National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

Scientific and Technical Aerospace Reports

STAR

Volume 41 Issue 5

March 7, 2003

WHAT'S INSIDE

- NASA STI Program Overview
- Introduction
- NASA STI Availability Information
- Table of Contents
- Subject Term Index
- Personal Author Index

NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA STI Database, the largest collection of aeronautical and space science in the world. The STI Program is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- TECHNICAL PUBLICATION. Reports of completed research or major significant phases of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed of continuing reference value. NASA counterpart of peer-reviewed formal professional papers, but has less stringent limitations on manuscript length and extent of graphic presentations.
- TECHNICAL MEMORANDUM. Scientific and technical findings that are of preliminary or specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- CONTRACTOR REPORT. Scientific and technical findings by NASA-sponsored contractors and grantees.
- CONFERENCE PUBLICATION. Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- SPECIAL PUBLICATION. Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- TECHNICAL TRANSLATION. English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that help round out the STI Program's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results ... even providing videos.

The NASA STI Program is managed by the NASA STI Program Office (STIPO). STIPO is the administrative office at Langley Research Center for the NASA STI Program.

For more information about the NASA STI Program, you can:

- Access the NASA STI Program Home Page at *http://www.sti.nasa.gov*
- E-mail your question via the Internet to *help@sti.nasa.gov*
- Fax your question to the NASA STI Help Desk at (301) 621-0134
- Telephone the NASA STI Help Desk at (301) 621-0390
- Write to:
  NASA STI Help Desk
  NASA Center for AeroSpace Information
  7121 Standard Drive
  Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (*STAR*) is an online information resource listing citations and abstracts of NASA and world wide aerospace-related STI. Updated biweekly, *STAR* highlights the most recent additions to the NASA STI Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related Research & Development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to Research & Development (R&D) results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA Scientific and Technical Information (STI) Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA STI Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up to date NASA STI, visit the STI Program's website at http://www.sti.nasa.gov.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the CASI TRS – the publicly available contents of the NASA STI Database.

Each citation in *STAR* indicates a 'Source of Availability'. When CASI is indicated, the user can order this information directly from CASI using the STI Online Order Form or contact help@sti.nasa.gov or telephone the CASI Help Desk at 301-621-0390. Before ordering you may access price code tables for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at http://www.ntis.gov.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** (FDLP) to ensure access by the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal Depository Libraries http://www.access.gpo.gov/su_docs.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at http://www.uspto.gov/patft/.

Table of Contents

Subject Divisions/Categories

Document citations are grouped by division and then by category, according to the NASA Scope and Coverage Category Guide.

Aeronautics

02 Aerodynamics 1

03 Air Transportation and Safety 9

04 Aircraft Communications and Navigation 12

05 Aircraft Design, Testing and Performance 14

06 Avionics and Aircraft Instrumentation 21

07 Aircraft Propulsion and Power 23

08 Aircraft Stability and Control 27

09 Research and Support Facilities (Air) 28

Astronautics

12 Astronautics (General) 28

13 Astrodynamics 29

14 Ground Support Systems and Facilities (Space) 29

15 Launch Vehicles and Launch Operations 30

16 Space Transportation and Safety 32

17 Space Communications, Spacecraft Communications, Command and Tracking 35

18 Spacecraft Design, Testing and Performance 36

19 Spacecraft Instrumentation and Astrionics 37

20 Spacecraft Propulsion and Power 38

Chemistry and Materials

23 Chemistry and Materials (General) 39

24 Composite Materials 41

25 Inorganic, Organic, and Physical Chemistry 45

26 Metals and Metallic Materials 52

27 Nonmetallic Materials 57

28 Propellants and Fuels 67

29 Space Processing 70

Engineering

31 Engineering (General) 70

32 Communications and Radar 71

33 Electronics and Electrical Engineering 77

34 Fluid Mechanics and Thermodynamics 84

35 Instrumentation and Photography 107

36 Lasers and Masers 114

37 Mechanical Engineering 116

38 Quality Assurance and Reliability 119

39 Structural Mechanics 122

Geosciences

42 Geosciences (General) 125

43 Earth Resources and Remote Sensing 136

44 Energy Production and Conversion 139

45 Environment Pollution 140

46 Geophysics 148

47 Meteorology and Climatology 152

48 Oceanography 156

Life Sciences

51 Life Sciences (General) 156

52 Aerospace Medicine 169

53 Behavioral Sciences 171

54 Man/System Technology and Life Support 172

55 Exobiology 173

Mathematical and Computer Sciences

59 Mathematical and Computer Sciences (General) 174

61 Computer Programming and Software 175

62 Computer Systems 184

63 Cybernetics, Artificial Intelligence and Robotics 186

64 Numerical Analysis 187

65 Statistics and Probability 191

66 Systems Analysis and Operations Research 192

67 Theoretical Mathematics 194

Physics

70 Physics (General) 195

71 Acoustics 199

72 Atomic and Molecular Physics 206

74 Optics 208

75 Plasma Physics 212

76 Solid-State Physics 215

77 Physics of Elementary Particles and Fields 219

Social and Information Sciences

80 Social and Information Sciences (General) 222

81 Administration and Management 225

82 Documentation and Information Science 232

Space Sciences

89 Astronomy 234

90 Astrophysics 237

91 Lunar and Planetary Science and Exploration 240

92 Solar Physics 246

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

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 41, MARCH 7, 2003

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.

20030012556 Swedish Defence Research Establishment, Aeronautics Div., Stockholm Sweden
Aeroengine Fan-Noise Resolution Requirement in Computational Fluid Dynamics
Jensen, K.; Efraimsson, G.; Dec. 05, 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101036; FOI-R-0330-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Jet-noise has eventually been reduced to a minimum, but still there are problems in keeping the overall noise levels low during take-off and approach. The reason for this is basically that fan-noise, i.e. pressure fluctuations generated in the compressor or turbine, becomes dominating. This phenomena can be recognized as non-linear and complex aerodynamics rather than acoustic problem in nature, and thus it becomes difficult to obtain models that are general and accurate. However, with the aid of CFD, the problem can now be studied in detail, but unfortunately this requires a very large number of points per wavelength to distinguish the wave solution from numerical errors. Applying the well-established linear methods for aeroacoustics in a parallel wall-duct to the fan stage, one can obtain analytical expressions for the dispersion-relation. A sinusoidal acoustic wave with the known dispersion-relation is then propagated thru a 2D numerical fan stage using a time-dependent finite-volume scheme. The numerical solution is then compared with the original wave to identify deviations that could originate from dispersion, dissipation and reflections induced by the numerical boundaries.
NTIS
Computational Fluid Dynamics; Fan Blades; Aeroacoustics; Jet Aircraft Noise; Aircraft Engines

20030012601 NASA Langley Research Center, Hampton, VA USA
Mach 4 Performance of a Fixed-Geometry Hypersonic Inlet with Rectangular-to-Elliptical Shape Transition
Smart, Michael K., NASA Langley Research Center, USA; Trexler, Carl A., NASA Langley Research Center, USA; [2003]; 11p; In English; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wind-tunnel testing of a hypersonic inlet with rectangular-to-elliptical shape transition has been conducted at Mach 4.0. These tests were performed to investigate the starting and back-pressure limits of this fixed-geometry inlet at conditions well below the Mach 5.7 design point. Results showed that the inlet required side spillage holes in order to self-start at Mach 4.0. Once started, the inlet generated a compression ratio of 12.6, captured almost 80% of available air and withstood a back-pressure ratio of 30.3 relative to tunnel static pressure. The spillage penalty for self-starting was estimated to be 4% of available air. These experimental results, along with previous experimental results at Mach 6.2 indicate that fixed-geometry inlets with rectangular-to-elliptical shape transition are a viable configuration for airframe- integrated scramjets that operate over a significant Mach number range.
Author
Wind Tunnel Tests; Hypersonic Inlets

20030012761 Impact Technologies, LLC, Rochester, NY USA

The Effect of Blade Lean on an Axial Turbine Stator Flow Having Various Hub Tip Ratios

Bennet, Edward M.; Jan. 2002; 17p; In English

Report No.(s): AD-A408925; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of simple lean on an axial turbine stator was examined using a three dimensional viscous flow code. A constant section stator with no meridional contouring was chosen to isolate the effect of the lean. Four different lean angles were examined at three hub/tip ratios.

DTIC

Axial Flow Turbines; Stators; Hubs; Blade Tips; Viscous Flow

20030012773 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR

Influence of Boundary Conditions on Properties of Stall

Zanin, B. Y.; Zverkov, I. D.; Jul. 2002; 5p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409189; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The present paper investigates what kinds of structure changes appear due to variation in flow conditions on model sides. The vertical plates were installed on the model end faces and they interfered the flow from the bottom wing surface to the top one. Visualization of flow pictures for the various variants of the flow was performed. Such researches can bring large advantage in perfection of low-speed airplanes aerodynamic characteristics with the purpose to carry out a comprehensive control of the flow and also to prevent occurring of adverse flow modes.

