames Research Center of advanced computational methods to provide appropriate fidelity computational analysis/design capabilities. Current thrusts of the Ames research include: 1) methods to enhance/accelerate viscous flow simulation procedures, and the development of hybrid/polyhedral-grid procedures for viscous flow; 2) the development of real time transonic flow simulation procedures for a production wind tunnel, and intelligent data management technology; and 3) the validation of methods and the flow physics study gives historical precedents to above research, and speculates on its future course.
CASI
NASA Programs; Computerized Simulation; Data Management; Flow Visualization; Applications Programs (Computers)

20020061704 NASA Glenn Research Center, Cleveland, OH USA
Three Dimensional CFD Analysis of the GTX Combustor
Steffen, C. J., Jr., NASA Glenn Research Center, USA; Bond, R. B., North Carolina State Univ., USA; Edwards, J. R., North Carolina State Univ., USA; June 2002; 22p; In English; Combustion, Airbreathing Propulsion, Propulsion Systems Hazards, and Modelling, 8-12 Apr. 2002, Destin, FL, Destin, FL, USA, USA; Sponsored by Department of the Army, USA; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2658; RTOP 708-90-63
Report No.(s): NASA/TM-2002-211572; NAS 1.15:211572; E-13357; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The annular combustor geometry of a combined-cycle engine has been analyzed with three-dimensional computational fluid dynamics. Both subsonic combustion and supersonic combustion flowfields have been simulated. The subsonic combustion analysis was executed in conjunction with a direct-connect test rig. Two cold-flow and one hot-flow results are presented. The simulations compare favorably with the test data for the two cold flow calculations; the hot-flow data was not yet available. The hot-flow simulation indicates that the conventional ejector-ramjet cycle would not provide adequate mixing at the conditions tested. The supersonic combustion ramjet flowfield was simulated with frozen chemistry model. A five-parameter test matrix was specified, according to statistical design-of-experiments theory. Twenty-seven separate simulations were used to assemble surrogate models for combustor mixing efficiency and total pressure recovery. ScramJet injector design parameters (injector angle, location, and fuel split) as well as mission variables (total fuel massflow and freestream Mach number) were included in the analysis. A promising injector design has been identified that provides good mixing characteristics with low total pressure losses. The surrogate models can be used to develop performance maps of different injector designs. Several complex three-way variable interactions appear within the dataset that are not adequately resolved with the current statistical analysis.
Author
Combustion Chambers; Computational Fluid Dynamics; Three Dimensional Flow; Supersonic Combustion; Supersonic Combustion Ramjet Engines

20020061865 NASA Glenn Research Center, Cleveland, OH USA
Ice Accretions on a Swept GLC-305 Airfoil
Vargas, Mario, NASA Glenn Research Center, USA; Papadakis, Michael, Wichita State Univ., USA; Potapczuk, Mark, NASA Glenn Research Center, USA; Addy, Harold, NASA Glenn Research Center, USA; Sheldon, David, NASA Glenn Research Center, USA; Giriunas, Julius, NASA Glenn Research Center, USA; April 2002; 20p; In English; General Aviation Technology Conference and Exhibition 2002, 16-18 Apr. 2002, Wichita, KS, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-20-13
Report No.(s): NASA/TM-2002-211557; NAS 1.15:211557; E-13337; SAE-02GAA-43; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An experiment was conducted in the Icing Research Tunnel (IRT) at NASA Glenn Research Center to obtain castings of ice accretions formed on a 28 deg. swept GLC-305 airfoil that is representative of a modern business aircraft wing. Because of the complexity of the casting process, the airfoil was designed with three removable leading edges covering the whole span. Ice accretions were obtained at six icing conditions. After the ice was accreted, the leading edges were detached from the airfoil and moved to a cold room. Molds of the ice accretions were obtained, and from them, urethane castings were fabricated. This experiment is the icing test of a two-part experiment to study the aerodynamic effects of ice accretions.
Author
Swept Wings; Aircraft Icing

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.

20020060131 NASA Langley Research Center, Hampton, VA USA
Opportunities for Breakthroughs in Large-Scale Computational Simulation and Design
Alexandrov, Natalia, NASA Langley Research Center, USA; Alter, Stephen J., NASA Langley Research Center, USA; Atkins, Harold L., NASA Langley Research Center, USA; Bey, Kim S., NASA Langley Research Center, USA; Bibb, Karen L., NASA Langley Research Center, USA; Biedron, Robert T., NASA Langley Research Center, USA; Carpenter, Mark H., NASA Langley Research Center, USA; Cheatwood, F. McNeil, NASA Langley Research Center, USA; Drummond, Philip J., NASA Langley Research Center, USA; Gnoffo, Peter A., NASA Langley Research Center, USA; June 2002; 27p; In English
Contract(s)/Grant(s): RTOP 706-31-21-80
Report No.(s): NASA/TM-2002-211747; L-18196; NAS 1.15:211747; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Opportunities for breakthroughs in the large-scale computational simulation and design of aerospace vehicles are presented. Computational fluid dynamics tools to be used within multidisciplinary analysis and design methods are emphasized. The

opportunities stem from speedups and robustness improvements in the underlying unit operations associated with simulation (geometry modeling, grid generation, physical modeling, analysis, etc.). Further, an improved programming environment can synergistically integrate these unit operations to leverage the gains. The speedups result from reducing the problem setup time through geometry modeling and grid generation operations, and reducing the solution time through the operation counts associated with solving the discretized equations to a sufficient accuracy. The opportunities are addressed only at a general level here, but an extensive list of references containing further details is included. The opportunities discussed are being addressed through the Fast Adaptive Aerospace Tools (FAAST) element of the Advanced Systems Concept to Test (ASCoT) and the third Generation ReUSAble Launch Vehicles (RLV) projects at NASA Langley Research Center. The overall goal is to enable greater inroads into the design process with large-scale simulations.
Author
Aerospace Vehicles; Computational Fluid Dynamics; Simulation; Computer Aided Design

20020060596 NASA Ames Research Center, Moffett Field, CA USA
Aerodynamic Influence of a Slat on a Flapped Wing
Mathias, Donovan L., Stanford Univ., USA; Baker, M. David, MCAT Inst., USA; Roth, Karlin R., NASA Ames Research Center, USA; Cummings, Russell M., California Polytechnic State Univ., USA; [1998]; 1p; In English; 16th AIAA Applied Aerodynamics Conference, 15-18 Jun. 1998, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Three high-lift configurations were computationally studied to assess the aerodynamic influence of slats. A flapped wing was simulated with no slat, a full-span slat, and a three quarter-span slat at a chord based Reynolds number of 3.7 million. The flows were computed using a compressible Navier-Stokes solver on structured grids with the Spalart-Allmaras turbulence model. All cases were compared with experimental data to validate the approach. The slats not only increase the lift generated by the wing but alter the topology of the flowfield considerably. The changes in the flow give insight into the working of a slat and contribute to a better understanding of high-lift flows in general.
Author
Wing Flaps; Aerodynamic Configurations; Computerized Simulation; Flow Distribution

20020061700 NASA Ames Research Center, Moffett Field, CA USA
On Use of Global Positioning Technology for Solution of Wake Vortex Problem
Rossow, Vernon J., NASA Ames Research Center, USA; November 1997; 1p; In English; International Wake Vortex Meeting, 2-4 Dec. 1997, Ottawa, Canada
Contract(s)/Grant(s): RTOP 538-03-13; No Copyright; Avail: Issuing Activity; Abstract Only

Improved precision of the flight paths used by aircraft to approach and depart airports is becoming available when the Global Positioning System (GPS) is implemented at airports. An overview will be given of published information on how GPS precision guidance at airports can be used to avoid encounters with the lift-generated vortices shed by preceding aircraft during landing. It is pointed out that GPS provides two needed services to bring about improved avoidance capability. Firstly, GPS pseudolites are being built and installed at airports so that, when coupled with autopilot systems currently available on subsonic transport aircraft, the aircraft can make precision approaches for zero visibility landings. The same equipment can also be used for precision approaches for wake-vortex avoidance. Secondly, regular monitoring of atmospheric motions along the approach corridor can be obtained by use of GPS equipment on board aircraft that are in the flight corridors. That is, wind velocity is determined by use of GPS equipment to measure the ground speed of the aircraft and then combined with onboard instrumentation to measure the airspeed of the aircraft. The difference between the two measurements yields the wind velocity. When the measured wind velocities are transmitted to an airport ground station they are used to monitor whether air motions adverse for safety in the flight corridor are present. If any parts of the corridor are unsafe, the spacing of the aircraft, or the location of the flight corridor being used, is modified. It is estimated that the spacings between any combination of aircraft can then be safely reduced to a uniform 3 n. mi. Information to be presented is contained in an article published in the AIAA Journal of Aircraft, May-June 1996.
Author
Global Positioning System; Vortex Avoidance; Wind Velocity; Aircraft Approach Spacing; Aircraft Landing; Instrument Landing Systems

20020061849 Virginia Polytechnic Inst. and State Univ., Dept. of Engineering Science and Mechanics, Blacksburg, VA USA
Alleviation of Buffet on the Twin-Tail Assemblies of High-Performance Aircraft (aasert) ***Final Report, 1 May 1998-31 Oct. 2001***
Nayfeh, Ali H.; Mook, Dean T.; Oct. 31, 2001; 19p; In English
Contract(s)/Grant(s): F49620-98-1-0393
Report No.(s): AD-A402695; AFRL-SR-AR-TR-02-0202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We carried out experiments on a structural dynamic model of the twin-tail assembly of the F-15 fighter built by Professor Sathya Hanagud of Georgia Tech. The model was placed on a 250 lb shaker and subjected to a principal parametric excitation. We fixed the excitation amplitude and varied the excitation frequency around 18 Hz. For the same excitation amplitude and frequency, we found five possible responses depending on the initial conditions: (a) very small-amplitude motions of both tails, (b) a large-amplitude motion of the right tail accompanied by a small-amplitude motion of the left tail, (c) a large-amplitude motion of the left tail accompanied by a small-amplitude motion of the right tail, (d) a large-amplitude motion involving both tails moving in phase, and (e) a large-amplitude motion involving both tails moving out-of-phase. The coexisting five responses are the result of the nonlinearities. These results point out some of the shortcomings of testing models with one rigid and one flexible tail or even testing only one tail counting on symmetry. We used nonlinear identification techniques to estimate the linear and nonlinear parameters in a mathematical model of the tail assembly. Then we devised a control methodology to suppress the vibrations of the structural model. Finally, we used the backpropagation-through-time neural controller to suppress its nonlinear responses.
DTIC
Fighter Aircraft; Aircraft Maintenance; Tail Assemblies; Aeroelasticity

20020061873 RAND Corp., Santa Monica, CA USA
Innovative Development. Global Hawk and Darkstar. Volume 2: Flight Test in the HAE UAV ACTD Program
Drezner, Jeffrey A.; Leonard, Robert S.; Jan. 2002; 109p; In English
Contract(s)/Grant(s): F49642-01-C-0003
Report No.(s): AD-A403029; RAND-MR-1475; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The USA has seen a three-decade-long history of poor outcomes in unmanned aerial vehicle (UAV) development efforts. Technical problems have led to cost growth and schedule slip as well as to disappointing operational results. Costs have tended to escalate so much during development that the resulting systems have cost more than users have been willing to pay, precipitating program cancellation in almost every case. This history prompted the unique developmental approach adopted at the beginning of the High-Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) program. There has also been a long history of efforts made to improve the efficiency and effectiveness of weapon system acquisition policy, processes, and management. Capturing the experience from ongoing or recently completed efforts employing nonstandard or innovative acquisition strategies can facilitate such improvements. This research contributes to that effort. In 1994, the Defense Advanced Research Projects Agency (DARPA), in conjunction with the Defense Airborne Reconnaissance Office (DARO), began the development of two UAVs. These systems were intended to provide intelligence, surveillance, and reconnaissance information to the warfighter. As such, they responded both to recommendations made by the Defense Science Board and to operational needs stated by DARO on behalf of military service users.
DTIC
Remotely Piloted Vehicles; Surveillance; Reconnaissance Aircraft; Pilotless Aircraft; Flight Tests

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.

20020059662 Southwest Research Inst., San Antonio, TX USA
General Aviation Interior Noise, Part 3, Noise Control Measure Evaluation
Unruh, James F., Southwest Research Inst., USA; Till, Paul D., Southwest Research Inst., USA; May 2002; 60p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2288; RTOP 781-10-13-01
Report No.(s): NASA/CR-2002-211667/PT3; NAS 1.26:211667/PT3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The work reported herein is an extension to the work accomplished under NASA Grant NAG1-2091 on the development of noise/source/path identification techniques for single engine propeller driven General Aviation aircraft. The previous work developed a Conditioned Response Analysis (CRA) technique to identify potential noise sources that contributed to the dominating tonal responses within the aircraft cabin. The objective of the present effort was to improve and verify the findings of the CRA and develop and demonstrate noise control measures for single engine propeller driven General Aviation aircraft.
Author
General Aviation Aircraft; Aircraft Compartments; Noise Reduction; Propellers; Acoustics

20020059663 Southwest Research Inst., San Antonio, TX USA
General Aviation Interior Noise, Part 1, Source/Path Identification
Unruh, James F., Southwest Research Inst., USA; Till, Paul D., Southwest Research Inst., USA; May 2002; 139p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2091; RTOP 706-81-14-01
Report No.(s): NASA/CR-2002-211665/PT1; NAS 1.26:211665/PT1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
There were two primary objectives of the research effort reported herein. The first objective was to identify and evaluate noise source/path identification technology applicable to single engine propeller driven aircraft that can be used to identify interior noise sources originating from structure-borne engine/propeller vibration, airborne propeller transmission, airborne engine exhaust noise, and engine case radiation. The approach taken to identify the contributions of each of these possible sources was first to conduct a Principal Component Analysis (PCA) of an in-flight noise and vibration database acquired on a Cessna Model 182E aircraft. The second objective was to develop and evaluate advanced technology for noise source ranking of interior panel groups such as the aircraft windshield, instrument panel, firewall, and door/window panels within the cabin of a single engine propeller driven aircraft. The technology employed was that of Acoustic Holography (AH). AH was applied to the test aircraft by acquiring a series of in-flight microphone array measurements within the aircraft cabin and correlating the measurements via PCA. The source contributions of the various panel groups leading to the array measurements were then synthesized by solving the inverse problem using the boundary element model.
Author
Propellers; Aircraft Instruments; Engine Noise; Windshields; Aircraft Compartments; Single Engine Aircraft; Aircraft Models; Vibration; Data Bases

20020060601 Civil Aerospace Medical Inst., Oklahoma City, OK USA
The Aviation Accident Experience of Civilian Airmen With Refractive Surgery *Final Report*
Nakagawara, Van B., Civil Aerospace Medical Inst., USA; Montgomery, Ron W., Civil Aerospace Medical Inst., USA; Wood, Kathryn J., Civil Aerospace Medical Inst., USA; June 2002; 16p; In English
Report No.(s): DOT/FAA/AM-02/10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Civil airmen with refractive surgery may obtain any class of Federal Aviation Administration (FAA) medical certificate provided they meet the applicable vision standards, and an eye specialist verifies that healing is complete, visual acuity is stable, and no significant glare intolerance is present. However, concerns remain regarding the quality of the resulting refractive correction, long-term stability, side effects, and the potential surgical complications associated with refractive surgery. The purpose of this study was to determine whether an association existed between refractive surgery and aviation accidents. Records for active airman during the study period, 1994-96, were extracted from the FAA's Consolidated Airman Information System medical database. Airmen who carried pathology codes for refractive surgery (130) and general eye surgery (5179) were identified. These records were cross-referenced with the Accident/Incident Data System database to determine those airmen involved in aircraft accidents. Frequency totals and mean accident rates (accidents/ 100,000 flight hours) were calculated for each class of FAA medical certification. Analysis of Variance was performed to compare the mean accident rates of non-refractive and refractive surgery airmen. The total accident rate was higher for airmen with refractive surgery (3,86/ 100,000 flight hours) when compared with those without refractive procedures (2.62/100,000 flight hours). Accident rates for airmen with refractive surgery were also higher in all three classes of medical certification; however, analysis found that these differences were not statistically significant (p greater than 0.05) for any class of medical certification or the total airman population. In addition, our review found no aviation accident in which refractive surgery was identified as a caUSAl factor. Conclusions: Although accident rates of refractive surgery airmen were higher, no direct association was identified between refractive surgery and aviation accidents.

Monitoring will be ongoing to ensure that airmen with newer laser refractive procedures perform safely in the aviation environment.
Author
Aerospace Medicine; Analysis of Variance; Data Bases; Eye (Anatomy); Flight Crews; Personnel; Visual Acuity

20020060722 NorthWest Research Associates, Inc., Bellevue, WA USA
NWRA AVOSS Wake Vortex Prediction Algorithm, 3.1.1
Robins, R. E., NorthWest Research Associates, Inc., USA; Delisi, D. P., NorthWest Research Associates, Inc., USA; June 2002; 64p; In English
Contract(s)/Grant(s): NAS1-99074; RTOP 727-04-10-01
Report No.(s): NASA/CR-2002-211746; NAS 1.26:211746; NWRA-CR-00-R229A; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides a detailed description of the wake vortex prediction algorithm used in the Demonstration Version of NASA's Aircraft Vortex Spacing System (AVOSS). The report includes all equations used in the algorithm, an explanation of how to run the algorithm, and a discussion of how the source code for the algorithm is organized. Several appendices contain important supplementary information, including suggestions for enhancing the algorithm and results from test cases.
Author
Algorithms; Prediction Analysis Techniques; Wing Tip Vortices; Aircraft Wakes; Aircraft Approach Spacing

20020060739 NorthWest Research Associates, Inc., Bellevue, WA USA
Wake Vortex Algorithm Scoring Results
Robins, R. E., NorthWest Research Associates, Inc., USA; Delisi, D. P., NorthWest Research Associates, Inc., USA; June 2002; 44p; In English
Contract(s)/Grant(s): NAS1-99074; RTOP 727-04-10-01
Report No.(s): NASA/CR-2002-211745; NAS 1.26:211745; NWRA-CR-00-R229B; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report compares the performance of two models of trailing vortex evolution for which interaction with the ground is not a significant factor. One model uses eddy dissipation rate (EDR) and the other uses the kinetic energy of turbulence fluctuations (TKE) to represent the effect of turbulence. In other respects, the models are nearly identical. The models are evaluated by comparing their predictions of circulation decay, vertical descent, and lateral transport to observations for over four hundred cases from Memphis and Dallas/Fort Worth International Airports. These observations were obtained during deployments in support of NASA's Aircraft Vortex Spacing System (AVOSS). The results of the comparisons show that the EDR model usually performs slightly better than the TKE model.
Author
Algorithms; Kinetic Energy; Turbulence Models; Aircraft Approach Spacing; Wing Tip Vortices

20020061359 NASA Langley Research Center, Hampton, VA USA
Speed Control Law for Precision Terminal Area In-Trail Self Spacing
Abbott, Terence S., NASA Langley Research Center, USA; July 2002; 14p; In English
Contract(s)/Grant(s): RTOP 727-01-26-01
Report No.(s): NASA/TM-2002-211742; NAS 1.15:211742; L-18203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document describes a speed control law for precision in-trail airborne self-spacing during final approach. This control law was designed to provide an operationally viable means to obtain a desired runway threshold crossing time or minimum distance, one aircraft relative to another. The control law compensates for dissimilar final approach speeds between aircraft pairs and provides guidance for a stable final approach. This algorithm has been extensively tested in Monte Carlo simulation and has been evaluated in piloted simulation, with preliminary results indicating acceptability from operational and workload standpoints.
Author
Speed Control; Aircraft Approach Spacing; Air Traffic Control; Airline Operations; Control Systems Design

20020061698 NASA Ames Research Center, Moffett Field, CA USA

APMS: An Integrated Suite of Tools for Measuring Performance and Safety

Statler, Irving C., NASA Ames Research Center, USA; Lynch, Robert E., Battelle Memorial Inst., USA; [1997]; 1p; In English; First International FOQA Symposium, 18-20 Nov. 1997, Irvine, CA, USA

Contract(s)/Grant(s): RTOP 505-64-53; No Copyright; Avail: Issuing Activity; Abstract Only

This is a report of work in progress. In it, I summarize the status of the research and development of the Aviation Performance Measuring System (APMS) for managing, processing, and analyzing digital flight-recorded data. The objectives of the NASA-FAA APMS research project are to establish a sound scientific and technological basis for flight-data analysis, to define an open and flexible architecture for flight-data-analysis systems, and to articulate guidelines for a standardized database structure on which to continue to build future flight-data-analysis extensions. APMS will offer to the air transport community an open, voluntary standard for flight-data-analysis software, a standard that will help to ensure suitable functionality, and data interchangeability, among competing software programs. APMS will develop and document the methodologies, algorithms, and procedures for data management and analyses to enable users to easily interpret the implications regarding safety and efficiency of operations. APMS does not entail the implementation of a nationwide flight-data-collection system. It is intended to provide technical tools to ease the large-scale implementation of flight-data analyses at both the air-carrier and the national-airspace levels in support of their Flight Operations and Quality Assurance (FOQA) Programs and Advanced Qualifications Programs (AQP). APMS cannot meet its objectives unless it develops tools that go substantially beyond the capabilities of the current commercially available software and supporting analytic methods that are mainly designed to count special events. These existing capabilities, while of proven value, were created primarily with the needs of air crews in mind. APMS tools must serve the needs of the government and air carriers, as well as air crews, to fully support the FOQA and AQP programs. They must be able to derive knowledge not only through the analysis of single flights (special-event detection), but through statistical evaluation of the performance of large groups of flights. This paper describes the integrated suite of tools that will assist analysts in evaluating the operational performance and safety of the national air transport system, the air carrier, and the air crew.

Author

Applications Programs (Computers); Data Management; Data Processing; Digital Data; Data Integration

20020061838 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Human Factors Associated with the Certification of Airplane Passenger Seats: Seat Belt Adjustment and Release *Final Report*

DeWeese, Richard, Civil Aerospace Medical Inst., USA; Gowdy, R. Van, Civil Aerospace Medical Inst., USA; June 2002; 12p; In English

Contract(s)/Grant(s): FAA-AM-B-02-PRS-96

Report No.(s): DOT/FAA/AM-02/11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two separate studies were accomplished to investigate human factors issues related to the use of lap belts. Human performance trials were conducted under two protocols to measure and assess: (1) seat belt tension adjustment during normal flight and emergency landing conditions, and (2) the effects on passenger emergency egress performance related to the lift-latch release angle of typical lap belts. In the lap belt tension adjustment study, subjects were asked to sit in a typical passenger seat and adjust the lap belts as they normally would for take-off or landing during a commercial flight. Participants were then asked to adjust the lap belts as if they were anticipating an emergency landing. The airplane seat used in this study was instrumented to measure the tension in the lap belt, which was recorded for both the normal and emergency conditions. A total of 1182 subjects participated in this study. An analysis of results indicate that most passengers (90%) tighten the lap belt to a tension less than 7 lb. during normal flight conditions and less than 10 lb. for an anticipated emergency. These data indicate that the tension adjustment of lap belts restraining anthropomorphic test dummies in airplane seat certification tests should not exceed 10 lbs. to be representative of belt tension applied by a typical passenger. The current standard practice for adjusting the belt tension prior to these tests was evaluated and found to be adequate in light of these findings. The lift-latch release angle experiments were designed to study lap belt restrained human subjects as they released the belt buckle and proceeded to egress from a typical passenger seat. Some foreign regulatory authorities require the release angle to be between 70 deg. and 95 deg whereas, typical U.S. buckles release between 45 deg. and 60 deg.. Three lap belts with latch release angles of 30 deg 60 deg and 90 deg. were installed on a triple passenger seat. Subjects were observed and timed as they tried to release the belts and exit from the seat. Each was instructed to perform the exercise quickly. A total of 201 subjects participated in this study. No significant differences in human performance factors related to the lift-latch angle were detected from an analysis of the data.

Author

Buckling; Certification; Flight Conditions; Human Beings; Human Factors Engineering; Seat Belts

20020061844 Air Force Flight Test Center, Edwards AFB, CA USA

AFFTC Instruction 99-5, Test and Evaluation Test and Control and Conduct

May 10, 2002; 9p; In English; Supersedes AFFTCI 99-5, dtd 26 May 1998

Report No.(s): AD-A403258; AFFTCI 99-5; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This instruction applies to both flight and ground tests. In the body of this instruction references to flight tests apply equally to ground tests where applicable. Test organizations at the AFFTC will conduct flight and ground tests in accordance with an approved test plan (AFFTCI99-1) and an approved safety plan (AFFTCI91-5). The Combined Test Force (CTF) director, USA Air Force Test Pilot School (USAFTPS) Commandant, squadron commander, or project manager will prepare written procedures in order to implement the provisions of this instruction and execute the test activity as stated in the plans.

DTIC

Education; Flight Tests; Ground Tests

20020061922 United Air Lines, Inc., Denver, CO USA

Optimizing Terrain Database Modelling for Integrated Systems Training

Bennett, Thomas W., United Air Lines, Inc., USA; Lindsay, John R., United Air Lines, Inc., USA; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 1.1 - 1.10; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

'Controlled Flight Into Terrain' (CFIT) continues to be a major cause of fatal aircraft accidents. The aviation industry has responded to this problem with improved avionics and increased training focus on terrain situational awareness. Avionics boxes have also been enhanced to provide flight crews with graphical displays of hazardous terrain and obstacles, and to provide earlier warnings when the flight path would bring the aircraft dangerously close to the ground. The Flight Safety Foundation has created the Approach and Landing Accident Reduction task force to educate pilots in terrain awareness and to promote safety improvements in policies, procedures, equipment, and training programs. On flight simulators, there has been an effort to provide pilots with the cues needed for terrain awareness. For the cues to be correct, it has become essential that all the terrain data on the flight simulator agree. Various forms of terrain simulation have existed for some time, but most have been crude approximations of terrain that are difficult to implement and do not provide the needed fidelity. During the last five years, through the use of better visual systems, terrain simulation improvements have been made. However a large number of older simulators are still in use, and these devices need to provide better terrain cues. This paper examines the problems that have existed with terrain simulation, and how the United Airlines Simulator Engineering department has evolved its approach to simulating the Earth. Also discussed are some ideas on future needs and enhancements.

Author

Aircraft Accidents; Flight Safety; Situational Awareness; Terrain; Avionics; Flight Paths

20020061940 Air Force Research Lab., Materials and Manufacturing Directorate, Tyndall AFB, FL USA

Minimum Performance Requirement for Air Force Flightline Fire Extinguishers: Extinguishing Performance Against 3-Dimensional and Hidden Fires *Final Report*

May 2002; 18p; In English; Original contains color images

Contract(s)/Grant(s): F08637-98-C-6001

Report No.(s): AD-A402968; AFRL-ML-TY-TR-02-4540; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report contains requirements for extinguishing fires occurring within an engine nacelle through access ports and to extinguish pooled or flowing fuel tail pipe fires. It provides the test protocol and test apparatus requirements for assessing the capability of fire extinguishers to suppress these two specific aircraft engine fires that frequently occur on the flightline. The current Air Force flightline extinguisher uses Halon 1211, an Ozone Depleting Substance (ODS). Any agent used in an extinguisher proposed for testing would be considered a replacement for an ODS. As a replacement under Section 612 of the Clean Air Act of 1990, the agent would have to be approved as an Acceptable Halon 1211 Replacement through the EPA (Environmental Protection Agency) Significant New Alternatives Policy (SNAP) program prior to testing. These criteria are provided for the sole purpose of assessing the capability of fire extinguishers to suppress aircraft engine fires on the flightline

DTIC

Fire Fighting; Fire Extinguishers; Extinguishing; Fire Prevention; Aircraft Engines

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.

20020060112 NASA Goddard Space Flight Center, Greenbelt, MD USA

Flight Performance Evaluation of Three GPS Receivers for Sounding Rocket Tracking

Bull, Barton, NASA Goddard Space Flight Center, USA; Diehl, James, Northrup-Grumman IT, USA; Montenbruck, Oliver, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Markgraf, Markus, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; [2002]; 9p; In English; ION Conference, 24-30 Jan. 2002, San Diego, CA, USA; Sponsored by NTAA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In preparation for the European Space Agency Maxus-4 mission, a sounding rocket test flight was carried out at Esrange, near Kiruna, Sweden on February 19, 2001 to validate existing ground facilities and range safety installations. Due to the absence of a dedicated scientific payload, the flight offered the opportunity to test multiple GPS receivers and assess their performance for the tracking of sounding rockets. The receivers included an Ashtech G12 HDMA receiver, a BAE (Canadian Marconi) Allstar receiver and a Mitel Orion receiver. All of them provide C/A code tracking on the L1 frequency to determine the user position and make use of Doppler measurements to derive the instantaneous velocity. Among the receivers, the G12 has been optimized for use under highly dynamic conditions and has earlier been flown successfully on NASA sounding rockets. The Allstar is representative of common single frequency receivers for terrestrial applications and received no particular modification, except for the disabling of the common altitude and velocity constraints that would otherwise inhibit its use for space application. The Orion receiver, finally, employs the same Mitel chipset as the Allstar, but has received various firmware modifications by DLR to safeguard it against signal losses and improve its tracking performance. While the two NASA receivers were driven by a common wrap-around antenna, the DLR experiment made use of a switchable antenna system comprising a helical antenna in the tip of the rocket and two blade antennas attached to the body of the vehicle. During the boost a peak acceleration of roughly l7g's was achieved which resulted in a velocity of about 1100 m/s at the end of the burn. At apogee, the rocket reached an altitude of over 80 km. A detailed analysis of the attained flight data is given together with a evaluation of different receiver designs and antenna concepts.

Author

Global Positioning System; Receivers; Sounding Rockets; Flight Tests; Antenna Design; Tracking (Position)

20020060738 NASA Langley Research Center, Hampton, VA USA

Development of Intent Information Changes to Revised Minimum Aviation System Performance Standards for Automatic Dependent Surveillance Broadcast (RTCA/DO-242A)

Barhydt, Richard, NASA Langley Research Center, USA; Warren, Anthony W., Boeing Air Traffic Management, USA; May 2002; 48p; In English

Contract(s)/Grant(s): RTOP 727-01-26-01

Report No.(s): NASA/TM-2002-211669; L-18206; NAS 1.15:211669; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

RTCA Special Committee 186 has recently adopted a series of changes to the original Minimum Aviation System Performance Standards (MASPS) for Automatic Dependent Surveillance Broadcast (ADS-B). The new document will be published as DO-242A. Major changes to the MASPS include a significant restructuring and expansion of the intent parameters for future ADS-B systems. ADS-B provides a means for aircraft to exchange information about their intended trajectories with each other and with ground systems. NASA and Boeing have played significant roles in recommending these changes and providing supporting analysis. The intent changes are anticipated to provide substantial benefits to several programs and operational concepts under development by the two organizations. Major changes include the addition of Target State reports and the replacement of Trajectory Change Point reports with Trajectory Change reports. These changes have been designed to better reflect the capabilities of existing and future aircraft avionics, while providing benefits to current and proposed applications. DO-242A implements intent information elements that can be supported by current avionics systems and data buses. Provisions are made for future incorporation of other intent elements, as needed to meet operational requirements. This document summarizes the reasons for the DO-242A intent changes and provides a detailed overview of current and future intended ADS-B MASPS changes related to aircraft intent.

Author

Avionics; Channels (Data Transmission); Surveillance; Aircraft Communication; Collision Avoidance

20020060758 NASA Ames Research Center, Moffett Field, CA USA

Virtual Environment Design for Low/Zero Visibility Tower Tools

Reisman, Ron, NASA Ames Research Center, USA; Farouk, Ahmed, California Univ., USA; [1998]; 1p; In English; ACM Special Interest Group Graphics, 19-24 Jul. 1998, Orlando, FL, USA; Sponsored by Association for Computing Machinery, USA
Contract(s)/Grant(s): RTOP 538-18-24; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes prototype software for three-dimensional display of aircraft movement based on realtime radar and other Air Traffic Control (ATC) information. This prototype can be used to develop operational tools for controllers in ATC Towers who cannot view aircraft in low or zero visibility (LZV) weather conditions. The controller could also use the software to arbitrarily reposition his virtual eyepoint to overcome physical obstructions or increase situation awareness. The LZV Tower tool prototype consists of server and client components. The server interfaces to operational ATC radar and communications systems, sending processed data to a client process written in java. This client process runs under Netscape Communicator to provide an interactive perspective display of aircraft in the airport environment. Prototype VRML airport models were derived from 3-D databases used in FAA-certified high fidelity flight-simulators. The web-based design offers potential efficiency increases and decreased costs in the development and deployment of operational LZV Tower tools.
Author

Air Traffic Control; Telecommunication; Real Time Operation; Flight Simulators; Radar Data

20020061256 NASA Ames Research Center, Moffett Field, CA USA

Steps Towards the Integration of Conflict Resolution with Metering and Scheduling

McNally, B. David, NASA Ames Research Center, USA; [1998]; 2p; In English; 2nd International Air Traffic Management R and D Seminar (ATM-98), 1-4 Dec. 1998, Orlando, FL, USA
Contract(s)/Grant(s): RTOP 538-04-25; No Copyright; Avail: Issuing Activity; Abstract Only

NASA Ames Research Center is developing decision support tool technology for air traffic controllers to improve the efficiency and capacity of National Airspace System. The goal is to provide technology, tools and procedures that result in the highest possible level of user preferred trajectories whenever possible with safe and efficient traffic management when necessary. The work is being conducted under the NASA Advanced Air Transportation Technology Program in cooperation with the FAA through the Inter-Agency Integrated Product Team. The objective is to develop technology and procedures that lead towards a seamless integration of conflict resolution with metering and scheduling for arrival aircraft and en route aircraft that are under metering restrictions. A requirement is that the integration incorporate user preferred trajectories. The ultimate goal is the implementation and validation of the Descent Advisor (DA) concept which provides clearance advisories to a sector controller that simultaneously meet metering constraints, are conflict free, incorporate a user preferred (e.g., minimum fuel) descent profile, and generally require no further corrective clearance as the aircraft transitions from en route cruise into the TRACON. The DA concept may also be applied to en route aircraft under metering constraints, e.g., miles-in-trail. to achieve the DA concept a stepwise development and field evaluation is anticipated. This paper addresses the initial steps towards implementation of the DA. The Traffic Management Advisor (TMA) computes arrival time sequence and required delay information for display to the sector controller during periods when arrivals must be metered due to landing rate restrictions at the airport. The Initial Conflict Probe (ICP) compares trajectory predictions for all aircraft and alerts the controller when any two aircraft are predicted to violate separation standards (5 mi. and 2000 ft. in en route airspace). ICP also includes a trial planning function allowing the controller to develop and check a separate ”what if” trajectory for conflict resolution. TMA and ICP currently operate independent of one another and have separate controller displays. The TMA meter list is on the radar controller’s plan view display. The ICP is still under development, but the current concept calls for a list of predicted conflicts at the data controller position. The research described herein address two steps towards the implementation of DA. The first is to develop a concept for integrated display of conflict and metering information on a controller’s display. The objective is to provide the controller with situational awareness of one problem while he develops a solution to the other. The next step is to expand the concept for display of automated clearance advisories for one problem (e.g., metering) which take into account the other problems (e.g., conflicts). Information to be communicated between TMA and ICP to facilitate’ manual or automated advisories is being identified as the concept matures. In order to study the ICP/TMA integration concept the CTAS conflict probe capability has been adapted to Ft. Worth Center. The system is being validated in the laboratory with all-track data and for non -interference with TMA, TMA is already running as a daily use prototype at Ft. Worth Center. A laboratory prototype system has been developed under the CTAS baseline which combines conflict and metering information on a common user interface. Elements of the user interface are shown in Figure 1. In this simple illustration the user sees the simultaneous effect of a trial plan on meter fix delay and conflict status. Delay information is shown in the aircraft flight data block, the meter list, and the TMA timeline. Experience during Descent Advisor

development and observations at Ft. Worth Center high and low attitude arrival sectors during metering suggests that manual trial planning will be unworkable during rush periods due to high controller workload.
Author
Air Traffic Controllers (Personnel); Air Transportation; Systems Integration; Display Devices; Scheduling

20020061257 NASA Ames Research Center, Moffett Field, CA USA
Model-Based Design of Air Traffic Controller-Automation Interaction
Romahn, Stephan, National Academy of Sciences - National Research Council, USA; Callantine, Todd J., San Jose State Univ., USA; Palmer, Everett A., NASA Ames Research Center, USA; [1998]; 6p; In English; 1998 IEEE International Conference on Systems, Man and Cybernetics, 11-14 Oct. 1998, San Diego, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): NCC2-798; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A model of controller and automation activities was used to design the controller-automation interactions necessary to implement a new terminal area air traffic management concept. The model was then used to design a controller interface that provides the requisite information and functionality. Using data from a preliminary study, the Crew Activity Tracking System (CATS) was used to help validate the model as a computational tool for describing controller performance.
Author
Air Traffic Control; Systems Engineering; Autonomy; Flight Management Systems

20020061259 NASA Ames Research Center, Moffett Field, CA USA
Slow: A Tool for Reporting and Diagnosing Performance Problems
Root, Darrell, Sterling Software, Inc., USA; Liviero, Belinda, INTEL Corp., USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 519-40-22; No Copyright; Avail: Issuing Activity; Abstract Only
Slow is a bourne shell script which is meant to be run by workstation users who are suffering performance problems. It collects a snapshot of performance data using previously published and publicly available diagnostic commands. This paper discusses how to interpret the output of those commands to identify the root-cause of unix workstation performance problems.
Author
Software Engineering; Computer Systems Programs

20020061260 NASA Ames Research Center, Moffett Field, CA USA
The Future of Air Traffic Management
Denery, Dallas G., NASA Ames Research Center, USA; Erzberger, Heinz, NASA Ames Research Center, USA; [1998]; 1p; In English; NASA-ASEE Stanford University Sminars, 10 Jun. 1998, Stanford, CA, USA; Sponsored by American Society for Electrical Engineers, USA
Contract(s)/Grant(s): RTOP 538-18-24; No Copyright; Avail: Issuing Activity; Abstract Only
A system for the control of terminal area traffic to improve productivity, referred to as the Center-TRACON Automation System (CTAS), is being developed at NASA's Ames Research Center under a joint program with the FAA. CTAS consists of a set of integrated tools that provide computer-generated advisories for en-route and terminal area controllers. The premise behind the design of CTAS has been that successful planning of traffic requires accurate trajectory prediction. Data bases consisting of representative aircraft performance models, airline preferred operational procedures and a three dimensional wind model support the trajectory prediction. The research effort has been the design of a set of automation tools that make use of this trajectory prediction capability to assist controllers in overall management of traffic. The first tool, the Traffic Management Advisor (TMA), provides the overall flow management between the en route and terminal areas. A second tool, the Final Approach Spacing Tool (FAST) provides terminal area controllers with sequence and runway advisories to allow optimal use of the runways. The TMA and FAST are now being used in daily operations at Dallas/Ft. Worth airport. Additional activities include the development of several other tools. These include: 1) the En Route Descent Advisor that assist the en route controller in issuing conflict free descents and ascents; 2) the extension of FAST to include speed and heading advisories and the Expedite Departure Path (EDP) that assists the terminal controller in management of departures; and 3) the Collaborative Arrival Planner (CAP) that will assist the airlines in operational decision making. The purpose of this presentation is to review the CTAS concept and to present the results of recent field tests. The paper will first discuss the overall concept and then discuss the status of the individual tools.
Author
Air Traffic Control; Automatic Control; Systems Engineering; Aeronautical Engineering

20020061308 NASA Goddard Space Flight Center, Greenbelt, MD USA

Global Positioning System Simulator Field Operational Procedures

Kizhner, Semion, NASA Goddard Space Flight Center, USA; Quinn, David A., NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; 2002 Institute of Navigation 58th Annual Meeting, 24-26 Jun. 2002, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Global Positioning System (GPS) simulation is an important activity in the development or qualification of GPS signal receivers for space flight. Because a GPS simulator is a critical resource it is highly desirable to develop a set of field operational procedures to supplement the basic procedures provided by most simulator vendors. Validated field procedures allow better utilization of the GPS simulator in the development of new test scenarios and simulation operations. These procedures expedite simulation scenario development while resulting in scenarios that are more representative of the true design, as well as enabling construction of more complex simulations than previously possible, for example, spacecraft maneuvers. One difficulty in the development of a simulation scenario is specifying various modes of test vehicle motion and associated maneuvers requiring that a user specify some (but not all) of a few closely related simulation parameters. Currently this can only be done by trial and error. A stand-alone procedure that implements the simulator maneuver motion equations and solves for the motion profile transient times, jerk and acceleration would be of considerable value. Another procedure would permit the specification of some configuration parameters that would determine the simulated GPS signal composition. The resulting signal navigation message, for example, would force the receiver under test to use only the intended C-code component of the simulated GPS signal. A representative class of GPS simulation-related field operational procedures is described in this paper. These procedures were developed and used in support of GPS integration and testing for many successful spacecraft missions such as SAC-A, EO-1, AMSAT, VCL, SeaStar, sounding rockets, and by using the industry standard Spirent Global Simulation Systems Incorporated (GSSI) STR series simulators.

Author

Global Positioning System; Simulators; Spacecraft Maneuvers; Flight Test Vehicles

20020061685 NASA Ames Research Center, Moffett Field, CA USA

Collaborative Arrival Planning: Data Sharing and User Preference Tools

Zelenka, Richard E., NASA Ames Research Center, USA; [1998]; 1p; In English; 2nd International Air Traffic Management Research and Development Seminar, 1-4 Dec. 1998, Orlando, FL, USA

Contract(s)/Grant(s): RTOP 538-18-24; No Copyright; Avail: Issuing Activity; Abstract Only

Air traffic growth and air carrier economic pressures have motivated efforts to increase the flexibility of the air traffic management process and change the relationship between the air traffic control service provider and the system user. One of the most visible of these efforts is the U.S. government/industry ”free flight” initiative, in which the service provider concentrates on safety and cross-airline fairness, and the user on their business objectives and operating preferences, including selecting their own path and speed in real-time. In the terminal arrival phase of flight, severe restrictions and rigid control are currently placed on system users, typically without regard for individual user operational preferences. Airborne delays applied to arriving aircraft into capacity constrained airports are imposed on a first-come, first-serve basis, and thus do not allow the system user to plan for or prioritize late arrivals, or to economically optimize their arrival sequence. A central tenant of the free-flight operating paradigm is collaboration between service providers and users in reaching air traffic management decisions. Such collaboration would be particularly beneficial to an airline’s ”hub” operation, where off-schedule arrival aircraft are a consistent problem, as they cause serious air-port ramp difficulties, rippling airline scheduling effects, and result in large economic inefficiencies. Greater collaboration can also lead to increased airport capacity and decrease the severity of over-capacity rush periods. In the NASA Collaborative Arrival Planning (CAP) project, both independent exchange of real-time data between the service provider and system user and collaborative decision support tools are addressed. Data exchange of real-time arrival scheduling, airspace management, and air carrier fleet data between the FAA service provider and an air carrier is being conducted and evaluated. Collaborative arrival decision support tools to allow intra-airline arrival preferences are being developed and simulated. The CAP project is part of and leveraged from the NASA/FAA Center TRACON Automation System (CTAS), a fielded set of decision support tools that provide computer generated advisories for both enroute and terminal area controllers to manage and control arrival traffic more efficiently. In this paper, the NASA Collaborative Arrival Planning project is outlined and recent results detailed, including the real-time use of CTAS arrival scheduling data by a major air carrier and simulations of tactical and strategic user preference decision support tools.

Author

Air Traffic Control; Airline Operations; Flight Control; Free Flight; Real Time Operation; Safety; Flexibility

20020061702 NASA Glenn Research Center, Cleveland, OH USA

Aeronautical Communications Research and Development Needs for Future Air Traffic Management Applications

Kerczewski, Robert J., NASA Glenn Research Center, USA; May 2002; 14p; In English; 2002 Aerospace Conference, 9-16 Mar. 2002, Big Sky, MT, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): RTOP 727-01-00

Report No.(s): NASA/TM-2002-211500; NAS 1.15:211500; E-13267; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Continuing growth in regional and global air travel has resulted in increasing traffic congestion in the air and on the ground. In spite of occasional temporary downturns due to economic recessions and catastrophic events, average growth rates of air travel have remained high since the 1960s. The resulting congestion, which constrains expansion of the air transportation industry, inflicts schedule delays and decreases overall system efficiency, creating a pressing need to develop more efficient methods of air traffic management (ATM). New ATM techniques, procedures, air space automation methods, and decision support tools are being researched and developed for deployment in time frames stretching from the next few years to the year 2020 and beyond. As these methods become more advanced and increase in complexity, the requirements for information generation, sharing and transfer among the relevant entities in the ATM system increase dramatically. However, current aeronautical communications systems will be inadequate to meet the future information transfer demands created by these advanced ATM systems. Therefore, the NASA Glenn Research Center is undertaking research programs to develop communication, methods and key technologies that can meet these future requirements. As part of this process, studies, workshops, testing and experimentation, and research and analysis have established a number of research and technology development needs. The purpose of this paper is to outline the critical research and technology needs that have been identified in these activities, and explain how these needs have been determined.

Author

Air Traffic Control; Air Transportation; Information Transfer; Telecommunication; System Effectiveness

20020061971 Corps of Engineers, Washington, DC USA

Engineering and Design. Use of the U.S. Coast Guard Differential Global Positioning System and the Continuously Operating Reference Station System

Enson, Carl F.; Oct. 01, 1998; 14p; In English

Report No.(s): AD-A403058; ETL-1110-1-184; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical letter provides guidance and procedures on the use of the U. S. Coast Guard's (USCG) Radiobeacon Differential Global Positioning System (DGPS) and the National Geodetic Survey's (NGS) Continuously Operating Reference Station (CORS) System. Procedures and equipment required for U.S. Army Corps of Engineers (USACE) access to these systems are defined.

DTIC

Global Positioning System; Navigation Aids

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.

20020060056 International Trade Commission, Washington, DC USA

Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry. Investigation No. 332-414

Jun. 2001; 200p; In English

Report No.(s): PB2002-107721; USITC/PUB-3433; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

On April 14, 2000, at the request of the House Committee on Ways and Means (Committee), the USA International Trade Commission (Commission) instituted investigation No. 332-414, Competitive Assessment of the U.S. Large Civil Aircraft Aerostructures Industry, under section 332(g) of the Tariff Act of 1930, for the purpose of exploring recent developments in the global large civil aircraft (LCA) aerostructures industry. The Commission's report includes: a description of the composition of the LCA aerostructures industry and recent trends; a description of the process of new aerostructures development; a review of

the means and trends in government support for research and development needs; and an evaluation of the relative strengths and weaknesses of the aerostructures industries in the USA, Europe, Canada, and Asia.
NTIS
Aircraft Industry; Civil Aviation; International Trade

20020060118 NASA Dryden Flight Research Center, Edwards, CA USA
Helicopter Tail Boom With Venting for Alleviation and Control of Tail Boom Aerodynamic Loads and Method Thereof
Banks, Daniel W., Inventor, NASA Dryden Flight Research Center, USA; Kelley, Henry L., Inventor, NASA Dryden Flight Research Center, USA; Mar. 05, 2002; 14p; In English
Patent Info.: Filed 2 Jun. 2000; NASA-Case-DRC-098096; US-Patent-6,352,220; US-Patent-Appl-SN-586603; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In at least one embodiment, the apparatus of the invention is a flight vehicle tail assembly having an exterior surface, at least one first vent in the exterior surface, at least one second vent in the exterior surface, and an air passage connecting the at least one first vent to the at least one second vent allowing air to flow there between. Where the at least one first vent is located near a high air pressure area acting on the exterior surface during a range of predefined flight conditions, Further, the at least one second vent is located near a low air pressure area acting on the exterior surface during the predefined flight conditions. So that at the predefined flight conditions adverse loads on the tail assembly are reduced by venting air from the high pressure area, through the tail assembly, to the low pressure area. The method of the present invention includes the steps of: receiving air through the at least one first vent in the exterior surface, passing the air through the tail assembly from the at least one first vent to at least one second vent in the exterior surface. and ejecting the air out of the tail assembly at the at least one second vent.
Official Gazette of the U.S. Patent and Trademark Office
Tail Assemblies; Helicopter Control; Aerodynamic Loads; Venting; Vents

20020060461 NASA Ames Research Center, Moffett Field, CA USA
Principal Components Analysis of Triaxial Vibration Data From Helicopter Transmissions
Tumer, Irem Y., NASA Ames Research Center, USA; Huff, Edward M., NASA Ames Research Center, USA; Aug. 26, 2001; 10p; In English; 56th Meeting of the Society for Machinery Failure Prevention Technology, May 2000, Virginia Beach, VA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Research on the nature of the vibration data collected from helicopter transmissions during flight experiments has led to several crucial observations believed to be responsible for the high rates of false alarms and missed detections in aircraft vibration monitoring systems. This work focuses on one such finding, namely, the need to consider additional sources of information about system vibrations. In this light, helicopter transmission vibration data, collected using triaxial accelerometers, were explored in three different directions, analyzed for content, and then combined using Principal Components Analysis (PCA) to analyze changes in directionality. In this paper, the PCA transformation is applied to 176 test conditions/data sets collected from an OH58C helicopter to derive the overall experiment-wide covariance matrix and its principal eigenvectors. The experiment-wide eigenvectors. are then projected onto the individual test conditions to evaluate changes and similarities in their directionality based on the various experimental factors. The paper will present the foundations of the proposed approach, addressing the question of whether experiment-wide eigenvectors accurately model the vibration modes in individual test conditions. The results will further determine the value of using directionality and triaxial accelerometers for vibration monitoring and anomaly detection.
Author
Principal Components Analysis; Transmissions (Machine Elements); Vibration Tests; Detection

20020060721 NASA Langley Research Center, Hampton, VA USA
Impact Testing and Simulation of a Crashworthy Composite Fuselage Section with Energy-Absorbing Seats and Dummies
Fasanella, Edwin L., NASA Langley Research Center, USA; Jackson, Karen E., Army Research Lab., USA; June 2002; 17p; In English; AHS International: Vertical Flight Society's 58th Annual Forum and Technology Display, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): RTOP 728-50-10-01
Report No.(s): NASA/TM-2002-211731; NAS 1.15:211731; ARL-TR-2734; L-18190; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 25-ft/s vertical drop test of a composite fuselage section was conducted with two energy-absorbing seats occupied by anthropomorphic dummies to evaluate the crashworthy features of the fuselage section and to determine its interaction with the seats and dummies. The 5-ft diameter fuselage section consists of a stiff structural floor and an energy-absorbing subfloor constructed of Rohacel foam blocks. The experimental data from this test were analyzed and correlated with predictions from a

crash simulation developed using the nonlinear, explicit transient dynamic computer code, MSC.Dytran. The anthropomorphic dummies were simulated using the Articulated Total Body (ATB) code, which is integrated into MSC.Dytran.
Author
Crashworthiness; Drop Tests; Dummies; Fuselages; Impact Tests; Computerized Simulation; Seats

20020060751 NASA Ames Research Center, Moffett Field, CA USA
High-Lift Optimization Design Using Neural Networks on a Multi-Element Airfoil
Greenman, Roxana M., NASA Ames Research Center, USA; Roth, Karlin R., NASA Ames Research Center, USA; [1998]; 10p; In English; Proceedings of DETC98: ASME 1998 Computers in Engineering Conference, 13-16 Sep. 1998, Atlanta, GA, USA
Contract(s)/Grant(s): RTOP 519-10-42
Report No.(s): DETC98/CIE-6006; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The high-lift performance of a multi-element airfoil was optimized by using neural-net predictions that were trained using a computational data set. The numerical data was generated using a two-dimensional, incompressible, Navier-Stokes algorithm with the Spalart-Allmaras turbulence model. Because it is difficult to predict maximum lift for high-lift systems, an empirically-based maximum lift criteria was used in this study to determine both the maximum lift and the angle at which it occurs. Multiple input, single output networks were trained using the NASA Ames variation of the Levenberg-Marquardt algorithm for each of the aerodynamic coefficients (lift, drag, and moment). The artificial neural networks were integrated with a gradient-based optimizer. Using independent numerical simulations and experimental data for this high-lift configuration, it was shown that this design process successfully optimized flap deflection, gap, overlap, and angle of attack to maximize lift. Once the neural networks were trained and integrated with the optimizer, minimal additional computer resources were required to perform optimization runs with different initial conditions and parameters. Applying the neural networks within the high-lift rigging optimization process reduced the amount of computational time and resources by 83% compared with traditional gradient-based optimization procedures for multiple optimization runs.
Author
Airfoils; Algorithms; Navier-Stokes Equation; Neural Nets; Turbulence Models; Optimization

20020060781 NASA Langley Research Center, Hampton, VA USA
Occupant Responses in a Full-Scale Crash Test of the Sikorsky ACAP Helicopter
Jackson, Karen E., Army Research Lab., USA; Fasanella, Edwin L., Army Research Lab., USA; Boitnott, Richard L., Army Research Lab., USA; McEntire, Joseph, Army Aeromedical Research Lab., USA; Lewis, Alan, Army Aeromedical Research Lab., USA; June 2002; 22p; In English; AHS International: The Vertical Flight Society's 58th Annual Forum and Technology Display, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): RTOP 728-50-10-01
Report No.(s): NASA/TM-2002-211733; NAS 1.15:211733; ARL-TR-2735; L-18189; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A full-scale crash test of the Sikorsky Advanced Composite Airframe Program (ACAP) helicopter was performed in 1999 to generate experimental data for correlation with a crash simulation developed using an explicit nonlinear, transient dynamic finite element code. The airframe was the residual flight test hardware from the ACAP program. For the test, the aircraft was outfitted with two crew and two troop seats, and four anthropomorphic test dummies. While the results of the impact test and crash simulation have been documented fairly extensively in the literature, the focus of this paper is to present the detailed occupant response data obtained from the crash test and to correlate the results with injury prediction models. These injury models include the Dynamic Response Index (DRI), the Head Injury Criteria (HIC), the spinal load requirement defined in FAR Part 27.562(c), and a comparison of the duration and magnitude of the occupant vertical acceleration responses with the Eiband whole-body acceleration tolerance curve.
Author
Helicopters; Crashworthiness; Impact Tests; Acceleration Tolerance; Composite Structures

20020061360 Institute for Human Factors TNO, Soesterberg, Netherlands
Report Activities on the Project Military General Instruction Learning and Testing *Final Report Rapportage Werkzaamheden Militaire Algemene Instructie, Leren en Toetsing*
Veldhuis, G. J., Institute for Human Factors TNO, Netherlands; vandeLaak, C. G. M., Institute for Human Factors TNO, Netherlands; vanVerseveld, O. H., Institute for Human Factors TNO, Netherlands; Feb. 05, 2002; 52p; In Dutch
Contract(s)/Grant(s): 013.11408; TNO Proj. 790.1
Report No.(s): TD-2001-0362; TNO-TM-02-A003; Copyright; Avail: Issuing Activity

Purpose: The Educational Organization for Initial Education (OCIO) of the Royal Netherlands Army (RNLA) has little experience in developing and implementing educational multimedia. However, their aim is to develop and implement educational multimedia In their educational program from August 2001 onwards. Therefore, a search has been started for suitable educational multimedia applications that can be used for both inexperienced, new soldiers as well as for the more experienced and older soldiers. In this project, the goal is to investigate how educational multimedia applications should look like. With respect to this goal, the role of TNO is to offer educational advice and support. In addition, it has to be sorted out how evaluation of educational multimedia can be processed within this specific context.
Derived from text
Education; Functional Design Specifications; Images; Multimedia; Prototypes; Shoulders

20020061845 Physics and Electronics Lab. TNO, The Hague, Netherlands
Recent Developments Unmanned Aerial Vehicles (UAVs): Report January-July 2001 ***Final Report, Jan. - Jul. 2001 Recente Ontwikkelingen Unmanned Aerial Vehicles (UAVs): Rapportage Januari-Juli 2001***
vanderVeen, E. M., Physics and Electronics Lab. TNO, Netherlands; Cambien, K. P. H., Physics and Electronics Lab. TNO, Netherlands; Visser, B. J., Physics and Electronics Lab. TNO, Netherlands; deVries, S. C., Physics and Electronics Lab. TNO, Netherlands; March 2002; 74p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/679; TNO Proj. 015.31088
Report No.(s): TD01-0260; FEL-01-A079; Copyright; Avail: Issuing Activity
This report is one of a series of publications, which provide an overview of recent developments in the field of Unmanned Aerial Vehicles (UAV's). The information provided is based on open sources, such as periodicals and research reports. The time period covered by this report is January 2001 through July 2001.
Author
Periodicals; Pilotless Aircraft; Research

20020061846 Institute for Human Factors TNO, Soesterberg, Netherlands
Making Aircraft Maintenance More Efficient and Less Physically Stressful ***Final Report TOEL: Toestel-Onderhoud Efficienter en Lichter***
Delleman, N. J., Institute for Human Factors TNO, Netherlands; Roeleveld, E., Institute for Human Factors TNO, Netherlands; vanVonderen, D., Institute for Human Factors TNO, Netherlands; Oudenhuijzen, A. J. K., Institute for Human Factors TNO, Netherlands; Dec. 31, 2001; 20p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): 013.30373; TNO Proj. 789.1
Report No.(s): TD-2001-0357; TNO-TM-01-A076; Copyright; Avail: Issuing Activity
Maintenance work is characterized by unfavourable postures, and every now and then the exertion of great forces (lifting, pushing/pulling, carrying). This physical workload often leads to specific complaints and disorders of the musculoskeletal system (bones, muscles, ligaments, and joints). The purpose of the project was to demonstrate how an overview of musculoskeletall problems for aircraft maintenance can be obtained, as well as to tackle one of the problems. The project was focused on F1 6 maintenance at Volkel Air Force Base In the Netherlands. All musculoskeletal problems detected by a questionnaire filled out the personnel were reasonably well supported by the technical work environment at the base and by the way the work is organized. The project team decided to work on the neck complaints for the personnel working on the engine after It is removed form the aircraft. Most likely these complaints are caused by the absence of head support while lying on the back on a small can on wheels during work underneath the engine. The adjustable headrest created was considered to be a real improvement by the personnel. It is expected that the approach used will also be successful in other maintenance environments. However, it would even be better to use the knowledge obtained when planning a new workplace/building for maintenance, and when acquiring a new type of aircraft.
Author
Aircraft Maintenance; Musculoskeletal System; Physical Work

20020061847 American Inst. of Aeronautics and Astronautics, Reston, VA USA
Final Report of the AIAA Student Aircraft Design, Build & Fly Competition ***Final Report, 1 Oct. 2001-30 Sep. 2002***
Page, Gregory; Bovias, Chris; Selig, Michael; Brock, Stephen; Jun. 15, 2002; 1805p; In English
Contract(s)/Grant(s): N00014-98-1-0493
Report No.(s): AD-A402640; 2002DBF7630; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche
This report is made up of the combined reports of 35 separate teams of students who entered the 2002 Design, Build & Fly Competition. The objectives of the Design, Build & Fly Competition were to have students teams design, build and fly unmanned

remote control electric aircraft designed for two specific missions: a short-field cargo sortie and a cruise/ferry sortie. A 'fly-off' took place on the Cessna Flight Test Field near Wichita, KS, in April 2002. Winners of the contest: 1st place, University of CA-San Diego; 2nd, University of Southern CA; 3rd, West Virginia University. The Design, Build & Fly Competition was supported by Cessna, the Office of Naval Research and the AIAA Foundation.
DTIC
Competition; Aircraft Design; Fly by Wire Control

20020061851 RAND Corp., Santa Monica, CA USA
Innovative Development. Global Hawk and Darkstar. Executive Summary: Their Advanced Concept Technology Demonstration Program Experience
Drezner, Jeffrey A.; Leonard, Robert S.; Jan. 2002; 67p; In English
Contract(s)/Grant(s): F49642-01-C-0003
Report No.(s): AD-A402715; RAND/MR-1473; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The USA has seen a three-decade-long history of poor outcomes in unmanned aerial vehicle (UAV) development efforts. UAV and tactical surveillance/reconnaissance programs have a history of failure involving inadequate integration of sensor, platform, and ground elements, together with unit costs far exceeding what operators have been willing to pay. This history motivated the unique management approach adopted at the beginning of the High-Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) program. The High-Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) Advanced Concept Technology Demonstration (ACTD) program incorporated a number of innovative elements into its development strategy. As a condition of conducting this ACTD, Congress required that an independent third party study its implementation. RAND was chosen for this role and has been following the HAE UAV ACTD program since its inception. The joint program was conducted until October 1998 under the direction of the Defense Advanced Research Projects Agency (DARPA) and the Defense Airborne Reconnaissance Office (DARO) and was then conducted under the U.S. Air Force through the completion of the ACTD. RAND's initial research covering Phase I and most of Phase II was sponsored by DARPA; the Air Force sponsored RAND's effort through the completion of the ACTD.
DTIC
Aerial Reconnaissance; Reconnaissance Aircraft; Pilotless Aircraft; High Altitude

20020061852 Defence Science and Technology Organisation, Victoria, Australia
A Literature Review on Bounding Flight in Birds With Applications to Micro Uninhabited Air Vehicles
Keating, Hilary A.; Mar. 2002; 25p; In English
Report No.(s): AD-A402713; DSTO-GD-0329; DODA-AR-012-173; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Bounding flight is an intermittent flight pattern observed in small birds, in which periods of flapping flight alternate with periods of wings-folded flight. It has been suggested that this flight pattern could be adopted by micro uninhabited air vehicles (microUAV) to improve their flight characteristics. In response to this suggestion, a literature review of the bounding flight of birds has been undertaken. Many authors have attempted to explain why birds adopt bounding flight. Hypotheses include the possibility that bounding flight is aerodynamically more efficient than continuous flapping, level flight; that bounding flight is used to counter a chemical imbalance in the flight muscles; or that bounding flight forms a compromise between aerodynamic and muscular constraints. These hypotheses are based on mainly circumstantial evidence. Birds have been observed to bound at a range of airspeeds, during both short and long range flights, and while hovering. However, no single hypothesis is adequate to explain bounding flight over all of these flight regimes. It is possible that an alternate explanation exists. While not sufficient to explain all observations of bounding flight in birds, the suggested hypotheses may have applications for microUAVs. In particular, the suggestion that bounding flight is aerodynamically more efficient than level flight could potentially be exploited in the design of a microUAV. Improvements in the flight characteristics of microUAVs, potentially through the adoption of bounding flight, will be an important step towards the development of an operational microUAV for use in defence applications.
DTIC
Flight Paths; Flight Characteristics; Airspeed; Flapping

20020061888 Boeing Co., Seattle, WA USA
Open Systems Core Avionics Requirement
Carter, Nick; Apr. 29, 1998; 19p; In English; Original contains color images
Report No.(s): AD-A402722; No Copyright; Avail: CASI; A03, Hardcopy

These viewgraphs discuss the ”OSCAR vision” which is to significantly reduce the life cycle support costs of the AV-8B avionic system through the application of open system principles, commercial technologies and acquisition reform initiatives. OSCAR is an open system architecture which standardizes physical, electrical and software interfaces at line replaceable module level.
DTIC
Computer Programs; Avionics; Architecture (Computers)

20020061892 Air Force Research Lab., Wright-Patterson AFB, OH USA
Open Systems Architecture for Legacy Aircraft (OSALA). Open Systems Project Engineering Conference (OSPEC), FY 98 Status Review
Carbonell, Juan M.; Harris, Mike J.; Apr. 29, 1998; 44p; In English; Original contains color images; Prepared in collaboration with Lockheed Martin
Report No.(s): AD-A402719; No Copyright; Avail: CASI; A03, Hardcopy
No abstract.
Author
Avionics; Project Management; Architecture (Computers)

20020061961 Defence Science and Technology Organisation, Victoria, Australia
Degradation of Peel and Tensile Strength of Bonded Panels Exposed to High Humidity
Rider, Andrew N.; Nov. 2001; 34p; In English
Report No.(s): AD-A402631; DSTO-TR-1272; DODA-AR-012-149; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Bonded sandwich panel structural integrity is an important component in the successful maintenance and continued operation of RAAF F-III aircraft through to the planned withdrawal date of 2020. F-lll airframe stiffness and strength is dependent on the integrity of bonded sandwich panel structure. Currently, limited knowledge exists as to the effect of environmental exposure on the mechanical integrity of bonded sandwich panels. The work presented in this report summarizes honeycomb studies undertaken in AIR task 98/186 that were designed to examine the influence that environmental exposure would have on the peel and tensile strength of bonded sandwich honeycomb panels constructed from either original materials or materials used in the refurbishment of damaged panels. The results indicate that the materials and processes used by the United States Air force in repair and rebuild programs are susceptible to mechanical degradation as a result of exposure to high humidity conditions. However, the panels constructed during the original aircraft manufacturing indicate better resistance to the effects of environmental exposure.
DTIC
Bonded Joints; Humidity; Manufacturing; Sandwich Structures

20020061968 RAND Corp., Santa Monica, CA USA
Innovative Development. Global Hawk and Darkstar. Volume 3: Transitions Within and Out of the HAE UAV ACTD Program
Drezner, Jeffrey A.; Leonard, Robert S.; Jan. 2002; 97p; In English
Contract(s)/Grant(s): F49642-01-C-0003
Report No.(s): AD-A403028; RAND-MR-1476; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The USA has seen a three-decade-long history of poor out comes in unmanned aerial vehicle (UAV) development efforts. Technical problems have led to cost and schedule increases as well as to disappointing operational results. Costs have tended to escalate so much during development that the resulting systems have cost more than users have been willing to pay, precipitating program cancellation in almost every case. This history prompted the unique developmental approach adopted at the beginning of the High-Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) Advanced Concept Technology Demonstration (ACTD) program. There has also been a long history of efforts made to improve the efficiency and effectiveness of weapon system acquisition policy, processes, and management for all weapon system types. Capturing the experience from ongoing or recently completed efforts employing nonstandard or innovative acquisition strategies can facilitate such improvements. This research contributes to that effort. In 1994, the Defense Advanced Research Projects Agency (DARPA), in conjunction with the Defense Airborne Reconnaissance Office (DARO), began the development of two UAVs. These systems were intended to provide surveillance information to the warfighter. As such, they responded both to the recommendations of the Defense Science Board and to operational needs stated by DARO on behalf of military service users.
DTIC
Remotely Piloted Vehicles; Research Management; Management Systems; Pilotless Aircraft; Reconnaissance Aircraft; Surveillance

20020061978 Institute for Human Factors TNO, Soesterberg, Netherlands
Localizing Tactile Stimuli on the Torso ***Final Report Lokalisatie van Tactiele Stimuli op de Torso***
vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; vanVeen, H. A. H. C., Institute for Human Factors TNO, Netherlands; Feb. 25, 2002; 13p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): 013.31307; TNO Proj. 788.1
Report No.(s): TD-2001-0367; TNO-TM-02-A010; Copyright; Avail: Issuing Activity
Tactile torso displays present information by localised vibration. Favourable applications are foreseen in presenting spatial Information, for example, the direction of an enemy aircraft can be mapped on the 3D form of the tactile torso display. Important precondition for this mapping is that the user is able to determine the absolute location of the vibration: mislocating the stimulus will result in an error in the perceived direction of the threat. Absolute localization performance has not been studied before. We Investigated localisation performance on the frontal side of the torso. by using a method based on triangulation, we determined the perceived locations of tactile stimuli and compared them with the physical locations. The results show that observers are able to determine the absolute location in space. There were no systematic deviations between the perceived and the physical location. However, there is a tendency for the perceived radius to be somewhat larger (0.7 cm) than the objective radius: stimuli are located outside the belly. A second tendency is that stimuli on the sides of the body are perceived under a smaller angle, that is more towards the mid-sagittal plane.
Author
Display Devices; Position (Location); Vibration

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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

20020061866 NASA Glenn Research Center, Cleveland, OH USA
Icing Sensor Probe
Emery, Edward, NASA Glenn Research Center, USA; Kok, Gregory L., Droplet Measurement Technologies, USA; March 2002; 16p; In English
Contract(s)/Grant(s): RTOP 708-20-13
Report No.(s): NASA/TM-2002-211368; NAS 1.15:211368; E-13190; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Aircraft icing is a serious safety problem for the general aviation and some commuter transport airplanes. There has been tremendous growth in the commuter aviation industry in the last few years, Since these type of aircraft generally operate at lower altitudes they consequently spend a far greater proportion of their time operating in icing conditions. For the past thirty years airborne and ground based facilities have relied primarily on two types of cloud physics instrumentation to measure the

characteristics of icing clouds: hot wire liquid water content probes and laser based particle sizing probes for the measurement of water droplet size. The instrumentation is severely limited by the technology that was developed during the 1970's and is quite large in size. The goal of this research is to develop one instrument with a wide bandwidth, better response time, higher resolution, user selectability, and small and lightweight. NASA Glenn Research Center, Droplet Measurement Technology, and Meteorology Society of Canada have developed a collaborative effort to develop such an instrument. This paper describes the development and test results of the prototype Icing Sensor Probe.
Author
Ice Formation; Aircraft Icing; Drop Size; Liquid Lasers; Moisture Content; Safety Factors

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.

20020061317 NASA Glenn Research Center, Cleveland, OH USA
Processing and Mechanical Properties of Various Zirconia/Alumina Composites for Fuel Cell Applications
Choi, Sung R., Ohio Aerospace Inst., USA; Bansal, Narottam P., NASA Glenn Research Center, USA; June 2002; 14p; In English; CIMTEC 2002, International Conferences on Modern Materials and Technologies, 14-19 Jul. 2002, Florence, Italy; Sponsored by International Academy of Ceramics, France
Contract(s)/Grant(s): RTOP 708-75-13
Report No.(s): NASA/TM-2002-211580; NAS 1.15:211580; G-1:P03; E-13365; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Various electrolyte materials for solid oxide fuel cells were fabricated by hot pressing 10 mol% yttria-stabilized zirconia (10-YSZ) reinforced with two different forms of alumina, particulates and platelets, each containing 0 to 30 mol% alumina. Flexure strength and fracture toughness of both particulate and platelet composites at ambient temperature increased with increasing alumina content, reaching a maximum at 30 mot% alumina. For a given alumina content, strength of particulate composites was greater than that of platelet composites, whereas, the difference in fracture toughness between the two composite systems was negligible. No virtual difference in elastic modulus and density was observed for a given alumina content between particulate and platelet composites. Thermal cycling up to 10 cycles between 200 to 1000 C did not show any effect on strength degradation of the 30 mol% platelet composites, indicative of negligible influence of CTE mismatches between YSZ matrix and alumina grains.
Author
Ceramic Matrix Composites; Zirconium Oxides; Aluminum Oxides; Fracture Strength; Ceramics; Mechanical Properties; Electrolytes; Fabrication

20020061355 NASA Glenn Research Center, Cleveland, OH USA
Slow Crack Growth of Brittle Materials With Exponential Crack-Velocity Formulation, Part 1, Analysis
Choi, Sung R., Ohio Aerospace Inst., USA; Nemeth, Noel N., NASA Glenn Research Center, USA; Gyekenyesi, John P., NASA Glenn Research Center, USA; June 2002; 26p; In English
Contract(s)/Grant(s): RTOP 708-31-13
Report No.(s): NASA/TM-2002-211153/PT1; NAS 1.15:211153/PT1; E-13009-1/PT1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Extensive slow-crack-growth (SCG) analysis was made using a primary exponential crack-velocity formulation under three widely used load configurations: constant stress rate, constant stress, and cyclic stress. Although the use of the exponential formulation in determining SCG parameters of a material requires somewhat inconvenient numerical procedures, the resulting solutions presented gave almost the same degree of simplicity in both data analysis and experiments as did the power-law formulation. However, the fact that the inert strength of a material should be known in advance to determine the corresponding SCG parameters was a major drawback of the exponential formulation as compared with the power-law formulation.
Author
Crack Propagation; Brittle Materials; Glass; Mechanical Properties; Ceramics; Life (Durability)

20020061367 NASA Glenn Research Center, Cleveland, OH USA

Optimal Micro-Scale Secondary Flow Control for the Management of High Cycle Fatigue and Distortion in Compact Inlet Diffusers

Anderson, Bernhard H., NASA Glenn Research Center, USA; Keller, Dennis J., RealWorld Quality Systems, Inc., USA; July 2002; 66p; In English

Contract(s)/Grant(s): RTOP 708-53-13

Report No.(s): NASA/TM-2002-211686; NAS 1.15:211686; E-13415; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this study on micro-scale secondary flow control (MSFC) is to study the aerodynamic behavior of micro-vane effectors through their factor (i.e., the design variable) interactions and to demonstrate how these statistical interactions, when brought together in an optimal manner, determine design robustness. The term micro-scale indicates the vane effectors are small in comparison to the local boundary layer height. Robustness in this situation means that it is possible to design fixed MSFC robust installation (i.e.. open loop) which operates well over the range of mission variables and is only marginally different from adaptive (i.e., closed loop) installation design, which would require a control system. The inherent robustness of MSFC micro-vane effector installation designs comes about because of their natural aerodynamic characteristics and the manner in which these characteristics are brought together in an optimal manner through a structured Response Surface Methodology design process. Author

Secondary Flow; Flow Distribution; Feedback Control; Robustness (Mathematics)

20020061387 NASA Glenn Research Center, Cleveland, OH USA

Impact Testing and Analysis of Composites for Aircraft Engine Fan Cases

Roberts, Gary D., NASA Glenn Research Center, USA; Revilock, Duane M., NASA Glenn Research Center, USA; Binienda, Wieslaw K., Akron Univ., USA; Nie, Walter Z., Akron Univ., USA; Mackenzie, S. Ben, Saint-Gobain Performance Plastics, USA; Todd, Kevin B., Saint-Gobain Performance Plastics, USA; April 2002; 20p; In English

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

Report No.(s): NASA/TM-2002-211493; E-13206; NAS 1.15:211493; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The fan case in a jet engine is a heavy structure because of its size and because of the requirement that it contain a blade released during engine operation. Composite materials offer the potential for reducing the weight of the case. Efficient design, test, and analysis methods are needed to efficiently evaluate the large number of potential composite materials and design concepts. The type of damage expected in a composite case under blade-out conditions was evaluated using a subscale test in which a glass/epoxy composite half-ring target was impacted with a wedge-shaped titanium projectile. Fiber shearing occurred near points of contact between the projectile and target. Delamination and tearing occurred on a larger scale. These damage modes were reproduced in a simpler test in which flat glass/epoxy composites were impacted with a blunt cylindrical projectile. A surface layer of ceramic eliminated fiber shear fracture but did not reduce delamination. Tests on 3D woven carbon/epoxy composites indicated that transverse reinforcement is effective in reducing delamination. A 91 cm (36 in.) diameter full-ring sub-component was proposed for larger scale testing of these and other composite concepts. Explicit, transient, finite element analyses indicated that a full-ring test is needed to simulate complete impact dynamics, but simpler tests using smaller ring sections are adequate when evaluation of initial impact damage is the primary concern.

Author

Impact Tests; Aircraft Engines; Epoxy Matrix Composites; Design Analysis

20020061677 NASA Glenn Research Center, Cleveland, OH USA

Ultimate Tensile Strength as a Function of Test Rate for Various Ceramic Matrix Composites at Elevated Temperatures

Choi, Sung R., Ohio Aerospace Inst., USA; Bansal, Narottam P., NASA Glenn Research Center, USA; Gyekenyesi, John P., NASA Glenn Research Center, USA; June 2002; 13p; In English; CIMTEC 2002: International Conferences of Modern Materials and Technologies, 14-19 Jul. 2002, Florence, Italy, Italy; Sponsored by International Academy of Ceramics, Switzerland

Contract(s)/Grant(s): RTOP 708-31-13

Report No.(s): NASA/TM-2002-211579; NAS 1.15:211579; E-13364; SV-5:L05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ultimate tensile strength of five different continuous fiber-reinforced ceramic composites, including SiC/BSAS (2D 2 types), SiC/MAS-5 (2D), SiC/SiC (2D enhanced), and C/SiC(2D) was determined as a function of test rate at I 100 to 1200 ’C in air. All five composite materials exhibited a significant dependency of ultimate strength on test rate such that the ultimate strength decreased with decreasing test rate, similar to the behavior observed in many advanced monolithic ceramics at elevated

temperatures. The application of the preloading technique as well as the prediction of life from one loading configuration (constant stress rate) to another (constant stress loading) for SiC/BSAS suggested that the overall macroscopic failure mechanism of the composites would be the one governed by a power-law type of damage evolution/accumulation, analogous to slow crack growth commonly observed in advanced monolithic ceramics.
Author
Ceramic Matrix Composites; Life (Durability); Tensile Strength; High Temperature

20020061717 NASA Glenn Research Center, Cleveland, OH USA
Calculation and Correlation of the Unsteady Flowfield in a High Pressure Turbine
Bakhle, Milind A., Toledo Univ., USA; Liu, Jong S., Honeywell Engines, Systems and Services, USA; Panovsky, Josef, Honeywell Engines, Systems and Services, USA; Keith, Theo G., Jr., Toledo Univ., USA; Mehmed, Oral, NASA Glenn Research Center, USA; March 2002; 20p; In English; Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 910-30-11
Report No.(s): NASA/TM-2002-211475; E-13242; NAS 1.15:211475; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Forced vibrations in turbomachinery components can cause blades to crack or fail due to high-cycle fatigue. Such forced response problems will become more pronounced in newer engines with higher pressure ratios and smaller axial gap between blade rows. An accurate numerical prediction of the unsteady aerodynamics phenomena that cause resonant forced vibrations is increasingly important to designers. Validation of the computational fluid dynamics (CFD) codes used to model the unsteady aerodynamic excitations is necessary before these codes can be used with confidence. Recently published benchmark data, including unsteady pressures and vibratory strains, for a high-pressure turbine stage makes such code validation possible. In the present work, a three dimensional, unsteady, multi blade-row, Reynolds-Averaged Navier Stokes code is applied to a turbine stage that was recently tested in a short duration test facility. Two configurations with three operating conditions corresponding to modes 2, 3, and 4 crossings on the Campbell diagram are analyzed. Unsteady pressures on the rotor surface are compared with data.
Author
High Pressure; Unsteady Aerodynamics; Flow Distribution; Turbines; Resonant Vibration; Forced Vibration; Computational Fluid Dynamics

20020061790 Honeywell, Inc., Minneapolis, MN USA
Flight Test of Propulsion Monitoring and Diagnostic System ***Final Report***
Gabel, Steve, Honeywell, Inc., USA; Elgersma, Mike, Honeywell, Inc., USA; March 2002; 78p; In English
Contract(s)/Grant(s): NAS3-01105; RTOP 728-30-20
Report No.(s): NASA/CR-2002-211485; NAS 1.26:211485; E-13253; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of this program was to perform flight tests of the propulsion monitoring and diagnostic system (PMDS) technology concept developed by Honeywell under the NASA Advanced General Aviation Transport Experiment (AGATE) program. The PMDS concept is intended to independently monitor the performance of the engine, providing continuous status to the pilot along with warnings if necessary as well as making the data available to ground maintenance personnel via a special interface. These flight tests were intended to demonstrate the ability of the PMDS concept to detect a class of selected sensor hardware failures, and the ability to successfully model the engine for the purpose of engine diagnosis.
Author
Flight Tests; General Aviation Aircraft; Propulsion System Performance; Systems Health Monitoring; Aircraft Engines

20020061870 NASA Glenn Research Center, Cleveland, OH USA
Gear Crack Detection Using Tooth Analysis
Decker, Harry J., Army Research Lab., USA; April 2002; 16p; In English; 56th Meeting of the Society for Machinery Failure Prevention Technology (MFPT), 15-19 Apr. 2002, Virginia Beach, VA, USA
Contract(s)/Grant(s): RTOP 708-90-13; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2002-211491; NAS 1.15:211491; E-13259; ARL-TR-2681; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Gear cracks are typically difficult to diagnose with sufficient warning time. Significant damage must be present before algorithms detect the damage. A new feature extraction and two new detection techniques are proposed. The time synchronous averaging concept was extended from revolution-based to tooth engagement-based. The detection techniques are based on

statistical comparisons among the averages for the individual teeth. These techniques were applied to a series of three seeded fault crack propagation tests. These tests were conducted on aerospace quality spur gears in a test rig. The tests were conducted at speeds ranging from 2500 to 7500 revolutions per minute and torques from 184 to 228 percent of design load. The inability to detect these cracks with high confidence may be caused by the high loading required to initiate the cracks. The results indicate that these techniques do not currently produce an indication of damage that significantly exceeds experimental scatter.
Author
Crack Propagation; Gears; Gear Teeth; Fault Detection; Structural Vibration; Vibration Tests; Cracks

20020061947 NASA Glenn Research Center, Cleveland, OH USA
A Low NO(x) Lean-Direct Injection, Multipoint Integrated Module Combuster Concept for Advanced Aircraft Gas Turbines
Tacina, Robert, NASA Glenn Research Center, USA; Wey, Changlie, QSS Group, Inc., USA; Laing, Peter, Parker-Hannifin Corp., USA; Mansour, Adel, Parker-Hannifin Corp., USA; April 2002; 26p; In English; Conference on Technologies and Combustion for a Clean Environment, 9-12 Jul. 2001, Oporto, Portugal; Sponsored by Instituto Superior Tecnico, Portugal; Original contains color illustrations
Contract(s)/Grant(s): RTOP 714-02-20
Report No.(s): NASA/TM-2002-211347; NAS 1.15:211347; E-13163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A low NO(x) emissions combustor has been demonstrated in flame-tube tests. A multipoint, lean-direct injection concept was used. Configurations were tested that had 25- and 36- fuel injectors in the size of a conventional single fuel injector. An integrated-module approach was used for the construction where chemically etched laminates, diffusion bonded together, combine the fuel injectors, air swirlers and fuel manifold into a single element. Test conditions were inlet temperatures up to 810 K, inlet pressures up to 2760 kPa, and flame temperatures up to 2100 K. A correlation was developed relating the NO(x) emissions with the inlet temperature, inlet pressure, fuel-air ratio and pressure drop. Assuming that 10 percent of the combustion air would be used for liner cooling and using a hypothetical engine cycle, the NO(x) emissions using the correlation from flame-tube tests were estimated to be less than 20 percent of the 1996 ICAO standard.
Author
Nitrogen Oxides; Exhaust Gases; Exhaust Emission; Gas Turbine Engines; Performance Tests

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.

20020061925 Naval Postgraduate School, Monterey, CA USA
Analysis of a Semi-Tailless Aircraft Design
Muller, Kurt W.; Mar. 2002; 108p; In English; Original contains color images
Report No.(s): AD-A402729; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Many unique aircraft configurations cane out of Germany in World War II, one of these was the Blohm and Voss BV P 208. by using longitudinal and directional control surfaces located outboard of the wing tips they are removed from the downwash of the main wing. Additionally, the result is fewer component surfaces with less total surface area, thereby reducing both friction and interference drag and manufacturing cost. The configuration should lend itself well to low-observability, making it a good stealth candidate. The P 208, provided the author an opportunity to analyze an unconventional configuration with the conceptual NASA design codes RAM, VORVIEW, and ACSYNT. A lack of wind tunnel or flight data prevented the evaluation of the performance of these codes for this configuration. However, results are presented for future comparison and evaluation. Claims of aerodynamic benefits of the P 208 configuration appear largely to be verified. The P 208 suffers from poor natural short-period longitudinal stability and an unstable Dutch-roll, neither of which are beyond the means of artificial control. The most immediate need for future work is a structural analysis and determination as to the structural and dynamic feasibility of the configuration.
DTIC
Tailless Aircraft; Aircraft Design; Flight Tests; Directional Control

20020061927 Naval Postgraduate School, Monterey, CA USA

Design and Rapid Prototyping of Flight Control and Navigation System for an Unmanned Aerial Vehicle

Lim, Bock Aeng; Mar. 2002; 121p; In English; Original contains color images

Report No.(s): AD-A402738; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The work in this thesis is in support of a larger research effort to implement a cluster of autonomous airborne vehicles with the capability to conduct coordinated flight maneuver planning and to perform distributed sensor fusion, Specifically, it seeks to design and implement an onboard flight control and navigation system for NPS FROG UAV, which will be used as the autonomous airborne vehicle for the research, using the newly marketed xPC Target Rapid Prototyping System from The Mathworks, Inc Part I briefly introduces the aircraft and explains the necessity for an onboard computer for the UAV. Part II describes the construction of the miniature aircraft computer, INS/GPS and air data sensor integration implementation as well as the rapid prototyping process. Part III covers the process to create a 6DOF model for the aircraft and the design of the aircraft autopilot, while Part IV presents a vision-based navigation algorithm that can be implemented on the UAV to give it some form of autonomous flight trajectory planning capability. Preliminary ground test results are presented in Part V to conclude this study.

DTIC

Autonomous Navigation; Automatic Pilots; Pilotless Aircraft; Aircraft Design; Data Integration

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).

20020059949 Natural Resources Canada, Geodetic Survey Div., Ottawa, Ontario Canada

Geodetic S2 VLBI: International Plans

Klatt, Calvin, Natural Resources Canada, Canada; Berube, Mario, Natural Resources Canada, Canada; Cannon, Wayne, York Univ., Canada; Petrachenko, W. T., Natural Resources Canada, Canada; Searle, Anthony, Natural Resources Canada, Canada; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 60-64; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

International use of the S2 geodetic system is beginning in 2002 after a successful series of experiments in Canada that began in 1999. The S2 Recording Terminal (RT), which utilizes commercial VCR tape transports, has been used internationally for several years. The S2 Data Acquisition System (DAS) is designed for geodetic USAge and differs from the Mk3/Mk4 mainly through its use of rapid frequency-switching to achieve the necessary delay resolution. Correlation is performed at the six-station Canadian Correlator, which has been used extensively for many years by the Space-VLBI community. We review the geodetic experiments that have been performed in Canada using the Algonquin, Yellowknife and CTVA antennas. In 2002 a network of stations equipped with S2 systems will be included in the IVS observation program. The goals of this international series of experiments will be discussed as well as our future plans.

Author

Correlators; Data Acquisition; Geodesy

20020061853 Naval Postgraduate School, Monterey, CA USA

Modeling the OH-6A Using FLIGHTLAB and Helicopter Simulator Considerations

Ouellette, Gregory A.; Mar. 2002; 177p; In English; Original contains color images

Report No.(s): AD-A402711; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Recent technological advancements in robust computer hardware, simulation modeling technology, newer electronic actuators and advanced computer graphics have enabled manufacturers to develop low cost, affordable helicopter flight simulators. This thesis presents detailed information on the U.S. Army Hughes OH-6A Cayuse" helicopter together with a comprehensive model of the aircraft suitable for high fidelity simulator modeling. Fidelity of the model is obtained through use of commercial off-the- shelf software that is incorporated in a low-cost flight simulator, which is marketed as FLIGHTLAB. The FLIGHTLAB development system facilitates rapid design and analysis of a high fidelity helicopter model using non-linear dynamic modeling techniques. The simulator model of the Hughes OH-6A helicopter is presented and its fidelity is compared

to actual fight test data conducted at the U.S. Naval Test Pilot School in Patuxent River, MD. Advancements in electromagnetic actuators and visual rendering systems are also presented to provide insight into the direction simulator technology is progressing.
DTIC
Computerized Simulation; Helicopters; Flight Simulators; Applications Programs (Computers); Aircraft Models; Design Analysis; Systems Simulation

20020061855 Boeing Co., Huntington Beach, CA USA
Recent History of Simulator Data Package Progression for a Large Commercial Transport Aircraft: Is There Value in Updating Data Packages?
Lara, Jesus, Boeing Co., USA; Mazzacavallo, Brandon, Boeing Co., USA; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 10.1 - 10.10; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity
This paper endeavours to describe the progression of the simulator data package for the MD-11 commercial aircraft. It discusses the history of the development program for the engineering simulations, the advances and enhancements they have undergone since their inception, and describes in varied detail some of the invaluable capability it has offered to The Boeing Company. It also examines the role the simulator data package has played in the simulator industry and what continued role it will play in the future. This study aims to answer whether there is value in updating and maintaining these simulations and if the training industry can benefit from them.
Author
Simulators; Commercial Aircraft; Computer Programs; Education; MD 11 Aircraft

20020061856 Thales Training and Simulation Ltd., Crawley, UK
The EUCLID 11.13: Realising the Potential of Networked Simulation in Europe
Dumetz, Joelle, Thales Training and Simulation Ltd., UK; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 7.1 - 7.12; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity
The term Synthetic Environment has different meanings to different communities. The UK MoD definition is: ”A Synthetic Environment (SE) links a combination of models, simulations, people and real equipment into a common representation of the world Reference [1] A SE is used to provide consistency and concurrency across previously discrete processes” Experience in constructing and operating complex distributed simulation were gained from previous RTPs (11.2, 11.3, 11.14) and in the UK with programs such as STOW (Synthetic Theater of War) and FOAS SE (Future Offensive Air System). These projects highlighted significant challenges to the widespread use of SEs; in particular, they are expensive and difficult to set up, they are not reUSAble, most legacy simulations cannot be easily networked. There is a lack a Central SE Database; legacy simulations were not designed with collective scenario building in mind. The varying levels of simulation fidelity do not contribute to the homogeneity of scenarios. Euclid 11.13 is a European programme funded by 13 Nations. It was set up with the aim of investigating and providing solutions to the above problems. This paper describes the work conducted to date on developing a process to support the use of synthetic environments. It will focus attention on how the process can be used to develop Air collective training SEs.
Author
Simulation; Education; Warfare; Data Bases

20020061857 Thales Training and Simulation Ltd., Crawley, UK
Tornado: Turning 20th Century Trainers into a 21st Century Service
Aylward, Mark, Thales Training and Simulation Ltd., UK; Talati, Amit, Thales Training and Simulation Ltd., UK; Swift, Adrian, Thales Training and Simulation Ltd., UK; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 3.1 - 3.13; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity
The RAF Tornado GR-1 Full Mission Simulators, designed and developed in the late seventies to support cold war training objectives, were highly advanced for their time. With updates throughout the eighties and nineties they have continued to provide good service. However the advent of the twenty-first century has seen a considerable shift in the global political environment, the consequential change in the operational demands on the aircraft, a major weapon system capability upgrade and the introduction in new concepts in the funding and delivery of synthetic training in the UK. Therefore it was time to re-think and re-engineer the air crew synthetic training solution. Tornado simulators differ from many other fast jet simulators in a number of ways: Crew interaction, resource management and situational awareness in a combat environment are key aspects of the training. The variety and range of tactical sensors and weapon systems fitted to the aircraft is broader than many other fast jets. The

architecture of the aircraft avionics and sensors is an evolutionary mix of the old and the new. These factors, combined with the need to provide enhanced interaction within a geospecific natural and tactical environment, present both significant challenges and constraints to be satisfied by the training system architecture. This paper outlines how the original Tornado GR-1 simulators were re-engineered into the Tornado GR-4 training system that is ready and able to meet both the training and logistic requirements of potentially another 30 years of training service delivery based operation. It will illustrate how both selective technology reuse and technology insertion can be blended to improve the operational utility derived from the training system.
Author
Flight Simulators; Avionics; Education; Resources Management; Situational Awareness; Training Devices

20020061861 Aermacchi S.p.A., Research and Development, Varese Italy
EUCLID RTP 11.12 ”In-Flight Demonstration of Embedded Simulation for Training Purposes On-Board Fighter Aircraft”: Design and Development of an Aircraft Embedded Simulation System
Visintini, Livio, Aermacchi S.p.A., Italy; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 8.1 - 8.8; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

RTP 11.12 is the codename for a EUCLID CEPA 11Research Technology Program (RTP) funded by the Ministries of Defence of five European countries under the framework of the EUCLID MoU. The purpose of the project is to design, implement and demonstrate an on-board embedded simulation system allowing the training of pilots against computer generated forces / adversaries, in a virtual scenario with a simulated threat environment, while flying on a real aircraft. The simulated scenario is focused on air-to-air beyond visual range engagements of fighter aircraft in varying force compositions, in the presence of ground-to-air threats such as SAMs, and using ECM/EPM. The simulation will be wholly autonomous and will allow the trainee to fly a number of different scenarios during the same flight. The system will be integrated onboard the MB339CD aircraft. Its modern fully digital avionics based on a MIL1553 bus and complete design responsibility of AerMacchi make it a perfect platform for this program. In addition, being a two seater, it will allow demonstration flights to pilots without the need for conversion to type. The paper will briefly present the contents and goals of the research program, the contributions of the participating industries, the system design, which is now complete, the integration, and the plans for ground testing and qualification in view of the test and demonstration flights which are planned for the first half of year 2003. Such demonstration flights will involve pilots from each of the five nations funding the project.
Author
Flight Simulators; Aircraft Design; Flight Tests; Pilot Training; Ground Tests; Avionics

20020061862 SimAuthor, Inc., USA
Toward the Development of Advanced Training Management Using Automated Event Detection and Assessment
Bresee, Jerry, SimAuthor, Inc., USA; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 19.1 - 19.6; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

Over the past several years, the aviation industry has developed increasingly sophisticated methods for making use of digital flight data, both from the aircraft and from simulators. The Flight Data Monitoring programs now in use worldwide have taught air carriers how to assess digital flight data for safety purposes. These techniques, when adapted for use with data collected from simulators, show great promise in ”closing the loop” in training, allowing organizations to make use of operational data to adjust training. However, a necessary pre-requisite is extensive research in simulators to identify flight data footprints for specific maneuvers and to validate quantitative standards of performance. This paper outlines an approach to such research, discusses findings of ongoing research programs of this nature, and presents some examples of employing analysis of simulator data in training management. Research approaches both envisioned and presently in use are described, including factor-analytic and regression-based approaches, and the development and validation of a priori standards of performance. The paper concludes with a set of recommendations for implementing data driven training systems in practice.
Author
Data Management; Training Simulators; Education; Data Systems; Digital Data

20020061919 Systems Technology, Inc., Hawthorne, CA USA

Parachute Training and Mission Rehearsal Using a Simulator Synthetic Environment

Hogue, Jeffrey R., Systems Technology, Inc., USA; Allen, R. Wade, Systems Technology, Inc., USA; Markham, Steve, Valentine Technologies Ltd., UK; Schmucker, Cliff, SSK Industries, Inc., USA; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 4.1 - 4.9; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

This paper describes a low cost, virtual reality based parachute maneuvering simulator that has evolved over the years to train a wide range of jumping tasks encountered by smoke jumpers, pilots, airborne troops and special operations personnel. The simulator represents chute deployment, malfunctions, maneuvering, and landing. Recent advancements allow for several jumpers to be networked together for coordinated jumps, and the simulated use of a GPS navigational aid system. This paper discusses the evolution of the simulator capabilities for a range of jumping tasks and situations, including recent enhancements for mission rehearsal and networking.