DTIC

Wings; Boundary Conditions; Aerodynamic Stalling

20030012791 NASA Langley Research Center, Hampton, VA USA

Rotor Wake Vortex Definition: Initial Evaluation of 3-C PIV Results of the Hart-II Study

Burley, Casey L., NASA Langley Research Center, USA; Brooks, Thomas F., NASA Langley Research Center, USA; vanderWall, Berend, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Richard, Hughes, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Raffel, Markus, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Beaumier, Philippe, Office National d'Etudes et de Recherches Aeronautiques, France; Delrieux, Yves, Office National d'Etudes et de Recherches Aeronautiques, France; Lim, Joon W., NASA Ames Research Center, USA; Yu, Yung H., NASA Ames Research Center, USA; Tung, Chee, NASA Ames Research Center, USA; [2002]; 30p; In English; 28th European Rotorcraft Forum, 17-20 Sep. 2002, Bristol, England, UK; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An initial evaluation is made of extensive three-component (3C) particle image velocimetry (PIV) measurements within the wake across a rotor disk plane. The model is a 40 percent scale BO-105 helicopter main rotor in forward flight simulation. This study is part of the HART II test program conducted in the German-Dutch Wind Tunnel (DNW). Included are wake vortex field measurements over the advancing and retreating sides of the rotor operating at a typical descent landing condition important for impulsive blade-vortex interaction (BVI) noise. Also included are advancing side results for rotor angle variations from climb to steep descent. Using detailed PIV vector maps of the vortex fields, methods of extracting key vortex parameters are examined and a new method was developed and evaluated. An objective processing method, involving a center-of-vorticity criterion and a vorticity 'disk' integration, was used to determine vortex core size, strength, core velocity distribution characteristics, and unsteadiness. These parameters are mapped over the rotor disk and offer unique physical insight for these parameters of importance for rotor noise and vibration prediction.

Author

Rotor Aerodynamics; Vortices; Wakes; BO-105 Helicopter; Rotary Wings; Wind Tunnel Tests

20030012814 Iowa State Univ. of Science and Technology, Dept. of Aerospace Engineering and Engineering Mechanics, Ames, IA USA

Local Heating Across a Surface Catalytic Discontinuity using Triple-Deck Theory

Inger, George R., Iowa State Univ. of Science and Technology, USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 54; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Surface property discontinuities on a hypersonic vehicle are most often associated with the junction of two different thermal protection materials. They may also be associated with abrupt loss or deposition of surface coatings or changes in thermal conductivity and heat capacity of sensors on a test article. The abrupt jump in surface properties (catalytic efficiency, emissivity)

in the presence of dissociated flow in hypersonic flight will lead to rapid changes in the local heat transfer rate. While the induced heating associated with discontinuous surface properties can be very large, the length scale of the interaction is usually poorly resolved by conventional CFD grids. A purely numerical analysis of the problem can be addressed by a local grid refinement in the flow direction until the interaction is fully resolved. However, a better approach-one that provides physical insight and reduces the computer time required for design-is to couple a local, analytic solution of the interaction region around the discontinuity with a CFD solution obtained on a conventional grid. The present research is developing an analytical, triple-deck theory of the local viscous-inviscid interaction field generated by a catalytic surface jump on a flat body such as the windside of a Reusable Launch Vehicle. The theory will be validated in detail by direct comparisons with a finely- resolved Navier-Stokes numerical code. Treatment of the rapid heat transfer changes both upstream and downstream of the jump is included. In this way, we expect to both clarify the interactive physics and provide a useful tool for preliminary design studies involving this problem.
Author
Heat Transfer; Surface Properties; Discontinuity; Thermal Conductivity; Hypersonic Vehicles; Computational Fluid Dynamics

20030012831 East Carolina Univ., Dept. of History, Greenville, NC USA
Researching and Editing the Private Papers of Wilbur and Orville Wright, 1900-1912
Tise, Larry E., East Carolina Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 71; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

As we approach the first centennial of flight--that is, the anniversary of ”the first manned, powered, controlled, and sustained flight of a heavier-than-air aircraft” by the brothers Wilbur and Orville Wright in 1903--thee is a growing and renewed interest in telling the story of the Wright Brother; and in recalling it accurately, authoritatively, and interestingly. A review of the literature on the Wright Brothers a year ago indicated that there was a growing and abundant literature on the Wrights and their great achievements, including a number of new biographies and related works. However, as a result of an examination of the manuscript and photo collections of the Wright Brothers at the Library of Congress and other collections in the North Carolina State Archives and the Outer Banks History Center in Manteo, North Carolina, it became clear that a majority of the original sources wherein Wilbur and Orville Wright--and their sister Katharine and father Milton--chart their progress with experimental aircraft--kites, gliders, and powered flyers--have never been edited and published. The thrust of the summer 2001 project has been to identify, photocopy, catalogue, and document all unpublished Wright documents for the period 1900 until 1912 and the untimely death of Wilbur Wright. A further aim of the project has been the further transcription of these documents for publication in an edition of the ”Private Papers of Wilbur and Orville Wright.” One principal finding of this period of research is that 75-80% of all original documents after 1903 have never been published. These documents particularly reveal the strong bonds of the Wright family, their secret business activities, their disagreements over business pursuits, the glories and disasters of 1908 when they became world famous, but Orville crashed and nearly lost his life, and their agonizing loss of control and leadership in the world of flight. This research activity is part of a larger goal to publish a definitive set of documents on the Wright experiences at Kitty Hawk in North Carolina between 1900 and 1911, to publish a definitive edition of the private papers of the Wrights, and to enhance activities leading to the commemoration of the centennial of flight in 2003 in North Carolina and around the world.
Author
Biography; Flight Control; Research Aircraft; Catalogs (Publications)

20030012935 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Multi-Component Measurements of Aerodynamic Loads at the Short-Duration Wind Tunnel ”Tranzit-M”
Vasenev, L. G.; Zvegintsev, V. I.; Kiselev, V. Ja.; Nalivajchenko, D. G.; Shahmatova, N. V.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002 Report No.(s): AD-A409202; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

It is a problem to achieve an acceptable confidence level in the determination of the aero dynamic coefficients in short duration facilities. Measurements of non-stationary aerodynamic load in this sort of wind tunnels require the application of special designed high-rigidity sting-mounted strain gauge balances. Natural mass of the model causes to develop special methods, which can remove the dynamic errors due to inertial forces from the balance data. Some of possible compensation techniques are described. It was the purpose of present study to investigate the possibilities of non-stationary aerodynamic load measurements when the mass of the model is small and dynamic errors are negligible.
DTIC
Wind Tunnel Tests; Aerodynamic Loads

20030013625 NASA Langley Research Center, Hampton, VA USA

Experimental Test Results of Energy Efficient Transport (EET) High-Lift Airfoil in Langley Low-Turbulence Pressure Tunnel

Morgan, Harry L., Jr., NASA Langley Research Center, USA; December 2002; 3p; In English

Contract(s)/Grant(s): RTOP 706-17-31-02

Report No.(s): NASA/TM-2002-211780; NAS 1.15:211780; L-18221; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report describes the results of an experimental study conducted in the Langley Low-Turbulence Pressure Tunnel to determine the effects of Reynolds number and Mach number on the two-dimensional aerodynamic performance of the Langley Energy Efficient Transport (EET) High-Lift Airfoil. The high-lift airfoil was a supercritical-type airfoil with a thickness-to- chord ratio of 0.12 and was equipped with a leading-edge slat and a double-slotted trailing-edge flap. The leading-edge slat could be deflected -30 deg, -40 deg, -50 deg, and -60 deg, and the trailing-edge flaps could be deflected to 15 deg, 30 deg, 45 deg, and 60 deg. The gaps and overlaps for the slat and flaps were fixed at each deflection resulting in 16 different configurations. All 16 configurations were tested through a Reynolds number range of 2.5 to 18 million at a Mach number of 0.20. Selected configurations were also tested through a Mach number range of 0.10 to 0.35. The plotted and tabulated force, moment, and pressure data are available on the CD-ROM supplement L-18221.