Author

Parachutes; Simulators; Virtual Reality; Maneuvers

20020061950 CAE Electronics Ltd., Montreal, Quebec Canada

Testing for Training: Applying New Technologies to an Improved Training Readiness

Fedele, Michael, CAE Electronics Ltd., Canada; Burroughs, David, CAE Electronics Ltd., Canada; Gauthier, Richard, CAE Electronics Ltd., Canada; Development in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 18.1 - 18.7; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

At present the most commonly used scheme for the validation of commercial flight simulators is based on unit testing. The engineer first executes a series of unit tests to validate the design. Thereafter, the manufacturers' quality control evaluation test pilot conducts the same series of tests to independently assess the simulator fidelity. Finally, the customer re-executes the same unit testing and, time permitting perhaps some training scenarios to confirm that the flight simulator has been built according to the contractual specifications. In using this approach, most of the testing effort is dedicated to unit level testing, while the customers only spend a portion of their time ensuring training suitability. Should customers and instructor pilots concern themselves with detailed unit level testing? Should they not primarily concern themselves with integrated testing and the overall training suitability of the simulator? Usually instructors and pilots appreciate a well-engineered simulator; but, the real satisfaction is found in being able to execute training that ensures safe operational flying of the aircraft. A solution to achieve this specific satisfaction and to meet the critical operational issues (COI) of simulator operators is to perform "operational testing" during the acceptance phase to validate that simulators ensure proper training. Realizing this solution, without adding additional time to the build schedule for operational testing is not easy. Similarly, one cannot eliminate unit testing and perform only the operational testing. A solution can only be found in maximizing the use of new technologies to change the testing process enabling unit testing, integrated engineering testing, and operational testing without increasing simulator schedule build time. The authors recently defined and developed a hierarchy of platforms for software development and testing. In this hierarchy, system design occurs on an "A" platform that resides within the design engineers' workspace. This design platform is followed by a "B" platform that is the first level using integrated simulations to perform independent integrated unit testing. The "C" platform is the second level independent testing platform. This platform is used to run independent integrated software and hardware engineering testing. Some simulator systems may not be present on the "C" platform such as motion, flight controls and visual; however, a great deal of testing can still be achieved. Finally, the third level of independent testing platform is the full flight simulator (Platform "D"). This platform is used to execute integrated engineering tests that cannot be run on lower level platforms as well as the operational testing. This paper describes the architecture of these platforms and how they can be used for testing as well as the methodologies used to define the unit level, integrated engineering, and operational testing.

Author

Training Simulators; Computer Programs; Flight Simulators; Flight Control; Education

20020061951 Aerospace Man-Machine Systems Consulting, Delft, Netherlands

Integrated Motion Cueing Algorithm and Motion-Based Design for Flight Simulation

Hosman, Ruud, Aerospace Man-Machine Systems Consulting, Netherlands; Advani, Sunjoo, Aircraft Development and Systems Engineering, Netherlands; Haeck, Nils, Haeck (Nils), Netherlands; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 16.1 - 16.12; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85769-192-4; Copyright; Avail: Issuing Activity

A forward design process applicable to the specification of flight simulator cueing systems is presented in this paper. This process is based on the analysis of the pilot vehicle control loop by using a pilot model incorporating both visual and vestibular feedback, and the aircraft dynamics. After substituting the model for the simulated aircraft, the analysis tools are used to adjust the washout filter parameters with the goal of restoring pilot control behaviour. This process allows the specification of the motion cueing algorithm. Then, based on flight files representative for the operational flight envelope, the required motion system space is determined. The motion-base geometry is established based on practical limitations, as well as criteria for the stability of the platform with respect to singular conditions. With this process the characteristics of the aircraft, the tasks to be simulated, and the missions themselves are taken into account in defining the simulator motion cueing system.
Author
Flight Simulators; Flight Characteristics; Aerodynamic Characteristics; Flight Envelopes; Flight Simulation

20020061952 Saab Aerospace, Sweden
The Use of Advanced Simulation in the Development of High Performance Tactical Aircraft Systems
Sjunnesson, Gert, Saab Aerospace, Sweden; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 14.1 - 14.10; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

Saab Aerospace has more than 30 years experience of using advanced system simulators in the development of its high performance aircraft, Viggen and Gripen. In this we have in some aspects been pioneers and even today we are probably using advanced simulators to a higher degree in our development process than most other aerospace companies. The use of simulators played a very significant roll already in the sixties and seventies in the development of the different Viggen versions. In the development of Gripen the simulators has played a decisive role in the development of all major systems of the aircraft as well as the system integration. The presentation will briefly describe how the simulators have evolved during this period and what they have been used for. Most of the presentation will be focused upon our current system development process and the use of various simulators in the different parts of this process. A particular feature of the way the Swedish Air Force and the Swedish industry work together is the continuous enhancement of the aircraft system after initial delivery. In this work there is much focus on functional and software development and this is a process where the use of advanced simulators is very important. This means that at Saab we have a lot of different simulators running to support all the different versions of Viggen and Gripen aircraft operated by the Swedish Air force. One way to achieve efficiency is to have as much as possible in common between different simulators, both regarding hardware and software. to achieve maximum efficiency when using simulators in the development it is important not to use a more sophisticated (read expensive!) simulator than necessary for the different steps in the development process. This is easy to say but difficult to achieve and we have spent a lot of effort in order to improve ourselves in this area. of particular interest is of course the use of simulators for validation and verification and thereby using simulators instead of the more expensive test aircraft. Our achievements and experiences in these including airworthiness aspects will be presented.
Author
Simulators; Aircraft Reliability; Systems Integration; Systems Engineering; Software Engineering

20020061953 BAE Systems, Flight Simulation, Warton UK
Piloted Simulation in Support of Flight Control Design and Clearance
Southworth, Mike, BAE Systems, UK; Hodge, Steve, BAE Systems, UK; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 12.1 - 12.12; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

This paper presents an overview of the simulation process and technology developments carried out by BAE SYSTEMS, in support of aircraft flight control research and development. The paper summarises the design and control challenges of various aircraft projects and how piloted simulation has contributed to the development and clearance of these aircraft. The flight simulator has become an integral part of an overall simulation-based design process and the simulator systems' requirements have been driven by a need to adapt to new engineering tools, processes and cultures. The paper covers a number of these new processes and technology developments in the BAE SYSTEMS simulation facilities at Warton, and how they have improved the effectiveness of the flight simulator in its ability to reduce the overall cost and time-scale of engineering development.
Author
Flight Control; Systems Simulation; Product Development; Flight Simulators

20020061954 United Air Lines, Inc., Denver, CO USA

Ensuring Fidelity Using Visual Warping Techniques

Lindsay, John R., United Air Lines, Inc., USA; Pepper, David W., United Air Lines, Inc., USA; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 17.1 - 17.11; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

During the past two decades, one of the major causes of aircraft accidents has continued to be ”Controlled Flight Into Terrain” (CFIT). In response to this problem, aircraft manufacturers and their component vendors have steadily enhanced onboard equipment to give the pilot more information about the world outside the aircraft. The accurate simulation of real-world terrain, radio aids, and visual topography, therefore, is of critical importance in flight simulation. This new need for accurate simulation of the radio navigation environment has forced a reconsideration of the method used to align visual scenes to radio landing aids. The common method of obtaining alignment between features of the visual scenes and the radio landing aids is by redefining the location of radio navigation stations. We discuss the serious disadvantages of this method and the impact that relocated stations have on the Flight Management Computer. This paper also provides an extensive description of an alternative method of alignment developed by the United Airlines Simulator Engineering Department. This alternate method, called VisWarp, aligns the visual scene by warping (i.e., offsetting) the location of the visual-system eye point. This provides the crew with a visual view that is consistent with the cockpit indications of aircraft location, relative to runways, gates, and other visual features that have locations documented in the published radio navigation database.

Author

Aircraft Accidents; Flight Management Systems; Flight Simulation; Accident Investigation

20020061955 Boeing Commercial Airplane Group, Seattle, WA USA

Boeing 777 Engineering Simulation USAge

Feller, Raymond F., Boeing Commercial Airplane Group, USA; Wang, David S., Boeing Commercial Airplane Group, USA; Development in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 15.1 - 15.9; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

Engineering simulation played an essential role during the development of the Boeing 777 airplane. This paper presents an overview of the set of simulation models that were developed for the 777 airplane program and discusses the various environments in which the engineering simulation was used. The paper focuses on a typical simulation model, the Hydraulic System, and demonstrates how effectively it was used during system integration. Included in the discussion is a description of the hydraulic simulation model, how it was structured, what its capabilities were, how it was used for engineering studies, and how well it matched airplane performance data.

Author

Aircraft Performance; Simulation; Systems Integration; Hydraulic Equipment

20020061956 QinetiQ Ltd., Bedford UK

The Use of Simulation in the VAAC Programme

Brook, Martin, QinetiQ Ltd., UK; DMello, Glenn, QinetiQ Ltd., UK; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 13.1 - 13.7; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

Over the past decade, the VAAC Harrier has played a pivotal role in researching advanced technologies for STOVL guidance and control. The aircraft, a modified two-seat trainer equipped with a digital fly-by-wire FCS with mechanical back-up, has been designed from the outset to allow these technologies to be validated safely but without the prohibitive costs associated with flight-critical software. However, to make the most effective use of flight-test time, ground-based simulation is still widely employed in a variety of roles. This paper begins with an introduction to the research carried out with the VAAC Harrier, listing some of the most significant milestones. Next, a brief overview of the key simulation facilities at QinetiQ Bedford is provided. This leads into a detailed discussion on how simulation is used to support the research in a wide variety of ways. Finally, before concluding, the paper describes how an integrated development environment has been implemented to unify the application development process, allowing software to be taken from the initial design and analysis phase, through to ground-based simulation and then into flight, with minimal effort and cost. List of Acronyms AFS Advanced Flight Simulator CLC Control Law Computer FCC Flight Control Computer FCS Flight Control System GPS Global Positioning System HDD Head Down Display HUD Head-Up Display IDE Integrated Development Environment IM Independent Monitor INS Inertial Navigation System RTADS Real Time Algorithm Development System RTAVS Real Time All Vehicle Simulator SNU Standard Navigation Unit STOVL

Short Take-Off and Vertical Landing TRC Translational Rate Command VAAC Vectored-thrust Aircraft Advanced flight Control WEM Wide Envelope Model
Author
Flight Simulators; Harrier Aircraft; Training Devices; Design Analysis; Flight Control

20020061969 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
Radiatively Driven Hypersonic Wind Tunnel ***Final Report, 1 Aug. 1992-27 Jul. 1999***
Miles, Richard B.; Brown, Garry L.; May 2002; 17p; In English
Contract(s)/Grant(s): F33615-96-C-3001; Proj-2404
Report No.(s): AD-A403037; AFRL-VA-WP-TM-2002-3048; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Work conduced from August 1, 1992 until November 30,1996 under support from the Air Force Arnold Engineering Development Center (AEDC), followed by continuing support from the Air Force Research Laboratory through September 30, 1998, established the foundation for the development of a new concept which is expected to extend the range of practical hypersonic wind tunnel testing from approximately Mach 8 to Mach 12 and beyond.
DTIC
Hypersonic Wind Tunnels; Wind Tunnel Tests; Test Facilities

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.

20020059973 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The VSOP-2 Space VLBI Mission
Hirabayashi, Hisashi, Institute of Space and Astronautical Science, Japan; Murata, Yasuhiro, Institute of Space and Astronautical Science, Japan; Murphy, David W., Jet Propulsion Lab., California Inst. of Tech., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 171-174; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
Following the success of the VLBI Space Observatory Program (VSOP), a next generation space VLBI mission, VSOP-2, is currently being planned. Higher observing frequencies, cooled receivers, increased bandwidths and larger telescope diameters will result in gains in resolution and interferometer sensitivity by factors of 10 over the VSOP mission. The use of phase-referencing by fast switching between a calibrator source and the target source is now being studied as this technique allows sources 50-150 times weaker to be observed depending on the frequency band. Such a capability would greatly enhance the VSOP-2 mission. Several other enhancements to the VSOP-2 mission are also presently under investigation including the VSOP-2 spacecraft operating at the same time as a US spacecraft to form what has come to be known as the iARISE (international ARISE) mission.
Author
Very Long Base Interferometry; Astronomical Observatories; Astronomical Satellites

20020060464 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Microwave Anisotropy Probe (MAP) Mission
Markley, F. Landis, NASA Goddard Space Flight Center, USA; Andrews, Stephen F., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; Ward, David K., NASA Goddard Space Flight Center, USA; Ericsson, Aprille J., NASA Goddard Space Flight Center, USA; [2002]; 7p; In English; AIAA Guidance and Control Conference, Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Microwave Anisotropy Probe mission is designed to produce a map of the cosmic microwave background radiation over the entire celestial sphere by executing a fast spin and a slow precession of its spin axis about the Sun line to obtain a highly interconnected set of measurements. The spacecraft attitude is sensed and controlled using an Inertial Reference Unit, two Autonomous Star Trackers, a Digital Sun Sensor, twelve Coarse Sun Sensors, three Reaction Wheel Assemblies, and a propulsion

system. This paper describes the design of the attitude control system that carries out this mission and presents some early flight experience.
Author
Satellite Attitude Control; Control Systems Design; Microwave Probes; Satellite Instruments

20020060778 NASA Ames Research Center, Moffett Field, CA USA
The Pioneer Missions
Lasher, Larry E., NASA Ames Research Center, USA; Dec. 01, 1999; 1p; In English
Contract(s)/Grant(s): RTOP 370-24-00; No Copyright; Avail: Issuing Activity; Abstract Only

This article describes the major achievements of the Pioneer Missions and gives information about mission objectives, spacecraft, and launches of the Pioneers. Pioneer was the USA' longest running space program. The Pioneer Missions began forty years ago. Pioneer 1 was launched shortly after Sputnik startled the world in 1957 as Earth's first artificial satellite at the start of the space age. The Pioneer Missions can be broken down into four distinct groups: Pioneer (PN's) 1 through 5, which comprise the first group - the "First Pioneers" - were launched from 1958 through 1960. These Pioneers made the first thrusts into space toward the Moon and into interplanetary orbit. The next group - the "Interplanetary Pioneers" - consists of PN's 6 through 9, with the initial launch being in 1965 (through 1968); this group explored inward and outward from Earth's orbit and travel in a heliocentric orbit around the Sun just as the Earth. The Pioneer group consisting of 10 and 11 - the "Outer Solar System Pioneers" - blazed a trail through the asteroid belt and was the first to explore Jupiter, Saturn and the outer Solar System and is seeking the borders of the heliosphere and will ultimately journey to the distant stars. The final group of Pioneer 12 and 13 the "Planetary Pioneers" - traveled to Earth's mysterious twin, Venus, to study this planet.
Author
Pioneer Space Probes; Pioneer Project; Spacecraft Launching; Space Exploration; Pioneer Venus Spacecraft

20020061283 NASA Ames Research Center, Moffett Field, CA USA
Aerothermal Effects of Cavities and Protuberances for High-Speed Sample Return Capsules
Olynick, David, NASA Ames Research Center, USA; Kontinos, Dean, Thermoscience Inst., USA; [1998]; 5p; In English; 37th AIAA Aerospace Sciences Meeting and Exhibit, 11-14 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 865-10-05; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Extraterrestrial sample return is a growing component of solar system exploration. Currently, four missions, Stardust, 1 Muses-C, 2 Genesis, and Mars Sample Return, are under development that employ sample return as a prime component of the mission architecture. Respectively, these missions will return samples from the tail of a comet, an asteroid, the solar wind, and, Mars. An important component of these missions and the focus of this paper is the design of the sample return capsule (SRC). The purpose of the SRC is to safely return to Earth any gathered samples for terrestrial analysis. The two major design constraints for any SRC are as follows: 1) it must be able to survive a high-speed Earth entry (11 km/s to as a high as 15 km/s), 2) the mass of the SRC must be as small as possible. Because the SRC mass is carried from Earth to the sample sight and back, the SRC mass is a strong driver in the mission mass budget. Further, for the Mars Sample Return Capsule, planetary protection is another constraint. For this capsule, the probability of planetary contamination at Earth due to an SRC failure at entry must be minimal. For an SRC, a possible failure mechanism is severe local heating as a result of cavities and or protuberances in the SRC forebody heatshield. For example, the Apollo Command Module had a number of cavities and protuberances as part of the baseline designs Wind-tunnel tests of models containing small cavities and protuberances showed severe local heating augmentations in the vicinity of these surface discontinuities.4-5 As another example, the Genesis SRC forebody heat-shield contains penetrations (cavities) to mount the vehicle to the carrier bus. It is expected that these penetrations will also experience a severe local heating environment. A concern is that the large thermal gradients may produce sufficient thermal stress to cause local mechanical failure of the heatshield. Penetrations to the forebody heat-shield can also result from damage at vehicle integration, during launch, or during transportation of the sample return capsule from earth to the sample site and back. For example, the Starting SRC was damaged near the shoulder during the heatshield integration process producing a local surface discontinuity. Also, the Starting SRC traverses through the tail of a comet and is in space for 7 years. Thus, damage to the heatshield as a result of micrometeroid impact is a concern. Finally, it is difficult to characterize the effects of these potential heatshield singularities with ground-test facilities. Either detailed simulation or a dedicated flight test is required.
Derived from text
Aerothermodynamics; Temperature Effects; Cavities; Protuberances; High Speed; Return to Earth Space Flight; Heat Shielding

20020061300 NASA, Washington, DC USA

Aerospace Safety Advisory Panel ***Annual Report, 2000***

[2001]; 110p; In English; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This annual report is based on the activities of the Aerospace Safety Advisory Panel in calendar year 2000. During this year, the construction of the International Space Station (ISS) moved into high gear. The launch of the Russian Service Module was followed by three Space Shuttle construction and logistics flights and the deployment of the Expedition One crew. Continuous habitation of the ISS has begun. to date, both the ISS and Space Shuttle programs have met or exceeded most of their flight objectives. In spite of the intensity of these efforts, it is clear that safety was always placed ahead of cost and schedule. This safety consciousness permitted the Panel to devote more of its efforts to examining the long-term picture. With ISS construction accelerating, demands on the Space Shuttle will increase. While Russian Soyuz and Progress spacecraft will make some flights, the Space Shuttle remains the primary vehicle to sustain the ISS and all other U.S. activities that require humans in space. Development of a next generation, human-rated vehicle has slowed due to a variety of technological problems and the absence of an approach that can accomplish the task significantly better than the Space Shuttle. Moreover, even if a viable design were currently available, the realities of funding and development cycles suggest that it would take many years to bring it to fruition. Thus, it is inescapable that for the foreseeable future the Space Shuttle will be the only human-rated vehicle available to the U.S. space program for support of the ISS and other missions requiring humans. Use of the Space Shuttle will extend well beyond current planning, and is likely to continue for the life of the ISS.

Derived from text

Aerospace Safety; International Space Station; Space Transportation System Flights; Space Programs; Space Shuttles

20020061933 Atmospheric and Environmental Research, Inc., Cambridge, MA USA

Strategic High Altitude Infrared Backgrounds

Gallery, William O.; Moncet, Jean-Luc; Snell, Hillary E.; Oct. 1998; 50p; In English

Contract(s)/Grant(s): F19628-93-C-0040; Proj-S321

Report No.(s): AD-A402952; AFRL-VS-HA-TR-98-0127; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This work describes the work done during the first year of a contract to analyze and model data from high altitude background measurements. The contract has five separate tasks: 1. MSX (Midcourse Space Experiment) Data Analysis; 2.1 Trace Species in Modtran; 2.2 Radiance Inversion Techniques; 2.3 Mesospheric Radiance Model; 2.4 FAScode for the Environment (FASE). In Task 1, techniques for analyzing data from the MSX are developed, including developing experiment plans, developing software for the automated analysis of data from visible and ultraviolet imagers, and developing techniques for correlating data from meteorological satellites with MSX data. In Task 2.2, a package for the general inversion for advanced retrieval of atmospheric species from high spectral resolution measurements is described. In Task 2.4, progress in the development of the line-by-line atmospheric transmittance/radiance program FASE (FAScode for the Environment) is described.

DTIC

Data Processing; Space Surveillance; High Altitude Tests; Background Radiation

20020061977 NASA Glenn Research Center, Cleveland, OH USA

Effect of Adventitious Carbon on the Environmental Degradation of SiC/BN/SiC Composites

Ogbuji, L. U. J. T., QSS Group, Inc., USA; Yun, H. M., Cleveland State Univ., USA; DiCarlo, J., NASA Glenn Research Center, USA; April 2002; 12p; In English; Seventh Conference on Interphase Phenomena in Composite Materials, 9-14 Sep. 2001, Arcachon, France; Sponsored by Interphase Phenomena in Composite Materials, Unknown

Contract(s)/Grant(s): RTOP 714-04-13

Report No.(s): NASA/TM-2002-211494; NAS 1.15:211494; E-13262; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pesting remains a major obstacle to the application of SiC/SiC composites in engine service and selective degradation of the boron nitride interphase at intermediate temperatures is of primary concern. However, significant progress has been made on interphase improvement recently and we now know more about the phenomenon and ways to suppress it. by screening SiC/BN/SiC materials through characterization of strength and microstructures after exposure in a burner rig, some factors that control pesting in these composites have been determined. A key precaution is careful control of elemental carbon presence in the interphase region.

Author

Boron Nitrides; Microstructure; Ceramic Matrix Composites; Degradation

13
ASTRODYNAMICS

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

20020060774 NASA Goddard Space Flight Center, Greenbelt, MD USA
GPS-Based Navigation and Orbit Determination for the AMSAT Phase 3D Satellite
Davis, George, Emergent Technologies Corp., USA; Carpenter, Russell, NASA Goddard Space Flight Center, USA; Moreau, Michael, NASA Goddard Space Flight Center, USA; Bauer, Frank H., NASA Goddard Space Flight Center, USA; Long, Anne, Computer Sciences Corp., USA; Kelbel, David, Computer Sciences Corp., USA; Martin, Thomas, Van Martin Consulting, Inc., USA; [2002]; 11p; In English; AIAA GN&C Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS5-01090; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper summarizes the results of processing GPS data from the AMSAT Phase 3D (AP3) satellite for real-time navigation and post-processed orbit determination experiments. AP3 was launched into a geostationary transfer orbit (GTO) on November 16, 2000 from Kourou, French Guiana, and then was maneuvered into its HEO over the next several months. It carries two Trimble TANS Vector GPS receivers for signal reception at apogee and at perigee. Its spin stabilization mode currently makes it favorable to track GPS satellites from the backside of the constellation while at perigee, and to track GPS satellites from below while at perigee. to date, the experiment has demonstrated that it is feasible to use GPS for navigation and orbit determination in HEO, which will be of great benefit to planned and proposed missions that will utilize such orbits for science observations. It has also shown that there are many important operational considerations to take into account. For example, GPS signals can be tracked above the constellation at altitudes as high as 58000 km, but sufficient amplification of those weak signals is needed. Moreover, GPS receivers can track up to 4 GPS satellites at perigee while moving as fast as 9.8 km/sec, but unless the receiver can maintain lock on the signals long enough, point solutions will be difficult to generate. The spin stabilization of AP3, for example, appears to cause signal levels to fluctuate as other antennas on the satellite block the signals. As a result, its TANS Vectors have been unable to lock on to the GPS signals long enough to down load the broadcast ephemeris and then generate position and velocity solutions. AP3 is currently in its eclipse season, and thus most of the spacecraft subsystems have been powered off. In Spring 2002, they will again be powered up and AP3 will be placed into a three-axis stabilization mode. This will significantly enhance the likelihood that point solutions can be generated, and perhaps more important, that the receiver clock can be synchronized to GPS time. This is extremely important for real-time and post-processed orbit determination, where removal of receiver clock bias from the data time tags is needed, for time-tagging of science observations. Current analysis suggests that the inability to generate point solutions has allowed the TANS Vector clock bias to drift freely, being perhaps as large as 5-7 seconds by October, 2001, thus causing up to 50 km of along-track orbit error. The data collected in May, 2002 while in three-axis stabilized mode should provide a significant improvement in the orbit determination results.
Author
Global Positioning System; Orbit Determination; Spin Stabilization; Real Time Operation

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20020059955 Norwegian Mapping Authority, Honefoss, Norway
Foot-Print of the Space-Geodetic Observatory, Ny-Alesund, Svalbard
Kierulf, Halfdan P., Norwegian Mapping Authority, Norway; Bockmann, Lars, Norwegian Mapping Authority, Norway; Kristiansen, Oddgeir, Norwegian Mapping Authority, Norway; Plag, Hans-Peter, Norwegian Mapping Authority, Norway; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 86-90; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The Space-Geodetic Observatory at Ny-Alesund, Svalbard, which is operated by the Norwegian Mapping Authority, has developed over recent years into a fundamental geodetic station. At such fundamental sites, detailed knowledge of the stability of the station, both locally and with respect to the region, is essential for geodetic and geophysical applications of the observations. The extensive foot-print study for the observatory includes repeated CPS campaigns on a 50 km by 30 km control network and

repeated classical surveys of the inner control network extending 400 m by 40 m. The results from the CPS campaigns indicate neo-tectonic movements in the vicinity of the observatory.
Author
Astronomical Observatories; Global Positioning System; Stability; Tectonics

20020059961 Communications Research Lab., Tokyo, Japan
Status of the KSP VLBI Stations and IMT-2000 Interference
Amagai, Jun, Communications Research Lab., Japan; Kiuchi, Hitoshi, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Sekido, Mamoru, Communications Research Lab., Japan; Ichikawa, Ryuichi, Communications Research Lab., Japan; Kondo, Tetsuro, Communications Research Lab., Japan; Yoshino, Taizoh, Communications Research Lab., Japan; Sebata, Koichi, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 117-119; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
Two Keystone project (KSP) VLBI stations operated by the Communications Research Laboratory (CRL) have been closed, and the antennas and facilities have been moved to Hokkaido and Gifu Universities. VLBI observation at the Koganei station revealed radio interference at 2.14 GHz. The source of the interference was found to be IMT-2000 signal.
Author
Radio Frequency Interference; Very Long Base Interferometry; Astronomical Observatories

20020059962 Finnish Geodetic Inst., Helsinki, Finland
Metsahovi Geodetic VLBI Station: Status Report
Paunonen, Matti, Finnish Geodetic Inst., Finland; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 120; In English; Also announced as 20020059943; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
The astronomical VLBI system of the Metsahovi Radio Observatory of the Helsinki University of Technology is being upgraded also for geodetic work by adding five baseband converters, a cooled S/X receiver, a removable subreflector and the cable delay and phase calibration units. The station is situated 40 km west from Helsinki. The Cassegrain telescope with a radome has a primary paraboloid dish with a diameter of 13.7 m and a focal length of 5.08 m, and a removable secondary mirror (a hyperboloid with a diameter of 1.7 m, an eccentricity of 1.5562, and an interfocal distance of 3.17 m) to be constructed from carbon fiber reinforced plastic. The cooled, axially positioned and removable, S/X receiver (15 K) and feed will be constructed by a Spanish company TTINorte. The cable delay calibrator will be of own design and the existing antenna unit for phase calibration is from Istituto di Radioastronomia, Italia. The existing data acquisition terminal is of type VLBA4. The estimated position of the antenna in ITRF2000 (Epoch 1997.0) is according to the survey in 1994: x = 2892585.59, y = 1311715.33, z = 5512639.81. The name METS 7601 in the IERS ITRF2000 VLBI catalog refers to the site named Sjokulla about 3 km North, where a mobile MV-3 instrument took five one-day-long observations in 1989. The geodetic VLBI system will be an important addition to the existing space geodetic and related instrumentation at the Metsahovi Geodetic Observatory of the Finnish Geodetic Institute (GPS, GLONASS, SLR, DORIS, a superconducting gravimeter, an absolute gravimeter, and a seismometer). Initial test measurements are expected within this year.
Author
Geodesy; Astronomical Observatories; Radio Telescopes; Very Long Base Interferometry

20020060543 NASA Goddard Space Flight Center, Greenbelt, MD USA
ReUSAble Autonomy
Truszkowski, Walt, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; SpaceOps, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Currently, spacecraft ground systems have a well defined and somewhat standard architecture and operations concept. Based on domain analysis studies of various control centers conducted over the years it is clear that ground systems have core capabilities and functionality that are common across all ground systems. This observation alone supports the realization of reuse. Additionally, spacecraft ground systems are increasing in their ability to do things autonomously. They are being engineered using advanced expert systems technology to provide automated support for operators. A clearer understanding of the possible roles of agent technology is advancing the prospects of greater autonomy for these systems. Many of their functional and management tasks are or could be supported by applied agent technology, the dynamics of the ground system's infrastructure could be monitored by agents, there are intelligent agent-based approaches to user-interfaces, etc. The premise of this paper is that the concepts associated with software reuse, applicable in consideration of classically-engineered ground systems, can be updated

to address their application in highly agent-based realizations of future ground systems. As a somewhat simplified example consider the following situation, involving human agents in a ground system context. Let Group A of controllers be working on Mission X. They are responsible for the command, control and health and safety of the Mission X spacecraft. Let us suppose that mission X successfully completes it mission and is turned off. Group A could be dispersed or perhaps move to another Mission Y. In this case there would be reuse of the human agents from Mission X to Mission Y. The Group A agents perform their well-understood functions in a somewhat but related context. There will be a learning or familiarization process that the group A agents go through to make the new context, determined by the new Mission Y, understood. This simplified scenario highlights some of the major issues that need to be addressed when considering the situation where Group A is composed of software-based agents (not their human counterparts) and they migrate from one mission support system to another. This paper will address: - definition of an agent architecture appropriate to support reuse; - identification of non-mission-specific agent capabilities required; - appropriate knowledge representation schemes for mission-specific knowledge; - agent interface with mission-specific knowledge (a type of Learning); development of a fully-operational group of cooperative software agents for ground system support; architecture and operation of a repository of reUSAble agents that could be the source of intelligent components for realizing an autonomous (or nearly autonomous) agent-based ground system, and an agent-based approach to repository management and operation (an intelligent interface for human use of the repository in a ground-system development activity).
Author
Autonomy; Software Reuse; Command and Control; Expert Systems

20020060546 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Virtual Mission Operations Center: Collaborative Environment
Medina, Barbara, NASA Goddard Space Flight Center, USA; Bussman, Marie, Booz-Allen and Hamilton, Inc., USA; [2002]; 1p; In English; SpaceOps 2002, 9-12 Oct. 2002, Houston, TX, USA
Contract(s)/Grant(s): NASA Order S-43979-G; No Copyright; Avail: Issuing Activity; Abstract Only

The Virtual Mission Operations Center - Collaborative Environment (VMOC-CE) intent is to have a central access point for all the resources used in a collaborative mission operations environment to assist mission operators in communicating on-site and off-site in the investigation and resolution of anomalies. It is a framework that as a minimum incorporates online chat, realtime file sharing and remote application sharing components in one central location. The use of a collaborative environment in mission operations opens up the possibilities for a central framework for other project members to access and interact with mission operations staff remotely. The goal of the Virtual Mission Operations Center (VMOC) Project is to identify, develop, and infuse technology to enable mission control by on-call personnel in geographically dispersed locations. In order to achieve this goal, the following capabilities are needed: Autonomous mission control systems Automated systems to contact on-call personnel Synthesis and presentation of mission control status and history information Desktop tools for data and situation analysis Secure mechanism for remote collaboration commanding Collaborative environment for remote cooperative work The VMOC-CE is a collaborative environment that facilitates remote cooperative work. It is an application instance of the Virtual System Design Environment (VSDE), developed by NASA Goddard Space Flight Center's (GSFC) Systems Engineering Services & Advanced Concepts (SESAC) Branch. The VSDE is a web-based portal that includes a knowledge repository and collaborative environment to serve science and engineering teams in product development. It is a "one stop shop" for product design, providing users real-time access to product development data, engineering and management tools, and relevant design specifications and resources through the Internet. The initial focus of the VSDE has been to serve teams working in the early portion of the system/product lifecycle - concept development, proposal preparation, and formulation. The VMOC-CE expands the application of the VSDE into the operations portion of the system lifecycle. It will enable meaningful and real-time collaboration regardless of the geographical distribution of project team members. Team members will be able to interact in satellite operations, specifically for resolving anomalies, through access to a desktop computer and the Internet. Mission Operations Management will be able to participate and monitor up to the minute status of anomalies or other mission operations issues. In this paper we present the VMOC-CE project, system capabilities, and technologies.
Author
Systems Engineering; Automatic Control; Information Analysis; Engineering Management; Design Analysis; Data Management

20020061966 NASA Ames Research Center, Moffett Field, CA USA
Facility Concepts for Mars Returned Sample Handling
Cohen, Marc M., NASA Ames Research Center, USA; [2001]; 1p; In English; 32nd International Conference on Environmental Systems, July 2002, San Antonio, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Samples returned from Mars must be held in quarantine until their biological safety has been determined. A significant challenge, unique to NASA's needs, is how to contain the samples (to protect the blaspheme) while simultaneously protecting their

pristine nature. This paper presents a comparative analysis of several quarantine facility concepts for handling and analyzing these samples. The considerations in this design analysis include: modes of manipulation; capability for destructive as well as non-destructive testing; avoidance of cross-contamination; linear versus recursive processing; and sample storage and retrieval within a closed system. The ability to rigorously contain biologically hazardous materials has been amply demonstrated by facilities that meet the specifications of the Center for Disease Control Biosafety Level 4. The newly defined Planetary Protection Level Alpha must provide comparable containment while assuring that the samples remain pristine; the latter requirement is based on the need to avoid compromising science analyses by instrumentation of the highest possible sensitivity (among other things this will assure that there is no false positive detection of organisms or organic molecules - a situation that would delay or prevent the release of the samples from quarantine). Protection of the samples against contamination by terrestrial organisms and organic molecules makes a considerable impact upon the sample handling facility. The use of glove boxes appears to be impractical because of their tendency to leak and to surges. As a result, a returned sample quarantine facility must consider the use of automation and remote manipulation to carry out the various functions of sample handling and transfer within the system. The problem of maintaining sensitive and bulky instrumentation under the constraints of simultaneous sample containment and contamination protection also places demands on the architectural configuration of the facility that houses it.
Author
Mars Surface Samples; Handling Equipment; Contamination; Nondestructive Tests; Design Analysis; Planetary Quarantine; Planetary Protection; Containment

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.

20020060129 NASA Lewis Research Center, Cleveland, OH USA
Performance Charts for Multistage Rocket Boosters
MacKay, John S., NASA Lewis Research Center, USA; Weber, Richard J., NASA Lewis Research Center, USA; January 1961; 92p; In English
Report No.(s): NASA-TN-D-582; E-799; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Charts relating the stage propellant fractions are given for two-and three-stage rockets launching payloads into nominal low-altitude circular orbits about the earth. A simple method is described for extending these data to higher orbit or escape missions. Various combinations of stages using RP - liquid-oxygen and hydrogen - liquid-oxygen propellants are considered. However, the results can be generalized with little error to any other propellant combination.Charts relating the stage propellant fractions are given for two-and three-stage rockets launching payloads into nominal low-altitude circular orbits about the earth. A simple method is described for extending these data to higher orbit or escape missions. Various combinations of stages using RP - liquid-oxygen and hydrogen - liquid-oxygen propellants are considered. However, the results can be generalized with little error to any other propellant combination.
Author
Performance Prediction; Booster Rocket Engines; Charts; Propellants

20020061728 NASA Glenn Research Center, Cleveland, OH USA
Performance Validation Approach for the GTX Air-Breathing Launch Vehicle
Trefny, Charles J., NASA Glenn Research Center, USA; Roche, Joseph M., NASA Glenn Research Center, USA; April 2002; 26p; In English; Combustion, Airbreathing Propulsion, Propulsion Systems Hazards and Modelling and Simulation Subcommittee Joint Meeting, 8-12 Apr. 2002, Destin, FL, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): RTOP 708-90-63
Report No.(s): NASA/TM-2002-211495; E-13263; NAS 1.15:211495; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The primary objective of the GTX effort is to determine whether or not air-breathing propulsion can enable a launch vehicle to achieve orbit in a single stage. Structural weight, vehicle aerodynamics, and propulsion performance must be accurately known over the entire flight trajectory in order to make a credible assessment. Structural, aerodynamic, and propulsion parameters are strongly interdependent, which necessitates a system approach to design, evaluation, and optimization of a single-stage-to-orbit concept. The GTX reference vehicle serves this purpose, by allowing design, development, and validation of components and subsystems in a system context. The reference vehicle configuration (including propulsion) was carefully chosen so as to provide

high potential for structural and volumetric efficiency, and to allow the high specific impulse of air-breathing propulsion cycles to be exploited. Minor evolution of the configuration has occurred as analytical and experimental results have become available. With this development process comes increasing validation of the weight and performance levels used in system performance determination. This paper presents an overview of the GTX reference vehicle and the approach to its performance validation. Subscale test rigs and numerical studies used to develop and validate component performance levels and unit structural weights are outlined. The sensitivity of the equivalent, effective specific impulse to key propulsion component efficiencies is presented. The role of flight demonstration in development and validation is discussed.
Author
Launch Vehicles; Air Breathing Engines; Design Optimization; Orbits; Systems Engineering; Flight Tests; Structural Design

20020061913 Lembaga Penerbangan dan Antariksa Nasional, Bidang Analisis Sistem Kedirgantaraan, Jakarta, Indonesia
Comparison of the Fixed and Mobile Launch Site Systems ***Komparasi Sistem Stasiun Peluncuran Tetap (Fixed) dan Bergerak (Mobile)***
Nasution, Husni, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Zainuddin, Lutfi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 164-175; In Malay-Indonesian; Copyright; Avail: Issuing Activity
Presently, many countries have launch sites. They are used as places to launch their satellites and other countries' satellites for commercial launch services. Until the middle of nineties, all of the launch sites system belong to the fixed system. by growing of the launch market demand, four private industries from some countries (USA, Russia, Ukraine, and England) have built and operated mobile launch site system together. The launch site system is called Sea Launch, operated for the first time on March 27, 1999. This paper will analyze the comparison of the fixed and mobile launch site systems. The results can be used as a part of material input related to development and operation a launch site. The analysis result show that the fixed launch site systems have more capabilities than the mobile one.
Author
Launching Sites; Spacecraft Launching; Space Transportation

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.

20020061904 Physics and Electronics Lab. TNO, The Hague, Netherlands
Data Flow Process in UAV Missions ***Final Report***
Cambien, K. P. H., Physics and Electronics Lab. TNO, Netherlands; Visser, B. J., Physics and Electronics Lab. TNO, Netherlands; vanderVeen, E. M., Physics and Electronics Lab. TNO, Netherlands; March 2002; 78p; In English; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/679; TNO Proj. 015.31088
Report No.(s): TD01-0261; FEL-01-A078; Copyright; Avail: Issuing Activity
One of the issues of extensively using UAVs for military applications is the data flow process, often referred to as the datalink problem. In short, the problem refers to the conflict between the increasing amount of data that becomes available because of the growing numbers of UAVs and their sensors, and the technical limitations that exist to handle this data. Technical limitations concern the entire process from data collection and storage, through processing and transmission to data dissemination and use, but also the restrictions on the platform itself, i.e. maximum payload and available space. This report describes the entire data flow process and the-different considerations that have to be taken into account.
Author
Data Links; Pilotless Aircraft; Information Flow

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.

20020059975 Graduate Univ. for Advanced Studies, Japan
Precise Positioning of Spacecrafts by Multi-Frequency VLBI
Kono, Yusuke, Graduate Univ. for Advanced Studies, Japan; Hanada, Hideo, National Astronomical Observatory, Japan; Iwadate, Kenzaburo, National Astronomical Observatory, Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Fukuzaki, Yoshihiro, Geographical Survey Inst., Japan; Kawano, Nobuyuki, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 179-183; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Multi-Frequency VLBI (MFV) is one of the most powerful methods for precise, positioning of spacecraft. Radio sources for MFV transmit three carrier waves at S-band and one wave at X-band. These frequencies are set to resolve the cycle ambiguity of the carrier wave at X-band from the two group delays between carrier waves at S-band. A procedure to resolve the cycle ambiguity is proposed. Some conditions about frequency variation and prediction of position and the ionosphere are also summarized for resolving cycle ambiguities. The dedicated recording system for MFV is also developed. A preliminary observation of MFV is carried out with this system by using Lunar Prospector. As a result of the experiment, residual phases from predicted ones are within about 1000 degrees, and the RMS of the residual for the period of several seconds is about 4 degrees, which corresponds to 1.5 m in the positioning error around the Moon. It is confirmed that the hardware and software system have enough availability to achieve the expected accuracy in MFV.
Author
Carrier Waves; Positioning; Superhigh Frequencies; Very Long Base Interferometry

20020060221 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Microwave Anisotropy Probe (MAP): Guidance, Navigation, and Control Hardware Suite
Ward, David K., NASA Goddard Space Flight Center, USA; Davis, Gary T., NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; AIAA Guidance and Control Conference, August 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Microwave Anisotropy Probe (MAP) was launched June 30, 2001 to create an all-sky map of the Cosmic Microwave Background. The mission's hardware suite included two Lockheed Martin AST-201 star trackers, two Kearfott Two-Axis Rate Assemblies (TARAs) mounted to provide X, Y and redundant Z-axis rates, two Adcole Digital Sun Sensor (DSS) heads sharing one set of electronics, twelve Adcole Coarse Sun Sensor (CSS) eyes, three Ithaco E-sized Reaction Wheel Assemblies (RWAs), and a Propulsion Subsystem that employed eight PRIMEX Rocket Engine Modules (REMs). This hardware has allowed MAP to meet its various Orbit and Attitude Control Requirements, including performing a complex zero-momentum scan, meeting its attitude determination requirements, and maintaining a trajectory that places MAP in a lissajous orbit around the second Sun-Earth Lagrange point (L2) via phasing loops and a lunar gravity assist. Details of MAP's attitude determination, attitude control, and trajectory design are presented separately. This paper will focus on the performance of the hardware components mentioned above, as well as the significant lessons learned through the use of these components. An emphasis will be placed on spacecraft design modifications that were needed to accommodate existing hardware designs into the MAP Observatory design.
Derived from text
Satellite Attitude Control; Satellite Guidance; Microwave Probes; Satellite Navigation Systems; Satellite Instruments

20020060507 NASA Goddard Space Flight Center, Greenbelt, MD USA
Characterization of the Twelve Channel 100/140 Micron Optical Fiber, Ribbon Cable and MTP Array Connector Assembly for Space Flight Environments
Ott, Melanie N., Sigma Research and Engineering Corp., USA; Macmurphy, Shawn, Sigma Research and Engineering Corp., USA; Friedberg, Patricia, NASA Goddard Space Flight Center, USA; [2002]; 20p; In English; SPIE's Aerospace 2002 Meeting, 1-3 Apr. 2002, Unknown; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Presented here is the second set of testing conducted by the Technology Validation Laboratory for Photonics at NASA Goddard Space Flight Center on the 12 optical fiber ribbon cable with MTP array connector for space flight environments. In the

first set of testing the commercial 62.5/125 cable assembly was characterized using space flight parameters. The testing showed that the cable assembly would survive a typical space flight mission with the exception of a vacuum environment. Two enhancements were conducted to the existing technology to better suit the vacuum environment as well as the existing optoelectronics and increase the reliability of the assembly during vibration. The MTP assembly characterized here has a 100/140 optical commercial fiber and non outgassing connector and cable components. The characterization for this enhanced fiber optic cable assembly involved vibration, thermal and radiation testing. The data and results of this characterization study are presented which include optical in-situ testing.
Author
Assemblies; Characterization; Electric Wire; Performance Tests; Optical Fibers

20020060665 NASA Goddard Space Flight Center, Greenbelt, MD USA
Development of a Two-Wheel Contingency Mode for the MAP Spacecraft
Starin, Scott R., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; [2002]; 6p; In English; AIAA Guidance and Control Conference, Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the event of a failure of one of MAP's three reaction wheel assemblies (RWAs), it is not possible to achieve three-axis, full-state attitude control using the remaining two wheels. Hence, two of the attitude control algorithms implemented on the MAP spacecraft will no longer be USAble in their current forms: Inertial Mode, used for slewing to and holding inertial attitudes, and Observing Mode, which implements the nominal dual-spin science mode. This paper describes the effort to create a complete strategy for using software algorithms to cope with a RWA failure. The discussion of the design process will be divided into three main subtopics: performing orbit maneuvers to reach and maintain an orbit about the second Earth-Sun libration point in the event of a RWA failure, completing the mission using a momentum-bias two-wheel science mode, and developing a new thruster-based mode for adjusting the inertially fixed momentum bias. In this summary, the philosophies used in designing these changes is shown; the full paper will supplement these with algorithm descriptions and testing results.
Author
Reaction Wheels; Contingency; Algorithms; Software Development Tools; Attitude Control

20020061379 NASA Goddard Space Flight Center, Greenbelt, MD USA
MAP Attitude Control System Design and Flight Performance
Andrews, S. F., NASA Goddard Space Flight Center, USA; ODonnell, J. R., NASA Goddard Space Flight Center, USA; January 2002; 7p; In English; AIAA Guidance and Control Conference, Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Microwave Anisotropy Probe (MAP) is a follow-on to the Differential Microwave Radiometer (DMR) instrument on the Cosmic Background Explorer (COBE) spacecraft. to make a full-sky map of cosmic microwave background fluctuations, a combination fast spin and slow precession motion will be used that will cover the entire celestial sphere in six months. The spin rate should be an order of magnitude higher than the precession rate, and each rate should be tightly controlled. The sunline angle should be 22.5 +/- 0.25 deg. Sufficient attitude knowledge must be provided to yield instrument pointing to a standard deviation of 1.3 arc-minutes RSS three axes. In addition, the spacecraft must be able to acquire and hold the sunline at initial acquisition, and in the event of a failure. Finally. the spacecraft must be able to slew to the proper burn orientations and to the proper off-sunline attitude to start the compound spin. The design and flight performance of the Attitude Control System on MAP that meets these requirements will be discussed.
Author
Cosmic Background Explorer Satellite; Satellite Attitude Control; Control Systems Design; Microwave Probes; Background Radiation; Radiation Measurement; Microwaves

20020061703 NASA Glenn Research Center, Cleveland, OH USA
Fast Three-Dimensional Method of Modeling Atomic Oxygen Undercutting of Protected Polymers
Snyder, Aaron, NASA Glenn Research Center, USA; Banks, Bruce A., NASA Glenn Research Center, USA; April 2002; 16p; In English; Sixth International Conference on Protection of Materials and Structures from Space Environment, 1-3 May 2002, Toronto, Canada; Sponsored by ITL, Unknown
Contract(s)/Grant(s): RTOP 755-A4-06
Report No.(s): NASA/TM-2002-211578; NAS 1.15:211578; E-13363; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method is presented to model atomic oxygen erosion of protected polymers in low Earth orbit (LEO). Undercutting of protected polymers by atomic oxygen occurs in LEO due to the presence of scratch, crack or pin-window defects in the protective coatings. As a means of providing a better understanding of undercutting processes, a fast method of modeling atomic-oxygen undercutting of protected polymers has been developed. Current simulation methods often rely on computationally expensive ray-tracing procedures to track the surface-to-surface movement of individual ”atoms.” The method introduced in this paper replaces slow individual particle approaches by substituting a model that utilizes both a geometric configuration-factor technique, which governs the diffuse transport of atoms between surfaces, and an efficient telescoping series algorithm, which rapidly integrates the cumulative effects stemming from the numerous atomic oxygen events occurring at the surfaces of an undercut cavity. This new method facilitates the systematic study of three-dimensional undercutting by allowing rapid simulations to be made over a wide range of erosion parameters.
Author
Low Earth Orbits; Atmospheric Effects; Oxygen Atoms; Erosion; Three Dimensional Models

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.

20020060724 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Anomalous External Force on the MAP Spacecraft
Starin, Scott R., NASA Goddard Space Flight Center, USA; Bay, P. Michael, NASA Goddard Space Flight Center, USA; Wollack, Edward J., NASA Goddard Space Flight Center, USA; Fink, Dale R., NASA Goddard Space Flight Center, USA; Ward, David K., NASA Goddard Space Flight Center, USA; ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; AIAA Guidance and Control Conference, August 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A common theme in discussions of the Microwave Anisotropy Probe (MAP) is the attainment of mission goals for minimal cost. One area of cost savings was a reduction in the fuel budget required. to reach orbit around the L2 notation point of the Earth-Sun system, the MAP spacecraft was guided very close to the Moon, allowing a gravity-assisted trajectory out to L2. In order to property time the lunar swing-by, MAP followed a trajectory of three-and-a-half highly elliptical phasing loops. At each perigee of this trajectory MAP executed a thruster maneuver to increase orbit velocity; maneuvers were required at one or both clothe first two perigees (called P1 and P2) and at the third and final perigee (P-final). The preference was for successful maneuvers at all three perigees because this scheme provided a small, additional fuel savings.
Derived from text
Actuators; Control Systems Design; Detection; Failure; Microwave Probes

20020060727 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mass Spectrometers in Deep Space Missions
Mahaffy, Paul, NASA Goddard Space Flight Center, USA; Niemann, Hasso, NASA Goddard Space Flight Center, USA; Harpold, Dan, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 2002 ARM Program Science Team Meeting, 8-12 Apr. 2002, Saint Petersburg, FL, Pasadena, CA, USA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Mass spectrometers have been included in the payloads of several deep space missions over the past three decades. Our laboratory has designed and developed mass spectrometers for the Galileo Probe into the atmosphere of Jupiter, the Pioneer Venus Orbiter, the Cassini Orbiter Mission to Saturn, the Cassini/Huygens Probe Mission to Saturn’s moon Titan, the Nozomi Mission to Mars, and most recently the CONTOUR comet nucleus flyby mission. Each mission has required attention to miniaturization, autonomous sampling, and consideration of the special hazards and measurement requirements of the target environment. Development ongoing in our laboratory includes further miniaturization, improved performance in the areas of sensitivity and precision for the important isotope measurements, and adaptation for the unusual environments to be encountered in locations

such as the surface or subsurface of Europa or Mars. Various aspects of both the technical implementation of these delivered and planned experiments and the science drivers will be described.
Author
Deep Space; Mass Spectrometers; Space Missions; Miniaturization

20020060733 NASA Goddard Space Flight Center, Greenbelt, MD USA
Fine Sun Sensor Field of View Calibration
Sedlak, Joseph E., Computer Sciences Corp., USA; Hashmall, J., Computer Sciences Corp., USA; [2002]; 1p; In English; COSPAR International Astronautical Congress Joint Session Astrodynamics Symposium, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research
Contract(s)/Grant(s): GS-35F-4381G; NASA Order S-43411-G; No Copyright; Avail: Issuing Activity; Abstract Only
The fine Sun sensor (FSS) used on many spacecraft consists of two independent single-axis sensors, nominally mounted perpendicularly, that detect Sun angle across a typical field of view of +/- 32 degrees. The nonlinear function that maps the measured counts into an observed angle is called the transfer function. The FSS transfer function provided by the manufacturer consists of nine parameters for each of the two sensitive axes. An improved transfer function has been previously reported that achieves a significant accuracy improvement across the entire field of view. This new function expands the parameter set to 12 coefficients per axis and includes cross terms combining counts from both axes. to make best use of the FSS for spacecraft attitude determination, it must be calibrated after launch. We are interested in simplifying the postlaunch calibration procedure for estimating improvements to the 24 parameters in the transfer function. This paper discusses how to recombine the terms of the transfer function to reduce their redundancy without decreasing its accuracy and then presents an attitude dependent procedure for estimating the parameters. The end result is a calibration algorithm that is easier to use and does not sacrifice accuracy. Results of calibration using on-orbit data are presented.
Author
Algorithms; Calibrating; Solar Sensors; Transfer Functions

20020060752 NASA Goddard Space Flight Center, Greenbelt, MD USA
New Attitude Sensor Alignment Calibration Algorithms
Hashmall, Joseph A., Computer Sciences Corp., USA; Sedlak, Joseph E., Computer Sciences Corp., USA; [2002]; 1p; In English; World Space Congress, 10-19 Oct. 2002, Houston, TX, USA
Contract(s)/Grant(s): GS-35F-4381-G; NASA Order S-43411-G; No Copyright; Avail: Issuing Activity; Abstract Only
Accurate spacecraft attitudes may only be obtained if the primary attitude sensors are well calibrated. Launch shock, relaxation of gravitational stresses and similar effects often produce large enough alignment shifts so that on-orbit alignment calibration is necessary if attitude accuracy requirements are to be met. A variety of attitude sensor alignment algorithms have been developed to meet the need for on-orbit calibration. Two new algorithms are presented here: ALICAL and ALIQUEST. Each of these has advantages in particular circumstances. ALICAL is an attitude independent algorithm that uses near simultaneous measurements from two or more sensors to produce accurate sensor alignments. For each set of simultaneous observations the attitude is overdetermined. The information content of the extra degrees of freedom can be combined over numerous sets to provide the sensor alignments. ALIQUEST is an attitude dependent algorithm that combines sensor and attitude data into a loss function that has the same mathematical form as the Wahba problem. Alignments can then be determined using any of the algorithms (such as the QUEST quaternion estimator) that have been developed to solve the Wahba problem for attitude. Results from the use of these methods on active missions are presented.
Author
Algorithms; Attitude (Inclination); Attitude Indicators; Calibrating; Spacecraft Instruments

20020060756 NASA Goddard Space Flight Center, Greenbelt, MD USA
Restoring Redundancy to the MAP Propulsion System
O'Donnell, James R., Jr., NASA Goddard Space Flight Center, USA; Davis, Gary T., NASA Goddard Space Flight Center, USA; Ward, David K., NASA Goddard Space Flight Center, USA; [2002]; 6p; In English; AIAA Guidance and Control Conference, Aug. 20002, Monterey, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Microwave Anisotropy Probe (MAP) is a follow-on to the Differential Microwave Radiometer (DMR) instrument on the Cosmic Background Explorer (COBE). Due to the MAP project's limited mass, power, and financial resources, a traditional reliability concept including fully redundant components was not feasible. The MAP design employs selective hardware redundancy, along with backup software modes and algorithms, to improve the odds of mission success. In particular, MAP's propulsion system, which is used for orbit maneuvers and momentum management, uses eight thrusters positioned and oriented

in such a way that its thruster-based attitude control modes can maintain three-axis attitude control in the event of the failure of any one thruster.
Derived from text
Cosmic Background Explorer Satellite; Redundancy; Microwave Probes; Propulsion; Microwave Radiometers

20020061278 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Assessment of the Ability of Potential Satellite Instruments to Resolve Spatial and Temporal Variability of Atmospheric CO2
Andrews, A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English, 19 May - 1 Jun. 2002, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Sufficiently precise satellite observations with adequate spatial and temporal resolution would substantially increase our knowledge of the atmospheric CO2 distribution and would undoubtedly lead to reduced uncertainty in estimates of the global carbon budget. An overview of possible strategies for measuring CO2 from space will be presented, including IR and nearby measurements, active sensors and broad band and narrow band passive sensors. The ability of potential satellite instruments with a variety of orbits, horizontal resolution and vertical weighting functions to capture the variation in atmospheric CO2 mixing ratios will be illustrated using a combination of surface data, aircraft data and model results.
Author
Atmospheric Composition; Satellite Instruments; Temporal Distribution; Meteorological Parameters; Carbon Dioxide; Spatial Distribution

20
SPACECRAFT PROPULSION AND POWER

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

20020060123 NASA Marshall Space Flight Center, Huntsville, AL USA
Atomic-Based Combined Cycle Propulsion System and Method
Schmidt, George R., Inventor, NASA Marshall Space Flight Center, USA; Apr. 09, 2002; 6p; In English
Patent Info.: Filed 10 Apr. 2000; NASA-Case-MFS-31341; US-Patent-6,367,243; US-Patent-Appl-SN-546030; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A method and system are provided for propelling an aerodynamic vehicle into space. The aerodynamic vehicle uses a nuclear-based thermal rocket (NTR) propulsion system capable of producing a hydrogen exhaust. A flow of air is introduced into the hydrogen exhaust to augment the thrust force at speeds of the vehicle up to approximately Mach 6. When the speed of the vehicle is approximately Mach 6 and the altitude of the vehicle is approximately 40 kilometers, the flow of air is stopped and the vehicle is propelled into space using only the NTR.
Official Gazette of the U.S. Patent and Trademark Office
Nuclear Propulsion; Spacecraft Launching; Rocket Thrust; Rocket Exhaust

20020060506 AFS Trinity Power Corp., Medina, WA USA
Energy Storage Flywheels on Spacecraft
Bartlett, Robert O., AFS Trinity Power Corp., USA; Brown, Gary, NASA Goddard Space Flight Center, USA; Levinthal, Joel, AFS Trinity Power Corp., USA; [2002]; 21p; In English; 25th Annual AAS Guidance and Control Conference, 6-10 Feb. 2002, Breckenridge, CO, USA; Sponsored by American Astronautical Society, USA
Report No.(s): AAS-02-063-Draft-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
With advances in carbon composite material, magnetic bearings, microprocessors, and high-speed power switching devices, work has begun on a space qualifiable Energy Momentum Wheel (EMW). An EMW is a device that can be used on a satellite to store energy, like a chemical battery, and manage angular momentum, like a reaction wheel. These combined functions are achieved by the simultaneous and balanced operation of two or more energy storage flywheels. An energy storage flywheel typically consists of a carbon composite rotor driven by a brushless DC motor/generator. Each rotor has a relatively large angular moment of inertia and is suspended on magnetic bearings to minimize energy loss. The use of flywheel batteries on spacecraft will increase system efficiencies (mass and power), while reducing design-production time and life-cycle cost. This paper will present a discussion of flywheel battery design considerations and a simulation of spacecraft system performance utilizing four

flywheel batteries to combine energy storage and momentum management for a typical LEO satellite. A proposed set of control laws and an engineering animation will also be presented. Once flight qualified and demonstrated, space flywheel batteries may alter the architecture of most medium and high-powered spacecraft.
Derived from text
Flywheels; Spacecraft Power Supplies; Kinetic Energy; Energy Storage; Computerized Simulation

20020061365 NASA Glenn Research Center, Cleveland, OH USA
Electrical Performance of the International Space Station U.S. Photovoltaic Array During Bifacial Illumination
Delleur, Ann M., NASA Glenn Research Center, USA; Kerslake, Thomas W., NASA Glenn Research Center, USA; July 2002; 12p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 2 Aug. 2002, Washington, DC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 575-15-69
Report No.(s): NASA/TM-2002-211724; NAS 1.15:211724; E-13476; IECE-2002-2004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the first USA (U.S.) photovoltaic array (PVA) activated on International Space Station (ISS) in December 2000, on-orbit data can now be compared to analytical predictions. Due to ISS operational constraints, it is not always possible to point the front side of the arrays at the Sun. Thus, in many cases, sunlight directly illuminates the backside of the PVA as well as albedo illumination on either the front or the back. During this time, appreciable power is produced since the solar cells are mounted on a thin, solar transparent substrate. It is important to present accurate predictions for both front and backside power generation for mission planning, certification of flight readiness for a given mission, and on-orbit mission support. to provide a more detailed assessment of the ISS power production capability, the authors developed a PVA electrical performance model applicable to generalized bifacial illumination conditions. On-orbit PVA performance data were also collected and analyzed. This paper describes the ISS PVA performance model, and the methods used to reduce orbital performance data. Analyses were performed using SPACE. a NASA-GRC developed computer code for the ISS program office. Results showed a excellent comparison of on-orbit performance data and analytical results.
Author
Photovoltaic Cells; Prediction Analysis Techniques; Solar Arrays; Electrical Properties; Data Reduction; Computer Programs

20020061976 NASA Glenn Research Center, Cleveland, OH USA
Carbon-Based Ion Optics Development at NASA GRC
Haag, Thomas, NASA Glenn Research Center, USA; Patterson, Michael, NASA Glenn Research Center, USA; Rawlin, Vince, NASA Glenn Research Center, USA; Soulas, George, NASA Glenn Research Center, USA; May 2002; 12p; In English; 27th International Electric Propulsion Conference, 14-19 Oct. 2001, Pasadena, CA, USA; Sponsored by Air Force Research Lab., USA
Contract(s)/Grant(s): RTOP 755-B4-04
Report No.(s): NASA/TM-2002-211501; NAS 1.15:211501; IEPC-01-94; E-13241; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With recent success of the NSTAR ion thruster on Deep Space 1, there is continued interest in long term, high propellant throughput thrusters to perform energetic missions. This requires flight qualified thrusters that can operate for long periods at high beam density, without degradation in performance resulting from sputter induced grid erosion. Carbon-based materials have shown nearly an order of magnitude improvement in sputter erosion resistance over molybdenum. NASA Glenn Research Center (GRC) has been active over the past several years pursuing carbon-based grid development. In 1995, NASA GRC sponsored work performed by the Jet Propulsion Laboratory to fabricate carbon/carbon composite grids using a machined panel approach. In 1999, a contract was initiated with a commercial vendor to produce carbon/carbon composite grids using a chemical vapor infiltration process. In 2001, NASA GRC purchased pyrolytic carbon grids from a commercial vendor. More recently, a multi-year contract was initiated with North Carolina A&T to develop carbon/carbon composite grids using a resin injection process. The following paper gives a brief overview of these four programs.
Author
Carbon; Ion Optics; Fabrication; Chemical Vapor Infiltration; Injection

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.

20020059637 Corps of Engineers, Engineer Research and Development Center, Champaign, IL USA
An Evaluation of Application and Surface Preparation Parameters for Thermal Spray Coatings ***Final Report***
Varcalle, Dominic J., Jr.; Beitelman, Alfred D.; Nov. 2001; 313p; In English; Prepared in collaboration with Vartech, Inc. Idaho Falls, ID
Report No.(s): AD-A401338; ERDC/CERL-TR-01-67; USACE-TR-HPMS-01-3; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy

The U.S. Army Corps of Engineers uses thermal-sprayed zinc and aluminum coatings on hydraulic structures exposed to severe impact and abrasion damage caused by ice and floating debris. These coatings are also used widely for corrosion prevention on civil engineering structures across the nation. An experimental study of the twin-wire electric arc (TWEA) spraying of zinc and aluminum coatings was conducted to demonstrate the suitability of this technology for Army applications. Experiments on six materials systems were conducted using classical and statistically designed fractional-factorial schemes. TWEA process parameters studied included current, spray angle, spray distance, and system pressure. A systematic design of experiments was utilized in order to display the range of processing conditions and their effect on the resultant coating. The coatings were characterized with bond strength and deposition efficiency tests, and optical metallography. Coating properties were quantified with respect to roughness, hardness, porosity, oxide content, bond strength, and microstructure. Coating performance was evaluated and quantified with erosion testing, and a parameter-property-performance relationship was developed for each materials system.
DTIC
Protective Coatings; Arc Spraying; Corrosion Prevention; Corrosion Resistance

20020060066 Technical Research Centre of Finland, Energy, Jyvaskyla, Finland
Guide to Physical Property Characterisation of Biomass-Derived Fast Pyrolysis Liquids
Oasmaa, A.; Peacocke, C.; 2001; 114p; In English
Report No.(s): PB2002-103477; VTT/PUB-450; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This publication is a revised and updated version of VTT Publication 306: Physical characterization of biomass-based pyrolysis liquids, issued in 1997. The main purpose of the on-going study is to test the applicability of standard fuel oil methods developed for petroleum-based fuels to biomass-derived fast pyrolysis liquids. New methods have also been tested and further developed to extend the range of properties that may be accurately determined. The methods were tested for pyrolysis liquids derived from hardwood, softwood, forest residue and straw. Recommendations on transport, liquid handling and analyses are presented. In general, most of the standard methods for fuel oils can be used as such, but the accuracy of the analyses can be improved by minor modifications. Homogeneity of the liquids is a critical factor in the accurate analyses, and hence procedures for its verification are presented.
NTIS
Biomass; Liquids; Pyrolysis; Crude Oil; Chemical Analysis

20020060120 NASA Langley Research Center, Hampton, VA USA
Poly (Aryl Ether Ketones) Bearing Alkylated Side Chains
Cassidy, Patrick E., Inventor, NASA Langley Research Center, USA; Fitch, John W., III, Inventor, NASA Langley Research Center, USA; Gronewald, Scott D., Inventor, NASA Langley Research Center, USA; St.Clair, Ann K., Inventor, NASA Langley Research Center, USA; Stoakley, Diane M., Inventor, NASA Langley Research Center, USA; Apr. 16, 2002; 6p; In English; Provisional US-Patent-Appl-SN-136926, filed 1 Jun. 1999
Patent Info.: Filed 1 Jun. 1999; NASA-Case-LAR-15962-1; US-Patent-6,372,877; US-Patent-Appl-SN-585456; US-Patent-Appl-SN-136926; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This invention relates generally to poly(aryl ether ketones) bearing alkylated side chains. It relates particularly to soluble, thermally stable. low dielectric poly(aryl ether ketones) with alkylated side chains and especially to films and coatings thereof.

These poly(aryl ether ketones) have a structural formula wherein Y is selected from the group consisting of CF3 and CH3; and wherein R is C(sub n)H(sub (2n+1)) and n = 11-18.
Official Gazette of the U.S. Patent and Trademark Office
Aromatic Compounds; Ethers; Ketones; Molecular Chains

20020061396 NASA Glenn Research Center, Cleveland, OH USA
Effects of Humidity On the Flow Characteristics of PS304 Plasma Spray Feedstock Powder Blend
Stanford, Malcolm K., Dayton Univ., USA; DellaCorte, Christopher, NASA Glenn Research Center, USA; May 2002; 16p; In English
Contract(s)/Grant(s): RTOP 708-18-13
Report No.(s): NASA/TM-2002-211549; NAS 1.15:211549; E-13313; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The effects of environmental humidity on the flow characteristics of PS304 feedstock have been investigated. Angular and spherical BaF2-CaF2 powder was fabricated by comminution and by atomization, respectively. The fluorides were added incrementally to the nichrome, chromia, and silver powders to produce PS304 feedstock. The powders were dried in a vacuum oven and cooled to a Tom temperature under dry nitrogen. The flow of the powder was studied from 2 to 100 percent relative humidity (RH) The results suggest that the feedstock flow is slightly degraded with increasing humidity below 66 percent RH and is more affected above 66 percent RH. There was no flow above 88 percent RH. Narrower particle size distributions of the angular fluorides allowed flow up to 95 percent RH. These results offer guidance that enhances the commercial potential for this material system.
Author
Flow Characteristics; Humidity; Plasmas (Physics); Powder (Particles); Comminution; Sprayers

20020061831 NASA Glenn Research Center, Cleveland, OH USA
Particle Size Effects on Flow Properties of PS304 Plasma Spray Feedstock Powder Blend
Stanford, Malcolm K., Dayton Univ., USA; DellaCorte, Christopher, NASA Glenn Research Center, USA; Eylon, Daniel, Dayton Univ., USA; May 2002; 18p; In English
Contract(s)/Grant(s): RTOP 708-18-13
Report No.(s): NASA/TM-2002-211550; NAS 1.15:211550; E-13315; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The effects of BaF2-CaF2 particle size and size distribution on PS304 feedstock powder flowability have been investigated. Angular BaF2-CaF2 eutectic powders were produced by comminution and classified by screening to obtain 38 to 45 microns 45 to 106 microns, 63 to 106 microns, 45 to 53 microns, 63 to 75 microns, and 90 to 106 microns particle size distributions. The fluorides were added incrementally from 0 to 10 wt% to the other powder constituents of the PS304 feedstock: nichrome, chromia, and silver powders. The flow rate of the powder blends decreased linearly with increasing concentration of the fluorides. Flow was degraded with decreasing BaF2-CaF2 particle size and with increasing BaF2-CaF2 particle size distribution. A semiempirical relationship is offered to describe the PS304 powder blend flow behavior. The Hausner Ratio confirmed the funnel flow test results, but was slightly less sensitive to differences in BaF2-CaF2 particle size and size distribution. These findings may have applicability to other powders that do not flow easily, such as ceramic powders.
Author
Particle Size Distribution; Flow Characteristics; Plasmas (Physics); Powder (Particles); Barium Fluorides; Calcium Fluorides

24
COMPOSITE MATERIALS

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

20020060736 NASA Goddard Space Flight Center, Greenbelt, MD USA
Structural Analysis of a Magnetically Actuated Silicon Nitride Micro-Shutter for Space Applications
Loughlin, James P., NASA Goddard Space Flight Center, USA; Fettig, Rainer K., Raytheon Information Technology and Scientific Services, USA; Moseley, S. Harvey, NASA Goddard Space Flight Center, USA; Kutyrev, Alexander S., Raytheon Information Technology and Scientific Services, USA; Mott, D. Brent, NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; MSM2002 Conference, 22-25 Apr. 2002, San Juan, Puerto Rico; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Finite element models have been created to simulate the electrostatic and electromagnetic actuation of a 0.5gm silicon nitride micro-shutter for use in a spacebased Multi-object Spectrometer (MOS). The micro-shutter uses a torsion hinge to go from the closed, 0 degree, position, to the open, 90 degree position. Stresses in the torsion hinge are determined with a large deformation nonlinear finite element model. The simulation results are compared to experimental measurements of fabricated micro-shutter devices.
Author
Structural Analysis; Silicon Nitrides; Technology Utilization

20020060784 NASA Glenn Research Center, Cleveland, OH USA
Computational Simulation of the High Strain Rate Tensile Response of Polymer Matrix Composites
Goldberg, Robert K., NASA Glenn Research Center, USA; March 2002; 20p; In English; 14th Symposium on Composite Materials: Testing and Design, 11-12 Mar. 2002, Pittsburgh, PA, USA; Sponsored by American Society for Testing and Materials, USA
Contract(s)/Grant(s): RTOP 708-24-13
Report No.(s): NASA/TM-2002-211489; E-13257; NAS 1.15:211489; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A research program is underway to develop strain rate dependent deformation and failure models for the analysis of polymer matrix composites subject to high strain rate impact loads. Under these types of loading conditions, the material response can be highly strain rate dependent and nonlinear. State variable constitutive equations based on a viscoplasticity approach have been developed to model the deformation of the polymer matrix. The constitutive equations are then combined with a mechanics of materials based micromechanics model which utilizes fiber substructuring to predict the effective mechanical and thermal response of the composite. to verify the analytical model, tensile stress-strain curves are predicted for a representative composite over strain rates ranging from around 1 x 10(exp -5)/sec to approximately 400/sec. The analytical predictions compare favorably to experimentally obtained values both qualitatively and quantitatively. Effective elastic and thermal constants are predicted for another composite, and compared to finite element results.
Author
Polymer Matrix Composites; Strain Rate; Stress-Strain Relationships; Prediction Analysis Techniques; Elastic Properties; Failure Analysis

20020060785 NASA Glenn Research Center, Cleveland, OH USA
Incorporation of Mean Stress Effects Into the Micromechanical Analysis of the High Strain Rate Response of Polymer Matrix Composites
Goldberg, Robert K., NASA Glenn Research Center, USA; Roberts, Gary D., NASA Glenn Research Center, USA; Gilat, Amos, Ohio State Univ., USA; June 2002; 30p; In English; Ninth International Conference on Composites Engineering, 1-6 Jul. 2002, San Diego, CA, USA; Sponsored by International Community for Composites Engineering, Unknown
Contract(s)/Grant(s): RTOP 708-24-13
Report No.(s): NASA/TM-2002-211702; E-13447; NAS 1.15:211702; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The results presented here are part of an ongoing research program, to develop strain rate dependent deformation and failure models for the analysis of polymer matrix composites subject to high strain rate impact loads. A micromechanics approach is employed in this work, in which state variable constitutive equations originally developed for metals have been modified to model the deformation of the polymer matrix, and a strength of materials based micromechanics method is used to predict the effective response of the composite. In the analysis of the inelastic deformation of the polymer matrix, the definitions of the effective stress and effective inelastic strain have been modified in order to account for the effect of hydrostatic stresses, which are significant in polymers. Two representative polymers, a toughened epoxy and a brittle epoxy, are characterized through the use of data from tensile and shear tests across a variety of strain rates. Results computed by using the developed constitutive equations correlate well with data generated via experiments. The procedure used to incorporate the constitutive equations within a micromechanics method is presented, and sample calculations of the deformation response of a composite for various fiber orientations and strain rates are discussed.
Author
Constitutive Equations; Deformation; Impact Loads; Micromechanics; Polymer Matrix Composites; Strain Rate

20020061676 NASA Glenn Research Center, Cleveland, OH USA

RQL Sector Rig Testing of SiC/SiC Combustor Liners

Verrilli, Michael J., NASA Glenn Research Center, USA; Martin, Lisa C., NASA Glenn Research Center, USA; Brewer, David N., Army Research Lab., USA; April 2002; 24p; In English

Contract(s)/Grant(s): RTOP 714-04-30

Report No.(s): NASA/TM-2002-211509; E-13287; NAS 1.15:211509; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Combustor liners, manufactured from silicon carbide fiber-reinforced silicon carbide (SiC/SiC) were tested for 260 hr using a simulated gas turbine engine cycle. This report documents the results of the last 56 hr of testing. Damage occurred in one of the six different components that make up the combustor liner set, the rich zone liner. Cracks in the rich zone liner initiated at the leading edge due to stresses resulting from the component attachment configuration. Thin film thermocouples and fiber optic pyrometers were used to measure the rich zone liner's temperature and these results are reported.

Author

Silicon Carbides; Combustion Chambers; Linings; Fiber Composites

20020061832 NASA Glenn Research Center, Cleveland, OH USA

Cyclic Failure Mechanisms of Thermal and Environmental Barrier Coating Systems Under Thermal Gradient Test Conditions

Zhu, Dongming, Ohio Aerospace Inst., USA; Lee, Kang N., Cleveland State Univ., USA; Miller, Robert A., NASA Glenn Research Center, USA; April 2002; 18p; In English; 26th Annual International Conference on Advanced Ceramics and Composites, 13-18 Jan. 2002, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA

Contract(s)/Grant(s): RTOP 714-04-20

Report No.(s): NASA/TM-2002-211478; NAS 1.15:211478; E-13245; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Plasma-sprayed ZrO2-8wt%Y2O3 and mullite+BSAS/Si multilayer thermal and environmental barrier coating (TBC-EBC) systems on SiC/SiC ceramic matrix composite (CMC) substrates were thermally cyclic tested under high thermal gradients using a laser high-heat-flux rig in conjunction with furnace exposure in water-vapor environments. Coating sintering and interface damage were assessed by monitoring the real-time thermal conductivity changes during the laser heat-flux tests and by examining the microstructural changes after exposure. Sintering kinetics of the coating systems were also independently characterized using a dilatometer. It was found that the coating failure involved both the time-temperature dependent sintering and the cycle frequency dependent cyclic fatigue processes. The water vapor environments not only facilitated the initial coating conductivity increases due to enhanced sintering and interface reaction, but also promoted later conductivity reductions due to the accelerated coating cracking and delamination. The failure mechanisms of the coating systems are also discussed based on the cyclic test results and are correlated to the sintering and thermal stress behavior under the thermal gradient test conditions.

Author

Ceramic Matrix Composites; Coating; Failure; Real Time Operation; Thermal Control Coatings; Thermal Stresses

20020061885 Connecticut Univ., Dept. of Mechanical Engineering, Storrs, CT USA

Total Quality Optimal Fabrication of Composite Materials via Liquid Molding and Intelligent Simulation-Assisted Liquid Composite Molding ***Final Report, 1 Jun. 1996-30 Sep. 2000***

Pitchumani, Ranga; Sep. 2000; 11p; In English

Contract(s)/Grant(s): N00014-96-1-0726; N00014-97-1-0730

Report No.(s): AD-A402954; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Liquid composite molding techniques potentially offer the capability to fabricate high-performance composite products of complex shapes at high throughputs. Strong parameter uncertainties and variabilities inherent in the process have remained a fundamental impediment to a complete realization of the process potential and the widespread use of the process in commercial and DoD applications. The overall research objective is to overcome the fundamental impediments and significantly advance the processing science and technology, leading to capabilities for rapid, robust and affordable manufacturing of composites.

DTIC

Composite Materials; Molds; Casting

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20020060139 Sandia National Labs., Albuquerque, NM USA
Preliminary Investigation of the Thermal Decomposition of Ablefoam and EF-AR20 Foam (Ablefoam Replacement)
Ulibarri, T. A.; Derzon, D. K.; Erickson, K. L.; Castaneda, J.; Borek, T. T.; January 2002; 80p; In English
Report No.(s): DE2002-020183; SAND2002-0183; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Preliminary thermal decomposition experiments with Ablefoam and EF-AR20 foam (Ablefoam replacement) were done to determine the important chemical and associated physical phenomena that should be investigated to develop the foam decomposition chemistry sub-models that are required in numerical simulations of the fire-induced response of foam-filled engineered systems for nuclear safety applications. Although the two epoxy foams are physically and chemically similar, the thermal decomposition of each foam involves different chemical mechanisms, and the associated physical behavior of the foams, particularly foaming and liquefaction, have significant implications for modeling. A simplified decomposition chemistry sub-model is suggested that, subject to certain caveats, may be appropriate for scoping-type calculations.
NTIS
Foams; Thermal Decomposition

20020060143 North Carolina Agricultural and Technical State Univ., Dept. of Chemical Engineering, Greensboro, NC USA
Enhancement of Equilibriumshift in Dehydrogenation Reactions Using a Novel Membrane Reactor
Ilias, S.; King, F. G.; Feb. 12, 2001; 64p; In English
Report No.(s): DE2002-792089; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

With the advances in new inorganic materials and processing techniques, there has been renewed interest in exploiting the benefits of membranes in many industrial applications. Inorganic and composite membranes are being considered as potential candidates for use in membrane-reactor configuration for effectively increasing reaction rate, selectivity and yield of equilibrium limited reactions. to investigate the usefulness of a palladium-ceramic composite membrane in a membrane reactor-separator configuration, we investigated the dehydrogenation of cyclohexane by equilibrium shift. A two-dimensional pseudo-homogeneous reactor model was developed to study the dehydrogenation of cyclohexane by equilibrium shift in a tubular membrane reactor. Radial diffusion was considered to account for the concentration gradient in the radial direction due to permeation through the membrane. For a dehydrogenation reaction, the feed stream to the reaction side contained cyclohexane and argon, while the separation side used argon as the sweep gas. Equilibrium conversion for dehydrogenation of cyclohexane is 18.7%. The present study showed that 100% conversion could be achieved by equilibrium shift using Pd-ceramic membrane reactor.
NTIS
Augmentation; Dehydrogenation; Reaction Kinetics; Reactor Materials

20020060458 NASA Marshall Space Flight Center, Huntsville, AL USA
Gravity Responsive NADH Oxidase of the Plasma Membrane
Morre, D. James, Inventor, NASA Marshall Space Flight Center, USA; Mar. 26, 2002; 8p; In English
Patent Info.: Filed 25 Apr. 2000; NASA-Case-MFS-31387-1; US-Patent-6,361,961; US-Patent-Appl-SN-560532; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method and apparatus for sensing gravity using an NADH oxidase of the plasma membrane which has been found to respond to unit gravity and low centrifugal g forces. The oxidation rate of NADH supplied to the NADH oxidase is measured and translated to represent the relative gravitational force exerted on the protein. The NADH oxidase of the plasma membrane may be obtained from plant or animal sources or may be produced recombinantly.
Official Gazette of the U.S. Patent and Trademark Office
Membranes; Oxidase; Proteins; Gravitational Fields; Sensors

20020061271 Hampton Univ., Dept. of Chemical Engineering, VA USA
Evaluation of the Effect of Water Vapor On the Performance of NASA's NMRO Catalysts for Carbon Monoxide Oxidation *Final Report, 1 Aug. 1999 - 31 Mar. 2002*
Akyurtlu, Ates, Hampton Univ., USA; Akyurtlu, Jale F., Hampton Univ., USA; Ammons, Vaughnery, Hampton Univ., USA;

Battle, Taikelia, Hampton Univ., USA; Gay, Amy, Hampton Univ., USA; Bray, Kyle, Hampton Univ., USA; Washington, Boe, Hampton Univ., USA; [2002]; 53p; In English
Contract(s)/Grant(s): NAG1-2223; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Noble Metal Reducible Oxide (NMRO) catalysts for the low temperature oxidation of carbon monoxide were developed by NASA for the reoxidation of carbon monoxide which forms by the dissociation of carbon dioxide during the operation of sealed carbon dioxide lasers. The NMRO catalyst, which consists of a noble metal in conjunction with a reducible metal oxide, was evaluated under conditions that will be encountered in a CO2 laser operation, namely temperatures in the range 298 to 373 K and no significant reaction gas components other than CO, CO2 and O2. The NMRO catalysts may have significant potential for spin-off applications such as the prevention of carbon monoxide build-up in closed spaces as in space vehicle cabins or submarines, and the elimination of the cold start-up problem of automobile exhaust catalysts. The most significant difference in the conditions of these possible future applications is the high moisture content of the gases to be processed. Lack of understanding of the effects of water vapor and high temperature on catalyst activity and operation for extended periods are currently the main stumbling blocks for the transfer of this NASA technology to be used for commercial purposes. In the original proposal the following objectives were stated: To obtain experimental data on the adsorption, desorption and reaction characteristics of CO and CO2 the catalysts under high moisture conditions; to collect evidence on the presence of carbonate and hydroxyl surface species and their involvement in the CO oxidation mechanism; and to model the reaction system using a Monte-Carlo simulation to gain insight on the various steps involved. After the work has commenced the NASA technical monitor Mr. David Scheyer informed us that there was increased interest in the possible use of the NMRO catalysts as automobile exhaust catalysts and therefore NASA wanted to know whether the catalysts can operate at high temperatures as well as with high moisture gases. At that meeting it was decided that investigation of the high temperature performance of the NMRO catalysts should be given priority and replace the Monte-Carlo simulation objective. As a result, the modified objectives of the investigation were taken as the investigation of the high-temperature activity of the NMRO catalysts, and the effect of water vapor on the performance of these catalysts.
Author
Noble Metals; Catalysts; Carbon Monoxide; Low Temperature; Oxidation; Carbon Dioxide

20020061302 NASA Ames Research Center, Moffett Field, CA USA
A Survey of Electron Impact Cross-Sections for Halogens and Halogen Compounds of Interest to Plasma Processing
Sharma, S. P., NASA Ames Research Center, USA; Rao, M. V. V. S., NASA Ames Research Center, USA; [1998]; 1p; In English; Gaseous Electronics Conference, 19-23 Oct. 1998, HI, USA
Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Published electron impact cross section data on halogens Cl2, F2, and halogen containing compounds such as Cx Fy, HCl, Cx Cly Fz are reviewed and critically evaluated based on the information provided by various researchers. The present work reports data on electron impact excitation, ionization, dissociation, electron attachment, electron detachment, and photo detachment. Elastic scattering cross sections and data on bulk properties such as diffusion coefficients in various background gases are also evaluated. Since some of the cross sectional data is derived from indirect measurements such as drift velocity, care has been taken to reconcile the differences among the reported data with due attention to the measurement technique. In conclusion, the processes with no or very limited amount of data and questionable set of data are identified and recommendation for further research direction is made.
Author
Electron Impact; Halogen Compounds; Scattering Cross Sections; Halogens; Plasmas (Physics)

20020061361 NASA Ames Research Center, Moffett Field, CA USA
Do Bond Functions Help for the Calculation of Accurate Bond Energies?
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The bond energies of 8 chemically bound diatomics are computed using several basis sets with and without bond functions (BF). The bond energies obtained using the aug-pVnZ+BF basis sets (with a correction for basis set superposition error, BSSE) tend to be slightly smaller that the results obtained using the aug-pV(n+I)Z basis sets, but slightly larger than the BSSE corrected aug-pV(n+I)Z results. The aug-cc-pVDZ+BF and aug-cc-pVTZ+BF basis sets yield reasonable estimates of bond energies, but, in most cases, these results cannot be considered highly accurate. Extrapolation of the results obtained with basis sets including bond functions appears to be inferior to the results obtained by extrapolation using atom-centered basis sets. Therefore bond

functions do not appear to offer a path for obtaining highly accurate results for chemically bound systems at a lower computational cost than atom centered basis sets.
Author
Chemical Bonds; Diatomic Molecules; Extrapolation

20020061369 NASA Ames Research Center, Moffett Field, CA USA
The Heats of Formation of GaCl3 and its Fragments
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only
The heats of formation of GaC13 and its fragments are computed. The geometries and frequencies are obtained at the B3LYP level. The CCSD(T) approach is used to solve the correlation problem. The effect of Ga 3d correlation is studied, and found to affect the bond energies by up to 1 kcal/mol. Both basis set extrapolation and bond functions are considered as ways to approach the basis set limit. Spin-orbit and scalar relativistic effects are also considered.
Author
Heat of Formation; Relativistic Effects; Extrapolation; Gallium Compounds

20020061371 NASA Ames Research Center, Moffett Field, CA USA
Gallium Compounds: A Possible Problem for the G2 Approaches
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Melius, Carl F., Sandia National Labs., USA; Allendorf, Mark D., Sandia National Labs., USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only
The G2 atomization energies of fluorine and oxygen containing Ga compounds are greatly in error. This arises from an inversion of the Ga 3d core orbital and the F 2s or O 2s valence orbitals. Adding the Ga 3d orbital to the correlation treatment or removing the F 2s orbitals from the correlation treatment are shown to eliminate the problem. Removing the O 2s orbital from the correlation treatment reduces the error, but it can still be more than 6 kcal/mol. It is concluded that the experimental atomization energy of GaF2 is too large.
Author
Fluorine; Oxygen; Gallium; Atomizing; Gallium Compounds

20020061937 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
Structure and Properties of Aluminum Nitride and AlON Ceramics ***Final Report, Oct. 2000-Sep. 2001***
McCauley, James W., Army Research Lab., USA; May 2002; 30p; In English
Report No.(s): AD-A402960; ARL-TR-2740; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
A brief review of aluminum nitride and AlON ceramics is presented in the context of the pseudobinary aluminum nitride-aluminum oxide phase equilibrium system. AlON is the name applied to the nitrogen stabilized cubic spinel in this system, with a composition centered at 35.7 mole-percent AlN. First, the phase equilibria and crystal chemistry of these phases are presented, focusing on a constant anion oxynitride spinel model and the various phases, including polytypoids, in this system. Then, a brief summary is given on the processing and microstructures of AlN and AlON, with comparisons to other microstructures in this system. Finally, selected properties of AlN and AlON are discussed and tabulated, with special reference to alumina. A comprehensive reference list is given.
DTIC
Chemical Equilibrium; Crystals; Aluminum Nitrides; Polytopes

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METALS AND METALLIC MATERIALS

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

20020060033 Michigan Univ., Dept. of Materials Science and Engineering, Ann Arbor, MI USA
Heat Transfer at the Mold-Metal Interface in Permanent Mold casting of Aluminum Alloys Project ***Final Report***
Pehlke, R. D.; Cookson, J. M.; Hao, S.; Krishna, P.; Bilkey, K. T.; Dec. 14, 2001; 114p; In English
Report No.(s): DE2002-791727; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This project on heat transfer coefficients in metal permanent mold casting has been conducted in three areas. They are the theoretical study at the University of Michigan, the experimental investigation of squeeze casting at CMI-Tech Center (Now

Hayes-Lemmerz Technical Center) and the experimental investigation of low pressure permanent mold casting at Amcast Automotive.
NTIS
Aluminum Alloys; Heat Transfer Coefficients; Molds; Casting; Metal Working

20020060050 International Trade Commission, Washington, DC USA
Certain Welded Large Diameter Line Pipe from Japan and Mexico. Investigations Nos. 731-TA-919-920 (Preliminary)
Mar. 2001; 20p; In English
Report No.(s): PB2002-107714; USITC/PUB-3400; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 733(a) of the Tariff Act of 1930 that there is a reasonable indication that an industry in the USA is materially injured by reason of imports from Japan and Mexico of certain welded large diameter line pipe, that are alleged to be sold in the USA at less than fair value (LTFV).
NTIS
International Trade; Pipes (Tubes); Welding; Investigation

20020060052 International Trade Commission, Washington, DC USA
Pure Magnesium from China and Israel. Investigations Nos. 701-TA-403 and 731-TA-895-896 (Final)
Nov. 2001; 62p
Report No.(s): PB2002-107728; USITC/PUB-3467; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
On the basis of the record1 developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 735(b) of the Tariff Act of 1930 (the Act), that an industry in the United States is materially injured by reason of imports from China of pure magnesium, provided for in subheading 8104.30.00 of the Harmonized Tariff Schedule of the USA (HTSUS), that have been found by the Department of Commerce to be sold in the USA at less than fair value (LTFV). The Commission also determines, pursuant to sections 705(b) and 735(b) of the Tariff Act of 1930 that an industry in the USA is not materially injured or threatened with material injury, and the establishment of an industry in the USA is not materially retarded by reason of imports from Israel of pure magnesium provided for in subheadings 8104.11.00 and 8104.19.00, and 8104.30.00 of the HTSUS, that have been found by the Department of Commerce to be sold in the USA at LTFV and to be subsidized by the Government of Israel.
NTIS
International Trade; Magnesium; Commerce

20020060053 International Trade Commission, Washington, DC USA
Certain Steel Wire Rod. Investigation No. NAFTA-312-1
Sep. 2001; 28p
Report No.(s): PB2002-107727; USITC/PUB-3453; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On the basis of the information in the investigation, the Commission determines that a surge in imports of certain steel wire rod from Canada and Mexico, respectively, undermines the effectiveness of the import relief on wire rod provided for in Presidential Proclamation 7273 of February 16, 2000.
NTIS
International Trade; Steels; Wire; Rods

20020060054 International Trade Commission, Washington, DC USA
Certain Structural Steel Beams from China, Germany, Italy, Luxembourg, Russia, and South Africa, Spain, and Taiwan. Investigations Nos. 731-TA-935-942 (Preliminary)
Jul. 2001; 22p; In English
Report No.(s): PB2002-107724; USITC/PUB-3438; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 733(a) of the Tariff Act of 1930 (the Act), that there is a reasonable indication that an industry in the USA is materially injured by reason of imports from China, Germany, Italy, Luxembourg, Russia, South Africa, Spain, and Taiwan of certain structural steel beams, provided for in subheadings 7216.32.00, 7216.33.00, 7216.50.00, 7216.61.00, 7216.69.00,

7216.91.00, 7216.99.00, 7228.70.30, and 7228.70.60 of the Harmonized Tariff Schedule of the USA, that are alleged to be sold in the USA at less than fair value (LTFV).
NTIS
International Trade; Investigation; Beams (Supports); Steels

20020060057 International Trade Commission, Washington, DC USA
Certain Seamless Carbon and Alloy Steel Standard, Line, and Pressure Pipe from Argentina, Brazil, Germany, and Italy. Investigations Nos. 701-TA-362 and 731-TA-707-710 (Review)
Jun. 2001; 34p; In English
Report No.(s): PB2002-107718; USITC/PUB-3429; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On the basis of the record developed in these subject five-year reviews, the USA International Trade Commission determines, pursuant to section 751(c) of the Tariff Act of 1930 (the Act), that revocation of the antidumping duty orders on certain seamless carbon and alloy steel standard, line, and pressure pipe from Argentina, Brazil, and Germany would be likely to lead to continuation or recurrence of material injury to an industry in the United States within a reasonably foreseeable time. The International Trade Commission also determines that revocation of the antidumping duty and countervailing duty orders on certain seamless carbon and alloy steel standard, line, and pressure pipe from Italy would not be likely to lead to continuation or recurrence of material injury to an industry in the USA within a reasonably foreseeable time.
NTIS
International Trade; Investigation; Standards; Carbon Steels; Pressure; Alloys

20020060090 Federal Aviation Administration, John A. Volpe National Transportation Systems Center, Cambridge, MA USA
Steel Alloys with Lower Bainite Microstructures for Use in Railroad Cars and Track ***Final Report***
Steele, R. K.; Jan. 2002; 102p; In English
Report No.(s): PB2002-104690; DOT/VNTSC/FRA-98/11; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
In-line heat treatment of hot-formed steel mill products potentially offers the opportunity to achieve superior strength, ductility, and toughness at modest cost. The approach has been applied to the manufacture of railroad rail in an extremely refined pearlitic microstructure. With appropriate adjustments to chemical composition to control the transformation behavior, the approach provides a means to achieve close-to-isothermally produced bainitic microstructures of better strength, ductility, and toughness over the current pearlitic microstructure hot-formed mill products. In the railroad field, the approach appears to be applicable to the manufacture of rails, wheels, and tank car plates. This report reviews (a) the essential features of the in-line heat treatment process as it is currently applied to rails in the USA, (b) studies that have shown the value of bainitic microstructures, and (c) the characteristics of bainitic microstructures. A widely available computer code, SteCal, has been used to assess the effect of alloying additions on transformation behavior in a semiquantitative fashion. Finally, the applicability of the in-line heat treating approach for achieving bainitic microstructures in rails, wheels and tank car plates is discussed.
NTIS
Tracks; Steels; Alloys; Bainite; Rail Transportation; Rails

20020060119 NASA Marshall Space Flight Center, Huntsville, AL USA
Aluminum-Silicon Alloy Having Improved Properties at Elevated Temperatures and Articles Cast Therefrom
Lee, Jonathan A., Inventor, NASA Marshall Space Flight Center, USA; Chen, Po-Shou, Inventor, NASA Marshall Space Flight Center, USA; Jun. 04, 2002; 6p; In English; Continuation-in-part of US-Patent-Appl-SN-322768, filed on 25 May 1999, which is a continuation-in-part of US-Patent-Appl-SN-218675, filed on 22 Dec. 1998, which is a division of US-Patent-Appl-SN-152469, filed on 8 Sep. 1998
Patent Info.: Filed 11 Oct. 2000; NASA-Case-MFS-31294-S-CIP; US-Patent-6,399,020; US-Patent-Appl-SN-688729; US-Patent-Appl-SN-322768; US-Patent-Appl-SN-218675; US-Patent-Appl-SN-152469; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An aluminum alloy suitable for high temperature applications, such as heavy duty pistons and other internal combustion applications. having the following composition, by weight percent (wt %): Silicon: 11.0-14.0; Copper: 5.6-8.0; Iron: 0-0.8; Magnesium: 0.5-1.5; Nickel: 0.05-0.9; Manganese: 0.5-1.5; Titanium: 0.05-1.2; Zirconium: 0.12-1.2; Vanadium: 0.05-1.2; Zinc: 0.005-0.9; Strontium: 0.001-0.1; Aluminum: balance. In this alloy the ratio of silicon:magnesium is 10-25, and the ratio of copper:magnesium is 4-15. After an article is cast from this alloy, the article is treated in a solutionizing step which dissolves

unwanted precipitates and reduces any segregation present in the original alloy. After this solutionizing step, the article is quenched, and is then aged at an elevated temperature for maximum strength.
Official Gazette of the U.S. Patent and Trademark Office
Aluminum Alloys; Silicon Alloys; Heat Treatment

20020061366 NASA Glenn Research Center, Cleveland, OH USA
High Temperature Spin Testing of a Superalloy Disk With a Dual Grain Structure
Gayda, John, NASA Glenn Research Center, USA; Kantzos, Pete, Ohio Aerospace Inst., USA; June 2002; 17p; In English
Contract(s)/Grant(s): RTOP 708-24-13
Report No.(s): NASA/TM-2002-211684; NAS 1.15:211684; E-13412; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Comparative spin tests were run on superalloy disks at an elevated temperature to determine the benefits of a DMHT disk, with a fine grain bore and coarse grain rim, versus a traditional subsolvus disk with a fine grain structure in the bore and rim. The results of these tests showed that the DMHT disk exhibited significantly lower growth at 1500 F. Further, the results of these tests could be accurately predicted using a 2D viscoelastic finite element analysis. These results indicate DMHT technology can be used to extend disk operating temperatures when compared to traditional subsolvus heat treatment options for superalloy disks. However, additional research is required to ensure the safe operation of a DMHT disk under more realistic engine operating conditions. This includes testing to determine the burst margin and cyclic capability of DMHT disks in a spin pit, at a minimum, and ultimately running an engine test with a DMHT disk.
Author
Heat Resistant Alloys; Spin Tests; Heat Treatment; Microstructure; Grain Size

20020061388 NASA Glenn Research Center, Cleveland, OH USA
Oxidation- and Creep-Enhanced Fatigue of Haynes 188 Alloy-Oxide Scale System Under Simulated Pulse Detonation Engine Conditions
Zhu, Dongming, Ohio Aerospace Inst., USA; Fox, Dennis S., NASA Glenn Research Center, USA; Miller, Robert A., NASA Glenn Research Center, USA; March 2002; 12p; In English; 26th Annual International Conference on Advanced Ceramics and Composites, 13-18 Jan. 2002, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-48-13
Report No.(s): NASA/TM-2002-211484; NAS 1.15:211484; E-13252; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of the pulse detonation engine (PDE) requires robust design of the engine components that are capable of enduring harsh detonation environments. In this study, a high cycle thermal fatigue test rig was developed for evaluating candidate PDE combustor materials using a CO2 laser. The high cycle thermal fatigue behavior of Haynes 188 alloy was investigated under an enhanced pulsed laser test condition of 30 Hz cycle frequency (33 ms pulse period, and 10 ms pulse width including 0.2 ms pulse spike). The temperature swings generated by the laser pulses near the specimen surface were characterized by using one-dimensional finite difference modeling combined with experimental measurements. The temperature swings resulted in significant thermal cyclic stresses in the oxide scale/alloy system, and induced extensive surface cracking. Striations of various sizes were observed at the cracked surfaces and oxide/alloy interfaces under the cyclic stresses. The test results indicated that oxidation and creep-enhanced fatigue at the oxide scale/alloy interface was an important mechanism for the surface crack initiation and propagation under the simulated PDE condition.
Author
Creep Properties; Mathematical Models; Oxidation; Pulse Detonation Engines; Metal Fatigue; Computerized Simulation; Alloys

20020061850 Defence Science and Technology Organisation, Victoria, Australia
The Use of Tritium Autoradiography to Assess Fatigue Damage in Metals
Tsoi, K. A.; Wong, A. K.; Feb. 2002; 43p; In English; Original contains color images
Report No.(s): AD-A402708; DSTO-TR-1273; DODA-AR-012-150; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report introduces a technique known as tritium autoradiography which may be useful in the detection of fatigue damage in metallic components. Tritium autoradiography involves the infusion of radioactive hydrogen (tritium) into a fatigue damaged

structure. The damaged areas of the structure may act as preferred trapping sites for the tritium and as the tritium decays via the emission of beta particles it can be detected using nuclear emulsion film.
DTIC
Autoradiography; Tritium; Fatigue (Materials); Radioactivity

27
NONMETALLIC MATERIALS

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

20020059643 Swedish Defence Research Establishment, Avd. foer Vapen och Skydd, Tumba, Sweden
7th ECERS Conference in Brugge ***7nde ECERS-Konferensen i Brugge***
Pettersson, A., Swedish Defence Research Establishment, Sweden; Oct. 2001; 28p; In Swedish
Report No.(s): PB2002-104976; FOI-R-0193-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The visited conference was the seventh ECERS in Brugge, Belgium, 2001 Sept 9-13. ECERS stands for the European Ceramic Society and was founded in 1987 to co-ordinate and support research within ceramics. Every other year a conference is held in one of the membership countries. During this conference there were four parallel sessions and two big poster sections. The subjects treated went under the following main headlines: Processing, Material and General. Throughout the lectures general themes were increased density, enhanced K-alpha and the use of disposable precursors. Material with close to theoretical density that were discussed were a-alpha and r-gamma Al2O3 and stabilized or unstabilized ZrO2. It was an interesting conference and a forum for meeting all aspects of ceramics research. It was well organized and the schedule felt carefully prepared. Many aspects of ceramics research were represented with the effect of enormous spread in the lectures. Many of the presented techniques can, from a ballistic point of view, be applicable in the manufacturing of new protection materials. A recommendation for the future is to attend this conference with a lecture or a poster.
NTIS
Belgium; Ceramics; Conferences

20020060055 International Trade Commission, Washington, DC USA
Pet Film from India and Taiwan. Investigations Nos. 701-TA-415 and 731-TA-933-934 (Preliminary)
Jul. 2001; 18p; In English
Report No.(s): PB2002-107723; USITC/PUB-3437; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to sections 703(a) and 733(a) of the Tariff Act of 1930 (the Act), respectively, that there is a reasonable indication that an industry in the USA is materially injured by reason of imports from India of polyethylene terephthalate film, sheet, and strip (PET film), provided for in subheading 3920.62.00 of the Harmonized Tariff Schedule of the USA, that are alleged to be subsidized by the Government of India and by reason of imports from India and Taiwan of PET film that are alleged to be sold in the USA at less than fair value (LTFV).
NTIS
International Trade; Investigation; Polyethylene Terephthalate

20020060087 NASA Langley Research Center, Hampton, VA USA
Molecular Level Coating of Metal Oxide Particles
McDaniel, Patricia R., Inventor, NASA Langley Research Center, USA; St.Clair, Terry L., Inventor, NASA Langley Research Center, USA; Apr. 09, 2002; 10p; In English; Division of US-Patent-Appl-SN-742068, filed 31 Oct. 1996
Patent Info.: Filed 1 Feb. 2000; NASA-Case-LAR-15555-2; US-Patent-6,368,662; US-Patent-Appl-SN-495575; US-Patent-Appl-SN-742068; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Polymer encapsulated metal oxide particles are prepared by combining a polyamide acid in a polar osmotic solvent with a metal alkoxide solution. The polymer was imidized and the metal oxide formed simultaneously in a refluxing organic solvent. The resulting polymer-metal oxide is an intimately mixed commingled blend, possessing, synergistic properties of both the polymer and preceramic metal oxide. The encapsulated metal oxide particles have multiple uses including, being useful in the

production of skin lubricating creams, weather resistant paints, as a filler for paper. making ultraviolet light stable filled printing ink, being extruded into fibers or ribbons, and coatings for fibers used in the production of composite structural panels.
Official Gazette of the U.S. Patent and Trademark Office
Metal Oxides; Encapsulating; Coating

20020060231 NASA Langley Research Center, Hampton, VA USA
Composition of and Method for Making High Performance Resins for Infusion and Transfer Molding Processes
Connell, John W., Inventor, NASA Langley Research Center, USA; Smith, Joseph G., Inventor, NASA Langley Research Center, USA; Hergenrother, Paul M., Inventor, NASA Langley Research Center, USA; Mar. 19, 2002; 48p; In English
Patent Info.: Filed 18 May 2000; NASA-Case-LAR-15834-1; US-Patent-6,359,107; US-Patent-Appl-SN-575826; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A composition of and method for making high performance imide resins that are processable by resin transfer molding (RTM) and resin infusion (RI) techniques were developed. Materials with a combination of properties, making them particularly useful for the fabrication of composite parts via RTM and/or RI processes, were prepared, characterized and fabricated into moldings and carbon fiber reinforced composites and their mechanical properties were determined. These materials are particularly useful for the fabrication of structural composite components for aerospace applications. The method for making high performance resins for RTM and RI processes is a multi-faceted approach. It involves the preparation of a mixture of products from a combination of aromatic diamines and aromatic dianhydrides at relatively low calculated molecular weights (i.e. high stoichiometric offsets) and endcapping with latent reactive groups. The combination of these monomers results in a mixture of products, in the imide form, that exhibits a stable melt viscosity of less than approximately 60 poise below approximately 300 C.
Official Gazette of the U.S. Patent and Trademark Office
Polyimide Resins; Diamines; Anhydrides; Monomers; Resin Transfer Molding

20020060766 NASA Goddard Space Flight Center, Greenbelt, MD USA
Intricacies of Using Kevlar and Thermal Knives in a Deployable Release System: Issues and Solutions
Stewart, Alphonso C., NASA Goddard Space Flight Center, USA; Hair, Jason H., NASA Goddard Space Flight Center, USA; [2002]; 13p; In English; Aerospace Mechanism Symposium, 15-17 May 2002, Cleveland, OH, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The utilization of Kevlar cord and thermal knives in a deployable release system produces a number of issues that must be addressed in the design of the system. This paper proposes design considerations that minimize the major issues, thermal knife failure, Kevlar cord relaxation, and the measurement of the cord tension. Design practices can minimize the potential for thermal knife laminate and element damage that result in failure of the knife. A process for in-situ inspection of the knife with resistance, rather than continuity, checks and 10x zoom optical imaging can detect damaged knives. Tests allow the characterization of the behavior of the particular Kevlar cord in use and the development of specific pre-stretching techniques and initial tension values needed to meet requirements. A new method can accurately measure the tension of the Kevlar cord using a guitar tuner, because more conventional methods do not apply to arimid cords such as Kevlar.
Author
Cordage; Kevlar (Trademark); Stretching; Tuners

20020061255 NASA Glenn Research Center, Cleveland, OH USA
Thermal Conductivity and Sintering Behavior of Advanced Thermal Barrier Coatings
Zhu, Dongming, Ohio Aerospace Inst., USA; Miller, Robert A., NASA Glenn Research Center, USA; May 2002; 14p; In English; 26th Annual International Conference on Advanced Ceramics and Composites, 13-18 Jan. 2002, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA
Contract(s)/Grant(s): RTOP 714-04-20
Report No.(s): NASA/TM-2002-211481; NAS 1.15:211481; E-13249; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Advanced thermal barrier coatings, having significantly reduced long-term thermal conductivities, are being developed using an approach that emphasizes real-time monitoring of thermal conductivity under conditions that are engine-like in terms of temperatures and heat fluxes. This is in contrast to the traditional approach where coatings are initially optimized in terms of furnace and burner rig durability with subsequent measurement in the as-processed or furnace-sintered condition. The present work establishes a laser high-heat-flux test as the basis for evaluating advanced plasma-sprayed and physical vapor-deposited thermal barrier coatings under the NASA Ultra Efficient Engine Technology (UEET) Program. The candidate coating materials

for this program are novel thermal barrier coatings that are found to have significantly reduced thermal conductivities due to an oxide-defect-cluster design. Critical issues for designing advanced low conductivity coatings with improved coating durability are also discussed.
Author
Thermal Control Coatings; Sintering; Thermal Conductivity; Heat Flux; Real Time Operation

20020061301 NASA Glenn Research Center, Cleveland, OH USA
Radiation Effects in a Semitransparent Gray Coating Heated by Convection and Cooled by Radiation
Spuckler, Charles M., NASA Glenn Research Center, USA; May 2002; 14p; In English; 36th Annual International Conference on Advanced Ceramics and Composites, 13-18 Jan. 2002, Cocoa Beach, FL, USA; Sponsored by American Ceramic Society, USA
Contract(s)/Grant(s): RTOP 708-31-13
Report No.(s): NASA/TM-2002-211554; NAS 1.15:211554; E-13329; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A parametric study using a one dimensional model of a semitransparent gray thermal barrier coating was performed to gain an understanding of the role thermal radiation can play in the heat transferred. Some ceramic materials are semitransparent in the wavelength ranges were thermal radiation is important. Therefore, absorption, emission, and scattering of thermal radiation can affect the he at transfer through the coating. In this paper, a one dimensional layer was used to model the heat transfer process occurring, in a burner test rig. The semitransparent layer is heated by a hot gas flowing over its surface. The layer and substrate at a cooled by radiation to the surroundings. The back side of the substrate is insulated. The coating is assumed to be gray (absorption and scattering coefficients are not function of wavelength). An absorption coefficient of 0.3/cm and scatter a rig coefficients of 0 (no scattering) and 100/cm (isotropic scattering) were used. The thickness and thermal conductivity of the layer are varied. The results show that the temperatures are affected by the properties of the semitransparent .ever and the emissivity of the substrate. The substrate and surface temperatures are presented. The apparent temperature an optical pyrometer would read for the emitted energy is also given. An apparent thermal conductivity was calculated for the layer.
Author
Thermal Control Coatings; Thermal Radiation; Conductivity; Scattering; Radiation Absorption

20020061718 NASA Glenn Research Center, Cleveland, OH USA
Techniques for Measuring Low Earth Orbital Atomic Oxygen Erosion of Polymers
deGroh, Kim K., NASA Glenn Research Center, USA; Banks, Bruce A., NASA Glenn Research Center, USA; Demko, Rikako, Cleveland State Univ., USA; March 2002; 20p; In English; 2002 Symposium and Exhibition, 12-16 May 2002, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA
Contract(s)/Grant(s): RTOP 755-A4-06
Report No.(s): NASA/TM-2002-211479; NAS 1.15:211479; E-13246; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polymers such as polyimide Kapton and Teflon FEP (fluorinated ethylene propylene) are commonly used spacecraft materials due to their desirable properties such as flexibility, low density, and in the case of FEP, a low solar absorptance and high thermal emittance. Polymers on the exterior of spacecraft in the low Earth orbit (LEO) environment are exposed to energetic atomic oxygen. Atomic oxygen reaction with polymers causes erosion, which is a threat to spacecraft durability. It is therefore important to understand the atomic oxygen erosion yield (E, the volume loss per incident oxygen atom) of polymers being considered in spacecraft design. The most common technique for determining E is through mass loss measurements. For limited duration exposure experiments, such as shuttle experiments, where the atomic oxygen fluence is often so low that mass loss measurements can not produce acceptable uncertainties, recession measurements based on atomic force microscopy analyses can be used. Equally necessary to knowing the mass loss or recession depth for determining the erosion yield of polymers is the knowledge of the atomic oxygen fluence that the polymers were exposed to in space. This paper discusses the procedures and relevant issues for mass loss and recession depth measurements for passive atomic oxygen erosion yield characterization of polymers, along with techniques for active atomic oxygen fluence and erosion characterization. One active atomic oxygen erosion technique discussed is a new technique based on optical measurements. Details including the use of both semi-transparent and opaque polymers for active erosion measurement are reviewed.
Author
Erosion; Low Earth Orbits; Polymers; Oxygen Atoms; Spacecraft Environments

20020061883 Aerospace Corp., Technology Operations, El Segundo, CA USA
Viton B O-Ring Resilience Study
Giants, T. W., Aerospace Corp., USA; Jan. 26, 2001; 49p; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A402958; TR-99(1413)-6; SMC-TR-02-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Challenger accident in January 1986 was attributed to failure of the pressure seal in the aft field joint of the solid rocket motor. It was concluded that the elastomeric O-ring seals did not perform their sealing function because of the low temperatures at launch. Because the Shuttle and Titan O-rings were both made of Viton, there was concern that the O-rings on the segment tang and clevis joints on the Titan solid rocket motor might cause a similar problem. Launch delays that exceeded the assembled segment O-ring service life of 12 months also raised concerns. These delays resulted in the initiation of a pad-life extension program and a reevaluation of the O-ring seal. Structural analysis of clevis joint motion had predicted that a gap could be generated at the clevis joint where the O-ring is seated. This gap must be closed by O-ring decompression to maintain the seal during ignition, pressurization, and flight. This decompression (determined by the resilience of the O-ring) - must take place rapidly enough to seal the clevis joint in advance of increasing exhaust gas pressure. This report presents data on the resilience characteristics of Viton (registered) B O-rings under long-term compression in real time. These data can be used in conjunction with structural analysis of joint motion to predict joint seal performance during installed seal lifetime. The resilience of Viton (registered) B O-rings was measured as a function of initial 17% and 23% compression, time under compression up to three years, test temperatures of 60 deg F and 70 deg F, and O-ring lot. The results showed that resilience of Viton B O-rings is reduced significantly as the temperature is lowered and with increasing time under compression, which is of concern when segments are stacked for long periods of time.
DTIC
Elastomers; Viton Rubber (Trademark); Joints (Junctions); O Ring Seals; Service Life

20020061886 Aerospace Corp., Lab. Operations, El Segundo, CA USA
Viton GLT O-Ring Resilience Study
Giants, T. W., Aerospace Corp., USA; Mar. 15, 2001; 35p; In English
Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A402953; TR-2001(1413)-4; SMC-TR-02-25; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

As part of an ongoing study of the resilience properties of O-ring materials made of Viton (registered), the properties of Viton GLT were compared with those of Viton B under comparable conditions. This study was the result of a contractor-proposed change in O-ring seal material. United Technologies Chemical Systems Division had proposed a change in the O-ring seal material used on the Titan solid rocket motor (SRM) clevis joint from Viton B to Viton GLT, a fluorocarbon elastomer with better low-temperature properties, in order to eliminate application of external joint heaters. The O-ring material made with Viton GLT was found to have significantly improved resilience and compression set properties under all conditions studied when compared to Viton B. Even under worst-case conditions, these properties exceeded even the best values obtained in a comparison study with Viton B. Based on these observations, Viton GLT is an excellent candidate for use in demanding applications that require both optimum resilience and compression set properties.
DTIC
O Ring Seals; Viton Rubber (Trademark)

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.

20020060029 Society of Automotive Engineers, Inc., Warrendale, PA USA
Interim Results from Alternative Fuel Truck Evaluation Project
Chandler, K. L.; Norton, P.; Clark, N.; May 1999; 22p; In English
Report No.(s): DE2002-771074; SAE-TP-1999-01-1505; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this project, which is supported by the US Department of Energy (DOE) through the National Renewable Energy Laboratory (NREL), is to provide a comprehensive comparison of heavy-duty trucks operating on alternative fuels and

diesel fuel. Data collection from up to eight sites is planned. Currently, the project has four sites. This paper summarizes current data collection and evaluation results from this project.
NTIS
Renewable Energy; Trucks; Diesel Fuels

20020060113 NASA Glenn Research Center, Cleveland, OH USA
Reduced Toxicity Fuel Satellite Propulsion System Including Catalytic Decomposing Element with Hydrogen Peroxide
Schneider, Steven J., Inventor, NASA Glenn Research Center, USA; Apr. 30, 2002; 30p; In English; Division of US-Patent-Appl-SN-291883, filed 14 Apr. 1999
Patent Info.: Filed 17 Apr. 2001; NASA-Case-LEW-16636-2; US-Patent-6,378,291; US-Patent-Appl-SN-837822; US-Patent-Appl-SN-291883; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A reduced toxicity fuel satellite propulsion system including a reduced toxicity propellant supply for consumption in an axial class thruster and an ACS class thruster. The system includes suitable valves and conduits for supplying the reduced toxicity propellant to the ACS decomposing element of an ACS thruster. The ACS decomposing element is operative to decompose the reduced toxicity propellant into hot propulsive gases. In addition the system includes suitable valves and conduits for supplying the reduced toxicity propellant to an axial decomposing element of the axial thruster. The axial decomposing element is operative to decompose the reduced toxicity propellant into hot gases. The system further includes suitable valves and conduits for supplying a second propellant to a combustion chamber of the axial thruster, whereby the hot gases and the second propellant auto-ignite and begin the combustion process for producing thrust.
Official Gazette of the U.S. Patent and Trademark Office
Spacecraft Propulsion; Catalytic Activity; Toxicity; Rocket Engine Design; Fuel Systems

20020061304 Sierra Lobo, Inc., Freemont, OH USA
Study Task for Determining the Effects of Boost-Phase Environments on Densified Propellants Thermal Conditions for Expendable Launch Vehicles *Final Report*
Haberbusch, Mark S., Sierra Lobo, Inc., USA; April 2002; 30p; In English
Contract(s)/Grant(s): NASA Order C-73676-J; RTOP 721-20-00
Report No.(s): NASA/CR-2002-210808; E-12715; NAS 1.26:210808; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A thermodynamic study has been conducted that investigated the effects of the boost-phase environment on densified propellant thermal conditions for expendable launch vehicles. Two thermodynamic models were developed and utilized to bound the expected thermodynamic conditions inside the cryogenic liquid hydrogen and oxygen propellant tanks of an Atlas IIAS/Centaur launch vehicle during the initial phases of flight. The ideal isentropic compression model was developed to predict minimum pressurant gas requirements. The thermal equilibrium model was developed to predict the maximum pressurant gas requirements. The models were modified to simulate the required flight tank pressure profiles through ramp pressurization, liquid expulsion, and tank venting. The transient parameters investigated were: liquid temperature, liquid level, and pressurant gas consumption. Several mission scenarios were analyzed using the thermodynamic models, and the results indicate that flying an Atlas IIAS launch vehicle with densified propellants is feasible and beneficial but may require some minor changes to the vehicle.
Author
Rocket Propellants; Propellant Tanks; Fuel Tank Pressurization; Pressurizing; Thermodynamics; Simulation

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.

20020060505 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Method for Estimating Costs and Benefits of Space Assembly and Servicing by Astronauts and Robots
Purves, Lloyd R., NASA Goddard Space Flight Center, USA; [2002]; 9p; In English; IEEE Aerospace Conference, Mar. 2002, MT, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One aspect of designing future space missions is to determine whether Space Assembly and Servicing (SAS) is useful and, if so, what combination of robots and astronauts provides the most effective means of accomplishing it. Certain aspects of these choices, such as the societal value of developing the means for humans to live in space, do not lend themselves to quantification. However, other SAS costs and benefits can be quantified in a manner that can help select the most cost-effective SAS approach. Any space facility, whether it is assembled and serviced or not, entails an eventual replacement cost due to wear and obsolescence. Servicing can reduce this cost by limiting replacement to only failed or obsolete components. However, servicing systems, such as space robots, have their own logistics cost, and astronauts can have even greater logistics requirements. On the other hand, humans can be more capable than robots at performing dexterous and unstructured tasks, which can reduce logistics costs by allowing a reduction in mass of replacement components. Overall, the cost-effectiveness of astronaut SAS depends on its efficiency; and, if astronauts have to be wholly justified by their servicing usefulness, then the serviced space facility has to be large enough to fully occupy them.
Author
Astronauts; Robots; Orbital Assembly; Cost Effectiveness; Spacecraft Maintenance; Extravehicular Activity

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.

20020060084 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermally Activated Joining Apparatus
Bryant, Melvin A., III, Inventor, NASA Marshall Space Flight Center, USA; Jun. 04, 2002; 6p; In English
Patent Info.: Filed 16 Mar. 2000; NASA-Case-MFS-31454; US-Patent-6,398,264; US-Patent-Appl-SN-528794; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A thermally activated joining apparatus is provided for reversibly joining piping components of a fluid management system. The joining apparatus includes a thermally activated sealant layers for securing the components together in a leakage free manner. A thermal conductor includes a ring shaped contact portion disposed between the layers for transferring heat from one or more heating elements to the sealant layers. After the seal in place, the components can later be disconnected by supplying heat from the heating element or elements through the thermal conductor to the sealant layers to cause breaking of the seal and thereby enable separation of components.
Official Gazette of the U.S. Patent and Trademark Office
Fluid Management; Heating; Sealers; Joints (Junctions)

20020060116 NASA Glenn Research Center, Cleveland, OH USA
Micro-Scalable Thermal Control Device
Moran, Matthew E., Inventor, NASA Glenn Research Center, USA; May 14, 2002; 26p; In English
Patent Info.: Filed 12 Jul. 2001; NASA-Case-LEW-17068-1; US-Patent-6,385,973; US-Patent-Appl-SN-906012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A microscalable thermal control module consists of a Stirling cycle cooler that can be manipulated to operate at a selected temperature within the heating and cooling range of the module. The microscalable thermal control module is particularly suited for controlling the temperature of devices that must be maintained at precise temperatures. It is particularly suited for controlling the temperature of devices that need to be alternately heated or cooled. The module contains upper and lower opposing diaphragms, with a regenerator region containing a plurality of regenerators interposed between the diaphragms. Gaps exist on each side of each diaphragm to permit it to oscillate freely. The gap on the interior side one diaphragm is in fluid connection with the gap on the interior side of the other diaphragm through regenerators. As the diaphragms oscillate working gas is forced through the regenerators. The surface area of each regenerator is sufficiently large to effectively transfer thermal energy to and from the working gas as it is passed through them. The phase and amplitude of the oscillations can be manipulated electronically to control the steady state temperature of the active thermal control surface, and to switch the operation of the module from cooling to heating, or vice versa. The ability of the microscalable thermal control module to heat and cool may be enhanced by operating a plurality of modules in series, in parallel, or in connection through a shared bottom layer.
Official Gazette of the U.S. Patent and Trademark Office
Temperature Control; Regenerators; Control Equipment

20020060233 NASA Marshall Space Flight Center, Huntsville, AL USA
Structural Assembly Device
Bryant, Melvin A., III, Inventor, NASA Marshall Space Flight Center, USA; May 28, 2002; 6p; In English
Patent Info.: Filed 16 Mar. 2000; NASA-Case-MFS-31403-1; US-Patent-6,394,501; US-Patent-Appl-SN-528792; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A structural assembly device and method for securing together a pair of surfaces of two fusible materials wherein an electrically conductive thermal element is located between the surfaces which will melt, without substantially degrading, when heated. When the thermal element is heated, it is elevated to a temperature sufficient to melt the first and second elements and then is allowed to cool such that the first and second elements are joined to the thermal element and may be joined to each other as well.
Official Gazette of the U.S. Patent and Trademark Office
Joining; Melting; Joints (Junctions)

20020061835 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Status Electrical Actuator Developments *Final Report Status Elektrische Actuator Ontwikkelingen*
Kaanders, M. A. M., Prins Maurits Lab. TNO, Netherlands; March 2002; 63p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KM/487; TNO Proj. 014.12726
Report No.(s): TD2001-0077; PML-2001-A77; Copyright; Avail: Issuing Activity

An inventory of actuator systems of the M-frigates ('Multi Purpose') was made and electrical alternatives were studied. Electrical actuators that are an alternative for the numerous manual, hydraulic and pneumatic actuators are described. This concerns existing as well as future rotating or linear electrical actuators. A comparison between the characteristics of pneumatic, hydraulic and electric systems is made. For the M-frigate, an electrical alternative for the hydraulic steering machine is presented. It shows that in particular the linear electrical motor is a promising drive option. Recent scientific literature and studies indicate that there is a tendency, both nationally and internationally, to apply more electrically operated actuators. The drive for this electrification is a reduction of the life cycle costs. In comparison with other types of actuators, end-to-end electrical actuator systems are more space efficient, use less energy and need less maintenance.
Author
Actuators; Hydraulic Equipment; Electrification; Pneumatics; Rotation

20020061882 Corps of Engineers, Washington, DC USA
Engineering and Design Calibration of Laboratory Soils Testing Equipment
Dec. 01, 1970; 45p; In English
Report No.(s): AD-A402942; EM-1110-2-1909; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This manual presents recommended procedures for the calibration of testing equipment commonly used in Corps of Engineers soils laboratories. As a supplement to EM 1110-2-1906, 'Laboratory Soils Testing,' it has been prepared as an aid in establishing and maintaining acceptable accuracy for soils testing equipment.
DTIC
Calibrating; Soils; Test Equipment

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.

20020059954 National Research Council, Radioastronomy Inst., Italy
A Multiband Primary Focus Receiver for Noto Antenna
Tuccari, Gino, National Research Council, Italy; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 84-85; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A new multiband receiver has been completed to be used in the primary focus of the 32-m Noto parabola. The included frequency bands in double circular polarization are: 3.6/13 coaxial, 21, 18, 2.5 cm. The range 250-1000 MHz is also covered with the addition of external dedicated antennas. Main features are described along with the architecture adopted to integrate in the

entire new system also receivers placed in the secondary focus. Cooled front-end and feeds for both L and S/X bands allow to achieve interesting performance.
Author
Frequencies; Radio Receivers; Very Long Baseline Array (VLBA)

20020059985 Bordeaux 2 Univ., France
Modeling Radio Source Structure for Improved VLBI Data Analysis
Charlot, Patrick, Bordeaux 2 Univ., France; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 233-242; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

At the milliarcsecond scale, most of the extragalactic radio sources exhibit spatially extended intrinsic structures which are variable in both time and frequency. Such radio structures may introduce sizeable effects in the VLBI (Very Long Baseline Interferometry) measurements which must be corrected for improved VLBI data analysis. Modeling these effects requires identification of a truly kinematically stable morphological feature for each source and calculation of structure corrections for the VLBI delays based on images of the source brightness distribution. This paper presents the model for calculating source structure corrections, discusses the magnitude of these corrections, and reviews the results obtained so far, with emphasis on a detailed study of the structural effects caused by the source 2200+420 in the framework of the massive analysis reported by Sovers et al. in these proceedings.
Author
Correction; Extragalactic Radio Sources; Very Long Base Interferometry; Delay

20020059986 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Structure Corrections in Modeling VLBI Delays for RDV Data
Sovers, Ojars J., Jet Propulsion Lab., California Inst. of Tech., USA; Charlot, Patrick, Bordeaux 2 Univ., France; Fey, Alan L., Naval Observatory, USA; Gordon, David, NASA Goddard Space Flight Center, USA; International VLBI Service for Geodesy and Astrometry: General Meeting Proceedings; May 2002, pp. 243-247; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Since 1997, bimonthly S- and X-band observing sessions have been carried out employing the VLBA (Very Long Baseline Array) and as many as ten additional antennas. Maps of the extended structures have been generated for the 160 sources observed in ten of these experiments (approximately 200,000 observations) taking place during 1997 and 1998. This paper reports the results of the first massive application of such structure maps to correct the modeled VLBI (Very Long Baseline Interferometry) delay in astrometric data analysis. For high-accuracy celestial reference frame work, proper choice of a reference point within each extended source is crucial. Here the reference point is taken at the point of maximum emitted flux. Overall, the weighted delay residuals (approximately equal to 30 ps) are reduced by 8 ps in quadrature upon introducing source maps to model the structure delays of the sources. Residuals of some sources with extended or fast-varying structures improve by as much as 40 ps. Scatter of ’arc positions’ about a time-linear model decreases substantially for most sources. Based on our results, it is also concluded that source structure is presently not the dominant error source in astrometric/geodetic VLBI.
Author
Very Long Base Interferometry; Very Long Baseline Array (VLBA); Error Analysis; Systematic Errors

20020060006 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Extending the ICRF to Higher Radio Frequencies
Jacobs, C. S., Jet Propulsion Lab., California Inst. of Tech., USA; Jones, D. L., Jet Propulsion Lab., California Inst. of Tech., USA; Lanyi, G. E., Jet Propulsion Lab., California Inst. of Tech., USA; Lowe, S. T., Jet Propulsion Lab., California Inst. of Tech., USA; Naudet, C. J., Jet Propulsion Lab., California Inst. of Tech., USA; Resch, G. M., Jet Propulsion Lab., California Inst. of Tech., USA; Steppe, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Zhang, L. D., Jet Propulsion Lab., California Inst. of Tech., USA; Ulvestad, J. S., National Radio Astronomy Observatory, Australia; Taylor, G. B., National Radio Astronomy Observatory, Australia; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 350-354; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The ICRF forms the basis for all astrometry including use as the inertial coordinate system for navigating deep space missions. This frame was defined using S/X-band observations over the past 20+ years. In January 2002, the VLBA approved our proposal for observing time to extend the ICRF to K-band (24 GHz) and Q-band (43 GHz). The first step will be observations at K- and Q-bands on a subset of ICRF sources. Eventually, K- and Q-band multi-epoch observations will be used to estimate positions, flux density and source structure for a large fraction of the current S/X-band ICRF source list. This work will benefit the radio

astronomy community by extending the VLBA calibrator list at these bands. In the longer term, we would also like to extend the ICRF to Ka-band (32 GHz). A celestial reference frame will be needed at this frequency to support deep space navigation. A navigation demonstration is being considered for NASA's Mars 2005 mission. The initial K- and Q-band work will serve to identify candidate sources at Ka-band for use with that mission.
Author
Extremely High Frequencies; Superhigh Frequencies; Very Long Baseline Array (VLBA); Celestial Reference Systems

20020060007 NASA Goddard Space Flight Center, Greenbelt, MD USA
Towards a Future ICRF Realization
Ma, Chopo, NASA Goddard Space Flight Center, USA; Gordon, David, Raytheon Information Technology and Scientific Services, USA; MacMillan, Daniel, NVI, Inc., USA; Petrov, Leonid, NVI, Inc., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 355-359; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The data and analysis for the ICRF were completed in 1995 to define a frame to which the Hipparcos optical catalog could be fixed. Additional observations on most of the 608 sources in the overall ICRF catalog have been acquired using a small portion of geodetic observing time as well as astrometric sessions concentrating on the Southern Hemisphere. Positions of new sources have been determined, including approximately 1200 from a VLBA phase calibrator survey. A future ICRF realization will require improved geophysical modeling, sophisticated treatment of position variations and/or source structure, optimized data selection and weighting, and re-identification of defining sources. The motivation for the next realization could be significant improvement in accuracy and density or preparation for optical extragalactic catalogs with microarcsecond precision.
Author
Celestial Reference Systems; Data Processing; Sky Surveys (Astronomy)

20020060010 NASA Goddard Space Flight Center, Greenbelt, MD USA
Radio Source Stability and the Observation of Precession-Nutation
Feissel, Martine, Observatoire de Paris, France; Ma, Chopo, NASA Goddard Space Flight Center, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 367-371; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Some of the radio sources used by VLBI to materialize the celestial reference frame are known to have apparent motions at the sub-milliarcsecond level, particularly those observed in the early years. On the other hand, state of the art precession-nutation models match the observations at this same level. We investigate to what extent the source instability may contaminate the VLBI determination of precession and nutation corrections in several frequency domains.
Author
Celestial Reference Systems; Nutation; Stability; Very Long Base Interferometry; Radio Sources (Astronomy)

20020060146 Mineta Transportation Inst., Coll. of Business, San Jose, CA USA
Using Fiber Networks to Stimulate Transit Oriented Development: Prospects, Barriers, and Best Practices ***Final Report***
Siembab, W.; Graham, S.; Roldan, M.; October 2001; 116p; In English
Report No.(s): PB2002-105915; MTI-01-16; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This study empirically examines a practical aspect of a relationship that is only now being conceptualized-the relationship between rail transit, land development, and telecommunications. It pushes the envelope of knowledge in so far as the interaction between just two of the factors, public transportation and land use (urban form), has been a focus of policy research for only about 30 years, especially the last 10 years. This study is concerned with the feasibility of introducing three telecommunications-based incentives for transit-oriented development. The market for these hypothetical incentives is the developers of transit-oriented projects. California's Bay Area/Santa Clara Valley and Los Angeles/Southern California regions are the study's geographical focus. The question is the extent to which members of the development community believe that the incentives would affect the viability of their transit-oriented projects.
NTIS
Fiber Optics; Telecommunication; Transportation; Computer Networks

20020060149 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden

Internet Organisations: Management of IT-related Security Issues ***Hanteringen av IT-Relaterade Saekerhetsfragor Inom Internetorganisationerana***

Lerdell, D.; March 2000; 98p; In Swedish

Report No.(s): PB2002-107004; FOA-R-00-01460-170-SE; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

On behalf of the Swedish government, the Defense Research Establishment, FOA, is carrying out studies within the area of international co-operation concerning IT-related threats and potential co-operational structures that may develop to meet the new IT-related threats. In the present report, the author describes how the Internet organizations manage the issues of IT-related security, and in particular, the development of the reformation of the so-called domain name system.

NTIS

Internets; Computer Information Security; Information Systems

20020060723 San Jose State Univ., CA USA

An Overview of Auralization and Psychoacoustics

Begault, Durand R., San Jose State Univ., USA; [1998]; 11p; In English; Journee Acoustique Virtuelle 1998, 28 Oct. 1998, Paris, France

Contract(s)/Grant(s): NCC2-327; RTOP 548-51-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation provides information on a study the goal of which was to determine the auditory threshold for speech reverberation using a specific room model. Procedures and hardware used are detailed as are the participants in the study.

CASI

Psychoacoustics; Reverberation; Auditory Perception

20020061281 NASA Glenn Research Center, Cleveland, OH USA

A Comparison of MOCLD With PLD Ba(x)SR(1-x)TiO3 Thin Films on LaAlO3 for Tunable Microwave Applications

VanKeuls, F. W., NASA Glenn Research Center, USA; Mueller, C. H., NASA Glenn Research Center, USA; Romanofsky, R. R., NASA Glenn Research Center, USA; Warner, J. D., NASA Glenn Research Center, USA; Miranda, F. A., NASA Glenn Research Center, USA; Jiang, H., Corning Applied Technologies, USA; April 2002; 12p; In English

Contract(s)/Grant(s): RTOP 755-08-0B

Report No.(s): NASA/TM-2002-210906; E-12783; NAS 1.15:210906; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Historically, tunable dielectric devices using thin crystalline Ba(x)SR(1-x)TiO3 (BST) films deposited on lattice-matched substrates, such as LaAlO3, have generally been grown using pulsed laser deposition (PLD). Highly oriented BST films can be grown by PLD but large projects are hampered by constraints of deposition area, deposition time and expense. The Metal-Organic Chemical Liquid Deposition (MOCLD) process allows for larger areas, faster turnover and lower cost. Several BST films deposited on LaAlO3 by MOCLD have been tested in 16 GHz coupled microstrip phase shifters. They can be compared with many PLD BST films tested in the same circuit design. The MOCLD phase shifter performance of 293 deg. phase shift with 53 V/micron dc bias and a figure of merit of 47 deg./dB is comparable to the most highly oriented PLD BST films. The PLD BST films used here have measured XRD full-width-at-half-maxima (FWHM) as low as 0.047 deg.. The best FWHM of these MOCLD BST films has been measured to be 0.058 deg.

Author

Ferroelectricity; Tunable Filters; Microwaves; Phase Shift

20020061929 Texas Univ., Austin, TX USA

Equipment for System Demonstration of Phased Array Antenna Using Polymer-Based Optical True Time Delay Module ***Final Report, 1 Apr. 2000-30 Sep. 2001***

Chen, Ray T.; Aug. 31, 2000; 26p; In English

Contract(s)/Grant(s): F49620-00-1-0250; Proj-3484

Report No.(s): AD-A402765; AFRL-SR-AR-TR-02-0171; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A novel 1-to-64 (6-bit(2.6)) optical true-time delay module that can provide linear time delays ranging from 0 to 443.03 picoseconds is presented. The total insertion loss, including the propagation loss and the 1-to-64 fan-out loss is confirmed to be less than 20 dB. The crosstalk among channels is measured to be less than - 40 dB. The polarization dependent loss among 64 fan-outs is within 0.37 dB. The bandwidth of the fully packaged module is determined to be as high as 539 GHz. This true-time delay module is employed to control an eight-element K-band phased array antenna system. Far field patterns covering 18 GHz

to 26.5 GHz are measured and compared with the simulated results to verify this module's wide instantaneous bandwidth. This module can bee employed to control phased array antennas working at 5 GHz - 40 GHz.
DTIC
Polymers; Optical Materials; Antenna Arrays; Phased Arrays; Antenna Design; Far Fields

20020061930 Air Force Research Lab., Rome, NY USA
Interference Mitigation in Spread Spectrum Systems Using Lapped Transforms ***Final Report, Dec. 1996-Dec 1999***
Medley, Michael J.; May 2002; 56p; In English
Contract(s)/Grant(s): Proj-4519
Report No.(s): AD-A402761; AFRL-IF-RS-TR-2002-96; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In this report, linear and non-linear transform domain filtering techniques are examined and proposed as a means of enhancing the inherent interference immunity associated with direct sequence spread spectrum communication receivers. This analysis begins with a review of block transform domain Wiener filters and is further developed in the lapped transform domain. The latter part of this report addresses the use of lapped transforms to transform the received data signal into the transform domain wherein adaptive excision is performed. System performance results are presented for a variety of channel conditions and compared to those obtained using orthonormal block transforms. These results demonstrate the improved performance and increased robustness with respect to jammer frequency and bandwidth of lapped transform domain excision techniques relative to similar algorithms based on non-weighted block transforms.
DTIC
Interference; Frequency Domain Analysis; Transformations (Mathematics); Spread Spectrum Transmission; Algorithms; Retarding

20020061935 Defence Science and Technology Organisation, Salisbury, Australia
Experimental Comparisons of Data Entry by Automatic Speech Recognition, Keyboard, and Mouse
Mitchard, Helen; Winkles, Jim; Nov. 2001; 56p; In English
Report No.(s): AD-A402966; DSTO-RR-0220; DODA-AR-012-066; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The objective was to determine the conditions under which Automatic Speech Recognition (ASR) is an efficient choice for data entry. In particular the focus was on data entry tasks that are part of constructing military messages. The ADF Formatted Messaging System utilizes a structured formatting system to constrain the semantics of a message but also includes a field for unlimited and unstructured text. Hence the data entry tasks involved range from form-filling to free dictation of short phrases. In the experiments, ASR and manual input modes are compared for three data entry tasks: textual phrase entry, selection from a list, and numerical data entry. to effect fair comparisons, the tasks minimized the transaction cycle for each input mode and data type and the main comparisons use only times from correct data entry. The results indicate that for inputting short phrases ASR only competes if the typist's speed is below 45 wpm. For selecting an item from a list, ASR offered an advantage only if the list length was greater than 15 items. For entering numerical data, ASR offered no advantage over keypad or mouse. The general conclusion for formatted data entry is that a keyboard/mouse interface designed to match the data to be entered will be more time efficient than any equivalent ASR interface.
DTIC
Speech Recognition; Evaluation; Input; Human-Computer Interface

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ELECTRONICS AND ELECTRICAL ENGINEERING

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

20020059642 Swedish Defence Research Establishment, Stockholm, Sweden
Evaluation of a Sea Trial with a Multisensor Network ***Utvaerdering av Sjoefoersoek med Sensorkedja***
Fristedt, T.; Lindqvist, P.; Jun. 2001; 54p; In Swedish
Report No.(s): PB2002-104979; FOI-R-0137-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A multi sensor network delivered by the Defense Research Agency to the Defense Material Administration was used for the first time at a sea trial at Rindo in the autumn 2000. The network consists of four units with sensors for measuring electric and

magnetic fields, pressure and acoustics. Data are transmitted over a fibre optic network to a main computer on land. This report describes the performance, behavior and some initial results of the measurement systems and sensor at this trial.
NTIS
Multisensor Fusion; Remote Sensing; Networks; Information Systems; Measuring Instruments

20020059647 Swedish Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Polarimetric Calibration of a Coherent Radar with Application at 94 GHz ***Polarimetrisk Kalibrering av Koherent Radar med Tilliaempning vid 94 GHz***
Johansson, C.; Sume, A.; Aug. 2001; 86p; In Swedish
Report No.(s): PB2002-104982; FOI-R-0161-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The report describes the application of a method for calibration of a polarimetric radar, published by the Sandia National Laboratories, USA. The method has been used with a coherent monostatic mm-wave radar at the FOI (Swedish Defence Research Agency), operating at 94 GHz, intended for use in polarimetric measurements of static objects. The method reflects an increasing demand for accurate, polarimetric target cross section determinations, including both amplitude and phase. It involves calibration measurements of known reference reflectors from which the polarization distortion of the system is determined, both in the transmitter and receiver parts. The method requires in the implemented general form three calibration measurements: one measurement of a sphere (alternatively flat plate, or trihedral) and two of a dihedral with different tilt angles with respect to the horizontal. If the transmitter and receiver parts have equal, symmetric transformation properties the requirement for independent measurements is reduced to only one, e.g. of a trihedral. The result shows that with a careful calibration it is possible to correct measurements with a system which is far from ideal, neither with respect to polarization purity nor low distortion. Hence a precise determination of the polarization properties of a target can be obtained, which raises possibilities of its recognition and measurement of the orientation from polarization analysis. This will be described in more detail in a future report.
NTIS
Polarimetry; Coherent Radar; Millimeter Waves; Calibrating

20020059657 Lockheed Martin Corp., Langley Program Office, Hampton, VA USA
The Software Element of the NASA Portable Electronic Device Radiated Emissions Investigation
Koppen, Sandra V., Lockheed Martin Corp., USA; May 2002; 33p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-00135; RTOP 722-64-10-53
Report No.(s): NASA/CR-2002-211675; NAS 1.26:211675; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
NASA Langley Research Center's (LaRC) High Intensity Radiated Fields Laboratory (HIRF Lab) recently conducted a series of electromagnetic radiated emissions tests under a cooperative agreement with Delta Airlines and an interagency agreement with the FAA. The frequency spectrum environment at a commercial airport was measured on location. The environment survey provides a comprehensive picture of the complex nature of the electromagnetic environment present in those areas outside the aircraft. In addition, radiated emissions tests were conducted on portable electronic devices (PEDs) that may be brought onboard aircraft. These tests were performed in both semi-anechoic and reverberation chambers located in the HIRF Lab. The PEDs included cell phones, laptop computers, electronic toys, and family radio systems. The data generated during the tests are intended to support the research on the effect of radiated emissions from wireless devices on aircraft systems. Both tests systems relied on customized control and data reduction software to provide test and instrument control, data acquisition, a user interface, real time data reduction, and data analysis. The software executed on PC's running MS Windows 98 and 2000, and used Agilent Pro Visual Engineering Environment (VEE) development software, Common Object Model (COM) technology, and MS Excel.
Author
Electromagnetic Fields; Airports; Anechoic Chambers; Reverberation Chambers; Data Reduction; Data Acquisition; Commercial Aircraft

20020060072 NASA Marshall Space Flight Center, Huntsville, AL USA
Process for a High Efficiency Class D Microwave Power Amplifier Operating in the S-Band
Sims, William Herbert, III, Inventor, NASA Marshall Space Flight Center, USA; May 14, 2002; 34p; In English
Patent Info.: Filed 3 Nov. 2000; NASA-Case-MFS-31455-1; US-Patent-6,388,512; US-Patent-Appl-SN-707290; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A process and product providing a High Efficiency Microwave Power Amplifier (HEMPA) which propagates S-Band microwave frequency square waves; utilizing a program simulating FETs at high DC-to-RF efficiencies, which analyses linear elements of selected FETs in a frequency domain, and non-linear elements of the FETs in a time domain, and converts the time domain values into the frequency domain, and performs DC and S-parameter simulated measurements based on predefined data

for each FET. Individual FET parameters are extracted and isolated by converting the S-parameters to admittance or impedance parameters to derive FET models for each FET, which the program uses to provide a final output of a HEMPA circuit based on iterative simulations of an amplification circuit utilizing microwave topology and frequencies. Iterative simulations of the amplification circuit analyze output values of a plurality of cascaded stages of the FETs, which are arranged in a push-pull configuration.
Official Gazette of the U.S. Patent and Trademark Office
Microwave Amplifiers; Power Amplifiers; Square Waves; Field Effect Transistors; Superhigh Frequencies

20020060092 NASA Glenn Research Center, Cleveland, OH USA
Design and Manufacturing Processes of Long-Life Hollow Cathode Assemblies
Patterson, Michael J., Inventor, NASA Glenn Research Center, USA; Verhey, Timothy R., Inventor, NASA Glenn Research Center, USA; Soulas, George C., Inventor, NASA Glenn Research Center, USA; Apr. 30, 2002; 18p; In English; Division of US-Patent-Appl-SN-503658, filed 14 Dec. 2000, which is a division of US-Patent-Appl-SN-152407, filed 14 Sep. 1998
Patent Info.: Filed 28 Dec. 2000; NASA-Case-LEW-16056-3; US-Patent-6,380,685; US-Patent-Appl-SN-754388; US-Patent-Appl-SN-503658; US-Patent-Appl-SN-152407; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The design and manufacturing processes for Hollow Cathode Assemblies (HCA's) that operate over a broad range of emission currents up to 30 Amperes, at low potentials, with lifetimes in excess of 17,500 hours. The processes include contamination control procedures which cover hollow cathode component cleaning procedures, gas feed system designs and specifications, and hollow cathode activation and operating procedures to thereby produce cathode assemblies that have demonstrated stable and repeatable operating conditions, for both the discharge current and voltage. The HCA of this invention provides lifetimes of greater than 10,000 hours, and expected lifetimes of greater than 17,500 hours, whereas the present state-of-the-art is less than 500 hours at emission currents in excess of 1 Ampere. Stable operation is provided over a large range of operating emission currents, up to a 6:1 ratio, and this HCA can emit electron currents of up to 30 Amperes in magnitude to an external anode that simulates the current drawn to a space plasma at voltages of less than 20 Volts.
Official Gazette of the U.S. Patent and Trademark Office
Hollow Cathodes; Contamination; Feed Systems

20020060232 NASA Johnson Space Center, Houston, TX USA
Method and Apparatus for Reducing the Vulnerability of Latches to Single Event Upsets
Shuler, Robert L., Jr., Inventor, NASA Johnson Space Center, USA; Apr. 23, 2002; 22p; In English
Patent Info.: Filed 13 Mar. 2000; NASA-Case-MSC-22953-1; US-Patent-6,377,097; US-Patent-Appl-SN-525371; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A delay circuit includes a first network having an input and an output node, a second network having an input and an output, the input of the second network being coupled to the output node of the first network. The first network and the second network are configured such that: a glitch at the input to the first network having a length of approximately one-half of a standard glitch time or less does not cause the voltage at the output of the second network to cross a threshold, a glitch at the input to the first network having a length of between approximately one-half and two standard glitch times causes the voltage at the output of the second network to cross the threshold for less than the length of the glitch, and a glitch at the input to the first network having a length of greater than approximately two standard glitch times causes the voltage at the output of the second network to cross the threshold for approximately the time of the glitch. The method reduces the vulnerability of a latch to single event upsets. The latch includes a gate having an input and an output and a feedback path from the output to the input of the gate. The method includes inserting a delay into the feedback path and providing a delay in the gate.
Official Gazette of the U.S. Patent and Trademark Office
Delay Circuits; Latches; Single Event Upsets

20020060511 NASA Marshall Space Flight Center, Huntsville, AL USA
The 2001 NASA Aerospace Battery Workshop
Brewer, Jeff C., Compiler, NASA Marshall Space Flight Center, USA; February 2002; 736p; In English, 27-29 Nov. 2001, Huntsville, AL, USA; Also announced as 20020060512 through 20020060540; CD-ROM contains full text document in PDF format; Compatible with MAC, Windows and UNIX Platforms
Report No.(s): NASA/CP-2002-211466; M-1039; NAS 1.55:211466; NONP-NASA-CD-2002092365; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This document contains the proceedings of the 34th annual NASA Aerospace Battery Workshop, hosted by the Marshall Space Flight Center, November 27-29, 2001. The workshop was attended by scientists and engineers from various agencies of

the US Government, aerospace contractors, and battery manufacturers, as well as international participation in like kind. The subjects covered included nickel-hydrogen, nickel-cadmium, lithium-ion, and silver-zinc technologies.
Author
Conferences; Electric Batteries; Lithium Batteries; Performance Tests; Nickel Hydrogen Batteries; Nickel Cadmium Batteries; Design Analysis

20020060512 Thermal Hazard Technology, Bletchley, UK
Battery Safety Testing Introducing the EV-ARC
OKane, Phill, Thermal Hazard Technology, UK; Ottaway, Martyn, Thermal Hazard Technology, UK; The 2001 NASA Aerospace Battery Workshop; February 2002; 50p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Accelerating rate calorimetry (ARC) was devised by Dow Chemical in the 1970s and it simulates the worst case 'runaway reaction'. ARC is widely used in the chemical and battery industry and is applicable for most domestic batteries. EV-ARC was developed for larger batteries.
Derived from text
Electric Batteries; Heat Measurement

20020060513 Spectrum Astro, Inc., USA
Performance of Li-S(TM) Cells Under LEO Test Regime and at Low Temperatures (to -40 C)
Kim, Joon, Moltech Corp., USA; Mikhaylik, Yuriy, Moltech Corp., USA; Geronov, Yordan, Moltech Corp., USA; Kettner, Rick, Spectrum Astro, Inc., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 28p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of the performance of Li-S(trademarked) cells under LEO test regimes and at low temperatures. Details are given product attributes, a theoretical energy density comparison, a Li-S and Li-ion cell performance comparison, cycle life evolution of Moltech prototype Li-S cells, voltage vs discharge capacity, and Li-S cell cycle testing.
CASI
Lithium Batteries; Lithium Sulfates; Performance Tests; Temperature Effects

20020060514 NASA Johnson Space Center, Houston, TX USA
Development Status of 3 Battery Systems for the X-38 Crew Return Vehicle
Darcy, Eric, NASA Johnson Space Center, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 61p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of the development status of three battery systems for the X-38 crew return vehicle. Details are given on the design features, the lithium battery module, PCM composite heat sinks, carbon fibercore blocks for Qual battery, battery module base housing, heat sink characteristics, and battery qualifications.
CASI
Electric Batteries; Spacecraft Power Supplies; Heat Sinks; Composite Materials

20020060515 BAE Systems, Battery Technology Center, Rockville, MD USA
Performance of Small, Commercial, Primary Cylindrical, Alkaline Cells
Baldwin, Sonja N., BAE Systems, USA; Markow, Andrew J., BAE Systems, USA; Surd, David J., BAE Systems, USA; Walk, C. Richard, BAE Systems, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 2p; In English; Also announced as 20020060511; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The new high tech commercial devices, like cellular phones, digital cameras, laptops, camcorders, and palm pilots require more energy and power than the devices we have been using in the past. The manufacturers of small cylindrical cells want a significant share of these large new markets and are, therefore, making cell improvements to meet these new requirements. For these devices, they are concerned with operation in the 0.5-2.0 watt range. The cell improvements began in the late 1990s with the Duracell Ultra, Energizer e(exp 2), Panasonic digital and similar improvements by other manufacturers to their standard product line. Since the aerospace community may have some interest in these commercial products, we have attempted with this

paper to present performance information for recently developed small cell technologies. Comparisons between manufacturers will not be made. The paper will be concerned only with the present state of the technologies.
Derived from text
Alkaline Batteries; Cylindrical Bodies; Performance Tests; Technology Assessment

20020060516 South Carolina Univ., Dept. of Electrical Engineering, Columbia, SC USA
Battery System Studies in a Virtual-Prototyping Environment
Jiang, Zhen-Hua, South Carolina Univ., USA; Liu, Sheng-Yi, South Carolina Univ., USA; Dougal, Roger A., South Carolina Univ., USA; Gao, Li-Jun, South Carolina Univ., USA; Weidner, John W., South Carolina Univ., USA; White, Ralph, South Carolina Univ., USA; February 2002; 24p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of battery system studies in a virtual prototyping environment. Details are given on battery models in a virtual test bed, satellite power system simulations, and comparisons of different configurations.
Derived from text
Electric Batteries; Prototypes; Computerized Simulation; Spacecraft Power Supplies; Virtual Reality

20020060517 NASA Goddard Space Flight Center, Greenbelt, MD USA
AEA Cell-Bypass-Switch Activation: An Update
Keys, Denney, NASA Goddard Space Flight Center, USA; Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; Wannemacher, Harry, QSS Group, Inc., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 23p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objectives of this project included the following: (1) verify the performance of AEA cell bypass protection device (CBPD) under simulated EOS-Aqua/Aura flight hardware configuration; (2) assess the safety of the hardware under an inadvertent firing of CBPD switch, as well as the closing of CBPD; and (3) confirm that the mode of operation of CBPD switch is the formation of a continuous low impedance path (a homogeneous low melting point alloy). The nominal performance of AEA CBPD under flight operating conditions (vacuum except zero-G, and high impedance cell) has been demonstrated. There is no evidence of cell rupture or excessive heat production during or after CBPD switch activation under simulated high cell impedance (open-circuit cell failure mode). The formation of a continuous low impedance path (a homogeneous low melting point alloy) has been confirmed.
Derived from text
Electric Switches; Electric Batteries; Vacuum; Performance Tests

20020060518 TRW Space and Electronics Group, Redondo Beach, CA USA
EOS-AQUA Nickel-Hydrogen Cell Life Test Update
Tobias, R. F., TRW Space and Electronics Group, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 26p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

As of 10/31/01, the EOS-AQUA Ni-H2 cells have successfully completed over 17,900 LEO cycles at 25% DOD. Pressure and end of discharge voltage decreased initially but stabilized after the RR was increased from 1.04 to 1.06. After approximately 10,000 cycles an increase in pressure with cycling has been observed. End of charge voltage increased slightly with cycles and voltage dispersion is minimal.
Derived from text
Electric Potential; Spacecraft Power Supplies; Nickel Hydrogen Batteries; Design Analysis; Performance Tests

20020060519 Eagle-Picher Technologies, LLC, Joplin, MO USA
Single Pressure Vessel Life Single Pressure Vessel Life Test Update
Dermott, Jeff, Eagle-Picher Technologies, LLC, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 13p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Nickel-hydrogen life testing at EPT was originally started to support early flight programs. Test beds have been expanded over past 20 years to include new designs. The Single Pressure Vessel (SPV) represents a significant change battery design. SPV life testing was required to prove reliability of the design. This viewgraph presentation reviews the SPV design.
Derived from text
Electric Batteries; Pressure Vessels; Design Analysis; Performance Tests

20020060520 Eagle-Picher Technologies, LLC, Joplin, MO USA
Methods Used to Prevent Capacity Fade In Nickel Hydrogen Batteries
Brill, Jack N., Eagle-Picher Technologies, LLC, USA; Mahan, Matt, Eagle-Picher Technologies, LLC, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 20p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

For some time it has been known that storage of cells with an internal hydrogen pressure can lead to capacity fade. Cells stored for periods of eight years or more have shown normal performance when the nickel precharge is maintained. Other cells stored for less time have exhibited capacity loss. The loss in capacity is attributed to loss of precharge. The loss of cell precharge can occur for various reasons: (1) extended trickle charge; (2) repeated overcharge of cells during integration and testing; and (3) allowing cells to stand in a partial charge condition for extended periods followed by overcharge. The capacity loss typically is a result of a second voltage plateau developing. A portion of the capacity is unUSAble since the cell terminal voltage is less than 1.00 volt. Normally the total capacity of the cell is the same.
Derived from text
Internal Pressure; Losses; Nickel Hydrogen Batteries

20020060521 Eagle-Picher Technologies, LLC, Joplin, MO USA
Packaging Design Concepts for Use in Small Satellite Applications
Cook, William D., Eagle-Picher Technologies, LLC, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 17p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Small NiH2 batteries have established themselves in satellites for the aerospace market. Packaging ratios average 1.34% of cell mass, specific energy averages 13.23 Wh/lb, and energy density averages 0.36 Wh/cubic inch. Battery designs using horizontal mountings exhibit better thermal heat transfer than those using vertical mountings.
Derived from text
Nickel Hydrogen Batteries; Packaging; Design Analysis; Mounting

20020060522 NASA Goddard Space Flight Center, Greenbelt, MD USA
International Space Station Nickel-Hydrogen Battery Startup and Initial Performance
Dalton, Penni, NASA Goddard Space Flight Center, USA; Cohen, Fred, Boeing Co., USA; Hajela, Gyan, Boeing Co., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 24p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Battery Orbital Replacement Unit (ORU) was designed to meet the following requirements: a 6.5-year design life, 38,000 charge/discharge Low Earth Orbit cycles, 81-Amp-hr nameplate capacity, 4 kWh nominal storage capacity, contingency orbit capability, an operating temperature of 5 +/- 5 C standard orbit and 5+5/-10 C contingency orbit, a non-operating temperature of -25 to +30 C, a five-year Mean Time between failure, an on-orbit replacement using ISS robotic interface, and one launch to orbit and one return to ground. The ISS electrical power system is successfully maintaining power for all on-board loads. ISS Eclipse power is currently supplied by six Ni-H2 batteries (12 ORUs), which are operating nominally.
Derived from text
Nickel Hydrogen Batteries; Operating Temperature; Requirements; Design Analysis

20020060523 Societe des Accumulateurs Fixes et de Traction, Specialty Battery Group, Poitiers, France
SAFT Li-Ion Module Design
Borthomieu, Y., Societe des Accumulateurs Fixes et de Traction, France; Semerie, J. P., Societe des Accumulateurs Fixes et de Traction, France; The 2001 NASA Aerospace Battery Workshop; February 2002; 33p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of the Li-ion module design. Details are given on VES 140S cells, cell performances, cell module principles, applications, cell module design, cell wiring, the 3P module, cell bypass characteristics, and failure modes and rates.
CASI
Design Analysis; Lithium Batteries; Characterization

20020060524 Japan Storage Battery Co. Ltd., Kyoto, Japan
Calendar and Cycle Life Prediction of 100Ah Lithium-Ion Cells for Space Applications
Inoue, Takefumi, Japan Storage Battery Co. Ltd., Japan; Sasaki, Takeshi, Japan Storage Battery Co. Ltd., Japan; Imamura, Nobutaka, Japan Storage Battery Co. Ltd., Japan; Yoshida, Hiroaki, Japan Storage Battery Co. Ltd., Japan; Mizutani, Minoru, Japan Storage Battery Co. Ltd., Japan; Goto, Masayoshi, Mitsubishi Electric Corp., Japan; The 2001 NASA Aerospace Battery Workshop; February 2002; 8p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche
Calendar and cycle life characteristics of 100Ah lithium-ion cells were evaluated under the test conditions with wide range of temperature, depth of discharge, and state of charge. From this test results, based on the plausible deterioration models, our prediction shows that our lithium-ion cell has capability sufficient to achieve the GEO and LEO mission life requirements. We also present the relations between the cell internal resistance and the capacity loss to estimate the end of discharge voltage during the missions.
Author
Life (Durability); Lithium Batteries; Performance Tests; Spacecraft Power Supplies

20020060525 Mine Safety Appliances Co., Sparks, MD USA
Thermal Modeling of Prismatic Lithium-Ion Cells
Shah, Pinakin M., Mine Safety Appliances Co., USA; Nispel, Michael T., Nispel (Michael T.), USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 30p; In English; Also announced as 20020060511; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche
The objectives of this project were to estimate the transient thermal profiles of an aerospace, prismatic, 50 Ah, lithium-ion cell during repeated Low Earth Orbit (LEO) charge/discharge duty cycles and to perform parametric studies to determine the effects of various changes in design; e.g., materials, dimensions, boundary conditions, cell age, etc. This study has been successful in providing a time and cost effective tool for estimating the thermal profile of a lithium-ion cell. A number of parametric studies are possible to optimize component designs and to determine the effects of material properties, cell aging, and boundary conditions on the thermal performance of a cell. FEM analyses can enhance safety studies by projecting operating limitations without costly experimentation.
Derived from text
Lithium Batteries; Temperature Effects; Design Analysis; Computerized Simulation; Thermodynamic Properties

20020060526 SAFT America, Inc., Advanced Battery System Div., Cockeysville, MD USA
SAFT Li-Ion Cells GEO and LEO Life Test Up-Date
Croft, Haiyan, SAFT America, Inc., USA; Staniewicz, R. J., SAFT America, Inc., USA; Borthomieu, Yannick, Societe des Accumulateurs Fixes et de Traction, France; Planchat, J. P., Societe des Accumulateurs Fixes et de Traction, France; The 2001 NASA Aerospace Battery Workshop; February 2002; 36p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche
Life and calendar tests have shown: (1) Limited effect of the EOCV; (2) Impacts of high charge (>12 Amps) current on fading effects, including reversible energy loss due to current density and partial localized Li plating (at end of charge); (3) Advantages of the Li excess (Ni based) for calendar; (4) LEO life tests demonstrate eight years missions at 20-25% DOD; (5) 56 GEO seasons at 80% DOD have been performed, showing less than 3% fading for 15 years; and (6) Expected calendar effect is less than 7% for 18 years at 20 C. The total energy decrease for 15 years in GEO is 10%.
Derived from text
Lithium Batteries; Spaceborne Experiments; Electrochemistry; Electrochemical Cells; Performance Tests; Service Life

20020060527 NASA Johnson Space Center, Houston, TX USA
Evaluation of Cycle Life and Characterization of YTP 45 Ah Li-Ion Battery for EMU
Deng, Yi, Lockheed Martin Space Operations, USA; Jeevarajan, Judith, Lockheed Martin Space Operations, USA; Rehm, Raymond, Lockheed Martin Space Operations, USA; Bragg, Bobby, NASA Johnson Space Center, USA; Strangways, Brad,

Symmetry Resources, Inc., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 22p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Li-ion batteries, with longer cycle life and higher energy density features, are now more and more attractive and applied in multiple fields. The YTP 45 Ah Li-ion battery has been evaluated here and may be employed in EMU in the future. Evaluations were on: (1) Cycle life tests - 500 cycles total (completed 40 cycles in simulated shuttle use mode and 460 cycles in an accelerated use mode, and recorded differential voltage of individual cell in battery); (2) Characterization test - discharge capacity measurement in environment temperature of -10, 25, 50 C before and after 500 cycles; and (3) Thermal testing - charge and discharge at 50 C and -10 C before and after 500 cycles. The battery showed less than a 9% drop of initial discharge capacity and energy within 500 cycles with 475 cycles 59% DOD plus 25 cycles 100% DOD. The EOD voltage ranged from 16.0 to 18.0 V, which fits the requirement for operating the EMU.

Derived from text

Characterization; Cycles; Life (Durability); Performance Tests; Lithium Batteries; Thermodynamic Properties

20020060528 SAFT America, Inc., Advanced Battery Systems Div., Cockeysville, MD USA

Lithium Ion DD Cells Space Application Cycling Update

Croft, Haiyan, SAFT America, Inc., USA; Staniewicz, Bob, SAFT America, Inc., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 23p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph presentation gives an overview of lithium ion DD cells in space application cycling. Details are given on how accelerated testing is performed, including LEO and GEO cycling performance for planetary and interplanetary applications.

Derived from text

Cycles; Accelerated Life Tests; Lithium Batteries

20020060529 TRW Space and Electronics Group, Redondo Beach, CA USA

Simulated LEO Cycling of AEA-STRV Lithium-Ion Battery Modules 2001 Update

Johnson, Philip, TRW Space and Electronics Group, USA; Lurie, Chuck, TRW Space and Electronics Group, USA; Spurrett, Rob, AEA Technology, UK; The 2001 NASA Aerospace Battery Workshop; February 2002; 19p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Lithium-ion battery modules, similar to the modules flown on the STRV spacecraft, have been tested for almost three years. The modules, designed and assembled by AEA Technology plc, each contain twelve Sony 26650 cells. Characterization testing and LEO cycling through 7700 25% DOD cycles were reported at this workshop last year. This presentation summarizes the results of the simulated LEO cycling to date.

Derived from text

Characterization; Cycles; Lithium Batteries; Performance Tests

20020060530 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

PROBA, The First ESA Spacecraft Flying Lithium-Ion

Schautz, M., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Olsson, D., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Dudley, Geoffrey J., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Holland, A., AEA Technology, UK; The 2001 NASA Aerospace Battery Workshop; February 2002; 14p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Project for On Board Autonomy includes onboard resource management and housekeeping, scheduling and execution of scientific observations, scientific data collection, storage, processing, and distribution, data communication management, performance evaluation and failure detection, failure detection, reconfigurations, and software exchanges. The first European spacecraft to rely entirely on a lithium ion battery is now in orbit. Battery performance is nominal.

Derived from text

Evaluation; Lithium Batteries; Spacecraft Power Supplies

20020060531 Aerospace Corp., Electronics and Photonics Lab., El Segundo, CA USA

Life Test Results with Adaptive Charge Control

Zimmerman, Albert H., Aerospace Corp., USA; Quinzio, Michael V., Aerospace Corp., USA; The 2001 NASA Aerospace Battery

Workshop; February 2002; 12p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Adaptive charge control has been developed to enable a power system to automatically sense the recharge needs of each cell in its complement of batteries, and to provide only the recharge that that cell requires. This enables the charge control system to handle any imbalances in performance behavior between the cells, to minimize the stress on each cell, and to automatically adjust recharge behavior according to the cell's changing needs over life. Results will be presented from thermal vacuum life tests on Li-ion cells, from a life-test running Li-ion cells in the same pack as nickel cadmium and nickel metal hydride cells, and from a nickel hydrogen life test. Adaptive charge control has demonstrated the capability to optimally operate cells having widely different behavior in the same battery pack.

Author

Adaptive Control; Lithium Batteries; Control Systems Design; Spacecraft Power Supplies; Nanosatellites

20020060532 Eagle-Picher Technologies, LLC, Power Subsystems Dept., Joplin, MO USA

A Dual Mode Lithium Ion Battery Charge Controller

Girard, Steve, Eagle-Picher Technologies, LLC, USA; Miller, Greg, Eagle-Picher Technologies, LLC, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 13p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

A design concept was initially developed to support launch and orbital activities for a reUSAble space vehicle. Charging was to be performed pre-launch and in orbit while docked. This design consists of two elements: an on-board system (Battery Management System) and an external system (External Current Source). Our concept attempts to achieve the 'best of both worlds'. Cell balancing at lower currents removes a large heat source from the battery system. The external subsystem reduces on-board mass and provides a convenient user interface. Embedded controllers provide for greater flexibility.

Derived from text

Controllers; Lithium Batteries; Management Systems; Design Analysis

20020060533 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Impact of Charge Methodology Upon the Performance of Lithium Ion Cells

Smart, M. C., Jet Propulsion Lab., California Inst. of Tech., USA; Ratnakumar, B. V., Jet Propulsion Lab., California Inst. of Tech., USA; Whitcanack, L., Jet Propulsion Lab., California Inst. of Tech., USA; Chin, K., Jet Propulsion Lab., California Inst. of Tech., USA; Surampudi, S., Jet Propulsion Lab., California Inst. of Tech., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 45p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

This viewgraph gives an overview on the impact of charge methodology upon the performance of lithium ion cells. Charge characteristics are given on the following: (1) lithium ion prototype cells, including charge rate characteristics at different temperatures, the effect of charge methodology upon cycle life performance, the effect of charge voltage upon cell performance; (2) three-electrode cells; and (3) lithium-ion eight-cell batteries.

Derived from text

Lithium Batteries; Charge Efficiency; Characterization; Temperature Effects

20020060534 NASA Goddard Space Flight Center, Greenbelt, MD USA

Performance of Li-Ion Cells Under Battery Voltage Charge Control

Vaidyanathan, Hari, Varidyanathan (Hari), USA; Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 16p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Li-ion cells manufactured by YTP, SAFT, and MSA have completed 6714, 6226, and 3441 cycles, respectively. An increase in the charge voltage limit was required in all cases to maintain the discharge voltage. SAFT and MSA cells were capable of cycling at -10 C and 0 C with an increase in the charge voltage limit, whereas Yardney cells could not be cycled. Reconditioning improved the discharge voltage of SAFT and MSA cells; it is important to note that the effect has been temporary as in Ni-H and Ni-Cd batteries. It was demonstrated that the charge operation with VT clamp at battery rather than at cell level is feasible. Continuation of testing depends on the health of the cells and on the funding situation.

Derived from text

Cycles; Lithium Batteries; Electric Potential

20020060535 Government of the USA of America, Chantilly, VA USA

DPA of 1.6 AHr Li-ion Pouch Cells Using Coin Cells

Wang, Enoch, Government of the USA of America, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 45p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The objectives of this viewgraph presentation were to identify the limiting electrode(s) and to shed understanding on failure mechanism.

Derived from text

Electrodes; Cycles; Service Life; Lithium Batteries; Anodes; Cathodes

20020060536 NASA Johnson Space Center, Houston, TX USA

Performance and Safety Tests on Samsung 18650 Li-ion Cells: Two Cell Designs

Deng, Yi, Lockheed Martin Space Operations, USA; Jeevarajan, Judith, Lockheed Martin Space Operations, USA; Rehm, Raymond, Lockheed Martin Space Operations, USA; Bragg, Bobby, NASA Johnson Space Center, USA; Zhang, Wenlin, Schlumberger Technologies Corp., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 23p; In English; Also announced as 20020060511; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In order to meet the applications for space shuttle in future, two types of Samsung cells, with capacity 1800 mAh and 2000 mAh, have been investigated. The studies focused on: (1) Performance tests: completed 250 cycles at various combinations of charge/discharge C rates and discharge capacity measurements at various temperatures; and (2) Safety tests: overcharge and overdischarge, heat abuse, short circuit, internal and external short, and vibration, vacuum, and drop tests

Derived from text

Drop Tests; Performance Tests; Safety; Lithium Batteries

20020060537 NASA Johnson Space Center, Houston, TX USA

Performance and Safety Testing of Cylindrical Moli Lithium-Ion Cells

Jeevarajan, Judith A., Lockheed Martin Space Operations, USA; Deng, Yi, Lockheed Martin Space Operations, USA; Rehm, Ray, Lockheed Martin Space Operations, USA; Tracinski, Walter A., Applied Power International, USA; Bragg, Bobby J., NASA Johnson Space Center, USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 24p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Moli lithium-ion cells were tested under normal and abuse conditions. The cells exhibit only 50% of their original capacity at about -10 C. The optimum charge/discharge rate with the least percentage loss in capacity is C/2 charge and C/4 discharge. The cells did not explode or go into a thermal runaway during venting at very high temperatures. They exhibited good tolerance under the vibration conditions tested and could potentially be used in the build up of large batteries that have high current pulse (up to 3C) applications.

Derived from text

Lithium Batteries; Performance Tests; Temperature Effects; Vibration Tests

20020060538 NASA Johnson Space Center, Houston, TX USA

Pulse Performance of Small Lithium Ion Cells

Darcy, Eric C., NASA Johnson Space Center, USA; Cowles, Philip R., COM DEV Ltd., Canada; The 2001 NASA Aerospace Battery Workshop; February 2002; 19p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Five types of small commercial cells were subject to capacity and resistance measurements under pulsed conditions and under a worst case application conditions. Results indicate that an 82S-102P array of 18650 cells will exceed the power/energy requirements for a proposed Space Shuttle EAPU battery system.

Author

Lithium Batteries; Flight Control; Performance Tests

20020060539 Lithion, Inc., Pawcatuck, CT USA

Low Temperature and High Rate Performance of Lithium-ion Systems for Space Applications

Gitzendanner, Rob L., Lithion, Inc., USA; Puglia, F., Lithion, Inc., USA; Marsh, Catherine, Lithion, Inc., USA; The 2001 NASA Aerospace Battery Workshop; February 2002; 26p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

As part of the Inter-Agency Lithium-ion Development Program, Lithion has undertaken an empirical analysis of the rate limiting steps in Lithium-ion cells. The goal is to improve high rate performance through: (1) continuous discharge - goal: is greater than 50% capacity at 20 C and 25 C (to 3.0 V cutoff) and is greater than 50% capacity at 5 C and -20 C (to 2.5 V cutoff); and (2) pulse discharge (is less than 1 second) - goal: is greater than 100 C at 25 C (above 2.0 V) and is greater than 10 C at -20 C (above 2.0 V).
Derived from text
Low Temperature; Lithium Batteries; Electric Potential; Performance Tests

20020060540 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands
Study of the Effects of Overdischarge on SONY 18650HC Cells
Dudley, Geoffrey J., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Spurrett, Rob, AEA Technology, UK; The 2001 NASA Aerospace Battery Workshop; February 2002; 21p; In English; Also announced as 20020060511; Compatible with MAC, Windows and UNIX Platforms; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche
Previously used secondary space battery cells can tolerate discharging to an open-circuit voltage of zero. Lithium-ion battery cells have a minimum allowed open-circuit voltages of typically around 2.4 V. below which manufacturers warn of irreversible damage. This means that if the bus of a spacecraft with Li-ion batteries collapses due to a fault condition, the spacecraft may not be recoverable. Several ESA scientific and Earth-observation spacecraft are planning to use batteries of SONY 18650HC cells. The tests described here were an initial attempt to find out how long could a bus collapse last before the battery was unUSAble and the mission lost?
Derived from text
Collapse; Lithium Batteries; Open Circuit Voltage; Performance Tests

20020060772 NASA Goddard Space Flight Center, Greenbelt, MD USA
Radiation Tolerant Antifuse FPGA
Wang, Jih-Jong, Actel Corp., USA; Cronquist, Brian, Actel Corp., USA; McCollum, John, Actel Corp., USA; Parker, Wanida, Actel Corp., USA; Katz, Rich, NASA Goddard Space Flight Center, USA; Kleyner, Igor, Orbital Sciences Corp., USA; [2002]; 5p; In English; GOMAC 2002, March 2002, Monterey, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The total dose performance of the antifuse FPGA for space applications is summarized. Optimization of the radiation tolerance in the fabless model is the main theme. Mechanisms to explain the variation in different products are discussed.
Author
Dosage; Radiation Tolerance; Circuit Protection

20020061272 NASA Ames Research Center, Moffett Field, CA USA
Simulation of Ultra-Small MOSFETs Using a 2-D Quantum-Corrected Drift-Diffusion Model
Biegal, Bryan A., MRJ Technology Solutions, Inc., USA; Rafferty, Connor S., Lucent Technologies, USA; Yu, Zhiping, Stanford Univ., USA; Ancona, Mario G., Naval Research Lab., USA; Dutton, Robert W., Stanford Univ., USA; [1998]; 1p; In English; Gigascale Integration Technology Symposium: 35th Annual Technical Meeting of the Society of Engineering Science, 27-30 Sep. 1998, Pullman, WA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only
The continued down-scaling of electronic devices, in particular the commercially dominant MOSFET, will force a fundamental change in the process of new electronics technology development in the next five to ten years. The cost of developing new technology generations is soaring along with the price of new fabrication facilities, even as competitive pressure intensifies to bring this new technology to market faster than ever before. to reduce cost and time to market, device simulation must become a more fundamental, indeed dominant, part of the technology development cycle. In order to produce these benefits, simulation accuracy must improve markedly. At the same time, device physics will become more complex, with the rapid increase in various small-geometry and quantum effects. This work describes both an approach to device simulator development and a physical model which advance the effort to meet the tremendous electronic device simulation challenge described above. The device simulation approach is to specify the physical model at a high level to a general-purpose (but highly efficient) partial differential equation solver (in this case PROPHET, developed by Lucent Technologies), which then simulates the model in 1-D, 2-D, or 3-D for a specified device and test regime. This approach allows for the rapid investigation of a wide range of device models and effects, which is certainly essential for device simulation to catch up with, and then stay ahead of, electronic device technology of the present and future. The physical device model used in this work is the density-gradient (DG) quantum correction to the drift-diffusion model [Ancona, Phys. Rev. B 35(5), 7959 (1987)]. This model adds tunneling and quantum smoothing of carrier

density profiles to the drift-diffusion model. We used the DG model in 1-D and 2-D (for the first time) to simulate both bipolar and unipolar devices. Simulations of heavily-doped, short-base diodes indicated that the DG quantum corrections do not have a large effect on the IN characteristics of electronic devices without heteroj unction s. On the other hand, ultra-small MOSFETs certainly exhibit important quantum effects that the DG model will include: quantum repulsion of the inversion and gate charges from the oxide interfaces, and quantum tunneling through thin gate oxides. We present initial results of 2-D DG simulations of ultra-small MOSFETs. Subtle but important issues involving the specification of the model, boundary conditions, and interface constraints for DG simulation of MOSFETs will also be illuminated.
Author
Metal Oxide Semiconductors; Computerized Simulation; Quantum Electronics; Two Dimensional Models; Diffusion Theory

20020061296 NASA Glenn Research Center, Cleveland, OH USA
MEMS, Ka-Band Single-Pole Double-Throw (SPDT) Switch for Switched Line Phase Shifters
Scardelletti, Maximilian C., NASA Glenn Research Center, USA; Ponchak, George E., NASA Glenn Research Center, USA; Varaljay, Nicholas C., NASA Glenn Research Center, USA; May 2002; 8p; In English; 2002 Antennas and Propagation Society International Symposium, 16-21 Jun. 2002, San Antonio, TX, San Antonio, TX, USA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): RTOP 755-08-0B
Report No.(s): NASA/TM-2002-211510; NAS 1.15:211510; E-13288; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Ka-band MEMS doubly anchored cantilever beam capacitive shunt devices are used to demonstrate a MEMS SPDT switch fabricated on high resistivity silicon (HRS) utilizing finite ground coplanar waveguide (FGC) transmission lines. The SPDT switch has an insertion loss (IL), return loss (RL), and isolation of 0.3dB, 40dB, and 30 dB, respectively at Ka-band.
Author
Switches; Microelectromechanical Systems; Cantilever Beams; Electrical Resistivity

20020061297 NASA Glenn Research Center, Cleveland, OH USA
Preliminary Evaluation of Polyarylate Dielectric Films for Cryogenic Applications
Patterson, Richard L., NASA Glenn Research Center, USA; Hammoud, Ahmad, QSS Group, Inc., USA; Fialla, Peter, ISONOVA Corp., Austria; April 2002; 10p; In English
Contract(s)/Grant(s): NAS3-00145; RTOP 297-60-10
Report No.(s): NASA/TM-2002-211382; NAS 1.15:211382; E-13210; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Polymeric materials are used extensively on spacecraft and satellites in electrical power and distribution systems, as thermal blankets and optical surface coatings, as well as mechanical support structures. The reliability of these systems when exposed to the harsh environment of space is very critical to the success of the mission and the safety of the crew in manned-flight ventures. In this work, polyarylate films were evaluated for potential use as capacitor dielectrics and wiring insulation for cryogenic applications. Two grades of the film were characterized in terms of their electrical and mechanical properties before and after exposure to liquid nitrogen (-196 C). The electrical characterization consisted of capacitance and dielectric loss measure Cents in the frequency range of 50 Hz to 100 kHz, and volume and surface resistivities. The mechanical measurements performed included changes in tensile (Young's modulus, elongation-at-break, and tensile strength) and structural properties (dimensional change, weight, and surface morphology). The preliminary results, which indicate good stability of the polymer after exposure to liquid nitrogen, are presented and discussed.
Author
Electrical Properties; Dielectric Loss; Capacitors; Cryogenics; Thin Films; Thermal Insulation; Reliability; Antireflection Coatings

20020061871 North Dakota State Univ., Fargo, ND USA
Laser Ionization Detection (LID) and Photoemissive (PE) Ion Mobility Spectrometry (IMS) Development ***Final Report, 13 Feb. 1998-15 Aug. 2001***
Swenson, Orven F.; Nov. 09, 2001; 276p; In English; Original contains color images
Contract(s)/Grant(s): F08637-98-C-6003; Proj-1900
Report No.(s): AD-A403013; AFRL-ML-TY-TR-2001-0051; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Significant advances are reported in the detection of trace analytes in ambient air by laser ionization detection and photoemissive ion mobility spectrometry. A numerical model was developed that describes the behavior of laser-produced ions

in an applied electric field and the subsequent induced current flow in an external detection circuit between the biased electrodes. The modeling and extensive measurements on parallel-plate and cylindrical electrodes resulted in a novel hemishperical cell geometry in which the cathode is a wire on a ceramic base (actually the wire will be positioned in a small depression in the base) and the anode is a half-cylinder of metal wire. This design minimizes noise generated by scattered ultraviolet light, allows a very small detection volume, is readily flash heated to eliminate memory effects, provides a peak in the induced current that makes it easier to extract temporal data, and is easily manufactured. Very narrow features were demonstrated in a laser ionization spectral study for molecules as large as indene even at room temperature under ambient pressure conditions. The narrowness of these features means that on-and-off-resonance measurements to separate out background LID signals are very feasible. A combined LI-IMS was demonstrated as an effective approach for speciation in ambient pressure air. An alternative ionization approach of photoemissive electron capture combined with IMS was demonstrated as a promising technique for detecting electronegative species such as explosives molecules.
DTIC
Laser Applications; Lasers; Ionization; Detection; Photoelectric Emission; Ions; Mobility; Spectroscopy

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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.