Author

Airfoils; Aerodynamic Characteristics; Wind Tunnel Tests; Pressure Measurement; Flow Distribution; Wind Tunnel Models

20030013627 NASA Langley Research Center, Hampton, VA USA

Measurement of Unsteady Pressure Data on a Large HSCT Semispan Wing and Comparison with Analysis

Scott, Robert C., NASA Langley Research Center, USA; Silva, Walter A., NASA Langley Research Center, USA; Florance, James R., NASA Langley Research Center, USA; Keller, Donald F., NASA Langley Research Center, USA; [2002]; 13p; In English; 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 22-25 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-1648; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Experimental data from wind-tunnel tests of the Rigid Semispan Model (RSM) performed at NASA Langley's Transonic Dynamics Tunnel (TDT) are presented. The primary focus of the paper is on data obtained from testing of the RSM on the Oscillating Turntable (OTT). The OTT is capable of oscillating models in pitch at various amplitudes and frequencies about mean angles of attack. Steady and unsteady pressure data obtained during testing of the RSM on the OTT is presented and compared to data obtained from previous tests of the RSM on a load balance and on a Pitch and Plunge Apparatus (PAPA). Testing of the RSM on the PAPA resulted in utter boundaries that were strongly dependent on angle of attack across the Mach number range. Pressure data from all three tests indicates the existence of vortical flows at moderate angles of attack. The correlation between the vortical flows and the unusual utter boundaries from the RSM/PAPA test is discussed. Comparisons of experimental data with analyses using the CFL3Dv6 computational fluid dynamics code are presented.

Author

Semispan Models; Wind Tunnel Tests; Transonic Wind Tunnels; Computational Fluid Dynamics; Oscillating Flow; Wings; Pressure Distribution; Supersonic Transports

20030013629 NASA Langley Research Center, Hampton, VA USA

A Lighter-Than-Air System Enhanced with Kinetic Lift

Spearman, M. Leroy, NASA Langley Research Center, USA; [2002]; 3p; In English; AIAA's Aircraft Technology, Integration and Operations 2002 Technical Forum, 1-3 Oct. 2002, Los Angeles, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-5816; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A hybrid airship system is proposed in which the buoyant lift is enhanced with kinetic lift. The airship would consist of twin hulls in which the buoyant gas is contained. The twin hulls would be connected in parallel by a wing having an airfoil contour. In forward flight, the wing would provide kinetic lift that would add to the buoyant lift. The added lift would permit a greater payload/altitude combination than that which could be supported by the buoyant lift alone. The buoyant lift is a function of the volume of gas and the flight altitude. The kinetic lift is a function of the airfoil section, wing area, and the speed and altitude of flight. Accordingly there are a number of factors that can be manipulated to arrive at a particular design. Particular designs could vary from small, lightweight systems to very large, heavy-load systems. It will be the purpose of this paper to examine the

sensitivity of such a design to the several variables. In addition, possible uses made achievable by such a hybrid system will be suggested.
Author
Airships; Lift; Buoyancy; Wings

20030013643 NASA Langley Research Center, Hampton, VA USA
On the Numerical Convergence to Steady State of Hypersonic Flows Over Bodies with Concavities
Gnoffo, Peter A., NASA Langley Research Center, USA; [2002]; 8p; In English; West East High Speed Flow Field Conference, 22-26 Apr. 2002, Marseilles, France; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Two recent numerical studies of hypersonic flows over bodies with concavities revealed problems with convergence to a steady state with an oft-used application of local-time-stepping. Both simulated flows showed a time-like, periodic shedding of vortices in a subsonic domain bounded by supersonic external flow although the simulations, using local-time-stepping, were not time accurate. Simple modifications to the numerical algorithm were implemented to enable implicit, first-order accurate in time simulations. Subsequent time-accurate simulations of the two test problems converged to a steady state. The baseline algorithm and modifications for temporal accuracy are described. The requirement for sub-iterations to achieve convergence is demonstrated. Failure to achieve convergence without time accuracy is conjectured to arise from temporal errors being continuously refocused into a subsonic domain.
Author
Convergence; Steady State; Hypersonic Flow; Concavity

20030013954 NASA Langley Research Center, Hampton, VA USA
Transonic Reynolds Number and Leading-Edge Bluntness Effects on a 65 deg Delta Wing
Luckring, J. M., NASA Langley Research Center, USA; [2003]; 13p; In English; 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0753; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 65 deg delta wing has been tested in the National Transonic Facility (NTF) at mean aerodynamic chord Reynolds numbers from 6 million to 120 million at subsonic and transonic speeds. The configuration incorporated a systematic variation of the leading edge bluntness. The analysis for this paper is focused on the Reynolds number and bluntness effects at transonic speeds (M=0.85) from this data set. The results show significant effects of both these parameters on the onset and progression of leading-edge vortex separation.
Author
Transonic Speed; Reynolds Number; Blunt Leading Edges; Delta Wings

20030013984 Central Research Inst. of Machine Building, Moscow, Russia
Aerodynamic Simulation and a Test Technique for Investigation of a Flight Vehicle with Jet Engine in Front Position and Lattice Fins
Voronin, V. V.; Koudriavtsev, V. V.; Lapygin, V. I.; Lipnitsky, Yu. M.; Stekenius, K. A.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409168; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A separated nose section of a launch vehicle with an emergency rescue system (ERS) is a flight vehicle (FV) with a jet engine (JE) in the front position and with honeycomb lattice fins (LF) in the base region. The flight vehicle configuration is illustrated in Fig. 1 above the X-axis and a schematic of its scaled aerodynamic model is shown below the X-axis. Determination of aerodynamic characteristics (AC) for that sort of fight vehicle is a complicated problem which may be solved combining experimental techniques and theoretical calculations. Such work includes the following stages.
DTIC
Aerodynamic Characteristics; Fins; Jet Engines; Simulation; Launch Vehicles; Jet Flow

20030013998 Technische Hochschule, Inst. fuer Aerodynamik und Gasdynamik, Stuttgart, Germany
A First Experimental Approach to the Distributed 3D-Vortex Receptivity of a Boundary Layer on an Airfoil
Wuerz, W.; Herr, S.; Wagner, S.; Kachanov, Y. S.; Jul. 2002; 7p; In English; See also ADM001433. 11th International Conference on Methods of Aerophysical Research. Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with Russian Academy of Sciences Inst. of Theoretical and Applied Mechanics

Report No.(s): AD-A409219; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper is devoted to an investigation of the distributed linear receptivity of a two-dimensional laminar boundary layer on the curved surface of an airfoil with respect to non-stationary free-stream vortices. The vortices represent a periodic anti-symmetric vortex street localized along the spanwise coordinate with the vorticity vector directed initially (i.e. upstream the airfoil) perpendicular to the flow velocity vector and the leading edge of the airfoil. The vortex-street frequency was chosen to be close to flat of the most amplified 2D TS-wave. Hot-wire measurements were performed as a set of spanwise scans which cover a part of the streamwise region of the continuously excited 3D TS-wave train. Due to different phase speeds of the outer disturbance and the TS-waves this wave train is found to be modulated in spanwise and streamwise directions. Using a phase-locked measurement system the complex TS-wave amplitude is determined at the maximum of the TS-eigenfunction inside the boundary layer and Fourier decomposed into spanwise wavenumber spectra. In a similar way the complex amplitude of the free-stream vortices is determined as a reference.

DTIC

Vortices; Airfoils

20030014007 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia

T-117 TsAGI Hypersonic Wind Tunnel

Boldyrev, S.; Brazhko, V.; Vaganov, A.; Davletkildeev, R.; Zadonsky, S.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409247; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

T-117 TsAGI is a large hypersonic blowdown arc heater wind tunnel. The facility is provided with two interchangeable electrical arc heaters with a maximum power of 25 and 2.5 megawatts. The first heater is a two arcs heater and the second one is a one arc heater. The supply air is heated between coaxial electrodes by an electric arc rotated in a magnetic field.

DTIC

Blowdown Wind Tunnels; Hypersonic Wind Tunnels; Arc Heating; Wind Tunnel Tests

20030014098 Novosibirsk State Univ., Architecture and Civil Engineering, USSR

Synthesis of Recurrent Algorithms of the Data Interpretation

Voskoboinikov, Yu. E.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409291; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The choice of the recurrent algorithm stop moment is considered in the literature rather insufficiently. Therefore a question arises how to choose the number n for which the norm of the solution error was minimum or recurrent algorithm meets certain requirements. to answer this question, the accuracy characteristics of the recurrent algorithm used to solve the problem of algorithm synthesis are introduced. It should be noted, flat the solution of this problem allows one to find the least number of the measurements, which is necessary to obtain the estimate theta(n) with the required accuracy.

DTIC

Mathematical Models; Aerodynamics; Algorithms

20030014159 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR

On a Mechanism of Intraphase Interaction in Non-Relaxing Two-Phase Flow

Boiko, V. M.; Klinkov, K. V.; Poplavski, S. V.; Jul. 2002; 5p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409245; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper deals with the experimental simulation of the intraphase interaction in a particle cloud through a turbulized trail. The simulation is carried out with the aid of a lengthwise system of spheres in the stream after the shock wave.