20020059658 NASA Ames Research Center, Moffett Field, CA USA
Time-Accurate Simulations of Incompressible Flows with Moving Boundaries
Kiris, Cetin C., NASA Ames Research Center, USA; Kwak, Dochan, NASA Ames Research Center, USA; Rogers, Stuart E., NASA Ames Research Center, USA; [2001]; 15p; In English; Workshop on Numerical Simulations of Incompressible Flows, 19-21 Jun. 2001, Half Moon Bay, CA, USA
Contract(s)/Grant(s): RTOP 725-10-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents viewgraphs of time-accurate simulations of unsteady incompressible flow with moving boundaries.
CASI
Incompressible Flow; Computerized Simulation; Numerical Analysis; Unsteady Aerodynamics

20020060059 Sandia National Labs., Albuquerque, NM USA
Verification and Validation in Computational Fluid Dynamics
Oberkampf, W. L.; Trucano, T. G.; Mar. 2002; 128p; In English
Report No.(s): DE2002-020529; SAND2002-0529; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Verification and validation (V&V) are the primary means to assess accuracy and reliability in computational simulations. This paper presents an extensive review of the literature in V&V in computational fluid dynamics (CFD), discusses methods and procedures for assessing V&V, and develops a number of extensions to existing ideas. The review of the development of V&V terminology and methodology points out the contributions from members of the operations research, statistics, and CFD communities. Fundamental issues in V&V are addressed, such as code verification versus solution verification, model validation versus solution validation, the distinction between error and uncertainty, conceptual sources of error and uncertainty, and the relationship between validation and prediction. The fundamental strategy of verification is the identification and quantification of errors in the computational model and its solution. In verification activities, the accuracy of a computational solution is primarily measured relative to two types of highly accurate solutions: analytical solutions and highly accurate numerical solutions. Methods for determining the accuracy of numerical solutions are presented and the importance of software testing during verification activities is emphasized.
NTIS
Computational Fluid Dynamics; Program Verification (Computers); Numerical Analysis; Computer Systems Simulation

20020060115 NASA Glenn Research Center, Cleveland, OH USA
Thermocouple Boundary Layer Rake
Hwang, Danny P., Inventor, NASA Glenn Research Center, USA; Will, Herbert A., Inventor, NASA Glenn Research Center, USA; Fralick, Gustave C., Inventor, NASA Glenn Research Center, USA; May 07, 2002; 10p; In English
Patent Info.: Filed 28 Jun. 2000; NASA-Case-LEW-16999-1; US-Patent-6,382,024; US-Patent-Appl-SN-613052; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Apparatus and method for providing a velocity flow profile near a reference surface. A measuring device utilizes a plurality of thermojunction pairs to provide the velocity flow profile in accordance with behavior of a gas relative to a constant thickness strut which stands vertically from the reference surface such that the span is normal to the surface, and the chord is parallel to the surface along the initial flow direction. Each thermojunction is carried on either side of a heater formed on a measuring surface in a constant thickness portion of a strut. Additionally, each thermojunction of a given pair is located at a predetermined height from the reference surface. Gas velocity data obtained from temperature differentials from one side of the heater to the other at each successive height is utilized to generate the velocity and turbulence level profiles.
Official Gazette of the U.S. Patent and Trademark Office
Boundary Layers; Thermocouples; Velocity Distribution

20020060457 NASA Ames Research Center, Moffett Field, CA USA
A Three Dimensional Parallel Time Accurate Turbopump Simulation Procedure Using Overset Grid Systems
Kiris, Cetin, NASA Ames Research Center, USA; Chan, William, NASA Ames Research Center, USA; Kwak, Dochan, NASA Ames Research Center, USA; [2001]; 2p; In English; 2nd International Conference on Computational Fluid Dynamics, 15-19 Jul. 2002, Sydney, Australia; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of the current effort is to provide a computational framework for design and analysis of the entire fuel supply system of a liquid rocket engine, including high-fidelity unsteady turbopump flow analysis. This capability is needed to support the design of pump sub-systems for advanced space transportation vehicles that are likely to involve liquid propulsion systems. to date, computational tools for design/analysis of turbopump flows are based on relatively lower fidelity methods. An unsteady, three-dimensional viscous flow analysis tool involving stationary and rotational components for the entire turbopump assembly has not been available for real-world engineering applications. The present effort provides developers with information such as transient flow phenomena at start up, and non-uniform inflows, and will eventually impact on system vibration and structures. In the proposed paper, the progress toward the capability of complete simulation of the turbo-pump for a liquid rocket engine is reported. The Space Shuttle Main Engine (SSME) turbo-pump is used as a test case for evaluation of the hybrid MPI/Open-MP and MLP versions of the INS3D code. CAD to solution auto-scripting capability is being developed for turbopump applications. The relative motion of the grid systems for the rotor-stator interaction was obtained using overset grid techniques. Unsteady computations for the SSME turbo-pump, which contains 114 zones with 34.5 million grid points, are carried out on Origin 3000 systems at NASA Ames Research Center. Results from these time-accurate simulations with moving boundary capability will be presented along with the performance of parallel versions of the code.
Author
Turbine Pumps; Liquid Propellant Rocket Engines; Computational Grids; Fuel Systems; Applications Programs (Computers); Computerized Simulation

20020060500 NASA Goddard Space Flight Center, Greenbelt, MD USA
Effect of External Pressure Drop on Loop Heat Pipe Operating Temperature
Jentung, Ku, NASA Goddard Space Flight Center, USA; Ottenstein, Laura, NASA Goddard Space Flight Center, USA; Rogers, Paul, Army Tank-Automotive Command, USA; Cheung, Kwok, Naval Research Lab., USA; [2002]; 10p; In English; 12th International Heat Pipe Conference, 19-24 May 2002, Moscow, Russia; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper discusses the effect of the pressure drop on the operating temperature in a loop heat pipe (LHP). Because the evaporator and the compensation chamber (CC) both contain two-phase fluid, a thermodynamic constraint exists between the temperature difference and the pressure drop for these two components. As the pressure drop increases, so will the temperature difference. The temperature difference in turn causes an increase of the heat leak from the evaporator to the CC, resulting in a higher CC temperature. Furthermore, the heat leak strongly depends on the vapor void fraction inside the evaporator core. Tests were conducted by installing a valve on the vapor line so as to vary the pressure drop, and by charging the LHP with various amounts of fluid. Test results verify that the LHP operating temperature increases with an increasing differential pressure, and the temperature increase is a strong function of the fluid inventory in the loop.
Author
Heat Pipes; Operating Temperature; Thermodynamics; Pressure Gradients

20020060728 NASA Goddard Space Flight Center, Greenbelt, MD USA
Capillary Limit in a Loop Heat Pipe with Dual Evaporators
Ku, Jentung, NASA Goddard Space Flight Center, USA; Birur, Gajanana, Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 17p; In English; 32nd ICES Conference, 15-18 Jul. 2001, San Antonio, TX, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a study on the capillary limit of a loop heat pipe (LHP) with two evaporators and two condensers. Both theoretical analysis and experimental investigation are conducted. Tests include heat load to one evaporator only, even heat loads to both evaporators and uneven heat load to both evaporators. Results show that after the capillary limit is exceeded, vapor will penetrate through the wick of the weaker evaporator and the compensation chamber (CC) of that evaporator will control the loop operating temperature regardless of which CC has been in control prior to the event Because the evaporator can tolerate vapor bubbles, the loop may continue to work and reach a new steady state at a higher operating temperature. The loop may even function with a modest increase in the heat load past the capillary limit With a heat load to only one evaporator, the capillary limit can be identified by rapid increases in the operating temperature and in the temperature difference between the evaporator and the CC. However, it is more difficult to tell when the capillary limit is exceeded if heat loads are applied to both evaporators. In all cases, the loop can recover by reducing the heat load to the loop.
Author
Evaporators; Heat Pipes; Temperature Gradients; Vapors

20020060735 Wyoming Univ., Dept. of Mechanical Engineering, Laramie, WY USA
Synthetic Jet Interaction With A Turbulent Boundary Layer Flow, *11 Apr. 2001 - 10 Apr. 2002*
Smith, Douglas R., Wyoming Univ., USA; [2002]; 11p; In English
Contract(s)/Grant(s): NAG1-01063; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Perhaps one of the more notable advances to have occurred in flow control technology in the last fifteen years is the application of surface-issuing jets for separation control on aerodynamic surfaces. The concept was introduced by Johnston and Night (1990) who proposed using circular jets, skewed and inclined to the wall, to generate streamwise vortices for the purpose of mitigating boundary layer separation. The skew and inclination angles have subsequently been shown to affect the strength and sign of the ensuing vortices. With a non-circular orifice, in addition to skew and inclination, the yaw angle of the major axis of the orifice can influence the flow control effectiveness of the jet. In particular, a study by Chang arid Collins (1997) revealed that a non-circular orifice, yawed relative to the freestream, can be used to control the size and strength of the vortices produced by the control jet. This early work used jets with only a steady injection of mass. Seifert et al. revealed that an unsteady blowing jet, could be as effective at separation control as a steady jet but with less mass flow. Seifert et al. showed that small amplitude blowing oscillations superimposed on a low momentum steady jet Was the most effective approach to delaying separation on a NACA 0015 airfoil at post-stall angles of attack. More recent work suggests that perhaps the most efficient jet control effect comes from a synthetic (oscillatory) jet where the time-averaged mass flux through the orifice is zero, but the net wall normal momentum is non-zero. The control effectiveness of synthetic jets has been demonstrated for several internal and external flow fields used synthetic jet control on a thick, blunt-nosed airfoil to delay stall well beyond the stall angles for the uncontrolled airfoil and with a dramatic increase in the lift-to-drag performance. Amitay et al. used an array of synthetic jets to mitigate flow separation in curved and diffusing ducts. While the control effectiveness of synthetic jet actuators in an application setting has been confirmed through a number of studies, the fluid dynamic mechanism by which control is effected is not well understood. Issues like yaw angle arid velocity ratio that have been studied for steady control jets have not been investigated for synthetic jets. Moreover, the role played by the inherently unsteady nature of a synthetic jet in the interaction with the controlled flow is not known. Some recent work by Rinehart and Glazer and Smith suggests that away from tile immediate vicinity of the jet orifice the flow field is steady in the mean, and that the interaction of a synthetic jet and a boundary layer creates a secondary flow in the boundary layer consisting primarily of streamwise vortices.
Derived from text
Aerodynamic Drag; Airfoils; Boundary Layer Separation; Controllability; Free Flow; Mass Flow; Vortices

20020061276 NASA Langley Research Center, Hampton, VA USA
Advanced Data Format (ADF) Software Library and Users Guide
Smith, Matthew, Boeing Commercial Airplane Group, USA; [1998]; 1p; In English
Contract(s)/Grant(s): NAS1-20267; RTOP 538-15-11; Copyright; Avail: Issuing Activity; Abstract Only
The ”CFD General Notation System” (CGNS) consists of a collection of conventions, and conforming software, for the storage and retrieval of Computational Fluid Dynamics (CFD) data. It facilitates the exchange of data between sites and applications, and helps stabilize the archiving of aerodynamic data. This effort was initiated in order to streamline the procedures in exchanging data and software between NASA and its customers, but the goal is to develop CGNS into a National Standard for the exchange of aerodynamic data. The CGNS development team is comprised of members from Boeing Commercial. Airplane Group, NASA-Ames, NASA-Langley, NASA-Lewis, McDonnell-Douglas Corporation (now Boeing-St. Louis), Air Force-Wright Lab., and ICEM-CFD Engineering. The elements of CGNS address all activities associated with the storage of data on external media and its movement to and from application programs. These elements include: 1) The Advanced Data Format

(ADF) Database manager, consisting of both a file format specification and its 1/0 software, which handles the actual reading and writing of data from and to external storage media; 2) The Standard Interface Data Structures (SIDS), which specify the intellectual content of CFD data and the conventions governing naming and terminology; 3) The SIDS-to-ADF File Mapping conventions, which specify the exact location where the CFD data defined by the SIDS is to be stored within the ADF file(s); and 4) The CGNS Mid-level Library, which provides CFD-knowledgeable routines suitable for direct installation into application codes. The ADF is a generic database manager with minimal intrinsic capability. It was written for the purpose of storing large numerical datasets in an efficient, platform independent manner. to be effective, it must be used in conjunction with external agreements on how the data will be organized within the ADF database such defined by the SIDS. There are currently 34 user callable functions that comprise the ADF Core library and are described in the Users Guide. The library is written in C, but each function has a FORTRAN counterpart.
Author
Computational Fluid Dynamics; Software Engineering; Libraries; Data Bases

20020061289 NASA Ames Research Center, Moffett Field, CA USA
Boundary Layer Receptivity to Three-Dimensional Freestream Disturbances at Two-Dimensional Roughness
Dietz, Anthony, NASA Ames Research Center, USA; Sheehan, Daniel, San Diego Univ., USA; [1997]; 1p; In English; DFD 1997 Meeting of the American Physical Society, 23-25 Nov. 1997, San Francisco, CA, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): RTOP 522-31-12; No Copyright; Avail: Issuing Activity; Abstract Only
The receptivity of a laminar boundary layer to an isolated three-dimensional convected disturbance is investigated in a low-speed wind tunnel experiment. The disturbance is created by the short-duration pulsed displacement of a small low-aspect-ratio wing located upstream of a flat plate. The height of the wing is set so that the convected disturbance grazes the edge of the flat-plate boundary layer. A receptivity site is provided by a two-dimensional roughness strip on the surface of the plate. The different propagation speeds of acoustic, convected and instability waves cause the various wave packets from the pulsed displacement to arrive at a downstream measurement station at different times, separating the phenomena and allowing them to be studied independently. Ensemble- averaged measurements are made with and without roughness on the plate. Preliminary analysis of the measurements suggest the presence of a two-dimensional T-S wave packet arising from an interaction between an acoustic wave and the roughness, and a three-dimensional T-S wave packet arising from an interaction between the localized convected disturbance and the roughness strip. The growth rates and spatial characteristics of the disturbances and the instability wave packets are measured as they propagate downstream.
Author
Laminar Boundary Layer; Boundary Layers; Low Aspect Ratio Wings; Acoustic Instability; Free Flow; Wind Tunnel Tests

20020061687 University of Western Michigan, Dept. of Mechanical and Aerospace Engineering, Kalamazoo, MI USA
A Unified LES/RANS Approach Using the CE/SE Method ***Final Report, 18 Jan. 2001 - 17 Jan. 2002***
Liou, William W., University of Western Michigan, USA; July 2002; 6p; In English
Contract(s)/Grant(s): NAG3-2529
Report No.(s): WMU/25-2214760-8922; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The goal of the proposed research is to develop advanced large eddy simulations (LES) and Reynolds average Navier-Stokes (RANS) capabilities for complex problems using the conservation element and solution element (CE/SE) method. This proposed use of the CE/SE method is justified by the many demonstrated advantages of the CE/SE method over the traditional computational fluid dynamics (CFD) methods. The proposed research will produce improved engineering modeling for near-term applications for focus programs as well as long-term impacts on the fundamental understanding of turbulence.
Author
Computational Fluid Dynamics; Large Eddy Simulation; Space-Time Ce/Se Method; Navier-Stokes Equation; Reynolds Averaging

20020061791 NASA Langley Research Center, Hampton, VA USA
Elliptic Relaxation of a Tensor Representation for the Redistribution Terms in a Reynolds Stress Turbulence Model
Carlson, J. R., NASA Langley Research Center, USA; Gatski, T. B., NASA Langley Research Center, USA; July 2002; 22p; In English
Contract(s)/Grant(s): RTOP 706-31-11-06
Report No.(s): NASA/TM-2002-211750; NAS 1.15:211750; L-18197; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A formulation to include the effects of wall proximity in a second-moment closure model that utilizes a tensor representation for the redistribution terms in the Reynolds stress equations is presented. The wall-proximity effects are modeled through an elliptic relaxation process of the tensor expansion coefficients that properly accounts for both correlation length and time scales as the wall is approached. Direct numerical simulation data and Reynolds stress solutions using a full differential approach are compared for the case of fully developed channel flow.
Author
Reynolds Stress; Tensors; Turbulence Models; Elliptic Functions; Relaxation (Mechanics)

20020061841 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Viscous Drag Measurement and Its Application to Base Drag Reduction
Decker, Robert K.; May 2002; 102p; In English
Report No.(s): AD-A403228; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
In this study two important topics have been investigated. First, a new automation procedure has been developed to detect fringe patterns in oil-film interferograms. The procedure combines a windowed Fourier transform and a cross correlation technique to determine regions where fringes are likely to reside. The cross correlation of a single cycle cosine function and the original intensity produce a filtered result that isolates the information being sought. The automation procedure is able to capture approximately 75% of the fringes in an image but additional refining of the technique could increase this percentage. Second, the effect of viscous fore-body drag on base drag has been investigated on a 2-D ramp model. Measurements made during the study include oil-film interferometry and hot-wire anemometry for viscous fore-body drag, and pressure measurements on the fore-body and base for fore-body and base drag. The results of this investigation show that an increase in viscous fore-body drag has very little effect on base drag, which contrasts previous studies where increases in viscous fore-body drag tended to decrease base drag. This means that a simple jet pumping mechanism is not the sole effect responsible for base drag reduction in this type of geometry. Hot-wire measurements in the wake of the model show that the flow in the base region is devoid of a dominant shedding frequency. It may be possible that the boundary layer somehow affects the vortex shedding mechanism but further investigations would be necessary to demonstrate that this is true.
DTIC
Two Dimensional Models; Drag Reduction; Viscous Drag; Drag Measurement; Interferometry

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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.

20020059638 Wisconsin Univ., Space Science and Engineering Center, Madison, WI USA
Continued Development of a Planetary Imaging Fourier Transform Spectrometer (PIFTS) ***Final Report, 15 Apr. 2001 - 14 Apr. 2002***
Sromovsky, L. A., Wisconsin Univ., USA; Jul. 08, 2002; 21p; In English
Contract(s)/Grant(s): NAG5-10729; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes continued efforts to evaluate a breadboard of a Planetary Imaging Fourier Transform Spectrometer (PIFTS). The PIFTS breadboard was developed under prior PIDDP funding. That effort is described in the final report for NASA Grant NAG5-6248 and in two conference papers (SRomovsky et al. 2000; Revercomb et al. 2000). The PIFTS breadboard was designed for near-IR (1-5.2 micrometer imaging of planetary targets with spectral resolving powers of several hundred to several thoUSAnd, using an InSb detector array providing at least 64x64 pixels imaging detail. The major focus of the development effort was to combine existing technologies to produce a small and low power design compatible with a very low mass flyable instrument. The objective of this grant (NAG5-10729) was further characterization of the breadboard performance, including intercomparisons with the highly accurate non-imaging Advanced Emitted Radiance Interferometer (AERI) (Revercomb et al. 1994; Best et al. 1997).
Author (revised)
Infrared Interferometers; Infrared Spectrometers; Imaging Spectrometers; Breadboard Models

20020059964 Helsinki Univ. of Technology, Metsahovi Radio Observatory, Kylmaelae, Finland

A VSI-H Compatible Recording System for VLBI and e-VLBI

Ritakari, Jouko, Helsinki Univ. of Technology, Finland; Mujunen, Ari, Helsinki Univ. of Technology, Finland; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 128-131; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Metsahovi is developing a scalable disk-based recording system. The system uses standard PC hardware and standard Linux operating system. VLBI data is stored in normal Linux files and can be transported via Internet using normal Linux networking programs. This makes the system especially suitable for short-term storage of data for near-real-time VLBI. We have estimated that it is possible to replace an existing VLBI recorder with only one office PC and that the system is scalable to at least 2048 Mbit/s just by adding a few more PCs.

Author

UNIX (Operating System); Very Long Base Interferometry; Software Engineering; Input/Output Routines

20020060008 National Radio Astronomy Observatory, Parkes, Australia

Searching for High Quality VLBI Calibrators

Fomalont, Edward, National Radio Astronomy Observatory, Australia; Beasley, Tony, Owens Valley Radio Observatory, USA; Peck, Alison, Harvard-Smithsonian Center for Astrophysics, USA; Gino, Colleen, Union Coll., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 360-362; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Phase referencing techniques are now commonly used with VLBI astronomical observations for the imaging of weak radio sources, and for the determination of relative positions with accuracies as small as tens of micro-arcseconds. This observing scheme alternates observations every few minutes between the target source and a suitable calibrator detectable in a few minutes, typically with correlated flux density is greater than 50 mJy, less than several degrees from the target source. Over the last seven years, a VLBA Calibrator Survey (VCS1) with dual-frequency S/X observations has been made for over 1800 radio sources. Most sources are suitable for phase referencing, and some of these sources are potential ICRF candidates. We are continuing the search for calibrators in regions of the sky with a low density of calibrators.

Author

Calibrating; Very Long Base Interferometry; Radio Sources (Astronomy); Sky Surveys (Astronomy)

20020060077 NASA Langley Research Center, Hampton, VA USA

Thermally Stable, Piezoelectric and Pyroelectric Polymeric Substrates and Method Relating Thereto

Simpson, Joycelyn O., Inventor, NASA Langley Research Center, USA; St.Claire, Terry L., Inventor, NASA Langley Research Center, USA; Apr. 30, 2002; 8p; In English; Continuation of US-Patent-Appl-SN-524855, filed 7 Sep. 1995

Patent Info.: Filed 18 Aug. 1998; NASA-Case-LAR-15279-3; US-Patent-6,379,809; US-Patent-Appl-SN-135888; US-Patent-Appl-SN-524855; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A thermally stable, piezoelectric and pyroelectric polymeric substrate was prepared, This thermally stable, piezoelectric and pyroelectric polymeric substrate may be used to prepare electromechanical transducers, thermomechanical transducers, accelerometers, acoustic sensors, infrared sensors, pressure sensors, vibration sensors, impact sensors. in-situ temperature sensors, in-situ stress/strain sensors, micro actuators, switches. adjustable fresnel lenses, speakers, tactile sensors, weather sensors, micro positioners, ultrasonic devices, power generators, tunable reflectors, microphones, and hydrophones. The process for preparing these polymeric substrates includes: providing a polymeric substrate having a softening temperature greater than 100 C; depositing a metal electrode material onto the polymer film; attaching a plurality of electrical leads to the metal electrode coated polymeric substrates; heating the metal electrode coated polymeric substrate in a low dielectric medium; applying a voltage to the heated metal electrode coated polymeric substrate to induce polarization; and cooling the polarized metal electrode coated polymeric electrode while maintaining a constant voltage.

Official Gazette of the U.S. Patent and Trademark Office

Accelerometers; Actuators; Dielectrics; Electric Potential; Thermal Stability; Pyroelectricity; Stress-Strain Relationships

20020060079 NASA Goddard Space Flight Center, Greenbelt, MD USA

Structural Analysis of a Magnetically Actuated Silicon Nitride Micro-Shutter for Space Applications

Loughlin, James P., NASA Goddard Space Flight Center, USA; Fettig, Rainer K., Raytheon Information Technology and Scientific Services, USA; Moseley, S. Harvey, NASA Goddard Space Flight Center, USA; Kutyrev, Alexander S., Raytheon Information Technology and Scientific Services, USA; Mott, D. Brent, NASA Goddard Space Flight Center, USA; [2002]; 4p; In English; 2002 ANSYS Workshop, 22-24 Apr. 2002, Pittsburgh, PA, USA; Sponsored by ANSYS, Inc., USA; No Copyright; Avail: CASI; A01, Hardcopy; A01,

Microfiche

Finite element models have been created to simulate the electrostatic and electromagnetic actuation of a 0.5 micrometers silicon nitride micro-shutter for use in a spacebased Multi-object Spectrometer (MOS). The microshutter uses a torsion hinge to go from the closed, 0 degree, position, to the open, 90 degree position. Stresses in the torsion hinge are determined with a large deformation nonlinear finite element model. The simulation results are compared to experimental measurements of fabricated micro-shutter devices.

Author

Nonlinearity; Mathematical Models; Structural Analysis; Silicon Nitrides; Electromagnetism

20020060086 NASA Marshall Space Flight Center, Huntsville, AL USA

Vacuum Arc Vapor Deposition Method and Apparatus for Applying Identification Symbols to Substrates

Schramm, Harry F., Inventor, NASA Marshall Space Flight Center, USA; Roxby, Donald L., Inventor, NASA Marshall Space Flight Center, USA; Weeks, Jack L., Inventor, NASA Marshall Space Flight Center, USA; May 28, 2002; 8p; In English

Patent Info.: Filed 26 Oct. 2000; NASA-Case-MFS-31229; US-Patent-6,395,151; US-Patent-Appl-SN-703029; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An apparatus for applying permanent markings onto products using a Vacuum Arc Vapor Deposition (VAVD) marker by accelerating atoms or molecules from a vaporization source onto a substrate to form human and/or machine-readable part identification marking that can be detected optically or via a sensing device like x-ray, thermal imaging, ultrasound, magneto-optic, micro-power impulse radar, capacitance, or other similar sensing means. The apparatus includes a housing with a nozzle having a marking end. A chamber having an electrode, a vacuum port and a charge is located within the housing. The charge is activated by the electrode in a vacuum environment and deposited onto a substrate at the marking end of the nozzle. The apparatus may be a hand-held device or be disconnected from the handle and mounted to a robot or fixed station.

Official Gazette of the U.S. Patent and Trademark Office

Vacuum Deposition; Marking; Identifying

20020060463 Maryland Univ., Goddard Earth Sciences and Technology Center, Baltimore, MD USA

Micro-Pulse Lidar Signals: Uncertainty Analysis

Welton, Ellsworth J., Maryland Univ., USA; Campbell, James R., Science Systems and Applications, Inc., USA; [2002]; 30p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Micro-pulse lidar (MPL) systems are small, autonomous, eye-safe lidars used for continuous observations of the vertical distribution of cloud and aerosol layers. Since the construction of the first MPL in 1993, procedures have been developed to correct for various instrument effects present in MPL signals. The primary instrument effects include afterpulse, laser-detector cross-talk, and overlap, poor near-range (less than 6 km) focusing. The accurate correction of both afterpulse and overlap effects are required to study both clouds and aerosols. Furthermore, the outgoing energy of the laser pulses and the statistical uncertainty of the MPL detector must also be correctly determined in order to assess the accuracy of MPL observations. The uncertainties associated with the afterpulse, overlap, pulse energy, detector noise, and all remaining quantities affecting measured MPL signals, are determined in this study. The uncertainties are propagated through the entire MPL correction process to give a net uncertainty on the final corrected MPL signal. The results show that in the near range, the overlap uncertainty dominates. At altitudes above the overlap region, the dominant source of uncertainty is caused by uncertainty in the pulse energy. However, if the laser energy is low, then during mid-day, high solar background levels can significantly reduce the signal-to-noise of the detector. In such a case, the statistical uncertainty of the detector count rate becomes dominant at altitudes above the overlap region.

Author

Aerosols; Cloud Cover; Optical Radar; Pulsed Lasers; Vertical Distribution

20020061400 NASA Glenn Research Center, Cleveland, OH USA

Thermocouple Calibration and Accuracy in a Materials Testing Laboratory

Lerch, B. A., NASA Glenn Research Center, USA; Nathal, M. V., NASA Glenn Research Center, USA; Keller, D. J., Real World Quality Systems, USA; April 2002; 58p; In English

Contract(s)/Grant(s): RTOP 708-31-13

Report No.(s): NASA/TM-2002-211507; E-13284; NAS 1.15:211507; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A consolidation of information has been provided that can be used to define procedures for enhancing and maintaining accuracy in temperature measurements in materials testing laboratories. These studies were restricted to type R and K thermocouples (TCs) tested in air. Thermocouple accuracies, as influenced by calibration methods, thermocouple stability, and

manufacturer's tolerances were all quantified in terms of statistical confidence intervals. By calibrating specific TCs the benefits in accuracy can be as great as 6 C or 5X better compared to relying on manufacturer's tolerances. The results emphasize strict reliance on the defined testing protocol and on the need to establish recalibration frequencies in order to maintain these levels of accuracy.
Author
Thermocouples; Temperature Measurement; Calibrating; Accuracy

20020061837 Physics and Electronics Lab. TNO, The Hague, Netherlands
Preliminary Report on the TG16 POLLEX Trial, May 2001 ***Final Report***
deJong, A. N., Physics and Electronics Lab. TNO, Netherlands; Winkel, J., Physics and Electronics Lab. TNO, Netherlands; Moerman, M. M., Physics and Electronics Lab. TNO, Netherlands; deRooy, R., Physics and Electronics Lab. TNO, Netherlands; March 2002; 65p; In English; Original contains color illustrations
Contract(s)/Grant(s): A98/KM/719
Report No.(s): TD00-0485; FEL-01-A222; Copyright; Avail: Issuing Activity
The POLLEX trial (POint target detection and Low Level EXperiment) has been carried out from 7-18 May 2001 in Livorno Italy. A number of NATO countries from Task Group 16 brought sensors to observe fixed targets on the island Gorgona and dynamic targets with an IR source (ship with mast and helicopter). The main objective was to collect data for validation of models, predicting the range performance of long-range IRST's. An extensive set of meteo stations was used to collect data for model input. Results were analyzed which showed a very critical behaviour of the target-signature when viewed by rays skinning the horizon. Effects like blur and scintillation are not well described by the models and tiny variations in the temperature profile in the boundary layer seem to have a dramatic effect on the received signals. Conditions were formed with more than 4 km over the horizon detection. of great benefit is the signal increase when targets pop-up over the horizon. This effect leads to improved detection probability and improved algorithms with strong of false alarms.
Author
Target Acquisition; Infrared Detectors; Over-The-Horizon Radar; Boundary Layers; Performance Prediction

20020061880 Stanford Univ., Dept. of Chemistry, Stanford, CA USA
Cavity Ring-Down Spectrometer for the Absorption Measurements of Molecular Ions ***Final Report, 1 Mar. 2001-28 Feb. 2002***
Zare, Richard N.; May 21, 2002; 9p; In English
Contract(s)/Grant(s): F49620-01-1-0235; Proj-3484
Report No.(s): AD-A402769; SPO-24056; AFRL-SR-AR-TR-02-0186; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The goal of this project was to develop an ion spectrometer capable of making absorption measurements on ions using cavity ring-down spectroscopy (CRDS). As part of our continuing goal of detecting ion products from ion-molecule reactions, we have successfully used CRDS to measure the vibronic absorption spectra of various small ions and radicals generated by a pulsed discharge nozzle. These spectra give information about the number densities and temperatures of the ions and radicals. Currently, our setup consists of a pulsed discharge nozzle that produces high concentrations of radicals and ions arranged perpendicular to the optical cavity made from two highly reflective mirrors. To date, we have obtained the absorption spectrum of N2(+) and CN as well as several atomic species.
DTIC
Absorption Spectra; Molecular Ions; Atmospheric Ionization; Ionic Reactions; Absorption Spectroscopy

20020061881 Ohio State Univ., Research Foundation, Columbus, OH USA
Acquisition of a Nanometer-Scale Auger Electron Spectroscopy Analytical Microprobe ***Final Report, 1 Apr. 2000-30 Sep. 2001***
Brillson, Leonard J.; Mar. 25, 2002; 5p; In English
Contract(s)/Grant(s): F49620-00-1-0247
Report No.(s): AD-A402787; AFRL-SR-AR-TR-02-0178; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We have acquired an Auger Electron Spectroscopy Microprobe Analysis System for elemental and bonding analysis of electronic materials, equipped with specimen stage, ion beam depth analyzer, and ultrahigh vacuum (UHV) preparation chamber interfaced to an existing UHV scanning electron microscope. The specific equipment purchased is: JEOL USA, Inc. Auger Electron Spectroscopy Depth Profiling Hardware and Software for the JAMP-7800 deg F. Its acquisition enhances a number of DoD-funded programs and student training that involve development of high power and high frequency electronic materials with

superior performance, especially improving the state-of-the-art and availability of radiation-tolerant semiconductor electronics for applications in the space environment investigators.
DTIC
Chemical Analysis; Electron Spectroscopy; Aerospace Environments; Auger Spectroscopy

36
LASERS AND MASERS

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

20020059977 Anritsu Corp., ATSugi, Japan
Laser-Pumped Cs Gas-Cell Type Atomic Clock for VLBI
Takahei, Kenichiro, Anritsu Corp., Japan; Suga, Hirohiko, Anritsu Corp., Japan; Ohuchi, Yuji, Anritsu Corp., Japan; Sutoh, Hiroshi, Anritsu Corp., Japan; Uchino, Masahuru, Anritsu Corp., Japan; Mattori, Shigenori, Anritsu Corp., Japan; Tsuda, Masahiro, Anritsu Corp., Japan; Saburi, Yoshikazu, Anritsu Corp., Japan; Koga, Yasuki, National Inst. of Advanced Industrial Science and Technology, Japan; Hagimoto, Ken, National Inst. of Advanced Industrial Science and Technology, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 189-193; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A hydrogen maser is generally used as a local clock of a VLBI (Very Long Baseline Interferometry) system, where very high frequency stability is required. No other atomic clocks such as Cs beam type and Rb gas-cell type clocks were sufficiently stable in the short- and medium-term time scale, which is used in VLBI measurements. Recently, we have developed a gas-cell type atomic clock using Cs gas and a semiconductor laser as a light source. It is desktop size and much smaller than conventional hydrogen masers, but it has a stability of 7 x 10(exp -13) at 1 second reaching a flicker floor of 2.5 x 10(exp -14) at 1000 seconds. When fluctuation due to the atmosphere in actual VLBI measurements is considered, this stability is good enough for most of the VLBI measurements using S-band and X-band. A preliminary results of VLBI experiments at X-band (8 GHz) using the atomic clock developed in this study is discussed.
Author
Atomic Clocks; Very Long Base Interferometry; Gas Lasers

20020060122 NASA Marshall Space Flight Center, Huntsville, AL USA
Laser Image Contrast Enhancement System
Kurtz, Robert L., Inventor, NASA Marshall Space Flight Center, USA; Holmes, Richard R., Inventor, NASA Marshall Space Flight Center, USA; Witherow, William K., Inventor, NASA Marshall Space Flight Center, USA; Apr. 02, 2002; 8p; In English Patent Info.: Filed 12 Feb. 2001; NASA-Case-MFS-31561-1; US-Patent-6,366,403; US-Patent-Appl-SN-782460; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An optical image enhancement system provides improved image contrast in imaging of a target in high temperature surroundings such as a furnace. The optical system includes a source of vertically polarized light such as laser and a beam splitter for receiving the light and directing the light toward the target. A retardation plate is affixed to a target-facing surface of the beam splitter and a vertical polarizer is disposed along a common optical path with the beam splitter between the retardation plate and the target. A horizontal polarizer disposed in the common optical path, receives light passing through a surface of the beam splitter opposed to the target-facing surface. An image detector is disposed at one end of the optical path. A band pass filter having a band pass filter characteristic matching the frequency of the vertically polarized light source is disposed in the path between the horizontal polarizer and the image detector. The use of circular polarization, together with cross polarizers, enables the reflected light to be passed to the detector while blocking thermal radiation.
Official Gazette of the U.S. Patent and Trademark Office
Beam Splitters; Circular Polarization; Image Enhancement; Imaging Techniques; Laser Target Interactions

20020061872 Connecticut Univ., Inst. of Materials Science, Storrs, CT USA
Solid Freeform Fabrication from Gas Precursors Using Laser Processing ***Final Report, 1 Jul. 1996-30 Sep. 2001***
Marcus, Harris L.; Jan. 31, 2002; 18p; In English
Contract(s)/Grant(s): N00014-95-1-0978
Report No.(s): AD-A403015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the research was to establish the technical approaches required to use localized laser induced chemical vapor deposition as an approach for solid freeform fabrication (SFF). The Three processing approaches to be developed are Selective Area Laser Deposition (SALD), Selective Area Laser Deposition Vapor Infiltration (SALDVI), and Selective Area Laser Deposition Joining (SALD-Joining) of ceramics.
DTIC
Laser Applications; Laser Deposition; Vapor Deposition

20020061928 Naval Postgraduate School, Monterey, CA USA
Resonant Blade Response in Turbine Rotor Spin Tests Using a Laser-Light Probe Non-Intrusive Measurement System
Mansisidor, Michael R.; Mar. 2002; 132p; In English; Original contains color images
Report No.(s): AD-A402747; No Copyright; Avail: CASI; A07, Hardcopy

Procedures to qualify turbomachinery components for a designed lifetime free of high cycle fatigue (HCF) failures have not yet evolved. As part of an initiative to address this issue, in the present study, laser-light probes were used in a Non-Intrusive Measurement System (NSMS) to measure the unsteady deflections created in the blades of a second-stage turbine rotor in an evacuated spin pit. Air-jet and eddy-current excitation (ECE) methods were used to stimulate blade resonance, The NSMS was calibrated directly to gauge measurements of strain, and testing was conducted toward three additional goals; assessing the effectiveness of an advanced internal damping system; attaining higher excitation amplitudes with ECE by silver plating blades, and improving the repeatability of resonance data by adding plastic inserts between the fir-tree blade roots and the disk, It was concluded that the ability of NSMS to record the response of all blades is key to understanding the rotor system behavior and quantifying the statistical variability between blades.
DTIC
Measurement; Vibration; Turbine Blades; Laser Applications; Calibrating; Light Beams; 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.

20020060026 Society of Automotive Engineers, Inc., Warrendale, PA USA
Heavy Vehicle Propulsion Materials Program
Diamond, S.; Johnson, D. R.; April 1999; 10p; In English
Report No.(s): DE2002-771102; SAE-TP-1999-01-2254; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of the Heavy Vehicle Propulsion Materials Program is to develop the enabling materials technology for the clean, high-efficiency diesel truck engines of the future. The development of cleaner, higher-efficiency diesel engines imposes greater mechanical, thermal, and tribological demands on materials of construction. Often the enabling technology for a new engine component is the material from which the part can be made. The Heavy Vehicle Propulsion Materials Program is a partnership between the Department of Energy (DOE), and the diesel engine companies in the USA, materials suppliers, national laboratories, and universities. A comprehensive research and development program has been developed to meet the enabling materials requirements for the diesel engines of the future. Advanced materials, including high-temperature metal alloys, intermetallics, cermets, ceramics, amorphous materials, metal- and ceramic-matrix composites, and coatings, are investigated for critical engine applications.
NTIS
Diesel Engines; Engine Parts; Propulsion; Tribology

20020060089 NASA Glenn Research Center, Cleveland, OH USA
Exoskeletal Engine
Chamis, Christos C., Inventor, NASA Glenn Research Center, USA; Blankson, Isaiah M., Inventor, NASA Glenn Research Center, USA; Richter, William A., Inventor, NASA Glenn Research Center, USA; May 28, 2002; 8p; In English
Patent Info.: Filed 17 Nov. 2000; NASA-Case-LEW-16790-1; US-Patent-6,393,831; US-Patent-Appl-SN-722194; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A turbojet engine is made from a drum-like portion having a circular blade section extending inwardly therefrom, a support member, and a bearing arranged around a circle having a diameter substantially equal to or greater than the diameter of the blade section. The drum-like portion is rotatably mounted within the support member on the bearing. Instead of a turbine spinning on a shaft, a turbine spinning within a drum is employed.
Official Gazette of the U.S. Patent and Trademark Office
Turbojet Engines; Turbine Blades; Engine Design

20020060121 NASA Marshall Space Flight Center, Huntsville, AL USA
Attachment Fitting for Pressure Vessel
Smeltzer, Stanley S., III, Inventor, NASA Marshall Space Flight Center, USA; Carrigan, Robert W., Inventor, NASA Marshall Space Flight Center, USA; Apr. 09, 2002; 6p; In English
Patent Info.: Filed 22 Jun. 1999; NASA-Case-MFS-31066; US-Patent-6,367,844; US-Patent-Appl-SN-338407; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This invention provides sealed access to the interior of a pressure vessel and consists of a tube. a collar, redundant seals, and a port. The port allows the seals to be pressurized and seated before the pressure vessel becomes pressurized.
Official Gazette of the U.S. Patent and Trademark Office
Pressure Vessels; Seals (Stoppers); Sealing

20020060126 NASA Johnson Space Center, Houston, TX USA
Androgynous, Reconfigurable Closed Loop Feedback Controlled Low Impact Docking System With Load Sensing Electromagnetic Capture Ring
Lewis, James L., Inventor, NASA Johnson Space Center, USA; Carroll, Monty B., Inventor, NASA Johnson Space Center, USA; Morales, Ray H., Inventor, NASA Johnson Space Center, USA; Le, Thang D., Inventor, NASA Johnson Space Center, USA; Mar. 12, 2002; 28p; In English; Provisional US-Patent-Appl-SN-104843, filed 29 Sep. 1998
Patent Info.: Filed 20 Sep. 1999; NASA-MSC-22931-1; US-Patent-6,354,540; US-Patent-Appl-SN-405301; US-Patent-Appl-SN-104843; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The present invention relates to a fully androgynous, reconfigurable closed loop feedback controlled low impact docking system with load sensing electromagnetic capture ring. The docking system of the present invention preferably comprises two Docking- assemblies, each docking assembly comprising a load sensing ring having an outer face, one of more electromagnets, one or more load cells coupled to said load sensing ring. The docking assembly further comprises a plurality of actuator arms coupled to said load sensing ring and capable of dynamically adjusting the orientation of said load sensing ring and a reconfigurable closed loop control system capable of analyzing signals originating from said plurality of load cells and of outputting real time control for each of the actuators. The docking assembly of the present invention incorporates an active load sensing system to automatically dynamically adjust the load sensing ring during capture instead of requiring significant force to push and realign the ring.
Official Gazette of the U.S. Patent and Trademark Office
Spacecraft Docking; Impact Tests; Feedback Control; Electromagnets

20020060136 Society of Automotive Engineers, Inc., Warrendale, PA USA
Heavy Vehicle Propulsion Materials Program: Progress and Highlights
Johnson, D. R.; Diamond, S.; June 2000; 14p; In English
Report No.(s): DE2002-770959; SAE-TP-2000-01-2200; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Heavy Vehicle Propulsion Materials Program was begun in 1997 to support the enabling materials needs of the DOE Office of Heavy Vehicle Technologies (OHVT). The technical agenda for the program grew out of the technology roadmap for the OHVT and includes efforts in materials for: fuel systems, exhaust aftertreatment, valve train, air handling, structural components, electrochemical propulsion, natural gas storage, and thermal management. A five-year program plan was written in early 2000, following a stakeholders workshop. The technical issues and planned and ongoing projects are discussed. Brief summaries of several technical highlights are given.
NTIS
Project Planning; Propulsion; Diesel Engines

20020061785 NASA Glenn Research Center, Cleveland, OH USA

Crack Detection for Aerospace Quality Spur Gears

Decker, Harry J., Army Research Lab., USA; April 2002; 16p; In English; International 58th Annual Forum and Technology Display, 11-13 Jun. 2002, Montreal, Quebec, Canada; Sponsored by American Helicopter Society, Inc., USA

Contract(s)/Grant(s): RTOP 708-90-13; DA Proj. 1L1-61102-AH-45

Report No.(s): NASA/TM-2002-211492; NAS 1.15:211492; E-13260; ARL-TR-2682; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Health and USAge Monitoring System research and development involves analysis of the vibration signals produced by a gearbox throughout its life. There are two major advantages of knowing the actual lifetime of a gearbox component: safety and cost. In this report, a technique is proposed to help extract the critical data and present it in a manner that can be easy to understand. The key feature of the technique is to make it independent of speed, torque and prior history for localized, single tooth damage such as gear cracks. This extraction technique is demonstrated on two sets of digitized vibration data from cracked spur gears. Standard vibration diagnostic parameters are calculated and presented for comparison. Several new detection algorithms are also presented. The results of this study indicate that crack detection methods examined are not robust or repeatable. The proposed techniques provide a limited improvement to existing diagnostic parameters. Current techniques show that the cracks progressed at a much faster rate than anticipated which reduced available time for detection.

Author

Gears; Cracks; Vibration; Transmissions (Machine Elements); Systems Health Monitoring

20020062003 Boeing Co., Mesa, AZ USA

Development of Face Gear Technology for Industrial and Aerospace Power Transmission ***Final Report***

Heath, Gregory F., Boeing Co., USA; Filler, Robert R., Boeing Co., USA; Tan, Jie, Boeing Co., USA; 20020501; 96p; In English; Original contains color pages.

Contract(s)/Grant(s): NCC3-356; RTOP 708-90-13--00

Report No.(s): NASA/CR-2002-21130; ARL-CR-0485; 1L18211-FR-01001; NAS 1.55:21130; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Tests of a 250 horsepower proof-of-concept (POC) split torque face gear transmission were completed by The Boeing Company in Mesa, Arizona, while working under a Defense Advanced Research Projects Agency (DARPA) Technology Reinvestment Program (TRP) This report provides a summary of these cooperative tests, which were jointly funded by Boeing and DARPA Design, manufacture and testing of the scaled-power TRP split torque gearbox followed preliminary evaluations of the concept performed early in the program The testing demonstrated the theory of operation for the concentric, tapered face gear assembly The results showed that the use of floating pinions in a concentric face gear arrangement produces a nearly even torque split The POC split torque tests determined that, with some improvements, face gears can be applied effectively in a split torque configuration which yields significant weight, cost and reliability improvements over conventional designs.

Author

Transmissions (Machine Elements); Gears; Torque

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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.

20020060459 NASA Langley Research Center, Hampton, VA USA

Photogrammetry Methodology Development for Gossamer Spacecraft Structures

Pappa, Richard S., NASA Langley Research Center, USA; Jones, Thomas W., NASA Langley Research Center, USA; Black, Jonathan T., George Washington Univ., USA; Walford, Alan, EOS System, Inc., Canada; Robson, Stuart, University Coll., UK; Shortis, Mark R., Melbourne Univ., Australia; June 2002; 23p; In English; AIAA Conference, 22-25 Apr. 2002, Unknown; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 755-06-00-11

Report No.(s): NASA/TM-2002-211739; L-18200; NAS 1.15:211739; AIAA Paper 2002-1375; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Photogrammetry--the science of calculating 3D object coordinates from images--is a flexible and robust approach for measuring the static and dynamic characteristics of future ultra-lightweight and inflatable space structures (a.k.a., Gossamer structures), such as large membrane reflectors, solar sails, and thin-film solar arrays. Shape and dynamic measurements are required to validate new structural modeling techniques and corresponding analytical models for these unconventional systems. This paper summarizes experiences at NASA Langley Research Center over the past three years to develop or adapt photogrammetry methods for the specific problem of measuring Gossamer space structures. Turnkey industrial photogrammetry systems were not considered a cost-effective choice for this basic research effort because of their high purchase and maintenance costs. Instead, this research uses mainly off-the-shelf digital-camera and software technologies that are affordable to most organizations and provide acceptable accuracy.
Author
Photogrammetry; Dynamic Characteristics; Static Characteristics; Digital Cameras; Inflatable Space Structures

20020060775 Building and Construction Research TNO, Centre for Maritime Engineering, Delft, Netherlands
Shock Testing of 5 Types of Pipe Fittings
Rink, M. R., Building and Construction Research TNO, Netherlands; Feb. 08, 2001; 45p; In English; Original contains color illustrations
Contract(s)/Grant(s): A99/KM/102; TNO Proj. 006.03522/01.01
Report No.(s): TD-2001-08; TNO-2001-CMC-R026; Copyright; Avail: Issuing Activity
Five types of pipe fittings havn been shock tested according to pulse form B(F). All equipment, except for the EO Cutting Ring fitting, meets the requirements for shocks with pulse form B(F).
Author
Shock Tests; Fittings; Pipes (Tubes)

20020061253 NASA Glenn Research Center, Cleveland, OH USA
Quantification of Processing Effects on Filament Wound Pressure Vessels
Aiello, Robert A., Modern Technologies Corp., USA; Chamis, Christos C., NASA Glenn Research Center, USA; March 2002; 16p; In English
Contract(s)/Grant(s): RTOP 523-22-13
Report No.(s): NASA/TM-1999-209434/REV1; NAS 1.15:209434/REV1; E-11899-1/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A computational simulation procedure is described which is designed specifically for the modeling and analysis of filament wound pressure vessels. Cylindrical vessels with spherical or elliptical end caps can be generated automatically. End caps other than spherical or elliptical may be modeled by varying circular sections along the x-axis according to the end cap shape. The finite element model generated is composed of plate type quadrilateral shell elements on the entire vessel surface. This computational procedure can also be used to generate grid, connectivity and material cards (bulk data) for component parts of a larger model. These bulk data are assigned to a user designated file for finite element structural/stress analysis of composite pressure vessels. The procedure accommodates filament wound pressure vessels of all types of shells-of -revolution. It has provisions to readily evaluate initial stresses due to pretension in the winding filaments and residual stresses due to cure temperature.
Author
Pressure Vessels; Filament Winding; Computerized Simulation

20020061316 NASA Glenn Research Center, Cleveland, OH USA
ASTROP2-LE: A Mistuned Aeroelastic Analysis System Based on a Two Dimensional Linearized Euler Solver
Reddy, T. S. R., Toledo Univ., USA; Srivastava, R., Toledo Univ., USA; Mehmed, Oral, NASA Glenn Research Center, USA; May 2002; 41p; In English
Contract(s)/Grant(s): RTOP 708-28-13
Report No.(s): NASA/TM-2002-211499; NAS 1.15:211499; E-13266; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An aeroelastic analysis system for flutter and forced response analysis of turbomachines based on a two-dimensional linearized unsteady Euler solver has been developed. The ASTROP2 code, an aeroelastic stability analysis program for turbomachinery, was used as a basis for this development. The ASTROP2 code uses strip theory to couple a two dimensional aerodynamic model with a three dimensional structural model. The code was modified to include forced response capability. The formulation was also modified to include aeroelastic analysis with mistuning. A linearized unsteady Euler solver, LINFLX2D is added to model the unsteady aerodynamics in ASTROP2. by calculating the unsteady aerodynamic loads using LINFLX2D,

it is possible to include the effects of transonic flow on flutter and forced response in the analysis. The stability is inferred from an eigenvalue analysis. The revised code, ASTROP2-LE for ASTROP2 code using Linearized Euler aerodynamics, is validated by comparing the predictions with those obtained using linear unsteady aerodynamic solutions.
Author
Flutter Analysis; Aeroelasticity; Unsteady Aerodynamics; Three Dimensional Models; Stability Tests; Turbomachinery; Two Dimensional Models

20020061671 Virginia Polytechnic Inst. and State Univ., Dept. of Aerospace and Ocean Engineering, Blacksburg, VA USA
Dynamic Stability of Uncertain Laminated Beams Under Subtangential Loads
Goyal, Vijay K., Virginia Polytechnic Inst. and State Univ., USA; Kapania, Rakesh K., Virginia Polytechnic Inst. and State Univ., USA; [2002]; 257p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG1-2277
Report No.(s): VPI-AOE-280; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
Because of the inherent complexity of fiber-reinforced laminated composites, it can be challenging to manufacture composite structures according to their exact design specifications, resulting in unwanted material and geometric uncertainties. In this research, we focus on the deterministic and probabilistic stability analysis of laminated structures subject to subtangential loading, a combination of conservative and nonconservative tangential loads, using the dynamic criterion. Thus a shear-deformable laminated beam element, including warping effects, is derived to study the deterministic and probabilistic response of laminated beams. This twenty-one degrees of freedom element can be used for solving both static and dynamic problems. In the first-order shear deformable model used here we have employed a more accurate method to obtain the transverse shear correction factor. The dynamic version of the principle of virtual work for laminated composites is expressed in its nondimensional form and the element tangent stiffness and mass matrices are obtained using analytical integration The stability is studied by giving the structure a small disturbance about an equilibrium configuration, and observing if the resulting response remains small. In order to study the dynamic behavior by including uncertainties into the problem, three models were developed: Exact Monte Carlo Simulation, Sensitivity Based Monte Carlo Simulation, and Probabilistic FEA. These methods were integrated into the developed finite element analysis. Also, perturbation and sensitivity analysis have been used to study nonconservative problems, as well as to study the stability analysis, using the dynamic criterion.
Author
Dynamic Stability; Laminates; Composite Structures; Beams (Supports); Dynamic Characteristics; Loads (Forces); Perturbation

20020061830 NASA Glenn Research Center, Cleveland, OH USA
High-Fidelity Generalization Method of Cells for Inelastic Periodic Multiphase Materials
Aboudi, Jacob, Tel-Aviv Univ., Ramat-Aviv, Israel; Pindera, Marek-Jerzy, Virginia Univ., USA; Arnold, Steven M., NASA Glenn Research Center, USA; March 2002; 54p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2524; RTOP 708-73-35
Report No.(s): NASA/TM-2002-211469; NAS 1.15:211469; E-13234; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
An extension of a recently-developed linear thermoelastic theory for multiphase periodic materials is presented which admits inelastic behavior of the constituent phases. The extended theory is capable of accurately estimating both the effective inelastic response of a periodic multiphase composite and the local stress and strain fields in the individual phases. The model is presently limited to materials characterized by constituent phases that are continuous in one direction, but arbitrarily distributed within the repeating unit cell which characterizes the material's periodic microstructure. The model's analytical framework is based on the homogenization technique for periodic media, but the method of solution for the local displacement and stress fields borrows concepts previously employed by the authors in constructing the higher-order theory for functionally graded materials, in contrast with the standard finite-element solution method typically used in conjunction with the homogenization technique. The present approach produces a closed-form macroscopic constitutive equation for a periodic multiphase material valid for both uniaxial and multiaxial loading. The model's predictive accuracy in generating both the effective inelastic stress-strain response and the local stress said inelastic strain fields is demonstrated by comparison with the results of an analytical inelastic solution for the axisymmetric and axial shear response of a unidirectional composite based on the concentric cylinder model, and with finite-element results for transverse loading.
Author
Thermoelasticity; Finite Element Method; Microstructure; Stress-Strain Relationships; Composite Materials

20020061843 Corps of Engineers, Washington, DC USA
Engineering and Design: Sliding Stability for Concrete Structures
Duscha, Lloyd A.; Jun. 24, 1981; 47p; In English
Report No.(s): AD-A403247; ETL-1110-2-256; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This ETL contains criteria and guidance for assessing the sliding stability of gravity dams and other concrete structures.
DTIC
Concrete Structures; Stability; Structural Engineering; Mechanical Properties

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GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20020059639 Bureau of Land Management, Denver, CO USA
Our Vanishing Past: The Crisis of Cultural and Paleontological Resources on BLM Lands
Hill, L., Bureau of Land Management, USA; Nov. 2001; 146p; In English
Report No.(s): PB2002-103530; BLM/WO/GI-02/004; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The public lands administered by the Bureau of Land Management (BLM) contain a wealth of cultural and paleontological resources. These resources are important to our understanding of both recorded history and prehistory-the period of time before written history. However, these resources are increasingly at risk from human activities, the forces of nature, and neglect. In fact, the need to preserve these resources has reached the crisis stage. The purpose of this report is to highlight the wealth of the Nation's cultural and paleontological resources, to focus attention on the deepening crisis with regard to their preservation, to present what the BLM is doing to address this crisis, and to define what yet needs to be done if we are to preserve these resources and save our vanishing past.
NTIS
Cultural Resources; Paleontology; USA; Land Management

20020059640 Geological Survey, Water Resources Div., Denver, CO USA
Effects of Piping Irrigation Laterals on Selenium and Salt Loads, Montrose Arroyo Basin, Western Colorado
Butler, D. L., Geological Survey, USA; 2001; 28p; In English
Report No.(s): PB2002-103526; USGS/WRI-01-4204; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Selenium and salinity are water-quality issues in the Upper Colorado River Basin. Certain water bodies in the lower Gunnison River Basin, including the lower Gunnison River and the Uncompahgre River, exceed the State standard for selenium of 5 micrograms per liter. Remediation methods to reduce selenium and salt loading in the lower Gunnison River Basin were examined. A demonstration project in Montrose Arroyo, located in the Uncompahgre River Basin near Montrose, was done during 1998-2000 to determine the effects on selenium and salt loads in Montrose Arroyo from replacing 8.5 miles of open-ditch irrigation laterals with 7.5 miles of pipe. The participants in the project were the National Irrigation Water Quality Program, the Colorado River Basin Salinity Control Program, the Uncompahgre Valley Water Users Association, and the U.S. Geological Survey.
NTIS
Selenium; Salinity; Colorado; Water Quality; Surface Water

20020059645 Stockholm Univ., International Meteorological Inst., Sweden
Forcing Glacier Models with Climate Scenarios Calculated by SWECLIM
Oerlemans, J.; Raeisaenen, J.; Rummukainen, M.; Oct. 1999; 24p; In English
Report No.(s): PB2002-104987; DM-80; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Glaciers are normally located in regions with a marked orography, which makes it difficult to formulate appropriate forcing for dynamic glacier models. To study the response of glaciers to greenhouse warming scenarios, output from global General Circulation Models is normally too coarse to provide suitable fields of precipitation and temperature. Here down-scaling by means of high-resolution atmospheric models may help. In this report output from such a regional model, SWECLIM, has been used to study the response of two glaciers (Nigardsbreen and Storglaciaren) to a 2.5 xeq CO2 scenario. The SWECLIM model is driven by output from the Hadley Centre model. A comparison is made between the changes in glacier mass balance obtained directly

from the Hadley output as well as from the SWECLIM output. It appears that significant differences exist, suggesting that the application of high-resolution models is meaningful.
NTIS
Glaciers; Mass Balance; High Resolution; Dynamic Models

20020060045 National Wildfire Coordinating Group, Boise, ID USA
Wildfire Prevention Patrol Guide
Jun. 1998; 84p; In English
Report No.(s): PB2002-107626; PMS-456; NFES-2570; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The objective of this guide is to provide Fire Management Specialists having patrol responsibilities, wildfire prevention techniques which will reduce unwanted wildland fire ignitions, suppression costs, damages to property and natural resources and reduce the risk of exposure from wildfire to firefighters and the public.
NTIS
Forest Fires; Fire Prevention; Patrols

20020060046 National Wildfire Coordinating Group, Boise, ID USA
National Fire Danger Rating System: Weather Station Standards
May 2000; 36p; In English
Report No.(s): PB2002-107625; PMS-426-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The National Fire Danger Rating System (NFDRS) is a system used by wildland fire management agencies to assess current fire danger at local and national levels. It consists of a variety of indices that portray current potential fire danger conditions. The weather station network supporting NFDRS has grown in a piecemeal fashion over the past 30 years. Inconsistent station standards, maintenance, fire weather network analysis, data communication and archiving has left the system with some deficiencies-- both real and perceived. This fragmented approach has compromised system reliability and data integrity. The data from these stations support interagency fire danger predictions and provide quantification of risk elements that are critical for daily decisions regarding firefighter resource placement, staffing levels, appropriate suppression response, and strategic decisions at local, regional, and national levels. The most important value among those provided by these data is consideration for firefighter safety. Firefighter safety is our number one priority.
NTIS
Fire Prevention; Ratings; Meteorological Parameters; Forest Fires

20020060047 Army Engineer District, Jacksonville, FL USA
Master Program Management Plan, Volume 1, Management Processes
Aug. 2000; 192p; In English
Report No.(s): PB2002-107624; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The purpose of this Master Program Management Plan (Master Plan) is to describe the framework and process to be used by the U.S. Army Corps of Engineers (Corps) and the South Florida Water Management District (SFWMD) for managing and monitoring implementation of the Comprehensive Everglades Restoration Plan (Comprehensive Plan). This document provides the Corps and the SFWMD with a common understanding of the business processes and protocols to be applied during implementation of the Comprehensive Plan. For this Master Plan the term program refers to the Comprehensive Plan projects for which the SFWMD is the local sponsor. The Comprehensive Plan was developed to accomplish a set of system-wide goals and objectives. Due to size and complexity, implementation of the Comprehensive Plan requires that it be divided into smaller implementable packages of components that are referred to as projects. As these projects are further planned and designed, analyses and evaluations that measure each package's overall contribution to system-wide goals will be conducted to determine and, thus, ensure that the system-wide goals and benefits of the Comprehensive Plan are being realized.
NTIS
Environment Management; Water Resources

20020060048 National Wildfire Coordinating Group, Fire Equipment Working Team, Boise, ID USA
Lot Acceptance, Quality Assurance, and Field Quality Control for Fire Retardant Chemicals (Sixth Edition)
Palm, S.; Taylor, R.; Johnson, C.; Pfouts, B.; Forbes, A.; May 2000; 72p; In English
Report No.(s): PB2002-107623; NFES-1245; PMS-444-1; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This document provides guidance for airtanker base personnel responsible for the sampling and testing of fire retardant. The Forest Service Manual requires agency participation in the Lot Acceptance and Quality Assurance Program. Other agencies may

have similar requirements or directives. Several million gallons of retardants are used every year in support of wildland fire suppression. The retardant must be properly formulated and prepared to maximize tactical performance and cost effectiveness. All of the approved retardants were tested in the laboratory and in the field to determine that their performance met minimum specification requirements. Retardants must be properly mixed and tested in the field to ensure that the critical properties are maintained. The Lot Acceptance and Quality Assurance program was developed to ensure that purchased retardant has the same formulation and exhibits the same critical properties measured in the laboratory.
NTIS
Fire Fighting; Forest Fires; Quality Control; Reliability Analysis; Fire Extinguishers

20020060049 National Wildfire Coordinating Group, Boise, ID USA
Incident Response Pocket Guide
Jan. 2002; 106p; In English
Report No.(s): PB2002-107622; PNS-461; NFES-1077; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The most essential element of successful wildland firefighting is competent and confident leadership. Leadership means providing purpose, direction and motivation for wildland firefighters working to accomplish difficult tasks under dangerous, stressful circumstances. In confusing and uncertain situations, a good operational leader will: take charge of assigned resources; motivate firefighters with a 'can do safely' attitude; demonstrate initiative by taking action in the absence of orders; communicate by giving specific instructions and asking for feedback, and supervise at the scene of action.
NTIS
Forest Fires; Leadership; Fire Fighting

20020060147 Geological Survey, Water Resources Div., Rapid City, SD USA
Water Resources Data for South Dakota, Water Year 2001 ***Annual Report, 1 Oct. 00 - 30 Sep. 01***
Burr, M. J.; Teller, R. W.; Neitzert, K. M.; March 2002; 506p; In English
Report No.(s): PB2002-105417; USGS-WDR-SD-01-1; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche
Water-resources data for the 2001 water year for South Dakota consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; precipitation; and water levels in wells. This report contains discharge records for 128 streamflow-gaging stations; stage and contents records for 10 lakes and reservoirs, stage for 12 streams and 2 lakes, water-quality records for 3 streamflow-gaging stations, 2 daily sediment stations, 3 wells, 9 ungaged stream sites, 5 lakes, 1 sewage lagoon, and 1 precipitation site; water levels for 7 wells; daily precipitation records at 4 sites; and 68 partial-record crest-stage gage sites. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in South Dakota.
NTIS
Data Acquisition; Water Resources; Geological Surveys; Water Quality

20020060651 NASA Goddard Space Flight Center, Greenbelt, MD USA
Visions of our Planet's Atmosphere, Land and Oceans: NASA/NOAA Electronic Theater 2002
Hasler, A. F., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English, Mar. 2002, Salt Lake City, UT, Salt Lake City, UT, USA, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The NASA/NOAA Electronic Theater presents Earth science observations and visualizations in a historical perspective. Fly in from outer space to the Olympic Medals Plaza, the new Gateway Center, and the University of Utah Stadium Site of the Olympic Opening and Closing Ceremonies in Salt Lake City. Fly in and through the Park City, and Snow Basin sites of the 2002 Winter Olympic Alpine Venues using 1 m IKONOS "Spy Satellite" data. See the four seasons of the Wasatch Front as observed by LANDSAT 7 at 15m resolution and watch the trees turn color in the Fall, snow come and go in the mountains and the reservoirs freeze and melt. Go back to the early weather satellite images from the 1960s and see them contrasted with the latest US and international global satellite weather movies including hurricanes & "tornadoes". See the latest visualizations of spectacular images from NASA/NOAA remote sensing missions like Terra, GOES, TRMM, SeaWiFS, LANDSAT 7 including new 1 - min GOES rapid scan image sequences of Nov 9th 2001 Midwest tornadic thunderstorms and have them explained. See how High-Definition Television (HDTV) is revolutionizing the way we communicate science. (In cooperation with the American Museum of Natural History in NYC) See dust storms in Africa and smoke plumes from fires in Mexico. See visualizations featured on the covers of Newsweek, TIME, National Geographic, Popular Science & on National & International Network TV. New computer software tools allow us to roam & zoom through massive global images e.g. LANDSAT tours of the US, and Africa, showing desert and mountain geology as well as seasonal changes in vegetation. See animations of the polar ice packs and the

motion of gigantic Antarctic Icebergs from SeaWinds data. Spectacular new visualizations of the global atmosphere & oceans are shown. See vortexes and currents in the global oceans that bring up the nutrients to feed tiny algae and draw the fish, whales and fisherman. See the how the ocean blooms in response to these currents and El Nino/La Nina climate changes. See the city lights, fishing fleets, gas flares and bio-mass burning of the Earth at night observed by the ”night-vision” DMSP military satellite. The demonstration is interactively driven by a SGI Octane Graphics Supercomputer with two CPUs, 4 Gigabytes of RAM and 0.5 Terabyte of disk using two projectors across a super sized panoramic 48 foot screen. In addition new HDTV technology will be demonstrated from a portable computer server.
Author
Earth Sciences; Satellite Imagery; Meteorological Satellites; LANDSAT Satellites; High Definition Television; Annual Variations

20020061279 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Science Behind the NASA/NOAA Electronic Theater 2002
Hasler, A. Fritz, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; Colloquium Lecture, Jan. 2002, UT, USA; Sponsored by Utah Univ., USA; No Copyright; Avail: Issuing Activity; Abstract Only

Details of the science stories and scientific results behind the Etheater Earth Science Visualizations from the major remote sensing institutions around the country will be explained. The NASA Electronic Theater presents Earth science observations and visualizations in a historical perspective. Fly in from outer space to Temple Square and the University of Utah Campus. Go back to the early weather satellite images from the 1960s see them contrasted with the latest US/Europe/Japan global weather data. See the latest images and image sequences from NASA & NOAA missions like Terra, GOES, NOAA, TRMM, SeaWiFS, LANDSAT 7 visualized with state-of-the art tools. A similar retrospective of numerical weather models from the 1960s will be compared with the latest ”year 2002” high-resolution models. See the inner workings of a powerful hurricane as it is sliced and dissected using the University of Wisconsin Vis-5D interactive visualization system. The largest super computers are now capable of realistic modeling of the global oceans. See ocean vortexes and currents that bring up the nutrients to feed phitoplankton and zooplankton as well as draw the crill fish, whales and fisherman. See the how the ocean blooms in response to these currents and El Nino/La Nina climate regimes. The Internet and networks have appeared while computers and visualizations have vastly improved over the last 40 years. These advances make it possible to present the broad scope and detailed structure of the huge new observed and simulated datasets in a compelling and instructive manner. New visualization tools allow us to interactively roam & zoom through massive global images larger than 40,000 x 20,000 pixels. Powerful movie players allow us to interactively roam, zoom & loop through 4000 x 4000 pixel bigger than HDTV movies of up to 5000 frames. New 3D tools allow highly interactive manipulation of detailed perspective views of many changing model quantities. See the 1m resolution before and after shots of lower Manhattan and the Pentagon after the September 11 disaster as well as shots of Afghanistan from the Space Imaging IKONOS as well as debris plume images from Terra MODIS and SPOT Image. Shown by the SGI-Octane Graphics-Supercomputer are visualizations of hurricanes Michelle 2001, Floyd, Mitch, Fran and Linda. Our visualizations of these storms have been featured on the covers of the National Geographic, Time, Newsweek and Popular Science. Highlights will be shown from the NASA’s large collection of High Definition TV (HDTV) visualizations clips New visualizations of a Los Alamos global ocean model, and high-resolution results of a NASA/JPL Atlantic ocean basin model showing currents, and salinity features will be shown. El Nino/La Nina effects on sea surface temperature and sea surface height of the Pacific Ocean will also be shown. The SST simulations will be compared with GOES Gulf Stream animations and ocean productivity observations. Tours will be given of the entire Earth’s land surface at 500 m resolution from recently composited Terra MODIS data, Visualizations will be shown from the Earth Science Etheater 2001 recently presented over the last years in New Zealand, Johannesburg, Tokyo, Paris, Munich, Sydney, Melbourne, Honolulu, Washington, New York City, Pasadena, UCAR/Boulder, and Penn State University. The presentation will use a 2-CPU SGI/CRAY Octane Super Graphics workstation with 4 GB RAM and terabyte disk array at 2048 x 768 resolution plus multimedia laptop with three high resolution projectors. Visualizations will also be featured from museum exhibits and presentations including: the Smithsonian Air & Space Museum in Washington, IMAX theater at the Maryland Science Center in Baltimore, the James Lovell Discovery World Science museum in Milwaukee, the American Museum of Natural History (NYC) Hayden Planetarium IMAX theater, etc. The Etheater is sponsored by NASA, NOAA and the American Meteorological Society. This presentation is brought to you by the University of Utah College of Mines and Earth Sciences and, the Utah Museum of Natural History.
Author
NASA Programs; Earth Sciences; NOAA Satellites; Scientific Visualization

20020061306 NASA Goddard Space Flight Center, Greenbelt, MD USA

Visions of our Planet's Atmosphere, Land and Oceans: NASA/NOAA Electronic-Theater 2002. Spectacular Visualizations of our Blue Marble

Hasler, A. F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English, 5 Jun. 2002, Orono, ME, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Spectacular Visualizations of our Blue Marble The NASA/NOAA Electronic Theater presents Earth science observations and visualizations in a historical perspective. Fly in from outer space to the 2002 Winter Olympic Stadium Site of the Olympic Opening and Closing Ceremonies in Salt Lake City. Fly in and through Olympic Alpine Venues using 1 m IKONOS "Spy Satellite" data. Go back to the early weather satellite images from the 1960s and see them contrasted with the latest US and international global satellite weather movies including hurricanes & "tornadoes". See the latest visualizations of spectacular images from NASA/NOAA remote sensing missions like Terra, GOES, TRMM, SeaWiFS, LANDSAT 7 including new 1 - min GOES rapid scan image sequences of Nov 9th 2001 Midwest tornadic thunderstorms and have them explained. See how High-Definition Television (HDTV) is revolutionizing the way we communicate science. (In cooperation with the American Museum of Natural History in NYC). See dust storms in Africa and smoke plumes from fires in Mexico. See visualizations featured on the covers of Newsweek, TIME, National Geographic, Popular Science & on National & International Network TV. New computer software tools allow us to roam & zoom through massive global images e.g. LANDSAT tours of the US, and Africa, showing desert and mountain geology as well as seasonal changes in vegetation. See animations of the polar ice packs and the motion of gigantic Antarctic Icebergs from SeaWinds data. Spectacular new visualizations of the global atmosphere & oceans are shown. See vertexes and currents in the global oceans that bring up the nutrients to feed tiny algae and draw the fish, whales and fisherman. See the how the ocean blooms in response to these currents and El Nicola Nina climate changes. See the city lights, fishing fleets, gas flares and biomass burning of the Earth at night observed by the "night-vision" DMSP military satellite.

Author

NASA Programs; Remote Sensing; Ocean Surface; Earth Atmosphere; NOAA Satellites; Climate Change

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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.

20020059652 Oxford Univ., Oxford UK

Algorithms for Adaptation in Aerial Surveillance ***Final Report, Apr. 1998-Apr. 2001***

Robertson, Paul; Reece, Steven; Brady, J. M.; Mar. 2002; 323p; In English; Original contains color images

Contract(s)/Grant(s): F30602-98-2-0056; ARPA ORDER F890; AF Proj-E096

Report No.(s): AD-A402198; AFRL-IF-RS-TR-2002-52; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy

This report discusses a self-adaptive architecture for image understanding that addresses lack of robustness common in image understanding programs. The architecture provides support for making image understanding programs that can manipulate their own semantics and thereby adjust their structure in response to changes in the environment that might cause static image understanding systems to fail. The general approach taken has been to explore the ideas of self-adaptive software and implement an architectural framework that addresses a class of problems that we term "interpretation" problems" common in image understanding. The idea is that to make programs robust to changing environmental conditions that they should be aware of their relationship with the environment and be able to restructure themselves at runtime in order to track changes in the environment. The implementation takes the form of a multi-layered reflective interpreter that manipulates and runs simple agents. The interpreter framework utilizes Monte-Carlo sampling as a mechanism for estimating most likely solutions, uses Minimum Description Length (MDL) as a central coordinating device, and includes a theorem prover based compiler to restructure the program when necessary. to test the architectural ideas developed in the report a test domain of interpreting aerial images was chosen. The task of the program is to segment, label, and parse aerial images so as to produce an image description similar to descriptions produced by a human expert. An image corpus is developed that is used as the source of domain knowledge.

DTIC

Aerial Reconnaissance; Algorithms; Image Processing; Surveillance

20020060068 Geological Survey, Water Resources Div., Indianapolis, IN USA
Water Resources Data for Indiana, Water Year 2001 ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Stewart, J. A.; Keeton, C. R.; Hammil, L. E.; Nguyen, H. T.; Majors, D. K.; March 2002; 708p; In English
Report No.(s): PB2002-107289; USGS/WDR/IN-01-1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche
Water resources data for the 2001 water year for Indiana consists of records of discharge, stage, and water quality of streams and wells; reservoir stage for 8 stream stations, stage and contents for 1 reservoir, water quality for 1 stream, water temperature at 11 sites, sediment analysis for 1 stream, water levels for 78 lakes and 88 observation wells. Also included are records of miscellaneous discharge measurements, miscellaneous levels and miscellaneous water-quality, not part of the systematic data-collecting program. Data contained in this report represent that part of the National Water Data System operated by the U.S. Geological Survey in Indiana in cooperation with State and Federal agencies.
NTIS
Water Resources; Data Acquisition; Indiana; Hydrology

20020060069 Geological Survey, Water Resources Div., New Cumberland, PA USA
Water Resources Data for Pennsylvania, Water Year 2001, Volume 2, Susquehanna and Potomac River Basins ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Durlin, R. R.; Schaffstall, W. P.; March 2001; 470p; In English
Report No.(s): PB2002-107288; USGS/WDR/PA-01-2; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche
Water resources data for the 2001 water year for Pennsylvania consist of records of discharge and water quality of streams; contents and elevations of lakes and reservoirs; and water levels and water quality of ground-water wells. This report, Volume 2 contains (1) discharge records for 83 continuous-record streamflow sites; (2) elevation and contents records for 12 lakes and reservoirs; (3) water-quality records for 9 gaging stations and 73 ungaged streamsites; (4) water-level records for 36 network observation wells and water-quality analyses of groundwater from 8 ground-water wells; (5) water-quality analyses at 123 special study ground-water wells; and (6) miscellaneous water-level measurements at 80 special study ground-water wells. Site locations are shown in figures throughout the report. Additional water data collected at various sites not involved in the systematic data-collection program are also presented. These data together with the data in Volumes 1 and 3 represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, local, and Federal agencies in Pennsylvania.
NTIS
Water Resources; Water Quality; Pennsylvania

20020060070 Geological Survey, Water Resources Div., Baton Rouge, LA USA
Water Resources Data Louisiana Water Year 2001 ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Goree, B. B.; Lovelace, W. M.; Montgomery, P. A.; Resweber, J. C.; Sasser, D. C.; April 2002; 660p; In English
Report No.(s): PB2002-107287; USGS-WDR-LA-01-1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche
Water sources data for the 2001 water year for Louisiana consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains records for water discharge at 71 gaging stations; stage only for 73 gaging stations and 7 lakes; water quality for 66 surface-water stations (including 39 gaging stations) and 92 wells; and water levels for 205 observation wells. Also included are data for 166 crest-stage and flood-profile partial-record stations. Additional water data were collected at various sites not included in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana.
NTIS
Data Acquisition; Surface Water; Water Resources; Hydrology

20020060234 NASA Goddard Space Flight Center, Greenbelt, MD USA
Ocean Raman Scattering in Satellite Backscatter UV Measurements
Vasilkov, Alexander P., Science Systems and Applications, Inc., USA; Joiner, Joanna, NASA Goddard Space Flight Center, USA; Gleason, James, NASA Goddard Space Flight Center, USA; Bhartia, Pawan, NASA Goddard Space Flight Center, USA; [2002]; 14p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Ocean Raman scattering significantly contributes to the filling-in of solar Fraunhofer lines measured by satellite backscatter ultraviolet (buy) instruments in the cloudless atmosphere over clear ocean waters. A model accounting for this effect in buy measurements is developed and compared with observations from the Global Ozone Monitoring Experiment (GONE). The model extends existing models for ocean Raman scattering to the UV spectral range. Ocean Raman scattering radiance is propagated through the atmosphere using a concept of the Lambert equivalent reflectively and an accurate radiative transfer model for

Rayleigh scattering. The model and observations can be used to evaluate laboratory measurements of pure water absorption in the UV. The good agreement between model and observations suggests that buy instruments may be useful for estimating chlorophyll content.
Author
Raman Spectra; Radiative Transfer; Ultraviolet Spectra; Satellite Observation; Air Water Interactions; Backscattering

20020060545 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Perspective of Our Planet's Atmosphere, Land, and Oceans: A View from Space
King, Michael D., NASA Goddard Space Flight Center, USA; Tucker, Compton, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 29th International Symposium on Remote Sensing of the Environment, 8-12 Apr. 2002, Buenos Aires, Puerto Madryn, Argentina, Argentina; Sponsored by Centro Nacional Patagonico, Argentina; No Copyright; Avail: Issuing Activity; Abstract Only

A birds eye view of the Earth from afar and up close reveals the power and magnificence of the Earth and juxtaposes the simultaneous impacts and powerlessness of humankind. The NASA Electronic Theater presents Earth science observations and visualizations in an historical perspective. Fly in from outer space to South America with its Andes Mountains and the glaciers of Patagonia, ending up close and personal in Buenos Aires. See the latest spectacular images from NASA & NOAA remote sensing missions like GOES, TRMM, LANDSAT 7, QuikScat, and Terra, which will be visualized and explained in the context of global change. See visualizations of global data sets currently available from Earth orbiting satellites, including the Earth at night with its city lights, aerosols from biomass burning in South America and Africa, and global cloud properties. See the dynamics of vegetation growth and decay over South America over 17 years, and its contrast to the North American and Africa continents. New visualization tools allow us to roam & zoom through massive global mosaic images from the Himalayas to the dynamics of the Pacific Ocean that affect the climate of South and North America. New visualization tools allow us to roam & zoom through massive global mosaic images including LANDSAT and Terra tours of South America and Africa showing land use and land cover change from Patagonia to the Amazon Basin, including the Andes Mountains, the Pantanal, and the Bolivian highlands. LANDSAT flyins to Rio Di Janeiro and Buenos Aires will be shows to emphasize the capabilities of new satellite technology to visualize our natural environment. Spectacular new visualizations of the global atmosphere & oceans are shown. See massive dust storms sweeping across Africa and across the Atlantic to the Caribbean and Amazon basin. See ocean vortexes and currents that bring up the nutrients to feed tiny phytoplankton and draw the fish, giant whales and fisherman. See how the ocean blooms in response to these currents and El Nino/La Nina climate changes. We will illustrate these and other topics with a dynamic theater-style presentation, along with animations of satellite launch deployments and orbital mapping to highlight aspects of Earth observations from space.
Author
Earth Observations (From Space); Land Use; Earth Sciences; Climate Change; Cloud Physics; Ocean Currents; Ocean Dynamics

20020060730 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Overview of the Earth Observing System Moderate Resolution Imaging Spectroradiometer (MODIS) Data Products Status and Availability for Environmental Applications and Global Change Studies
Salomonson, Vincent V., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 53rd International Astronautical Congress, 10-19 Oct. 2002, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Moderate Resolution Imaging Spectroradiometer (MODIS) on the Earth Observing System (EOS) Terra Mission began to produce data in February 2000. The Terra MODIS is in a sun-synchronous orbit going north to south in the daylight portion of the orbit crossing the equator at about 1030 hours local time. The spacecraft, instrument, and data systems are performing well and are producing a wide variety of data products useful for scientific and applications studies in relatively consistent fashion extending from November 2000 to the present. Within the approximately 40 MODIS data products, several are new and represent powerful and exciting capabilities such the ability to provide observations over the globe of fire occurrences, microphysical properties of clouds and sun-stimulated fluorescence from phytoplankton in the surface waters of the ocean. The remainder of the MODIS products exceed or, at a minimum, match the capabilities of products from heritage sensors such as, for example, the Advanced Very High Resolution Radiometer (AVHRR). Efforts are underway to provide data sets for the greater Earth science community and to improve access to these products at the various Distributed Active Archive Centers (DAAC's) or through Direct Broadcast (DB) stations. The MODIS instrument on the EOS Aqua mission should also be expected to be in orbit and functioning in the Spring of 2002. The Aqua spacecraft will operate in a sun-synchronous orbit going south to north in the daylight portion

of the orbit crossing the equator at approximately 1330 hours local time. Subsequently the Aqua MODIS observations will substantially add to the capabilities of the Terra MODIS for environmental applications and global change studies.
Author
Spectroradiometers; Data Systems; Advanced Very High Resolution Radiometer; Imaging Spectrometers

20020060734 NASA Goddard Space Flight Center, Greenbelt, MD USA
Land Product Validation
Morisette, Jeffrey, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Global Observation of Forest Cover, 11-13 Feb. 2002, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

The Land Product Validation (LPV) subgroup of the Committee on Earth Observing Satellites Working Group on Calibration and Validation was formed in 2000. Goals of the LPV subgroup are: 1) to increase the quality and economy of global satellite product validation via developing and promoting international standards and protocols for field sampling, scaling, error budgeting, data exchange and product evaluation; 2) to advocate mission-long validation programs for current and future earth observing satellites.
Author
Satellite Observation; Artificial Satellites

20020060780 NASA Goddard Space Flight Center, Greenbelt, MD USA
Spectral Data Reduction via Wavelet Decomposition
Kaewpijit, S., George Mason Univ., USA; LeMoigne, J., NASA Goddard Space Flight Center, USA; El-Ghazawi, T., George Washington Univ., USA; [2002]; 8p; In English; SPIE Aerospace 2002: Wavelet Applications IX, 1-5 Apr. 2002, Orlando, FL, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The greatest advantage gained from hyperspectral imagery is that narrow spectral features can be used to give more information about materials than was previously possible with broad-band multispectral imagery. For many applications, the new larger data volumes from such hyperspectral sensors, however, present a challenge for traditional processing techniques. For example, the actual identification of each ground surface pixel by its corresponding reflecting spectral signature is still one of the most difficult challenges in the exploitation of this advanced technology, because of the immense volume of data collected. Therefore, conventional classification methods require a preprocessing step of dimension reduction to conquer the so-called ”curse of dimensionality.” Spectral data reduction using wavelet decomposition could be useful, as it does not only reduce the data volume, but also preserves the distinctions between spectral signatures. This characteristic is related to the intrinsic property of wavelet transforms that preserves high- and low-frequency features during the signal decomposition, therefore preserving peaks and valleys found in typical spectra. When comparing to the most widespread dimension reduction technique, the Principal Component Analysis (PCA), and looking at the same level of compression rate, we show that Wavelet Reduction yields better classification accuracy, for hyperspectral data processed with a conventional supervised classification such as a maximum likelihood method.
Author
Spectral Signatures; Data Reduction; Wavelet Analysis; Decomposition

20020061307 NASA Goddard Space Flight Center, Greenbelt, MD USA
Forcing a Global, Offline Land Surface Modeling System with Observation-Based Fields
Rodell, Matthew, NASA Goddard Space Flight Center, USA; Houser, Paul R., NASA Goddard Space Flight Center, USA; Jambor, U., NASA Goddard Space Flight Center, USA; Gottschalck, J., NASA Goddard Space Flight Center, USA; Radakovich, J., NASA Goddard Space Flight Center, USA; Arsenault, K., NASA Goddard Space Flight Center, USA; Meng, C.-J., NASA Goddard Space Flight Center, USA; Mitchell, K. E., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; American Meterological Society Meeting, 13-17 Jan. 2002, Orlando, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Global Land Data Assimilation System (GLDAS) drives multiple uncoupled land surface models in order to produce optimal output fields of surface states in near-real time, globally, at 1/4 degree spatial resolution. These fields are then made available for coupled atmospheric model initialization and further research. One of the unique aspects of GLDAS is its ability to ingest both modeled and observation-derived forcing for running global scale land surface models. This paper compares results of runs forced by modeled and observed precipitation and shortwave radiation fields. Differences are examined and the impact of the observations on model skill is assessed.
Author
Earth Surface; Atmospheric Models; Data Acquisition; Short Wave Radiation

20020061356 NASA Ames Research Center, Moffett Field, CA USA

Wetlands Discrimination Using Sun Glint

Vanderbilt, Vern C., NASA Ames Research Center, USA; Perry, Guillaume L., NASA Ames Research Center, USA; Livingston, Gerald P., NASA Ames Research Center, USA; Ustin, SUSAn L., NASA Ames Research Center, USA; DiazBarrios, Martha C., NASA Ames Research Center, USA; Breon, Francois-Marie, NASA Ames Research Center, USA; Leroy, Marc M., NASA Ames Research Center, USA; Balois, Jean-Yves, NASA Ames Research Center, USA; Morrissey, Leslie A., NASA Ames Research Center, USA; Shewchuk, Stanley R., NASA Ames Research Center, USA; [1998]; 26p; In English

Contract(s)/Grant(s): RTOP 622-93-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The areal extent of Boreal wetlands, source areas for methane, an important greenhouse gas, is poorly known - estimates differ by as much as seven fold, which contributes uncertainty to present day energy and carbon budgets and to projections of future climates. Application of optical remote sensing technology to discriminate successfully methane source areas across large regions has proven elusive. Classifications often lead to confusion both between different wetland types and between wetlands and non-wetlands. Here we describe a new remote sensing technique for classifying wetlands that is based upon the properties of the glitter - the strong, unique, often visually blinding, angular signature reflection that is characteristic of surface water and uncharacteristic of other cover types. From analysis of data collected by the POLDER sensor (polarization and directionality of Earth's reflectance) flown aboard an aircraft during the Boreas Experiment, we discriminated three types of methane source areas displaying different emissions rates: vegetation above inundated soils, open water, and non inundated cover types. We found that values of the normalized difference vegetation index (NDVI) decreased dramatically in the glitter direction, providing indication of surface water. Application of our new technique holds promise for mapping and estimating the areal extent of Boreal wetlands. Author

Methane; Remote Sensing; Wetlands; Reflectance; Glint

20020061383 NASA Goddard Space Flight Center, Greenbelt, MD USA

Remote Sensing of Aerosol and their Effect on Climate

Kaufman, Yoram, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AAAS Annual Meeting, 17-18 Feb. 2002, Boston, MA, USA; Sponsored by American Association for the Advancement of Science, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Smoke aerosol, pollution or dust affects the distribution of sunlight reaching the Earth. It enhances reflection of sunlight back to space and absorption in the atmosphere. Aerosol particles also affect cloud formation, thickness and formation of precipitation. The concentration of aerosol and their properties vary rapidly, due to the heterogeneity of sources and a short lifetime of about a week. Satellite and ground based network of remote sensing instruments were developed for continues measurement of the global distribution of aerosol and variation of their concentration and properties. I shall present examples of such measurements from the Terra spacecraft and the Aerosol Robotic Network, and explore the pathways to integrate these measurements into models that calculate the aerosol radiative forcing of climate.

Author

Remote Sensing; Aerosols; Climate; Smoke

20020061858 Lembaga Penerbangan dan Antariksa Nasional, PUSAt Pengembangan Pemanfaatan dan Teknologi Penginderaan Jauh, Jakarta, Indonesia

Observation About Mangrove Forest Condition in Lombok Island using LANDSAT-TM and Geographical Information System (SIG) ***KerUSAkan Hutan Mangrove di Pulau Lombok Menggunakan Data LANDSAT-TM dan Sistem Informasi Geografis (SIG)***

Budhiman, Syarif, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Dewanti, Ratih, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Kusmana, Cecep, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Puspaningsih, Nining, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 200-210; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The observation about mangrove forest condition in Lombok Island has already conducted. According to forestry statistic data of West NUSA Tenggara Province in 1993, West NUSA Tenggara province has 49.174 ha of mangrove forest. The purpose of this activity is to know the area of mangrove forest in Lombok Island and also for the damage level inventory in mangrove forest potency area. Generally the method is using LANDSAT - TM digital analysis data, dated August 19, 1997 and Geographical Information System (GIS). Land covered classification is conducted using Maximum Likelihood Classification (MLC) method and vegetation density level using land system map, and the quality making using field observation data. The quality formulation is KL = f (pl, kt, kkp, kta). The damage level of mangrove area is determine using mathematical method of TNSs = (pl x 35) + (kta. x 30) + (kkp x 20) + (kt x 15) for temporary damage level data is used as a reference to field observation, while mathematical

model TNS = (N x 30)+(Np x 20)+(L x 15)+(A x 15)+(P x 10)+(C x 10) to make the final mangrove damage level map. Besides that also identified the factors causing mangrove damage in Lombok Island. From the LANDSAT-TM data processing result it is obtained that the mangrove forest area in Lombok Island is 1.340,1 ha. and for the mangrove damage level in mangrove forest potency area in Lombok Island; damage mangrove 1.519,85 ha and heavy damage forest 906,31 ha. According to the damaging factors identification, it shows that generally the social-economic factor of the community around mangrove ecosystem take a big role to the damage.
Author
LANDSAT Satellites; Mathematical Models; Data Processing; Geographic Information Systems

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ENERGY PRODUCTION AND CONVERSION

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

20020060058 Global Energy Concepts, LLC, Kirkland, WA USA
Laboratory Testing of Drivetrain Component Efficiencies for Constant-Speed and Variable-Speed Wind Turbines, *4 Nov. 1997 - 3 Nov. 2000*
Migliore, P.; Jan. 2002; 50p; In English
Report No.(s): DE2002-30117; NREL/SR-500-30117; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In 1993, the National Renewable Energy Laboratory (NREL) awarded Electronic Power Conditioning, Inc., (EPC) a subcontract under which EPC designed, built and tested variable speed generator systems (VSGS) as retrofits for two different existing fixed-speed turbine designs. The VSGS were tested in the laboratory and in the field. One of the VSGS designs was for the Advanced Wind Turbines, Inc., (AWT) model AWT-26 wind turbine. That design was tested at the National Wind Technology Center (NWTC) test site on an AWT-26 prototype known as P3. to support this design and testing program, EPC and AWT carried out laboratory tests of drivetrain component efficiencies. The AWT gearbox tests involved three different models of Flender PZBS-170 (two-stage, planetary) gearboxes. The test results showed that the gearbox power losses resulted mainly from oil churning, depended strongly on oil temperature, increased rapidly with shaft rotation speed, and increased weakly with gearbox load. At a given (low-speed shaft) rotational speed, the power losses were found to be independent of both gearing ratio and rotation direction. EPC laboratory testing included both the original P3 induction generator at fixed speed, and the doubly-fed generator/power converter VSGS system that EPC designed for variable-speed operation of P3. The fixed-speed induction generator had higher efficiency than the VSGS at all power levels.
NTIS
Renewable Energy; Wind Turbines; Rotating Shafts; Transmissions (Machine Elements); Velocity Distribution

20020060061 Argonne National Lab., IL USA
Well-to-Wheels Analysis of Fuel-Cell Vehicle/Fuel Systems
Wang, M.; 2002; 14p; In English
Report No.(s): DE2002-41887; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Major automobile companies worldwide are undertaking vigorous research and development efforts aimed at developing fuel-cell vehicles (FCVs). Proton membrane exchange (PEM)-based FCVs require hydrogen (H2) as the fuel-cell (FC) fuel. Because production and distribution infrastructure for H2 off board FCVs as a transportation fuel does not exist yet, researchers are developing FCVs that can use hydrocarbon fuels, such as methanol (MeOH) and gasoline, for onboard production of H2 via fuel processors. This paper focuses on FCVs powered by several transportation fuels. Gasoline vehicles (GVs) equipped with internal combustion engines (ICEs) are the baseline technology to which FCVs are compared. Table 1 lists the 13 fuel pathways included in this study. Petroleum-to-gasoline (with 30-ppm sulfur (S) content) is the baseline fuel pathway for GVs.
NTIS
Automobiles; Fuel Cells; Hydrocarbon Fuels; Internal Combustion Engines

20020060081 Alabama Univ., Huntsville, AL USA

Optical Amplifier Based Space Solar Power ***Final Report, 8 May - 7 Nov. 2001***

Fork, Richard L., Alabama Univ., USA; [2001]; 5p; In English

Contract(s)/Grant(s): NAG8-1815; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective was to design a safe optical power beaming system for use in space. Research was focused on identification of strategies and structures that would enable achievement near diffraction limited optical beam quality, highly efficient electrical to optical conversion, and high average power in combination in a single system. Efforts centered on producing high efficiency, low mass of the overall system, low operating temperature, precision pointing and tracking capability, compatibility with useful satellite orbits, component and system reliability, and long component and system life in space. A system based on increasing the power handled by each individual module to an optimum and the number of modules in the complete structure was planned. We were concerned with identifying the most economical and rapid path to commercially viable safe space solar power.

Author

Diffraction; Light Amplifiers; Light Beams; Power Beaming; Satellite Orbits; Solar Generators; Solar Power Satellites

20020060117 NASA Pasadena Office, CA USA

Carbon Dioxide Absorption Heat Pump

Jones, Jack A., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Apr. 23, 2002; 4p; In English

Patent Info.: Filed 9 May 2001; NASA-Case-NPO-19855; US-Patent-6,374,630; US-Patent-Appl-SN-853931; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A carbon dioxide absorption heat pump cycle is disclosed using a high pressure stage and a super-critical cooling stage to provide a non-toxic system. Using carbon dioxide gas as the working fluid in the system, the present invention desorbs the CO2 from an absorbent and cools the gas in the super-critical state to deliver heat thereby. The cooled CO2 gas is then expanded thereby providing cooling and is returned to an absorber for further cycling. Strategic use of heat exchangers can increase the efficiency and performance of the system.

Official Gazette of the U.S. Patent and Trademark Office

Carbon Dioxide; Cooling Systems; Absorption Cooling; Heat Pumps

20020061277 NASA Goddard Space Flight Center, Greenbelt, MD USA

SMEX-Lite Modular Solar Array Architecture

Lyons, John, NASA Goddard Space Flight Center, USA; [2002]; 2p; In English; IECEC 2002, 2002, USA; No Copyright; Avail: Issuing Activity; Abstract Only

For the most part, Goddard solar arrays have been custom designs that are unique to each mission. The solar panel design has been frozen prior to issuing an RFP for their procurement. There has typically been 6-9 months between RFP release and contract award, followed by an additional 24 months for performance of the contract. For Small Explorer (SMEX) missions, with three years between mission definition and launch, this has been a significant problem. The SMEX solar panels have been sufficiently small that the contract performance period has been reduced to 12-15 months. The bulk of this time is used up in the final design definition and fabrication of flight solar cell assemblies. Even so, it has been virtually impossible to have the spacecraft design at a level of maturity sufficient to freeze the solar panel geometry and release the RFP in time to avoid schedule problems with integrating the solar panels to the spacecraft. With that in mind, the SMEX-Lite project team developed a modular architecture for the assembly of solar arrays to greatly reduce the cost and schedule associated with the development of a mission-specific solar array. In the modular architecture, solar cells are fabricated onto small substrate panels. This modular panel (approximately 8.5” x 17” in this case) becomes the building block for constructing solar arrays for multiple missions with varying power requirements and geometrical arrangements. The mechanical framework that holds these modules together as a solar array is the only mission-unique design, changing in size and shape as required for each mission. There are several advantages to this approach. First, the typical solar array development cycle requires a mission unique design, procurement, and qualification including a custom qualification panel. With the modular architecture, a single qualification of the SMEX-Lite modules and the associated mechanical framework in a typical configuration provided a qualification by similarity to multiple missions. It then becomes possible to procure solar array modules in advance of mission definition and respond quickly and inexpensively to a selected mission’s unique requirements. The solar array modular architecture allows the procurement of solar array modules before the array geometry has been frozen. This reduces the effect of procurement lead-time on the mission integration and test flow by as much as 50%. Second, by spreading the non-recurring costs over multiple missions, the cost per unit area is also reduced. In the case of the SMEX-Lite procurement, this reduction was by about one third of the cost per unit area compared to previous SMEX mission-unique procurements. Third, the modular architecture greatly facilitates the infusion of new solar cell technologies into flight programs as these technologies become available. New solar cell technologies need only be fabricated

onto a standard-sized module to be incorporated into the next available mission. The modular solar array can be flown in a mixed configuration with some new and some standard cell technologies. Since each module has its own wiring terminals, the array can be arranged as desired electrically with little impact to cost and schedule. The solar array modular architecture does impose some additional constraints on systems and subsystem engineers. First, they must work with discrete solar array modules rather than size the array to fit exactly within an available envelope. The array area is constrained to an integer multiple of the module area. Second, the modular design is optimized for space radiation and thermal environments not greatly different from a typical SMEX LEO environment. For example, a mission with a highly elliptical orbit (e.g., Polar, SMEX/FAST) would require thicker coverglasses to protect the solar cells from the more intense radiation environment.
Author
Solar Arrays; Small Scientific Satellites; Earth Orbital Environments; Spacecraft Design

20020061680 NASA Glenn Research Center, Cleveland, OH USA
Impact Testing of a Stirling Converter's Linear Alternator
Suarez, Vicente J., NASA Glenn Research Center, USA; Goodnight, Thomas W., NASA Glenn Research Center, USA; Hughes, William O., NASA Glenn Research Center, USA; Samorezov, Sergey, ZIN Technologies, Inc., USA; May 2002; 16p; In English; Space Technology and Applications International Forum (STAIF-2002), 3-7 Feb. 2002, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 896-30-00
Report No.(s): NASA/TM-2002-211342; NAS 1.15:211342; E-13156; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The U.S. Department of Energy (DOE), in conjunction with the NASA John H. Glenn Research Center and Stirling Technology Company, are currently developing a Stirling convertor for a Stirling Radioisotope Generator (SRG). NASA Headquarters and DOE have identified the SRG for potential use as an advanced spacecraft power system for future NASA deep-space and Mars surface missions. Low-level dynamic impact tests were conducted at NASA Glenn Research Center's Structural Dynamics Laboratory as part of the development of this technology. The purpose of this test was to identify dynamic structural characteristics of the Stirling Technology Demonstration Convertor (TDC). This paper addresses the test setup, procedure, and results of the impact testing conducted on the Stirling TDC in May 2001.
Author
Impact Tests; Spacecraft Power Supplies; Stirling Cycle; Linear Alternators; Dynamic Response; Dynamic Structural Analysis

45
ENVIRONMENT POLLUTION

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

20020060027 Society of Automotive Engineers, Inc., Warrendale, PA USA
Progress in Understanding the Toxicity of Gasoline and Diesel Engine Exhaust Emissions
Nikula, K. J.; Finch, G. L.; Westhouse, R. A.; Seagrove, J. C.; Mauderly, J. L.; April 1999; 20p; In English
Report No.(s): DE2002-771098; SAE-TP-1999-01-2250; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
To help guide heavy vehicle engine, fuel, and exhaust after-treatment technology development, the US Department of Energy and the Lovelace Respiratory Research Institute are conducting research not addressed elsewhere on aspects of the toxicity of particulate engine emissions. New, short-term toxicity data are needed to make health-based choices among diesel technologies and to compare the toxicity of diesel emissions to those of other engine technologies. This research program has two facets: (1) development and use of short-term in vitro and in vivo toxicity assays for comparing the toxicities of gasoline and diesel exhaust emissions; and (2) determination of the disposition of inhaled ultrafine particles deposited in the lung. Responses of cultured cells, cultured lung slices, and rodent lungs to various types of particles were compared to develop an improved short-term toxicity screening capability. to date, chemical toxicity indicators of cultured human A549 cells and early inflammatory and cytotoxic indicators of rat lungs have given the best distinguishing capability.
NTIS
Cells (Biology); Combustion Products; Diesel Engines; Exhaust Emission; Exhaust Gases; Health; Lungs; Toxicity

20020060028 Society of Automotive Engineers, Inc., Warrendale, PA USA

Emissions from Buses with DDC 6V92 Engines Using Synthetic Diesel Fuel

Norton, P.; Vertin, K.; Clark, N. N.; Lyons, D. W.; Gautam, M.; May 1999; 16p; In English

Report No.(s): DE2002-771076; SAE-TP-1999-01-1512; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this study was a preliminary assessment of the emissions from older model transit operated on Mossgas synthetic diesel fuel. The study compared emissions from transit buses operating on Federal no. 2 Diesel fuel, Mossgas synthetic diesel (MGSD), and a 50/50 blend of the two fuels. The buses were equipped with unmodified Detroit Diesel 6V92 2-stroke diesel engines. Six 40-foot buses were tested. Three of the buses had recently rebuilt engines and were equipped with an oxidation catalytic converter. Vehicle emissions measurements were performed using West Virginia University's unique transportable chassis dynamometer. The emissions were measured over the Central Business District (CBD) driving cycle.

NTIS

Diesel Fuels; Exhaust Emission; Exhaust Gases; Synthetic Fuels

20020060030 Operating Engineers National Hazmat Program, Beaver, WV USA

International Union of Operating Engineers National Hazmat Program. Porter-Cable Circular Saw OENHP Number: 2001-04, A

Jan. 2002; 32p; In English

Report No.(s): DE2002-792084; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Florida International University's (FIU) Hemispheric Center for Environmental Technology (HCET) evaluated five saws for their effectiveness in cutting specially prepared fiberglass-reinforced plywood crates. These crates were built as surrogates for crates that presently hold radioactively contaminated glove boxes at the Department of Energy's (DOE) Los Alamos facility. The Porter-Cable circular saw was assessed on August 15-16, 2001 (Porter-Cable No.1 and Porter-Cable No.2, respectively). During the FIU test of efficacy, a team from the Operating Engineers National Hazmat Program (OENHP) evaluated the occupational safety and health issues associated with this technology. The Porter-Cable saw is a straightforward machine for cutting wood of varying thickness. The blade is fully guarded with a fixed upper and a lower retractable guard. The lower guard retracts as the blade engages the work piece. The unit is operated with an on/off guarded trigger switch and is supported with a handgrip mounted near the front of the saw. The saw is equipped with a directional nozzle, which aims sawdust away from the operator and the line of cut. An optional vacuum system, attached to the directional nozzle, is used to remove and collect dust. During the demonstration of Porter-Cable No.1, personal noise sampling indicated that one worker was under and one was at the Occupational Safety and Health Administration's (OSHA) Action Level of 85 decibels (dBA) with time-weighted averages (TWA's) of 82.7 and 84.6 dBA, respectively. During the demonstration of Porter-Cable No.2, however, both workers did exceed the Action Level with TWA's of 89.7 and 90.0 dBA. These data are not entirely representative as they were gathered during a simulation and not at the actual worksite. Additional sampling should be conducted on-site, but the workers should wear hearing protection until it is determined that it is no longer necessary. The total nuisance dust sample for Porter-Cable No.1 was 3.53 milligrams per cubic meter (mg/m(sup 3)), which is lower than the OSHA Permissible Exposure Limit (PEL) of 15 mg/m(sup 3) and the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Value (TLV) of 10 mg/m(sup 3). Porter-Cable No.2's nuisance dust results yielded a value of 22.05 mg/m(sup 3), which is over the PEL and TLV.

NTIS

Hazardous Wastes; Health Physics; Saws; Composite Materials

20020060080 Bay Area Environmental Research Inst., Sonoma , CA USA

Analysis of Atmospheric Aerosol Data Sets and Application of Radiative Transfer Models to Compute Aerosol Effects *Final Report, 1 Apr. 1999 - 30 Jun. 2002*

Schmid, Beat, Bay Area Environmental Research Inst., USA; Bergstrom, Robert W., Bay Area Environmental Research Inst., USA; Redemann, Jens, Bay Area Environmental Research Inst., USA; Jul. 08, 2002; 13p; In English

Contract(s)/Grant(s): NCC2-1094; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is the final report for "Analysis of Atmospheric Aerosol Data Sets and Application of Radiative Transfer Models to Compute Aerosol Effects". It is a bibliographic compilation of 29 peer-reviewed publications (published, in press or submitted) produced under this Cooperative Agreement and 30 first-authored conference presentations. The tasks outlined in the various proposals are listed below with a brief comment as to the research performed. Copies of title/abstract pages of peer-reviewed publications are attached.

Derived from text

Radiative Transfer; Aerosols; Atmospheric Composition; Air Pollution; Data Correlation

20020060132 National Inst. for Occupational Safety and Health, Rockville, MD USA

NIOSH Hazard Review: Health Effects of Occupational Exposure to Respirable Crystalline Silica

April 2002; 212p; In English

Report No.(s): PB2002-107483; DHHS/PUB/NIOSH-2002-129; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Occupational exposures to reparable crystalline silica are associated with the development of silicosis, lung cancer, pulmonary tuberculosis, and airways diseases. These exposures may also be related to the development of autoimmune disorders, chronic renal disease, and other adverse health effects. Recent epidemiologic studies demonstrate that workers have a significant risk of developing chronic silicosis when they are exposed to respirable crystalline silica over a working lifetime at the current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL), the Mine Safety and Health Administration (MSHA) PEL, or the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL). This NIOSH Hazard Review (1) examines the health risks and diseases associated with occupational exposures to respirable crystalline silica, (2) discusses important findings of recent epidemiological studies, (3) provides the reader with sources of more comprehensive information about health effects and experimental studies, (4) describes current sampling and analytical methods and their limitations for assessing occupational exposures to respirable crystalline silica, and (5) suggests many areas for further research.

NTIS

Epidemiology; Exposure; Silicon Dioxide; Health Physics; Crystallinity

20020060135 NASA Ames Research Center, Moffett Field, CA USA

Detecting a Terrestrial Biosphere Sink for Carbon Dioxide: Interannual Ecosystem Modeling for the Mid-1980s

Potter, Christopher S., NASA Ames Research Center, USA; Klooster, Steven A., California State Univ., USA; Brooks, Vanessa, Johnson Controls World Services, USA; Apr. 03, 1998; 22p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is considerable uncertainty as to whether interannual variability in climate and terrestrial ecosystem production is sufficient to explain observed variation in atmospheric carbon content over the past 20-30 years. In this paper, we investigated the response of net CO2 exchange in terrestrial ecosystems to interannual climate variability (1983 to 1988) using global satellite observations as drivers for the NASA-CASA (Carnegie-Ames-Stanford Approach) simulation model. This computer model of net ecosystem production (NEP) is calibrated for interannual simulations driven by monthly satellite vegetation index data (NDVI) from the NOAA Advanced Very High Resolution Radiometer (AVHRR) at 1 degree spatial resolution. Major results from NASA-CASA simulations suggest that from 1985 to 1988, the northern middle-latitude zone (between 30 and 60 degrees N) was the principal region driving progressive annual increases in global net primary production (NPP; i.e., the terrestrial biosphere sink for carbon). The average annual increase in NPP over this predominantly northern forest zone was on the order of +0.4 Pg (10 (exp 15) g) C per year. This increase resulted mainly from notable expansion of the growing season for plant carbon fixation toward the zonal latitude extremes, a pattern uniquely demonstrated in our regional visualization results. A net biosphere source flux of CO2 in 1983-1984, coinciding with an El Nino event, was followed by a major recovery of global NEP in 1985 which lasted through 1987 as a net carbon sink of between 0.4 and 2.6 Avg C per year. Analysis of model controls on NPP and soil heterotrophic CO2 fluxes (Rh) suggests that regional warming in northern forests can enhance ecosystem production significantly. In seasonally dry tropical zones, periodic drought and temperature drying effects may carry over with at least a two-year lag time to adversely impact ecosystem production. These yearly patterns in our model-predicted NEP are consistent in magnitude with the estimated exchange of CO2 by the terrestrial biosphere with the atmosphere, as determined by previous isotopic (delta (sup 13 C) convolution analysis. Ecosystem simulation results can help further target locations where net carbon sink fluxes have occurred in the past or may be verified in subsequent field studies.

Author

Biosphere; Atmospheric Models; Annual Variations; Sinks; Carbon Dioxide Concentration

20020060666 NASA Goddard Space Flight Center, Greenbelt, MD USA

Importance of Winds and Soil Moistures to the US Summertime Drought of 1988: A GCM Simulation Study

Mocko, David M., NASA Goddard Space Flight Center, USA; Sud, Y. C., NASA Goddard Space Flight Center, USA; [2001]; 3p; In English; AMS Conference, 13-17 Jan. 2001, Orlando, FL, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The climate version of NASA's GEOS 2 GCM did not simulate a realistic 1988 summertime drought in the central USA (Mocko et al., 1999). Despite several new upgrades to the model's parameterizations, as well as finer grid spacing from 4x5 degrees to 2x2.5 degrees, no significant improvements were noted in the model's simulation of the U.S. drought.
Derived from text
Earth Observing System (EOS); Soil Moisture; Simulation; Drought; Climate

20020060729 NASA Goddard Space Flight Center, Greenbelt, MD USA
Dust, Pollution, and Biomass Burning Aerosols in Asian Pacific: A Column Surface/Satellite Perspective
Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Air Pollution Workshop/Aerosol Workshop, 28 Apr. - 3 May 2002, HI, Beijing, USA, China; No Copyright; Avail: Issuing Activity; Abstract Only

Many recent field experiments are designed to study the compelling variability in spatial and temporal scale of both pollution-derived and naturally occurring aerosols, which often exist in high concentrations over eastern/southeastern Asia and along the rim of the western Pacific. For example, the phase-I of ACE-Asia was conducted from March-May 2001 in the vicinity of the Gobi desert, East Coast of China, Yellow Sea, Korea, and Japan, along the pathway of Kosa (severe events that blanket East Asia with yellow desert dust, peaked in the Spring season). Asian dust typically originates in desert areas far from polluted urban regions. During transport, dust layers can interact with anthropogenic sulfate and soot aerosols from heavily polluted urban areas. Springtime is also the peak season for biomass burning in southeastern Asia. Added to the complex effects of clouds and natural marine aerosols, dust particles reaching the marine environment can have drastically different properties than those from the source. Thus, understanding the unique temporal and spatial variations of Asian aerosols is of special importance in regional-to-global climate issues such as radiative forcing, the hydrological cycle, and primary biological productivity in the mid-Pacific Ocean. During ACE-Asia we have measured continuously aerosol physical/optical/radiative properties, column precipitable water amount, and surface reflectivity over homogeneous areas from surface. The inclusion of flux measurements permits the determination of aerosol radiative flux in addition to measurements of loading and optical depth. At the time of the Terra/MODIS (Moderate Resolution Imaging Spectroradiometer), SeaWiFS (Sea-viewing Wide Field-of-view Sensor), TOMS (Total Ozone Mapping Spectrometer) and other satellite overpasses, these ground-based observations can provide valuable data to compare with satellite retrievals over land. A column satellite-surface perspective of Asian aerosols will be presented and will discuss their implications in regional-to-global effects on climate, fresh water redistribution, and health issues. (to be presented in Hawaii, April 28 - May 3, and Beijing, China, May 6 - 10, 2002)
Author
Aerosols; Air Pollution; Asia; Biomass Burning; Dust; Pacific Ocean

20020060742 NASA Ames Research Center, Moffett Field, CA USA
Impacts of PSC Microphysics on Modelled Ozone Loss
Drdla, K., NASA Ames Research Center, USA; Schoeberl, M. R., NASA Ames Research Center, USA; [2002]; 1p; In English; Arctic Ozone Loss Workshop, 4-6 Mar. 2002, Potsdam, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

Winter-long simulations of the 1999-2000 winter using a coupled microphysical/chemical model have been carried out to explore how PSC microphysics affects ozone loss. Although many models assures that water ice formation leads to denitrification, these simulations show that observed characteristics of the 1999-2000 winter can not be reproduced by such a denitrification mechanism. Instead, denitrification observations are best reproduced by a small number of particles freezing at temperatures near the nitric acid trihydration condensation point. Implications of such a mechanism for assessments of future ozone loss will be discussed. The simulations have also revealed that ozone loss during the 1999-2000 winter was sensitive to chlorine reactivation that occurred during February. Uncertainties in PSC microphysics and heterogeneous reaction rates both influence the modelled chlorine reactivation. For the 1999-2000 winter, these uncertainties have a larger effect on model ozone loss than denitrification. The role of denitrification would have increased if the Arctic vortex had persisted for a longer period.
Author
Ozone; Reaction Kinetics; Ice Formation; Denitrogenation; Heterogeneity

20020060753 NASA Goddard Space Flight Center, Greenbelt, MD USA
Ozone Layer Observations
McPeters, Richard, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Invited Talk for the Communications Research Laboratory International Symposium on Light Propagation and Sensing Technologies for Future Applications, 13-14 Mar. 2002, Tokyo, Japan; No Copyright; Avail: Issuing Activity; Abstract Only

The US National Aeronautics and Space Administration (NASA) has been monitoring the ozone layer from space using optical remote sensing techniques since 1970. With concern over catalytic destruction of ozone (mid-1970s) and the development

of the Antarctic ozone hole (mid-1980s), long term ozone monitoring has become the primary focus of NASA's series of ozone measuring instruments. A series of TOMS (Total Ozone Mapping Spectrometer) and SBUV (Solar Backscatter Ultraviolet) instruments has produced a nearly continuous record of global ozone from 1979 to the present. These instruments infer ozone by measuring sunlight backscattered from the atmosphere in the ultraviolet through differential absorption. These measurements have documented a 15 Dobson Unit drop in global average ozone since 1980, and the declines in ozone in the antarctic each October have been far more dramatic. Instruments that measure the ozone vertical distribution, the SBUV and SAGE (Stratospheric Aerosol and Gas Experiment) instruments for example, show that the largest changes are occurring in the lower stratosphere and upper troposphere. The goal of ozone measurement in the next decades will be to document the predicted recovery of the ozone layer as CFC (chlorofluorocarbon) levels decline. This will require a continuation of global measurements of total column ozone on a global basis, but using data from successor instruments to TOMS. Hyperspectral instruments capable of measuring in the UV will be needed for this purpose. Establishing the relative roles of chemistry and dynamics will require instruments to measure ozone in the troposphere and in the stratosphere with good vertical resolution. Instruments that can measure other chemicals important to ozone formation and destruction will also be needed.
Author
Ozone; Ozonosphere; Remote Sensing; Earth Observations (From Space)

20020061263 NASA Goddard Space Flight Center, Greenbelt, MD USA
MODIS and AERONET Characterization of the Global Aerosol
Kaufman, Yoram, NASA Goddard Space Flight Center, USA; Reme, Lorraine, NASA Goddard Space Flight Center, USA; Tanre, Didier, Laboratorie d'Optique Atmosphere, France; [2002]; 1p; In English; Air Pollution / Aerosol Workshop, 28 Apr. - 10 May 2002, HI, USA, China; No Copyright; Avail: Issuing Activity; Abstract Only

Recently produced daily MODIS aerosol data for the whole year of 2001 are used to show the concentration and dynamics of aerosol over ocean and large parts of the continents. The data were validated against the Aerosol Robotic Network (AERONET) measurements over land and ocean. Monthly averages and a movie based on the daily data are produced and used to demonstrate the spatial and temporal evolution of aerosol. The MODIS wide spectral range is used to distinguish fine smoke and pollution aerosol from coarse dust and salt. The movie produced from the MODIS data provides a new dimension to aerosol observations by showing the dynamics of the system. For example in February smoke and dust emitted from the Sahel and West Africa is shown to travel to the North-East Atlantic. In April heavy dust and pollution from East Asia is shown to travel to North America. In May-June pollution and dust play a dynamical dance in the Arabian Sea and Bay of Bengal. In Aug-September smoke from South Africa and South America is shown to pulsate in tandem and to periodically to be transported to the otherwise pristine Southern part of the Southern Hemisphere.
Author
Aerosols; Imaging Spectrometers; Robotics; Air Water Interactions; Oceans

20020061293 NASA Goddard Space Flight Center, Greenbelt, MD USA
SHADOZ (Southern Hemisphere ADditional Ozonesondes): What Have We Learned About Tropical Tropospheric Ozone from the First Three Years' (1998-2000) Data?
Thompson, Anne M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English, 17 May 2002, Irvine, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The first climatological overview of total, stratospheric and tropospheric ozone in the southern hemisphere tropical and subtropics is based on ozone sounding data from 10 sites comprising the Southern Hemisphere Additional OZonesondes (SHADOZ) network. The period covered is 1998-2000. Observations were made over: Ascension Island; Nairobi, Kenya; Irene, South Africa; RCunion Island; Watukosek, Java; Fiji; Tahiti; American Samoa; San Cristobal, Galapagos; Natal, Brazil. Campaign data were collected on a trans-Atlantic oceanographic cruise and during SAFARI-2000 in Zambia. The ozone data, with simultaneous temperature profiles to approx. 7 hPa and relative humidity to approx. 200 hPa, reside at: <http://code9l6.gsfc.nasa.ov/ Data_services/shadoz>. SHADOZ ozone time-series and profiles give a perspective on tropical total, stratospheric and tropospheric ozone in 1998-2000. Prominent features are highly variable tropospheric ozone, a zonal wave-one pattern in total (and tropospheric) column ozone, and signatures of the Quasi-Biennial Oscillation (QBO) in stratospheric ozone. Total, stratospheric and tropospheric column ozone amounts peak between August and November and are lowest between March and May. Tropospheric ozone variability over the Indian and Pacific Ocean displays influences of the Indian Ocean Dipole, and convective mixing. Pollution transport from Africa, South American and the Maritime Continent is a seasonal feature. Tropospheric ozone seasonality over the Atlantic Basin shows effects of regional subsidence and recirculation

as well as biomass burning. Dynamical and chemical influences appear to be of comparable magnitude though model studies are needed to quantify this.
Author
Climatology; Oceanography; Ozone; Southern Hemisphere; Troposphere; Annual Variations; Sondes; Tropical Regions

20020061382 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mesoscale Convective Systems in SCSMEX: Simulated by a Regional Climate Model and a Cloud Resolving Model
Tao, W.-K., NASA Goddard Space Flight Center, USA; Wang, Y., NASA Goddard Space Flight Center, USA; Qian, I., NASA Goddard Space Flight Center, USA; Lau, W., NASA Goddard Space Flight Center, USA; Shie, C.-L., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; INDO-US Workshop, 7-9 Feb. 2002, New Delhi, India; No Copyright; Avail: Issuing Activity; Abstract Only

A Regional Land-Atmosphere Climate Simulation (RELACS) System is being developed and implemented at NASA Goddard Space Flight Center. One of the major goals of RELACS is to use a regional scale model with improved physical processes, in particular land-related processes, to understand the role of the land surface and its interaction with convection and radiation as well as the water and energy cycles in Indo-China/ South China Sea (SCS)/China, N. America and S. America. The Penn State/NCAR MM5 atmospheric modeling system, a state of the art atmospheric numerical model designed to simulate regional weather and climate, has been successfully coupled to the Goddard Parameterization for Land-Atmosphere-C loud Exchange (PLACE) land surface model. PLACE allows for the effects of vegetation, and thus important physical processes such as evapotranspiration and interception are included. The PLACE model incorporates vegetation type and has been shown in international comparisons to accurately predict evapotranspiration and runoff over a wide variety of land surfaces. The coupling of MM5 and PLACE creates a numerical modeling system with the potential to more realistically simulate the atmosphere and land surface processes including land-sea interaction, regional circulations such as monsoons, and flash flood events. RELACS has been used to simulate the onset of the South China Sea Monsoon in 1986, 1997 and 1998. Sensitivity tests on various land surface models, cumulus parameterization schemes (CPSs), sea surface temperature (SST) variations and midlatitude influences have been performed. These tests have indicated that the land surface model has a major impact on the circulation over the S. China Sea. CPSs can effect the precipitation pattern while SST variation can effect the precipitation amounts over both land and ocean. RELACS has also been used to understand the soil-precipitation interaction and feedback associated with a flood event that occurred in and around China's Yantz River during 1998. The exact location (region) of the flooding can be effected by the soil-rainfall feedback. Also, the Goddard Cumulus Ensemble (GCE) model which allows for realistic moist processes as well as explicit interactions between cloud and radiation, and cloud and surface processes will be used to simulate convective systems associated with the onset of the South China Sea Monsoon in 1998. The GCE model also includes the same PLACE and radiation scheme used in the RELACS. A detailed comparison between the results from the GCE model and RELACS will be performed.
Author
Atmospheric Chemistry; Atmospheric Circulation; Atmospheric Models; Atmospheric Temperature; Climate Models; Mathematical Models; Temperate Regions

20020061385 NASA Goddard Space Flight Center, Greenbelt, MD USA
Validation of MODIS Dust Aerosol Retrieval and Development Ambient Dust Phase Function using PRIDE Data
Remer, Lorraine A., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; PRIDE Workshop, 11-14 Feb. 2002, Miami, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The PRIDE data set of MODIS aerosol retrievals co-located with sunphotometer measurements provides the basis of MODIS validation in a dust environment. The sunphotometer measurements include AERONET automatic instruments, land-based Microtops instruments, ship-board Microtops instruments and the AATS-6 aboard the Navajo aircraft. Analysis of these data indicate that the MODIS retrieval is within pre-launch estimates of uncertainty within the spectral range of 600-900 nm. However, the MODIS algorithm consistently retrieves smaller particles than reality thus leading to incorrect spectral response outside of the 600-900 nm range and improper size information. Further analysis of MODIS retrievals in other dust environments shows the inconsistencies are due to nonspherical effects in the phase function. These data are used to develop an ambient phase function for dust aerosol to be used for remote sensing purposes.
Author
Aerosols; Algorithms; Dust; Estimates

20020061957 Lembaga Penerbangan dan Antariksa Nasional, PUSAt Sains Atmosfer dan Iklim, Jakarta, Indonesia

Levels of NO(x) Air Pollution in Jakarta for the Period 1996-1998 ***Tingkat Pencemaran Udara NO(x) di Jakarta Periode 1996-1998***

Asiati, Siti, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Budiyono, Afif, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Gusnita, Dessy, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 189-194; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The dominant air pollution in big cities is mainly caused by the transportation activity such as NOx, CO, VOC and particulate. Jakarta is the big city in Indonesia, as the centre of governmental, business, industrial activities and attracted the urbanization. The increasing population cause the larger energy consumption, for household, transportation, and other activities. The result of NOx measurement in Jakarta during 1996 - 1998 period shows that the NOx concentration in the centre of Jakarta was effected by climate. NOx concentration in dry seasons is large than in wet seasons. In period of March to September 1997, the NOx concentration was relatively higher due to the El Nino phenomena caused the long dry seasons, and no atmospheric washing by rain. The high level of NOx concentration in centre of Jakarta is around Gambir station about 38 - 168 ppb, while in Istiqlal, Library building, Tebet, Senayan, and Casablanca are about 0.6 ppb - 54.5 ppb. In the out side of Jakarta, the NOx concentration fluctuated, seems to be unaffected by the seasons. Pulogadung, as the busy transportation and the industrial area, during 1997, the highest concentration of NOx was about 24 - 67 ppb, while in the other side of station was about 0.6 - 46.8 ppb. In 1998, the NOx concentration in Jakarta decreased significantly due to the atmospheric washing process by rain, in addition to the decreasing of the amount of vehicle of about 20.55% from 1997. The high level of NOx concentration in centre of Jakarta indicated the transportation is dominant source of NOx. The highest-level NOx concentration occurred in Gambir station, and the lower level occurred in Istiqlal, Library Building, of Senayan, Casablanca and Tebet.

Author

Air Pollution; Nitrogen Oxides; Climate; Contaminants

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.

20020059943 NASA Goddard Space Flight Center, Greenbelt, MD USA

International VLBI Service for Geodesy and Astrometry: General Meeting Proceedings

Vandenberg, Nancy R., Editor, NASA Goddard Space Flight Center, USA; Baver, Karen D., Editor, NASA Goddard Space Flight Center, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceedings; May 2002; 450p; In English; 2nd General Meeting of the International VLBI Service for Geodesy and Astrometry, 4-7 Feb. 2002, Tsukuba, Japan; Also announced as 20020059944 through 20020060013

Report No.(s): NASA/CP-2002-210002; NAS 1.55:210002; Rept-2002-02213-0; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

This volume contains the proceedings of the second General Meeting of the International VLBI Service for Geodesy and Astrometry (IVS), held in Tsukuba, Japan, February 4-7, 2002. The contents of this volume also appear on the IVS Web site at http://ivscc.gsfc.nasa.gov/publications/gm2002. The key-note of the second GM was prospectives for the future, in keeping with the re-organization of the IAG around the motivation of geodesy as ’an old science with a dynamic future’ and noting that providing reference frames for Earth system science that are consistent over decades on the highest accuracy level will provide a challenging role for IVS. The goal of the meeting was to provide an interesting and informative program for a wide cross section of IVS members, including station operators, program managers, and analysts. This volume contains 72 papers and five abstracts of papers presented at the GM. The volume also includes reports about three splinter meetings held in conjunction with the GM: a mini-TOW (Technical Operations Workshop), the third IVS Analysis Workshop and a meeting of the analysis working group on geophysical modeling.

Author

Astrometry; Conferences; Geodesy; Very Long Base Interferometry; Radio Astronomy; Very Long Baseline Array (VLBA)

20020059945 Deutsches Geodaetisches Forschungsinstut, Munich, Germany

Challenges for VLBI within an Integrated Global Geodetic Observing System

Drewes, Hermann, Deutsches Geodaetisches Forschungsinstut, Germany; Beutler, Gerhard, Bern Univ., Switzerland; Rummel, Reiner, Technische Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 24-32; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Integrated Global Geodetic Observing System (IGGOS), proposed as a Project in the new structure of the International Association of Geodesy (IAG), is viewed as the essential contribution of geodesy to the interdisciplinary research of the System Earth. It will provide the basis for precise, reliable point positioning, the orientation of Earth in space, and the determination of the Earth's gravity field within a consistent reference system. All space geodetic techniques and their services have to be integrated into the IGGOS, and they shall take over their specific role according to their strengths and preferences. VLBI has some extraordinary capabilities which cannot be accomplished by other techniques. These are, in particular, the direct connection to the inertial celestial reference system, its high precision, and the independence from the Earth's gravity field. In addition, there is a very long VLBI time series for geodetic parameters (Earth rotation, station positions and velocities) which is not available from other techniques. Therefore, VLBI has to take a prominent role in the establishment of the Integrated Global Geodetic Observing System.

Author

Earth Gravitation; Celestial Geodesy; Very Long Base Interferometry; Earth Orientation

20020059946 Technische Univ., Forschungseinrichtung Satellitengeodaesie, Germany

Combination of Space-Geodetic Techniques

Rothacher, Markus, Technische Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 33-43; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The combination of all major space-geodetic techniques - Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), Lunar Laser Ranging (LLR), Global Positioning System (GPS), and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) - into an 'Integrated Global Geodetic Observing System' (IGGOS) must be a primary goal in geodesy in the next years. Such an integrated system should also include observation techniques such as satellite altimetry, Synthetic Aperture Radar (SAR) and the various measurements that become or will become available through the new satellite gravity missions CHAMP, GRACE, and GOCE. In this article we will mainly focus on the combination of the observation techniques VLBI, SLR, LLR, GPS, and DORIS, that form the basis for the realization of the International Terrestrial Reference Frame (ITRF), the International Celestial Reference Frame (ICRF), and the Earth orientation parameters (EOPs) that describe the transformation between the ICRF and ITRF. A combination of these techniques is beneficial in many ways, especially to distinguish genuine geodetic/geophysical signals from technique-specific systematic biases and to ensure the consistency of the resulting geodetic products. The integration effort should finally lead to a more detailed view and understanding of the complexity of the 'System Earth' and its geophysical processes. The variety of combination aspects resulting from a rigorous integration will be discussed and illustrated.

Author

Celestial Reference Systems; Geodesy; Satellite Altimetry; Synthetic Aperture Radar; Very Long Base Interferometry; Observation

20020059947 NASA Goddard Space Flight Center, Greenbelt, MD USA

Geodetic Results from Mark 4 VLBI

MacMillan, Daniel, NVI, Inc., USA; Petrov, Leonid, NVI, Inc., USA; Ma, Chopo, NASA Goddard Space Flight Center, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 50-54; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We present geodetic results of a series of 30 VLBI experiments recorded in Mark 4 mode at rates of 128 and 256 Mbps. The formal uncertainties of UT1, polar motion, and nutation offsets derived from these experiments are better than the corresponding uncertainties from NEOS-A experiments by a factor of 1.3-2. Baseline length repeatability for the series of 32 experiments over a period of one year is about 0.9 ppb. For comparison, NEOS-A length repeatability is about 1.4 ppb. We will discuss optimal use of Mark 4 in the design of future observing networks.

Author

Geodesy; Very Long Base Interferometry; Satellite Observation; Earth Orientation

20020059948 Communications Research Lab., Kashima Space Research Center, Kashima, Japan

Expected Contributions of the K-4 and Its Next-Generation Systems

Koyama, Yasuhiro, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 55-59; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Unattended observations at observing stations and automated data processing were realized under the Key Stone Project by utilizing the capabilities of the K-4 VLBI observation and data processing system in 1995. The data recording to the magnetic media were replaced later with the high speed data transmission system in 1997, which enabled the almost continuous observations at the total data rate of 256 Mbps and real time data processing. Current developments of the Communications Research Laboratory are in the directions to enhance the sensitivities of the VLBI observations by using the higher data rate and the use of Internet Protocol to realize real time VLBI observations with many VLBI observing sites in the world. Expected contributions of these system developments for the IVS products will be discussed in this paper.

Author

Data Processing; Very Long Base Interferometry; Technology Utilization

20020059950 Korea Astronomy Observatory, Taejon, Korea, Republic of

Construction of the Korean VLBI Network (KVN)

Minh, Y. C., Korea Astronomy Observatory, Korea, Republic of; Roh, D.-G., Korea Astronomy Observatory, Korea, Republic of; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 68-71; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Korea's new VLBI project has been started at 2001 as a five-year project. We plan to build three new radio telescopes of 20-m diameters in three places in Korea, Yonsei University at Seoul, Ulsan University at Ulsan, and Tamna University at Jeju island. This KVN is the first VLBI facility in Korea and these telescopes will be used for VLBI observations exclusively. We plan to focus on the 100 and 150 GHz millimeter-wave VLBI observations, but the 2/8, 22, and 43 GHz HEMT receivers will be installed first for astronomical, geodetic, and earth science researches. The new hard-disk type recorder Mk 5 will be KVN's main recorder and the KVN correlator will also be developed. The KVN research center is also planned to be built at Seoul, which will be a center for exchanges of manpower, research activities, and technical developments. It must be essential to collaborate with the leading institutes in VLBI activities in the world for the success of this project. After the completion of our project, we will be actively involved in the international VLBI activities.

Author

Astronomy; South Korea; Radio Telescopes; Very Long Base Interferometry

20020059951 National Astronomical Observatory, Tokyo, Japan

VRAD Mission: Precise Observation of Orbits of Sub-Satellites in SELENE with International VLBI Network

Hanada, Hideo, National Astronomical Observatory, Japan; Iwata, Takahiro, National Space Development Agency, Japan; Kono, Yusuke, Graduate Univ. for Advanced Studies, Japan; Matsumoto, Koji, National Astronomical Observatory, Japan; Tsuruta, Seiitsu, National Astronomical Observatory, Japan; Ishikawa, Toshiaki, National Astronomical Observatory, Japan; Asari, Kazuyoshi, National Astronomical Observatory, Japan; Ping, Jinsong, National Astronomical Observatory, Japan; Heki, Kosuke, National Astronomical Observatory, Japan; Kawano, Nobuyuki, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 72-76; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The VRAD (VLBI radio source on the Moon) mission is one of the selenodetic missions in SELENE project and measures angular distance between radio transmitters on board two sub-satellites around the Moon and quasars by differential VLBI. VRAD helps establish a lunar gravity field model and a lunar ephemeris with higher accuracy and higher reliability by measuring components of the orbits perpendicular to line-of-sight direction. The radio transmitters emit three carrier waves in S-band and one wave in X-band and special recording systems as well as conventional ones (such as K-4) receive the waves through VLBI antennas and determine phase differences between them within 10 degrees. Combination of Japanese VERA and International VLBI network will observe the radio sources for one year including intensive observation periods of one month. The intensive observation will need more than 200 hours of machine time. It is under way to establish an International VLBI network for VRAD mission.

Author

Radio Transmitters; Very Long Base Interferometry; Radio Astronomy; Space Observations (From Earth); Mission Planning

20020059952 Natural Resources Canada, Geodetic Survey, Ottawa, Ontario Canada

A Next Generation Geodetic Experiment Scheduling Tool? (SKED++)

Klatt, Calvin, Natural Resources Canada, Canada; Berube, Mario, Natural Resources Canada, Canada; Searle, Anthony, Natural Resources Canada, Canada; Silliker, Jason, Natural Resources Canada, Canada; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 77-80; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A number of the software tools used in geodetic VLBI were designed twenty years ago and written in FORTRAN. Despite their good performance, the software requires maintenance and new features are desirable. This presentation is a proposal to the geodetic VLBI community to think about rewriting one of the essential utilities, namely SKED. A new version of SKED could take advantage of new programming techniques, such as object-oriented (OO) programming to ease the maintenance of the software. Such a new OO software design would enable the optimization routines to be improved by a variety of users, with the best features of SKED remaining. This presentation is intended to get feedback on this proposal and generate further discussion about the status of crucial VLBI operational software.

Author

Object-Oriented Programming; Software Engineering; Very Long Base Interferometry; Software Development Tools

20020059953 Gifu Univ., Faculty of Engineering, Gifu, Japan

Geodesy with the World's Smallest (3-m) VLBI Telescope

Takaba, Hiroshi, Gifu Univ., Japan; Yoshida, Minoru, Gifu Univ., Japan; Wakamatsu, Ken-ichi, Gifu Univ., Japan; Kondo, Tetsuro, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Nakajima, Jun-ichi, Communications Research Lab., Japan; Sekido, Mamoru, Communications Research Lab., Japan; Ichikawa, Ryuichi, Communications Research Lab., Japan; Kawai, Eiji, Communications Research Lab., Japan; Okubo, Hiroshi, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 81-83; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We show results of geodetic VLBI with the world's smallest 3-m VLBI telescope at Gifu University. This telescope was originally made for mobile VLBI experiments in 1984 by the Communications Research Laboratory, and was moved to Okinawa, Wakkanai, Minami-Daitoh Island, and Koganei. In 1999, the telescope was moved to Gifu University, which lies at the central part in Japan. Geodesy VLBI experiments by using the Giga-bit Recorder System succeeded and the baseline between Kashima 34-m telescope and Gifu 3-m telescope was obtained.

Author

Radio Telescopes; Very Long Base Interferometry

20020059956 Onsala Space Observatory, Sweden

Local Ties Between the Space Geodetic Techniques at the Onsala Space Observatory

Lidberg, Martin, Onsala Space Observatory, Sweden; Haas, Ruediger, Onsala Space Observatory, Sweden; Bergstrand, Sten, Onsala Space Observatory, Sweden; Johansson, Jan, Onsala Space Observatory, Sweden; Elgered, Gunnar, Onsala Space Observatory, Sweden; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 91-95; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We describe the local tie measurements between the collocated space geodetic techniques at the Onsala Space Observatory. Several classical geodetic measurement campaigns have been performed since the beginning of the 70s. Later also short baseline VLBI measurements and GPS campaigns have been performed. So far all realizations of local tie measurements had to use some information from construction drawings of the 20 m telescope. Thus, the local tie between the IVS reference point, i.e., the intersection of the azimuth and elevation axes of the 20 m radio telescope, and the IGS reference point, i.e., the phase center of the GPS antenna, has an uncertainty at a level of several millimeters. Footprint GPS-campaigns indicate that the observatory site is more stable than the uncertainty of these measurements which is 1-3 mm. Currently a small network of new observation pillars is installed to allow a new classical geodetic determination of the local tie between the IGS and the IVS reference points. We expect this new realization of the tie to reach sub-millimeter uncertainties.

Author

Geodesy; Astronomical Observatories; Very Long Base Interferometry

20020059957 Geographical Survey Inst., Tokyo, Japan

VLBI-GPS Collocation Method at Geographical Survey Institute

Matsuzaka, Shigeru, Geographical Survey Inst., Japan; Hatanaka, Yuki, Geographical Survey Inst., Japan; Nemoto, Keizo, Geographical Survey Inst., Japan; Fukuzaki, Yoshihiro, Geographical Survey Inst., Japan; Kobayashi, Kyoko, Geographical

Survey Inst., Japan; Abe, Kaoru, Geographical Survey Inst., Japan; Akiyama, Tadayuki, Geographical Survey Inst., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 96-100; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We report our effort to establish a precise tie between VLBI and GPS. For local-tie survey, we employed conventional survey method using total-stations and leveling, and to pursue the precision, introduced permanent observation monuments for ground survey and Cateye reflector for the target on the VLBI antenna. With these instruments and careful measurements, 3D coordinates of antenna reference point were determined with sub-mm error at GSI-Tsukuba and Aira stations.
Author
Collocation; Global Positioning System; Very Long Base Interferometry

20020059958 Bonn Univ., Geodetic Inst., Germany
The Mark IV Correlator: Faster, Better, Optimal??
Mueskens, A., Bonn Univ., Germany; Rottmann, I., Bonn Univ., Germany; Rottmann, H., Bonn Univ., Germany; Hoefer, A., Bonn Univ., Germany; Benndorf, Hoefer I., Bonn Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 102-106; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We present a detailed efficiency analysis of the various processing stages of an experiment, from the tape shipment phase up to the final release of the correlated datasets. We summarize and evaluate the statistics accumulated for all geodetic experiments processed at the Bonn Correlator during 2001. These statistical data are used to identify 'bottlenecks' and weak spots in the processing chain. We propose possible ways of further improving the efficiency of the Bonn correlator in order to match the IVS goals of fast and routine processing of geodetic experiments.
Author
Correlators; Data Processing; Evaluation

20020059959 Bonn Univ., Geodetic Inst., Germany
Comparison of the Output of Repeated Mark III and Mark IV Correlation Results
Nothnagel, A., Bonn Univ., Germany; Bromorzki, O., Bonn Univ., Germany; Campbell, J., Bonn Univ., Germany; Mueskens, A., Bonn Univ., Germany; Rottmann, H., Bonn Univ., Germany; Rottmann, I., Bonn Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 107-111; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

During the transition phase from the Mark IIIA to the Mark IV correlator but also at later stages of the maturing Mark IV correlator a number of correlations of the same session was carried out at the MPIFR/BKG Correlator Center in Bonn. Comparisons of the results provide a good insight into the repeatability of the correlation process. It is found that at the latest stage the repeatability of Mark IV correlations in terms of WRMS differences between two correlations is on average on the order of 6 picoseconds (ps) for the X band delay observables and 50 ps for S band. On the other hand, the larger scatter of differences between the results from the 'old' and the 'new' correlator persists.
Author
Correlation; Correlators; Comparison

20020059960 Massachusetts Inst. of Tech., Haystack Observatory, Westford, MA USA
Comparison of the VLBI Observables from Mk3 and Mk4 Correlation of a 24-Hour Geodetic Experiment
Corey, Brian, Massachusetts Inst. of Tech., USA; Titus, Michael, Massachusetts Inst. of Tech., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 112-116; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Data from geodetic experiment CORE-B605 were processed on a Mk3A and a Mk4 correlator, and the resulting X-band delays, rates, and fringe amplitudes were compared. The scatter in multiband delay differences is larger than expected. Time series of phase delay differences exhibit geometry-dependent systematic variations of a few ps. The singleband delay differences have baseline-dependent biases as large as 5-8 ns. Mk4 fringe amplitudes are generally 2-5% lower than Mk3.
Author
Correlators; Time Series Analysis; Very Long Base Interferometry; Comparison

20020059963 Communications Research Lab., Kashima Space Research Center, Kashima, Japan
VSI Interface Implementation, Performance Enhancement of Gbps VLBI Instruments
Nakajima, Junichi, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Kondo,

Tetsuro, Communications Research Lab., Japan; Sekido, Mamoru, Communications Research Lab., Japan; Kimura, Moritaka, Communications Research Lab., Japan; Okubo, Hiroshi, Communications Research Lab., Japan; Osaki, Hiroo, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 123-127; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The Communications Research Laboratory had intensively performed implementation of the VSI (VLBI Standard Interface) and popularization. As a Technology Development Center of the IVS (International VLBI Service), this is the first attempt to adapt the VSI to existing VLBI system. The VSI modifications of the former CRL VLBI system proved the Gbps performance both in tape based observation and real-time observation. The VSI functional block concept also enabled flexible system integration and future enhancement to PC-based VLBI. Realization of the VSI compatibility in telescopes will bring further strength to the worldwide VLBI observation network which used in astrometry and geodesy. As well as several astronomy dedicated VLBI systems, the VSI-based VLBI will increase the network potential. In other words, Gbps compatibility between different systems will be difficult without VSI.

Author

Systems Integration; Very Long Base Interferometry; Systems Compatibility

20020059966 Massachusetts Inst. of Tech., Haystack Observatory, Westford, MA USA

High-Speed e-VLBI Demonstration: Haystack Observatory to NASA/GSFC

Whitney, Alan R., Massachusetts Inst. of Tech., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 137-141; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Haystack Observatory is preparing a high-speed e-VLBI demonstration using antennas at Westford, MA and NASA/GSFC in Maryland, with correlation at Haystack Observatory. The link between Haystack and GSFC includes a number of both private and public network facilities, including the Bossnet, Glownet, Supernet and GSFC/HECN networks. The Mark 5 system will be used at both stations and at the Haystack Mark 4 correlator to interface VLBI data through a standard TCP/IP Gigabit Ethernet connection at a sustained rate of 900 Mbps. Due to the many different networks involved, much effort is being undertaken to examine every link in the path and to optimize and upgrade components as necessary in order to achieve the desired speed. Expansion of this effort to include stations in Europe and Japan is being explored.

Author

Astronomical Observatories; Very Long Base Interferometry; Systems Integration

20020059968 Kagoshima Univ., Dept. of Electrical and Electronics Engineering, Japan

Observation of Atmospheric Disturbances Using a Real-Time VLBI System

Liu, Qinghui, Kagoshima Univ., Japan; Nishio, Masanori, Kagoshima Univ., Japan; Yamamura, Kunihiro, Kagoshima Univ., Japan; Miyazaki, Tomoyuki, Kagoshima Univ., Japan; International VLBI Service for Geodesy and Astrometry: General Meeting Proceedings; May 2002, pp. 147-151; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

This paper reports observation results of atmospheric disturbances on a very long baseline. Using a real-time VLBI system, the observation was performed by the Kagoshima 6-m and the MizUSAwa 10-m radio telescopes, which are 1,284 km apart. Beacon waves from geostationary satellites were received and data were sent via public communication lines. The time variation of the correlation phase obtained was analyzed by calculating the Allan standard deviation, omega(sub y)(tau), and the time structure function, D(sub phi)(tau), as a function of a time interval tau. It is found that the time variations of the correlation phase were mainly caused by atmospheric disturbances, and that for 1 sis less than tau is less than 200 s, the Allan standard deviation of atmospheric disturbances omega(sub y)(tau) is proportional to tau(exp -0.2) and the time structure function D(sub phi)(tau) is proportional to tau(exp 5/3).

Author

Real Time Operation; Standard Deviation; Time Functions; Very Long Base Interferometry; Atmospheric Effects

20020059971 Natural Resources Canada, Geodetic Survey Div., Ottawa, Ontario Canada

Multi-Beam VLBI

Petrachenko, W. T., Natural Resources Canada, Canada; Klatt, Calvin, Natural Resources Canada, Canada; Ward, Vincent, Natural Resources Canada, Canada; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 162-166; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

In comparison to GPS, VLBI, as it is typically practiced today, suffers from the fact that at any location only one source can be observed at a time. In this paper, we ask the audience to consider a world in which each VLBI reference location is equipped

with a cluster of small antennas. Fringe detection limitations experienced by the small antenna pairs can be overcome by using large antennas for SNR enhancement and then mathematically forming the cluster-cluster observables after the fact. The resulting network, if the co-located antennas are carefully tied together, could perform multi-beam VLBI. By having multiple beams in different directions, parameter correlations could be reduced and parameters of interest could be determined more quickly and accurately. Taking advantage of new developments in the astronomical community, inexpensive antennas may be available to make this dream a reality. Advantages and limitations of this approach will be considered. The resulting advancement in geodetic VLBI science may be significantly more cost-effective than simply increasing the recording bandwidth. This presentation is intended to generate further discussion and lateral thinking about the future of geodetic VLBI.
Author
Very Long Base Interferometry; Space Observations (From Earth); Radio Antennas; Antenna Arrays

20020059972 National Astronomical Observatory, Japan
Geodetic Observation System in VERA
Tamura, Yoshiaki, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 167-170; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

VERA (VLBI Exploration of Radio Astrometry) consists of four VLBI stations. Each Station has a 20 m diameter antenna and is capable of observing at the frequencies of 2, 8, 22 and 43 GHz bands. The baseline length of VERA network is 1000-2270 km. The first VLBI fringe test in 22 GHz band was carried out in February 2002 between two stations. The geodetic observation system is under preparation to carry out the first observation in middle of 2002. Several observation modes are expected in the geodetic VLBI observations in VERA. One is VERA original mode which has a recording rate of 1 Gbps at the maximum. Another is so called K4 system whose recording rate is 128 Mbps. The latter system will be used for principally domestic compatible observations. The aimed accuracy of geodetic observation is 1-2 mm in three dimensions in VERA internal network, and 10 mm in the ITRF. This accuracy is required to obtain 10 micro arcsecond order astrometry purposes.
Author
Geodesy; Space Observations (From Earth); Very Long Base Interferometry; Radio Antennas

20020059974 Institute of Space and Astronautical Science, Sagamihara, Japan
Wide-Band Data Transmission System Expected in the Next Generation Space VLBI Mission: VSOP-2
Murata, Yasuhiro, Institute of Space and Astronautical Science, Japan; Hirabayashi, Hisashi, Institute of Space and Astronautical Science, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 175-178; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Following the success of the VLBI Space Observatory Program (VSOP), a next generation space VLBI mission (VSOP-2) is currently being planned. We expect the data rate of more than 1 Gbps to get more sensitivity. Here we will present: (1) How to sample the data (on board), including the radiation test results which show we can have the 10 Gbps sampler LSI which can use in space; (2) Possibility of the bit rate more than 1 Gbps to downlink the VLBI data. We studied the link budget for the wide band data transmission, and discussed the various ideas which can get more than 1 Gbps; and (3) What kind of VLBI tracking station and recording system will be expected for the VSOP-2 mission? We will present the idea of using normal radio telescopes as a tracking station, and also review the possibility of recording and processing at the tracking stations and correlators.
Author
Data Transmission; Radio Telescopes; Tracking Stations; Very Long Base Interferometry; Data Sampling

20020059978 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Media Calibration in the Deep Space Network: A Status Report
Naudet, Charles J., Jet Propulsion Lab., California Inst. of Tech., USA; Keihm, Steve, Jet Propulsion Lab., California Inst. of Tech., USA; Lanyi, Gabor, Jet Propulsion Lab., California Inst. of Tech., USA; Linfield, Roger, Jet Propulsion Lab., California Inst. of Tech., USA; Resch, George, Jet Propulsion Lab., California Inst. of Tech., USA; Riley, Lance, Jet Propulsion Lab., California Inst. of Tech., USA; Rosenberger, Hans, Jet Propulsion Lab., California Inst. of Tech., USA; Tanner, Alan, Jet Propulsion Lab., California Inst. of Tech., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 194-198; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A new media calibration system (MCS) has been implemented at the Goldstone complex of the DSN (Deep Space Network). It is intended to calibrate the delay of radio signals imposed by the neutral atmosphere. The system provides periodic measurements of both the static dry and fluctuating wet components of this delay. In particular, the system will calibrate the

fluctuations in line of sight path delay due to atmospheric water vapor that we believe will dominate the error budget for several radio science and radio astronomy experiments. We have compared two of these media calibration systems with a connected element interferometer on a 21 km baseline. In this report we describe a total of 30 observations in which a radio source was tracked for an hour or more and the delay residuals then calibrated using the MCS. The accuracy of the comparison appears to be limited by systematic errors in the interferometer, which are under investigation. However, our results do indicate that the MCS can meet or exceed the two-way Allan standard deviation specification of 1.5 x 10(exp -15) on time scales of 2,000 - 10,000 sec, as required by the Cassini GWE (Gravitational Wave Experiment) for two way Doppler tracking.
Author
Calibrating; Deep Space Network; Interferometry; Radio Communication

20020059980 Chalmers Univ. of Technology, Radio and Space Science, Goeteborg, Sweden
Ocean Tide and Atmospheric Loading
Scherneck, Hans-Georg, Chalmers Univ. of Technology, Sweden; Bos, Machiel S., Technische Hogeschool, Netherlands; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 205-214; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

We describe the ingredients of an automatic service for the dissemination of ocean tide loading coefficients and the considerations that led to the solution employed. The paper reviews the surface loading problem, methods for computation and especially the improvement of coastline resolution for accurate representation of coastal loads. We finally compare the loading results based on several ocean tide models with coefficients estimated from VLBI (Very Long Baseline Interferometry) observations.
Author
Tides; Very Long Base Interferometry; Ocean Surface; Geodesy

20020059981 Massachusetts Inst. of Tech., Haystack Observatory, Westford, MA USA
Gradient Mapping Functions for VLBI and GPS
Niell, Arthur, Massachusetts Inst. of Tech., USA; Tang, Jennifer, Rice Univ., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 215-218; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A hydrostatic gradient mapping function based on in situ meteorological data has been developed to provide an a priori correction to the hydrostatic delay. In the same way that the symmetric atmosphere estimation is improved by first removing the hydrostatic delay, application of the a priori hydrostatic gradient delay correction allows the use of a more accurate partial derivative for the asymmetric wet component, to the extent that it can be described by the gradient formulation. Application of the a priori hydrostatic gradient delays prior to estimating a wet gradient improves the repeatability of baseline lengths for the twelve days of CONT94 compared to estimating a hydrostatic gradient.
Author
Global Positioning System; Very Long Base Interferometry; Delay; Atmospheric Correction

20020059982 Technische Hochschule, Inst. of Geodesy and Geophysics, Vienna, Austria
Tropospheric Zenith Path Derived from GPS Used for the Determination of VLBI Station Heights
Boehm, Johannes, Technische Hochschule, Austria; Schuh, Harald, Technische Hochschule, Austria; Weber, Robert, Technische Hochschule, Austria; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 219-222; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The variable tropospheric refraction is a major error source for the estimation of geodetic parameters by GPS (Global Positioning System) and VLBI (Very Long Baseline Interferometry). As both techniques use microwave signals, tropospheric zenith delays derived by GPS are comparable to those obtained by VLBI. In the investigation presented here, zenith delays which were provided by the IGS (International GPS Service) at 2h time intervals were entered and constrained in the VLBI analyses. This procedure avoids the correlation between station height parameters and zenith delay parameters and reduces the number of unknowns in the VLBI least-squares fits. The formal errors and repeatabilities of several VLBI station heights were compared with results of standard VLBI analyses where no external information about the troposphere had been used. About 100 VLBI NEOS-A experiments in 1999 and 2000 were analyzed. The results show that the repeatability of VLBI station heights has significantly improved (up to 40%) when constraining the GPS zenith delays.
Author
Global Positioning System; Troposphere; Very Long Base Interferometry; Zenith

20020059983 Communications Research Lab., Kashima Space Research Center, Kashima, Japan

Comparison of Atmospheric Parameters from VLBI, GPS and WVR

Ichikawa, Ryuichi, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Nakajima, Junichi, Communications Research Lab., Japan; Sekido, Mamoru, Communications Research Lab., Japan; Kawai, Eiji, Communications Research Lab., Japan; Ohkubo, Hiroshi, Communications Research Lab., Japan; Ohsaki, Hiro, Communications Research Lab., Japan; Kondo, Tetsuro, Communications Research Lab., Japan; Amagai, Jun, Communications Research Lab., Japan; Kiuchi, Hitoshi, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry: General Meeting Proceedings; May 2002, pp. 223-227; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The comparison of atmospheric parameters (equivalent zenith wet delay and linear horizontal delay gradients) derived from VLBI (Very Long Baseline Interferometry), GPS (Global Positioning System), and WVR (Water Vapor Radiometer) has been carried out to reveal the limitation of the anisotropic mapping functions. The horizontal delay gradient components from all these techniques at Kashima and Shintotsugawa are not consistent with each other while the agreement for the zenith wet delay estimates are significant. Moreover, we perform a numerical simulation of the atmospheric parameters using a non-hydrostatic numerical weather model to assess the utility of the anisotropic model.

Author

Global Positioning System; Delay; Radiometers; Very Long Base Interferometry; Meteorological Parameters

20020059991 Deutsches Geodaetisches Forschungsinstut, Munich, Germany

Statistical Assessment of Subdiurnal Earth Orientation Parameters from VLBI

Kutterer, Hansjoerg, Deutsches Geodaetisches Forschungsinstut, Germany; Tesmer, Volker, Deutsches Geodaetisches Forschungsinstut, Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 272-276; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Very Long Baseline Interferometry (VLBI) permits the direct determination of Earth orientation parameters (EOP) in subdiurnal resolution. For this reason, it enables monitoring of regular geophysical effects on this time scale such as EOP variations due to subdiurnal ocean tides. The question is if singular effects on the Earth rotation can also be detected which are, e.g., excited by earthquakes. Since the EOP are determined by means of a least-squares adjustment, the statistical properties of highly resolved EOP are of particular interest. Besides the analysis of VLBI session configurations, statistical hypothesis tests can be performed to assess the significance of the estimated EOP. In this paper, eleven parallel NEOS-A and CORE-A sessions are considered. The data are processed using the software package OCCAM 5.0 LSM. The estimated EOP of each session and their variance-covariance matrices show a clear dependency of the precision and the correlations of the estimated EOP on the chosen temporal resolution. In addition, there is a strong relevance of the representation of the terrestrial and celestial reference frame by the VLBI antennas and the radio sources. The statistical significance of the highly resolved EOP decreases with increasing resolution. For this reason there is a limit for the magnitude of detectable geophysical causes.

Author

Geophysics; Statistical Analysis; Very Long Base Interferometry; Geodetic Coordinates; Precision

20020059994 NASA Goddard Space Flight Center, Greenbelt, MD USA

The New IERS Special Bureau for Loading (SBL)

vanDam, Tonie, European Center for Geodynamics and Seismology, Luxembourg; Plag, Hans-Peter, Norwegian Mapping Authority, Norway; Blewitt, Geoffrey, Nevada Univ., USA; Boy, Jean-Paul, NASA Goddard Space Flight Center, USA; Francis, Olivier, European Center for Geodynamics and Seismology, Luxembourg; Gegout, Pascal, Observatoire des Sciences de la Terre, France; Kierulf, Halfdan Pascal, Norwegian Mapping Authority, Norway; Sato, Tadahiro, National Astronomical Observatory, Japan; Scherneck, Hans-Georg, Onsala Space Observatory, Sweden; Wahr, John, Colorado Univ., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 287-291; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Currently, the establishment of the International Earth Rotation Service (IERS) Special Bureau for Loading (SBL) is in progress as part of the IERS Global Geophysical Fluids Center (GGFC). The main purpose of the SBL is to provide reliable, consistent model predictions of loading signals that have been thoroughly tested and validated. The products will describe at least the surface deformation, gravity signal and geo-center variations due to the various surface loading processes in reference frames relevant for direct comparison with existing geodetic observing techniques. to achieve these goals, major scientific advances are

required with respect to the Earth model, the theory and algorithms used to model deformations of the Earth as well as improvements in the observational data related to surface loading.
Author
Deformation; Earth Rotation; Earth Gravitation; Earth Surface; Loads (Forces)

20020059996 Communications Research Lab., Tokyo, Japan
SLR-Based TRF Contributing to the ITRF2000 Project
Otsubo, Toshimichi, Communications Research Lab., Japan; Gotoh, Tadahiro, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 300-303; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The ten-year TRF solution constructed by Communications Research Laboratory contributed to the ITRF2000 project as one of SLR solutions. Our solution used LAGEOS-1 and -2 data to derive the position and velocity vectors of 60 worldwide stations. The ITRF2000 final solution released in March 2001 adopted the newly defined datum based on SLR and VLBI. The SLR-based TRFs had a great advantage in the precise determination of the origin (a few mm) and the scale (approx. 1 ppb).
Author
Satellite Laser Ranging; Data Processing; Computer Programs; Software Engineering

20020059998 Academy of Sciences (USSR), Inst. of Applied Astronomy, Moscow, USSR
Influence of Antenna Thermal Deformations on Estimation of Seasonal Variations in Baseline Length
Skurikhina, Elena, Academy of Sciences (USSR), USSR; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 310-314; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The results of analysis of baselines length variations calculated at the Institute of Applied Astronomy with the OCCAM package from all available VLBI sessions with and without modelling antenna thermal deformations are presented.
Author
Annual Variations; Deformation; Very Long Base Interferometry

20020060000 Communications Research Lab., Kashima Space Research center, Kashima, Japan
Comparison of the Baseline Length Between the Keystone Sites by Different Space Geodetic Techniques
Yoshino, Taizoh, Communications Research Lab., Japan; Kunimori, Hiroo, Communications Research Lab., Japan; Katsuo, Futaba, Communications Research Lab., Japan; Amagai, Jun, Communications Research Lab., Japan; Kiuchi, Hitoshi, Communications Research Lab., Japan; Otsubo, Toshimichi, Communications Research Lab., Japan; Kondo, Tetsuro, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Ichikawa, Ryuichi, Communications Research Lab., Japan; Takahashi, Fujinobu, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 320-323; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Three independent space geodetic systems, VLBI, SLR and GPS, are closely located at the Keystone sites maintained by the Communications Research Laboratory (CRL). The main purpose of the system is the study of the crustal deformation around the Tokyo area. The other purpose is to contribute to improve the terrestrial reference frame. In the summer of 2000, extraordinary crustal deformation was observed in the Keystone network due to the seismic and volcanic event occurred at the Izu islands about 150 km south of Tokyo. The full process of the event was observed by the VLBI system, and a part of the process was also observed by the SLR and GPS of CPL. This kind of significant crustal deformation was first observed by the collocated space geodetic systems. Exploiting unique facilities, baseline length is compared between the different space geodetic systems which are tied by the precise surveying. The obtained geodetic results are contributed to the IERS to improve the ITRF.
Author
Crustal Fractures; Geodesy; Seismology; Very Long Base Interferometry

20020060001 National Astronomical Observatory, Japan
The Antarctic VLBI Experiments During JARE39 and Geodetic Analysis by the Mitaka FX Correlator
Jike, Takaaki, National Astronomical Observatory, Japan; Manabe, Seiji, National Astronomical Observatory, Japan; Tamura, Yoshiaki, National Astronomical Observatory, Japan; Shibuya, Kazuo, National Inst. of Polar Research, Antarctica; Doi, Koichiro, National Inst. of Polar Research, Antarctica; Tanaka, Teruhito, Nippon Electric Co. Ltd., Japan; McCulloch, Peter, Tasmania Univ., Australia; Costa, Marco, Tasmania Univ., Australia; Nicolson, George, Hartebeesthoek Radio Astronomy Observatory, South Africa; Quick, Jonathan F. H., Hartebeesthoek Radio Astronomy Observatory, South Africa; International

VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 324-328; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

JARE39 started the Antarctic VLBI project at Syowa station. In this project, four regular VLBI observations during the winter were carried out and the VLBI raw data were correlated by the Mitaka FX correlator. We developed new software and applied it to the geodetic analysis of the Antarctic VLBI data. The main parts of development are the bandwidth synthesis and the time system transformation. by using this software, the position of Syowa VLBI reference point was estimated with standard deviations of 2.9 cm, 2.5 cm and 6.2 cm in x-, y- and z-components in the geocentric Cartesian system. These errors are larger than typical values of recent inter-continental VLBI experiments. to inspect the reliability of our analysis software, we compared performance of ours and GSI's analysis system by using observed delays which were determined from common VLBI data. Then, systematic delay differences with about 2 nanosecond were detected. Now, we are investigating its cause.

Author

Antarctic Regions; Very Long Base Interferometry; Software Development Tools; Software Engineering

20020060002 Observatoire de Paris, France

Comparative Study of the EOP Series Derived for the Second IVS Pilot Project

Gambis, D., Observatoire de Paris, France; Bizouard, Ch., Observatoire de Paris, France; Carlucci, T., Observatoire de Paris, France; Jean-Alexis, D., Observatoire de Paris, France; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 330-334; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Biases and rms of IVS 2001 Pilot series with respect to the IERS reference series C04 are presented and compared to those derived by the GPS operational series. Significant inconsistencies appear and are discussed.

Author

Bias; Global Positioning System

20020060003 Academy of Sciences (USSR), Inst. of Applied Astronomy, Moscow, USSR

A Comparison of the VLBI Nutation Series with IAU2000 Model

Malkin, Zinovy, Academy of Sciences (USSR), USSR; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 335-339; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

This paper presents preliminary results of investigation of VLBI nutation series available in the IVS data base. It is shown that rather large systematic differences exist between these series, especially in 1984-1986. However, all series reveal common details in comparison with IAU2000A and MHB2000 nutation models. From analysis of the differences between VLBI and model nutation series preliminary values of corrections to precession parameters are estimated.

Author

Nutation; Very Long Base Interferometry; Precession

20020060004 Wien Univ., Inst. of Geodesy and Geophysics, Austria

Comparison of Tropospheric Parameters Submitted to the 2nd IVS Analysis Pilot Project

Boehm, Johannes, Wien Univ., Austria; Messerer, Eva, Wien Univ., Austria; Schuh, Harald, Wien Univ., Austria; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 340-344; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

At the IVS Analysis Workshop at GSFC in February 2001, it was agreed that the 2nd IVS Analysis Pilot Project should also deal with a comparison of tropospheric parameters to be submitted by the Analysis Centers (AC) in addition to the Earth orientation parameters. Nine ACs provided ten series of tropospheric parameters, derived from all NEOS-A sessions in the years 1999 and 2000. These parameters included total (hydrostatic and wet) zenith path delays and horizontal gradients. First comparisons show that the VLBI and IGS (International GPS Service) total zenith path delays are of comparable accuracy with regard to 24 h mean values as well as hourly values. However there is a constant off-set between the VLBI and GPS time series of the individual sites.

Author

Troposphere; Very Long Base Interferometry; Zenith

20020060005 Wien Univ., Inst. of Geodesy and Geophysics, Austria

Determination of Ionospheric Parameters by Geodetic VLBI

Hobiger, Thomas, Wien Univ., Austria; Boehm, Johannes, Wien Univ., Austria; Schuh, Harald, Wien Univ., Austria; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 345-349; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

In geodetic VLBI the observations are performed at two frequencies (2-3 and 8.4 GHz) in order to determine ionospheric delay corrections. This also provides information about the total electron content (TEC) of the ionosphere from VLBI observables. Various VLBI sessions are used to determine TEC differences. The results are compared with TEC values obtained from CPS within IGS (IONEX). A very good agreement can be observed, in particular for baselines longer than 2000 km. by using external information for absolute calibration it is possible to calculate the unknown offset per baseline and to generate regional maps of TEC values, e.g., over Europe. Animated maps that represent the time dependency of the data are also produced and compared with CPS solutions.

Author

Electron Density (Concentration); Geodesy; Very Long Base Interferometry; Earth Ionosphere

20020060011 National Astronomical Observatory, Tokyo, Japan

Astrometric and Geodetic Analysis System of VERA

Manabe, Seiji, National Astronomical Observatory, Japan; Imai, Hiroshi, National Astronomical Observatory, Japan; Jike, Takaaki, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 372-376; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

VERA is a unique VLBI array both in scientific objectives and in innovative technologies. Its hardware is designed for accomplishing highest accuracy in determining relative positions of a pair of radio sources up to two degrees apart by phase-referencing VLBI. Each antenna is equipped with a dual-beam observation system. A system for calibrating differences in optical path lengths between the two beams is an indispensable component of the dual-beam observing system. The analysis software of VERA is required to handle properly the calibration data in order to remove instrumental errors as much as possible. Very high accuracy of antenna position determination and precise information on structures of reference sources are also required. No existing software system meets all the requirements of VERA and a new one is under development. In the first step of the development, functions to meet VERA's requirements will be added to NRAO's AIPS. The reason to use AIPS as a platform is that phase-referencing observations will begin in this year and the reduction program must be ready before the observations. However, whether or not AIPS or AIPS++ is adopted as a platform of the VERA analysis software is still under investigation. A database for managing raw data from the Mitaka FX correlator is under development and will become available soon. Other databases that manage intermediate and final analysis results are in a designing phase. In this paper requirements, the design of, and current status of the software are reviewed.

Author

Calibrating; Very Long Base Interferometry; Software Development Tools; Software Engineering

20020060012 National Space Development Agency, Tsukuba space Center, Tsukuba, Japan

Results of the Critical Design for the Selenodetic Mission using Differential VLBI Methods by SELENE

Iwata, Takahiro, National Space Development Agency, Japan; Sasaki, Takeshi, National Space Development Agency, Japan; Kono, Yusuke, National Astronomical Observatory, Japan; Hanada, Hideo, National Astronomical Observatory, Japan; Kawano, Nobuyuki, National Astronomical Observatory, Japan; Namiki, Noriyuki, Kyushu Univ., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 377-380; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Global mapping of the lunar gravity field will be conducted using two micro sub-satellites of SELENE; the Relay Satellite (Rstar) and the VLBI Radio Satellite (Vstar). Differential VLBI observations will be conducted for three pairs of S-band and one pair of X-band carriers emitted from 'The Differential VLBI Radio Sources (VRAD)' on Rstar and Vstar. Four-way Doppler measurements toward the SELENE Main Orbiter above the lunar far side will be conducted by 'The Relay Satellite Transponder (RSAT)' on Rstar. These sub-satellites are requested to have long arcs of orbit without maneuver to detect orbit turbulence perturbed by lunar gravity, and to be simple design, therefore, there is no orbital and attitude control except spin stabilization. We have designed the simple structured and light weighted release mechanism, and confirmed the release properties by ground tests. Attitude analysis shows that the nutation caused by the tip off by the release mechanism is dominant for the attitude inclination.

Author

Attitude (Inclination); Gravitational Fields; Lunar Gravitation; Very Long Base Interferometry

20020060065 Istituto Superiore di Sanita, Rome, Italy

Ozone Concentration from 1999-2000 as Measured at the Botanical Gardens of Rome

Puledda, S.; Inglessis, M.; Ferdinandi, M.; 2001; 96p; In Italian

Report No.(s): PB2002-103972; ISTISAN-01/16; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The paper reports the concentrations of tropospheric ozone from 1 July 1999 to 30 September 2000 as continuously measured at the Botanical Gardens of Rome. The site was chosen because the concentration of tropospheric ozone tends to increase in green areas as its formation is triggered by volatile organic compounds (VOC), precursors which are not only anthropogenic but of vegetable origin as well. Another factor that determined this choice was the controversy over the validity of the European threshold for the safeguard of vegetation established on the basis of the daily mean, i.e. 65 microns/cu m. This threshold has been objected by the Mediterranean countries for they frequently record ozone concentrations above or around this value in summer (which Northern countries do not) with no apparent significant damage for the vegetation. One of the most interesting conclusions that can be drawn from the collected data is that no damage has so far been observed in species well known for their sensitivity to ozone, in spite of the fact that the percentage of values exceeding the daily threshold for vegetation safety of 65 microns/cu m was 81% in July 1999 and 68% in August 1999.

NTIS

Ozone; Air Pollution; Troposphere; Photochemical Reactions; Measuring Instruments

20020060082 Idaho Univ., Dept. of Geology and Geological Engineering, Moscow, ID USA

Behavior of Rare Earth Elements in Geothermal Systems: A New Exploration/Exploitation Tool ***Final Report, 1 Jan. 1998 - 30 Sep. 2001***

Wood, S. A.; Dec. 17, 2001; 98p; In English

Report No.(s): DE2002-792697; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The goal of this four-year project was to provide a database by which to judge the utility of the rare earth elements (REE) in the exploration for and exploitation of geothermal fields in the USA. Geothermal fluids from hot springs and wells have been sampled from a number of locations, including: (1) the North Island of New Zealand (1 set of samples); (2) the Cascades of Oregon; (3) the Harney, Alvord Desert and Owyhee geothermal areas of Oregon; (4) the Dixie Valley and Beowawe fields in Nevada; (5) Palinpion, the Philippines: (6) the Salton Sea and Heber geothermal fields of southern California; and (7) the Dieng field in Central Java, Indonesia. We have analyzed the samples from all fields for REE except the last two.

NTIS

Rare Earth Elements; Geothermal Technology; Geochemistry; Exploitation

20020060094 California Univ., Berkeley, CA USA

Summary of Geotail Funding Activities ***Final Report, Mar. 1999 - Feb. 2002***

[2002]; 1p; In English

Contract(s)/Grant(s): NAG5-9626; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This final report summarizes results of Geotail project monitoring Earth's magnetotail during funding period. Compares project's transport statistics to those of International Sun-Earth Explorer (ISEE) and Ion Release Module (IRM). Program established relations between disruption and flow events, and made observations on the nature of electric field fluctuations and plasma sheet flows.

CASI

Geomagnetic Tail; Magnetohydrodynamic Flow; Electric Fields; Plasma Currents

20020060509 NASA Goddard Space Flight Center, Greenbelt, MD USA

Airborne Lidar Measurements of Aerosol Optical Properties During SAFARI-2000

McGill, M. J., NASA Goddard Space Flight Center, USA; Hlavka, D. L., NASA Goddard Space Flight Center, USA; Hart, W. D., NASA Goddard Space Flight Center, USA; Welton, E. J., NASA Goddard Space Flight Center, USA; Campbell, J. R., NASA Goddard Space Flight Center, USA; [2002]; 22p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Cloud Physics Lidar (CPL) operated onboard the NASA ER-2 high altitude aircraft during the SAFARI-2000 field campaign. The CPL provided high spatial resolution measurements of aerosol optical properties at both 1064 nm and 532 nm. We present here results of planetary boundary layer (PBL) aerosol optical depth analysis and profiles of aerosol extinction. Variation of optical depth and extinction are examined as a function of regional location. The wide-scale aerosol mapping obtained

by the CPL is a unique data set that will aid in future studies of aerosol transport. Comparisons between the airborne CPL and ground-based MicroPulse Lidar Network (MPL-Net) sites are shown to have good agreement.
Author
Aerosols; Cloud Physics; Optical Properties; Optical Radar; Radar Measurement

20020060657 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
Polar Plasma Wave Investigation Data Analysis in the Extended Mission ***Final Report, 1 Apr. 1999 - 31 Mar. 2002***
Gurnett, Donald A., Iowa Univ., USA; [2002]; 10p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-7943; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This Summary of Research is being submitted to NASA Goddard Space Flight Center in fulfillment of the final reporting requirement under Grant NAG5-7943, which terminated on March 31, 2002. The following contains a summary of the significant accomplishments of the Polar Plasma Wave Investigation (PWI) team during the period of the grant, April 1, 1999 through March 31, 2002, and a listing of all of the publications that resulted from work carried out under the grant. Also included below is a listing of the numerous public outreach activities that took place during the period of the grant in which the Polar mission and Polar PWI science were discussed.
Derived from text
Plasma Waves; Turbulent Boundary Layer; Wave Propagation; Electromagnetic Radiation

20020060732 NASA Goddard Space Flight Center, Greenbelt, MD USA
Comments on "Tropical Convection and the Energy Balance at the Top of the Atmosphere"
Chou, Ming-Dah, NASA Goddard Space Flight Center, USA; Lindzen, Richard S., Massachusetts Inst. of Tech., USA; [2002]; 15p; In English
Contract(s)/Grant(s): DE-FG02-01ER-63257; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Analyses of the Earth Radiation Budget Experiment (ERBE) data show that the effects of clouds on the solar and thermal infrared radiation in the tropical deep convective regions have a similar magnitude but opposite signs. This small difference in the effects of clouds on radiation led Hartmann et al. (2001) to conclude that the contrast in the net radiation at the top of the atmosphere between the convective and non-convective regions must also be small. However, we have found that the ERBE data do not generally show a small contrast in the radiation between the convective and non-convective regions, and the model used by Hartmann et al., therefore, seems unlikely to represent the real physical processes involving convection, radiation, and climate in an appropriate way.
Author
Tropical Regions; Convection; Climate; Radiation Effects; Thermal Radiation

20020061299 California Inst. of Tech., Div. of Geological and Planetary Sciences, Pasadena, CA USA
Chemistry and Transport In a Multi-Dimensional Model ***Final Report, 1 Jan. 1999 - 31 Dec. 2001***
Yung, Yuk L., California Inst. of Tech., USA; Allen, M., California Inst. of Tech., USA; Zurek, R. W., California Inst. of Tech., USA; Salawitch, R. J., California Inst. of Tech., USA; [2002]; 5p; In English
Contract(s)/Grant(s): NAG1-2151; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The focus of the work funded under this proposal is the exchange between the stratosphere and the troposphere, and between the troposphere and the blaspheme. These two interfaces represent the frontiers of atmospheric chemistry. It is the combination of exchange processes at both interfaces that ultimately controls how the blaspheme (including human activities) affects the ozone layer. The modeling work was motivated by and attempts to integrate information obtained by aircraft, spacecraft, shuttle and oceanic measurements. The model development and research activities accomplished in the past three years provide a technical and intellectual basis for the research in this group. The innovative part of our research program is related to the IAV of ozone and the hydrological cycle. Other related but independently supported work include the study of isotopic fractionation of atmospheric species, e.g., N2O and CO2. Our theory suggests that we now have the ability to probe the middle atmosphere at a level of sensitivity where subtle details such as the isotopic composition of simple molecules can yield measurable systematic effects. This creates the possibility for probing the chemistry and dynamics of the middle atmosphere using all of the N2O and CO2 isotopologues. In the following we will briefly describe the model development and review the highlights of recent accomplishments.
Author
Atmospheric Chemistry; Stratosphere; Hydrological Cycle; Ozonosphere; Nitrogen Oxides; Carbon Dioxide; Atmospheric Composition

20020061833 Physics and Electronics Lab. TNO, The Hague, Netherlands

SeaCluse Progress Report II ***Final Report***

VanEijk, A. M. J., Physics and Electronics Lab. TNO, Netherlands; Mestayer, P. G., Physics and Electronics Lab. TNO, Netherlands; March 2002; 114p; In English

Contract(s)/Grant(s): A99/KM/853; TNO Proj. 29456

Report No.(s): TD00-0435; FEL-01-A091; Copyright; Avail: Issuing Activity

The SeaCluse code describes the dynamic and thermodynamic processes of aerosol droplets in the lower marine atmosphere. The model aims at identifying the major processes that govern the (electro-optical) propagation environment as function of meteorological conditions. In this report, the model equations are described and the results of the first simulations presented.

Author

Aerosols; Lower Atmosphere; Thermodynamics; Electro-Optics; Drops (Liquids)

20020061854 Lembaga Penerbangan dan Antariksa Nasional, Bidang Ionosfer dan Telekomunikasi, Jakarta, Indonesia

Validation of the Modified Model Total Ionospheric Content INTIM-1 ***Verifikasi dan Modifikasi Model Total Electron Content Ionosfer INTIM-1***

Suhandi, Bambang, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Asnawi, Effendi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Nolly, A. H., Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Nana, S., Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 195-199; In Malay-Indonesian; Copyright; Avail: Issuing Activity

Total Electron Content (TEC) model for Indonesian ionosphere is an empirical model designed through The Indonesia - Germany cooperation executed since 1997. INTIM-1 (Indonesia Neustrelitz TEC Ionosfer Model-1) is a software to calculate ionospheric TEC special for Indonesian region. The validation for the INTIM-1 model has been conducted but the results are not accurate with deviation of about 50% so that the model should be modified. In the investigation INTIM-1 has been verified and modified to be INTIM-2. The results are relatively more accurate which can be seen from the increase of the correlation coefficient between observed and model TEC data. If the INTIM-1 is used the correlation coefficient is 0.45, while INTIM-2 gives about 0,82.

Author

Mathematical Models; Earth Ionosphere; Software Engineering; Correlation Coefficients

20020061898 NASA Ames Research Center, Moffett Field, CA USA

Processes Controlling Water Vapor in the Winter Arctic Tropopause Region

Pfister, Leonhard, NASA Ames Research Center, USA; Selkirk, Henry B., Space Physics Research Inst., USA; Jensen, Eric J., NASA Ames Research Center, USA; Podolske, James, NASA Ames Research Center, USA; Sachse, Glen, NASA Langley Research Center, USA; Avery, Melody, NASA Langley Research Center, USA; Schoeberl, Mark R., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English

Contract(s)/Grant(s): RTOP 622-65-07-10; No Copyright; Avail: Issuing Activity; Abstract Only

This work describes transport and thermodynamic processes that control water vapor near the tropopause during the SAGE Ozone Loss and Validation Experiment (SOLVE), held during the Arctic 1999-2000 winter season. Aircraft based water vapor, carbon monoxide, and ozone measurements are analyzed so as to establish how deeply tropospheric air mixes into the arctic lower-most stratosphere, and what the implications are for cloud formation and water vapor removal in this region of the atmosphere. There are three major findings. First, troposphere-to- stratosphere exchange extends into the arctic stratosphere to about 13 km. Penetration is to similar levels throughout the winter, however, because ozone increases idly in the early spring, tropospheric air mixes with the highest values of ozone in that season. The effect of this upward mixing is to elevate water vapor mixing ratios significantly above their prevailing stratospheric values of about 5 ppmv. Second, the potential for cloud formation in the stratosphere is highest during early spring, with about 20\% of the parcels which have ozone values of 300-350ppbv experiencing ice saturation in a given 10 day period. Third, during early Spring temperatures at the tropopause are cold enough so that 5-10\% of parcels experience relative humidities above 100\%, even if the water content is as low as 5 ppmv. The implication is that during, this period the arctic tropopause can play an important role in maintaining a very dry upper troposphere during early Spring.

Author

Water Vapor; Troposphere; Mixing Ratios; Moisture Content; Ozone

20020061939 Michigan Univ., Ann Arbor, MI USA

Study of Relativistic Electron Beam Propagation in the Atmosphere-Ionosphere-Magnetosphere ***Final Report, Jun. 1996-Mar. 2000***

Gilchrist, Brian E.; Khazanov, George; Krause, Linda; Neubert, Torsten; Dec. 12, 2001; 66p; In English

Contract(s)/Grant(s): F19628-96-K-0004; Proj-2311

Report No.(s): AD-A402969; AFRL-VS-TR-2001-1505; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Models for propagation physics and associated ionospheric/atmospheric modification have been developed for the space-based injection of relativistic (E(-) 1-100 MeV) electron beams. Initial evaluations of beam propagation effects in the ionosphere, magnetosphere, and atmosphere have been conducted. The overall goal of this work was to develop computational tools and use them to better assess relativistic beam launch, propagation, and interaction with the space environment and atmosphere. Computational tools developed and then applied to this problem include models addressing: beam propagation using an envelope equation; integrated beam-atmosphere interactions (This model contains time-dependent chemistry effects necessary to compute optical emissions as a function of altitude); beam launch and propagation using particle-in-cell (PIC) techniques; and magnetospheric propagation and plasma transport (Khazanov models). It is concluded that for practical beam energies and current the beam propagation is stable. This is done theoretically and using the PIC modeling. Over long distance propagation the Khazanov models were able to show that the beam particles will scatter in pitch-angle and relative location, but lifetimes are expected to be similar to those found for the radiation belts for nearly equatorial mirroring injection.

DTIC

Relativistic Electron Beams; Earth Ionosphere; Particle In Cell Technique; Earth Magnetosphere; Computerized Simulation

20020061958 Lembaga Penerbangan dan Antariksa Nasional, PUSAt Sains Antariksa, Jakarta, Indonesia

Correlation Between Intensity Radiation of Solar X-Ray with Parameter of Ionospheric E-Layer ***Analisis Periodisitas Intensitas Radiasi Sinar-X Matahari Dan Parameter Lapisan E Ionosfer***

Rachyany, Sity, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Suratno, Suprijanto, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 159-163; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The parameter condition of ionospheric E layer is influenced by radiation of solar X-ray. The parameter of ionospheric E layer is indicated by minimum frequency (fmin), critical frequency of ionospheric E layer (foE) and virtual height of ionospheric E layer (foE). This paper discusses correlation between intensity radiation of solar X-ray (Soft X-ray) with parameter of ionospheric E layer. by analyzing data of ionospheric parameter over Biak (1.11 deg LS; 136.07 deg BT) and Soft X-ray during January to June 1993, it is obtained the indication of the greatest influence with the same period (about 6, 11, 15, and 23-33 days) between Soft X-ray and minimum frequency of ionospheric layer.

Author

Solar X-Rays; E Region; Earth Ionosphere; Radiant Flux Density

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020059646 Stockholm Univ., International Meteorological Inst., Sweden

Study of the Sub-Cloud Layer Conditions during Precipitation and at Temperatures near Freezing

Hansson, M., Stockholm Univ., Sweden; Dec. 1999; 56p; In English

Report No.(s): PB2002-104986; DM-82; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The wet-bulb temperature (T(iw)) has been used as a melting temperature, to study the impact on the sub-cloud layer's meteorological conditions in precipitation and temperatures just above freezing. T(iw) is regarded as a very important predictor of the water phase shift and results from the simulations indicate effects on the meteorological parameters in the sub-cloud layer. The first simulations were performed with a 1D (one dimensional)-model, containing 50 vertical levels but vertical diffusion and radiation processes were excluded, because the aim of the first study was to focus on thermodynamical processes only. In the last set of simulations, HRLAM (High Resolution Limited Area Model) was used, equipped with 16 vertical levels and a horizontal resolution of 0.5 degrees. In both models, the parameterization of condensation was based on Sundqvist's scheme. The implementation of T(iw) = 0 degrees C as a melting level, compared to T - 0 deg C, lowers the melting level thereby the transformation from snow to rain takes place later, or not at all. The lower terminal velocity of snow yields a larger efficiency of vaporization, if all other conditions are unchanged, which effects the meteorological parameters in the sub-cloud layer, such as

e.g. temperature, specific humidity, vertical static stability and precipitation. The HRLAM-simulations showed changes in the sub-cloud layer water budget as well. However, the differences were extremely small (less than 0.01 mm), probably due to the very short integration time, 24 hours (ID model) and 12 hours (HRLAM), respectively.
NTIS
Rain; Cloud Cover; Atmospheric Temperature; Phase Transformations; Transition Temperature; Meteorological Parameters

20020059649 Stockholm Univ., International Meteorological Inst., Sweden
Singular Vectors and Breeding Modes: A Comparative Study
Bontemps, B.; Kaellen, E.; Oct. 1999; 48p; In English
Report No.(s): PB2002-104988; DM-81; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Two different methods to study error evolution patterns in atmospheric models have been intercompared. The two methods are singular vectors and breeding. The authors use a forced and dissipative, spherical, baroclinic, two-layer, quasi-geostrophic model with a T21 truncation. The comparison is based on properties such as baroclinicity, heat transport, growth rate and spatial structures. The authors find that the spatial structure of the modes is very similar in both methods. The energy cascade, which takes place in the non-linear model integrations, goes toward the synoptic scales at optimization time in both cases. The baroclinicity is well pronounced for both methods but at different evolution times. The authors conclude that both methods give the same kind of information about the most unstable 'phase-space' directions for a simple model. A major part of the observed differences between the two methods appears to depend on differences in models and fields used to initialize the modes instead of differences in the formulation of the methods.
NTIS
Atmospheric Models; Dissipation; Error Analysis

20020060108 NASA Kennedy Space Center, Cocoa Beach, FL USA
Extreme Wind Velocity Measurement System
Zysko, Jan A., Inventor, NASA Kennedy Space Center, USA; Starr, Stanley O., Inventor, NASA Kennedy Space Center, USA; Apr. 16, 2002; 10p; In English
Patent Info.: Filed 14 Sep. 1999; NASA-Case-KSC-11886; US-Patent-6,370,949; US-Patent-Appl-SN-408654; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A wind velocity measurement system employs two different principles of physics to measure wind speed: (1) the aerodynamic force imparted to a low profile, rigidly mounted cylindrical rod, and (2) the vibrating frequency of the rod as vortices are shed from the rod's cylindrical surface. A set of strain gages is used as a common sensor for both measurements, and these provide force measurements imparted by the wind on the rod. The signals generated by the strain gages are fed to processing circuitry that calculates the wind speed and direction from the signals. The force measurement is proportional to the square of the wind speed. Since it is a vector quantity, it can also be used to derive wind direction. The vortex shedding frequency is a scalar quantity and is linearly proportional to wind speed. This frequency can be calculated by analyzing the force measurements generated by the strain gages over time. Both of the wind velocity calculations can be advantageously used by the processing circuitry to generate an accurate wind velocity reading.
Official Gazette of the U.S. Patent and Trademark Office
Strain Gages; Wind Velocity Measurement; Flow Direction Indicators

20020060501 NASA Goddard Space Flight Center, Greenbelt, MD USA
Variability of South American Convective Cloud Systems and Tropospheric Circulation During January-March 1998 and 1999
Ferreira, Rosana Nieto, Maryland Univ., USA; Rickenbach, Thomas M., NASA Goddard Space Flight Center, USA; Herdies, Dirceu L., Maryland Univ., USA; Carvalho, Leila M. V., California Univ., USA; [2002]; 50p; In English; Original contains color illustrations
Contract(s)/Grant(s): FAPESP Proj. 98/14414-0; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A comparison of the submonthly variability of atmospheric circulation and organization of convection in South America during January-March of 1998 and January-March of 1999 is presented.
Derived from text
Atmospheric Circulation; Troposphere; Variability; Annual Variations; Convection

20020060502 NASA Goddard Space Flight Center, Greenbelt, MD USA

Tropical Convection's Roles in Tropical Tropopause Cirrus

Boehm, Matthew T., National Academy of Sciences - National Research Council, USA; Starr, David OC., NASA Goddard Space Flight Center, USA; Verlinde, Johannes, Pennsylvania State Univ., USA; Lee, Sukyoung, Pennsylvania State Univ., USA; [2002]; 7p; In English; 11th Conference on Cloud Physics, Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The results presented here show that tropical convection plays a role in each of the three primary processes involved in the in situ formation of tropopause cirrus. First, tropical convection transports moisture from the surface into the upper troposphere. Second, tropical convection excites Rossby waves that transport zonal momentum toward the ITCZ, thereby generating rising motion near the equator. This rising motion helps transport moisture from where it is detrained from convection to the cold-point tropopause. Finally, tropical convection excites vertically propagating tropical waves (e.g. Kelvin waves) that provide one source of large-scale cooling near the cold-point tropopause, leading to tropopause cirrus formation.

Author

Tropopause; Cirrus Clouds; Cloud Physics; Convection

20020060510 NASA Goddard Space Flight Center, Greenbelt, MD USA

Are Stronger North-Atlantic Southwesterlies Forcing to the Late Winter Warming in Europe?

Otterman, J., NASA Goddard Space Flight Center, USA; Atlas, Robert, NASA Goddard Space Flight Center, USA; Chou, S.-H., NASA Goddard Space Flight Center, USA; Jusem, J. C., General Sciences Corp., USA; Pielke, R. A., Sr., Colorado Univ., USA; Chase, T. N., Colorado State Univ., USA; Rogers, J., Ohio State Univ., USA; Russell, G. L., NASA Goddard Inst. for Space Studies, USA; Schubert, S. D., NASA Goddard Space Flight Center, USA; Sud, Y. C., NASA Goddard Space Flight Center, USA; [2001]; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We examine a possible mechanism leading to late-winter warming and thus to an early spring in Europe. From the NCEP Reanalysis, we extract for the years 1948-1999 ocean-surface winds over the eastern North Atlantic, and air temperatures at the surface, T(sub s), and at the 500 mb level, T(sub 500), in late-winter and spring. T(sub s) is extracted at six European locations, all at 50.5 N, ranging in longitude from 1.9 E (northeastern France) to 26.2 E (Ukraine). to quantify the advection of maritime air into Europe, we evaluate for 3-pentad groups the Index I(sub na) of the southwesterlies at 45 N; 20 W: I(sub na) is the average wind speed at this point if the direction is from the quadrant 180-270 deg (when the direction is different, the contribution counts as zero). In late winter correlations C(sub it) between the Index I(sub na) and the temperature T(sub s) are substantial, up to the 0.6 level, in western Europe (but weaker correlations for Poland and Ukraine). C(sub it) drops sharply by mid-March, taking occasionally negative values subsequently. This drop in C(sub it) indicates that maritime air advection is no longer associated closely with the surface-air warming, the role of immolation becomes important, and thus the drop in C(sub it) marks the arrival of spring. Correlations C(sub i delta) between I(sub na) and our lapse-rate parameter delta, the difference between T(sub s) and T(sub 500), indicate that the flow of warm maritime-air from the North Atlantic into this 'corridor' at 50.5 N is predominantly at low tropospheric level. by computing the best linear fit to I(sub na) and T(sub s), the trends for the period 1948-1999 are evaluated. The trends are appreciable in the second half of February and the first half of March. Our 3-pentad analysis points to the interval from mid-February to mid-March as the end-of-winter period in which the southwesterlies over the eastern North Atlantic become stronger and the surface-air temperatures in Europe rise markedly, the lapse rate becomes steeper, and concurrently the longitudinal temperature gradient between the Somme (France) and the Oder (Germany/Poland border) is reduced by 0.8 C, that is, by 20% of its 1948 value. Our thesis, that the observed late-winter warming and the corollary advancement of spring in Europe resulted at least in part from stronger southwesterlies over the North Atlantic, merits further investigations.

Author

Atmospheric Temperature; Temperature Gradients; Annual Variations; Trends; Land Surface Temperature; Air Land Interactions

20020060656 NASA Goddard Space Flight Center, Greenbelt, MD USA

Improving Environmental Prediction Using Rainfall Observations from Space

Hou, Arthur Y., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; University of Connecticut Environmental Scholars Colloquium, 19 Apr. 2002, Storrs, CT, USA; No Copyright; Avail: Issuing Activity; Abstract Only

I discuss the need for accurate rainfall observations to improve our knowledge of the atmospheric state and the ability to provide better numerical weather forecasts. I will give an overview of the recent progress in using rainfall data provided by TRMM and other microwave instruments in data assimilation to improve global analyses and shortrange forecasts. In cases of Hurricanes Bonnie and Floyd, results show that assimilation of TRMM and SSM/I rain rates produces initial conditions with better defined

tropical storm features that lead to better Hurricane track and quantitative precipitation forecasts. I will outline the current and future research strategies in preparation for the Global Precipitation Mission.
Author
Precipitation (Meteorology); Rain; Microwave Imagery; Numerical Weather Forecasting

20020060740 NASA Goddard Space Flight Center, Greenbelt, MD USA
Science Formulation of Global Precipitation Mission (GPM)
Smith, Eric A., NASA Goddard Space Flight Center, USA; Mehta, Amita, NASA Goddard Space Flight Center, USA; Shepherd, Marshall, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; EGS XXVII General Assembly, 21-26 Apr. 2002, Nice, France; No Copyright; Avail: Issuing Activity; Abstract Only

In late 2001, the Global Precipitation Measurement (GPM) mission was approved as a new start by the National Aeronautics and Space Administration (NASA). The new mission, which is now in its formulation phase, is motivated by a number of scientific questions that are posed over a range of space and time scales that generally fall within the discipline of the global water and energy cycle (GWEC), although not restricted to that branch of research. Recognizing that satellite rainfall datasets are now a foremost tool for understanding global climate variability out to decadal scales and beyond, for improving weather forecasting, and for producing better predictions of hydrometeorological processes including short-term hazardous flooding and seasonal fresh water resources assessment, a comprehensive and internationally sanctioned global measuring strategy has led to the GPM mission. The GPM mission plans to expand the scope of rainfall measurement through use of a multi-member satellite constellation that will be contributed by a number of world nations. This talk overviews the GPM scientific research program that has been fostered within NASA, then focuses on scientific progress that is being made in various areas in the course of the mission formulation phase that are of interest to the Natural Hazards scientific community. This latter part of the talk addresses research issues that have become central to the GPM science implementation plan concerning the rate of the global water cycling, cloud macrophysical-microphysical processes of flood-producing storms, and the general improvement in measuring precipitation at the fundamental microphysical level.
Author
Precipitation (Meteorology); Weather Forecasting; Hydrological Cycle; Meteorological Satellites

20020060750 NASA Goddard Space Flight Center, Greenbelt, MD USA
Global Modeling Activities and NAME
Schubert, Siegfried, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 5th Session of the CLIVAR/VAMOS Meeting, 13-16 Mar 2002, San Jose, Costa Rica; No Copyright; Avail: Issuing Activity; Abstract Only

In this talk I will review global modeling activities in the United States that could contribute to and benefit from NAME activities. I will present some preliminary results from several global atmospheric general circulation model simulation experiments for the initial NAME model intercomparison project period of May-Oct 1990. These include an ensemble of medium resolution simulations, and a high resolution (one half degree) simulation. I will also discuss possible high resolution global data assimilation experiments that could be used to help validate the model simulations and assimilate planned NAME observations.
Author
Atmospheric General Circulation Models; Simulation; Data Acquisition

20020060754 NASA Goddard Space Flight Center, Greenbelt, MD USA
Observing System Forecast Experiments at the DAO
Atlas, Robert, NASA Goddard Space Flight Center, USA; [2001]; 3p; In English; AMS 82nd Annual Meeting, 13-17 Jan. 2002, Orlando, FL, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Since the advent of meteorological satellites in the 1960's, numerous experiments have been conducted in order to evaluate the impact of these and other data on atmospheric analysis and prediction. Such studies have included both OSE'S and OSSE's. The OSE's were conducted to evaluate the impact of specific observations or classes of observations on analyses and forecasts. Such experiments have been performed for selected types of conventional data and for various satellite data sets as they became available. (See for example the 1989 ECMWF/EUMETSAT workshop proceedings on "The use of satellite data in operational numerical weather prediction" and the references contained therein.) The ODYSSEY were conducted to evaluate the potential for future observing systems to improve Numerical Weather Prediction NWP and to plan for the Global Weather Experiment and more recently for EVANS (Atlas et al., 1985a; Arnold and Day, 1986; Hoffman et al., 1990). In addition, OSSE's have been run

to evaluate trade-offs in the design of observing systems and observing networks (Atlas and Emmitt, 1991; Rohaly and Krishnamurti, 1993), and to test new methodology for data assimilation (Atlas and Bloom, 1989).
Author
Data Acquisition; Meteorological Satellites; Numerical Weather Forecasting; Observation

20020060765 NASA Goddard Space Flight Center, Greenbelt, MD USA
Variability of Winter Air Temperature in Mid-Latitude Europe
Otterman, J., NASA Goddard Space Flight Center, USA; Ardizzone, J., General Sciences Corp., USA; Atlas, R., NASA Goddard Space Flight Center, USA; Bungato, D., General Sciences Corp., USA; Cierniewski, J., Adam Mickiewicz Univ., Poland; Jusem, J. C., General Sciences Corp., USA; Przybylak, R., Nicolaus Copernicus Univ., Poland; Schubert, S., NASA Goddard Space Flight Center, USA; Starr, D., NASA Goddard Space Flight Center, USA; Walczewski, J., Institute for Meteorology and Water Economy, Poland; [2002]; 15p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The aim of this paper is to report extreme winter/early-spring air temperature (hereinafter temperature) anomalies in mid-latitude Europe, and to discuss the underlying forcing to these interannual fluctuations. Warm advection from the North Atlantic in late winter controls the surface-air temperature, as indicated by the substantial correlation between the speed of the surface southwesterlies over the eastern North Atlantic (quantified by a specific Index Ina) and the 2-meter level air temperatures (hereinafter Ts) over Europe, 45-60 deg N, in winter. In mid-March and subsequently, the correlation drops drastically (quite often it is negative). This change in the relationship between Ts and Ina marks a transition in the control of the surface-air temperature: absorption of insolation replaces the warm advection as the dominant control. This forcing by maritime-air advection in winter was demonstrated in a previous publication, and is re-examined here in conjunction with extreme fluctuations of temperatures in Europe. We analyze here the interannual variability at its extreme by comparing warm-winter/early-spring of 1989/90 with the opposite scenario in 1995/96. For these two December-to-March periods the differences in the monthly mean temperature in Warsaw and Torun, Poland, range above 10 C. Short-term (shorter than a month) fluctuations of the temperature are likewise very strong. We conduct pentad-by-pentad analysis of the surface-maximum air temperature (hereinafter Tmax), in a selected location, examining the dependence on Ina. The increased cloudiness and higher amounts of total precipitable water, corollary effects to the warm low-level advection. in the 1989/90 winter, enhance the positive temperature anomalies. The analysis of the ocean surface winds is based on the Special Sensor Microwave/Imager (SSM/I) dataset; ascent rates, and over land wind data are from the European Centre for Medium-Range Weather Forecasts (ECMWF); maps of 2-m temperature, cloud cover and precipitable water are from the National Centers for Environmental Prediction (NCEP) Reanalysis.
Author
Advection; Anomalies; Atmospheric Temperature; Cloud Cover; Temperate Regions; Variability; Weather Forecasting

20020060773 NASA Goddard Space Flight Center, Greenbelt, MD USA
Application of HARLIE Measurements in Mesoscale Studies: Measurements of Aerosol Backscatter and Winds During A Gust Front
Demoz, Belay, Maryland Univ. Baltimore County, USA; Miller, David, Maryland Univ. Baltimore County, USA; Schwemmer, Geary, NASA Goddard Space Flight Center, USA; [2001; 3p; In English; AMS 82nd Annual Meeting, 13-17 Jan. 2002, Orlando, FL, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Lidar atmospheric systems have required large telescope for receiving atmospheric backscatter signals. Thus, the relative complexity in size and ease of operation has limited their wider use in the atmospheric science and meteorology community. The Holographic Airborne Rotating Lidar Instrument Experiment (HARLIE) uses a scanning holographic receiver and demonstrates that these issues can be overcome. HARLIE participated at the DOE-ARM Southern Great Plains site (CART) during the Water Vapor Intensive Operation Period (WVIOP2000) held September-October 2000. It provided exceptional high temporal and spatial resolution measurements of aerosol and cloud backscatter in three dimensions. HARLIE recorded over 110 hours of data were recorded on 16 days between 17 September and 6 October 2000. Placed in a ground-based trailer for upward looking scanning measurements of clouds and aerosols, HARLIE provided a unique record of time-resolved atmospheric backscatter at 1-micron wavelength. The conical scanning lidar measures atmospheric backscatter on the surface of an inverted 90 degree (full angle) cone up to an altitude of 20 km, 360-degree scans having spatial resolutions of 20 meters in the vertical and 1 degree in azimuth were obtained every 36 seconds during the daily, operating period. In this study we present highlights of HARLIE-based measurements of the boundary layer and cloud parameters as well as atmospheric wind vectors where there is sufficiently resolved structure in the backscatter. In particular we present data and discussions from a bore-front case observed on 23 September 2000.
Derived from text
Aerosols; Airborne Equipment; Atmospheric Chemistry; Atmospheric Circulation; Atmospheric Physics; Optical Radar

20020061262 NASA Goddard Space Flight Center, Greenbelt, MD USA

Convective Systems during the South China Sea Monsoon Onset and Post-Onset Simulated by a Cloud Resolving Model Using SCSMEX Data

Shie, C.-L., NASA Goddard Space Flight Center, USA; Tao, W.-K., NASA Goddard Space Flight Center, USA; Johnson, D., NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; Braun, S., NASA Goddard Space Flight Center, USA; Wang, J.-J., NASA Goddard Space Flight Center, USA; Johnson, R., Colorado State Univ., USA; Ciesielski, E., Colorado State Univ., USA; [2002]; 1p; In English; International TRMM Science Conference, 22-26 Jul. 2002, Honolulu, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

South China Sea Monsoon Experiment (SCSMEX, 1998), one of several major TRMM field experiments, has successfully obtained a wealth of information and observational data on the summer monsoon onset and evolution in the South China Sea region. The primary goal of the experiment is to provide a better understanding of the key physical processes for the onset and maintenance of the monsoon over Southeast Asia and southern China leading to improved predictions. In this paper, our objective is to investigate the major physical and microphysical processes involved in the convective systems that developed during the onset and post-onset of the South China Sea monsoon - for both the similarities and differences between these two phases. There are two episodes simulated in this study, one of the onset period (May 18-26, 1998) and one of the post-onset period (June 2-11, 1998). The focus of this paper is to study four major aspects between these two different episodes. First, characteristics of rainfall such as rainfall amount and occurrence in the convective and stratiform regions are investigated, as well as the propagation of convective systems. The numerical precipitation fields are also validated against both the TRMM Microwave Imager (TMI) soundings and Precipitation Radar (PR) observations. Second, the domain-averaged heat and moisture budgets are analyzed to comprehend the essential roles played by physical processes such as the large-scale forcing and latent heat flux. Third, the microphysical processes associated with warm rain or ice are also closely examined during these two episodes. Finally, vertical distributions of Q1 and Q2 budgets are presented to perform a detailed discussion on the energy and moisture cascade in the vertical direction.