DTIC

Particles; Two Phase Flow; Simulation; Turbulence

20030014161 Central Research Inst. of Tech. and Machine Building, Kaliningrad, Moscow, Russia

Peculiarities of Gasdynamics of Descent and Landing on Planets with Rarefield Atmosphere

Bachin, A. A.; Kalinin, E. M.; Lapygin, V. I.; Khramov, N. E.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409243; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

TSNIIMash was one of the first scientific centers were such investigations had been started dealing with force and heat loads from the engine jets acted on the space vehicle structure during soft landing on the lunar and Martian surfaces. Interaction of single/multiple jet with oncoming flow or surface is characterized by appearance of a large number of shock waves contact surfaces separated zones and other peculiarities and this defined the necessity of fulfillment of extensive experimental studies. For these aims U-22 and U-22M vacuum chambers were created in TSNIIMash in 1970-ies and 1980-ies. Some results regarding drag coefficient of the space vehicle with working jets are presented below.
DTIC
Jet Flow; Soft Landing Spacecraft; Planetary Atmospheres; Gas Dynamics; Descent

20030014162 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia
Ejection in Wind Tunnels: The Theory Explaining Pressure Losses in Subsonic Diffusers
Arkadov, Y. K.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409242; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
When testing an aircraft model in a wind tunnel the drag of the model itself requires only a low proportion of the wind tunnel compressor power- say the blockage ratio which is a few per cent. An almost equal proportion is lost in the balance i.e. 90% of the electric power consumed is spent to recover the total pressure loss in wind tunnel diffusers. Therefore it is crucially important to reveal mechanisms of the diffuser loss and predict it. Gas flow in a divergent diffuser is essentially multidimensional viscous often nonstationary and depends on flow nonuniformity at the diffuser entry station. These difficulties did not allow researchers to identity major processes in a diffuser with an (almost) optimum divergence angle and develop a rather clear, one-dimensional loss theory which could describe flow with general initial nonuniformity. Crocco had cast doubt on even the possibility of creating any one-dimensional theory for analyzing diffusers, nonetheless, he appreciated one-dimensional approximations and had succeeded in this area.
DTIC
Pressure Reduction; Diffusers; Subsonic Flow

20030014177 Novosibirsk State Univ., USSR
Technique of Multibeam Bridge Span Aeroelastic Oscillations Suppressing
Salenko, S. D.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409336; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
At the basis of different methods and means of oscillations extinction the aerodynamic, mechanical, combined principles can lie, the active and passive systems for control can be used. At the basis of mechanical methods lies a change in the natural vibration frequency of construction (due to increase in the hardness, change in the design scheme, etc.), increase of the damping properties of construction as a whole, and also the attachment of additional masses by means of the elastic and damping connections with the properly selected parameters. It is possible to note the following basic mechanical methods: Tuned Mass Dampers (TMD), viscoelastic dampers, liquid dampers. We will examine in more detail the aerodynamic methods of the extinction of oscillations.
DTIC
Oscillations; Viscoelastic Damping; Resonant Frequencies; Controllability; Aerodynamics

20030014195 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Experimental Study of Controlled Disturbances Development In A Supersonic Boundary Layer on A Swept Wing
Levchenko, V. Ya.; Kosinov, A. D.; Semionov, N. V.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409281; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The experimental results on the laminar-turbulent transition in three-dimensional boundary layers for M is greater than 1 are described. Stationary structures were registered using different methods of flow visualization. The first experimental studies of instability of a three-dimensional boundary layer at supersonic velocities were conducted. Evolution of natural fluctuations in the boundary layer on a swept wing was studied. It was shown that the character of distribution of the mean and fluctuating characteristics of the boundary layer is similar to the case of subsonic velocities. A downstream increase in these disturbances was found in analyzing the spectra of natural fluctuations. It was obtained at M=2, flat the disturbances growth in three-dimensional boundary layer occurs much faster, than in the flat plate case. The increase of the Mach number up to 3.5 extends frequency band of amplifying disturbances and leads to earlier turbulent transition. The results of an experimental study of evolution of controlled disturbances on a swept-wing model for Mach number M=2 are presented. The wave characteristics of

traveling waves are obtained. The objective of present work is an experimental study of nonlinear evolution of controlled disturbances on a swept wing supersonic boundary layer.
DTIC
Swept Wings; Boundary Layer Transition; Flat Plates; Laminar Flow; Flow Visualization

20030014262 NASA Langley Research Center, Hampton, VA USA
Preliminary Investigation of Stagnation Point Liquid Injection Influence on Blunt Body Aerodynamics
Woods, William C., NASA Langley Research Center, USA; Jones, Kenneth M., NASA Langley Research Center, USA; Genzel, Noah N., NASA Langley Research Center, USA; [2002]; 11p; In English; AIAA Missile Sciences Conference, 5-7 Nov. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-15-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A preliminary investigation has been performed to determine the influence of stagnation point water injection on the hypersonic aerodynamic forces and moments for two-dimensional blunt bodies. This investigation was performed in the Langley 20-Inch Mach 6 Air Tunnel, and represents the qualitative first phase of a study to examine the potential benefits of water injection to reduce aerodynamic drag and aero-heating. Tests with a 4-inch diameter hemisphere cylinder and a 4-inch diameter cylinder with a span 1.5 times the diameter were performed over a range of free-stream unit Reynolds number from two million to six million per ft and of angle of attack (-5 deg to 5 deg) with water and gaseous nitrogen injection at the geometric stagnation point. The momentum flux ratio, that is, the ratio of the momentum flux of the jet to that of the free-stream flow, was varied from the non-blowing value of zero up to 0.00031 by maintaining the jet momentum fixed and varying the free-stream momentum, hence Reynolds number. The effect of water injection on the aerodynamic drag coefficient for the hemisphere cylinder was observed to be negligible as the momentum flux ratio was increased to 0.00017, but decreased significantly as this ratio increased above 0.00017; a nearly 50 percent reduction in drag occurred for a factor of two increase in momentum flux ratio.
Author
Stagnation Point; Water Injection; Blunt Bodies; Hypersonic Forces; Wind Tunnel Tests; Aerodynamics; Two Dimensional Bodies

20030014297 NASA Langley Research Center, Hampton, VA USA
Wind Tunnel Database Development using Modern Experiment Design and Multivariate Orthogonal Functions
Morelli, Eugene A., NASA Langley Research Center, USA; DeLoach, Richard, NASA Langley Research Center, USA; [2003]; 18p; In English; 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2003-0653; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A wind tunnel experiment for characterizing the aerodynamic and propulsion forces and moments acting on a research model airplane is described. The model airplane called the Free-flying Airplane for Sub-scale Experimental Research (FASER), is a modified off-the-shelf radio-controlled model airplane, with 7 ft wingspan, a tractor propeller driven by an electric motor, and aerobatic capability. FASER was tested in the NASA Langley 12-foot Low-Speed Wind Tunnel, using a combination of traditional sweeps and modern experiment design. Power level was included as an independent variable in the wind tunnel test, to allow characterization of power effects on aerodynamic forces and moments. A modeling technique that employs multivariate orthogonal functions was used to develop accurate analytic models for the aerodynamic and propulsion force and moment coefficient dependencies from the wind tunnel data. Efficient methods for generating orthogonal modeling functions, expanding the orthogonal modeling functions in terms of ordinary polynomial functions, and analytical orthogonal blocking were developed and discussed. The resulting models comprise a set of smooth, differentiable functions for the non-dimensional aerodynamic force and moment coefficients in terms of ordinary polynomials in the independent variables, suitable for nonlinear aircraft simulation.
Author
Data Bases; Experiment Design; Multivariate Statistical Analysis; Orthogonal Functions; Wind Tunnel Tests; Free Flight; Mathematical Models

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.