Author

Monsoons; Microwave Imagery; Atmospheric Models; Clouds (Meteorology); Precipitation (Meteorology); Meteorological Radar

20020061290 NASA Goddard Space Flight Center, USA

Requirements for Space-Based Wind Lidar

Atlas, Robert M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 6th International Winds Workshop, 6-10 May 2002, Madison, WI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Global wind profiles are needed for a wide range of meteorological applications. Since the 1980's, observing system simulation experiments have been conducted in order to evaluate the potential impact of space-based wind profiler data on numerical weather prediction, and to evaluate trade-offs in lidar design. These experiments indicated tremendous potential for satellite lidar observations to improve atmospheric analyses and forecasts. More recent experiments are aimed at assessing the precise requirements for space-based lidar wind profile data and to evaluate the potential for alternative technologies. At the workshop, OSSE methodology, and results from experiments conducted at the DAO to the define requirements for space-based lidar wind will be presented.

Author

Optical Radar; Wind (Meteorology); Wind Profiles; Space Based Radar; Numerical Weather Forecasting

20020061291 NASA Goddard Space Flight Center, Greenbelt, MD USA

TRMM Science Highlights and 3-hr Quasi-global Precipitation Estimates

Adler, Robert F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; EGS 2002 Meeting, 21-26 Apr. 2002, Nice, France; Sponsored by European Geophysical Society, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Tropical Rainfall Measuring Mission (TRMM) has completed more than four years in orbit. A summary of research highlights will be presented focusing on application of TRMM data to topics ranging over climate analysis, improving forecasts, precipitation processes and non-precipitation applications. One focus of the talk will be the quasi-global TRMM real-time merged rainfall analysis with 3-hr resolution, which uses TRMM to calibrate estimates from other polar-orbit and geosynchronous satellites. These rainfall estimates provide useful information for applications for assimilation into numerical models and for hydrological studies. The status of precipitation estimates from different TRMM instruments and algorithms will be described. Monthly surface rainfall estimates over the ocean based on different instruments on TRMM currently differ by 20% in overall mean. In addition, time changes in global ocean rainfall between El Nino and La Nina conditions show differences between the active and passive microwave products. Improved versions of algorithms will shortly resolve most of these differences. The

TRMM rainfall estimates are intercompared among themselves and with other estimates, including those of the standard, monthly Global Precipitation Climatology Project (GPCP) analysis. A four-year TRMM rainfall climatology is presented, including anomaly fields related to the changing ENSO situation during the mission. The evolution of precipitation analysis incorporating Advanced Microwave Scanning Radiometer (AMSR) data on AQUA and ADEOS II and eventually data from the Global Precipitation Mission (GPM) will also be described.
Author
Climatology; Precipitation (Meteorology); Trmm Satellite; Estimating; Ocean Surface; Quasi-Biennial Oscillation

20020061292 NASA Goddard Space Flight Center, Greenbelt, MD USA
Global Precipitation Analyses at Time Scales of Monthly to 3-Hourly
Adler, Robert F., NASA Goddard Space Flight Center, USA; Huffman, George, Science Systems and Applications, Inc., USA; Curtis, Scott, NASA Goddard Space Flight Center, USA; Bolvin, David, Science Systems and Applications, Inc., USA; Nelkin, Eric, Science Systems and Applications, Inc., USA; [2002]; 1p; In English; EGS Meeting 2002, 21-26 Apr. 2002, Nice, France; No Copyright; Avail: Issuing Activity; Abstract Only

Global precipitation analysis covering the last few decades and the impact of the new TRMM precipitation observations are discussed. The 20+ year, monthly, globally complete precipitation analysis of the World Climate Research Program's (WCRP/GEWEX) Global Precipitation Climatology Project (GPCP) is used to explore global and regional variations and trends and is compared to the much shorter TRMM (Tropical Rainfall Measuring Mission) tropical data set. The GPCP data set shows no significant trend in precipitation over the twenty years, unlike the positive trend in global surface temperatures over the past century. Regional trends are also analyzed. A trend pattern that is a combination of both El Nino and La Nina precipitation features is evident in the Goodyear data set. This pattern is related to an increase with time in the number of combined months of El Nino and La Nina during the Goodyear period. Monthly anomalies of precipitation are related to ENRON variations with clear signals extending into middle and high latitudes of both hemispheres. The GPCP daily, 1 degree latitude-longitude analysis, which is available from January 1997 to the present is described and the evolution of precipitation patterns on this time scale related to El Nino and La Nina is described. Finally, a TRMM-based Based analysis is described that uses TRMM to calibrate polar-orbit microwave observations from SSM/I and geosynchronous OR observations and merges the various calibrated observations into a final, Baehr resolution map. This TRMM standard product will be available for the entire TRMM period (January Represent). A real-time version of this merged product is being produced and is available at 0.25 degree latitude-longitude resolution over the latitude range from 50 deg. N -50 deg. S. Examples will be shown, including its use in monitoring flood conditions.
Author
Climatology; Precipitation (Meteorology); Trmm Satellite; Remote Sensing; Annual Variations

20020061294 NASA Goddard Space Flight Center, Greenbelt, MD USA
Ensemble Canonical Correlation Prediction of Seasonal Precipitation Over the USA: Raising the Bar for Dynamical Model Forecasts
Lau, William K. M., NASA Goddard Space Flight Center, USA; Kim, Kyu-Myong, NASA Goddard Space Flight Center, USA; Shen, S. P., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; AMS Meeting, 13-17 Jan. 2001, Orlando, FL, USA; Sponsored by American Meteorological Society, USA
Report No.(s): Paper-27772; No Copyright; Avail: Issuing Activity; Abstract Only

This paper presents preliminary results of an ensemble canonical correlation (ECC) prediction scheme developed at the Climate and Radiation Branch, NASA/Goddard Space Flight Center for determining the potential predictability of regional precipitation, and for climate downscaling studies. The scheme is tested on seasonal hindcasts of anomalous precipitation over the continental USA using global sea surface temperature (SST) for 1951-2000. to maximize the forecast skill derived from SST, the world ocean is divided into non-overlapping sectors. The canonical SST modes for each sector are used as the predictor for the ensemble hindcasts. Results show that the ECC yields a substantial (10-25%) increase in prediction skills for all the regions of the US in every season compared to traditional CCA prediction schemes. For the boreal winter, the tropical Pacific contributes the largest potential predictability to precipitation in the southwestern and southeastern regions, while the North Pacific and the North Atlantic are responsible to the enhanced forecast skills in the Pacific Northwest, the northern Great Plains and Ohio Valley. Most importantly, the ECC increases skill for summertime precipitation prediction and substantially reduces the spring predictability barrier over all the regions of the US continent. Besides SST, the ECC is designed with the flexibility to include any number of predictor fields, such as soil moisture, snow cover and additional local observations. The enhanced ECC forecast skill provides a new benchmark for evaluating dynamical model forecasts.
Author
Precipitation (Meteorology); Dynamic Models; Weather Forecasting; Climatology; Annual Variations; USA

20020061380 NASA Goddard Space Flight Center, Greenbelt, MD USA

Mesoscale Convective Systems During SCSMEX: Simulations with a Regional Climate Model and a Cloud-Resolving Model

Tao, W. K., NASA Goddard Space Flight Center, USA; Wang, Y., Maryland Univ. Baltimore County, USA; Qian, J., Columbia Univ., USA; Shie, C. -L., Maryland Univ. Baltimore County, USA; Lau, W. K. -M., NASA Goddard Space Flight Center, USA; Kakar, R., NASA, USA; April 2002; 18p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The South China Sea Monsoon Experiment (SCSMEX) was conducted in May-June 1998. One of its major objectives is to better understand the key physical processes for the onset and evolution of the summer monsoon over Southeast Asia and southern China (Lau et al. 2000). Multiple observation platforms (e.g., soundings, Doppler radar, ships, wind seafarers, radiometers, etc.) during SCSMEX provided a first attempt at investigating the detailed characteristics of convection and circulation changes, associated with monsoons over the South China Sea region. SCSMEX also provided precipitation derived from atmospheric budgets (Johnson and Ciesielski 2002) and comparison to those obtained from the Tropical Rainfall Measuring Mission (TRMM). In this paper, a regional climate model and a cloud-resolving model are used to perform multi-day integrations to understand the precipitation processes associated with the summer monsoon over Southeast Asia and southern China. The regional climate model is used to understand the soil - precipitation interaction and feedback associated with a flood event that occurred in and around China's Atlantic River during SCSMEX. Sensitivity tests on various land surface models, cumulus parameterization schemes (CASE), sea surface temperature (SST) variations and midlatitude influences are also performed to understand the processes associated with the onset of the monsoon over the S. China Sea during SCSMEX. Cloud-resolving models (CRMs) use more sophisticated and physically realistic parameterizations of cloud microphysical processes with very fine spatial and temporal resolution. One of the major characteristics of CRMs is an explicit interaction between clouds, radiation and the land/ocean surface. It is for this reason that GEWEX (Global Energy and Water Cycle Experiment) has formed the GCSS (GEWEX Cloud System Study) expressly for the purpose of improving the representation of the moist processes in large-scale models using CRMs. The Goddard Cumulus Ensemble (GCE) model is a CRM and is used to simulate convective systems associated with the onset of the South China Sea monsoon in 1998. The BRUCE model includes the same land surface model, cloud physics, and radiation scheme used in the regional climate model. A comparison between the results from the GCE model and regional climate model is performed.

Author

Climate Models; Atmospheric Models; Monsoons; Mesoscale Phenomena; Convection Clouds; Thunderstorms; Seas; China

20020061684 NASA Goddard Space Flight Center, Greenbelt, MD USA

Large Forecast Centers Using TRMM Real-Time Data

Shepherd, James Marshall, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AAAS Annual Meeting, 14-15 Feb. 2002, Boston, MA, USA; Sponsored by American Association for the Advancement of Science, USA; No Copyright; Avail: Issuing Activity; Abstract Only

As a part of NASA's Earth System Enterprise, The Tropical Rainfall Measuring Mission (TRMM) seeks to understand the mechanisms through which changes in tropical rainfall influence global circulation. Over the past 3 years, TRMM has contributed significantly towards reducing uncertainty in satellite estimates of rainfall in the Tropics, where almost 67% of the Earth's rain falls. TRMM has provided knowledge related to the climatology, seasonality, and variation of tropical rainfall; the mesoscale structure of rain-producing systems, and the physics of precipitation. As with many NASA missions, however, TRMM has provided surprising new knowledge and insight in scientific areas ranging from hurricane diagnosis/prediction to weather forecasting. Examples of current and future plans for use of TRMM data by operational weather centers will be discussed.

Author

Climatology; Diagnosis; Information Systems; Rain; Weather Forecasting

20020061795 NASA Goddard Space Flight Center, Greenbelt, MD USA

Satellite Observation of Extremes in Precipitation

Adler, Robert F., NASA Goddard Space Flight Center, USA; Huffman, George, Science Systems and Applications, Inc., USA; Curtis, Scott, Science Systems and Applications, Inc., USA; Bolvin, David, Science Systems and Applications, Inc., USA; Nelkin, Eric, Maryland Univ., USA; [2002]; 1p; In English; AAAS Annual Meeting, 14-15 Feb. 2002, Boston, MA, USA; Sponsored by American Association for the Advancement of Science, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The 22 year, monthly, globally complete precipitation analysis of the World Climate Research Program's (WCRP/GEWEX) Global Precipitation Climatology Project (GPCP), the four year (1997-present) daily GPCP analysis and 3-hr semi-global analyses using Tropical Rainfall Measuring Mission (TRMM) data are used to study global and regional variations and trends during the 22 years and the shorter-time scale events that constitute those variations. The GPCP monthly data set shows no

significant trend in global precipitation over the twenty years, unlike the positive trend in global surface temperatures over the past century. In terms of regional trends 1979 to 2000 the tropics have a distribution of regional rainfall trends that has an ENSO-like pattern with features of both the El Nino and La Nina. This feature is related to a possible trend in the frequency of ENSO events (either El Nino or La Nina) over the past 20 years. Monthly anomalies of precipitation are related to ENSO variations with clear signals extending into middle and high latitudes of both hemispheres. The El Nino and La Nina mean anomalies are near mirror images of each other and when combined produce an ENSO signal with significant spatial continuity over large distances. A number of the features are shown to extend into high latitudes. Positive anomalies extend in the Southern Hemisphere (S.H.) from the Pacific southeastward across Chile and Argentina into the south Atlantic Ocean. In the Northern Hemisphere (N.H.) the counterpart feature extends across the southern U.S. and Atlantic Ocean into Europe. In the Southern Hemisphere an anomaly feature is shown to spiral into the Antarctica land mass. The extremes of ENSO-related anomalies are also examined and indicate that globally, during both El Nino and La Nina, more extremes of precipitation (both wet and dry) occur than during the ”neutral” regime, with the El Nino regime showing larger magnitudes. The distribution is different for the globe as a whole and when the area is restricted to just land. The data sets are also explored to monitor extremes in precipitation related to localized and regional flooding and the occurrence of droughts.
Author
Precipitation (Meteorology); Anomalies; Satellite Observation

20020061842 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Satellite-Based Multi-Channel Approach to Tropical Cyclone Intensity Estimation Using the AMSU Passive Microwave Sensor
Kabat, Brian W.; Jun. 25, 2002; 76p; In English; Original contains color images
Report No.(s): AD-A403227; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
In tropical cyclones, a strong inverse relationship exists between the magnitude of the upper-tropospheric warm anomaly (UTWA) and minimum sea level pressure (MSLP). Uniquely poised to capture this warming aloft, the Advanced Microwave Sounding Unit (AMSU) flown aboard current National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellites is capable of observing Tropical Cyclones (TC’s) worldwide. A physical/statistical MSLP estimation algorithm based on AMSU brightness temperature anomalies (dTbs) has been operating in an experimental mode at the University of Wisconsin Cooperative Institute for Meteorological Satellite Studies (UW-CIMSS) for two years. The algorithm relies on a single AMSU channel (54.9 GHz) and shows great promise as a viable TC analysis tool. However, the radiances can be susceptible to environmental variability leading to sub-sampling and errors in MSLP. The goal of this research is to improve the existing single-channel algorithm by introducing an additional channel (55.5 GHz) that seeks to capture the true magnitude of the UTWA in instances when the single channel fails. By implementing the multi-channel approach, the goal is to create an operationally viable satellite-based guidance tool to help support tropical forecast and analysis centers worldwide.
DTIC
Advanced Microwave Sounding Unit; Cyclones; Meteorological Satellites; Tropical Storms

20020061884 Northeast Consortium for Engineering Education, Port Royal, VA USA
Internal Waves Generated by a Vortex Pair *Interim Report*
Lapham, Gary S.; McHugh, John P.; Sep. 1999; 34p; In English
Contract(s)/Grant(s): F19628-98-C-0029; Proj-9993
Report No.(s): AD-A402957; AFRL-VS-TR-2002-1560; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Both observations and direct numerical simulations have shown that convecting storms create significant internal gravity wave activity. However, the physical mechanism for gravity wave generation is not clear. In this work, numerical simulations of a simple vortex model of convection have been performed for three different cases: a constant density case; a constant Brunt-Vasala frequency case: and a case with two layers, each with its own Brunt-Vasala frequency.
DTIC
Vortices; Gravity Waves; Direct Numerical Simulation

20020061932 Northeast Consortium for Engineering Education, Port Royal, VA USA
Cloud Scene Simulation Model (CSSM)
Triantafillou, SUSAn A.; Aug. 2000; 26p; In English
Contract(s)/Grant(s): F19628-98-C-0029; Proj-9993
Report No.(s): AD-A402757; AFRL-VS-TR-2002-1561; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The majority of the effort focused on fine tuning the Cloud Scene Simulation Model(CSSM). Support was also provided for the National Polar Orbiting Operational Environmental Satellite System (NPOESS) by determining NPOESS Environmental Data Records accuracy requirements.
DTIC
Mathematical Models; Computerized Simulation; Information Transfer; Atmospheric Models; Clouds (Meteorology)

48
OCEANOGRAPHY

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

20020060091 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Rapidly Declining Arctic Perennial Sea Ice Cover
Comiso, Josefino C., NASA Goddard Space Flight Center, USA; [2002]; 19p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The perennial sea ice cover in the Arctic is shown to be declining at -8.9 plus or minus 2.0% per decade, using 22 years of satellite data. A sustained decline at this rate would mean the disappearance of the multiyear ice cover during this century and drastic changes in the seasonal characteristics of the Arctic ice cover. An apparent increase in the fraction of second year ice in the 1990s is also inferred suggesting an overall thinning of the ice cover while co-registered satellite surface temperatures show a warming trend of 0.8 plus or minus 0.6 K per decade in summer and a good correlation with the perennial ice data.
Author
Arctic Regions; Sea Ice; Data Acquisition; Ocean Temperature

20020060726 NASA Goddard Space Flight Center, Greenbelt, MD USA
Arctic Sea Ice Export Through Fram Strait and Atmospheric Planetary Waves
Cavalieri, Donald J., NASA Goddard Space Flight Center, USA; [2001]; 15p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A link is found between the variability of Arctic sea ice export through Ram Strait and the phase of the longest atmospheric planetary wave (zonal wave 1) in SLP for the period 1958-1997. Previous studies have identified a link between From Strait ice export and the North Atlantic Oscillation (NAO), but this link has been described as unstable because of a lack of consistency over time scales longer than the last two decades. Inconsistent and low correlations are also found between From Strait ice export and the Arctic Oscillation (AD) index. This paper shows that the phase of zonal wave 1 explains 60% - 70% of the simulated From Strait ice export variance over the Goodyear period 1958 - 1997. Unlike the NAB and AD links, these high variances are consistent for both the first and second halves of the Goodyear period. This consistency is attributed to the sensitivity of the wave I phase at high latitudes to the presence of secondary low pressure systems in the Barents Sea that serve to drive sea ice southward through From Strait. These results provide further evidence that the phase of zonal wave 1 in SLP at high latitudes drives regional as well as hemispheric low frequency Arctic Ocean and sea ice variability.
Author
Arctic Ocean; Barents Sea; Sea Ice; Oscillations

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.

20020060777 NASA Ames Research Center, Moffett Field, CA USA
Hypersaline Microbial Mat Lipid Biomarkers
Jahnke, Linda L., NASA Ames Research Center, USA; Embaye, Tsegereda, Search for Extraterrestrial Intelligence Inst., USA; Turk, Kendra A., California Univ., USA; Summons, Roger E., Massachusetts Inst. of Tech., USA; Feb. 28, 2002; 1p; In English; 2nd Astrobiology Science Conference, 7-11 Apr. 2002, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 344-38-92-10; No Copyright; Avail: Issuing Activity; Abstract Only

Lipid biomarkers and compound specific isotopic abundances are powerful tools for studies of contemporary microbial ecosystems. Knowledge of the relationship of biomarkers to microbial physiology and community structure creates important links for understanding the nature of early organisms and paleoenvironments. Our recent work has focused on the hypersaline microbial mats in evaporation ponds at Guerrero Negro, Baja California Sur, Mexico. Specific biomarkers for diatoms, cyanobacteria, archaea, green nonsulfur (GNS), sulfate reducing, sulfur oxidizing and methanotrophic bacteria have been identified. Analyses of the ester-bound fatty acids indicate a highly diverse microbial community, dominated by photosynthetic organisms at the surface. The delta C-13 of cyanobacterial biomarkers such as the monomethylalkanes and hopanoids are consistent with the delta C-13 measured for bulk mat (-10%o), while a GNS biomarker, wax esters (WXE), suggests a more depleted delta C-13 for GNS biomass (-16%o). This isotopic relationship is different than that observed in mats at Octopus Spring, Yellowstone National Park (YSNP) where GNS appear to grow photoheterotrophic ally. WXE abundance, while relatively low, is most pronounced in an anaerobic zone just below the cyanobacterial layer. The WXE isotope composition at GN suggests that these bacteria utilize photoautotrophy incorporating dissolved inorganic carbon (DIC) via the 3-hydroxypropionate pathway using H2S or H2.
Author
Biomarkers; Esters; Fatty Acids; Bacteria; Carbon; Microorganisms

20020061287 NASA Ames Research Center, Moffett Field, CA USA
The Effect of Hindlimb Suspension on the Reproductive System of Young Male Rats
Tou, Janet, NASA Ames Research Center, USA; Grindeland, R., NASA Ames Research Center, USA; Baer, L., NASA Ames Research Center, USA; Guran, G., NASA Ames Research Center, USA; Fung, C., NASA Ames Research Center, USA; Wade, C., NASA Ames Research Center, USA; [2001]; 1p; In English; Experimental Biology 2002, 20-24 Apr. 2002, New Orleans, LA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Colonization of space requires the ability to reproduce in reduced gravity. Following spaceflight, astronauts and male rats exhibit decreased testosterone (T). This has important implications as T effects the testes and accessory sex glands. to our knowledge no studies have examined the effects of spaceflight on accessory sex glands. Due to the rarity of spaceflight opportunities, ground models have been used to simulate weightlessness. The objective of this study was to determine the effect of long-term (21 d) weightlessness on the reproductive system of male rats. Weightlessness was simulated using the Morey-Holton hindlimb suspension (HLS) model. Age 10 week old, male Sprague-Dawley rats weighing (209.0 +9.7g) were randomly assigned (n=10/group) to either HLS or ambulatory control. In HLS rats, testes mass was 33% lower (pis less than 0.05) than ambulatory controls. However, HLS had no effect on prostate (0.65 +0.09g vs 0.69 +0.12g) or seminal vesicles (1.01 +0.35g vs 0.75 +0.22g) weights compared to controls. The absence of effects on plasma T in this study contrasts previous reports of reduced plasma T in HLS male rats. This discrepancy may have been due to the age of animal and timing of sampling. T levels vary dramatically during testes development as well as within normal diurnal cycles. In young HLS rats, testes weight was reduced but not plasma T. Subsequently there was no effect on accessory sex glands. However, this may not be the case in older rats. More studies using standardized methods are needed to gain a better understanding of male reproduction function and capability in weightlessness. Funding provided by NASA.
Author
Reproductive Systems; Rats; Sex Glands; Weightlessness; Testes; Hindlimb Suspension

20020061699 NASA Ames Research Center, Moffett Field, CA USA
Three-Dimensional Analysis of Nuclear Size, Shape and Displacement in Clover Root Cap Statocytes from Space and a Clinostat
Smith, J.D., NASA Ames Research Center, USA; Todd, P. W., NASA Ames Research Center, USA; Staehelin, L. A., Colorado Univ., USA; Oct. 15, 1997; 1p; In English; 13th Annual American Society for Gravitational and Space Biology, 19-22 Nov. 1997, Washington, DC, USA; Sponsored by American Society for Gravitational and Space Biology, USA
Contract(s)/Grant(s): RTOP 199-97-62-15; No Copyright; Avail: Issuing Activity; Abstract Only

Under normal (l-g) conditions the statocytes of root caps have a characteristic polarity with the nucleus in tight association with the proximal cell wall; but, in altered gravity environments including microgravity (mu-g) and the clinostat (c-g) movement of the nucleus away from the proximal cell wall is not uncommon. to further understand the cause of gravity-dependent nuclear displacement in statocytes, three-dimensional cell reconstruction techniques were used to precisely measure the volumes, shapes, and positions of nuclei in white clover (Trifolium repens) flown in space and rotated on a clinostat. Seeds were germinated and grown for 72 hours aboard the Space Shuttle (STS-63) in the Fluid Processing Apparatus (BioServe Space Technologies, Univ. of Colorado, Boulder). Clinorotation experiments were performed on a two-axis clinostat (BioServe). Computer reconstruction of selected groups of statocytes were made from serial sections (0.5 microns thick) using the ROSS (Reconstruction Of Serial

Sections) software package (Biocomputation Center, NASA Ames Research Center). Nuclei were significantly displaced from the tops of cells in mu-g (4.2 +/- 1.0 microns) and c-g (4.9 +/- 1.4 microns) when compared to l-g controls (3.4 +/- 0.8 gm); but, nuclear volume (113 +/- 36 cu microns, 127 +/- 32 cu microns and 125 +/- 28 cu microns for l-g, mu-g and c-g respectively) and the ratio of nuclear volume to cell volume (4.310.7%, 4.211.0% and 4.911.4% respectively) were not significantly dependent on gravity treatment (ANOVA; alpha = 0.05). Three-dimensional analysis of nuclear shape and proximity to the cell wall, however, showed that nuclei from l-g controls appeared ellipsoidal while those from space and the clinostat were more spherically shaped. This change in nuclear shape may be responsible for its displacement under altered gravity conditions. Since the cytoskeleton is known to affect nuclear polarity in root cap statocytes, those same cytoskeletal elements could also control nuclear shape. This alteration in nuclear shape and position in mu-g and c-g when compared to l-g may lead to functional differences in the gravity signaling systems of plants subjected to altered gravity environments.
Author
Cells (Biology); Nuclei (Cytology); Gravitational Effects; Plants (Botany); Microgravity; Spaceborne Experiments

20020061836 NASA Glenn Research Center, Cleveland, OH USA
Polarimetric Glucose Sensing Using Brewster Reflection off of Eye Lens: Theoretical Analysis
Boeckle, Stefan, Brescia Univ., Italy; Rovati, Luigi, Brescia Univ., Italy; Ansari, Rafat R., NASA Glenn Research Center, USA; March 2002; 8p; In English; Photonics West, 19-25 Jan. 2002, San Jose, CA, USA; Sponsored by International Society for Optical Engineering, USA
Contract(s)/Grant(s): RTOP 101-51-00
Report No.(s): NASA/TM-2002-211354; NAS 1.15:211354; E-13172; SPIE-4624-24; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An important task of in vivo polarimetric glucose sensing is to find an appropriate way to optically access the aqueous humor of the human eye. In this paper two different approaches are analyzed theoretically and applied to the eye model of Le Grand. First approach is the tangential path of Cote, et al. (G.L. Cot6, M.D. Fox, and R.B. Northrop: Noninvasive Optical Polarimetric Glucose Sensing Using a True Phase Measurement Technique. IEEE Transactions on Biomedical Engineering, vol. 39, no. 7, pp. 752-756, 1992.) and the second is a new scheme of this paper of applying Brewster reflection off the eye lens.
Author
Detection; Eye (Anatomy); Glucose; Polarimetry

20020061960 Defence Research and Development Canada, Ottawa, Ontario Canada
Part I: Development of an Animal Model to Investigate the 2D and 3D High Image Resolution Ultrasonic Technology Using Synthetic Aperture and Adaptive Beamformers
Suntres, Zacharias E.; Stergiopoulos, Stergios; Apr. 2002; 24p; In English
Report No.(s): AD-A402634; DRDC-T-TR-2002-023; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In recent years, it has been demonstrated that the current ultrasound imaging system may be unreliable due to its poor imaging quality; in several instances, it lacks clarity, specificity, resolution, and sensitivity. These disadvantages have negative consequences when diagnosing patients, since false-positive or false-negative results are sometimes inevitable. It is therefore of great importance to design a new ultrasound imaging system that is able to enhance the images provided by the current technology and subsequently prevent chances for misdiagnosis. An animal model of organ injuries has been established where the current technology in ultrasonography will be tested and compared to the newly developed 3-D ultrasound technology. For this, the effect of lipopolysaccharide (LPS), a bacterial cell wall component, on the lung, liver, and kidney organs of rabbits was examined. Administration of LPS to animals was more or less injurious to all organs examined as evidenced by an increase in organ weights. In addition, a significant increase in lipid peroxidation as well as reduction in glutathione levels in tissue homogenates, confirmed the involvement of oxidative stress as a major mechanism of LPS-induced tissue injury. In conclusion, LPS administration to rabbits appears to produce a good animal model in obtaining images of normal and injured organs that will be used to validate the diagnostic superiority of the 3D ultrasound technology over the existing technologies.
DTIC
Ultrasonics; Organs; Membranes; Imaging Techniques; Glutathione; Bacteria; Cell Membranes (Biology)

20020061965 Spaceflight Control Center, Russia
Space Biology: Studies at Orbital Stations
Nechitailo, Galina, Spaceflight Control Center, Russia; Mashinsky, Alexander, Institute of Biomedical Problems, USSR; [1996]; In English; Copyright; Avail: Issuing Activity

Human access to space is possible through extensive research during spaceflights. The impressive programs of the Soviet Union, US, and other countries use space engineering as a springboard to the exploration and civilian exploitation of space. Increasing contributions of space science to global economic demands have been made in various communication technologies, in industries and transport, the production of new materials, and pharmacological agents in space. An efficient program of space development is also desirable politically as a boost towards membership of the international space club, membership now obtained by many developing nations.
Derived from text
Space Flight; Aerospace Engineering; Exobiology

20020061973 NASA Ames Research Center, Moffett Field, CA USA
SSBRP User Operations Facility (UOF) Overview and Development Strategy
Picinich, Lou, NASA Ames Research Center, USA; Stone, Thom, NASA Ames Research Center, USA; Sun, Charles, NASA Ames Research Center, USA; Windrem, May, NASA Ames Research Center, USA; Jul. 01, 1995; 8p; In English
Contract(s)/Grant(s): NAS2-14263
Report No.(s): Rept-5c015; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This paper will present the Space Station Biological Research Project (SSBRP) User Operations Facility (UOF) architecture and development strategy. A major element of the UOF at NASA Ames Research Center, the Communication and Data System (CDS) will be the primary focus of the discussions. CDS operational, telescience, security, and development objectives will be discussed along with CDS implementation strategy. The implementation strategy discussions will include: Object Oriented Analysis & Design, System & Software Prototyping, and Technology Utilization. A CDS design overview that includes: CDS Context Diagram, CDS Architecture, Object Models, Use Cases, and User Interfaces will also be presented. CDS development brings together ”cutting edge” technologies and techniques such as: object oriented development, network security, multimedia networking, web-based data distribution, JAVA, and graphical user interfaces. Use of these ”cutting edge” technologies and techniques translates directly to lower development and operations costs.
Author
International Space Station; Communication Networks; Data Systems; Architecture (Computers); Technology Utilization

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.

20020060741 NASA Ames Research Center, Moffett Field, CA USA
Effect of 3-Day Bed Rest on the Basal Sympathetic Activity and Responsiveness of this System to Physiological Stimuli In Athletes and Sedentary Subjects
Smorawinski, Jerzy, Academy of Physical Education, Poland; Adrian, Jacek, Academy of Physical Education, Poland; Kaciuba-Uscilko, Hanna, Polish Academy of Sciences, Poland; Nazar, Krystyna, Polish Academy of Sciences, Poland; Greenleaf, John E., NASA Ames Research Center, USA; [2002]; 1p; In English; European Space Agency Life Sciences Symposium 2002, 2002, Stockholm, Sweden; No Copyright; Avail: Issuing Activity; Abstract Only
The aims of this study were: (1) to examine the effect of three days of bed rest (BR) on basal plasma epinephrine [E] and norepinephrine [NE] and the catecholamine responses to various physiological stimuli, and (2) to find out whether previous physical activity modifies effects of BR. In the first series, 29 young men (11 sedentary students, 8 endurance and 10 strength trained athletes) were submitted to oral glucose tolerance test in supine position and to active orthostatic test before and after 3 days of BR. Plasma [E] and [NE] were measured after overnight fast (basal condition), at 60, 120 and 180 min after glucose ingestion (70 a), and at the 8th min of unsupported standing. In the second series, other 22 subjects (12 sedentary students, 10 endurance and 10 strength trained athletes) were submitted to 2 min cold pressor test (CPT) and exercise. Plasma E and NE were determined in the supine position after overnight fast and at 60th and 120th s of hand cooling. Then, after breakfast followed by 2-3 hour sitting, the subjects performed cycle ergometer exercise with workload increasing until volitional exhaustion. Plasma [E] and [NE] were determined at the end of each load. Plasma catecholamines were determined made radioenzymatically. After BR, basal plasma [NE] was decreased in endurance and strength athletes (pis less than 0.01) but not in sedentary subjects. In neither group BR affected the basal [E]. Responses of both catecholamines to glucose load were diminished after BR in all three groups (pis less than 0.05) but the effect was most pronounced in the endurance athletes. All subjects tolerated well 8-min standing

although their heart rate response was increased after BR. Plasma catecholamine responses standing were not significantly affected by BR in either group but the plasma [NE] and [E] during standing were lowered after BR in endurance athletes (pis less than 0.01). BR did not affect blood pressure and catecholamine responses to CPT. The pre- and post-exercise plasma catecholamines were similar before and after BR although the subjects achieved lower maximal loads after BR. In endurance athletes the threshold for plasma NA rise occurred at lower work intensity after than before BR (pis less than 0.05).
Author
Bed Rest; Sympathetic Nervous System; Physiological Responses; Plasmas (Physics); Exhaustion; Activity (Biology)

20020060743 NASA Ames Research Center, Moffett Field, CA USA
The Semicircular Canal Microphonic
Rabbitt, R. D., NASA Ames Research Center, USA; Boyle, R., NASA Ames Research Center, USA; Highstein, S. M., NASA Ames Research Center, USA; [2002]; 1p; In English; Association for Research in Otolaryngology, 2002, Unknown; Sponsored by Association for Research in Otolaryngology, USA
Contract(s)/Grant(s): NIH-NIDCD-PO1-DC-01837; No Copyright; Avail: Issuing Activity; Abstract Only
Present experiments were designed to quantify the alternating current (AC) component of the semicircular canal microphonic for angular motion stimulation as a function of stimulus frequency and amplitude. The oyster toadfish, Opsanus tau, was used as the experimental model. Calibrated mechanical indentation of the horizontal canal duct was used as a stimulus to generate hair-cell and afferent responses reproducing those present during head rotation. Sensitivity to polarization of the endolymph DC voltage re: perilymph was also investigated. Modulation of endolymph voltage was recorded using conventional glass electrodes and lock-in amplification over the frequency range 0.2-80 Hz. Access to the endolymph for inserting voltage recording and current passing electrodes was obtained by sectioning the anterior canal at its apex and isolating the cut ends in air. For sinusoidal stimulation below approx.10 Hz, the horizontal semicircular canal AC microphonic was nearly independent of stimulus frequency and equal to approximately 4 microV per micron indent (equivalent to approx. 1 microV per deg/s). A saturating nonlinearity decreasing the microphonic gain was present for stimuli exceeding approx.3 micron indent (approx. 12 deg/s angular velocity). The phase was not sensitive to the saturating nonlinearity. The microphonic exhibited a resonance near 30Hz consistent with basolateral current hair cell resonance observed previously in voltage-clamp records from semicircular canal hair cells. The magnitude and phase of the microphonic exhibited sensitivity to endolymphatic polarization consistent with electro-chemical reversal of hair cell transduction currents.
Author
Alternating Current; Amplification; Electric Potential; Semicircular Canals; Frequency Ranges

20020061907 Institute for Human Factors TNO, Soesterberg, Netherlands
Tests of the Dynamic Visual System *Final Report Keuring van het Dynamisch Gezichtsvermogen*
Toet, A., Institute for Human Factors TNO, Netherlands; Bos, J. E., Institute for Human Factors TNO, Netherlands; Feb. 20, 2002; 27p; In Dutch
Contract(s)/Grant(s): 013.31426; TNO Proj. 786.1
Report No.(s): TD-2001-0365; TNO-TM-02-A008; Copyright; Avail: Issuing Activity
Visual tests for aviators and pilots mainly address the perception of static scenes. On behalf of the Royal Netherlands Air Force TNO-HF investigated: 1. whether limits of dynamic vision co-determinate aviator performance. 2 Whether restrictions of dynamic vision indeed occur in the aviator population. 3. Whether it is possible to mitigate or eliminate relevant shortcomings of the dynamic visual system by training. A literature study and interviews with aeromedical physicians were performed to investigate the abovementioned issues.
Derived from text
Visual Control; Aircraft Pilots; Dynamic Tests; Human Performance

20020061936 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Motion Sickness Literature Search *Final Report*
Burcham, Patricia M.; May 2002; 57p; In English; Original contains color images
Report No.(s): AD-A402963; ARL-MR-504; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A review of the literature about motion-induced cognitive and perceptual decrements and about motion sickness was conducted to identify screening methods and mitigation techniques and to gain estimates of the portion of population affected.

Screening and mitigation techniques that show promise for indirect driving will be evaluated in imminent laboratory and field experiments.
DTIC
Motion Sickness; Personnel Selection

20020061975 Netherlands Aeromedical Inst., Soesterberg, Netherlands
Allergic Diseases in Pilots of the Royal Netherlands Air Force ***Final Report***
Brouwers, M. J. A., Netherlands Aeromedical Inst., Netherlands; Simons, M., Netherlands Aeromedical Inst., Netherlands; Krol, J. R., Netherlands Aeromedical Inst., Netherlands; February 2002; 26p; In English
Contract(s)/Grant(s): A01/KLu/144
Report No.(s): TD-2002-0084; TNO-2002-K1; Copyright; Avail: Issuing Activity

A review was performed of the literature regarding the epidemiology of allergic diseases, the most important caUSAl allergens, taking into account occupational exposure, and the predictive values of the used skin prick test, nasal and bronchial challenge test. For this purpose medicine was used. It was concluded that careful history taking and skin prick tests are still the fundamentals of allergy screening as there is no 'golden standard' test for the screening of allergy. The hostile aerospace environment, namely higher levels of ozone, dry air, air pollutants, and breathing pure oxygen during missions, might put pilots at increased risk as these factors prime the mucosa of the respiratory tract for true allergens, like pollens, house dust mite and animal danger. Western lifestyle and air pollution are the most important caUSAtive factors for the increase in allergic diseases worldwide. Pilots are at increased risk for developing an allergic disorder of the respiratory tract and therefore allergic individuals should be turned down from the airforce. The current screening methods still meet today's standards for military screening purposes. It is recommended to: 1. Emphasize the importance of accurate history taking, including family history. 2. Extend the number of allergens in initial skin prick test with tree and weed pollens, cat and dog danger, in addition to grass pollens and house dust mite. 3. Further investigate the symptoms of allergic rhinitis and asthmatic complaints among pilots.
Author
Aerospace Environments; Allergic Diseases; Dust; Exposure; Hazards

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BEHAVIORAL SCIENCES

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

20020059648 NASA Ames Research Center, Moffett Field, CA USA
Simulating Activities: Relating Motives, Deliberation and Attentive Coordination
Clancey, William J., NASA Ames Research Center, USA; [2002]; 36p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Activities are located behaviors, taking time, conceived as socially meaningful, and usually involving interaction with tools and the environment. In modeling human cognition as a form of problem solving (goal-directed search and operator sequencing), cognitive science researchers have not adequately studied "off-task" activities (e.g., waiting), non-intellectual motives (e.g., hunger), sustaining a goal state (e.g., playful interaction), and coupled perceptual-motor dynamics (e.g., following someone). These aspects of human behavior have been considered in bits and pieces in past research, identified as scripts, human factors, behavior settings, ensemble, flow experience, and situated action. More broadly, activity theory provides a comprehensive framework relating motives, goals, and operations. This paper ties these ideas together, using examples from work life in a Canadian High Arctic research station. The emphasis is on simulating human behavior as it naturally occurs, such that "working" is understood as an aspect of living. The result is a synthesis of previously unrelated analytic perspectives and a broader appreciation of the nature of human cognition. Simulating activities in this comprehensive way is useful for understanding work practice, promoting learning, and designing better tools, including human-robot systems.
Author
Human Behavior; Cognition; Problem Solving; Simulation

20020060063 National Defence Research Establishment, Linkoeping, Sweden
Game and Entertainment Technology for Distributed Training) ***Spel och Underhallningsteknologi foer Distribuerat Laerande***
Soederberg, H.; Kylesten, B.; September 2001; 34p; In Swedish
Report No.(s): PB2002-106067; FOI-R-0210-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the study was to create a basic report concerning if game- and entertainment-technology in support for training and education could be an interesting research area. The background was a project proposal with the name 'Game-and Entertainment-Technology in support for advanced distributed training,' that was sent to FOI's independent research council. The proposal was considered to be relevant and therefore received funds to continue the preparation of a basic report. The report begins with a description of how game- and entertainment-technology today are used in different defense forces, mainly USA and DoD, but also in civilian areas. There are some suggestions made of how this technology can be used within the Swedish Armed Forces and which prototypes that could be developed, which is followed by a discussion concerning evaluation and comparison between game- and entertainment-technology and existing technology for training and education performed. Finally, there are some suggestions made of which kind of training, education and research that is possible to perform with this type of consumer technology.
NTIS
Military Technology; Game Theory; Computer Techniques; Education

20020061362 NASA Ames Research Center, Moffett Field, CA USA
Testing Models for Perceptual Discrimination Using Repeatable Noise
Ahumada, Albert J., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English; Twenty First European Conference on Visual Perception, 24-28 Aug. 1998, Oxford, UK
Contract(s)/Grant(s): RTOP 505-65-53; No Copyright; Avail: Issuing Activity; Abstract Only
Adding noise to stimuli to be discriminated allows estimation of observer classification functions based on the correlation between observer responses and relevant features of the noisy stimuli. Examples will be presented of stimulus features that are found in auditory tone detection and visual Vernier acuity. Using the standard signal detection model (Thurstone scaling), we derive formulas to estimate the proportion of the observer's decision variable variance that is controlled by the added noise. One is based on the probability of agreement of the observer with him/herself on trials with the same noise sample. Another is based on the relative performance of the observer and the model. When these do not agree, the model can be rejected. A second derivation gives the probability of agreement of observer and model when the observer follows the model except for internal noise. Agreement significantly less than this amount allows rejection of the model.
Author
Auditory Perception; Correlation; Noise (Sound); Visual Acuity

20020061372 NASA Ames Research Center, Moffett Field, CA USA
Masking by Gratings Predicted by an Image Sequence Discriminating Model: Testing Models for Perceptual Discrimination Using Repeatable Noise
Ahumada, Albert J., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English; Twenty-First European Conference on Visual Perception, 24-28 Aug. 1998, Oxford, UK
Contract(s)/Grant(s): RTOP 548-50-12; No Copyright; Avail: Issuing Activity; Abstract Only
Adding noise to stimuli to be discriminated allows estimation of observer classification functions based on the correlation between observer responses and relevant features of the noisy stimuli. Examples will be presented of stimulus features that are found in auditory tone detection and visual vernier acuity. using the standard signal detection model (Thurstone scaling), we derive formulas to estimate the proportion of the observers decision variable variance that is controlled by the added noise. one is based on the probability of agreement of the observer with him/herself on trials with the same noise sample. Another is based on the relative performance of the observer and the model. When these do not agree, the model can be rejected. A second derivation gives the probability of agreement of observer and model when the observer follows the model except for internal noise. Agreement significantly less than this amount allows rejection of the model.
Author
Auditory Perception; Noise (Sound); Spatial Distribution; Visual Acuity; Probability Theory; Correlation

20020061840 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Modeling Indirect Vision Driving With Fixed Flat Panel Displays: Task Performance and Mental Workload ***Final Report***
Smyth, Christopher C.; May 2002; 89p; In English; Original contains color images
Report No.(s): AD-A403232; ARL-TR-2701; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The relation between mental workload and situational awareness and the effects on vehicle performance are of interest to designers of future combat ground vehicles. In this report, a micro-state task time line analysis of attention workload is used to describe a model of driving performance and mental workload for indirect vision driving. The model is based on the results of a field study in which a military vehicle was driven with flat panel, liquid crystal displays fixed in the cab and a forward viewing

monocular camera array mounted on the front roof. The task load times for the model are calculated with a mathematical equation for vehicle speed as a function of the camera field of view. The vehicle speed equation is derived with consideration given to the effects of scene compression on the informational needs of the driver in a self-paced task. An analysis shows that the task performance and mental workload are separable for the short course runs used in the field study. The effect of indirect vision driving on mental workload is determined from the subjective ratings of perceived task loading that were reported in the field study. Along with the perceived workload, the study participants rated the mental measures of task allocated attention, situational awareness, motion sickness, and subjective stress. Because of collinearity, the perceived workload is regressed on the factorial components of a cognitive loading space derived from a factorial analysis of the mental measures. Following rotation to a 'skills-rules-knowledge' cognitive processing space derived from the clustering of the measures, the perceived workload is shown to be a function of the skills and rule-based components. On this basis, a micro-state time line model is proposed for the task information processing.
DTIC
Flat Panel Displays; Mental Performance; Workloads (Psychophysiology); Vision; Mathematical Models

20020061979 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Cognitive Performance: Literature Overview of Nutritional Factors *Final Report Literatuuroverzicht en Kennisnetwerk: Voedingscomponenten en Cognitie*
Voorrips, L. E., Institute for Nutrition and Food Research TNO, Netherlands; vanDusseldorp, M., Institute for Nutrition and Food Research TNO, Netherlands; January 2002; 42p; In Dutch
Contract(s)/Grant(s): A01/KL/118; TNO Proj. 22014/01.01
Report No.(s): TD-2002-0083; V4492; Copyright; Avail: Issuing Activity
In certain military settings, heavy demands are made on someone's cognitive abilities such as vigilance, concentration, memory and reaction time. Several aspects of cognitive performance may be influenced by nutrition. Using computerized databases of recent literature, an overview has been made of the most important nutritional factors that show a relationship with cognitive abilities. Some effects such as the improvement of alertness, reaction time and memory after caffeine consumption may have direct implications for use. Other substances such as glucose, Ginkgo biloba, taurine, tyrosine, and tryptophan have interesting effects on cognitive performance but neural tailor-made research to generate results suitable in the military setting. Apart from the literature review, an inventory has been made of the network of institutions and specialists, within TNO and the Ministry of Defense that have their focus in the field of cognitive functioning. In the final part of the report a synthesis is presented of the main findings of the study and suggestions for further research and implementation are given. The extent to which nutritional components can improve the military performance will be the deciding factor for further research.
Author
Nutrition; Mental Performance; Alertness; Glucose; Tyrosine; Tryptophan; Reaction Time

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20020060125 San Jose State Univ., Moffett Field, CA USA
Context in Models of Human-Machine Systems
Callantine, Todd J., San Jose State Univ., USA; Jun. 30, 1998; 6p; In English; 7th IFAC/IFIP/IFORS/IEA Symposium, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
All human-machine systems models represent context. This paper proposes a theory of context through which models may be usefully related and integrated for design. The paper presents examples of context representation in various models, describes an application to developing models for the Crew Activity Tracking System (CATS), and advances context as a foundation for integrated design of complex dynamic systems.
Author
Man Machine Systems; Context; Dynamic Models; Systems Engineering; Complex Systems

20020061375 NASA Ames Research Center, Moffett Field, CA USA
Methodology for Examining the Operator and the System Concurrently: Pilot Interaction with Automation
Austin, David, NASA Ames Research Center, USA; Degani, Asaf, NASA Ames Research Center, USA; Heymann, Michael,

NASA Ames Research Center, USA; Moodi, Mike, Boeing Commercial Airplane Co., USA; [1998]; 1p; In English; 10th Symposium on Aviation Psychology, 2-7 May 1999, Columbus, OH, USA
Contract(s)/Grant(s): NCC2-798; No Copyright; Avail: Issuing Activity; Abstract Only

Complex system description is problematic when considering operator task activities interacting with system dynamics. Engineering languages have matured sufficiently to allow machine system description at various levels of depth and breadth but without operator synergy. Concurrently, Task Analysis methods have evolved along diverse lines enabling a description of the operator in the system from various paradigms but not describing the system. A void exists when attempting to view the system and the operator in the same plane. We propose a methodology employing descriptive languages from different domains viewed in a single dimension. Finite Automata (FA) languages describe the machine system in the proposed approach. Operator task specifications, a form of task analysis output, examine the operator activities within the system. Operator task specifications were then selected for discrete task activities and overlaid on the system description to examine operator inputs and subsequently view system responses. Unexpected (surprise) and undesirable system behavior was expected to emerge from this analysis. In this paper we shall first describe the methodology and show how the two perspectives, machine model and operator task specifications are integrated. Following we describe the process of doing such analysis using an example from cockpit automation. The methodology was employed in the analysis of a new function that was added to an existing automatic flight control system. We begin by defining a flight scenario involving all aspects of pilot interaction with the new function. Then, we proceed to develop a basic model of the machine behavior, in the context of pilot actions. Finally we superimpose the operator task specification on the machine model and perform the analysis. The proposed methodology may have broad appeal to system designers and human factors specialists. A common language for engineers of diverse domains is a strong point of this approach. Systems engineers may not fully understand operational considerations and human limitations, and human factors specialists may not be exposed to the full extent of system behavior. We hope the proposed methodology is adopted by both disciplines and in the process each assimilates a common language to address potential shortcomings of either approach separately.
Author
Human Factors Engineering; Operator Performance; Man Machine Systems; Pilot Performance

20020061879 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
Helmet-Mounted Tracker and Display (HMT/D) Inferfaces Developing a ”Standardized” Helmet-Vehicle Interface (HVI) ***Final Report, Sep. 1990-Sep 2000***
Kocian, Dean F.; Sep. 2000; 23p; In English
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A402770; AFRL-HE-WP-TR-2002-0105; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The successful integration of technology and human factors meets its ultimate challenge in the area of military performance. Nowhere are the stakes so high and the competition so rigorous as in the arena of combat. This paper documents the attempt to define, develop, and test a ’standardized’ interface for helmet-mounted tracker and displays aircraft. The design that has been evolved is based upon active use and refinement in an environment that is as close to combat conditions as resources permit. Many of the design ideas and lessons-learned covered in this paper came either directly or indirectly from pilots and support personnel of the USAF 422 Test and Evaluations Squadron located at Nellis AFB NV.
DTIC
Helmet Mounted Displays; Pilots (Personnel); Competition; Combat

20020061963 Human Systems Information Analysis Center, Wright-Patterson AFB, OH USA
Cost Benefit Analysis: Cost Benefit Analysis for Human Effectiveness Research: Bioacoustic Protection ***Final Report***
Rench, Michael E.; Johnson, Sharon; Sanders, Thomas; Jul. 21, 2001; 43p; In English; Original contains color images
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A402647; HSIAC-TR-2001-014; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Human Systems IAC was asked to perform a cost benefit analysis on replacing the fielded Army aircrew ensemble of clothing and individual equipment and nuclear, chemical, and biological protection with the Air Warrior system. A standard eight-step process was used to identify both the costs and benefits associated with the Army’s system approach to address positive and negative elements of the fielded system and the Army’s MANPRINT initiative. The least effective alternative with respect to benefits was the Legacy system (112). The most effective system was Air Warrior Blocks 1, 2, and 3 (993), with Air Warrior Block 1 falling in the middle (474). When the costs are added to the benefits, the cost benefit ratios show that Air Warrior Blocks 1, 2, and 3 with a cost/ benefit ratio (CBR) of 814, is the preferred alternative with respect to the defined goals. With the information available, it costs more than the least preferred alternative, the legacy system (CBR of 4,170), but provides greater than 300% increase in benefits. The CBR for Block 1 (1,499) fell in the middle. Both its costs and benefits are greater than the legacy system

and less than the fully fielded Blocks 1-3, making it a viable program option, but not as desirable as Air Warrior Blocks 1, 2, and 3. This report is based on the costs received. As costs are determined, the results may change significantly.
DTIC
Cost Analysis; Ear Protectors; Cost Effectiveness

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EXOBIOLOGY

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

20020060744 NASA Ames Research Center, Moffett Field, CA USA
Astrobiology
DesMarais, David, NASA Ames Research Center, USA; [2002]; 1p; In English; Burpee Museum's Paleo Festival, 22-24 Feb. 2002, Rockford, IL, USA
Contract(s)/Grant(s): RTOP 344-50-92-02; No Copyright; Avail: Issuing Activity; Abstract Only

Astrobiology is the study of the origins, evolution and distribution of life in the universe. It provides a biological perspective to many areas of NASA research, linking such endeavors as the search for habitable planets beyond our solar system, exploration missions to Mars and Europa, and efforts to understand the origin and early evolution of life. Astrobiology addresses three fundamental questions: How does life begin and develop? Does life exist elsewhere in the universe What is the future of life on Earth and beyond? This talk will address our concepts about the definition of life, how life might have begun, and how our blaspheme and planet have co-evolved for billions of years. The talk will explore how the perspectives gained from interdisciplinary research in the biological, geological and space sciences will prepare us to search for habitable environments and blasphemes elsewhere in the Universe.
Author
Life Sciences; Biological Evolution; Aerospace Engineering; Exobiology

20020060745 Search for Extraterrestrial Intelligence Inst., Center for the Study of Life in the Universe, Mountain View, CA USA
Identification, Characterization, and Exploration of Environments for Life on Mars ***Final Report, 1 Sep. 2000 - 28 Feb. 2002***
Acevedo, Sara E., Search for Extraterrestrial Intelligence Inst., USA; Jun. 28, 2002; 4p; In English
Contract(s)/Grant(s): NCC2-1064; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A bibliography (18 references) listing the publications during the current grant period of The Center for the Study of Life in the Universe, part of the SETI (Search for Extraterrestrial Intelligence) Institute is presented. The publications, from the Period of Performance September 1, 2000 to February 28, 2002, primarily cover Mars and its potential for life, as well as extreme environments and primitive life forms on Earth. One of the publications covers Europa and the Galileo spacecraft.
CASI
Mars (Planet); Exobiology; Bibliographies

20020061364 NASA Ames Research Center, Moffett Field, CA USA
Occurrence and Forms of Water and Ice on the Earth and Beyond, and the Origin(s) of Life
Blake, David F., NASA Ames Research Center, USA; [1998]; 24p; In English; ISOPOW 7 Symposium, Helsinki, Finland
Contract(s)/Grant(s): RTOP 344-38-12; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The natural history of the biogenic elements (H,C,O,N) from their first association within cold molecular clouds to their delivery to the Earth during the late bombardment of the inner solar system, is intimately linked to water ice. The earliest organic compounds are formed in cold interstellar molecular clouds as a result of UV and thermal processing of sub-micrometer ice grains which contain trapped carbon and nitrogen molecules. Structural changes in the water ice host underlie and fundamentally control important macroscopic phenomena such as the outgassing of volatiles, the rates of chemical reactions, and processing and retention of organic compounds. Prebiotic organic material was in all likelihood delivered the early Earth in a pristine state as a consequence of its sequestration within a protective water ice host.
Author
Extraterrestrial Life; Exobiology; Organic Compounds; Ice; Earth Surface

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

20020059641 Swedish Defence Research Establishment, Div. of Systems Technology, Stockholm, Sweden
Domain Truncation in the Finite-Difference Time-Domain Method for Maxwell's Equations in Seawater
Johansson, S., Swedish Defence Research Establishment, Sweden; Mar. 2001; 38p; In English
Report No.(s): PB2002-104448; FOI-R-0090-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of the thesis was to implement the Finite-Difference Time-Domain (FDTD) method for low frequency electromagnetic wave propagation in seawater. One specific problem has been the truncation of the computational domain at the air-sea surface. For this purpose I have developed and tested an impedance boundary condition (IBC), which simulates the influence and air space. By the use of this IBC you only need numerical values from the water volume. For validation of my code I have used NLAYER, a solver for electromagnetic wave propagation for horizontally stratified media developed at FOI. I found that the IBC at the air/water boundary gave good results if the computational box was big enough. Another condition was that the receivers cannot be placed too close to the source.
NTIS
Finite Difference Time Domain Method; Sea Water; Maxwell Equation; Electromagnetic Wave Transmission

20020060064 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Chern Numbers of Ample Vector Bundles on Toric Surfaces
Di Rocco, S.; Sommese, A. J.; November 1999; 22p; In English
Report No.(s): PB2002-104992; TRITA-MAT-99-MA-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Let E be an ample rank r bundle on a smooth projective surface, S, whose topological Euler and characteristic is e(S). In this article, we prove a number of surprisingly strong lower bounds for c1(E) to the second power and c2(E).
NTIS
Vectors (Mathematics); Topology; Number Theory

20020060085 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Local Geometric Properties of Real Submanifolds in Complex Space
Baouendi, M. S.; Ebenfelt, P.; Preiss Rothschild, L.; November 1999; 36p; In English
Report No.(s): PB2002-104990; TRITA-MAT-1999-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A fundamental theorem in the theory of one complex variable is the Riemann mapping theorem which asserts that any proper simply connected domain omega in the complex plane is biholomorphically equivalent to the unit disk, i.e. there exists an invertible holomorphic mapping sending omega onto the unit disk. Moreover, it is a classical result that if omega has a smooth C(sup infinity) boundary, then the mapping extends smoothly to the boundary aloha omega. Similarly, if aloha omega is real-analytic, then the mapping extends holomorphically to an open neighborhood of straight line over omega, the closure of omega. The classification (up to biholomorphic equivalence) of domains in C(sup N), N greater than or = 2, is much more complicated. Already early in the 20th century, Poincare (Po 1907) showed that the bidisk is not biholomorphically equivalent to the unit ball in C(sup 2), even though both are bounded domains which are diffeomorphic to each other (and even real analytically equivalent). It was also known to him that two domains, chosen at random in a class of bounded diffeomorphic domains, are very unlikely to be biholomorphically equivalent.
NTIS
Complex Variables; Analytic Functions; Riemann Manifold; Geometry

20020060144 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Polarized Surfaces of Low Degree Whose Adjoint Bundles are not Spanned
Besana, G. M.; Di Rocco, S.; November 1999; 20p; In English
Report No.(s): PB2002-104991; TRITA-MAT-1999-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Smooth, complex, projective surfaces, polarized with an ample and globally generated line bundle of degree three and four, such that the adjoint bundle is not globally generated, are considered. Scrolls of a vector bundle over a smooth curve are shown

to be the only examples in degree three. Two classes of examples in degree four are presented, one of which is shown to characterize regular such pairs. A Reider-type theorem is obtained in which the assumption on the degree of L is removed.
NTIS
Complex Variables; Vectors (Mathematics); Surface Geometry

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.

20020059636 NASA Langley Research Center, Hampton, VA USA
Some User's Insights Into ADIFOR 2.0D
Giesy, Daniel P., NASA Langley Research Center, USA; June 2002; 49p; In English
Contract(s)/Grant(s): RTOP 728-30-30-01
Report No.(s): NASA/TM-2002-211738; L-18184; NAS 1.15:211738; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Some insights are given which were gained by one user through experience with the use of the ADIFOR 2.0D software for automatic differentiation of FORTRAN code. These insights are generally in the area of the user interface with the generated derivative code - particularly the actual form of the interface and the use of derivative objects, including "seed" matrices. Some remarks are given as to how to iterate application of ADIFOR in order to generate second derivative code.
Author
FORTRAN; Matrices; Applications Programs (Computers); Differentiation; Dynamics

20020059655 Naval Research Lab., Washington, DC USA
Environmental Scenario Generator (ESG) IPR 5-17-00
Siquig, Richard, Naval Research Lab., USA; May 17, 2000; 14p; In English; Original contains color images
Report No.(s): AD-A402209; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Create a physically consistent, cross-domain authoritative ground truth of the natural environment that meets user requirements.
DTIC
Software Engineering; Generators; Information Systems

20020059660 Research Inst. for Advanced Computer Science, Moffett Field, CA USA
Aspect-Oriented Programming is Quantification and Implicit Invocation
Filman, Robert E., Research Inst. for Advanced Computer Science, USA; Friedman, Daniel P., Indiana Univ., USA; [2001]; 11p; In English; Aspects Oriented Software Development, Apr. 2002, Twente, Netherlands; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We propose that the distinguishing characteristic of Aspect-Oriented Programming (AOP) languages is that they allow programming by making quantified programmatic assertions over programs that lack local notation indicating the invocation of these assertions. This suggests that AOP systems can be analyzed with respect to three critical dimensions: the kinds of quantifications allowed, the nature of the interactions that can be asserted, and the mechanism for combining base-level actions with asserted actions. Consequences of this perspective are the recognition that certain systems are not AOP and that some mechanisms are metabolism: they are sufficiently expressive to allow straightforwardly programming an AOP system within them.
Author
Programming Languages; Distributed Processing; Computer Systems Design; Computer Systems Programs

20020060133 NASA Glenn Research Center, Cleveland, OH USA
Shape Memory Alloy Actuator
Baumbick, Robert J., Inventor, NASA Glenn Research Center, USA; Apr. 09, 2002; 18p; In English; Division of US-Patent-Appl-SN-286877, filed 6 Apr. 1999
Patent Info.: Filed 1 Sep. 2000; NASA-Case-LEW-16685-2; US-Patent-6,367,250; US-Patent-Appl-SN-660124; US-Patent-Appl-SN-286877; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present invention discloses and teaches a unique, remote optically controlled micro actuator particularly suitable for aerospace vehicle applications wherein hot gas, or in the alternative optical energy, is employed as the medium by which shape memory alloy elements are activated. In gas turbine powered aircraft the source of the hot gas may be the turbine engine compressor or turbine sections.
Official Gazette of the U.S. Patent and Trademark Office
Actuators; Computer Storage Devices; Inventions; Shape Memory Alloys

20020060140 Department of Energy, Washington, DC USA
ASCI Applications Software Quality Engineering Practices
Zepper, J.; Aragon, K.; Ellis, M.; Byle, K.; Eaton, D.; January 2002; 80p; In English
Report No.(s): DE2002-020121; SAND2002-0121; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document provides a guide to the deployment of the software verification activities, software engineering practices, and project management principles that guide the development of Accelerated Strategic Computing Initiative (ASCI) applications software at Sandia National Laboratories (Sandia). The goal of this document is to identify practices and activities that will foster the development of reliable and trusted products produced by the ASCI Applications program. Document contents include an explanation of the structure and purpose of the ASCI Quality Management Council, an overview of the software development lifecycle, an outline of the practices and activities that should be followed, and an assessment tool. These sections map practices and activities at Sandia to the ASCI Software Quality Engineering: Goals, Principles, and Guidelines, a Department of Energy document.
NTIS
Applications Programs (Computers); Computer Programming; Engineering Management; Program Verification (Computers); Project Management; Software Engineering

20020060663 Vanderbilt Univ., Dept. of Mechanical Engineering, Nashville, TN USA
Design Through Manufacturing: The Solid Model-Finite Element Analysis Interface ***Semiannual Report, 10 Jan. - 30 Sep. 2001***
Rubin, Carol, Vanderbilt Univ., USA; [2002]; 6p; In English
Contract(s)/Grant(s): NAG9-1273; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
State-of-the-art computer aided design (CAD) presently affords engineers the opportunity to create solid models of machine parts reflecting every detail of the finished product. Ideally, in the aerospace industry, these models should fulfill two very important functions: (1) provide numerical. control information for automated manufacturing of precision parts, and (2) enable analysts to easily evaluate the stress levels (using finite element analysis - FEA) for all structurally significant parts used in aircraft and space vehicles. Today's state-of-the-art CAD programs perform function (1) very well, providing an excellent model for precision manufacturing. But they do not provide a straightforward and simple means of automating the translation from CAD to FEA models, especially for aircraft-type structures. Presently, the process of preparing CAD models for FEA consumes a great deal of the analyst's time.
Derived from text
Computer Aided Design; Finite Element Method; Manufacturing

20020060725 NASA Goddard Space Flight Center, Greenbelt, MD USA
Partially Decentralized Control Architectures for Satellite Formations
Carpenter, J. Russell, NASA Goddard Space Flight Center, USA; Bauer, Frank H., NASA Goddard Space Flight Center, USA; [2002]; 12p; In English; AIAA GNC Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In a partially decentralized control architecture, more than one but less than all nodes have supervisory capability. This paper describes an approach to choosing the number of supervisors in such au architecture, based on a reliability vs. cost trade. It also considers the implications of these results for the design of navigation systems for satellite formations that could be controlled with a partially decentralized architecture. Using an assumed cost model, analytic and simulation-based results indicate that it may be cheaper to achieve a given overall system reliability with a partially decentralized architecture containing only a few supervisors, than with either fully decentralized or purely centralized architectures. Nominally, the subset of supervisors may act as centralized estimation and control nodes for corresponding subsets of the remaining subordinate nodes, and act as decentralized estimation and control peers with respect to each other. However, in the context of partially decentralized satellite formation control, the absolute positions and velocities of each spacecraft are unique, so that correlations which make estimates using only

local information suboptimal only occur through common biases and process noise. Covariance and monte-carlo analysis of a simplified system show that this lack of correlation may allow simplification of the local estimators while preserving the global optimality of the maneuvers commanded by the supervisors.
Author
Mathematical Models; Architecture (Computers); Simulation; Navigation Satellites

20020060737 NASA Goddard Space Flight Center, Greenbelt, MD USA
An End-to-End Architecture for Science Goal Driven Observing
Jones, Jeremy, NASA Goddard Space Flight Center, USA; Grosvenor, Sandy, Booz-Allen and Hamilton, Inc., USA; Koratkar, Anuradha, Space Telescope Science Inst., USA; Memarsadeghi, Nargess, NASA Goddard Space Flight Center, USA; Wolf, Karl, Commerce One, Inc., USA; [2002]; 1p; In English; SPIE 2002, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

New observatories will have greater on-board storage capacity and on-board processing capabilities. The new bottleneck will be download capacity. The cost of downlink time and limitations of bandwidth will end the era where all exposure data is downloaded and all data processing is performed on the ground. In addition, observing campaigns involving inherently variable targets will need scheduling flexibility to focus observing time and data download on exposures that are scientifically interesting. The ability to quickly recognize and react to such events by re-prioritizing the observing schedule will be an essential characteristic for maximizing scientific returns. It will also be a step towards increasing spacecraft autonomy, a major goal of NASA's strategic plan. The science goal monitoring (SGM) system is a proof-of-concept effort to address these challenges. We are developing an interactive distributed system that will use on-board processing and storage combined with event-driven interfaces with ground-based processing and operations, to enable fast re-prioritization of observing schedules, and to minimize time spent on non-optimized observations. SGM is initially aimed towards time-tagged observing modes used frequently in spectroscopic studies of varying targets. In particular, the SGM is collaborating with the proposed MIDEX-class mission Kronos team. The variable targets that Kronos seeks to study make an adaptive system such as SGM particularly valuable for achieving mission goals. However, the architecture and interfaces will also be designed for easy adaptability to other observing platforms, including ground-based systems and to work with different scheduling and pipeline processing systems. This talk will focus on our strategy for developing SGM and the technical challenges that we have encountered. We will discuss the SGM architecture as it applies to the Kronos mission and explain how it is scalable to other missions.
Author
Architecture (Computers); Autonomy; End-to-End Data Systems; Onboard Data Processing

20020060748 NASA Goddard Space Flight Center, Greenbelt, MD USA
Science Goal Driven Observing: A Step Towards Maximizing Science Returns and Spacecraft Autonomy
Jones, Jeremy, NASA Goddard Space Flight Center, USA; Grosvenor, Sandy, Booz-Allen and Hamilton, Inc., USA; Koratkar, Anuradha, Space Telescope Science Inst., USA; Memarsadeghi, Nargess, NASA Goddard Space Flight Center, USA; Wolf, Karl, Commerce One, Inc., USA; [2002]; 1p; In English; SPIE 2002, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

While recent missions have made great strides in the ability to autonomously monitor and react to changing health and physical status of spacecraft, little progress has been made in responding quickly to science driven events. Also, the new generation of space-based telescopes will generate data at an unprecedented rate. Yet, while on-board data processing and storage capability will increase rapidly, bandwidth for downloading data will not increase as fast and can become a significant cost of a science program. For observations of inherently variable targets and targets of opportunity, the ability to recognize early if an observation will not meet the science goals, and react accordingly, can have a major positive impact on the overall scientific returns of an observatory and on its operational costs. If the observatory can reprioritize the schedule to focus on alternate targets, discard uninteresting observations prior to downloading, or download them at a reduced resolution its overall efficiency will be dramatically increased. We are investigating and developing tools for a science goal monitoring (SGM) system. The SGM will have an interface to help capture higher-level science goals from the scientists and translate them into a flexible observing strategy that SGM can execute and monitor. SGM will then monitor the incoming data stream and interface with data processing systems to recognize significant events. When an event occurs, the system will use the science goals given it to reprioritize observations, and react appropriately and/or communicate with ground systems - both human and machine - for confirmation and/or further high priority analyses.
Author
Data Processing Equipment; Autonomy; Onboard Data Processing

20020060749 NASA Goddard Space Flight Center, Greenbelt, MD USA

Systems Architecture for Fully Autonomous Space Missions

Esper, Jamie, NASA Goddard Space Flight Center, USA; Schnurr, R., NASA Goddard Space Flight Center, USA; VanSteenberg, M., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 53rd IAC, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Goddard Space Flight Center is working to develop a revolutionary new system architecture concept in support of fully autonomous missions. As part of GSFC's contribution to the New Millenium Program (NMP) Space Technology 7 Autonomy and on-Board Processing (ST7-A) Concept Definition Study, the system incorporates the latest commercial Internet and software development ideas and extends them into NASA ground and space segment architectures. The unique challenges facing the exploration of remote and inaccessible locales and the need to incorporate corresponding autonomy technologies within reasonable cost necessitate the re-thinking of traditional mission architectures. A measure of the resiliency of this architecture in its application to a broad range of future autonomy missions will depend on its effectiveness in leveraging from commercial tools developed for the personal computer and Internet markets. Specialized test stations and supporting software come to past as spacecraft take advantage of the extensive tools and research investments of billion-dollar commercial ventures. The projected improvements of the Internet and supporting infrastructure go hand-in-hand with market pressures that provide continuity in research. by taking advantage of consumer-oriented methods and processes, space-flight missions will continue to leverage on investments tailored to provide better services at reduced cost. The application of ground and space segment architectures each based on Local Area Networks (LAN), the use of personal computer-based operating systems, and the execution of activities and operations through a Wide Area Network (Internet) enable a revolution in spacecraft mission formulation, implementation, and flight operations. Hardware and software design, development, integration, test, and flight operations are all tied-in closely to a common thread that enables the smooth transitioning between program phases. The application of commercial software development techniques lays the foundation for delivery of product-oriented flight software modules and models. Software can then be readily applied to support the on-board autonomy required for mission self-management. An on-board intelligent system, based on advanced scripting languages, facilitates the mission autonomy required to offload ground system resources, and enables the spacecraft to manage itself safely through an efficient and effective process of reactive planning, science data acquisition, synthesis, and transmission to the ground. Autonomous ground systems in turn coordinate and support schedule contact times with the spacecraft. Specific autonomy software modules on-board include mission and science planners, instrument and subsystem control, and fault tolerance response software, all residing within a distributed computing environment supported through the flight LAN. Autonomy also requires the minimization of human intervention between users on the ground and the spacecraft, and hence calls for the elimination of the traditional operations control center as a funnel for data manipulation. Basic goal-oriented commands are sent directly from the user to the spacecraft through a distributed internet-based payload operations "center". The ensuing architecture calls for the use of spacecraft as point extensions on the Internet. This paper will detail the system architecture implementation chosen to enable cost-effective autonomous missions with applicability to a broad range of conditions. It will define the structure needed for implementation of such missions, including software and hardware infrastructures. The overall architecture is then laid out as a common thread in the mission life cycle from formulation through implementation and flight operations.

Author

Applications Programs (Computers); Architecture (Computers); Computer Programming; Software Engineering; Space Missions; Autonomy; Onboard Data Processing

20020060755 NASA Goddard Space Flight Center, Greenbelt, MD USA

High-Efficiency High-Resolution Global Model Developments at the NASA Goddard Data Assimilation Office

Lin, Shian-Jiann, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; CCSR Workshop, 4-8 Mar. 2002, Awaji-Yumebutai, Tsukuba, Japan, Japan; No Copyright; Avail: Issuing Activity; Abstract Only

The Data Assimilation Office (DAO) has been developing a new generation of ultra-high resolution General Circulation Model (GCM) that is suitable for 4-D data assimilation, numerical weather predictions, and climate simulations. These three applications have conflicting requirements. For 4-D data assimilation and weather predictions, it is highly desirable to run the model at the highest possible spatial resolution (e.g., 55 km or finer) so as to be able to resolve and predict socially and economically important weather phenomena such as tropical cyclones, hurricanes, and severe winter storms. For climate change applications, the model simulations need to be carried out for decades, if not centuries. to reduce uncertainty in climate change assessments, the next generation model would also need to be run at a fine enough spatial resolution that can at least marginally simulate the effects of intense tropical cyclones. Scientific problems (e.g., parameterization of subgrid scale moist processes) aside, all three areas of application require the model's computational performance to be dramatically improved as compared to the previous generation. In this talk, I will present the current and future developments of the "finite-volume dynamical core" at

the Data Assimilation Office. This dynamical core applies modem monotonicity preserving algorithms and is genuinely conservative by construction, not by an ad hoc fixer. The ”discretization” of the conservation laws is purely local, which is clearly advantageous for resolving sharp gradient flow features. In addition, the local nature of the finite-volume discretization also has a significant advantage on distributed memory parallel computers. Together with a unique vertically Lagrangian control volume discretization that essentially reduces the dimension of the computational problem from three to two, the finite-volume dynamical core is very efficient, particularly at high resolutions. I will also present the computational design of the dynamical core using a hybrid distributed-shared memory programming paradigm that is portable to virtually any of today’s high-end parallel super-computing clusters.
Author
Atmospheric General Circulation Models; Climate Change; Distributed Memory; Memory (Computers); Weather Forecasting

20020060759 NASA Ames Research Center, Moffett Field, CA USA
Parallelization of ARC3D with Computer-Aided Tools
Jin, Haoqiang, MRJ Technology Solutions, Inc., USA; Hribar, Michelle, MRJ Technology Solutions, Inc., USA; Yan, Jerry, MRJ Technology Solutions, Inc., USA; Apr. 08, 1998; 14p; In English
Contract(s)/Grant(s): NAS2-14303; RTOP 509-10-31
Report No.(s): NAS-98-005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A series of efforts have been devoted to investigating methods of porting and parallelizing applications quickly and efficiently for new architectures, such as the SCSI Origin 2000 and Cray T3E. This report presents the parallelization of a CFD application, ARC3D, using the computer-aided tools, Cesspools. Steps of parallelizing this code and requirements of achieving better performance are discussed. The generated parallel version has achieved reasonably well performance, for example, having a speedup of 30 for 36 Cray T3E processors. However, this performance could not be obtained without modification of the original serial code. It is suggested that in many cases improving serial code and performing necessary code transformations are important parts for the automated parallelization process although user intervention in many of these parts are still necessary. Nevertheless, development and improvement of useful software tools, such as Cesspools, can help trim down many tedious parallelization details and improve the processing efficiency.
Author
Computational Fluid Dynamics; Computer Techniques; Cray Computers

20020060770 NASA Goddard Space Flight Center, Greenbelt, MD USA
The NASA Goddard Space Flight Center Virtual Science Fair
Bolognese, Jeff, NASA Goddard Space Flight Center, USA; Walden, Harvey, NASA Goddard Space Flight Center, USA; December 2001; 58p; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes the development of the NASA Goddard Space Flight Center Virtual Science Fair, including its history and outgrowth from the traditional regional science fairs supported by NASA. The results of the 1999 Virtual Science Fair pilot program, the mechanics of running the 2000 Virtual Science Fair and its results, and comments and suggestions for future Virtual Science Fairs are provided. The appendices to the report contain supporting documentation, including the original proposal for this project, the judging criteria, the user’s guide and the judge’s guide to the Virtual Science Fair Web site, the Fair publicity brochure and the Fair award designs, judges’ and students’ responses to survey questions about the Virtual Science Fair, and lists of student entries to both the 1999 and 2000 Fairs.
Author
Earth Sciences; NASA Space Programs; Space Flight

20020061267 NASA Ames Research Center, Moffett Field, CA USA
Towards a Theory for Integration of Mathematical Verification and Empirical Testing
Lowry, Michael, NASA Ames Research Center, USA; Boyd, Mark, NASA Ames Research Center, USA; Kulkarni, Deepak, NASA Ames Research Center, USA; [1998]; 2p; In English; ASE ’98 Conference, Oct. 1998, Honolulu, HI, USA
Contract(s)/Grant(s): RTOP 519-50-22
Report No.(s): ASE-Paper-133; No Copyright; Avail: Issuing Activity; Abstract Only
From the viewpoint of a project manager responsible for the V&V (verification and validation) of a software system, mathematical verification techniques provide a possibly useful orthogonal dimension to otherwise standard empirical testing. However, the value they add to an empirical testing regime both in terms of coverage and in fault detection has been difficult to quantify. Furthermore, potential cost savings from replacing testing with mathematical verification techniques cannot be realized until the tradeoffs and synergies can be formulated. Integration of formal verification with empirical testing is also difficult

because the idealized view of mathematical verification providing a correctness proof with total coverage is unrealistic and does not reflect the limitations imposed by computational complexity of mathematical techniques. This paper first describes a framework based on software reliability and formalized fault models for a theory of software design fault detection - and hence the utility of various tools for debugging. It then describes a utility model for integrating mathematical and empirical techniques with respect to fault detection and coverage analysis. It then considers the optimal combination of black-box testing, white-box (structural) testing, and formal methods in V&V of a software system. Using case studies from NASA software systems, it then demonstrates how this utility model can be used in practice.
Author
Fault Detection; Program Verification (Computers); Software Reliability

20020061273 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Charon Toolkit for Parallel, Implicit Structured-Grid Computations: Functional Design
VanderWijngaart, Rob F., MRJ Technology Solutions, Inc., USA; [1997]; 1p; In English
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only
Charon is a software toolkit that enables engineers to develop high-performing message-passing programs in a convenient and piecemeal fashion. Emphasis is on rapid program development and prototyping. In this report a detailed description of the functional design of the toolkit is presented. It is illustrated by the stepwise parallelization of two representative code examples.
Author
Structured Grids (Mathematics); Software Development Tools

20020061282 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Development of a Multi-Source Visualization Prototype
Keely, Leslie, MRJ Technology Solutions, Inc., USA; Uselton, Sam, MRJ Technology Solutions, Inc., USA; [1998]; 6p; In English; IEEE Visualization 1998 Conference, 1998, Research Triangle Park, NC, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-72; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This case study describes the design and development of VISOR (Visual Integration of Simulated and Observed Results), a tool which supports the visualization and analysis of a wide variety of data relevant to aerospace engineering design. Integrating data from such disparate sources is challenging; overcoming the obstacles results in a powerful tool. The process has also been valuable in exposing requirements for the libraries of reUSAble software tools for visualization and data analysis being developed at NASA Ames.
Author
Software Development Tools; Aerospace Engineering; Computer Programs; Prototypes

20020061312 NASA Ames Research Center, Moffett Field, CA USA
SSBRP Communication & Data System Development using the Unified Modeling Language (UML)
Windrem, May, NASA Ames Research Center, USA; Picinich, Lou, NASA Ames Research Center, USA; [1998]; 8p; In English
Contract(s)/Grant(s): NAS2-14263; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Unified Modeling Language (UML) is the standard method for specifying, visualizing, and documenting the artifacts of an object-oriented system under development. UML is the unification of the object-oriented methods developed by Grady Booch and James Rumbaugh, and of the Use Case Model developed by Ivar Jacobson. This paper discusses the application of UML by the Communications and Data Systems (CDS) team to model the ground control and command of the Space Station Biological Research Project (SSBRP) User Operations Facility (UOF). UML is used to define the context of the system, the logical static structure, the life history of objects, and the interactions among objects.
Author
Object-Oriented Programming; Telecommunication; Data Systems; Ground Based Control

20020061314 NASA Ames Research Center, Moffett Field, CA USA
Three Program Architecture for Design Optimization
Miura, Hirokazu, NASA Ames Research Center, USA; [1998]; 12p; In English; OptiCon ’98, 8-9 Oct. 1998, Newport Beach, CA, USA
Contract(s)/Grant(s): RTOP 522-41-42; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In this presentation, I would like to review historical perspective on the program architecture used to build design optimization capabilities based on mathematical programming and other numerical search techniques. It is rather straightforward to classify

the program architecture in three categories as shown above. However, the relative importance of each of the three approaches has not been static, instead dynamically changing as the capabilities of available computational resource increases. For example, we considered that the direct coupling architecture would never be used for practical problems, but availability of such computer systems as multi-processor. In this presentation, I would like to review the roles of three architecture from historical as well as current and future perspective. There may also be some possibility for emergence of hybrid architecture. I hope to provide some seeds for active discussion where we are heading to in the very dynamic environment for high speed computing and communication.
Derived from text
Architecture (Computers); Design Optimization; Mathematical Programming

20020061315 NASA Ames Research Center, Moffett Field, CA USA
Real-Time Payload Control and Monitoring on the World Wide Web
Sun, Charles, NASA Ames Research Center, USA; Windrem, May, NASA Ames Research Center, USA; [1998]; 8p; In English
Contract(s)/Grant(s): NAS2-14263; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

World Wide Web (W3) technologies such as the Hypertext Transfer Protocol (HTTP) and the Java object-oriented programming environment offer a powerful, yet relatively inexpensive, framework for distributed application software development. This paper describes the design of a real-time payload control and monitoring system that was developed with W3 technologies at NASA Ames Research Center. Based on Java Development Toolkit (JDK) 1.1, the system uses an event-driven ”publish and subscribe” approach to inter-process communication and graphical user-interface construction. A C Language Integrated Production System (CLIPS) compatible inference engine provides the back-end intelligent data processing capability, while Oracle Relational Database Management System (RDBMS) provides the data management function. Preliminary evaluation shows acceptable performance for some classes of payloads, with Java’s portability and multimedia support identified as the most significant benefit.
Author
Real Time Operation; Payload Control; World Wide Web; Object-Oriented Programming; Computer Programming; Software Development Tools; Programming Environments

20020061318 NASA Ames Research Center, Moffett Field, CA USA
Explaining Synthesized Software
VanBaalen, Jeffrey, NASA Ames Research Center, USA; Robinson, Peter, RECOM Technologies, Inc., USA; Lowry, Michael, NASA Ames Research Center, USA; Pressburger, Thomas, RECOM Technologies, Inc., USA; [1998]; 1p; In English, Oct. 1998, Honolulu, HI, USA
Contract(s)/Grant(s): NAS2-14217; No Copyright; Avail: Issuing Activity; Abstract Only

Motivated by NASA’s need for high-assurance software, NASA Ames’ Amphion project has developed a generic program generation system based on deductive synthesis. Amphion has a number of advantages, such as the ability to develop a new synthesis system simply by writing a declarative domain theory. However, as a practical matter, the validation of the domain theory for such a system is problematic because the link between generated programs and the domain theory is complex. As a result, when generated programs do not behave as expected, it is difficult to isolate the cause, whether it be an incorrect problem specification or an error in the domain theory. This paper describes a tool we are developing that provides formal traceability between specifications and generated code for deductive synthesis systems. It is based on extensive instrumentation of the refutation-based theorem prover used to synthesize programs. It takes augmented proof structures and abstracts them to provide explanations of the relation between a specification, a domain theory, and synthesized code. In generating these explanations, the tool exploits the structure of Amphion domain theories, so the end user is not confronted with the intricacies of raw proof traces. This tool is crucial for the validation of domain theories as well as being important in everyday use of the code synthesis system. It plays an important role in validation because when generated programs exhibit incorrect behavior, it provides the links that can be traced to identify errors in specifications or domain theory. It plays an important role in the everyday use of the synthesis system by explaining to users what parts of a specification or of the domain theory contribute to what pieces of a generated program. Comments are inserted into the synthesized code that document these explanations.
Author
Software Engineering; Computer Systems Programs; Applications Programs (Computers)

20020061363 NASA Ames Research Center, Moffett Field, CA USA

Leap Before You Look: Information Gathering In the PUCCINI Planner

Golden, Keith, NASA Ames Research Center, USA; [1998]; 9p; In English; AIPS, 7-10 Jun. 1998, Pittsburgh, PA, USA

Contract(s)/Grant(s): NAS2-14217; N00014-94-1-0060; N00014-98-1-0147; F30602-95-1-0024; NSF IRI-93-03461; RTOP 632-30-00; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Most of the work in planning with incomplete information takes a ”look before you leap” perspective: Actions must be guaranteed to have their intended effects before they can be executed. We argue that this approach is impossible to follow in many real-world domains. The agent may not have enough information to ensure that an action will have a given effect in advance of executing it. This paper describes PUCCINI, a partial order planner used to control the Internet Softbot (Etzioni & Weld 1994). PUCCINI takes a different approach to coping with incomplete information: ”Leap before you look!” PUCCINI doesn’t require actions to be known to have the desired effects before execution. However, it still maintains soundness, by requiring the effects to be verified eventually. We discuss how this is achieved using a simple generalization of caUSAl links.

Author

Information Theory; Domains; Information Management; Information Systems

20020061450 Raytheon Information Technology and Scientific Services, Wallops Island, VA USA

ICESat (GLAS) Science Processing Software Document Series, Volume 3, GLAS Science Software Requirements Document, Ver 2.1

Jester, Peggy L., Raytheon Information Technology and Scientific Services, USA; Lee, Jeffrey, Raytheon Information Technology and Scientific Services, USA; February 2001; 54p; In English

Contract(s)/Grant(s): NAS5-00181; RTOP 229-15-37-26

Report No.(s): NASA/TM-2001-208641/VOL3; Rept-2001-01561-0; NAS 1.15:208641/VOL3; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document addresses the software requirements of the Geoscience Laser Altimeter System (GLAS) Standard Data Software (SDS) supporting the GLAS instrument on the EOS ICESat Spacecraft. This Software Requirements Document represents the initial collection of the technical engineering information for the GLAS SDS. This information is detailed within the second of four main volumes of the Standard documentation, the Product Specification volume. This document is a ”roll-out” from the governing volume outline containing the Concept and Requirements sections.