20030012561 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Analysis and Comparison of Separation Measurement Errors in Single Sensor and Multiple Radar Mosaic Display Terminal Environments
Thompson, S. D.; Oct. 21, 2002; 124p; In English
Report No.(s): PB2003-101348; ATC-306; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The paper presents an analysis to estimate and characterize the errors in the measured separation distance between aircraft that are displayed on a radar screen to a controller in a single sensor terminal environment compared to a multiple radar mosaic terminal environment. The error in measured or displayed separation is the difference between the true separation or distance between aircraft in the air and the separation displayed to a controller on a radar screen. In order to eliminate as many variables as possible and to concentrate specifically on the differences between displayed separation errors in the two environments, for the purposes of this analysis, only full operation Mode S secondary beacon surveillance characteristics are considered.
NTIS
Beacons; Sensors; Error Analysis; Distance Measuring Equipment; Air Traffic Control

20030012700 Bird Strike Committee USA, Sandusky, OH USA
2002 Bird Strike Committee USA/Canada Conference ***Final Report, 15 Sep. 2002-31 Dec. 2002***
Dolbeer, Richard A.; Oct. 24, 2002; 53p; In English; Pres: Bird Strike Committee USA/Canada, 21-24 Oct 2002, Sacramento, CA
Contract(s)/Grant(s): F49620-02-1-0374; AF Proj. 2313
Report No.(s): AD-A409191; AFRL-SR-AR-TR-02-0419; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Over 380 people from 20 countries and 17 exhibitors attended the 4th annual joint meeting of Bird Strike Committee-USA and Bird Strike Committee Canada in Sacramento, California on October 21-24, 2002. Attendees included 91 U.S. Air Force and 7 Air National guard personnel. In all, 51 technical papers and posters were presented, including a special session of five papers dealing with the use of RADAR to detect birds to reduce collisions with aircraft. The conference also had a special pyrotechnics training course for 150 of the attendees. Highlights included presentations by representatives from the Air Line Pilots Association (ALPA) and Air Transport Association (ATA) regarding the need for greater action to minimize wildlife hazards on airports, which cost civil and military aviation worldwide over $1.2 billion annually. The goal of BSC-USA is to increase communication and professionalism among the diverse groups dealing with wildlife issues on airports, and the 2002 meeting appeared to be highly successful in this regard.
DTIC
Civil Aviation; Bird-Aircraft Collisions

20030012750 General Accounting Office, Washington, DC USA
Aviation Safety: Undeclared Air Shipments of Dangerous Goods and DOT's Enforcement Approach
Jan. 2003; 50p
Report No.(s): PB2003-101860; GAO-03-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
When shipments of dangerous goods (hazardous chemical substances that could endanger public safety or the environment, such as flammable liquids or radioactive materials) are not properly packaged and labeled for air transport, they can pose significant threats because there is little room for error when something goes wrong in flight. to better understand the risks posed by improper (undeclared) air shipments, we assessed what is known about their nature and frequency, what key mechanisms are in place to prevent their occurrence, and what the Department of Transportation (DOT) and the Postal Service do to enforce federal regulations for shipping dangerous goods by air.
NTIS
Hazardous Materials; Air Transportation; Law (Jurisprudence)

20030012754 Forest Service, Washington, DC USA
Federal Aerial Firefighting: Assessing Safety and Effectiveness
Dec. 2002; 64p; In English
Report No.(s): PB2003-101808; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The response to the 2002 fire season's fatal aircraft accidents, the USDA Forest Service and USDI Bureau of Land Management (BLM) jointly established an independent, five-member Blue Ribbon Commission to identify essential information for planning a safe and effective future aviation program. On August 15, 2002, the Chief of the Forest Service and Director of the BLM asked the panel to identify weaknesses and fail points in the current aviation program, focusing on safety, operational effectiveness, costs, sustainability, and strategic guidance. Assuming an integrated approach, the agencies tasked the panel to address these five areas as they relate to the operation and supervision of air tankers, lead planes and air supervision modules, helicopters, and air attack platforms. The massive amount of material and brief time for analysis forced the panel to address, for the most part, only major considerations. Possibly the single largest challenge now facing leaders of these federal agencies is to foster cooperation and collaboration among working-level staffs, contractors, and states to raise the standards of aerial wildland firefighting in the USA. This report presents eight key findings, which the panel believes are critical for planning a safe and effective future firefighting aviation program. The panel relied significantly on the knowledge, experience, and judgment of its members to develop its findings, which are strong inferences rather than deduced certainties. The panel's mandate was to identify problems, not advocate solutions or make recommendations.
NTIS
Fire Fighting; Rescue Operations; Aircraft

20030012793 NASA Langley Research Center, Hampton, VA USA
Data Reduction and Its Impact on Test-Analysis Correlation
Lyle, Karen H., NASA Langley Research Center, USA; Bark, Lindley W., MSC.Software Corp., USA; [2001]; 7p; In English; Third Triennial International Fire and Cabin Safety Research Conference, 22-25 Oct. 2001, Atlantic City, NJ, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A research project has been initiated to improve crash test and analysis correlation. The research has focused on two specimen types: simple metallic beams and plates; and a representative composite fuselage section. Impact tests were performed under carefully controlled conditions. In addition, the specimens were densely instrumented to enable not only correlation with finite element simulations, but to also assess the repeatability of the data. Simulations utilizing a detailed finite element model were executed in a nonlinear transient dynamic code. The results presented in this paper concentrate on the effect of several data reduction processes, to include filtering frequency and sampling rate, on the correlation accuracy.
Author
Data Reduction; Impact Tests; Metal Plates; Beams (Supports); Fuselages

20030012838 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
UNIPASS for AvSP? A Broader View
Wu, N. Eva, Binghamton Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 78; In English; Also announced as 20030012804; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The goal of the NASA Aviation Safety Program (AvSP) is to reduce the fatal aircraft accident rate by 80 percent in 10 years, and by 90 percent in 25 years. One of the six project areas in AvSP is the Single Aircraft Accident Prevention (SAAP) project. A key challenge of implementing newly developed safety enhancement technologies into the aircraft fleet is the validation and certification of these highly complex integrated and adaptive systems. Reliability analysis, in conjunction with simulation, flight test and laboratory test, plays a central role in addressing the issue of system validation and certification. UNIPASS is a general-purpose probabilistic computer program that has the potential for being adopted as a tool for reliability analysis in the AvSP in order to aid the process of validation and certification. The tasks at hand are to understand the underlying theory upon which UNIPASS is built as a reliability assessment tool, to determine the utility of UNIPASS in the AvSP, and to compare the capabilities of UNIPASS to other known software tools that have been used in the AvSP, more specifically, WinASSIST and WinSURE. UNIPASS can perform the following three functions. (1) Failure probability computation for components and simple systems given the joint probability distribution of the root causes affecting the component state, and the limit state function that defines the boundary between the failure domain and safe domains. (2) Sensitivity analysis of failure probability and reliability index for single components with respect to physical variables and their means and standard deviations. (3) Estimation of probability density functions of limit state functions for single components. Although it was not in the originally intended applications scope of UNIPASS, an attempt was made through some creative problem formulation to use the tool for fatigue life

prediction of a system with a degradable two-layer parallel-to-series configuration. It was found that UNIPASS is not as efficient and accurate as WinASSIST and WinSURE in predicting the life of a complex system, and it is incapable of handling system reconfiguration. On the other hand, since the reliability modeling of UNIPASS is based on the physics of failures, rather than statistics, it can be used to obtain a more accurate component failure model, if the limit state function can be established for the component with sufficient accuracy. These more accurate component failure models can help identify the needs and the potential for component reliability enhancement, and model dynamic failure processes through the covariate method.
Author
Accident Prevention; Aircraft Safety; Aircraft Accidents; Prediction Analysis Techniques; Component Reliability

20030012871 National Inst. for Occupational Safety and Health, Div. of Surveillance, Hazard Evaluations and Field Studies, Cincinnati, OH USA
Health Hazard Evaluation Report: HETA 2000-0423-2858, Ogden Aviation Services, St. Louis, Missouri
King, B.; Hess, J. E.; Aug. 2001; 30p; In English
Report No.(s): PB2003-102007; HETA-2000-0423-2858; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In September of 2000, the National Institute for Occupational Safety and Health (NIOSH) received a request for a Health Hazard Evaluation (HHE) from employees at Ogden Aviation Services located at Lambert-St. Louis International Airport in St. Louis, Missouri. The employees expressed concerns that potential exposure to jet fuel and aircraft exhaust may be related to health symptoms such as headache and respiratory problems. On October 19, 2000, an initial site visit was performed by a NIOSH industrial hygienist and medical officer to conduct opening talks with management, union officials, and employees, as well as to observe the work area and practices. A return visit was completed December 11 and 12, 2000, during which quantitative sampling was performed for major compounds of the jet fuel, such as benzene, toluene, and xylene. Carbon monoxide (CO) exposure was also monitored. Confidential interviews with employees were held to discuss possible work-related health concerns.
NTIS
Evaluation; Airports; Jet Engine Fuels; Health; Hazards; Exhaust Emission

20030012919 Transportation Research Board, National Cooperative Highway Research Program, Washington, DC USA
Aviation Airport and Air Traffic Economic and Operational Issues. Including 2002 TRB Distinguished Lecture. Aviation. Journal of the Transportation Research Board No. 1788
2002; 156p
Report No.(s): PB2003-101382; ISBN 0-309-07713-3; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Contents include the following: Foreword; (Part 1) 2002 TRB Distinguished Lecture, Perspective on Our National Air Transportation System: Past, Present, and Future; (Part 2) Aviation: Airport and Air Traffic Economic and Operational Issues; Parking Capacity Requirements for Relocated Airports: The New Athens International Airport; Airport Terminal Signs: Use of Advance Guide Signs to Speed Search Times; User-Perceived Level-of-Service Evaluation Model for Airport Baggage-Handling Systems
NTIS
Transportation; Aeronautics; Air Traffic Control; Airports

20030014089 General Accounting Office, Washington, DC USA
Military Readiness: Civil Reserve Air Fleet Can Respond as Planned, but Incentives May Need Revamping
Dec. 2002; 28p
Report No.(s): PB2003-101838; GAO-03-278; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In the event of a national emergency, the Department of Defense (DOD) can use commercial aircraft drawn from the Civil Reserve Air Fleet to augment its own airlift capabilities. The Civil Reserve Air Fleet is a fleet of aircraft owned by U.S. commercial air carriers but committed voluntarily to DOD for use during emergencies. After the terrorist attacks of September 11, 2001, many air carriers experienced financial difficulties. This sparked concern about the fleets ability to respond, if activated, and prompted the Subcommittee to ask GAO (General Accounting Office) to determine whether the fleet could respond to an activation with the required number of aircraft and crews and in the required time frame. The Subcommittee also wanted to know whether the incentives used to attract and retain participants are effective.
NTIS
Commercial Aircraft; Civil Aviation; Armed Forces

20030014090 Federal Aviation Administration, Washington, DC USA
National Plan of Integrated Airport Systems (NPIAS) (2001-2005)
2002; In English; This document is color dependent and/or in landscape layout. It is currenly only available on CD-ROM
Report No.(s): PB2003-101802; No Copyright; Avail: National Technical Information Service (NTIS)

The National Plan of Integrated Airport Systems (NPIAS) is submitted to Congress in accordance with Section 47103 of Title 49 of USA Code. The plan identifies 3,364 existing airports that are significant to national air transportation and contains estimates that $46.2 billion in infrastructure development that is eligible for Federal aid will be needed over the next five years to meet the needs of all segments of civil aviation. The NPIAS is used by the Federal Aviation Administration (FAA) management in administering the Airport Improvement Program. It supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying the specific airport improvements that will contribute to achievement of those goals. The NPIAS includes a section on the condition and performance of the airport system, highlighting six topics: safety, capacity, pavement condition, financial performance, accessibility, and noise. The findings are generally favorable, indicating that the system is safe, convenient, well maintained, and largely supported by rents, fees, and taxes paid by users. Problems are apparent in specific areas, with a large number of people exposed to high noise levels and delays due to airfield and ground access congestion at some of the busiest airports.
NTIS
Construction; Airports; Position (Location)

20030014506 Agency for Toxic Substances and Disease Registry, Superfund Site Assessment Branch, Atlanta, GA USA
Public Health Assessment for Tri-County Public Airport Delavan, Morris County, Kansas. EPA Facility ID: KS0001402320, November 25, 2002 ***Final Report***
Nov. 25, 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only
Report No.(s): PB2003-101566; No Copyright; Avail: National Technical Information Service (NTIS)

The proposed Tri-County Public Airport (TCPA) National Priorities List site is a former World War II Army Airfield. During its peak operating period the airfield consisted of more than 300 buildings and housed approximately 2,000 personnel. The airfield had a waste water treatment plant, a 200,000-gallon fuel storage tank, warehouse area, barracks, and a recreation area. The airfield was officially declared surplus in 1946 and deeded to the city of Herington, Kansas in 1948. Most of the 300 buildings and structures previously at the airfield have been removed, but two hangars, a water tower, several water supply wells, and a few small buildings remain. From 1948 to the present, the site has been leased to a number of companies for various purposes. Operations at the site have included, but are not limited to, aircraft restoration, aircraft storage, the manufacturing of farm implements, black powder manufacture, and the manufacture of roofing materials.
NTIS
Public Health; Hazards; Airports; Environmental Monitoring

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.

20030012586 NASA Langley Research Center, Hampton, VA USA
Airborne Use of Traffic Intent Information in a Distributed Air-Ground Traffic Management Concept: Experiment Design and Preliminary Results
Wing, David J., NASA Langley Research Center, USA; Adams, Richard J., Booz-Allen and Hamilton, Inc., USA; Barmore, Bryan E., Titan Systems, Inc., USA; Moses, Donald, Science Applications International Corp., USA; [2002]; 11p; In English; 4th USA/Europe Air Traffic Management R and D Seminar, 3-7 Dec. 2001, Sante Fe, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents initial findings of a research study designed to provide insight into the issue of intent information exchange in constrained en-route air-traffic operations and its effect on pilot decision making and flight performance. The piloted simulation was conducted in the Air Traffic Operations Laboratory at the NASA Langley Research Center. Two operational modes for autonomous operations were compared under conditions of low and high operational complexity. The tactical mode was characterized primarily by the use of state information for conflict detection and resolution and an open-loop means for the pilot

to meet operational constraints. The strategic mode involved the combined use of state and intent information, provided the pilot an additional level of alerting, and allowed a closed-loop approach to meeting operational constraints. Operational constraints included separation assurance, schedule adherence, airspace hazard avoidance, flight efficiency, and passenger comfort. Potential operational benefits of both modes are illustrated through several scenario case studies. Subjective pilot ratings and comments comparing the tactical and strategic modes are presented.
Author
Air Traffic Control; Pilot Performance; Decision Making; Experiment Design; Flight Characteristics

20030012794 NASA Langley Research Center, Hampton, VA USA
EMI Standards for Wireless Voice and Data on Board Aircraft
Ely, Jay J., NASA Langley Research Center, USA; Nguyen, Truong X., NASA Langley Research Center, USA; [2002]; 6p; In English; 2002 World Wireless Congress, 28-31 May 2002, San Francisco, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The use of portable electronic devices (PEDs) on board aircraft continues to be an increasing source of misunderstanding between passengers and flight-crews, and consequently, an issue of controversy between wireless product manufacturers and air transport regulatory authorities. This conflict arises primarily because of the vastly different regulatory objectives between commercial product and airborne equipment standards for avoiding electromagnetic interference (EMI). This paper summarizes international regulatory limits and test processes for measuring spurious radiated emissions from commercially available PEDs, and compares them to international standards for airborne equipment. The goal is to provide insight for wireless product developers desiring to extend the freedom of their customers to use wireless products on-board aircraft, and to identify future product characteristics, test methods and technologies that may facilitate improved wireless freedom for airline passengers.
Author
Airborne Equipment; Electromagnetic Interference; Electronic Equipment; Commercial Aircraft; Regulations

20030014580 NASA Glenn Research Center, Cleveland, OH USA
Performance Enhancement of Tunable Bandpass Filters Using Selective Etched Ferroelectric Thin Films
Miranda, Felix A., NASA Glenn Research Center, USA; Mueller, Carl H., Analex Corp., USA; VanKeuls, Fred W., Ohio Aerospace Inst., USA; Subramanyam, Guru, Dayton Univ., USA; Vignesparamoorthy, Sivaruban, Dayton Univ., USA; January 2003; 12p; In English; 13th International Symposium on the Applications of Ferroelectrics, 28 May - 1 Jun. 2002, Nara, Japan; Sponsored by Ultrasonics, Ferroelectrics and Frequency Control Society, Unknown; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-08-02
Report No.(s): NASA/TM-2003-211972; E-13423; NAS 1.15:211972; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The inclusion of voltage-tunable barium strontium titanate (BSTO) thin films into planar band pass filters offers tremendous potential to increase their versatility. The ability to tune the passband so as to correct for minor deviations in manufacturing tolerances, or to completely reconfigure the operating frequencies of a microwave communication system, are highly sought-after goals. However, use of ferroelectric films in these devices results in higher dielectric losses, which in turn increase the insertion loss and decrease the quality factors of the filters. This study explores the use of patterned ferroelectric layers to minimize dielectric losses without degrading tunability. Patterning the ferroelectric layers enables us to constrict the width of the ferroelectric layers between the coupled microstrip lines, and minimize losses due to ferroelectric layers. Coupled one-pole microstrip bandpass filters with fundamental resonances at approx. 7.2 GHz and well defined harmonic resonances at approx. 14.4 and approx. 21.6 GHz, were designed, simulated and tested. For one of the filters, experimental results verified that its center frequency was tunable by 528 MHz at a center frequency of 21.957 GHz, with insertion losses varying from 4.3 to 2.5 dB, at 0 and 3.5 V/micron, respectively. These data demonstrate that the tuning-to-loss figure of merit of tunable microstrip filters can be greatly improved using patterned ferroelectric thin films as the tuning element, and tuning can be controlled by engineering the ferroelectric constriction in the coupled sections.
Author
Ferroelectricity; Microstrip Transmission Lines; Microwaves; Etching; Tunable Filters; Insertion Loss

20030014648 Arizona Univ., Inst. of Atmospheric Physics, Tucson, AZ USA
Improvement and Refinement of the GPS/MET Data Analysis Algorithm
Herman, Benjamin M., Arizona Univ., USA; [2003]; 2p; In English
Contract(s)/Grant(s): NAG1-2218; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The GPS/MET project was a satellite-to-satellite active microwave atmospheric limb sounder using the Global Positioning System transmitters as signal sources. Despite its remarkable success, GPS/MET could not independently sense atmospheric water vapor and ozone. Additionally the GPS/MET data retrieval algorithm needs to be further improved and refined to enhance the retrieval accuracies in the lower tropospheric region and the upper stratospheric region. The objectives of this proposal were to address these 3 problem areas.
Author
Global Positioning System; Algorithms; Optimization; Data Retrieval

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.