Derived from text

Computer Programming; Software Engineering; Data Management; Laser Altimeters

20020061688 NASA Langley Research Center, Hampton, VA USA

Analog Simulation of a Pilot-Controlled Rendezvous

Brissenden, Roy F., NASA Langley Research Center, USA; Burton, Bert B., NASA Langley Research Center, USA; Foudriat, Edwin C., NASA Langley Research Center, USA; Whitten, James B., NASA Langley Research Center, USA; April 1961; 52p; In English

Report No.(s): NASA-TN-D-747; L-1250; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The rendezvous of a pilot-controlled space ferry vehicle with an orbiting space station was simulated in six degrees of freedom. A fixed-base simulator and an analog computer were used. The ferry vehicle was assumed to have a single main thrusting rocket and to be provided with attitude control. Control of the thrust was provided by a rocket throttle quadrant which could provide either proportional or on-off control. The attitude of the vehicle was controlled during the rendezvous with a two-axis, pencil-type side-arm controller and rudder pedals. For the most part rendezvous maneuvers were made with the target satellite in a circular orbit. In addition, an elliptical station orbit was investigated. Tolerable initial conditions, as well as adequate data presentations, were determined. Results of the investigation indicate that a human pilot can rendezvous successfully with the vehicle and instrumentation considered over a wide band of initial conditions. Coplanar conditions are not necessary. Retro-rocket fuel used is not greatly increased by imposing perturbing influences such as rocket-misalignment torques on the rendezvous vehicle. When excessive attitude-control torques are required to maintain the necessary trim attitudes under misalignment influences, the reaction fuel used for this control increases. The time required for a specific rendezvous varies somewhat between pilots. If control of the time for completing the rendezvous is desired, requirements for retrorocket fuel are affected, and an energy-management schedule is required. Continuous variation of the thrust is not necessary. The pilot positions the throttle to obtain a desired level of thrust, and applies bursts of thrust as required. All data were presented on dialed instruments. The quantities required are range and range rate and line-of-sight rates between the vehicle and the station, vehicle attitudes and angular

rates, and the angles subtended by the line of sight. For the equipment assumed herein, satellite rendezvous presented no great problem to the pilot.
Derived from text
Attitude Control; Orbital Rendezvous; Degrees of Freedom; Rendezvous Spacecraft; Elliptical Orbits; Circular Orbits

20020061834 Institute for Human Factors TNO, Soesterberg, Netherlands
Information Operations: Effects of Information Order and Context on Decision Making ***Final Report Information Operations: Effect Van Informatievolgorde en Context op Besluitvorming***
Jansen, E. J. M., Institute for Human Factors TNO, Netherlands; Kerstholt, J. H., Institute for Human Factors TNO, Netherlands; Feb. 26, 2002; 19p; In Dutch
Contract(s)/Grant(s): 013.40345; TNO Proj. 787.1
Report No.(s): TD-2001-0368; TNO-TM-02-A011; Copyright; Avail: Issuing Activity
For effective and efficient use of available resources, it is of utmost importance to obtain a complete, actual and consistent picture of the situation (i.e. full battle space awareness). The process of interpreting information can be affected by Information Operations (Info Ops) on various levels. In the present study that was commissioned by the Program Leader of the Information Operations Program, we have investigated in which way judgements are affected by context and the order of information presentation for two different tasks. In one task participants had to adjust their judgement each time they received new Information, whereas In the other task they had to make a single judgement only after they had received all the information.
Derived from text
Decision Making; Images; Expectation

20020061893 Naval Postgraduate School, Monterey, CA USA
Class Translator for the Federation Interoperability Object Model (FIOM)
Lee, Shong Cheng; Mar. 2002; 355p; In English; Original contains color images
Report No.(s): AD-A402736; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche
There is a growing need for systems to inter-operate in order to facilitate information sharing and to achieve objectives through joint task executions, The differences in data representation between the systems greatly complicate the task of achieving interoperability between them. Young's Object Oriented Method for Interoperability (OOMI) defines an architecture and suite of tools to resolve representational differences between systems. The OOMI architecture and tool suite will reduce the labor-intensity and complexity of the integration of disparate systems into a cooperative system of systems (federation of systems) and their subsequent deployment. At the heart of this architecture is the definition of translations between any two different classes of objects and a run-time component (the Translator) that will execute such translations. This thesis describes a prototype framework that implements the OOMI, a prototype class translation code generator that assists an Interoperability Engineer in the definition of the translations and a prototype Translator that executes these translations.
DTIC
Computer Programs; Object-Oriented Programming; Data Systems; Interoperability

20020061914 Boeing Phantom Works, Long Beach, CA USA
Open Systems Ada Technology (OSAT) Program
Winter, Don; Jun. 2002; 20p; In English; Original contains color images
Report No.(s): AD-A402658; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Project objectives were to: convert the mission computer of an AV-8B to a COTS, open standards-based platform, develop/demonstrate an HOL OFP, compare the observed CEP from this demonstration with the AV-8B Fleet OFP CEP , integrate the data fusion integrity process (DFIP), and collect and report lessons learned.
DTIC
Harrier Aircraft; Ada (Programming Language)

20020061934 Cincinnati Univ., OH USA
Computer Aided Engineering for Reconfigurable Computing (CAERC) ***Final Report, 25 Jul. 1997-30 Sep. 2001***
Vemuri, Ranga; Oct. 2001; 182p; In English
Contract(s)/Grant(s): F33615-97-C-1043; Proj-6096
Report No.(s): AD-A402967; AFRL-IF-WP-TR-2001-1549; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
Synthesis and Partitioning for Adaptive and Reconfigurable Computing Systems (SPARCS) is a computer aided engineering environment for reconfigurable computers. SPARCS contains software implementations of a variety of methods and algorithms

for various subproblems for automating the task of producing designs for multi-FPGA (Field Programmable Gate Array) based reconfigurable computers. The SPARCS system includes tools for temporal partitioning, spatial partitioning, high-level synthesis, physical design, and arbiter synthesis. This is a comprehensive report on the SPARCS project, describing various techniques developed for solving these problems. In addition, this report contains some experimental results demonstrating the effectiveness of the SPARCS tools.
DTIC
Software Engineering; Computer Aided Design; Field-Programmable Gate Arrays

20020061938 Defence Research and Development Canada, Ottawa, Ontario Canada
Software Documentation for CF-18 ACD
Minor, Daniel; Farrell, Phillip S.; Apr. 2002; 91p; In English
Report No.(s): AD-A402959; TM-2002-026; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Since 1998, The Aircraft Crewstation Demonstrator (ACD) has provided the opportunity for scientists and practitioners to review interface designs in a dynamic setting with the human-in-the-loop. This document serves as a reference for the software developed to support the CF-18 ACD that resides at DCIEM (Defence and Civil Institute of Environmental Medicine). The ACD has a very modular architecture, which allows for components to be added and removed over time. As such, the ACD is best described in terms of its individual components. The modular nature of the ACD, combined with the physical separation of the software components across several computers, makes interprocess communication of central importance to the software architecture. As such this document gives a comprehensive view of the interprocess communication that occurs during the running of the ACD, before treating each component in depth. This document is current as of January 17, 2002. It is anticipated that as other components are added to the CF-18 ACD, this reference document will also need to be updated.
DTIC
Computerized Simulation; Human Factors Engineering; Crew Workstations; User Manuals (Computer Programs)

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COMPUTER SYSTEMS

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

20020060044 Texas Univ., Center for Transportation Research, Austin, TX USA
GIS Implemntation Plan for PMIS, *Sep. 1996 - Aug. 1998*
Zhang, Z.; Zhang, X.; Hudson, W. R.; McNerney, M. T.; Mar. 2002; 180p; In English
Report No.(s): PB2002-107298; RR-1747-3-Rev; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
This report presents a comprehensive and practical implementation plan of using GIS (Geographic Information System) to enhance the pavement management practice in TXDOT. As the basis of the implementation plan, a 'three-stage implementation' concept was used to assess the current practice, define the visionary system, and identify the intermediate solutions. The report covers recommendations not only in the information technologies themselves but also in the report is a detailed summary of the completed tasks, major findings and key recommendations from the research project.
NTIS
Geographic Information Systems; Data Processing; Information Systems; Pavements; Highways

20020061261 NASA Ames Research Center, Moffett Field, CA USA
Code AI Personal Web Pages
Garcia, Joseph A., NASA Ames Research Center, USA; [1998]; 2p; In English; No Copyright; Avail: Issuing Activity; Abstract Only
The document consists of a publicly available web site (george.arc.nasa.gov) for Joseph A. Garcia's personal web pages in the AI division. Only general information will be posted and no technical material. All the information is unclassified.
Author
Aeronautical Engineering; Information Transfer; Websites

20020061269 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Charon Message-Passing Toolkit for Scientific Computations
VanderWijngaart, Rob F., MRJ Technology Solutions, Inc., USA; [1998]; 1p; In English; National Energy Research Scientific

Computing Center Meeting, 26 Aug. 1998, Berkeley, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

The Charon toolkit for piecemeal development of high-efficiency parallel programs for scientific computing is described. The portable toolkit, callable from C and FORTRAN, provides flexible domain decompositions and high-level distributed constructs for easy translation of serial legacy code or design to distributed environments. Gradual tuning can subsequently be applied to obtain high performance, possibly by using explicit message passing. Charon also features general structured communications that support stencil-based computations with complex recurrences. Through the separation of partitioning and distribution, the toolkit can also be used for blocking of uni-processor code, and for debugging of parallel algorithms on serial machines. An elaborate review of recent parallelization aids is presented to highlight the need for a toolkit like Charon. Some performance results of parallelizing the NAS Parallel Benchmark SP program using Charon are given, showing good scalability. Author

Parallel Processing (Computers); Applications Programs (Computers); Computer Systems Programs

20020061839 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Quantum Logic and Parallel Computing Using Spectral Holeburning Technologies ***Final Report, 1 Mar. 1998-31 Oct. 2001***
Shahriar, Selim; Ezekiel, Shaoul; Lloyd, Seth; Jun. 04, 2002; 40p; In English
Contract(s)/Grant(s): F49620-98-1-0313
Report No.(s): AD-A403221; AFOSR-2305/DS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this project was to investigate the use of spectral holeburning technologies for quantum logic and parallel computing. to this end, we have made substantial progress on both experimental and theoretical fronts. In NV-diamond, we have demonstrated the alignment of spins, which can then be used as quantum bits for a quantum computer. We have performed high resolution imaging of color centers in NV-diamond, as a key step towards isolating and detecting individual quantum bits. We have also developed a detailed model for cavity induced coupling of qubits in this system. Furthermore, we have developed a concrete design for producing a photonic band gap based cavity directly in a diamond substrate. Such a cavity will have the requisite combination of high finesse and low loss necessary for photon-mediated coupling of qubits, which is not possible using bulk mirror cavities because of high surface reflection losses from an embedded crystal. We have also developed a novel model for cavity-induced coupling via the atom-cavity-dark-state, a process that is robust against atomic as well cavity-decay. Finally, we have identified a mechanism for direct dipole-dipole coupling of the qubits as well. This scheme is particularly well suited for creating in parallel many quantum computers, each containing a small number of coupled qubits. Dubbed Type II Quantum Computing, this architecture is expected to outperform the best classical computers in specialized tasks such as modeling turbulence through the cellular automaton based lattice gas dynamics. In Pr:YSO, we have demonstrated a slowing (45 m/sec) and high-fidelity storage and recall of light pulses.
DTIC

Parallel Processing (Computers); Quantum Computation; Logic Programming; Hole Burning; Applications Programs (Computers)

20020061964 Naval Postgraduate School, Monterey, CA USA
Toward an Internet Service Provider (ISP) Centric Security Approach
Price, Patrick D.; Mar. 2002; 92p; In English; Original contains color images
Report No.(s): AD-A402645; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Individual users, businesses, and governments have become functionally dependent on the Internet's connectivity to interact at the most basic levels of social and economic intercourse. Yet self-propagating worms and distributed denial of service attacks have demonstrated that disruption of the Internet infrastructure can be quickly achieved despite the vast knowledge of vulnerabilities and readily available subscriber-based countermeasures. In part, this condition is made possible because networks continue to operate under an obsolete subscriber-centric security paradigm that is based on all end users being trusted to act appropriately. This thesis develops the idea of an Internet Service Provider (ISP)- centric security approach by examining the types, roles, security mechanisms, and operational precepts of ISP's to illustrate their functional control within the infrastructure, Denial of service and worm attacks are detailed to provide the context for an emerging set of conditions that forms the basis of the requirement for the ISP approach. This paper concludes by examining four enabling technologies currently available that, used uniformly, provide ISPs with the framework to implement Internet based security that can serve to enhance the layered defense model and invoke the tenants of best practices.
DTIC

Internets; Computer Viruses; Commerce

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

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

20020060138 Sandia National Labs., Albuquerque, NM USA
Pattern Discovery in Time-Ordered Data
Conrad, G. N.; Britanik, J. M.; DeLand, S. M.; Jenkin, C. L.; February 2002; 62p; In English
Report No.(s): DE2002-020245; SAND2002-0245; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report describes the results of a Laboratory-Directed Research and Development project on techniques for pattern discovery in discrete event time series data. In this project, we explored two different aspects of the pattern matching/discovery problem. The first aspect studied was the use of Dynamic Time Warping for pattern matching in continuous data. In essence, DTW is a technique for aligning time series along the time axis to optimize the similarity measure. The second aspect studied was techniques for discovering patterns in discrete event data. We developed a pattern discovery tool based on adaptations of the a-priori and GSP (Generalized Sequential Pattern mining) algorithms. We then used the tool on three different application areas--unattended monitoring system data from a storage magazine, computer network intrusion detection, and analysis of robot training data.
NTIS
Pattern Recognition; Time Series Analysis

20020060508 Pennsylvania State Univ., Dept. of Computer Science and Engineering, University Park, PA USA
Wire Detection Algorithms for Navigation ***Final Report, 1 Jul. 2001 - 30 Jun. 2002***
Kasturi, Rangachar, Pennsylvania State Univ., USA; Camps, Octavia I., Pennsylvania State Univ., USA; [2002]; 73p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG2-1487; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this research we addressed the problem of obstacle detection for low altitude rotorcraft flight. In particular, the problem of detecting thin wires in the presence of image clutter and noise was studied. Wires present a serious hazard to rotorcrafts. Since they are very thin, their detection early enough so that the pilot has enough time to take evasive action is difficult, as their images can be less than one or two pixels wide. Two approaches were explored for this purpose. The first approach involved a technique for sub-pixel edge detection and subsequent post processing, in order to reduce the false alarms. After reviewing the line detection literature, an algorithm for sub-pixel edge detection proposed by Steger was identified as having good potential to solve the considered task. The algorithm was tested using a set of images synthetically generated by combining real outdoor images with computer generated wire images. The performance of the algorithm was evaluated both, at the pixel and the wire levels. It was observed that the algorithm performs well, provided that the wires are not too thin (or distant) and that some post processing is performed to remove false alarms due to clutter. The second approach involved the use of an example-based learning scheme namely, Support Vector Machines. The purpose of this approach was to explore the feasibility of an example-based learning based approach for the task of detecting wires from their images. Support Vector Machines (SVMs) have emerged as a promising pattern classification tool and have been used in various applications. It was found that this approach is not suitable for very thin wires and of course, not suitable at all for sub-pixel thick wires. High dimensionality of the data as such does not present a major problem for SVMs. However it is desirable to have a large number of training examples especially for high dimensional data. The main difficulty in using SVMs (or any other example-based learning method) is the need for a very good set of positive and negative examples since the performance depends on the quality of the training set.
Author
Algorithms; Edge Detection; Image Processing; Navigation; Wire

20020060647 NASA Goddard Space Flight Center, Greenbelt, MD USA
Attitude Error Representations for Kalman Filtering
Markley, F. Landis, NASA Goddard Space Flight Center, USA; [2002]; 15p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The quaternion has the lowest dimensionality possible for a globally nonsingular attitude representation. The quaternion must obey a unit norm constraint, though, which has led to the development of an extended Kalman filter using a quaternion for the

global attitude estimate and a three-component representation for attitude errors. We consider various attitude error representations for this Multiplicative Extended Kalman Filter and its second-order extension.
Author
Attitude (Inclination); Errors; Kalman Filters

20020060660 NASA Goddard Space Flight Center, Greenbelt, MD USA
Image Information Mining Utilizing Hierarchical Segmentation
Tilton, James C., NASA Goddard Space Flight Center, USA; Marchisio, Giovanni, Insightful Corp., USA; Koperski, Krzysztof, Insightful Corp., USA; Datcu, Mihai, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; [2002]; 3p; In English; 2002 International Geoscience and Remote Sensing Symposium, 24-28 Jun. 2002, Toronto, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Hierarchical Segmentation (HSEG) algorithm is an approach for producing high quality, hierarchically related image segmentations. The VisiMine image information mining system utilizes clustering and segmentation algorithms for reducing visual information in multispectral images to a manageable size. The project discussed herein seeks to enhance the VisiMine system through incorporating hierarchical segmentations from HSEG into the VisiMine system.
Author
Information Systems; Visual Perception; Segments; Algorithms

20020060767 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Automatic Evolution of Molecular Nanotechnology Designs
Globus, Al, NASA Ames Research Center, USA; Lawton, John, California Univ., USA; Wipke, Todd, California Univ., USA; [1998]; 2p; In English; Foresight Conference on Molecular Nanotechnology, 13-15 Nov. 1998, Santa Clara, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper describes strategies for automatically generating designs for analog circuits at the molecular level. Software maps out the edges and vertices of potential nanotechnology systems on graphs, then selects appropriate ones through evolutionary or genetic paradigms.
CASI
Nanotechnology; Genetic Algorithms; Graphs (Charts); Analog Circuits; Mathematical Programming

20020060783 NASA Ames Research Center, Moffett Field, CA USA
A Hybrid Procedural/Deductive Executive for Autonomous Spacecraft
Pell, Barney, Research Inst. for Advanced Computer Science, USA; Gamble, Edward B., Jet Propulsion Lab., California Inst. of Tech., USA; Gat, Erann, Jet Propulsion Lab., California Inst. of Tech., USA; Kessing, Ron, Caelum Research Corp., USA; Kurien, James, Caelum Research Corp., USA; Millar, William, Caelum Research Corp., USA; Nayak, P. Pandurang, Research Inst. for Advanced Computer Science, USA; Plaunt, Christian, Caelum Research Corp., USA; Williams, Brian C., NASA Ames Research Center, USA; [1998]; 8p; In English
Contract(s)/Grant(s): NAS2-14217; NCC2-1006
Report No.(s): Rept-632-30; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The New Millennium Remote Agent (NMRA) will be the first AI system to control an actual spacecraft. The spacecraft domain places a strong premium on autonomy and requires dynamic recoveries and robust concurrent execution, all in the presence of tight real-time deadlines, changing goals, scarce resource constraints, and a wide variety of possible failures. to achieve this level of execution robustness, we have integrated a procedural executive based on generic procedures with a deductive model-based executive. A procedural executive provides sophisticated control constructs such as loops, parallel activity, locks, and synchronization which are used for robust schedule execution, hierarchical task decomposition, and routine configuration management. A deductive executive provides algorithms for sophisticated state inference and optimal failure recover), planning. The integrated executive enables designers to code knowledge via a combination of procedures and declarative models, yielding a rich modeling capability suitable to the challenges of real spacecraft control. The interface between the two executives ensures both that recovery sequences are smoothly merged into high-level schedule execution and that a high degree of reactivity is retained to effectively handle additional failures during recovery.
Author
Autonomy; Spacecraft Control; Failure; Real Time Operation; Synchronism

20020061254 NASA Glenn Research Center, Cleveland, OH USA

Control of Initialized Fractional-Order Systems

Hartley, Tom T., Akron Univ., USA; Lorenzo, Carl F., NASA Glenn Research Center, USA; May 2002; 41p; In English
Contract(s)/Grant(s): NCC3-526; NAG3-1491; RTOP 708-90-53
Report No.(s): NASA/TM-2002-211377/REV1; NAS 1.15:211377/REV1; E-13202-1/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Due to the importance of historical effects in fractional-order systems, this paper presents a general fractional-order control theory that includes the time-varying initialization response. Previous studies have not properly accounted for these historical effects. The initialization response, along with the forced response, for fractional-order systems is determined. Stability properties of fractional-order systems are presented in the complex w-plane, which is a transformation of the s-plane. Time responses are discussed with respect to pole positions in the complex w-plane and frequency response behavior is included. A fractional-order vector space representation, which is a generalization of the state space concept, is presented including the initialization response. Control methods for vector representations of initialized fractional-order systems are shown. Nyquist, root-locus, and other input-output control methods are adapted to the control of fractional-order systems. Finally, the fractional-order differintegral is generalized to continuous order-distributions that have the possibility of including a continuum of fractional orders in a system element.

Author

Control Theory; Dynamical Systems; Vector Spaces; Differential Equations; Integral Equations

20020061258 NASA Ames Research Center, Moffett Field, CA USA

Using Decision Procedures to Build Domain-Specific Deductive Synthesis Systems

VanBaalen, Jeffrey, NASA Ames Research Center, USA; Roach, Steven, NASA Ames Research Center, USA; [1998]; 8p; In English; 8th International Workshop on Logic-Based Program Synthesis and Transformation, 15-19 Jun. 1998, Manchester, UK
Contract(s)/Grant(s): NAS2-14217; RTOP 632-30-00; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes a class of decision procedures that we have found useful for efficient, domain-specific deductive synthesis. These procedures are called closure-based ground literal satisfiability procedures. We argue that this is a large and interesting class of procedures and show how to interface these procedures to a theorem prover for efficient deductive synthesis. Finally, we describe some results we have observed from our implementation. Amphion/NAIF is a domain-specific, high-assurance software synthesis system. It takes an abstract specification of a problem in solar system mechanics, such as 'when will a signal sent from the Cassini spacecraft to Earth be blocked by the planet Saturn?', and automatically synthesizes a FORTRAN program to solve it.

Derived from text

Deduction; Software Development Tools; Logic Programming; Artificial Intelligence

20020061268 NASA Ames Research Center, Moffett Field, CA USA

Testing Planetary Rovers: Technologies, Perspectives, and Lessons Learned

Thomas, Hans, NASA Ames Research Center, USA; [1998]; 1p; In English; IEEE Conference on Robotics and Automation, 16 May 1998, Leuven, Belgium; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Rovers are a vital component of NASA's strategy for manned and unmanned exploration of space. For the past five years, the Intelligent Mechanisms Group at the NASA Ames Research Center has conducted a vigorous program of field testing of rovers from both technology and science team productivity perspective. In this talk, I will give an overview of the the last two years of the test program, focusing on tests conducted in the Painted Desert of Arizona, the Atacama desert in Chile, and on IMG participation in the Mars Pathfinder mission. An overview of autonomy, manipulation, and user interface technologies developed in response to these missions will be presented, and lesson's learned in these missions and their impact on future flight missions will be presented. I will close with some perspectives on how the testing program has affected current rover systems.

Author

Roving Vehicles; Manned Mars Missions; Planetary Surfaces

20020061381 NASA Goddard Space Flight Center, Greenbelt, MD USA

Smart Aerospace eCommerce: Using Intelligent Agents in a NASA Mission Services Ordering Application

Moleski, Walt, NASA Goddard Space Flight Center, USA; Luczak, Ed, Computer Sciences Corp., USA; Morris, Kim, Honeywell Technology Solutions, Inc., USA; Clayton, Bill, GHG Corp., USA; Scherf, Patricia, Lockheed Martin Corp., USA; January 2002; 9p; In English; IEEE 2002 Aerospace Conference, Mar. 2002, Big Sky, MT, USA; Sponsored by Institute of Electrical and

Electronics Engineers, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes how intelligent agent technology was successfully prototyped and then deployed in a smart eCommerce application for NASA. An intelligent software agent called the Intelligent Service Validation Agent (ISVA) was added to an existing web-based ordering application to validate complex orders for spacecraft mission services. This integration of intelligent agent technology with conventional web technology satisfies an immediate NASA need to reduce manual order processing costs. The ISVA agent checks orders for completeness, consistency, and correctness, and notifies users of detected problems. ISVA uses NASA business rules and a knowledge base of NASA services, and is implemented using the Java Expert System Shell (Jess), a fast rule-based inference engine. The paper discusses the design of the agent and knowledge base, and the prototyping and deployment approach. It also discusses future directions and other applications, and discusses lessons-learned that may help other projects make their aerospace eCommerce applications smarter.

Author

Knowledge Based Systems; Electronic Commerce; Java (Programming Language)

20020061890 Northwestern Univ., Medical School, Chicago, IL USA

Neural Controller for an Artificial Limb: Development of a Bio/Robotic Interface ***Final Report***

Mussa-Ivaldi, Ferdinando; May 09, 2002; 6p; In English

Contract(s)/Grant(s): N00014-97-1-0714

Report No.(s): AD-A402726; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This AASERT project was aimed at complementing an ongoing research project funded by ONR (grant no. N00014-95-1-0571). The goal of the parent grant was twofold: a) to further our understanding of the organization of motor control in the spinal cord; and b) to develop an artificial system consistent with this understanding. The purpose of this augmentation award was to enhance the ongoing sponsored research while training a graduate student in Mechanical Engineering. The system developed thanks to the AASERT support is a hybrid device that combines living neural tissue from the sea Lamprey brainstem and spinal cord with a small mobile robot. The goal was therefore twofold: 1) developing a novel device; and 2) engaging a graduate student in an advance research/development project. The AASERT award has provided an extremely valuable complement of the parent grant. The research under the AASERT award led to a novel and successful line of research, aimed at the integration of living neural tissue with artificial devices. This goal has been reached and the first prototype of a hybrid system operating with a closed sensory-motor loop has been created and utilized for investigating the structure of the neural connections and the mechanisms of synaptic plasticity.

DTIC

Robotics; Neural Nets; Robots; Spinal Cord; Sensorimotor Performance; Education

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NUMERICAL ANALYSIS

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

20020059995 Deutsches Geodaetisches Forschungsinstut, Munich, Germany

VLBI Solution DGFI01R01 Based on Least-Squares Estimation Using OCCAM 5.0 and DOGS-CS

Tesmer, Volker, Deutsches Geodaetisches Forschungsinstut, Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 295-299; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The latest International Terrestrial Reference Frame realization (ITRF2000) includes solutions of all space-geodetic techniques. All three VLBI solutions contributing to the ITRF2000 are computed using the CALC/SOLVE software package. Therefore a solution based on a different software should provide an insight in the reliability of VLBI results and could provide a higher reliability to a VLBI-determined terrestrial reference frame. This paper presents the first DGFI VLBI solution computed with OCCAM 5.0 and DOGS-CS using the least-squares method (DGFI01R01). It is based on observation data from 2067 VLBI sessions between 1984 and the end of 2000, available from the IVS and CDDISA. The solution strategy is discussed. Comparisons of the coordinates and velocities of the 47 stations of the DGFI01ROI and other VLBI solutions with the ITRF2000 indicate that it is a competitive VLBI solution but needs still further improvement.

Author

Coordinates; Celestial Geodesy; Very Long Base Interferometry; Software Reliability; Software Development Tools

20020060128 NASA Ames Research Center, Moffett Field, CA USA

[ ] or SUCCESS is Not Enough: Current Technology and Future Directions in Proof Presentation

Schumann, Johann, Research Inst. for Advanced Computer Science, USA; Robinson, Peter, NASA Ames Research Center, USA; [2001]; 8p; In English; Future Directions of Automated Deduction, 2001, Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Automated theorem provers for first order logic are now around for several decades. Over the last few years, their deductive power to solve hard problems has increased tremendously. The annual CASC system competitions [Se97] give a clear picture of this situation. However, today's automated theorem provers are restricted "more by general USAbility than by raw deductive power." As a result of this, there are only very few serious applications of automated theorem provers. There are numerous features which a theorem prover lacks for real-world applicability. An automated theorem prover (as it is currently seen) is nothing more than a fast and elaborate search procedure. In that sense, an ATP can compared to a formulated race car, cool and fast, but virtually unUSAble for shopping groceries around the corner. Many important features are missing, or are optimized for speed rather than for applicability. [Schol] identifies important features which are needed for practical USAbility like detection of non-theorems, handling of modal/inductive proof tasks, control of the prover, and proof output. In this paper, we will focus solely on the last point, the presentation of the ATP's result to the user. In the rest of this paper, we will first discuss the general importance of providing feedback to the user, then we will describe the system ExplainIt!, a part of the deductive synthesis system AMPHION/NAV. In the conclusions we will relate proof presentation to other ways of post-processing a proof found by an ATP and stress their role in the future of automated deduction.

Author

Architecture (Computers); Applications Programs (Computers); Automatic Control; Program Verification (Computers)

20020060761 Caelum Research Corp., Moffett Field, CA USA

Basis Selection for Wavelet Regression

Wheeler, Kevin R., Caelum Research Corp., USA; [1998]; 8p; In English

Contract(s)/Grant(s): NAS2-14217; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A wavelet basis selection procedure is presented for wavelet regression. Both the basis and the threshold are selected using cross-validation. The method includes the capability of incorporating prior knowledge on the smoothness (or shape of the basis functions) into the basis selection procedure. The results of the method are demonstrated on sampled functions widely used in the wavelet regression literature. The results of the method are contrasted with other published methods.

Author

Wavelet Analysis; Selection

20020060762 Caelum Research Corp., Moffett Field, CA USA

Markov Tracking for Agent Coordination

Washington, Richard, Caelum Research Corp., USA; [1998]; 8p; In English; 1998 Second International Conference on Autonomous Agents, 10-13 May 1998, USA

Contract(s)/Grant(s): NAS2-14217

Report No.(s): Rept-632-30; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Partially observable Markov decision processes (POMDPs) axe an attractive representation for representing agent behavior, since they capture uncertainty in both the agent's state and its actions. However, finding an optimal policy for POMDPs in general is computationally difficult. In this paper we present Markov Tracking, a restricted problem of coordinating actions with an agent or process represented as a POMDP Because the actions coordinate with the agent rather than influence its behavior, the optimal solution to this problem can be computed locally and quickly. We also demonstrate the use of the technique on sequential POMDPs, which can be used to model a behavior that follows a linear, acyclic trajectory through a series of states. by imposing a "windowing" restriction that restricts the number of possible alternatives considered at any moment to a fixed size, a coordinating action can be calculated in constant time, making this amenable to coordination with complex agents.

Author

Markov Processes; Coordination; Tracking Problem

20020061701 NASA Glenn Research Center, Cleveland, OH USA

Evaluation of Far-Field Boundary Conditions for the Gust Response Problem

Scott, James R., NASA Glenn Research Center, USA; Kreider, Kevin L., Akron Univ., USA; Heminger, John A., Akron Univ., USA; June 2002; 20p; In English; Eighth Aeroacoustics Conference, 17-19 Jun. 2002, Brechenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 708-90-33
Report No.(s): NASA/TM-2002-211567; NAS 1.15:211567; E-13351; AIAA Paper 2002-2441; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a detailed situ dy of four far-field boundary conditions used in solving the single airfoil gust response problem. The boundary conditions, examined are the partial Sommerfeld radiation condition with only radial derivatives, the full Sommerfeld radiation condition with both radial and tangential derivatives, the Bayliss-Turkel condition of order one, and the Hagstrom-Hariharan condition of order one. The main objectives of the study were to determine which far-field boundary condition was most accurate, which condition was least sensitive to changes in grid. and which condition was best overall in terms of both accuracy and efficiency. Through a systematic study of the flat plate gust response problem, it was determined that the Hagstrom-Hariharan condition was most accurate, the Bayliss-Turkel condition was least sensitive to changes in grid, and Bayliss-Turkel was best in terms of both accuracy and efficiency.
Author
Boundary Conditions; Aeroacoustics; Computational Fluid Dynamics; Unsteady Aerodynamics; Gusts; Sound Waves

65
STATISTICS AND PROBABILITY

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

20020061264 NASA Ames Research Center, Moffett Field, CA USA
Auxilliary Variables for Markov Random Fields with Higher Order Interactions
Morris, Robin D., NASA Ames Research Center, USA; [1998]; 2p; In English
Contract(s)/Grant(s): NCC2-1006; No Copyright; Avail: Issuing Activity; Abstract Only

Markov Random Fields are widely used in many image processing applications. Recently the shortcomings of some of the simpler forms of these models have become apparent, and models based on larger neighborhoods have been developed. When single-site updating methods are used with these models, a large number of iterations are required for convergence. The Swendsen-Wang algorithm and Partial Decoupling have been shown to give potentially enormous speed-up to computation with the simple Ising and Potts models. In this paper we show how the same ideas can be used with binary Markov Random Fields with essentially any support to construct auxilliary variable algorithms. However, because of the complexity and certain characteristics of the models, the computational gains are marginal.
Author
Markov Processes; Random Variables; Algorithms; Iteration

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20020060544 NASA Goddard Space Flight Center, Greenbelt, MD USA
REACH: Real-Time Data Awareness in Multi-Spacecraft Missions
Maks, Lori, NASA Goddard Space Flight Center, USA; Coleman, Jason, Aquilent, Inc., USA; [2002]; 1p; In English; SpaceOps 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Missions have been proposed that will use multiple spacecraft to perform scientific or commercial tasks. Indeed, in the commercial world, some spacecraft constellations already exist. Aside from the technical challenges of constructing and flying these missions, there is also the financial challenge presented by the tradition model of the flight operations team (FOT) when it is applied to a constellation mission. Proposed constellation missions range in size from three spacecraft to more than 50. If the current ratio of three-to-five FOT personnel per spacecraft is maintained, the size of the FOT becomes cost prohibitive. The Advanced Architectures and Automation Branch at the Goddard Space Flight Center (GSFC Code 588) saw the potential to reduce the cost of these missions by creating new user interfaces to the ground system health-and-safety data. The goal is to enable a smaller FOT to remain aware and responsive to the increased amount of ground system information in a multi-spacecraft environment. Rather than abandon the tried and true, these interfaces were developed to run alongside existing ground system software to provide additional support to the FOT. These new user interfaces have been combined in a tool called REACH. REACH-the Real-time Evaluation and Analysis of Consolidated Health-is a software product that uses advanced visualization techniques to make spacecraft anomalies easy to spot, no matter how many spacecraft are in the constellation. REACH reads a

real-time stream of data from the ground system and displays it to the FOT such that anomalies are easy to pick out and investigate. Data visualization has been used in ground system operations for many years. to provide a unique visualization tool, we developed a unique source of data to visualize: the REACH Health Model Engine. The Health Model Engine is rule-based software that receives real-time telemetry information and outputs ”health” information related to the subsystems and spacecraft that the telemetry belong to. The Health Engine can run out-of-the-box or can be tailored with a scripting language. Out of the box, it uses limit violations to determine the health of subsystems and spacecraft; when tailored, it determines health using equations combining the values and limits of any telemetry in the spacecraft. The REACH visualizations then ”roll up” the information from the Health Engine into high level, summary displays. These summary visualizations can be ”zoomed” into for increasing levels of detail. Currently REACH is installed in the Small Explorer (SMEX) lab at GSFC, and is monitoring three of their five spacecraft. We are scheduled to install REACH in the Mid-sized Explorer (MIDEX) lab, which will allow us to monitor up to six more spacecraft. The process of installing and using our ”research” software in an operational environment has provided many insights into which parts of REACH are a step forward and which of our ideas are missteps. Our paper explores both the new concepts in spacecraft health-and-safety visualization, the difficulties of such systems in the operational environment, and the cost and safety issues of multi-spacecraft missions.
Author
Spacecraft Environments; Space Missions; Real Time Operation; Data Systems; Display Devices; Ground Operational Support System

20020060652 NASA Goddard Space Flight Center, Greenbelt, MD USA
Science Planning for Multi-Spacecraft Coordinated Observations
Maks, Lori, NASA Goddard Space Flight Center, USA; Fishman, Mark, Aquilent, Inc., USA; Pell, Vince, Aquilent, Inc., USA; [2002]; 2p; In English; SpaceOps 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Fulfilling the promise of an era of great observatories, NASA now has more than three space-based astronomical telescopes operating in different wavebands. This situation provides astronomers with a unique opportunity to simultaneously observe with multiple observatories. Yet scheduling multiple observatories simultaneously is highly inefficient when compared to single observatory observations. Thus, programs using multiple observatories are limited not due to scientific restrictions, but due to operational inefficiencies. Each year, a number of proposals are accepted by a space-based observatory for conduction of astronomical observations and gathering of science data for the study of galactic events. Since each space-based observatory uses a set of instruments designed to operate in specific energy regions, most such studies are conducted by submitting observation proposals to multiple observatories, with requests to coordinate among themselves. to assure that the proposed observations can be scheduled, each observatory’s staff has to check that the observations are valid and meet all the constraints for their own observatory; in addition, they have to verify that the observations satisfy the constraints of the other observatories. Thus, coordinated observations require painstaking manual collaboration among the observatory staff at each observatory. In order to exploit new paradigms for observatory operation, the Goddard Space Flight Center’s Advanced Architectures and Automation Branch has developed a prototype tool called the Visual Observation Layout Tool (VOLT). The main objective of VOLT is to provide a visual tool to automate the science planning of coordinated observations for multiple spacecraft, as well as to increase the scheduling probability of observations. However, VOLT is also useful for single observatory planning to optimize observatory control. Three space-based missions are interested in using VOLT (the Hubble Space Telescope, the Chandra X-Ray Observatory, and the Far Ultraviolet Spectroscopic Explorer). The VOLT team members have collaborated with these missions to gather requirements and obtain feedback on their mission planning processes. VOLT has been developed as a cross-platform Java client application for use by scientists and observatory science planning staff to visualize scheduling options and constraints. It also supports a lightweight graphical user interface for remote viewing via a Web front end. Additionally, it uniquely supports the ability to interact with multiple, diverse scheduling packages in order to determine windows of opportunity for observations and visually portray the constraints of each observation request. VOLT enables science data capture scenarios which are currently either impossible, or which require extensive time and manpower to coordinate amongst multiple observatories. it supports early detection of planning conflicts by generating coordinated solutions based on observatory schedulability and constraints. The project development approach has included frequent prototype demonstrations to our interested missions to obtain feedback after each release of the software. We will present an overview of our lessons learned in infusing the VOLT tool into the operations of the missions we have collaborated with and a brief demonstration of the software.
Author
Satellite Observation; Mission Planning; Project Management; Far UV Spectroscopic Explorer

20020061926 Naval Postgraduate School, Monterey, CA USA
Information Superiority and Game Theory: The Value of Varying Levels of Information
McIntosh, Gary A.; Mar. 2002; 103p; In English; Original contains color images
Report No.(s): AD-A402744; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The ability to acquire and use information superiority to enhance combat power and contribute to the success of military operations is a primary factor in the fulfillment of the tenets of Joint Vision 2020. This thesis examines how various levels of information and information superiority affect strategy choices and decision-making in determining the payoff value for opposing forces in a classic zero-sum two-sided contest. The results show that if opposing forces possess options with equivalent strategic capabilities, the payoff advantage is determined by the quantity of choices from which to choose. The degree of advantage in payoff for the force wide superior information is determined by the amount of choices and the quantify of bad information for the opponent. When a force possesses significantly fewer strategic options, more superior information is required to assume a payoff advantage, and for a force having more flexibility, significantly less information is required to affect an advantage in payoff. Additionally, we see that the effects of intelligence provides the greatest payoff advantage when a force possesses its maximum number of strategic options combined with the opposition also having its maximum number of choices.
DTIC
Combat; Game Theory; Information Systems; Intelligence

20020061972 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Supporting New Horizons: The Evolution of the Military Satellite Command and Control Systems, 1944-1969
Arnold, David C.; May 11, 2002; 352p; In English
Report No.(s): AD-A403222; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

Like every large technological system, military or civilian, the Air Force Satellite Control Facility evolved because of the interaction of human beings with technology. The Air Force Satellite Control Facility did not simply turn out the way it did because the technology evolved autonomously. The United States Air Force purposefully built the Air Force Satellite Control Facility to support the National Reconnaissance Program. In his large body of writing, historian Thomas Parke Hughes has shown that large technological systems evolve as social constructions according to a pattern of systems development. The Air Force Satellite Control Facility grew in the early 1960's into a true satellite command and control network following this Hughesian pattern of development. The air force system of satellite command and control, therefore, provides an example of how a large technological system, designed not for the marketplace but for government needs, still evolved as a socially constructed technology. The Air Force Satellite Control Facility illustrates a pattern of systems development that applies whether the system is a large private venture like an electrical power network or an important government project like a satellite command and control system. In the case of the Air Force Satellite Control Facility, however, there was an extraordinary player in the background pulling strings. The Air Force Satellite Control Facility had a unique relationship with the National Reconnaissance Office, a secret organization that the government officially concealed into the 1990's. In the special relationship between the National Reconnaissance Office and the Air Force Satellite Control Facility, one sees a social construction of technology at the behest of a particular interest group most clearly revealed.
DTIC
Command and Control; Systems Engineering; Satellite Control; Military Technology

67
THEORETICAL MATHEMATICS

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

20020061949 CAE Electronics Ltd., Montreal, Quebec Canada
Immersion in the Real World: Towards an Integrated Global Simulator Environment
Drummond, Fiona, CAE Electronics Ltd., Canada; Lavoie, Jean-Sebastien, CAE Electronics Ltd., Canada; Developments in Simulator Systems: Integration and Effectiveness: Proceedings; [2002], pp. 5.1 - 5.7; In English; Developments in Simulator Systems: Integration and Effectiveness, 8-9 May 2002, London, UK; ISBN 1-85768-192-4; Copyright; Avail: Issuing Activity

While full flight simulators provide high fidelity models of the aircraft systems and performance, the air traffic and weather environment in which flight simulator trainees are immersed is still quite barren and static. On one hand, the simulators themselves are now near perfect copies of the real aircraft, but on the other, they still operate in relatively sterile surroundings. Nature seems frozen in place and there are few or no contacts with other traffic or traffic control elements, except for what may be role-played by the onboard instructor. In contrast, real life traffic is more congested than ever, and pilots in terminal airspace and on airport

grounds are literally bombarded with sensory inputs, both visual and aural, as they negotiate their way through traffic and adverse weather phenomenon. While flight simulators are a great means of testing and improving motor and decision skills, the environment could be greatly improved to provide better training of situational awareness skills. In order to rectify this situation, an integrated weather, traffic and air traffic control environment is required. Such an environment must provide the simulator crew with a full virtual reality experience, complete with visual representations of the traffic and weather, correlated sound and aerodynamic effects and realistic radio communications. In order to be believable, the simulated environment must be fully customizable. This would allow all aspects of the weather and traffic to be rendered representatively, from localized, dynamic weather systems to seamless enroute variations, airport-specific procedures to cultural accents. of course, all this must be provided in such a way that instructor involvement remains minimal, which requires the capability to define complex and detailed off-line scenarios that can later be selected and executed during training or evaluation sessions. Generating a complex, yet easy-to-use and cost-effective environment poses a real challenge. This paper will cover the virtual environment approaches currently in use on aircraft simulators and their visual systems, highlighting areas of recent advancement and, for those requiring further improvement, potential avenues of development.
Author
Flight Simulators; Training Evaluation; Education; Virtual Reality; Situational Awareness

70
PHYSICS (GENERAL)

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

20020060088 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Application of the Domain-Integrated Field Relations Method to the Solution of Large Scale Quasi-Static Magnetic Field Problems
Lager, I. E.; Mur, G.; October 2000; 12p; In English
Report No.(s): PB2002-106047; ITS/EM-2000-27; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
A new, efficient implementation of the domain-integrated field relations approach to computing quasi-static magnetic fields is presented. The philosophy behind this implementation is to combine the robustness of this method with a computational efficient discretization technique that uses first-order Cartesian expansion functions on a simplicial mesh. The efficiency and the robustness of the implementation is demonstrated by solving a two-dimensional field problem. The ability of the method to accurately model the behavior of the field at interfaces between highly contrasting media and at geometrical singularities is emphasized.
NTIS
Magnetostatic Fields; Singularity (Mathematics); Robustness (Mathematics); Discretization (Mathematics)

20020060137 Jefferson (Thomas) Lab. Computer Center, Newport News, VA USA
Nucleon Electromagnetic Form Factors
De Jager, K.; Feb. 08, 2002; 16p; In English
Report No.(s): DE2002-754846; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A review of data on the nucleon electromagnetic form factors in the space-like region is presented. Recent results from experiments using polarized beams and polarized targets or nucleon recoil polarimeters have yielded a significant improvement on the precision of the data obtained with the traditional Rosenbluth separation. Future plans for extended measurements are outlined.
NTIS
Form Factors; Nucleons; Elementary Particle Interactions

20020060145 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Transient Electromagnetic Field Interference through Circular Apertures in a Plane Screen
Quak, D.; deHoop, A. T.; May 2000; 18p; In English
Report No.(s): PB2002-106041; ITS/EM-2000-21; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The transfer of an incident transient electromagnetic field disturbance across a set of apertures in a perfectly conducting plane screen is investigated. The time-domain field integral representations are used to express the electric and the magnetic field in the screened region in terms of the tangential electric field in the screened region in terms of the tangential electric field distribution in the aperture. The latter is approximated by its value carried by the incident disturbance (modified Kirchoff approximation). Time-domain expressions are presented for a normally incident plane-wave disturbance. Since in the Kirchoff approximation the transferred field for a collection of apertures is the summation of the contributions for the individual apertures, the result yields an easy-to-use estimate for the screening efficiency of a perforated plate.
NTIS
Apertures; Plane Waves; Electromagnetic Interference; Plates (Structural Members)

71
ACOUSTICS

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

20020060067 General Accounting Office, Washington, DC USA
Defense Acquisitions: Testing Needed to Prove SURTASS/LFA Effectiveness in Littoral Waters
June 2002; 22p; In English
Report No.(s): PB2002-107139; GAO-02-692; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
For decades, the Navy has been striving to improve its ability to detect potential enemy submarines before they can get within effective weapons range of U.S. forces. In 1985, the Navy established the Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active (LFA) sonar program to develop a long-range capability for detecting a new generation of quieter Soviet nuclear and diesel submarines operating principally in the open ocean. Since the end of the Cold War, the Navy has shifted its focus to include regional conflicts and the threat posed by diesel-electric submarines operating in littoral waters. The Navy continued to develop SURTASS/LFA because it showed technological potential to detect objects at great distances. Sound produced at low frequencies can travel further underwater than sound produced at higher frequencies. However, as the Navy conducted testing of the system in the mid-1990s, some public interest groups and scientists raised concerns that SURTASS/LFA may cause harm to marine mammals. The Navy discontinued operational testing of the system and initiated an environmental impact statement process. Currently, the Navy will not begin testing or operating the system until it receives a Letter of Authorization from the National Marine Fisheries Service. According to Navy officials, a decision on the authorization is expected later in 2002. In addition, some of the same groups that have raised environmental concerns have questioned whether SURTASS/LFA will increase the Navy's undersea detection capabilities and whether the Navy has an alternative for the system.
NTIS
Sonar; Surveillance; Oceans; Submarines; Defense Program

20020060109 NASA Glenn Research Center, Cleveland, OH USA
Plating Processes Utilizing High Intensity Acoustic Beams
Oeftering, Richard C., Inventor, NASA Glenn Research Center, USA; Denofrio, Charles, Inventor, NASA Glenn Research Center, USA; Apr. 09, 2002; 28p; In English
Patent Info.: Filed 19 Sep. 2000; NASA-Case-LEW-17041-1; US-Patent-6,368,482; US-Patent-Appl-SN-669052; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A system and a method for selective plating processes are disclosed which use directed beams of high intensity acoustic waves to create non-linear effects that alter and improve the plating process. The directed beams are focused on the surface of an object, which in one embodiment is immersed in a plating solution, and in another embodiment is suspended above a plating solution. The plating processes provide precise control of the thickness of the layers of the plating, while at the same time, in at least some incidents, eliminates the need for masking.
Official Gazette of the U.S. Patent and Trademark Office
Beams (Radiation); Plating; Sound Waves

20020060763 Virginia Polytechnic Inst. and State Univ., Vibrations and Acoustics Labs., Blacksburg, VA USA
Development of an Efficient Binaural Simulation for the Analysis of Structural Acoustic Data
Lalime, Aimee L., Virginia Polytechnic Inst. and State Univ., USA; Johnson, Marty E., Virginia Polytechnic Inst. and State Univ., USA; July 2002; 44p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC1-01029; RTOP 705-30-11-13
Report No.(s): NASA/CR-2002-211753; NAS 1.26:211753; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Binaural or ”virtual acoustic” representation has been proposed as a method of analyzing acoustic and vibroacoustic data. Unfortunately, this binaural representation can require extensive computer power to apply the Head Related Transfer Functions (HRTFs) to a large number of sources, as with a vibrating structure. This work focuses on reducing the number of real-time computations required in this binaural analysis through the use of Singular Value Decomposition (SVD) and Equivalent Source Reduction (ESR). The SVD method reduces the complexity of the HRTF computations by breaking the HRTFs into dominant singular values (and vectors). The ESR method reduces the number of sources to be analyzed in real-time computation by replacing sources on the scale of a structural wavelength with sources on the scale of an acoustic wavelength. It is shown that the effectiveness of the SVD and ESR methods improves as the complexity of the source increases. In addition, preliminary auralization tests have shown that the results from both the SVD and ESR methods are indistinguishable from the results found with the exhaustive method.
Author
Acoustics; Transfer Functions; Binaural Hearing; Acoustic Properties; Vibrational Stress

20020060776 NASA Glenn Research Center, Cleveland, OH USA
Analysis of Three-Dimensional, Nonlinear Development of Wave-Like Structure in a Compressible Round Jet
Dahl, Milo D., NASA Glenn Research Center, USA; Mankbadi, Reda R., Embry-Riddle Aeronautical Univ., USA; June 2002; 14p; In English; Eighth Aeroacoustics Conference, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 708-90-33
Report No.(s): NASA/TM-2002-211585; E-13370; NAS 1.15:211585; AIAA Paper 2002-2451; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An analysis of the nonlinear development of the large-scale structures or instability waves in compressible round jets was conducted using the integral energy method. The equations of motion were decomposed into two sets of equations; one set governing the mean flow motion and the other set governing the large-scale structure motion. The equations in each set were then combined to derive kinetic energy equations that were integrated in the radial direction across the jet after the boundary-layer approximations were applied. Following the application of further assumptions regarding the radial shape of the mean flow and the large structures, equations were derived that govern the nonlinear, streamwise development of the large structures. Using numerically generated mean flows, calculations show the energy exchanges and the effects of the initial amplitude on the coherent structure development in the jet.
Author
Boundary Layers; Kinetic Energy; Energy Methods; Energy Transfer; Equations of Motion

20020060786 San Jose State Univ., Moffett Field, CA USA
Methods for Room Acoustic Analysis and Synthesis using a Monopole-Dipole Microphone Array
Abel, J. S., San Jose State Univ., USA; Begault, Durand R., San Jose State Univ., USA; [1998]; 6p; In English; 1998 Int. Congress Noise Control Engineering, 16-18 Nov. 1998, Christchurch, New Zealand
Contract(s)/Grant(s): NCC2-327; NCC2-237; RTOP 548-51-12; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In recent work, a microphone array consisting of an omnidirectional microphone and colocated dipole microphones having orthogonally aligned dipole axes was used to examine the directional nature of a room impulse response. The arrival of significant reflections was indicated by peaks in the power of the omnidirectional microphone response; reflection direction of arrival was revealed by comparing zero-lag crosscorrelations between the omnidirectional response and the dipole responses to the omnidirectional response power to estimate arrival direction cosines with respect to the dipole axes.
Author
Microphones; Acoustic Measurement; Monopoles; Signal Analyzers

20020061298 NASA Ames Research Center, Moffett Field, CA USA
Effect of Free Stream Turbulence on the Flow-Induced Background Noise of In-Flow Microphones
Allen, Christopher S., NASA Ames Research Center, USA; [1998]; 1p; In English; 1998 AIAA/CEAS Joint Acoustics Conference, 2-4 Jun. 1998, Toulouse, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 519-20-22; No Copyright; Avail: Issuing Activity; Abstract Only

When making noise measurements of sound sources in flow using microphones immersed in an air stream or wind tunnel, the factor limiting the dynamic range of the measurement is, in many cases, the noise caused by the flow over the microphone.

to lower this self-noise, and to protect the microphone diaphragm, an aerodynamic microphone forebody is usually mounted on the tip of the omnidirectional microphone. The microphone probe is then pointed into the wind stream. Even with a microphone forebody, however, the self-noise persists, prompting further research in the area of microphone forebody design for flow-induced self-noise reduction. The magnitude and frequency characteristics of in-flow microphone probe self-noise is dependent upon the exterior shape of the probe and on the level of turbulence in the onset flow, among other things. Several recent studies present new designs for microphone forebodies, some showing the forbodies' self-noise characteristics when used in a given facility. However, these self-noise characteristics may change when the probes are used in different facilities. The present paper will present results of an experimental investigation to determine an empirical relationship between flow turbulence and self-noise levels for several microphone forebody shapes as a function of frequency. As a result, the microphone probe self-noise for these probes will be known as a function of freestream turbulence, and knowing the freestream turbulence spectra for a given facility, the probe self-noise can be predicted. Flow-induced microphone self-noise is believed to be related to the freestream. turbulence by three separate mechanisms. The first mechanism is produced by large scale, as compared to the probe size, turbulence which appears to the probe as a variation in the angle of attack of the freestream. flow. This apparent angle of attack variation causes the pressure along the probe surface to fluctuate, and at the location of the sensor orifice this fluctuating surface pressure is sensed by the diaphragm as noise. The second mechanism is caused by the convection of smaller sized turbulence, on the order of the probe cross-section, which passes nearby or strikes the probe giving rise to a fluctuating pressure at the sensor orifice. And, the third mechanism is related to fine scale turbulence through its effects on boundary layer growth and transition to a turbulent boundary layer. The method for relating the probe self-noise to the freestream turbulence will be based on the method of K. J. Young5 from Boeing, who developed the technique and presented flow noise results for a Bruel & Kjaer Type 0385, 1/4 inch (6.35 mm) nose cone. The experimental set-up used in the present experiment is similar to that of Young and is described in the present paper. Finally, flow noise predictions are made using the empirical correlations. These predictions are then compared with actual flow noise measurements made in the National Full-Scale Aerodynamics Complex 40- by 80-Foot Wind Tunnel at NASA Ames Research Center.
Author
Free Flow; Forebodies; Microphones; Background Noise; Dynamic Range; Noise Measurement; Boundary Layer Transition; Flow Noise

20020061894 Naval Postgraduate School, Monterey, CA USA
Environmental Influence on Shallow Water Bottom Reverberation
Chuan, Lee Boon; Mar. 2002; 69p; In English; Original contains color images
Report No.(s): AD-A402735; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In this work, the influences of various environmental scenarios on the bottom interface and volume reverberation in shallow water were numerically analyzed. Based on similar modeling reverberation geometry defined in previous works, the numerical analyses were conducted for broadband pulse signals to generate complex reverberation structures in the time-domain. The reverberation model used is based on the well- documented Parabolic Equation (PE) approximation The environmental scenarios are divided into three main categories. They include different sound speed profiles, different levels of bottom interface roughness and different bottom volume fluctuations. While one category is being analyzed, the other two are held constant. The various analyses include broadband two-way reverberation levels comparisons, vertical correlation analysis and power spectral analysis. DTIC
Shallow Water; Reverberation; Broadband; Surface Roughness

72
ATOMIC AND MOLECULAR PHYSICS

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

20020060769 Thermoscience Inst., Moffett Field, CA USA
A Transport Model for Non-Local Heating of Electrons in ICP Reactors
Chang, C. H., Thermoscience Inst., USA; Bose, Deepak, Thermoscience Inst., USA; [1998]; 1p; In English; GEC 1998 Meeting of the American Physical Society, 19-22 Nov. 1998, Maui, HI, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): NAS2-14031; RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only
A new model has been developed for non-local heating of electrons in ICP reactors, based on a hydrodynamic approach. The model has been derived using the electron momentum conservation in azimuthal direction with electromagnetic and frictional

forces respectively as driving force and damper of harmonic oscillatory motion of electrons. The resulting transport equations include the convection of azimuthal electron momentum in radial and axial directions, thereby accounting for the non-local effects. The azimuthal velocity of electrons and the resulting electrical current are coupled to the Maxwell's relations, thus forming a self-consistent model for non-local heating. This model is being implemented along with a set of Navier-Stokes equations for plasma dynamics and gas flow to simulate low-pressure (few mTorr's) ICP discharges. Characteristics of nitrogen plasma in a TCP 300mm etch reactor is being studied. The results will be compared against the available Langmuir probe measurements.
Author
Gas Flow; Plasma Dynamics; Nitrogen Plasma; Electrostatic Probes; Heating; Azimuth; Navier-Stokes Equation

20020061374 NASA Ames Research Center, Moffett Field, CA USA
An Infrared Spectroscopic and Density Functional Theoretical Investigation of the Reaction Products of Laser-Ablated Scandium and Titanium Atoms with Nitric Oxide
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Kushto, Gary P., Virginia Univ., USA; Zhou, Mingfei, Virginia Univ., USA; Andrews, Lester, Virginia Univ., USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only
Laser-ablated Sc and Ti atoms have been reacted with NO during condensation in excess argon. Matrix infrared spectra show that the major products are the side bonded Sc[NO] species and the inserted NScO and NTiO molecules based on isotopic substitution (15NI6O and 15N18O) and DIFT calculations of isotopic frequencies, which provide a match for two modes in three isotopic modifications for each molecule. The NScO and NTiO molecules are nitride/oxides with M-O stretching modes only 46-88/cm below the diatomic metal oxides but M-N stretching modes 314-442/cm lower than the diatomic metal nitride molecules. The ScN, ScO, TiN, and TiO molecules are observed as decomposition products. Evidence is also presented for the nitrosyls ScNO and TiNO, the Sc[NO]+ cation, and the NTiO- anion.
Author
Lasers; Removal; Scandium; Titanium; Atoms; Nitric Oxide; Argon

20020061377 NASA Ames Research Center, Moffett Field, CA USA
A Computational Chemistry Database for Semiconductor Processing
Jaffe, R., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; [1998]; 1p; In English; 194th Meeting of the Electrochemical Society, 1-6 Nov. 1998, Boston, MA, USA; Sponsored by Electrochemical Society, Inc., USA
Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only
The concept of 'virtual reactor' or 'virtual prototyping' has received much attention recently in the semiconductor industry. Commercial codes to simulate thermal CVD and plasma processes have become available to aid in equipment and process design efforts, The virtual prototyping effort would go nowhere if codes do not come with a reliable database of chemical and physical properties of gases involved in semiconductor processing. Commercial code vendors have no capabilities to generate such a database, rather leave the task to the user of finding whatever is needed. While individual investigations of interesting chemical systems continue at Universities, there has not been any large scale effort to create a database. In this presentation, we outline our efforts in this area. Our effort focuses on the following five areas: 1. Thermal CVD reaction mechanism and rate constants. 2. Thermochemical properties. 3. Transport properties.4. Electron-molecule collision cross sections. and 5. Gas-surface interactions.
Derived from text
Computational Chemistry; Data Bases; Semiconductors (Materials); Technology Assessment; Thermochemical Properties; Transport Properties; Electron Scattering; Gas-Solid Interactions

20020061962 Arizona Univ., Dept. of Chemistry, Tucson, AZ USA
Approaches to Advanced Materials for Photorefractive Applications and Radiation Hardening ***Final Report, 1 Dec. 1998-30 Nov. 2001***
Marder, Seth R.; Jun. 01, 2002; 39p; In English
Contract(s)/Grant(s): F49620-99-1-0019
Report No.(s): AD-A402629; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have made considerable advances in the development of optical-limiting systems based upon two-photon absorption processes. to accomplish this, it has been essential to develop an understanding of basic structure-property relationships for conjugated organic materials. to this end, we have investigated a range of phenylene-vinylene-based materials substituted with various combinations of donor and acceptor moieties. We now have a more thorough understanding of how to design materials

with very high two-photon cross-sections in any part of the visible spectrum, opening the possibility for broad-band optical limiting based on a combination of these materials. We have used the dioxaborine moiety as an acceptor in a variety of conjugated systems and have found that in certain molecular architectures, this can lead to very high two-photon cross-sections. Some of the dioxaborine moieties also show very high electron mobilities, suggesting applications as charge carriers in photorefractive polymer composites. New carbazole-based materials have been designed and synthesized and are anticipated to be more photostable than related bis(diarylamino)biphenyls, whilst retaining the charge carrying and optical-limiting properties of the latter class of materials. Finally, the charge-transporting and optical-limiting bis(diarylamino)biphenyl group has been incorporated into new polymers, that can readily be cast into thermally stable films.
DTIC
Radiation Hardening; Optical Properties; Photons; Photorefractivity

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NUCLEAR PHYSICS

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

20020060031 Continuous Electron Beam Accelerator Facility, Newport New, VA USA
Performance of SRF Systems in Large Scale Applications
Hovater, J. C.; 2001; 22p; In English
Report No.(s): DE2002-791938; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In the last ten years superconducting RF (sc) cavities have become a viable acceleration technique used at many facilities. Applications include electron accelerators like CEBAF, heavy ion accelerators like Atlas, and e(sup +)e(sup -) storage rings such as Tristan. The advantage of sc cavities is twofold: one, they can supply high gradients with a nominal RF source, and two, the state of the art in the design and production techniques has risen to a level that is acceptable. Systems such as Atlas and Tristan have proven that a reliable machine can be produced and have increased the confidence of the operability of SRF technology. As new and larger systems come on line, system performance becomes an issue. Because of the nature of SRF systems, rigid machine protection interlocks, vacuum requirements etc., different limitations that may have not occurred in normal conducting accelerators are being observed. Problems concerning gas discharges, tuning, gradient degradation and other phenomena have to be dealt with. This paper discusses operational performance of large scale SRF systems worldwide. Facilities discussed include high beta machines such as Tristan (KEK), LEP (CERN), HERA (DESY) and CEBAF and heavy ion linacs such as Atlas (Argonne). Key operational issues concerning interlocks, controls and system reliability are included. Particular emphasis is placed on CEBAF's operational experience because the author is closest to it and CEBAF will have 80% of installed SRF cavities by January 1994.
NTIS
Superconductivity; Storage Rings (Particle Accelerators); Radio Frequencies; Performance Tests; Systems Engineering

20020060032 Continuous Electron Beam Accelerator Facility, Newport New, VA USA
Status Report: SRF Activities at CEBAF
2001; 20p; In English
Report No.(s): DE2002-791935; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The construction of the Continuous Electron Beam Accelerator Facility (CEBAF) is nearing completion in Newport News, Virginia. The accelerator consists of 42.25 cryomodules in which 338 5-cell niobium cavities are to be installed. Presently 38.25 cryomodules are installed in the accelerator, 32 have been commissioned and all meet or exceed design criteria for energy gain and dynamic heat load.
NTIS
Electron Beams; Linear Accelerators; Cryogenics; Enthalpy

20020060062 Argonne National Lab., IL USA
Users Guide for the Rebus-PC Code, 1.4
Olson, A. P.; Dec. 21, 2001; 150p; In English
Report No.(s): DE2002-41834; ANL/RERTR/TM-32; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Reduced Enrichment Research and Test Reactor (RERTR) Program uses the REBUS-PC computer code to provide reactor physics and core design information such as neutron flux distributions in space, energy, and time, and to track isotopic changes in fuel and neutron absorbers with burnup. REBUS-PC has evolved away from the original REBUS code, which was created starting in the 1960s to study large liquid metal cooled fast breeder reactors. REBUS and REBUS-PC both model the external cycle, and are very general codes with 1D, 2D, and 3D neutronics capabilities, and with complete fuel shuffling capabilities. REBUS-PC has evolved to its present status over the past decade. While it incorporates the same neutronics capabilities from DIF3D 9.0 as does REBUS 9.0 created by the RAE Division of ANL, REBUS-PC has numerous changes and enhancements directed toward the needs of the thermal reactor analyst using WINDOWS or linux-based PCs.
NTIS
Computer Systems Programs; Reactor Physics; Software Engineering; Applications Programs (Computers)

20020060083 Continuous Electron Beam Accelerator Facility, Newport New, VA USA
Experience with Control of Frequency, Amplitude, and Phase
2001; 16p; In English
Report No.(s): DE2002-791939; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In superconducting accelerators, requirements for frequency, amplitude, and phase control are different from those used for normal conducting activities. Superconducting cavities have a very narrow bandwidth and are therefore highly sensitive to mechanical perturbations. Significant phase and amplitude errors are induced by the resulting frequency variations. Perturbations can be excited by microphonics, changes in pressure, or Lorentz forces. Slow (less than 1 Hz), large changes in frequency are typically corrected by a frequency tuner, while faster changes (greater than 1Hz) are corrected by modulation of the incident rf power in amplitude and phase. The basic principles of rf control systems used in superconducting electron accelerators and their operational performance have been presented by Graf. The present paper extends this earlier work. Operational experience gained at various accelerator facilities and performance details of the CEBAF rf control system are presented.
NTIS
Amplitudes; Frequency Control; Electron Accelerators; Superconductivity; Phase Control

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OPTICS

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

20020059644 Swedish Defence Research Establishment, Sensor Technology, Linkoeping, Sweden
Overview of Laser Activities at FOI Linkoeping, Sweden
Steinvall, O., Swedish Defence Research Establishment, Sweden; Sep. 2001; 36p; In English
Report No.(s): PB2002-104452; FOI-R-0199-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This overview gives a brief historical overview of the Department of Laser Systems at FOI, along with a more detailed description of the recent research. The activities within the Laser Department are organized in four research areas: Lasers for remote sensing, Distributed laser sensor networks, Photonics and optical components, and Modeling and simulation. Recent activities in our research include field studies of fiber hydrophones, test of an electronic nose in Kosovo, field tests of range gated viewing for target recognition, development of a compact multifunctional coherent laser radar, demonstration of an antisensor laser system (LYSA), development of a computer based laser radar model, field trial and data analysis of airborne and ground based laser scanning for synthetic environments and 3-D (three dimensional) laser radar cross-section measurements. We are also studying laser warning devices and their role in the Defensive Aids Suite for different platforms. Free space laser communications is another area in which we are active, both in performance testing of commercial links and in development of new concepts.
NTIS
Lasers; Remote Sensing; Photonics; Laser Applications; Simulation

20020060043 Ecole Polytechnique, Lab. pour l'Utilisation des Lasers Intenses, Palaiseau, France
Plasma Physics on LULI Facilities ***Annual Report, 2001 Laboratoire pour l'Utilisation Des Lasers Intenses: Rapport Scientifique 2001***
Amiranoff, F.; Jun. 2002; 136p; In French
Report No.(s): PB2002-107374; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Work performed at LULI (Laboratoire pour l'Utilisation Des Lasers Intenses) during the year 2001 is described in a set of 39 original contributions covering topics such as: laser-matter interaction, shocks, hydrodynamics, equations of states, atomic physics, X-ray lasers and laser developments.
NTIS
Plasma Physics; Controlled Fusion; High Power Lasers; Inertial Fusion (Reactor)

20020060107 NASA Langley Research Center, Hampton, VA USA
System and Method for Measuring the Transfer Function of a Guided Wave Device
Froggatt, Mark E., Inventor, NASA Langley Research Center, USA; Erdogan, Turan, Inventor, NASA Langley Research Center, USA; Apr. 23, 2002; 12p; In English; Provisional US-Patent-Appl-SN-153873, filed 14 Sep. 1999
Patent Info.: Filed 15 Jun. 2000; NASA-Case-LAR-15954-1; US-Patent-6,376,830; US-Patent-Appl-SN-606120; US-Patent-Appl-SN-153873; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A method/system are provided for measuring the NxN scalar transfer function elements for an N-port guided wave device. Optical energy of a selected wavelength is generated at a source and directed along N reference optical paths having N reference path lengths. Each reference optical path terminates in one of N detectors such that N reference signals are produced at the N detectors. The reference signals are indicative of amplitude, phase and frequency of the optical energy carried along the N reference optical paths. The optical energy from the source is also directed to the N-ports of the guided wave device and then on to each of the N detectors such that N measurement optical paths are defined between the source and each of the N detectors. A portion of the optical energy is modified in terms of at least one of the amplitude and phase to produce N modified signals at each of the N detectors. At each of the N detectors, each of the N modified signals is combined with a corresponding one of the N reference signals to produce corresponding N combined signals at each of the N detectors. A total of N(sup 2) measurement signals are generated by the N detectors. Each of the N(sup 2) measurement signals is sampled at a wave number increment (Delta)k so that N(sup 2) sampled signals are produced. The NxN transfer function elements are generated using the N(sup 2) sampled signals. Reference and measurement path length constraints are defined such that the N combined signals at each of the N detectors are spatially separated from one another in the time domain.
Official Gazette of the U.S. Patent and Trademark Office
Scalars; Optical Waveguides; Optical Transfer Function

20020060124 NASA Pasadena Office, CA USA
Flexure-Ring for Centering a Concave Lens in a Bore of a Housing for an Optical System
Ford, Virginia G., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; Apr. 30, 2002; 6p; In English
Patent Info.: Filed 19 Jan. 2001; NASA-Case-NPO-19518; US-Patent-6,381,081; US-Patent-Appl-SN-770798; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A flexure-ring is provided for centering a lens in a bore of a housing with 3N lens contacting stubs, where N is an integer equal to or greater than one. The stubs are formed by increasing the inside diameter of the ring made to fit tightly around a lens except at 3N locations for the aforesaid stubs, and said ring having an outside diameter made to fit tightly inside the housing bore locations. Behind each stub, a segment of the ring is removed down to a chord perpendicular to a ring diameter passing through the center of each stub. That chord is selected to have a length greater than the lens contacting surface of the stub, thereby to produce a reduced cross section of the ring on both sides of the stub to serve as flexures in relieving stresses due to different coefficients of thermal expansion of the three parts involved due to changes in temperature while in use.
Official Gazette of the U.S. Patent and Trademark Office
Cavities; Lenses; Ring Structures; Position (Location)

20020060141 Fermi National Accelerator Lab., Batavia, IL USA
Polarized RF Guns for Linear Colliders. An ICFA Workshop
Edwards, D. A.; January 2002; 18p; In English
Report No.(s): DE2002-791021; FERMILAB-TM-2165; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The ICFA Workshop on Polarized RF Guns for Linear Colliders was held at Fermilab during April 18-20, 2001. It was attended by 37 scientists from 14 institutions. A list of participants is appended. An RF photoemission gun that delivers polarized electrons at low emittance would be an attractive electron source for a linear collider. Moreover, recently it has been demonstrated that an RF gun in conjunction with nearby injection system optics can deliver a beam with a high ratio of transverse emittances; a simplification of a linear collider's damping system could result. However, at present RF electron gun technology has not developed sufficiently to assure that such a source is feasible. The purpose of the workshop was to review the status of polarized

RF gun development with linear collider application in mind, and outline a possible program for the future. A table lists the requirements for the electron injector for proposed linear colliders. The specifications are given for the beam before and after the electron damping ring.
NTIS
Damping; Electron Guns; Radio Frequencies; Conferences

20020060661 NASA Ames Research Center, Moffett Field, CA USA
Technology Investigations With the Tilt Rotor Aeroacoustic Model (TRAM)
Young, Larry A., NASA Ames Research Center, USA; Yamauchi, Gloria K., NASA Ames Research Center, USA; Booth, Earl, NASA Langley Research Center, USA; Johnson, Jeff L., Sterling Software, Inc., USA; Derby, Michael R., Sterling Software, Inc., USA; Sullivan, Ken, Micro Craft, Inc., USA; Ralston, Scott, Micro Craft, Inc., USA; Shockey, Gerald, Boeing Co., USA; Dawson, Seth, Boeing Co., USA; [1998]; 1p; In English; Test and Evaluation Session at the 54th Annual Forum of the American Helicopter Society, 20-22 May 1998, Washington, DC, USA; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): RTOP 538-07-14; No Copyright; Avail: Issuing Activity; Abstract Only

This paper introduces the Tilt Rotor Aeroacoustic Model (TRAM) project. The TRAM project is a key infrastructure investment for NASA tiltrotor research. The TRAM project consists of the development and testing of two modular, hardware-compatible, test stands: an isolated rotor configuration and a fullspan model (dual rotors with a complete airframe representation). These two test stands are inclusively called the Tilt Rotor Aeroacoustic Model (TRAM). The baseline proprotors and airframe of the TRAM test stands are nominally 1/4-scale representative of the V-22 Osprey aircraft. The research objectives of the project, the TRAM hardware design features and capabilities, illustrative examples of the type and quality of data that can be acquired with the TRAM, and the current status of the overall project will be discussed in this paper.
Author
Aeroacoustics; Tilt Rotor Aircraft; Technology Utilization; Aircraft Models

20020061280 NASA Goddard Space Flight Center, Greenbelt, MD USA
Comparison of Stress Relief Procedures for Cryogenic Aluminum Mirrors
Ohl, Raymond G., NASA Goddard Space Flight Center, USA; Barthelmy, Michael P., NASA Goddard Space Flight Center, USA; Zewari, S. Wahid, NASA Goddard Space Flight Center, USA; Toland, Ronald, NASA Goddard Space Flight Center, USA; Mink, Ronald, NASA Goddard Space Flight Center, USA; Mentzell, J. Eric, NASA Goddard Space Flight Center, USA; Greenhouse, Matthew A., NASA Goddard Space Flight Center, USA; McMann, Joseph C., ManTech, Inc., USA; Hylan, Jason, Swales Aerospace, USA; Hagopian, John G., SOWILO Networks, USA; [2002]; 3p; In English; SPIE Conference, 8-11 Jul. 2002, Seattle, WA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Infrared Multi-Object Spectrograph (IRMOS) is a facility instrument for the Kitt Peak National Observatory Mayall Telescope (3.8 meter) and an engineering prototype for a potential design for the Next Generation Space Telescope/Multi-Object Spectrograph. IRMOS is a low-to mid-resolution (R = lambda/delta-lambda = 300-3800), near-IR (0.8-2.5 micron) spectrograph which produces simultaneous spectra of approximately 100 objects in its 2.8 x 2.0 arcmin field of view using a commercial MEMS multimirror array device. The instrument operating temperature is 80 K and the design is athermal --- the optical bench and mirrors are machined from aluminum 6061-T651. In spite of its baseline mechanical stress relief, aluminum 6061-T651 harbors some residual stress, which, unless relieved during fabrication, may relieve and distort mirror figure to unacceptable levels at the operating temperature. Other cryogenic instruments using aluminum mirrors for both ground-based and space IR astronomy have employed a variety of heat treatment formulae, with mixed results. We present the results of a test program designed to empirically determine the best stress relief procedure for the IRMOS mirrors. Identical test mirrors with spherical and flat optical prescriptions are processed with five different heat treatment formulae from the literature and compared to samples with out any additional processing. After figuring via diamond turning, the mirrors are tested for figure error and radius of curvature at room temperature and at 80 K for several thermal cycles. The heat treatment procedure for the mirrors that yielded the least and most repeatable change in figure error and radius is applied to the IRMOS mirror blanks. We correlate the results of our optical testing with heat treatment and metallographic data.
Author
Cryogenics; Mirrors; Aluminum; Metallography; Residual Stress; Spaceborne Telescopes

20020061309 NASA Goddard Space Flight Center, Greenbelt, MD USA

Design, Fabrication, Optical Testing, and Performance of Diamond Machined Aspheric Mirrors for Ground-Based Near-IR Astronomy

Ohl, Raymond G., NASA Goddard Space Flight Center, USA; Mink, Ronald, NASA Goddard Space Flight Center, USA; Chambers, V. John, NASA Goddard Space Flight Center, USA; Connelly, Joseph A., NASA Goddard Space Flight Center, USA; Mentzell, J. Eric, NASA Goddard Space Flight Center, USA; Tveekrem, June L., NASA Goddard Space Flight Center, USA; Howard, Joseph M., NASA Goddard Space Flight Center, USA; Preuss, Werner, Bremen Univ., Germany; Schroeder, Mechthild, Bremen Univ., Germany; Sohn, Alex, North Carolina State Univ., USA; [2002]; 5p; In English; SPIE Conference, 21-30 Aug. 2002, Kona, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Challenges in fabrication and testing have historically limited the choice of surfaces available for the design of reflective optical instruments. Spherical and conic mirrors are common, but, for future science instruments, more degrees of freedom are necessary to meet challenging performance and packaging requirements. These instruments will be composed of unusual aspheres located far off-axis with large spherical departure, and some designs will require asymmetric surface profiles. In particular, single-surface astigmatism correction in spectrographs necessitates a toroidal surface, which lacks an axis of rotational symmetry. We describe the design, fabrication, optical testing, and performance of three rotationally symmetric, off-axis, aspheric mirrors and one toroidal, off-axis, biconic camera mirror on aluminum substrates for the Infrared Multi-Object Spectrograph (IRMOS) instrument. IRMOS is a facility instrument for the Kitt Peak National Observatory's Mayall Telescope (3.8 m) and an engineering prototype for a possible design of the Next Generation Space Telescope/Multi-Object Spectrograph. The symmetric mirrors range in aperture from 94x86 mm to 286x269 mm and in f-number from 0.9 to 2.4. They are various off-axis, convex and concave, prolate and oblate ellipsoids. The concave biconic mirror has a 94x76 mm aperture, Rx=377 mm, kx=0.0778, Ry=407 mm, and ky=0.1265 and is decentered. by -2 mm in x and 227 mm in y. The mirrors have an aspect ratio of approximately 4:1. The surface error fabrication tolerances are less than 63.3 nm RMS figure error and less than 10 nm RMS microroughness. The mirrors are attached to the instrument bench via a semi-kinematic, integral flexure mount. We describe mirror design, diamond machining, the results of figure testing using computer-generated holograms, and imaging and scattered light modeling and performance.
Author

Aspheric Optics; Diamonds; Fabrication; Mirrors; Near Infrared Radiation; Infrared Astronomy; Performance Prediction

20020061368 NASA Ames Research Center, Moffett Field, CA USA

Implications of Random Cone-Type Arrangements

Ahumada, Albert J., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English; Optical Society of America Conference, 4-7 Oct. 1998, Unknown; Sponsored by Optical Society of America, USA

Contract(s)/Grant(s): RTOP 548-50-12; No Copyright; Avail: Issuing Activity; Abstract Only

A review of results of tests for randomness in the L-M cone array and its implications for chromatic and achromatic visual processing.
Author

Random Processes; Color; Arrays

20020061384 NASA Goddard Space Flight Center, Greenbelt, MD USA

LISA Telescope Sensitivity Analysis

Waluschka, Eugene, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English, 7-11 Jul. 2002, Seattle, WA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Laser Interferometer Space Antenna (LISA) for the detection of Gravitational Waves is a very long baseline interferometer which will measure the changes in the distance of a five million kilometer arm to picometer accuracies. As with any optical system, even one with such very large separations between the transmitting and receiving, telescopes, a sensitivity analysis should be performed to see how, in this case, the far field phase varies when the telescope parameters change as a result of small temperature changes.
Author

Gravitational Waves; Sensitivity Analysis; Detection; Antennas; Interferometers

20020061848 Naval Research Lab., Ocean Sciences Branch, Bay Saint Louis, MS USA

Algorithm and Code to Calculate Specular Reflection of Light from a Wavy Water Surface

Haltrin, Vladimir; May 22, 2002; 10p; In English; Presented at the International Conference (7th) on Remote Sensing for Marine and Coastal Environments, held in Miami, FL, on 20-22 May 2002

Report No.(s): AD-A402679; NRL/PP/7330/01/0084; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In studying light and image transfer in sea water the influence of Fresnel surface reflection is as significant as scattering and absorption phenomena. In these cases a knowledge of the reflective properties of sea surface at different wind speeds is very important. At present, little is published about these properties. We present here results of numerical modeling of Fresnel light reflection coefficient of sea water as a function of solar zenith angle and wind speed. The ray-tracing computer model was developed to generate wave slopes and elevations. In order to generate a realistic sea surface the model used Paul Hwang wave height spectrums. The final result of this paper is a simple equation and very fast FORTRAN code to calculate Fresnel reflection coefficient of wavy water surface and specular part of remote sensing reflectance.
DTIC
Mathematical Models; Algorithms; Water Waves; Specular Reflection

20020061891 Lehigh Univ., Bethlehem, PA USA
Theoretical Studies of Self-Trapped Optical Beams in Photorefractive Media ***Final Report, 1 Dec. 1997-31 May 2001***
Christodoulides, Demetrios N.; May 13, 2002; 229p; In English
Contract(s)/Grant(s): F49620-98-1-0080
Report No.(s): AD-A402725; 533047; AFRL-SR-AR-TR-02-0783; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The objective of this research project is to theoretically study self-trapping phenomena of incoherent and coherent optical beams in photorefractive media. Particular emphasis is given to the newly discovered class of incoherent solitons. We study their dynamics, modal composition and coherence properties. Other topics targeted in this research effort include theory of higher-order dark solitons, stability issues of incoherent and coherent photorefractive spatial solitons and interactions among photorefractive optical solitons.
DTIC
Nonlinear Optics; Photorefractivity; Stability

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PLASMA PHYSICS

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

20020060111 Alabama Univ., Center for Space Plasma and Aeronomic Research, Huntsville, AL USA
Analysis of EIT/LASCO Observations Using Available MHD Models: Investigation of CME Initiation Propagation and Geoeffectiveness ***Final Report, 1 Jun. 2000 - 31 May 2001***
Wu, S. T., Alabama Univ., USA; [2001]; 14p; In English
Contract(s)/Grant(s): NAG5-9508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Sun's activity drives the variability of geospace (i.e., near-earth environment). Observations show that the ejection of plasma from the sun, called coronal mass ejections (CMEs), are the major cause of geomagnetic storms. This global-scale solar dynamical feature of coronal mass ejection was discovered almost three decades ago by the use of space-borne coronagraphs (OSO-7, Skylab/ATM and P78-1). Significant progress has been made in understanding the physical nature of the CMEs. Observations show that these global-scale CMEs have size in the order of a solar radius (approximately 6.7 x 10(exp 5) km) near the sun, and each event involves a mass of about 10(exp 15) g and an energy comparable to that of a large flare on the order of 10(exp 32) ergs. The radial propagation speeds of CMEs have a wide range from tens to thoUSAnds of kilometers per second. Thus, the transit time to near earth's environment [i.e., 1 AU (astronomical unit)] can be as fast as 40 hours to 100 hours. The typical transit time for geoeffective events is approximately 60-80 h. This paper consists of two parts: 1) A summary of the observed CMEs from Skylab to the present SOHO will be presented. Special attention will be made to SOHO/ LASCO/ EIT observations and their characteristics leading to a geoeffectiv a CME 2) The chronological development of theory and models to interpret the physical nature of this fascinating phenomenon will be reviewed. Finally, an example will be presented to illustrate the geoeffectiveness of the CMEs by using both observation and model.
Author
Coronagraphs; Coronal Mass Ejection; Magnetohydrodynamics; Models; Space Plasmas; Magnetic Storms

20020060142 Princeton Univ., Plasma Physics Lab., NJ USA

Role of Axisymmetric Reconnection Events in JET Discharges with Extreme Shear Reversal

Stratton, B. C.; Breslau, J. A.; Budny, R. V.; Hawkes, N. C.; Jardin, S. C.; Dec. 2001; 36p; In English

Report No.(s): DE2002-792848; PPPL-3635; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Injection of Lower Hybrid Heating and Current Drive into the current ramp-up phase of Joint European Torus (JET) discharges can produce extremely reversed q-profiles characterized by a core region of very small or zero current density (within Motional Stark Effect diagnostic measurement errors) and q(subscript min) > 1. T(subscript e)-profiles show sawtooth-like collapses and the presence of an internal transport barrier. Accurate equilibrium reconstructions of these discharges are obtained using the ESC code, which was recently extended to allow equilibrium reconstructions in which a free boundary solver determines the plasma boundary and a fixed boundary solver provides the magnetic geometry and current density profile. The core current density does not appear to go negative, although current diffusion calculations indicate that sufficient non-inductive current drive to cause this is present. This is explained by nonlinear resistive MHD simulations in toroidal geometry which predict that these discharges undergo n=0 reconnection events (axisymmetric sawteeth) that redistribute the current to hold the core.

NTIS

Joint European Torus; Magnetic Field Reconnection; Magnetohydrodynamics; Electric Discharges; Symmetry

20020060760 NASA Ames Research Center, Moffett Field, CA USA

A Coupled Plasma Dynamics and Gas Flow Model for Semiconductor Processing

Bose, Deepak, Thermoscience Inst., USA; Govindan, T. R., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; [1998]; 1p; In English; GEC 1998 Meeting of the American Physical Society, 19-22 Nov. 1998, Maui, HI, USA; Sponsored by American Physical Society, USA

Contract(s)/Grant(s): NAS2-14031; RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

A continuum modeling approach by self-consistently coupling plasma dynamics and gas flow will be presented for the analysis of high density plasma reactors. Experimental data shows that gas flow distribution affects the etch rate uniformity even at low pressures (6-20 mTorr) and flow rates (20-70 sccm). This study will investigate the effects of gas flow and gas energy on bulk plasma densities and temperatures using a continuum model. The model solves multidimensional equations of mass balance for neutrals and ions, gas momentum, separate energy equations for electrons and neutrals and Maxwell's equations for power coupling. A test case of N2 plasma in a 300mm TCP etch reactor, for which hybrid model and Langmuir probe data are available, is chosen for this analysis. Our preliminary results show that modeling gas flow and energy improves the predictions of electron density and its spatial variation in the reactor when compared with the experimental data. The aim of this study is to identify the operating conditions for the TCP reactor when a self-consistent modeling of gas flow is important.

Author

Plasma Dynamics; Gas Flow; Continuum Modeling; Semiconductors (Materials); Electron Density (Concentration); Flow Distribution

20020061265 NASA Ames Research Center, Moffett Field, CA USA

Ion Energy Distributions and their Relative Abundance in Inductively Coupled Plasmas

Kim, J. S., Stanford Univ., USA; Rao, M. V. V. S., Eloret Corp., USA; Cappelli, M. A., Stanford Univ., USA; Sharma, S. P., NASA Ames Research Center, USA; [1998]; 2p; In English; Gaseous Electronics Conference, 19-23 Oct. 1998, HI, USA

Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Study of kinetics of ions and neutrals produced in high density inductively coupled plasma (ICP) discharges is of great importance for achieving a high degree of plasma assisted deposition and etching. In this paper, we present the ion energy distributions (IEDs) of various ions arriving at the grounded lower electrode. The ions were energy as well as mass analyzed by a combination of electrostatic analyzer-quadrupole mass spectrometer for pure Ar and CF4/Ar mixtures. The measurements have been made at gas pressures ranging from 30 to 100 mTorr. In addition, the IEDs were measured when the wafer-supporting electrode was also rf-powered and the effect of the self-bias was observed in the energy distributions of ions. The shapes of the IEDs are discussed an related to the sheath properties and measured electrical waveforms, as a function of pressure and applied power. Relative ion intensities were obtained by integration of each ion kinetic energy distribution function over its energy range.

Author

Kinetic Energy; Abundance; Ion Distribution; Plasmas (Physics); Energy Distribution

20020061357 NASA Ames Research Center, Moffett Field, CA USA

Langmuir Probe Measurements in an Inductively Coupled GEC Reference Cell Plasma

Ji, J. S., Stanford Univ., USA; Kim, J. S., Stanford Univ., USA; Cappelli, M. A., Stanford Univ., USA; Sharma, S. P., NASA Ames Research Center, USA; [1998]; 1p; In English; Gaseous Electronics Conference, 19-23 Oct. 1998, Hawaii, USA

Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Measurements of electron number density, electron temperature, and electron energy distribution function (EEDF) using a compensated Langmuir probe have been performed on an inductively (transformer) coupled Gaseous Electronics Conference (GEC) reference cell plasma. The plasma source is operated with CH4, CF4, or their mixtures with argon. The effect of independently driving the electrode supporting the wafer on the probe data is studied. In particular, we find that the plasma structure depends on the phase in addition to the magnitude of the power coupled to the electrode relative to that of the transformer coil. The Langmuir probe is translated in a plane parallel to the electrode to investigate the spatial structure of the plasma. The probe data is also compared with fluid model predictions.

Author

Electron Density (Concentration); Electrical Measurement; Distribution Functions; Electron Energy

20020061376 NASA Ames Research Center, Moffett Field, CA USA

In situ CF3 Detection in Low Pressure Inductive Discharges by Fourier Transform Infrared Spectroscopy

Kim, J. S., Stanford Univ., USA; Cappelli, M. A., Stanford Univ., USA; Sharma, S. P., NASA Ames Research Center, USA; [1998]; 1p; In English; Gaseous Electronics Conference, 19-23 Oct. 1998, Hawaii, USA

Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

The detection of CF(x) (x=1-3) radicals in low pressure discharges using source gases such as CF4 and CHF3 is of importance to the understanding of their chemical structure and relevance in plasma based etching processes. These radicals are known to contribute to the formation of fluorocarbon polymer films, which affect the selectivity and anisotropy of etching. In this study, we present preliminary results of the quantitative measurement of trifluoromethyl radicals, CF3, in low pressure discharges. The discharge studied here is an inductively (transformer) coupled plasma (ICP) source in the GEC reference cell, operating on pure CF4 at pressures ranging from 10 - 100 mTorr, This plasma source generates higher electron number densities at lower operating pressures than obtainable with the parallel-plate capacitively coupled version of the GEC reference cell. Also, this expanded operating regime is more relevant to new generations of industrial plasma reactors being used by the microelectronics industry. Fourier transform infrared (FTIR) spectroscopy is employed to observe the absorption band of CF3 radicals in the electronic ground state X2Al in the region of 1233-1270/cm. The spectrometer is equipped with a high sensitivity HgCdTe (MCT) detector and has a fixed resolution of 0.125/cm. The CF3 concentrations are measured for a range of operating pressures and discharge power levels.

Author

Chemical Composition; Fluorocarbons; Detection; Plasma Etching; Mercury Cadmium Tellurides

20020061378 NASA Ames Research Center, Moffett Field, CA USA

Simulation of Etching Profiles Using Level Sets

Hwang, Helen, Thermoscience Inst., USA; Govindan, T. R., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; [1998]; 1p; In English; GEC98 Meeting of the American Physical Society, 19-22 Nov. 1998, Maui, HI, USA; Sponsored by American Physical Society, USA

Contract(s)/Grant(s): NAS2-14031; RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Using plasma discharges to etch trenches and via holes in substrates is an important process in semiconductor manufacturing. Ion enhanced etching involves both neutral fluxes, which are isotropic, and ion fluxes, which are anisotropic. The angular distributions for the ions determines the degree of vertical etch, while the amount of the neutral fluxes determines the etch rate. We have developed a 2D profile evolution simulation which uses level set methods to model the plasma-substrate interface. Using level sets instead of traditional string models avoids the use of complicated delooping algorithms. The simulation calculates the etch rate based on the fluxes and distribution functions of both ions and neutrals. We will present etching profiles of Si substrates in low pressure (10s mTorr) Ar/Cl2 discharges for a variety of incident ion angular distributions. Both ion and neutral re-emission fluxes are included in the calculation of the etch rate, and their contributions to the total etch profile will be demonstrated. In addition, we will show RIE lag effects as a function of different trench aspect ratios. (For sample profiles, please see http://www.ipt.arc.nasa.gov/hwangfig1.html)

Author

Etching; Substrates; Ion Emission; Manufacturing; Plasma Jets; Semiconductors (Materials); Holes (Mechanics)

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.

20020060130 Alabama Univ., Center for Applied Optics, Huntsville, AL USA
Investigation of Space Based Solid State Coherent Lidar, ***2 Oct. 1997 - 30 Nov. 2001***
Amzajerdian, Farzin, Alabama Univ., USA; Jun. 10, 2002; 132p; In English
Contract(s)/Grant(s): NCC8-146; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report describes the work performed over the period of October 1, 1997 through March 31, 2001. Under this contract, UAH/CAO participated in defining and designing the SPAce Readiness Coherent Lidar Experiment (SPARCLE) mission, and developed the instrument's optical subsystem. This work was performed in collaborative fashion with NASA/MSFC engineers at both UAH/CAO and NASA/MSFC facilities. Earlier work by the UAH/CAO had produced a preliminary top-level system design for the Shuttle lidar instrument meeting the proposed mission performance requirements and the Space Shuttle Hitchhiker canister volume constraints. The UAH/CAO system design efforts had concentrated on the optical and mechanical designs of the instrument. The instrument electronics were also addressed, and the major electronic components and their interfaces defined. The instrument design concept was mainly based on the state of the transmitter and local oscillator laser development at NASA Langley Research Center and Jet Propulsion Laboratory, and utilized several lidar-related technologies that were either developed or evaluated by the NASA/MSFC and UAH/CAO scientists. UAH/CAO has developed a comprehensive coherent lidar numerical model capable of analyzing the performance of different instrument and mission concepts. This model uses the instrument configuration, atmospheric conditions and current velocity estimation theory to provide prediction of instrument performance during different phases of operation. This model can also optimize the design parameters of the instrument.
Author
Design Analysis; Lasers; Optical Radar; Performance Prediction; Solid State

20020060659 Alabama Univ., Dept. of Chemical Engineering, Huntsville, AL USA
Effects of Convective Transport of Solute and Impurities on Defect-Causing Kinetics Instabilities in Protein Crystallization ***Final Report, 1 Jan. - 30 Aug. 2001***
Vekilov, Peter G., Alabama Univ., USA; [2002]; 7p; In English
Contract(s)/Grant(s): NAG8-1790; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of the proposed research is to obtain further insight into the onset and development of the defect-causing instabilities that anise due to the coupling of the bulk transport and nonlinear-interfacial kinetics during growth in the mixed regime, utilizing the reduction of the convective contribution to the bulk transport under microgravity. These studies will build upon the data on the effects of quantitative variations of the forced convection velocity on the averaged and time-dependent kinetic behavior of protein crystal growth systems that have recently been obtained in our laboratory.
Author
Protein Crystal Growth; Kinetics; Defects; Impurities; Solutes; Stability; Forced Convection

20020060768 NASA Ames Research Center, Moffett Field, CA USA
Large-Scale Processing of Carbon Nanotubes
Finn, John, NASA Ames Research Center, USA; Sridhar, K. R., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; [1998]; 1p; In English; Nano-1998, 1-6 Nov. 1998, Houston, TX, USA
Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

Scale-up difficulties and high energy costs are two of the more important factors that limit the availability of various types of nanotube carbon. While several approaches are known for producing nanotube carbon, the high-powered reactors typically produce nanotubes at rates measured in only grams per hour and operate at temperatures in excess of 1000 C. These scale-up and energy challenges must be overcome before nanotube carbon can become practical for high-consumption structural and mechanical applications. This presentation examines the issues associated with using various nanotube production methods at larger scales, and discusses research being performed at NASA Ames Research Center on carbon nanotube reactor technology.
Author
Carbon Nanotubes; Reactor Technology; Production Engineering; Structural Design

20020061275 NASA Ames Research Center, Moffett Field, CA USA

The Opacity of TiO from a Coupled Electronic State Calculation Parameterized by ab initio and Experimental Data

Schwenke, David W., NASA Ames Research Center, USA; [1998]; 1p; In English; Invited Talk for Faraday Discussion 109, 15-17 Apr. 1998, Nottingham, UK

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

We have carried out ab initio electronic structure calculations of the spin-orbit and rotation-orbit couplings among the 14 lowest electronic states of TiO and used them to predict ro-vibrational energy levels. We report on the qualitative results as well as our progress in optimizing our Hamiltonian parameters in order to improve agreement with experimental line positions.

Author

Electron States; Titanium Oxides; Opacity; Coupling; Parameterization

20020061358 MRJ Technology Solutions, Inc., Moffett Field, CA USA

Automatic Nanodesign Using Evolutionary Techniques

Globus, Al, MRJ Technology Solutions, Inc., USA; [1998]; 1p; In English; IBC Nano Conference, 6-7 Dec. 1998, San Fransico, CA, USA

Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Many problems associated with the development of nanotechnology require custom designed molecules. We use genetic graph software, a new development, to automatically evolve molecules of interest when only the requirements are known. Genetic graph software designs molecules, and potentially nanoelectronic circuits, given a fitness function that determines which of two molecules is better. A set of molecules, the first generation, is generated at random then tested with the fitness function, Subsequent generations are created by randomly choosing two parent molecules with a bias towards high scoring molecules, tearing each molecules in two at random, and mating parts from the mother and father to create two children. This procedure is repeated until a satisfactory molecule is found. An atom pair similarity test is currently used as the fitness function to evolve molecules similar to existing pharmaceuticals.

Author

Software Engineering; Nanotechnology; Molecules; Computer Programming

20020061370 NASA Ames Research Center, Moffett Field, CA USA

Electronic Properties of Carbon Nanotubes and Junctions

Anantram, M. P., NASA Ames Research Center, USA; Han, Jie, NASA Ames Research Center, USA; Yang, Liu, NASA Ames Research Center, USA; Govindan, T. R., NASA Ames Research Center, USA; Jaffe, R., NASA Ames Research Center, USA; [1998]; 1p; In English; 35th; Gigascale Integration Technology Symposium, 27-30 Sep. 1998, Pullman, WA, USA; Sponsored by Society of Engineering Science, USA

Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Metallic and semiconducting Single Wall Carbon Nanotubes (CNT) have recently been characterized using scanning tunneling microscopy (STM) and the manipulation of individual CNT has been demonstrated. These developments make the prospect of using CNT as molecular wires and possibly as electronic devices an even more interesting one. We have been modeling various electronic properties such as the density of states and the transmission coefficient of CNT wires and junctions. These studies involve first calculating the stability of junctions using molecular dynamics simulations and then calculating the electronic properties using a pi-electron tight binding Hamiltonian. We have developed the expertise to calculate the electronic properties of both finite-sized CNT and CNT systems with semi-infinite boundary conditions. In this poster, we will present an overview of some of our results. The electronic application of CNT that is most promising at this time is their use as molecular wires. The conductance can however be greatly reduced because of reflection due to defects and contacts. We have modeled the transmission through CNT in the presence of two types of defects: weak uniform disorder and strong isolated scatterers. We find that the conductance is affected in significantly different manners due to these defects Junctions of CNT have also been imaged using STM. This makes it essential to derive rules for the formation of junctions between tubes of different chirality, study their relative energies and electronic properties. We have generalized the rules for connecting two different CNT and have calculated the transmission and density of states through CNT junctions. Metallic and semiconducting CNT can be joined to form a stable junction and their current versus voltage characteristics are asymmetric. CNT are deformed by the application of external forces including interactions with a substrate or other CNT. In many experiments, these deformation are expected to occur naturally. We will present some preliminary results of our calculations of the modification of CNT electronic properties as a result of deformations.