20030012596 NASA Langley Research Center, Hampton, VA USA
Transonic Experimental Observations of Abrupt Wing Stall on an F/A-18E Model (Invited)
McMillin, S. Naomi, NASA Langley Research Center, USA; Hall, Robert M., NASA Langley Research Center, USA; Lamar, John E., NASA Langley Research Center, USA; [2003]; 40p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0591; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A transonic wind tunnel test of an 8% F/A-18E model was conducted in the NASA Langley Research Center (LaRC) 16 ft Transonic Tunnel (16-ft TT) to investigate on-surface flow physics during stall. The technical approach employed focused on correlating static (or time-averaged) and unsteady wind-tunnel test data to the unsteady wing-stall events using force, moment, pressure, and pressure-sensitive-paint measurements. This paper focuses on data obtained on the pre-production configuration of the F/A-18E aircraft at Mach number of 0.90. The flow unsteadiness occurring on the wing as the wing went through the stall process was captured using the time history of balance and pressure measurements and by calculating the root mean square (RMS) for a number of instrument signals. The second step was to gather global perspectives on the pressures influencing the wing stall process. The abrupt wing stall experienced by the 8% F/A-18E Model was observed to be an unsteady event triggered by the rapid advancement of separation, which had migrated forward from the trailing edge, to the leading-edge flap hingeline over a very small increment in angle of attack. The angle of attack at which this stall occurred varied, from run to run, over an 1 deg increment. The abrupt wing stall was observed, using pressure-sensitive-paint, to occur simultaneously on both wing panels or asymmetrically. The pressure-sensitive paint data and wingroot bending moment data were essential in providing insight to the flow structures occurring over the wing and the possible asymmetry of those flow structures. A repeatability analysis conducted on eight runs of static data provided a quick and inexpensive examination of the unsteady aerodynamic characteristics of abrupt wing stall. The results of the repeatability analysis agreed extremely well with data obtained using unsteady measurement techniques. This approach could be used to identify test conditions for more complex unsteady data measurements using special instrumentation.
Author
Wind Tunnel Tests; Transonic Wind Tunnels; Aerodynamic Stalling; F-18 Aircraft; Wings; Unsteady Aerodynamics; Pressure Measurement; Mean Square Values; Wind Tunnel Models

20030012600 NASA Langley Research Center, Hampton, VA USA
Introduction to the Abrupt Wing Stall (AWS) Program
Hall, Robert M., NASA Langley Research Center, USA; Woodson, Shawn H., Naval Air Systems Command, USA; [2003]; 28p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0589; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Abrupt Wing Stall (AWS) Program has addressed the problem of uncommanded, transonic lateral motions, such as wing drop, with experimental, computational, and simulation tools. Background to the establishment of the AWS program is given as well as program objectives. In order to understand the fundamental flow mechanisms that caused the undesirable motions for a pre-production version of the F/A-18E, steady and unsteady flow field details were gathered from dedicated transonic wind-tunnel testing and computational studies. The AWS program has also adapted a free-to-roll (FTR) wind-tunnel testing technique traditionally used for low-speed studies of lateral dynamic stability to the transonic flow regime. This FTR capability was

demonstrated first in a proof-of -concept study and then applied to an assessment of four different aircraft configurations. Figures of merit for static testing and for FTR testing have been evaluated for two configurations that demonstrated wing drop susceptibility during full-scale flight conditions (the pre-production F/A-18E and the AV-8B at the extremes of its flight envelope) and two configurations that do not exhibit wing drop (the F/A-18C and the F-16C). Design insights have been obtained from aerodynamic computational studies of the four aircraft configurations and from computations quantifying the impact of the various geometric wing differences between the F/A-18C and the F/A-18E wings. Finally, the AWS program provides guidance for assessing, in the simulator, the impact of experimentally determined lateral activity on flight characteristics before going to flight.
Author
Wind Tunnel Tests; Aerodynamic Stalling; Aircraft Configurations; Lateral Stability; Wings; Steady Flow; Unsteady Flow

20030012609 NASA Langley Research Center, Hampton, VA USA
Measured Engine Installation Effects of Four Civil Transport Airplanes
Senzig, David A., Senzig Engineering, USA; Fleming, Gregg G., Federal Aviation Administration, USA; Shepherd, Kevin P., NASA Langley Research Center, USA; [2001]; 6p; In English; NOISE-CON 2002, 29-31 Oct. 2002, Portland, ME, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Federal Aviation Administration's Integrated Noise Model (INM) is one of the primary tools for land use planning around airports. The INM currently calculates airplane noise lateral attenuation using the methods contained in the Society of Automotive Engineer's Aerospace Information Report No. 1751 (SAE AIR 1751). Researchers have noted that improved lateral attenuation algorithms may improve airplane noise prediction. The authors of SAE AIR 1751 based existing methods on empirical data collected from flight tests using 1960s-technology airplanes with tail-mounted engines. to determine whether the SAE AIR 1751 methods are applicable for predicting the engine installation component of lateral attenuation for airplanes with wing-mounted engines, the National Aeronautics and Space Administration (NASA) sponsored a series of flight tests during September 2000 at their Wallops Flight Facility. Four airplanes, a Boeing 767-400, a Douglas DC-9, a Dassault Falcon 2000, and a Beech KingAir, were flown through a 20 microphone array. The airplanes were flown through the array at various power settings, flap settings, and altitudes to simulate take-off and arrival configurations. This paper presents the preliminary findings of this study.
Derived from text
Airports; Civil Aviation; Flight Tests; NASA Programs; Installing; Aircraft Engines; Noise Prediction (Aircraft); Transport Aircraft

20030012715 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Revised Anthropometric Restrictions for US Navy and Marine Corps Trainer and Fixed Wing Nonejection Aircraft and US Coast Guard HU-25
Tucker, Heather; Brattin, Lori; Reason, William; Jun. 27, 2002; 33p; In English; Original contains color images
Report No.(s): AD-A408959; NAWCADPAX/TR-2002/103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
NAVAIRSYSCOM (PMA-202) tasked NAWCAD Patuxent River, Maryland, (AIR-4.6) to perform a baseline accommodation assessment of existing U.S. Navy (USN) and U.S. Marine Corps (USMC) fixed wing nonejection aircraft and their respective trainer aircraft and establish anthropometric restriction codes (ARC's) as appropriate. The assessment also determined the estimated percentage of future candidate aviators suitable for flight duty in a particular aircraft with respect to their measured anthropometric characteristics. The percents reported were based on the population data set used to provide seven test cases cited in the Joint Services Specification Guidance 2010-3. The methods used in the assessment were different than procedures historically used to determine USN/USMC aviator suitability and to verify cockpit design with regard to aircrew accommodation. A multi variate statistical approach was employed and served as the basis for determining the safe accommodation envelopes for each platform/crew station. Revised ARC's are presented and the respective percents accommodated are summarized.
DTIC
Aircraft Pilots; Anthropometry; Fixed Wings; Navy; Training Devices; Constrictions

20030012775 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Numerical Research of Airframe/Engine Integrative Hypersonic Vehicle
Yuanyan, He; Jialing, Le; Hougli, Ni; Aug. 23, 2002; 8p; In English; Original contains color images; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002, The original document contains color images
Report No.(s): AD-A409187; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Hypersonic airbreathing vehicles are characterized by highly-integrated airframe and propulsion system. Computational Fluid Dynamics (CFD) tools have been used extensively in the design and analysis phrase of hypersonic vehicles. In this paper, an engineering method and a finite volume method based on the center of grid are developed for preliminary research of interested integrative hypersonic vehicles with waverider configurations (cone-shaped or canard structure). Some longitudinal aerodynamic performance increments are obtained under conditions of shut-down engine or working engine. For the vehicle with canard structure, in order to study the lateral-directional stability characteristics, we also consider the influence of yaw angle on the flow field of fore-body.
DTIC
Air Breathing Engines; Numerical Analysis; Airframes; Hypersonic Vehicles