Author

Carbon Nanotubes; Scanning Tunneling Microscopy; Electrical Properties; Wire; Molecular Dynamics; Electric Potential

20020061794 NASA Ames Research Center, Moffett Field, CA USA

The Dissociation Energies of He2, HeH, and ArH; A Bond Function Study

Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; [1998]; 1p; In English

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

The bond energies and bond lengths are determined for He2, HeH, and ArH at the CCSD(T) level using both atom-centered basis sets and those that include bond functions. The addition of bond functions dramatically improves the rate of convergence of the results with respect to the size of the atom-centered basis set; with bond functions, triple zeta atom-centered basis set, outperform quintuple zeta basis sets without bond functions. The addition of bond functions also reduces the number of diffuse functions that must be added to the atom-centered sets. Employing bond functions appear to offer a very cost effective method of computing the interaction between weakly bound systems, especially for He.

Author

Bonding; Helium Compounds; Argon; Dissociation; Convergence

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.

20020060764 NASA Langley Research Center, Hampton, VA USA

Thermal Nondestructive Evaluation Report: Inspection of the Refurbished Manipulator Arm System in the Manipulator Development Facility at Johnson Space Center 10-12 January 2001

Cramer, K. Elliott, NASA Langley Research Center, USA; July 2002; 19p; In English

Contract(s)/Grant(s): RTOP 323-78-01-04

Report No.(s): NASA/TM-2002-211732; L-18177; NAS 1.15:211732; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On 4 December 2002, a failure of the Refurbished Manipulator Arm System (RMAS) occurred in the Manipulator Development Facility (MDF) at Johnson Space Center. When the Test Director commanded a should pitch maneuver to lift the arm from its payload bay pedestal, the yaw controls failed. This, coupled with a gravitational forces (due to the angle of the shoulder joint with respect to vertical), resulted in uncontrolled arm motion. The shoulder yaw joint moved approximately 20 degrees, causing the extended arm to strike and severely damage the port side MDF catwalk handrails. The arm motion stopped after impact with the handrails. On 10-12 January 2001, inspections were performed on the port face of the lower and upper arms of the RMAS using a infrared thermography developed at Langley Research Center. This paper presents the results of those nondestructive inspections and provides a complete description of the anomalies found and their locations.

Author

Thermography; Nondestructive Tests; Inspection; Manipulators

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

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

20020060662 NASA Ames Research Center, Moffett Field, CA USA

Women Working in Engineering and Science

Luna, Bernadette, NASA Ames Research Center, USA; [1998]; 1p; In English; Peninsula Borough School District QUEST Program Conference, 26-28 Jan. 1998, Soldotna, AK, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The presentation will focus on topics of interest to young women pursuing an engineering or scientific career, such as intrinsic personality traits of most engineers, average salaries for the various types of engineers, appropriate preparation classes at the high school and undergraduate levels, gaining experience through internships, summer jobs and graduate school, skills necessary but not always included in engineering curricula (i.e., multimedia, computer skills, communication skills), the work environment, balancing family and career, and sexual harassment. Specific examples from the speaker's own experience in NASA's Space Life Sciences Program will be used to illustrate the above topics. In particular, projects from Extravehicular Activity and Protective

Systems research and Regenerative Life Support research will be used as examples of real world problem-solving to enable human exploration of the solar system.
Author
Engineers; Life Sciences; Females; Solar System

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020060042 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
New Paradigms in Technology and Acquisition Strategy. Evolutionary Acquisition in Networks ***Nya Paradigm foer Teknologi-och Materielfoersoerjning. Evaolutionaer Materielfoersoerjning i Naetverk***
Kindvall, G.; Eriksson, E. A.; Ostroem, B.; March 2000; 70p; In Swedish
Report No.(s): PB2002-106878; FOA-R-00-01479-170-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The nineties have been characterized by great interest in new developments in technology and acquisition strategy. This interest has been most evident in the US and the UK. That is one basis for this report. In the report emphasis is put on the radical changes in best practice for innovation in commercial high technology businesses. From these the conditions for future technology and acquisition strategies for defense are discussed, as a basis not only for looking at own opportunities but also to understand the opportunities that technological development can create on the side of the threat. Among the important concepts that are discussed in the report are evolutionary system development, that is the increased opportunities to develop even complex technological systems in steps, and integrated project teams (IPTs), that is development in close cooperation between representatives for the different phases of a systems lifecycle. In the report the traditional platform centric view is discussed and compared with the new network centric view. According to the former military capability is made up of a relatively small number of organizations defining platform systems while according to the latter operational capability is created by letting platforms and units interact according to patterns specific for every situation.
NTIS
Computer Networks; Data Acquisition; Technology Utilization

20020060051 National Inst. of Standards and Technology, CSTL, Gaithersburg, MD USA
Celebrating One Hundred Years of Chemistry at the National Institute of Standards and Technology
Sep. 2000; 54p; In English
Report No.(s): PB2002-107658; NISTIR-6388-2000-ED; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The report describes a brief history of NIST (National Institute of Standards and Technology) from 1901 to 2001.
NTIS
Standards; Institutions; Laboratories; Histories; USA; Manufacturing

20020060106 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
Benchmarking in the Swedish Defence Industry. Perspectives in Four Companies
Lundmark, M.; March +2000; 114p; In English
Report No.(s): PB2002-106879; FOA-R-00-01477-170-SE; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report presents the approach to and the use of benchmarking in the Swedish defense industry. This is based on interviews with representatives for four Swedish defense companies. Benchmarking is presented, discussed and put in a context. Representatives for the four companies were interviewed and their descriptions are thoroughly presented. In order to structure the respondents' answers and also the discussion, a model is presented for discussing the use of benchmarking. After that, a discussion is presented which aims to highlight in what areas benchmarking could be performed more and also what could limit the possible use of benchmarking. Finally, based on the discussion and the respondents' answers, a number of conclusions and recommendations for further action is presented. The main conclusions are that the studied companies tend to benchmark in a qualitative, intuitive manner. Furthermore that most benchmarking methods fail to capture crucial, qualitative aspects. The main recommendations are that the Swedish defense industry to a larger extent should compare itself with other industries, not see itself as having unique characteristics, benchmark supporting processes and interfaces between processes. Companies should also decompose complex variables such as competitiveness and competency into more processual parts in order to make benchmarking

possible. Furthermore that the European Commission should promote harmonization of standards and legislation concerning the defense materiel, but should not support a common European database with benchmarking figures.
NTIS
Defense Industry; Complex Variables; Data Bases

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.

20020059653 Department of the Army, Washington, DC USA
Information Management: Records Management: The Modern Army Recordkeeping System (MARKS)
Oct. 2001; 64p; In English
Report No.(s): AD-A402193; AR-25-400-2; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
The purpose of Army recordkeeping is to properly manage information, from its creation through final disposition, according to Federal laws and Army Recordkeeping System (MARKS) as a portion of the Army Information Resources. This regulation (a) establishes the MARKS as a portion of the Army Information Resources Management Program; (b) furnishes the only legal authority for destroying nonpermanent Army information; (c) provides life cycle management instructions for the systematic identification, maintenance, storage, retirement, and destruction of Army information recorded on any medium (paper, microforms, electronic, or any other); (d) ensures that the commander and staff have the information needed to accomplish the mission; that they have it when and where they need it; that they have it in USAble format; and that it is created, maintained, used, and disposed of at the least possible cost; (e) preserves those records needed to protect the rights and interests of the Army and its members and former members, and those that are of permanent value; (f) ensures records related to matters involved in administrative or legal proceedings will be retained until the staff judge advocates or legal adviser authorizes resumption of normal disposition; and (g) provides for the systematic removal of less active records from office space to low-cost storage space.
DTIC
Information Resources Management; Conferences; Records Management

20020059654 Department of the Army, Washington, DC USA
Information Management: Records Management: Preparing and Managing Correspondence
Mar. 05, 2001; 122p; In English
Report No.(s): AD-A402203; AR-25-60; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
This regulation on the preparation and management of Army correspondence has been revised. This revision establishes three forms of correspondence authorized for use within the Army, a letter, a memorandum, and a message, in support of the Army Effective Writing Program.
DTIC
Records Management; Armed Forces (USA)

20020059965 Massachusetts Inst. of Tech., Haystack Observatory, Westford, MA USA
Mark 5 Disc-Based Gbps VLBI Data System
Whitney, Alan R., Massachusetts Inst. of Tech., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 132-136; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
The Mark 5 system is being developed as the first high-data-rate VLBI data system based on magnetic-disc technology. Incorporating primarily low-cost PC-based components, the Mark 5 system will support data rates up to 1024 Mbps recording to an array of up to 16 inexpensive removable IDE discs. An initial demonstration system was used in March 2001 to record data at 576 Mbps, with correlation on the Mark 4 correlator at Haystack Observatory. With the continuing fall in disc prices, IDE discs are already becoming competitive with the cost of Mark 4/VLBA/K4 tape, with the expectation that prices will continue to fall to a level below approx. $1/GB with capacities of hundreds of GB per disc. The Mark 5A system, which is a direct replacement for a Mark4 or VLBA tape transport, will deploy approx. 12 prototype units in mid-2002 to stations and correlators around the world, at a cost of approx. $20K/unit. A fully VSI-compliant Mark 5 system, dubbed Mark 5B, will be available in late 2003, along with the necessary adapter interface required to utilize the system with existing Mark 4 and VLBA data-acquisition and correlator

systems. The Mark 5 development effort at Haystack Observatory is supported by BKG, EVN/JIVE, KVN, MPI, NASA, NRAO and USNO.
Author
Correlators; Data Systems; Magnetic Disks; Very Long Base Interferometry

20020059967 Communications Research Lab., Kashima Space Research Center, Kashima, Japan
Real-Time Gigabit VLBI System and Internet VLBI System
Kondo, Tetsuro, Communications Research Lab., Japan; Koyama, Yasuhiro, Communications Research Lab., Japan; Nakajima, Juichi, Communications Research Lab., Japan; Sekido, Mamoru, Communications Research Lab., Japan; Ichikawa, Ryuichi, Communications Research Lab., Japan; Kawai, Eiji, Communications Research Lab., Japan; Okubo, Hiroshi, Communications Research Lab., Japan; Osaki, Hiro, Communications Research Lab., Japan; Kimura, Moritaka, Communications Research Lab., Japan; Ichikawa, Yuichi, Nihon Tsushinki Co. Ltd., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 142-146; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The development of a gigabit VLBI system and an Internet VLBI system at CRL is carried out as one of the subjects to promote 'research on key technologies to establish the space-time infrastructure in the space', a new project started two years ago. First we have developed a tape-based gigabit VLBI system. Some geodetic VLBI experiments were performed using this system. In parallel with the development of the tape-based system, a real-time gigabit VLBI system has been developed in collaboration with National Astronomical Observatory Japan (NAOJ), Institute of Space and Astronautical Science (ISAS) and Nippon Telegraph and Telephone Corp. (NTT). In the real-time system, VLBI data are transmitted through the high speed ATM network to a correlator. We successfully carried out the first real-time 1 Gbps VLBI experiment using the Kashima 34-m antenna and the Usuda 64-m antenna on June 23, 2001, and first real-time fringes were successfully detected. In addition to the success in 1 Gbps real-time VLBI, we also succeeded in 2 Gbps tape-based VLBI on December 12, 2001. On the other hand a new real-time VLBI system using IP (Internet protocol) technology called 'IP-VLBI' or 'Internet VLBI' has been developed since 1999 to reduce network cost and to expand connection sites. We have been developing the IP-VLBI system as a PC-based system consisting of a PCI-bus sampler board and PC software to make real-time data transmission, reception and correlation.
Author
Data Transmission; Internets; Real Time Operation; Systems Engineering; Very Long Base Interferometry

20020059969 Nippon Telegraph and Telephone Public Corp., Information Sharing Platform Labs., Japan
IP Data Transfer System for Real-Time VLBI
Iwamura, Sotetsu, Nippon Telegraph and Telephone Public Corp., Japan; Uose, Hisao, Nippon Telegraph and Telephone Public Corp., Japan; Kondo, Tetsuro, Communications Research Lab., Japan; Nakagawa, Shin-ichi, Communications Research Lab., Japan; Fujisawa, Kenta, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 152-156; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We constructed a data transfer system for real-time very long baseline interferometry (VLBI) using Internet protocol (IP) in GALAXY project. The system achieves maximum transfer rate of 256 Mbits/sec based on parallel transfer using multiple IP streams. This system features bandwidth scalability by increasing the number of PCs for transmitting and receiving IP data. Using the system, we conducted experiments transmitting VLBI observation data at 128 Mbits/sec and successfully detected a fringe. This is the first IP-based real-time VLBI in the world.
Author
Internets; Protocol (Computers); Real Time Operation; Very Long Base Interferometry; Data Transmission

20020059970 Communications Research Lab., Tokyo, Japan
Parallel Data Processing System
Kiuchi, Hitoshi, Communications Research Lab., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 157-161; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Signal processing in the current correlation processing algorithm is bit-serial. The speed of correlation is limited by the speed of the correlation device, and, as a result, the device speed limits observing bandwidth. The algorithm is thus not effective for

astronomical applications. to overcome this problem, I have developed a new correlation-processing algorithm for parallel data. We focus on the derivation of serial data-processing algorithms for parallel data.
Author
Algorithms; Correlators; Data Processing; Parallel Processing (Computers)

20020059976 Geographical Survey Inst., Tokyo, Japan
Processing of the Data of Syowa VLBI Experiment by Copying Between the Different Recording Systems and the Result of the Analysis
Fukuzaki, Yoshihiro, Geographical Survey Inst., Japan; Shibuya, Kazuo, National Inst. of Polar Research, Antarctica; Doi, Koichiro, National Inst. of Polar Research, Antarctica; Jike, Takaaki, National Astronomical Observatory, Japan; Jauncey, David L., Hartebeesthoek Radio Astronomy Observatory, South Africa; Nicolson, George D., Australia Telescope National Facility, Australia; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 184-188; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
At the Syowa Station on Antarctica, regular VLBI experiments have been undertaken since 1998. In this experiment different recording systems were employed. Development of copy system, however, enabled us to process the data. Meanwhile, since 1992, the O'Higgins Station on Antarctic Peninsula has participated in VLBI experiment with most of the VLBI stations in the southern hemisphere. The Syowa station has been taking part in this experiment since 1999 by developing another copy system. This is the first VLBI observation of the intra-Antarctic plate baseline.
Author
Antarctic Regions; Very Long Base Interferometry; Ground Stations; Data Processing

20020059984 Shanghai Astronomical Observatory, China
A Discussion on the Modeling of the Residual Clock Behavior and Atmosphere Effects in the Astrometric and Geodetic VLBI Data Analysis
Li, Jinling, Shanghai Astronomical Observatory, China; Zhang, Bo, Shanghai Astronomical Observatory, China; Wang, Guangli, Shanghai Astronomical Observatory, China; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 228-232; In English; Also announced as 20020059943
Contract(s)/Grant(s): G1998040703; Proj. 970231003; Proj.-19833030; Proj. 10173019; KJ951-1-304; STF-JC14012; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
We checked the dependence of the estimation of scientific interest parameters on the choice of the time span of each piece in the continuous piecewise linear modeling of the residual clock behavior and atmosphere effects by single analysis of 27 randomly selected VLBI (Very Long Baseline Interferometry) sessions in which Shanghai station (Seshan25) participated. Results show that (1) different choices of the time span of each piece lead to differences in the estimation of station coordinates up to centimeters and in the weighted root mean squares (wrms) of the delay residuals up to dozens of picoseconds; (2) since the conditions of clock and atmosphere are different from session to session and from site to site, the reasonable range of the time span of each piece should be tested and chosen for each session as well as for each site, which is really arduous work in routine data analysis. We also checked the performance of this modeling by simulated data tests. by using the User Partial function of CALC/SOLVE we compared the delay residuals from the continuous piecewise linear modeling of the residual clock behavior with that from the periodic modeling.
Author
Atmospheric Effects; Clocks; Very Long Base Interferometry; Time Lag

20020059987 Observatoire de Paris, France
PIVEX: A Proposal for a Platform Independent VLBI Exchange Format
Gontier, Anne-Marie, Observatoire de Paris, France; Feissel, Martine, Observatoire de Paris, France; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 248-254; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche
Following a recommendation of the second IVS (International VLBI (Very Long Baseline Interferometry) Service for Geodesy and Astrometry) Analysis Workshop, a working group was set up to develop a VLBI exchange format independent of platforms and operating systems. The aim of this format is to ease the international extension of VLBI analysis for astrometry and geodesy. The working group members were selected in such a way that their knowledge should collectively encompass all

data environments involved. We present, in this paper, the PIVEX (platform-independent VLBI exchange) format that was discussed and tested and the future insertion of the PIVEX files into the VLBI data flow.
Author
Very Long Base Interferometry; Format; Interoperability

20020059988 NASA Goddard Space Flight Center, Greenbelt, MD USA
Integrating Analysis Goals for EOP, CRF and TRF
Ma, Chopo, NASA Goddard Space Flight Center, USA; MacMillan, Daniel, NVI, Inc., USA; Petrov, Leonid, NVI, Inc., USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 255-259; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

In a simplified, idealized way the TRF (Terrestrial Reference Frame) can be considered a set of positions at epoch and corresponding linear rates of change while the CRF (Celestial Reference Frame) is a set of fixed directions in space. VLBI analysis can be optimized for CRF and TRF separately while handling some of the complexity of geodetic and astrometric reality. For EOP (Earth Orientation Parameter) time series both CRF and TRF should be accurate at the epoch of interest and well defined over time. The optimal integration of EOP, TRF and CRF in a single VLBI solution configuration requires a detailed consideration of the data set and the possibly conflicting nature of the reference frames. A possible approach for an integrated analysis is described.
Author
Very Long Base Interferometry; Astrometry; Geodesy; Astronomical Coordinates

20020059989 Bonn Univ., Geodetic Inst., Germany
On Correlations Between Parameters in Geodetic VLBI Data Analysis
Nothnagel, Axel, Bonn Univ., Germany; Vennebusch, Markus, Bonn Univ., Germany; Campbell, James, Bonn Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 260-264; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The study of correlations between parameters estimated in least squares adjustments helps to investigate observing geometries and permit a more thorough assessment of the parameters' formal errors. High correlations between atmospheric parameters represented as zenith atmospheric excess path lengths and the vertical component of the station coordinates have long been considered as established facts in geodetic and astrometric VLBI (Very Long Baseline Interferometry). In this paper we investigate this commonly held view on the basis of transforming the variance/covariance matrices from geocentric into local (topocentric) coordinates. We find that correlations between the estimated relative clock offsets and the local vertical components are much higher than those between the atmospheric parameters and the vertical components. This result may be used as an argument to invest more in the stability of atomic clocks for further improvements in geodetic and astrometric VLBI.
Author
Geodesy; Very Long Base Interferometry; Variance (Statistics)

20020059990 Bonn Univ., Geodetic Inst., Germany
Outlier Detection in the Combination of VLBI EOP
Steinforth, Christoph, Bonn Univ., Germany; Nothnagel, Axel, Bonn Univ., Germany; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 265-271; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

On March 1, 2002, a new combined IVS (International VLBI (Very Long Baseline Interferometry) Service for Geodesy and Astrometry) EOP (Earth Orientation Parameter) series has been established which is linked directly to the ITRF2000 (International Terrestrial Reference Frame) reference frame. As compared to the input series submitted previously, the ITRF2000 based input series provided by the IVS Analysis Centers agree much better. In the process of automatic combination, the detection of outliers is of great importance in order to reduce human intervention to a minimum. The procedure used for outlier elimination responds to the level of the scatter in the residuals. As a consequence the new combination seems to be more robust against outliers.
Author
Geodetic Coordinates; Outliers (Statistics); Very Long Base Interferometry

20020059992 NASA Goddard Space Flight Center, Greenbelt, MD USA
RDV Analysis and Mark 4/VLBA Comparison Results
Gordon, David, NASA Goddard Space Flight Center, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 277-281; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The processing of the RDV sessions and problems encountered in their analysis axe briefly discussed. Results of a VLBA/Mark 4 correlator comparison are presented. Comparison of group delays in session RDV22 processed by two different correlating/fringing systems shows good agreement, with an RMS of approx. 12 psec. Group delay formal errors may be underestimated in the RDV processing.
Author
Correlators; Error Analysis; Very Long Baseline Array (VLBA)

20020059993 Naval Observatory, USA
USNO Analysis of VLBA RDV Data
Fey, Alan L., Naval Observatory, USA; Boboltz, David A., Naval Observatory, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 282-286; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Previous analyses have indicated that there may be a problem with the VLBA RDV data for sources south of the celestial equator. We present an analysis of the effects of including VLBA RDV data in global VLBI SOLVE solutions on astrometric position estimation and on Earth Orientation Parameter estimation.
Author
Earth Orientation; Estimating; Very Long Baseline Array (VLBA)

20020059997 Geographical Survey Inst., Tokyo, Japan
Establishment of the New Geodetic Reference Frame of Japan (JGD2000)
Imakiire, Tetsuro, Geographical Survey Inst., Japan; Murakami, Masaki, Geographical Survey Inst., Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 304-308; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The Geographical Survey Institute (GSI) has constructed a new geodetic reference frame of Japan. The Survey Act and the related government ordinances were revised to adopt the new geodetic frame as the national reference system. The new frame is a geocentric system based on the observation using space geodetic techniques. The current framework based on Tokyo Datum was established at the beginning of the twentieth century and has been used as a national reference for nearly one hundred years. However, it has a large internal distortion and a shift from a geocentric reference frame, which was revealed by space geodetic techniques. The new framework has been built by referring to ITRF94 (International Terrestrial Reference Frame 1994) at the epoch of 1997.0. The coordinates of the Kashima VLBI station are fixed in ITRF94 using the data from international VLBI observations. Positions of two other domestic VLBI stations (Shintotsugawa and Kainan) were determined referred to Kashima VLBI station. Using these three VLBI stations as anchor points, the coordinates of 950 stations of the nationwide permanent GPS array (GEONET) were determined The coordinates of the first- through third-order triangulation points are calculated by referring to the GPS array. GSI resurveyed 6300 of first- to third-order triangulation points using EDM or GPS. For other 30,000 triangulation points, survey records, which have been obtained by theodolite since 1883, are used. The coordinates newly determined for VLBI stations, GPS stations, and triangulation points are the realization of Japan's new geodetic reference system. GSI named it 'Japanese Geodetic Datum 2000' (JGD2000).
Author
Geodetic Coordinates; Global Positioning System; Japan; Very Long Base Interferometry; Ground Stations

20020059999 Geoscience Australia, Bruce, Australia
Spectral Analysis of the Baseline Length Time Series from VLBI Data
Titov, Oleg, Geoscience Australia, Australia; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 315-319; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

In addition to a linear trend VLBI baseline lengths demonstrate seasonal variations. Spectral and wavelet analysis of the baseline time series having the longest history show that annual and semiannual variations are present at these frequencies. It appears that the baseline length variations arise from instability in the vertical component of one or both VLBI sites.
Author
Annual Variations; Spectrum Analysis; Very Long Base Interferometry; Wavelet Analysis

20020060071 General Accounting Office, Washington, DC USA
Information Management: Challenges in Managing and Preserving Electronic Records
June 2002; 86p; In English
Report No.(s): PB2002-107611; GAO-02-586; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
In the wake of the transition from paper-based to electronic processes, federal agencies are producing vast and rapidly growing volumes of electronic records. The difficulties of managing, preserving, and providing access to these records represent challenges for the National Archives and Records Administration (NARA) as the nation's recordkeeper and archivist. GAO was requested to (1) determine the status and adequacy of NARA's response to these challenges and (2) review NARA's efforts to acquire an advanced electronic records archiving system, which will be based on new technologies that are still the subject of research.
NTIS
Information Management; Documents

20020060148 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA
Proceedings from the Texas ITS Data Uses and Archiving Workshop ***Topical Report, Aug. 1998 - Sep. 1999***
Turner, S. M.; Eisele, W. L.; February 1999; 142p; In English
Report No.(s): PB2002-105405; RR-1752-4; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
The 'Texas ITS Data Uses and Archiving Workshop' was held November 10, 1998, in Austin, Texas, to discuss issues and opportunities related to archiving data from intelligent transportation systems (ITS). The workshop participants represented several of Texas' urban areas (Austin, Dallas, Ft. Worth, Houston, and San Antonio) as well as many different disciplines within transportation, including planning, system operations and management, system integration, research and evaluation, emergency management, and air quality analysis. The purpose of the workshop was threefold: (1) share information about ITS data archiving activities and plans at the national level as well as within Texas' major urban areas; (2) discuss common issues and areas of concern related to ITS data archiving and data needs; and (3) identify common themes, best practices, and issues that need to be addressed. Technical presentations at the workshop focused on the following topics: (1) national activities related to the archived data user service (ADUS), traffic management data dictionary (TMDD), and the national data registry; (2) state activities related to ITS architecture, statewide system integration, and the information sharing policy; (3) data archiving and management approaches at several TXDOT districts; and (4) planning data collection practices and needs. Break-out discussion groups covered the topics of data user groups and needs, data warehousing technology, and data standards.
NTIS
Conferences; Data Management; Architecture (Computers); Transportation Networks; Houston (TX)

20020061959 NASA Ames Research Center, Moffett Field, CA USA
Security for Multimedia Space Data Distribution over the Internet
Stone, Thom, NASA Ames Research Center, USA; Picinich, Lou, NASA Ames Research Center, USA; Jul. 01, 1995; 8p; In English
Contract(s)/Grant(s): NAS2-14263
Report No.(s): Rept-5d004; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Distribution of interactive multimedia to remote investigators will be required for high quality science on the International Space Station (ISS). The Internet with the World Wide Web (WWW) and the JAVA environment are a good match for distribution of data, video and voice to remote science centers. Utilizing the "open" Internet in a secure manner is the major hurdle in making use of this cost effective, off-the-shelf, universal resource. This paper examines the major security threats to an Internet distribution system for payload data and the mitigation of these threats. A proposed security environment for the Space Station Biological Research Facility (SSBRP) is presented with a short description of the tools that have been implemented or planned. Formulating and implementing a security policy, firewalls, host hardware and software security are also discussed in this paper. Security is a vast topic and this paper can only give an overview of important issues. This paper postulates that a structured approach is required and stresses that security must be built into a network from the start. Ignoring security issues or putting them off until late in the development cycle can be disastrous.
Author
Computer Information Security; World Wide Web; Data Transmission; Multimedia

20020061970 Department of Defense, Office of the Inspector General, Arlington, VA USA
Information Technology: Defense Hotline Allegations Regarding the Military Airspace Management System
Jun. 25, 2002; 49p; In English
Report No.(s): AD-A403047; IG/DOD-D-2002-119; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This audit resulted from Defense Hotline allegations on the System. Specifically, the Defense Hotline complainant submitted seven allegations relating to the efficiency and effectiveness of the System. Appendix B addresses the allegations and the results of our review in more detail. DoD developed the Internet-based system to provide the capability to efficiently schedule, manage, document, and report military airspace use data. The System is to interface with selected existing Special Use Airspace scheduling systems and, where feasible, provide a consolidated database of schedule data and scheduling capability for nonautomated users. In addition, the System will interface with the Federal Aviation Administration for airspace use reporting.
DTIC
Planning; Contracts; Management Systems; Scheduling

20020061974 Physics and Electronics Lab. TNO, The Hague, Netherlands
System Concept of the Support at Training and Instruction Needs Statements for the Royal Netherlands Army *Final Report Systeemconcept van de Ondersteuning bij GOLM-behoeftestellingen*
vanderArend, J. G. M., Physics and Electronics Lab. TNO, Netherlands; Vertegen, D. M. L., Physics and Electronics Lab. TNO, Netherlands; February 2002; 45p; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KL/919; TNO Proj. 015.31670
Report No.(s): TD-01-0265; FEL-01-A273; Copyright; Avail: Issuing Activity
The study is aimed at the support in writing the training and instruction needs statements within the Royal Netherlands Army. In the needs assessment phase the involvement of training systems is determined and a preliminary cost estimation must be made. The persons that have to make the needs statements are confronted with limitations in time and information available. Based on the TNO knowledge and experience a toolset is defined to support the needs assessment task. This document describes the system concept of this toolset. TNO Physics and Electronics Laboratory and TNO Human Factors performed the study in collaboration with the Royal Netherlands Army. The system concept is a client/server architecture using the current intranet infrastructure. The data is stored in a central database; these data can be reached from every location with a connection to the intranet. The system will an integrated solution of the following components: method toolset, method reference and project environment. Important aspects in the development are the data structure of the central database and the reuse of existing concepts, systems and tools. The results offer enough ingredients and details to start the development of the preliminary prototype in 2002.
Author
Education; Human Factors Engineering; Computer Networks; Data Structures; Data Bases

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20020061859 Lembaga Penerbangan dan Antariksa Nasional, Bidang Analisis dan Informasi Kedirgantaraan Pussisfogan, Jakarta, Indonesia
Legal Analysis of the Creation of International Space Law by UNCOPUOS *Kajian Tentang Keabsahan UNCOPUOS Dalam Pembentukan Hukum Antariksa Internasional*
Diogenes, Mardianis, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; December 2001; ISSN 0126-9754; Volume 3, No. 4, pp. 176-188; In Malay-Indonesian; Copyright; Avail: Issuing Activity
UNCOPUOS is an international organization under auspiciuos United Nations, which has produced a number of international space law. The international space law have been produced by UNCOPUOS on the basis of authority which has given for it as a international organization. This paper is aimed to analyse its legalization of the authority of UNCOPUOS according law of international organization and its product as international space law. Based on the analysis of law of international organization as well as its products, it is concluded that UNCOPUOS has the authority and its products are legal by law.
Author
International Law; Space Law; Legal Liability

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

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

20020060782 Center for Technology Commercialization, Inc., NASA New England Outreach Center, Nashua, NH USA
NASA New England Outreach Center ***Annual Report, 1 Jul. 2001 - 30 Jun. 2002***
[2002]; 22p; In English
Contract(s)/Grant(s): NCC5-567; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA New England Outreach Center in Nashua, New Hampshire was established to serve as a catalyst for heightening regional business awareness of NASA procurement, technology and commercialization opportunities. Emphasis is placed on small business participation, with the highest priority given to small disadvantaged businesses, women-owned businesses, HUBZone businesses, service disabled veteran owned businesses, and historically black colleges and universities and minority institutions. The Center assists firms and organizations to understand NASA requirements and to develop strategies to capture NASA related procurement and technology opportunities. The establishment of the NASA Outreach Center serves to stimulate business in a historically underserved area. NASA direct business awards have traditionally been highly present in the West, Midwest, South, and Southeast areas of the USA. The Center guides and assists businesses and organizations in the northeast to target opportunities within NASA and its prime contractors and capture business and technology opportunities. The Center employs an array of technology access, one-on-one meetings, seminars, site visits, and targeted conferences to acquaint Northeast firms and organizations with representatives from NASA and its prime contractors to learn about and discuss opportunities to do business and access the inventory of NASA technology. This stimulus of interaction also provides firms and organizations the opportunity to propose the use of their developed technology and ideas for current and future requirements at NASA. The Center provides a complement to the NASA Northeast Regional Technology Transfer Center in developing prospects for commercialization of NASA technology. In addition, the Center responds to local requests for assistance and NASA material and documents, and is available to address immediate concerns and needs in assessing opportunities, timely support to interact with NASA Centers on a local level, and develop easy access to information. The Center acts in the manner of a ”NASA Center or Field Office” with direction from NASA Headquarters, Code K.
Author
Technology Utilization; NASA Programs; Commerce; Technology Transfer

88
SPACE SCIENCES (GENERAL)

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

20020060747 NASA Goddard Space Flight Center, Greenbelt, MD USA
LISA Optics Model
Waluschka, Eugene, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; SPIE 2002, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The LISA experiment has six telescopes, in three spacecraft, in orbit about the sun. There is a continuous laser link between all of the spacecraft. Because of the large, 5 million kilometer distances, between the spacecraft and the need to perform picometer level interferometry and the fact that the optical system is dynamic precludes the use of standard optical codes in the design and analysis of this optical system. A detailed description of the approach used to model all of the optics, in the spacecraft in orbit, is presented and the ability of this model to analyze requirements is discussed. A dynamic computer simulation will be shown to illustrate the laser link and the effects of this dynamic environment on the interferometry.
Author
Interferometry; Telescopes; Computerized Simulation; Continuous Wave Lasers

89
ASTRONOMY

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

20020059656 TerraSystems, Inc., Space Science Research Div., Lee, NH USA
Research Support for the Analysis and Management of Celestial Backgrounds Data ***Final Report, 16 Jun. 1998-22 Sep. 2000***
Tedesco, Edward F., TerraSystems, Inc., USA; Sep. 22, 2000; 56p; In English
Contract(s)/Grant(s): F19628-98-C-0032; AF Proj-MSX8
Report No.(s): AD-A402207; AFRL-VS-TR-2000-1601; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

TerraSystems, Inc. (TSI) supported the validation and analysis of celestial backgrounds data collected by various sensors (including MSX) and assisted in incorporating the results of these analyses into improved computer models which were then integrated into existing Celestial Backgrounds codes. The results of this activity will improve the quality of the data and the ability to accurately simulate and predict the behavior of the infrared environment on operational spaced borne systems. TSI's effort included: (1) methods of improving the quality of collected data through error analysis and post-event correction, especially with respect to removing known and unknown asteroids from the MSX point and source list and improving the celestial background asteroid model with new sources of data from SIMPS, ISO, and polarimetry and (2) developing techniques useful in promoting collaborative analysis by geographically dispersed teams either in small groups or at large, topical meetings.
DTIC
Celestial Mechanics; Computerized Simulation; Astronomical Polarimetry; Data Processing

20020059944 Observatoire de Paris, France
The Essential Contribution of VLBI to Fundamental Astronomy
Capitaine, Nicole, Observatoire de Paris, France; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 14-23; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The adoption of the International Celestial Reference System MRS based on VLBI observations of extragalactic radio sources, by the International Astronomical Union (IAU), since 1st January 1998, has open a new era for astronomy. The MRS and the corresponding frame ICRF replaced the FK5 based on positions and proper motions of bright stars. According to its definition, the MRS is such that the barycentric directions of distant extragalactic objects show no global rotation with respect to these objects. The old dream of astronomers of an absolute reference for measuring the angular motion of celestial bodies has thus become reality. This results in an historical abandonment of the link of the celestial reference system with the motion of the Earth. This has to be taken into account by revising the current concepts of fundamental astronomy; IAU 2000 Resolutions provided new definitions for the celestial pole, Universal Time and parameters to be used in the transformation between celestial and terrestrial frames, in consistency with the properties of the ICRS. VLBI observations of Earth orientation referred to the ICRS provide very accurate determination of the actual celestial position of the pole and of the Earth's angle of rotation. This has led to significant improvements in the models for variations of Earth's angular velocity as well as for precession and nutation. Such models are very useful for astrometry and provide a better knowledge of the dynamics of the Earth's interior.
Author
Celestial Reference Systems; Very Long Base Interferometry; Technology Utilization; Earth Orientation

20020059979 National Astronomical Observatory, Tokyo, Japan
A Proposal for Constructing a New Sub-mm VLBI Array, Horizon Telescope: Imaging Black Hole Vicinity
Miyoshi, Makoto, National Astronomical Observatory, Japan; Kameno, Seiji, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 199-202; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

The existence of a black hole in the universe has become very clear and is now common sense in astronomy. But the direct image of a black hole showing relativistic phenomena around the event horizon was still beyond our reach at the previous century because the sizes of black holes are too small to observe. Sagittarius A* (SgrA*) is the closest massive black hole at our galactic center. The Schwarzschild radius of SgrA* is about 6 (micro)arcseconds. Early in the 21st century developments of VLBI (Very Long Baseline Interferometry) techniques and millimeter and sub-millimeter radio astronomy will soon reach the point to make

such observations of black holes possible. We here propose to construct a new VLBI array that should be named the (Event) Horizon Telescope.
Author
Black Holes (Astronomy); Event Horizon; Radio Astronomy; Telescopes; Very Long Base Interferometry

20020060462 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cryo Cooler Induced Micro-Vibration Disturbances to the Hubble Space Telescope
Jedrich, Nick, Jackson and Tull, Inc., USA; Zimbelman, Darrell, NASA Goddard Space Flight Center, USA; Turczyn, Mark, NASA Goddard Space Flight Center, USA; Sills, Joel, United Space Alliance, USA; Voorhees, Carl, Lockheed Martin Corp., USA; Clapp, Brian, Lockheed Martin Technical Operations, Inc., USA; [2002]; 7p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents an overview of the Hubble Space Telescope (HST) Near Infrared Camera and Multi-Object Spectrometer (NICMOS) Cryo Cooler (MCC) system, a description of the micro-vibration characterization testing performed, and a discussion of the simulated performance. The NCC is a reverse Brayton cycle system that employs micro turbo-machinery to provide cooling to the NICMOS instrument. Extensive testing was conducted to quantify the expected on-orbit disturbances caused by the micro turbo-machinery and provide input to a flexible-body dynamic simulation to demonstrate compliance with the HST 7 milli-arcsecond root mean square jitter requirement.
Author
Hubble Space Telescope; Spectrometers; Satellite Instruments; Cooling Systems

20020061270 NASA Ames Research Center, Moffett Field, CA USA
Comparison of the Kepler and Eddington Missions
Borucki, William J., NASA Ames Research Center, USA; [2002]; 1p; In English; Royal Astrnomical Society Meeting, London, UK; Sponsored by Royal Astronomical Society, UK
Contract(s)/Grant(s): RTOP 997-24-00; No Copyright; Avail: Issuing Activity; Abstract Only

The Kepler and Eddington missions are spaceborne photometric missions with similar apertures. Both are capable of finding Earth-size extrasolar planets and both can detect p-mode oscillations in stars. The Kepler mission is optimized to find Earth-size planets in the habitability zone of Solar-like stars and does astroseismology only as incidental science. The Eddington mission appears to be optimized for astroseismology. The Kepler design provides a very large field of view, a low measurement cadence, a heliocentric orbit, and a long mission duration. The demand for a large field-of-view results in a Schmidt design with a massive corrector. However, the use of the corrector allows a 105 square degree FOV and thereby provides 15 times the number of stars at a given magnitude than does the optical design used in Eddington. Because Kepler stares at a single FOV throughout the mission, it does much less astroseismology than Eddington. Other comparisons are also discussed.
Author
Space Missions; Photometry; Extrasolar Planets; Field of View; Optical Equipment

20020061303 NASA Ames Research Center, Moffett Field, CA USA
Detection by Transit Photometry
Borucki, William J., NASA Ames Research Center, USA; Koch, David G., NASA Ames Research Center, USA; Jenkins, Jon M., Search for Extraterrestrial Intelligence Inst., USA; [2002]; 1p; In English; AAS 199th Meeting, Washington, DC, USA; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): RTOP 344-37-00-03; No Copyright; Avail: Issuing Activity; Abstract Only

A periodic sequence of planetary transits provides a valid detection of an orbiting planet and provides the relative size of the planet and its orbital period. Ancillary measurements of the stellar spectrum and the variations of the star's radial velocity or position combined with stellar models allow the absolute size of the planet and its mass to be obtained. The results of this approach have already shown that the planet orbiting HD209458 has only 70% of the mass of Jupiter, but is nearly 50% larger in radius. Based on models of planetary structure, these results imply that the planet must have spent most of its lifetime so close to the star that it has not been able to cool and contract as have the giant planets in our Solar System. Thus its density is much less than Jupiter and Saturn and is actually less than that of water; i.e., about 0.4 gr/cu cm. If more sensitive measurements of the light curve of stars with closely orbiting planets can be made that provide the varying amplitude of the light reflected by the planet at various phases in its orbit, then characteristics of the planetary atmosphere can be obtained. Potentially, these data can identify major molecular species present in the atmosphere and tell us if clouds are present and yield the phase function of the aerosols. Although such detail cannot be obtained for Earth-size planets because their signal amplitudes are too small, it is possible to get data critical to the determination of the structure of extrasolar planetary systems. In particular, the size distributions and their orbital

distributions can be measured by the transit photometry missions now in development. The COROT mission should be able to find large terrestrial planets in short-period orbits while the more ambitious Kepler and Eddington missions should be able to detect planets even smaller than the Earth and at orbital distances that place them in the habitable zone of their stars.
Author
Photometry; Radial Velocity; Planetary Systems; Planetary Atmospheres; Molecular Gases; Planetary Structure

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ASTROPHYSICS

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

20020059659 California Univ., Inst. of Geophysics and Planetary Physics, Los Angeles, CA USA
Chondritic Meteorites: Nebular and Parent-Body Formation Processes ***Final Report, 1 Jun. 1997 - 31 May 2002***
Rubin, Alan E., California Univ., USA; [2002]; 3p; In English
Contract(s)/Grant(s): NAG5-4766; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
It is important to identify features in chondrites that formed as a result of parent-body modification in order to disentangle nebular and asteroidal processes. However, this task is difficult because unmetamorphosed chondritic meteorites are mixtures of diverse components including various types of chondrules, chondrule fragments, refractory and mafic inclusions, metal-sulfide grains and fine-grained matrix material. Shocked chondrites can contain melt pockets, silicate-darkened material, metal veins, silicate melt veins, and impact-melt-rock clasts. This grant paid for several studies that went far in helping to distinguish primitive nebular features from those produced during asteroidal modification processes.
Derived from text
Chondrites; Meteorites; Geochemistry; Veins (Petrology); Metamorphism (Geology)

20020060236 Alabama Univ., Office of Research Administration, Huntsville, AL USA
Batse Triggered Observations of Galactic Superluminal Sources GROJ1655-40 ***Final Report, 15 Feb. 1999 - 14 Feb. 2002***
Zhang, Shuang Nan, Alabama Univ., USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG5-8234; No Copyright; Avail: Issuing Activity; Abstract Only
We have analyzed multiwavelength data of galactic superluminal sources including GROJ1655-40. Currently there are thirteen X-ray binaries, in which the masses of the invisible and compact objects have been determined to be much higher than three solar masses, the well-known upper limit to the mass of a neutron star. Because no stable and compact objects are believed to exist above this limit, these compact objects are consequently considered as stellar mass black holes, though clean evidence of strong gravity effects around the assumed black holes is very rare. From optical and radio observations, their system inclination angles have been determined to range between 25 degrees and 80 degrees, but peaked between 60-70 degrees. This peak is not explained in the frame work of Newtonian gravity in these systems. However, this peak is reproduced naturally if we model the observed X-ray radiation as being produced in the accretion disks very close to the black hole horizons, where the extremely strong general and special relativistic effects, caused by the extremely strong gravity near the black hole horizons, modify the local radiation significantly as the X-rays propagate to the remote observer.
Author
Galaxies; Gamma Ray Bursts; Gamma Ray Sources (Astronomy); Radio Observation

20020060658 NASA Ames Research Center, Moffett Field, CA USA
Dispersal of Disks Around Young Stars: Constraints on Kuiper Belt Formation
Hollenbach, David, NASA Ames Research Center, USA; [2002]; 1p; In English; Debris Disks and the Formation of Planets: A Symposium in Memory of Fred Gillett, 11-13 Apr. 2002, Tucson, AZ, USA
Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only
We review the evidence pertaining to the lifetimes of planet-forming disks and discuss possible disk dispersal mechanisms: 1) viscous accretion of material onto the central source; 2) close stellar encounters; 3) stellar winds; and 4) photoevaporation by ultraviolet radiation. We focus on 3) and 4) and describe the quasi-steady state appearance and the overall evolution of disks under the influence of winds and radiation from the central star and of radiation from external OB stars. Viscous accretion likely dominates disk dispersal in the inner disk (r approx. is less than or equal to 10 AU), while photoevaporation is the principal process of disk dispersal outside of r approx. is greater than = 10 AU for low mass stars. Disk dispersal timescales are compared and discussed in relation to theoretical estimates for planet formation timescales. Photoevaporation may explain the large differences in the hydrogen content of the giant planets in the solar system. The commonly held belief that our early sun's stellar wind

dispersed the solar nebula is called into question. Finally, we study the constraints that the evaporation of the outer disk has on the formation of Kuiper belts in extrasolar planetary systems.
Author
Kuiper Belt; Accretion Disks; Planetary Systems; Planetary Evolution; Stellar Winds; Stellar Radiation; Solar System Evolution

20020060664 NASA Goddard Space Flight Center, Greenbelt, MD USA
Abundances of Planetary Nebulae NGC 7662 and NGC 6741
Pottasch, S. R., Kapteyn Astronomical Lab., Netherlands; Beintema, D. A., Kapteyn Astronomical Lab., Netherlands; Salas, J. Bernard, Kapteyn Astronomical Lab., Netherlands; Feibelman, W. A., NASA Goddard Space Flight Center, USA; Astronomy and Astrophysics; 2001; ISSN 0004-6361; Volume 380, pp. 684-694; In English; Copyright; Avail: Issuing Activity
The ISO and IUE spectra of the elliptical nebulae NGC 7662 and NGC 6741 are presented. These spectra are combined with the spectra in the visual wavelength region to obtain a complete, extinction corrected, .spectrum. The chemical composition of the nebulae is then calculated and compared to previous determinations. The abundances found are compared to determinations made in other nebulae using ISO data. A discussion is given to see if possible evolutionary effects can be found from the abundance differences.
Author
Abundance; Planetary Nebulae; Spectra; Chemical Composition; Wavelet Analysis

20020060771 NASA Ames Research Center, Moffett Field, CA USA
Star Formation in the Galaxy and the Fluctuating UV Radiation Field
Hollenbach, David, NASA Ames Research Center, USA; Parravano, Antonio, Universidad de Los Andes, Venezuela; McKee, Christopher H., California Univ., USA; Nov. 26, 2001; 1p; In English; American Astronomical Society Conference, 1 Jan. 2002, Washington, DC, USA; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): RTOP 344-04-10-02; No Copyright; Avail: Issuing Activity; Abstract Only
We examine the formation of massive stars in the Galaxy, the resultant fluctuating UV radiation field, and the effect of this field on the star-forming interstellar medium (ISM). There are substantial fluctuations of the UV radiation field in space (scales of 100's of parsecs) and time (time-scales of order 100 million years) at the solar circle. The Far Ultraviolet (FUV) (6 eV<hvislessthan13.6eV)fieldad the pressure determines whether the thermal balance of the neutral gas results in cold clouds or warm (T - 10(exp 4) neutral medium. We show how to calculate the average fractions of the gas in the cold and warm phases when the interstellar gas is subject to this fluctuating FUV field. The knowledge of how these fractions depend on the gas properties and on the FUV sources is a basic step in building a model of the large scale behavior of the ISM and the mutual relation between the ISM and the star formation rate. Application is made to observations of spiral galaxies which correlate the star formation rate per unit area with the surface density of the gas. We acknowledge support from the NASA Astrophysical Theory program.
Author
Interstellar Matter; Interstellar Gas; Massive Stars; Radiation Distribution; Star Formation; Far Ultraviolet Radiation

20020060779 NASA Ames Research Center, Moffett Field, CA USA
Evolution of Interstellar Grains
Allamandola, Lou J., NASA Ames Research Center, USA; [1998]; 1p; In English, 9 Sep. 1998, Basel, Bern, Switzerland, USA
Contract(s)/Grant(s): RTOP 344-38-12-04; RTOP 344-02-06-01; No Copyright; Avail: Issuing Activity; Abstract Only
During the past two decades observations combined with laboratory simulations, have revolutionized our understanding of interstellar ice and dust, the raw materials from which planets, comets and stars form. Most interstellar material is concentrated in large molecular clouds where simple molecules are formed by dust-grain and gas-phase reactions. Gaseous species striking the cold (10K) dust stick, forming an icy grain mantle. This accretion, coupled with UV photolysis, produces a complex chemical mixture containing volatile, non-volatile, and isotopically fractionated species. Ices in molecular clouds contain the very simple molecules H2O, CH3OH, CO, CO2, H2, and perhaps some NH3 and H2CO, as well as more complex species. The evidence for these compounds, as well as carbon-rich materials, will be reviewed and the possible connections with comets and meteorites will be presented in the first part of the talk . The second part of the presentation will focus on interstellar/precometary ice photochemical evolution and the species likely to be found in comets. The chemical composition and photochemical evolution of realistic interstellar/pre-cometary ice analogs will be discussed. Ultraviolet photolysis of these ices produces H2, H2CO, CO2, CO, CH4, HCO, and more complex molecules. When ices representative of interstellar grains and comets are exposed to UV radiation at low temperature a series of moderately complex organic molecules are formed in the ice including: CH3CH2OH (ethanol), HC(=O)NH2 (formamide), CH3C(=O)NH2 (acetamide), and R-C=N (nitriles). Several of these are already known to be in the interstellar medium, and their presence indicates the importance of grain processing. After warming to room temperature

an organic residue remains. This is composed primarily of hexamethylenetetramine (HMT, C6H12N4), with lesser amounts of polyoxymethylene-related species (POMs), amides, and ketones. This is in sharp contrast to the organic residues produced by irradiating unrealistic interstellar ice analogs or thermally promoted polymerization-type reactions in unirradiated realistic ice mixtures.
Author
Interstellar Matter; Dust; Ice; Molecular Clouds; Photochemical Reactions; Gas Composition; Ultraviolet Radiation

20020061266 NASA Ames Research Center, Moffett Field, CA USA
Planet Formation
Lissauer, Jack J., NASA Ames Research Center, USA; [1998]; 2p; In English, 30 Apr. 1998, France, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

An overview of current theories of star and planet formation is presented. These models are based upon observations of the Solar System and of young stars and their environments. They predict that rocky planets should form around most single stars, although it is possible that in some cases such planets are lost to orbital decay within the protoplanetary disk. The frequency of formation of gas giant planets is more difficult to predict theoretically. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth like terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates.
Author
Solar System; Planetary Evolution; Astronomical Models; General Overviews

20020061284 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Is There a Cosmological Constant? ***Final Report, 1 Jul. 1999 - 31 Mar. 2002***
Kochanek, Christopher, Smithsonian Astrophysical Observatory, USA; July 2002; 3p; In English
Contract(s)/Grant(s): NAG5-8831; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The grant contributed to the publication of 18 refereed papers and 5 conference proceedings. The primary uses of the funding have been for page charges, travel for invited talks related to the grant research, and the support of a graduate student, Charles Keeton. The refereed papers address four of the primary goals of the proposal: (1) the statistics of radio lenses as a probe of the cosmological model (#1), (2) the role of spiral galaxies as lenses (#3), (3) the effects of dust on statistics of lenses (#7, #8), and (4) the role of groups and clusters as lenses (#2, #6, #10, #13, #15, #16). Four papers (#4, #5, #11, #12) address general issues of lens models, calibrations, and the relationship between lens galaxies and nearby galaxies. One considered cosmological effects in lensing X-ray sources (#9), and two addressed issues related to the overall power spectrum and theories of gravity (#17, #18). Our theoretical studies combined with the explosion in the number of lenses and the quality of the data obtained for them is greatly increasing our ability to characterize and understand the lens population. We can now firmly conclude both from our study of the statistics of radio lenses and our survey of extinctions in individual lenses that the statistics of optically selected quasars were significantly affected by extinction. However, the limits on the cosmological constant remain at lambda is less than 0.65 at a 2-sigma confidence level, which is in mild conflict with the results of the Type la supernova surveys. We continue to find that neither spiral galaxies nor groups and clusters contribute significantly to the production of gravitational lenses. The lack of group and cluster lenses is strong evidence for the role of baryonic cooling in increasing the efficiency of galaxies as lenses compared to groups and clusters of higher mass but lower central density. Unfortunately for the ultimate objective of the proposal, improved constraints on the cosmological constant, the next large survey for gravitational lenses did not release its results during the term of the proposal. The research supported the career development. of six graduate students (polar, Fletcher, Herold, Keeton, Deng and Rusin) and two post-docs (Labor and Munoz).
Author
Cosmology; Astronomical Models; Spiral Galaxies; Galactic Clusters; Dust

20020061285 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Toward An Understanding of Cluster Evolution: A Deep X-Ray Selected Cluster Catalog from ROSAT ***Final Report, 1 Oct. 1995 - 31 Mar. 2002***
Jones, Christine, Smithsonian Astrophysical Observatory, USA; July 2002; 2p; In English
Contract(s)/Grant(s): NAG5-3064; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the past year, we have focussed on studying individual clusters found in this sample with Chandra, as well as using Chandra to measure the luminosity-temperature relation for a sample of distant clusters identified through the ROSAT study, and finally we are continuing our study of fossil groups. For the luminosity-temperature study, we compared a sample of nearby clusters with

a sample of distant clusters and, for the first time, measured a significant change in the relation as a function of redshift (Vikhlinin et al. in final preparation for submission to Cape). We also used our ROSAT analysis to select and propose for Chandra observations of individual clusters. We are now analyzing the Chandra observations of the distant cluster A520, which appears to have undergone a recent merger. Finally, we have completed the analysis of the fossil groups identified in ROM observations. In the past few months, we have derived X-ray fluxes and luminosities as well as X-ray extents for an initial sample of 89 objects. Based on the X-ray extents and the lack of bright galaxies, we have identified 16 fossil groups. We are comparing their X-ray and optical properties with those of optically rich groups. A paper is being readied for submission (Jones, Forman, and Vikhlinin in preparation).
Author
Galactic Clusters; Galaxies; X Ray Optics; Fossils

20020061286 NASA Ames Research Center, Moffett Field, CA USA
Cometary Science After Hale-Bopp
Wooden, Diane H., NASA Ames Research Center, USA; [2002]; 1p; In English; 186th; International Astronomical Union Colloquium, Puerto de La Cruz, Spain; Sponsored by International Astronomical Union, Unknown
Contract(s)/Grant(s): RTOP 344-37-22-07
Report No.(s): Rept-1; No Copyright; Avail: Issuing Activity; Abstract Only
Comets and the chondritic porous interplanetary dust particles (CP IDPs) that they shed in their comae are reservoirs of primitive solar nebula materials. The high porosity and fragility of cometary grains and CP IDPs, and anomalously high deuterium contents of pyroxene-rich CP IDPs imply these aggregate particles contain significant interstellar grain components. Spectrophotometry of comets at thermal IR wavelengths (3-40 microns) reveal the presence of a warm (near-IR) featureless emission modeled by amorphous carbon grains, and mid-IR and far-IR broad and narrow resonances modeled by chondritic (50% Fe and 50% Mg) amorphous and Mg-rich crystalline silicate minerals, respectively. Cometary amorphous silicate resonances are well matched by IR spectra of CP IDPs dominated by 0.1 micron spherules of Glass with Embedded Metal and Sulfides (GEMS) that are thought to be the interstellar Fe-bearing amorphous silicates produced in the cooling outflows of Asymptotic Giant Branch (AGB) stars. Acid-etched microtomed CP IDP samples, however, show that both the carbon phase (aliphatic) and the amorphous silicate phase (Mg-rich) are not optically absorbing while the embedded Fe nanoparticles make the IDPs dark. The CP IDPs suggest either significant processing has occurred in the ISM or that the AGB amorphous silicates have Mg-rich stoichiometry and possibly grew on Fe particle condensates. Cometary crystalline silicate resonances are well matched by IR spectra of laboratory submicron Mg-rich olivine crystals, [Mg(sub y),Fe(sub 1-y)]2SiO4 with y/ge0.85, and in the case of Hale-Bopp at r(sub h) less than or equal to approx. 1.5 AU, by Mg-rich pyroxene crystals, [Mg(sub x),Fe(sub 1-x)]SiO3 with x/ge0.85. While a fraction of AGB stardust (less than or equal to 15%) are Mg-rich crystals, this interstellar star dust component is insufficient to account for the deduced abundance of crystalline minerals in comet dust. An insufficient source of ISM Mg-rich crystals leads to the inference that Mg-rich crystals in comets may be hot, early solar nebula condensates that traveled large radial distances out to the comet-forming zone.
Author
Cometary Atmospheres; Interplanetary Dust; Porosity; Infrared Radiation; Asymptotic Giant Branch Stars

20020061288 NASA Ames Research Center, Moffett Field, CA USA
Annealing of Silicate Dust by Nebular Shocks at 10 AU
Harker, David E., NASA Ames Research Center, USA; Desch, Steven J., Carnegie Institution of Washington, USA; [2001]; 1p; In English
Contract(s)/Grant(s): RTOP 344-37-22-07; No Copyright; Avail: Issuing Activity; Abstract Only
Silicate dust grains in the interstellar medium are known to be mostly amorphous, yet crystalline silicate grains have been observed in many long-period comets and in protoplanetary disks. Annealing of amorphous silicate grains into crystalline grains requires temperatures greater than or approximately equal to 1000 K, but exposure of dust grains in comets to such high temperatures is apparently incompatible with the generally low temperatures experienced by comets. This has led to the proposal of models in which dust grains were thermally processed near the protoSun, then underwent considerable radial transport until they reached the gas giant planet region where the long-period comets originated. We hypothesize instead that silicate dust grains were annealed in situ, by shock waves triggered by gravitational instabilities. We assume a shock speed of 5 km/s, a plausible value for shocks driven by gravitational instabilities. We calculate the peak temperatures of pyroxene grains under conditions typical

in protoplanetary disks at 5-10 AU. We show that in situ annealing of micron-sized dust grains can occur, obviating the need for large-scale radial transport.
Author
Silicates; Dust; Annealing; Protoplanetary Disks; Comets; Shock Waves; Interstellar Matter

20020061310 NASA Goddard Space Flight Center, Greenbelt, MD USA
Energetic Particles in the Galaxy: Causes and Consequences
Ormes, Jonathan F., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only
This talk will discuss the production of energetic particles in the galaxy known as cosmic rays. I will discuss the problems and prospects for learning more about their origin and history in the galaxy. New missions such as GLAST and ACCESS have the potential for breakthrough in the study of their origins.
Author
Cosmic Rays; Energetic Particles

20020061313 NASA Ames Research Center, Moffett Field, CA USA
Formation of Jupiter and Saturn
Lissauer, Jack J., NASA Ames Research Center, USA; [1998]; 2p; In English; Jupiter and Saturn Meeting, 11-15 May 1998, Nantes, France
Contract(s)/Grant(s): RTOP 334-30-50; No Copyright; Avail: Issuing Activity; Abstract Only
An overview of current theories of the formation of our Solar System, with emphasis on giant planets, is presented. The most detailed models are based upon observations of planets and smaller bodies within our own Solar System and of young stars and their environments. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth as do terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates. Larger disk mass allows for faster growth of solid planetary bodies. The ability of a solid planet to trap gas from the protoplanetary disk increases rapidly as its mass increases (because the depth of its gravitational potential well increases), but decreases as the planetesimal accretion rate is increased (as it becomes hotter). The net effect of increasing disk mass is that gas giant planets form more rapidly, but with larger core masses. Observations of circumstellar disks suggest an upper bound on the time available prior to dissipation of the gas, and planetary models place upper limits on core sizes. Together, these constraints suggest that Jupiter and Saturn formed in 1 - 10 million years, and the density of solids in the region of their formation was a few times as large as the lower bound provided by the traditional minimum mass nebula.
Author
Jupiter (Planet); Saturn (Planet); Planetary Structure; Solar System

20020061373 NASA Ames Research Center, Moffett Field, CA USA
Theory of the Shape of the Heliospheric Termination Shock: Axial Symmetry
Barnes, Aaron, NASA Ames Research Center, USA; [1998]; 1p; In English; Solar Wind 9 Conference, 5-9 Oct. 1998, Nantucket, MA, USA
Contract(s)/Grant(s): RTOP 370-16-01-14; Copyright; Avail: Issuing Activity; Abstract Only
The heliospheric termination shock must exhibit asymmetry in its shape, due in part to internal latitude variations in the solar wind, and in part to the special directions defined by the external interstellar flow and/or the galactic magnetic field. This asymmetry shows up naturally in numerical simulations of the interaction between the heliosphere and local interstellar medium. However, to date only one analytical treatment of the theory has appeared, which discussed the modification of the shock shape due to solar wind latitude variations in the presence of spherically symmetric outer boundary conditions. In the present report, we discuss an extension and generalization of this theory to an axially symmetric gasdynamic system, in which departure from spherical symmetry may be due either to internal solar wind variations or to the directional properties of the external interstellar medium. It is shown that for steady flow the post-shock region is characterized by an infinite set of quantities that are conserved along streamlines; among these invariants are the stagnation pressure and a quantity closely related to vorticity. Moreover, for a given latitude profile of the (supersonic) solar wind, the geometry of the termination shock uniquely determines the valued of these invariants at the points where the streamlines emerge from the shock. A self-consistent solution of the problem thus requires a

match between the shock geometry and distant boundary conditions. The theory is applied to give estimates of termination-shock asymmetry for various internal and external conditions.
Author
Heliosphere; Shock Discontinuity; Asymmetry; Solar Wind; Interstellar Magnetic Fields

20020061398 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Coronal Structures In Cool Stars ***Final Report, 15 Jul. 2001 - 14 Jul. 2002***
Dupree, Andrea K., Smithsonian Astrophysical Observatory, USA; July 2002; 8p; In English
Contract(s)/Grant(s): NAG5-11093; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Many papers have been published that further elucidate the structure of coronas in cool stars as determined from EUVE, HST, FUSE, Chandra, and XMM-Newton observations. Highlights of these are summarized in several pages folk wing that were presented at, the AAS Meeting in Albuquerque in June 2002 during the Topical Session.
Author
Coronas; Cool Stars; Extreme Ultraviolet Explorer Satellite; Stellar Coronas

20020061931 Northeast Consortium for Engineering Education, Port Royal, VA USA
Phillips Laboratory Scholar Program ***Final Report, 28 May 1993-28 May 1998***
Peele, Janette D.; May 1998; 50p; In English
Contract(s)/Grant(s): F19628-93-C-0027; Proj-9993
Report No.(s): AD-A402759; AFRL-VS-TR-2002-1559; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The USAF Phillips Laboratory Scholar Program provided research opportunities for qualified doctorate-level engineers and scientists to work in the laboratory either at Hanscom Air Force Base, Mass., or at Kirtland Air Force Base, N.M. Twenty-seven scholars participated during the period of the contract, including four during the period 1 July 1997-28 May 1998. Dr. Sean Carey used UV extinction data to investigate the properties of interstellar dust grains and used data from the Midcourse Space Experiment (MSX) to investigate the structure of infrared-dark clouds. Dr. Brian Kane used data from the Five Colleges Radio Astronomy Observatory and the Infrared Space Observatory (ISO) to investigate the structure and kinematics of Bok globules, which are small, isolated, star-forming clouds in our galaxy. Dr. Anthony Midey measured rate constants for ion-molecule reactions, using a high-temperature flowing afterglow (HTFA) apparatus. Dr. SUSAn Triantafillou adapted the lattice Boltzmann (LB) computational method to the prediction of atmospheric phenomena, including cloud development and turbulent eddies. Results of these research efforts are described in the individual contributions of the Scholars to this final report.
DTIC
Geophysics; Scientists; Engineers; Infrared Radiation

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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.

20020060013 National Astronomical Observatory, Div. of Earth Rotation, Tokyo, Japan
Global Lunar Gravity Field Recovery from SELENE
Matsumoto, Koji, National Astronomical Observatory, Japan; Heki, Kosuke, National Astronomical Observatory, Japan; Hanada, Hideo, National Astronomical Observatory, Japan; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 381-385; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche
Results of numerical simulation are presented to examine the global gravity field recovery capability of the Japanese lunar exploration project SELENE (Selenological and Engineering Explorer) which will be launched in 2005. New characteristics of the SELENE lunar gravimetry include four-way satellite-to-satellite Doppler tracking of main orbiter and differential VLBI tracking of two small free-flier satellites. It is shown that planned satellites configuration will improve lunar gravity field in wide range of wavelength as well as far-side selenoid.
Author
Gravitational Fields; Lunar Gravitation; Satellite-to-Satellite Tracking; Very Long Base Interferometry; Computerized Simulation

20020060127 NASA Ames Research Center, Moffett Field, CA USA

Transition from Gaseous Compounds to Aerosols in Titan's Atmosphere

Lebonnois, Sebastien, NASA Ames Research Center, USA; Bakes, E. L. O., NASA Ames Research Center, USA; McKay, Christopher P., NASA Ames Research Center, USA; [2002]; 19p; In English

Contract(s)/Grant(s): RTOP 344-33-00-18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We investigate the chemical transition of simple molecules like C2H2 and HCN into aerosol particles in the context of Titan's atmosphere. Experiments that synthesize analogs (tholins) for these aerosols can help understand and constrain these polymerization mechanisms. Using information available from these experiments, we suggest chemical pathways that can link simple molecules to macromolecules, that will be the precursors to aerosol particles: polymers of acetylene and cyanoacetylene, polycyclic aromatics (PAHs), polymers of HCN and other nitriles, and polynes. Although our goal here is not to build a detailed kinetic model for this transition, we propose parameterizations to estimate the production rates of these macromolecules, their C/N and C/H ratios, and the loss of parent molecules (C2H2, HCN, HC3N and other nitriles, C6H6) from the gas phase to the haze. We use a 1-dimensional photochemical model of Titan's atmosphere to estimate the formation rate of precursors macromolecules. We find a production zone slightly lower than 200 km altitude with a total production rate of 4 x 10(exp -14) g/ sq cm s and a C/N approx. = 4. These results are compared with experimental data, and to microphysical models requirements. The Cassini/Huygens mission will bring a detailed picture of the haze distribution and properties, that will be a great challenge for our understanding of those chemical processes.

Author

Aerosols; Atmospheric Models; Chemical Reactions; Molecular Gases; Photochemical Reactions; Polymerization; Titan; Vapor Phases

20020060731 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Revolution in Mars Topography and Gravity and Magnetic Fields

Smith, David E., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; 39th Space Congress Meeting, 30 Apr. - 3 May 2002, Cape Canaveral, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since the arrival of the Mars Global Surveyor (MGS) at Mars in September 1997 and the subsequent beginning of observations of the planet there has been a constant stream of surprises and puzzling observations that have kept scientists looking at new 'out of the box' explanations. Observations of the shape and topography have shown a planet with one hemisphere, the southern, several kilometers higher than the north and a northern hemisphere that is so flat and smooth in places that it's difficult to imagine it was not once the bottom of an ocean. and yet the ocean idea presents some enormous difficulties. The measurements of gravity derived from the tracking of MGS have shown that several Mars volcanoes are enormous positive gravity anomalies much larger than we see on Earth and revealed small errors in the orbit of Mars and or Earth. and the magnetic field is found to be composed of a number of extremely large crustal anomalies; but as far as can be ascertained there is no main dipole field such as we have on Earth. Understanding these diverse observations and placing them in the sequence of the evolution of the planet will be a long, challenging but rewarding task.

Author

Planetary Gravitation; Mars Surface; Topography; Planetary Magnetic Fields

20020061305 NASA Goddard Space Flight Center, Greenbelt, MD USA

Dynamical Effects on the Escape of H and D: Martian Water Reservoirs

Hartle, Richard E., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; European Geophysical Society XXVII General Assembly, 21-26 Apr. 2002, Nice, France; Sponsored by European Geophysical Society, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

The evolution of water on Mars is dependent on the loss rates of H and D from its atmosphere, where the dominant loss mechanism for these constituents is Jeans escape. Throughout time, preferential escape of H over D has produced a deuterium rich atmosphere with a D/H ratio 5.2 times that of terrestrial water. Motion in the atmosphere of Mars is shown to change the Jeans escape rates of H and D in two important ways: (1) Atmospheric wind and rotation at the exobase increase the escape fluxes of H and D above the corresponding Jeans fluxes. (2) The percentage increase in escape flux due to motion is greatest for D. Recently, several models have been used to estimate the magnitudes of current and ancient crustal water reservoirs on Mars that freely exchange with its atmosphere. Differences in the reservoir sizes are influenced by differences in the composition at the exobase, thermal history of the atmosphere and the D/H ratio of earlier epochs as inferred from meteorites. When motion enhanced Jeans

escape is applied to each of these models, it is shown in every case that factors (1) and (2) above lead to current and ancient crustal water reservoirs that are larger than those obtained without motion.
Author
Mars Atmosphere; Water; Atmospheric Circulation; Hydrogen; Deuterium; Wind (Meteorology)

20020061967 NASA Ames Research Center, Moffett Field, CA USA
Searching for Organics, Fossils, and Biology on Mars
McKay, Christopher P., NASA Ames Research Center, USA; [2001]; 1p; In English; International Symposia on Environmental Biogeochemistry, 11-15 Sep. 2001, Wroclaw, Poland
Contract(s)/Grant(s): RTOP 344-38-82-04; Copyright; Avail: Issuing Activity; Abstract Only
One of the goals of Astrobiology is to understand life on a fundamental level. All life on Earth is constructed from the same basic biochemical building blocks consisting of 20 amino acids with left handed symmetry, five nucleotides, a few sugars of right handed symmetry and some lipids. Using the metaphor of computers this is equivalent to saying that all life shares the same hardware. Beyond hardware similarity, it is now known that all life has fundamentally the same software. The genetic code of life is common to all organisms. Some have argued that the ”hammer of evolution is heavy” and life anywhere is likely to be composed of identical biochemical and genetic patterns. However, in a system as complex as biochemistry it is likely that there are numerous local optima and the details of the optimum found by evolutionary selection on another world would likely depend on the initial conditions and random developments in the early biological history on that world. to address these fundamental questions in Astrobiology we need a second example of life: a second genesis.
Derived from text
Exobiology; Fossils; Biochemistry; Genetics; Life Sciences; Organisms

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SOLAR PHYSICS

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

20020059661 Interferometrics, Inc., Chantilly, VA USA
Studies of Solar EUV Irradiance from SOHO *Final Report, 1-30 Jun. 2002*
Floyd, Linton, Interferometrics, Inc., USA; Jun. 30, 2002; 6p; In English
Contract(s)/Grant(s): NASA Order W-24283
Report No.(s): Rept-II-4010; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Extreme Ultraviolet (EUV) irradiance central and first order channel time series (COC and FOC) from the Solar EUV Monitor aboard the Solar and Heliospheric observatory (SOHO) issued in early 2002 covering the time period 1/1/96-31/1201 were analyzed in terms of other solar measurements and indices. A significant solar proton effect in the first order irradiance was found and characterized. When this effect is removed, the two irradiance time series are almost perfectly correlated. Earlier studies have shown good correlation between the FOC and the Hall core-to-wing ratio and likewise, it was the strongest component of the COC. Analysis of the FOC showed dependence on the F10.7 radio flux. Analysis of the CDC signals showed additional dependences on F10.7 and the GOES x-ray fluxes. The SEM FOC was also well correlated with thein 30.4 nm channel of the SOHO EUV Imaging Telescope (EIT). The irradiance derived from all four EIT channels (30.4 nm, 17.1 nm, 28.4 nm, and 19.5 nm) showed better correlation with MgII than F10.7.
Author
Solar Flux; Irradiance; Extreme Ultraviolet Radiation; Radiation Measurement; Time Series Analysis

20020060093 Alabama Univ., Dept. of Physics, Huntsville, AL USA
Stochastic Particle Acceleration in Impulsive Solar Flares
Miller, James A., Alabama Univ., USA; [2001]; 4p; In English
Contract(s)/Grant(s): NAG5-8480; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The acceleration of a huge number of electrons and ions to relativistic energies over timescales ranging from several seconds to several tens of seconds is the fundamental problem in high-energy solar physics. The cascading turbulence model we have developed has been shown previously (e.g., Miller 2000; Miller & Roberts 1995; Miner, LaRosa, & Moore 1996) to account for all the bulk features (such as acceleration timescales, fluxes, total number of energetic particles, and maximum energies) of electron and proton acceleration in impulsive solar flares. While the simulation of this acceleration process is involved, the essential idea of the model is quite simple, and consists of just a few parts: 1. During the primary flare energy release phase, we

assume that low-amplitude MHD Alfven and fast mode waves are excited at long wavelengths, say comparable to the size of the event (although the results are actually insensitive to this initial wavelength). While an assumption, this appears reasonable in light of the likely highly turbulent nature of the flare. 2. These waves then cascade in a Kolmogorov-like fashion to smaller wavelengths (e.g., Verma et al. 1996), forming a power-law spectral density in wavenumber space through the inertial range. 3. When the mean wavenumber of the fast mode waves has increased sufficiently, the transit-time acceleration rate (Miller 1997) for superAlfvenic electrons can overcome Coulomb energy losses, and these electrons are accelerated out of the thermal distribution and to relativistic energies (Miller et al. 1996). As the Alfven waves cascade to higher wavenumbers, they can cyclotron resonate with progressively lower energy protons. Eventually, they will resonate with protons in the tail of the thermal distribution, which will then be accelerated to relativistic energies as well (Miller & Roberts 1995). Hence, both ions and electrons are stochastically accelerated, albeit by different mechanisms and different waves. 4. When the protons become superAlfvenic (above about 1 MeV/nucleon), they too can suffer transit-time acceleration by the fast mode waves and will receive an extra acceleration ”kick.” The basic overall objective of this 1 year effort was to construct a spatially-dependent version of this acceleration model and this has been realized.
Author
Solar Flares; Particle Acceleration; Stochastic Processes; Electron Acceleration; Relativistic Particles; Magnetohydrodynamic Waves

20020060503 NASA Goddard Space Flight Center, Greenbelt, MD USA
NASA’s Living with a Star Program: The Geospace Mission Concept
Barth, Janet L., NASA Goddard Space Flight Center, USA; Giles, Barbara, NASA Goddard Space Flight Center, USA; Zanetti, Lawrence, Johns Hopkins Univ., USA; Spann, James, NASA, USA; [2002]; 7p; In English; AIAA Proceedings, Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-0086; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
NASA has initiated the Living with a Star Program (LWS) to develop the scientific understanding to address the aspects of the Connected Sun-Earth system that affect life and society. A goal of the program is to bridge the gap between science, engineering, and user application communities. This will enable future science, operational, and commercial objectives in space and atmospheric environments by improving engineering approaches to the accommodation and/or mitigation of the effects of solar variability on technological systems. Three program elements are the Science Missions; a Theory, Modeling, and Data Analysis program; and a Space Environment Testbeds program. Because many of the effects of solar variability on humanity are observed in Geospace regions of space, the science research for all three elements of the LWS Program have significant components in Geospace regions.
Author
Mission Planning; Sun; Solar Activity Effects; Solar Terrestrial Interactions; NASA Programs

20020061274 NASA Ames Research Center, Moffett Field, CA USA
The Impact of FU Orionis Outbursts and the Solar Nebula
Bell, Robbins, NASA Ames Research Center, USA; [1998]; 2p; In English; Protostars and Planet IV Conference, 5-9 Jul. 1998, Santa Barbara, CA, USA; Copyright; Avail: Issuing Activity; Abstract Only
Protostellar systems are variable on many timescales. One of the most dramatic forms of variability known to occur in low mass stellar systems is the FU Orionis outburst (Herbig 1977). Throughout a typical outburst lasting several decades, system luminosities may be a hundred times what is typical of the quiesent state. FU Orionis outburst events are thought to have significant impact on the thermal structure of the protosolar nebula; their existence has been used to explain features in the meteoritic record from thermally induced homogenization to the formation of chondrules. Until recently, the magnitude of the likely effect from such outbursts has been largely speculative due to the lack of a detailed understanding of the outburst mechanism. Recent numerical models (Bell\& Lin 1994) have demonstrated the viability of the observational hypothesis (Hartmann\& Kenyon 1985) that the radiation observed during outburst is emitted by a luminous circumstellar disk transporting mass at a thoUSAnd times the quiesent rate. Light curves and color and line width evolution observed in FU Orionis systems are naturally explained by time dependent outbursting model disks (Bell et al. 1995). The radial temperature structure and shape of the disk during outburst derived from these models may be used to calculate the outburst’s expected impact on primitive material at various radii throughout the disk. In this review, we will begin by discussing what is known about the FU Orionis outburst phenomenon from recent observations and theory including statistically deduced outburst timescales and observed peak temperatures. Unless covered by another author, we will discuss the evidence which suggests that outburst radiation is emitted by a circumstellar disk rather than by the star and will briefly review the thermal instability as a mechanism for outburst. We will then report on recent work which investigates the likely heating of solar nebula material due to FU Orionis outbursts including the following effects:

(1) heating of the planet forming region by direct radiation from the hot inner nebula; (2) heating by the diffuse radiation field of a coccooning envelope; and (3) time-dependent penetration of the increased luminosity from the above sources into the optically thick nebula. Some of this work is currently in progress. The potential effects on condensation and migration in the nebula and the thermal processing of solids will be evaluated.
Author
Mathematical Models; Pre-Main Sequence Stars; Solar Nebula; Variable Stars

20020061311 NASA Goddard Space Flight Center, Greenbelt, MD USA
Satellite Observations of Solar Irradiance and Sun-Climate Impacts
Cahalan, Robert, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; European Geographical Society Meeting, 21-26 Apr. 2002, Nice, France; Sponsored by European Geophysical Society, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

Solar activity is now near its maximum, with events such as the 2001 ”Bastille Day Event”, a Coronal Mass Ejection which merited a full session at AGUs annual meeting - and two major sunspot groupings earlier this year, with associated variations in TSI (Total Solar Irradiance). We discuss recent satellite measurements of TSI by ACRIM 2 and 3 and Virgo, and new precision observations of TSI and SSI (Solar Spectral Irradiance) expected from the SORCE mission, planned to launch in fall 2002. SSI has been added to TSI as a required EOS and NPOESS measurement because different spectral components provide energy inputs to different components of the climate system - UV into upper atmosphere and ozone, IR into lower atmosphere and clouds, and Visible into the biosphere. Succeeding satellite missions being planned for 2006 and 2010 will continue to monitor both TSI and SSI. We summarize current ideas about the potential impact of solar variability on Earth’s climate on time scales from days to decades to centuries.
Author
Satellite Observation; Solar Radiation; Coronal Mass Ejection; Solar Activity

20020061860 Alabama Univ., Dept. of Physics, Huntsville, AL USA
An Empirical Model of Coronal Heating Deduced from SOHO Observations of Transition Region Dynamics ***Final Report, 1 Feb. 1999 - 31 Jan. 2002***
Emslie, A. Gordon, Alabama Univ., USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG5-7991; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The research carried out under the above award was concerned with the analysis of ”explosive events” in the solar atmosphere. Explosive events are small energy releases that reveal themselves as skewed, broadened line profiles in the 10(exp 5) K degree material of the solar transition region. Using a data set of such events from the Solar Ultraviolet Measurements of Emitted Radiation (SUMER) instrument on the NASA SoHo satellite, with unprecedented temporal, spatial and spectral resolution, we have evaluated (Winebarger, Emslie, Mariska, & Warren 1999, Ap. J., 526, 471) the energetics of these events through application of the Velocity Differential Emission Measure (VDEM) analysis technique introduced by Newton, Emslie & Mariska, (1995, Ap. J, 447, 915). This work has allowed us to evaluate the contribution of various terms (such as enthalpy flux, free-streaming of high-energy electrons, etc.) to the energy budget of these events.
Author
SOHO Mission; Solar Corona; Solar Transition Region; Solar Flares

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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.

20020060009 Naval Observatory, USA
Extragalactic Radio Source Selection for Radio/Optical Frame Ties
Fey, Alan L., Naval Observatory, USA; Boboltz, David A., Naval Observatory, USA; Gaume, Ralph A., Naval Observatory, USA; Eubanks, T. Marshall, Naval Observatory, USA; Johnston, Kenneth J., Naval Observatory, USA; International VLBI Service for Geodesy and Astrometry General Meeting Proceeding; May 2002, pp. 363-366; In English; Also announced as 20020059943; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Future space-based optical astrometric satellite missions present the possibility of directly linking the radio and optical reference frames at the micro-arcsecond level. We have evaluated the current database of radio observations of the extragalactic

objects which make up the International Celestial Reference Frame to determine the optimum candidates, in terms of their radio properties, for use as radio/optical frame tie sources. We suggest that the radio astrometric quality as described in this paper can be applied to the next realization of the ICRF.
Author
Astrometry; Celestial Reference Systems; Radio Observation; Radio Sources (Astronomy)

20020060078 NASA Goddard Space Flight Center, Greenbelt, MD USA
Microwave Anisotrophy Probe Launch and Early Operations
ODonnell, James R., Jr., NASA Goddard Space Flight Center, USA; Andrews, Stephen F., NASA Goddard Space Flight Center, USA; Starin, Scott R., NASA Goddard Space Flight Center, USA; Ward, David K., NASA Goddard Space Flight Center, USA; [2002]; 20p; In English; AAS Guidance and Control Conference, 6-10 Feb. 2002, Breckenridge, CO, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Microwave Anisotropy Probe (MAP), a follow-on to the Differential Microwave Radiometer (DMR) instrument on the Cosmic Background Explorer (COBE), was launched from the Kennedy Space Center at 19:46:46 UTC on June 30, 2001. The powered flight and separation from the Delta II appeared to go as designed, with the launch placing MAP well within sigma launch dispersion and with less than 7 Nms of tip-off momentum. Because of this relatively low momentum, MAP was able to acquire the sun within only 15 minutes with a battery state of charge of 94%. After MAP's successful launch, a six week period of in-orbit checkout and orbit maneuvers followed. The dual purpose of the in-orbit checkout period was to validate the correct performance of all of MAP's systems and, from the attitude control system (ACS) point of view, to calibrate the performance of the spacecraft ACS sensors and actuators to maximize system performance. In addition to the checkout activities performed by the MAP team, the other critical activity taking place during the first six weeks after launch were a series of orbit maneuvers necessary to get the spacecraft from its launch orbit out to its desired orbit about L2, the second Earth-Sun Lagrange point. As MAP continues its standard operations, its ACS design is meeting all of its requirements to successfully complete the mission. This paper will describe the launch and early operations summarized above in greater detail, and show the performance of the attitude control and attitude determination system versus its requirements. Additionally, some of the unexpected events that occurred during this period will be discussed, including two events which dropped the spacecraft into its Safehold Mode and the presence of an "anomalous force" observed during each of the perigee orbit maneuvers that had the potential to cause these critical maneuvers to be prematurely aborted.
Author
Anisotropy; Spacecraft Instruments; Microwave Probes; Flight Operations; Spacecraft Launching

20020060110 Alabama Univ., Dept. of Physics, Huntsville, AL USA
Broad Band Long Term Monitoring of X-Ray Bursters ***Final Report, 1 Feb. 1999 - 31 Jan. 2001***
Zhang, Shuang Nan, Alabama Univ., USA; [2001]; 2p; In English
Contract(s)/Grant(s): NAG5-8440; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have analysed the BATSE (Burst and Transient Source Experiment) long term monitoring data of X-ray bursters. We generated the long-term light-curves of several X-ray bursters and studied their spectral evolution and compared them with black hole X-ray binaries. Our research results have been published in two papers.
Derived from text
Gamma Ray Bursts; X Ray Binaries; Gamma Ray Astronomy; X Ray Astronomy

20020060114 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Outbursts In Symbiotic Binaries (FUSE 2000) ***Annual Report, 1 Sep. 2001 - 31 Aug. 2002***
Kenyon, Scott J., Smithsonian Astrophysical Observatory, USA; June 2002; 1p; In English
Contract(s)/Grant(s): NAG5-11207; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

During the past year, we made good progress on analysis of FUSE observations of the symbiotic binary Z And. For background, Z and is a binary system composed of a red giant and a hot component of unknown status. The orbital period is roughly 750 days. The hot component undergoes large-scale eruptions every 10-20 yr. An outburst began several years ago, triggering this FUSE opportunity. First, we obtained an excellent set of ground-based optical data in support, of the FUSE observations. We used FAST, a high throughput low resolution spectrograph on the 1.5-m telescope at Mt. Hopkins, Arizona. A 300 g/ mm grating blazed at 4750 A, a 3 in. slit, and a thinned Loral 512 x 2688 CCD gave us spectra covering 3800-7500 A at a resolution of 6 A. The wavelength solution for each spectrum has a probable error of +/- 0.5 A or better. Most of the resulting spectra have moderate signal-to-noise, S/.N approx. greater than 30 per pixel. The time coverage for these spectra is excellent. Typically, we acquired spectra every 1-2 nights during dark runs at Mt. Hopkins. These data cover most of the rise and all of the decline of the recent

outburst. The spectra show a wealth of emission lines, including H I, He I, He II, [Fe V11], and the Raman scattering bands at 6830 A and 7088 A. The Raman bands and other high ionization features vary considerably throughout the outburst. These features will enable us to correlate variations in the FUSE spectra with variations in the optical spectra. Second, we began an analysis of FUSE spectra of Z And. We have carefully examined the spectra, identifying real features and defects. We have identified and measured fluxes for all strong emission lines, including the O VI doublet at 1032 A and 1038 A. These and several other strong emission lines display pronounced P Cygni absorption components indicative of outgrowing gas. We will attempt to correlate these velocities with similar profiles observed on optical spectra. The line velocities - together with line variations - will yield physical parameters for the expanding shell of gas in the outer atmosphere of the hot component. We also worked on several diagnostic tools, including upgrades to photoionization programs developed by the PI and others. We plan to use these tools to derive electron densities and temperatures front intercombination and forbidden lines observed on optical and FUSE spectra. Preliminary results indicate a large electron density, n(sub e) is greater than or = 10(exp 10)/cc and a modest electron temperature, T(sub e) approx. 20,000 K. We see no evidence for shocked gas as observed in some other symbiotics. However, we have yet to include several important lines of [Fe VII] and [Ne V] in the analysis. Inclusion of these lines will yield an improved estimate of the electron temperature in the gas. Finally, we have one additional FUSE spectrum planned for acquisition during this cycle. These data will provide important information concerning the state of the system farther along in its decline. Once we have this spectrum in hand, we plan to complete our analysis and publish our results.
Author
Binary Stars; Defects; Electron Density (Concentration); Electron Energy; Emission Spectra; Spectrum Analysis

20020060235 Alabama Univ., Huntsville, AL USA
Batse/Sax and Batse/RXTE-ASM Joint Spectral Studies of GRBs ***Final Report, 15 Jun. 2000 - 14 Jun. 2001***
Paciesas, William S., Alabama Univ., USA; May 31, 2002; 2p; In English
Contract(s)/Grant(s): NAG5-9686; No Copyright; Avail: Issuing Activity; Abstract Only
We proposed to make joint spectral analysis of gamma-ray bursts (GRBs) in the BATSE data base that are located within the fields of view of either the BeppoSAX wide field cameras (WFCs) or the RXTE all-sky monitor (ASM). The very broad-band coverage obtained in this way would facilitate various studies of GRB spectra that are difficult to perform with BATSE data alone. Unfortunately, the termination of the CGRO mission in June 2000 was not anticipated at the time of the proposal, and the sample of common events turned out to be smaller than we would have liked.
Derived from text
Gamma Ray Bursts; Spectrum Analysis; Gamma Ray Spectra

20020060460 NASA Goddard Space Flight Center, Greenbelt, MD USA
Radiation Environments and Environmental Models: Probability Model for Cumulative Solar Proton Event Fluences
Xapsos, M. A., NASA Goddard Space Flight Center, USA; Barth, J. L., NASA Goddard Space Flight Center, USA; [2002]; 25p; In English; SPENVIS User Workshop, 27-29 May 2002, Noordwijk, Netherlands; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In this viewgraph presentation, the following space radiations are covered: solar particle events, galactic cosmic rays, and trapped particles. Characteristics and models for each are presented.
CASI
Environment Models; Extraterrestrial Radiation

20020060504 NASA Goddard Space Flight Center, Greenbelt, MD USA
Performance of the Microwave Anisotropy Probe AST-201 Star Trackers
Ward, David K., NASA Goddard Space Flight Center, USA; vanBezooijen, Roelof, Lockheed Martin Missiles and Space, USA; [2002]; 4p; In English; AIAA Guidance and Control Conference, Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The Microwave Anisotropy Probe (MAP) was launched to create a full-sky map of the cosmic microwave background. MAP incorporates two modified Lockheed Martin AST-201 (Autonomous Star Tracker) star trackers. The AST-201 employs an eight element radiation hardened lens assembly which is used to focus an image on a charge coupled device (CCD). The CCD image is then processed by a star identification algorithm which outputs a three-axis attitude. A CCD-shift algorithm called Time Delayed Integration (TDI) was also included in each star tracker. In order to provide some radiation effect filtering during MAP's three to five phasing loop passes through the Van Allen radiation belts, a simple pixel filtering scheme was implemented, rather

than using a more complex, but more robust windowing algorithm. The trackers also include a fiber optic data interface. This paper details the ground testing that was accomplished on the MAP trackers.
Derived from text
Algorithms; Attitude (Inclination); Ground Tests; CCD Star Tracker; Spacecraft Guidance

20020061295 NASA Goddard Space Flight Center, Greenbelt, MD USA
Orbit Determination Support for the Microwave Anisotropy Probe (MAP)
Truong, Son H., NASA Goddard Space Flight Center, USA; Cuevas, Osvaldo O., NASA Goddard Space Flight Center, USA; Slojkowski, Steven, Computer Sciences Corp., USA; [2002]; 3p; In English; AIAA Monterey Conference, Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Microwave Anisotropy Probe (MAP) is a Medium Class Explorers (MIDEX) mission produced in partnership between Goddard Space Flight Center (GSFC) and Princeton University. The main science objective of the MAP mission is to produce an accurate full-sky map of the cosmic microwave background temperature fluctuations anisotropy. MAP was launched from the Cape Canaveral Air Force Station Complex 17 aboard a Delta II 7425-10 expendable launch vehicle at exactly 19:46:46.183 UTC on June 30, 2001. The spacecraft received a nominal direct insertion by the Delta into a 185 km circular orbit. MAP was then maneuvered into a sequence of phasing loops designed to set up a lunar swingby (gravity-assisted acceleration) of the spacecraft onto a transfer trajectory to a Lissajous orbit about the Earth-Sun L2 point. The mission duration is approximately 27 months with 3 to 4 months of transfer time to the final mission orbit about L2. The MAP transfer orbit consisted of 3.5 phasing loops: the first loop has a 7-day period, the second and third loops have a 9-day period, and the last half loop has a 4-day period as illustrated in Figure 1, which also indicates the placement of maneuvers. A Pfinal correction maneuver was performed 18 hours after the last perigee to more closely achieve the targeted lissajous orbit. The lunar encounter or swingby took place approximately 30 days after launch. After the lunar encounter, the spacecraft will cruise for approximately 120 days before it arrives at L2. A Mid-Course Correction (MCC) maneuver was executed seven days after the swingby to further refine the trajectory. Once the MAP satellite is injected into the L2 Lissajous orbit, it will perform occasional stationkeeping maneuvers to maintain the Lissajous orbit for a minimum of two years (and a goal of four years). Because of its complex orbital characteristics, the mission provided a unique challenge to orbit determination (OD) support in many orbital regimes. Extensive trajectory error covariance analysis was performed to predict ephemeris accuracy for the OD process using a Bayesian least-squares technique. The orbit determination error analysis is essential for maneuver planning and maneuver recovery study. Several tracking scenarios were investigated for each phase of the mission. This paper provides a summary of the premission trajectory covariance error analysis, as well as actual real-time OD results. The use and impact of the various tracking stations, systems, and measurements will be discussed. Details of the operational OD support and the inferred OD accuracy will be presented, and the results will be compared to the premission covariance analysis, In addition, there will be a discussion of the challenges presented to OD support including delta-Vs at apogee as well as perigee, and effects due to spacecraft attitude mode, in light of their implications to the OD accuracy and covariance analysis.
Author
Anisotropy; Microwave Probes; Orbit Determination; Space Missions

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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.

20020059650 Naval Research Lab., Washington, DC USA
Naval Research Lab Review 2001
Bultman, John D.; Jan. 2001; 254p; In English
Report No.(s): AD-A402066; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This document is an overview of the research and development activities at the Naval Research Laboratory in 2000. Topics include acoustics, atmospheric science and technology, chemical/biochemical research, electronics and electromagnetics, energetic particles, plasmas, and beams, information technology and communications, materials science and technology, ocean

science and technology, optical sciences, remote sensing, simulation, computing, and modeling, space research and satellite technology, special awards and recognition, and programs for professional development.
CASI
Acoustics; Atmospheric Chemistry; Atmospheric Physics; Biochemistry; Electromagnetism; Energetic Particles; Remote Sensing; Research and Development; Technologies

20020059651 Naval Research Lab., Washington, DC USA
1997 NRL Review
Apr. 1997; 244p; In English; Original contains color images
Report No.(s): AD-A402139; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The Navy Unit Commendation was awarded by The Honorable John H. Dalton, Secretary of the Navy, jointly to the military and civilian personnel of NRL and its parent organization, the Office of Naval Research. The award was presented for 'unparalleled research and development that significantly contributed to the technological capabilities of current and future Naval forces' during the period January 1992 through July 1996. This award, an unusual distinction for an acquisition activity, further states they 'have developed programs that have shaped every aspect of our Naval forces today and are defining the Navy and Marine Corps of the future.' Further; they 'consistently ensured that the Department of the Navy is at the forefront of scientific knowledge, technology development, and application.'
DTIC
Navy; Research and Development; Military Technology; Laboratories

Subject Term Index

A

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