20030012810 Embry-Riddle Aeronautical Univ., Dept. of Aerospace Engineering, Prescott, AZ USA
Constrained Aerothermodynamic Design of Hypersonic Vehicles
Gally, Thomas A., Embry-Riddle Aeronautical Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 50; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

An investigation has been conducted into incorporating a hypersonic capability into the CDISC (Constrained Direct Iterative Surface Curvature) aerodynamic design tool. In the first phase, a simple rule relating surface curvature (or rather d(exp 2)y/dx(exp 2)) to pressure coefficient gradients was formulated based upon Modified Newtonian Theory. The suitability of this rule is demonstrated by successfully driving surface shape modifications to match a target surface pressure distribution. While successful, it is noted that much of hypersonic design revolves around the leading edge and stagnation points - both of which are singularities in the design method. As a result, some concern still remains that there will exist particular design situations in which the method may fail or not lead to a desired result. Next, a high level method for relating surface pressures to heat transfer rates was conceived and implemented as a design constraint. This method is based upon stagnation point theory and is suitable for design near vehicle leading edges where maximum heating rates typically occur. Validation of this method in 2-D was performed by successfully redesigning a surface shape to satisfy maximum surface heating constraints near a vehicle nose. Both these methods are currently being extended to 3-D geometries. Future work should investigate applying heating constraints on aft portions of the vehicle; simultaneously including addition constraints like lift, drag or pitching moment; and exploring additional constraints useful for applied vehicle design situations.
Author
Hypersonic Vehicles; Aerothermodynamics; Stagnation Point; Leading Edges; Pressure Distribution; Aerodynamic Drag

20030012826 Hampton Univ., Dept. of Architecture, VA USA
Geometrical Concepts for the Active Shape Control of a Jet Inlet
Sanchez-del-Valle, Carmina, Hampton Univ., USA; Arch, D., Hampton Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 66; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Preliminary research has demonstrated that the active shape control of conventional jet engine inlets can render aerodynamic performance benefits, in particular drag reduction. This is an initial study focusing on identifying form transformation or morphing concepts that would allow the leading edge of a nacelle to change shape from cruise to off-cruise position and vice versa, while maintaining its structural stability. A literature search was conducted in the areas of deployable structures, bio-inspired structures, robotics, shape memory alloys and elastomer polymers in an effort to find actuation mechanisms and solutions to similar geometric problems. Further study will involve the evaluation of promising morphing concepts through detailed modeling and testing. The selection of viable alternatives will be conditioned by a number of variables including recovery speed, life cycle, and weight/mass. The leading edge portion of a nacelle is a hollow toroidal 3D continuous surface shell. Geometrically, the interior space defined by the shell approximates a catenoid bounded by two circles with different radii. The required transformation of the leading edge is effected through changing its interior and exterior cross-sectional diameter, and the shape of its longitudinal section. This must be a controlled gradual change. The dynamic reduction of the diameter or circumference of a toroid-shaped structure results in surface deformations that diminish its structural stability, and affect its aerodynamic performance (i.e. turbulence). In this case, such deformations are detrimental to the potential benefits made possible through shape morphing. Therefore, form transformation concepts must aim towards producing minimal, or no surface deformation. The active shape control approach frames the solution to the shape morphing problem in the context of a controlled structure that contains sensors and/or actuators that are highly integrated into the structure and have structural and control functionality. (Wada and Fanson, 1990) Initially, concepts identified included a transformable support structure with a highly elastic skin. Examples of these were structural ribs with ratchet joints, structural frame with variable length struts, tension structures with SMA actuators, pressure

membrane structures, and flexible honeycomb structures. In the absence of a skin material that can morph without wrinkling or folding, it was decided to investigate alternatives for a segmented structural shell with active seams. Options dealt conceptually with the mechanics, materials, and structure of the seams created by dividing the leading edge into twelve segments. Concepts for mechanisms to open and close the seams involved worm gears, deformable pneumatic actuators, SMA actuators, piezoelectric actuators, elastomer actuators, tensegrity devices, scissor-hinged devices, and wrapping membrane devices.
Author
Active Control; Shape Control; Aerodynamic Characteristics; Leading Edges

20030012928 NASA Langley Research Center, Hampton, VA USA
A Computational Study of the Abrupt Wing Stall (AWS) Characteristics for Various Fighter Jets, Part 1, F/A-18E and F-16C
Parikh, Paresh, NASA Langley Research Center, USA; Chung, James, Naval Air Systems Command, USA; [2003]; 11p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0746; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Steady state Computational Fluid Dynamic (CFD) simulations are used to gain an understanding of the physics behind the Abrupt Wing Stall (AWS) phenomenon and to arrive at static Figures of Merit (FOMs). Navier-Stokes simulations are conducted using the NASA Langley developed TetrUSS simulation suite which is based on tetrahedral, unstructured grids. The physics of the AWS phenomenon is understood by comparing CFD simulation results on two aircraft; a pre-production F/A-18E configuration which exhibits AWS phenomenon under certain geometric and flow conditions, and an F-16C aircraft configuration that does not. The CFD code is first validated against two sets of experimental data to build confidence in its use for the problem of AWS. An attempt is then made to understand the possible causes of AWS by analyzing and comparing the detailed flow fields between the two configurations under a variety of flow conditions. Based on this approach, a number of static Figures of Merit are developed to predict the potential existence of AWS. The FOMs include the break in the lift and wing root bending moment versus angle-of-attack (AoA) curves and the rate of change of sectional lift with respect to AoA. A companion paper, in Part II, describes a similar CFD study on two other aircraft, the AV-8B Harrier and F/A-18C. Results from both these studies, as well as other CFD studies conducted as part of the AWS program are used to recommend a CFD procedure for predicting the existence of AWS in future aerospace designs.
Author
Aerodynamic Stalling; F-18 Aircraft; F-16 Aircraft; Computational Fluid Dynamics; Navier-Stokes Equation; Computerized Simulation

20030012931 NASA Langley Research Center, Hampton, VA USA
Affordable/Acceptable Supersonic Flight: Is It Near?
Darden, Christine M., NASA Langley Research Center, USA; [2003]; 5p; In English; JSASS 16th International Session in 40th Aircraft Symposium, 9-11 Oct. 2002, Yokohama, Japan; Sponsored by Japan Society for Aeronautical and Space Sciences, Japan
Report No.(s): Paper-IL-1; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The author takes a historical look at supersonic flight and humankind's first encounter with the sonic boom. A review is given from the 1950s to the present of the quest to understand the sonic boom, quantify its disturbance on humans and structures, and minimize its effect through aircraft design and operation. Finally, the author reminds readers that sonic boom is only one factor, though critical, in enabling an economically viable commercial supersonic aircraft.
Author
Histories; Supersonic Flight; Sonic Booms

20030012943 Mie Univ., Tsu, Japan
DSMC Calculation of Supersonic Free Jets from an Orifice with Convex and Concave Corners
Usami, Masaru; Teshima, Koji; Jul. 09, 2000; 9p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom., The original document contains color images
Report No.(s): AD-A409087; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Supersonic free jets from an orifice with convex and concave corners are investigated in three-dimensional field by the DSMC method. The plumes develop faster from the concave corners of a hexagram orifice with symmetric cross section than those from the convex corners. The mechanism of the development is revealed through the observation of velocity vectors right behind the orifice. The directions of flow are also investigated in various cross sections of a jet. There is a complicated flow-field and several circulations of flow are observed. The variation of cross section of a star shaped jet along the jet axis changes with the ratio of

a stagnation pressure to a background pressure. In an asymmetric orifice, a plume from a concave corner is inclined to an adjacent plume and they are merged into a bigger plume.
DTIC
Computerized Simulation; Monte Carlo Method; Supersonic Aircraft; Supersonic Jet Flow

20030012952 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia
The Durability of Epoxy Adhesive Bonds Formed with Titanium Alloy
Ridder, Andrew; Aug. 2002; 33p; In English
Report No.(s): AD-A409002; DSTO-TR-1333; DODA-AR-012-426; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The durability of adhesive bonds formed between titanium alloy (Ti-6A1-4V) and rubber toughened epoxy structural adhesives used for repair bonding applications was examined. Two surface treatments were studied; the grit-blast and silane method, currently employed for titanium repairs on F-111 at RAAF amberley and the F/A-18 SRM method which uses Pasa-Jell 107, a proprietary based toxic chemical treatment Results from wedge style durability tests indicated the grit-blast and silane pre-treatment provided notably better performance than the Pasa-Jell 107 pre-treatment for epoxy bonds formed with Ti-6A1AV alloy. Addition of BR127 primer to the pre-treated surfaces did not offer substantial improvement in durability performance. The durability of titanium-epoxy adhesive bonds for the grit-blast and silane pre-treatment on titanium was inferior to the performance observed on aluminum alloys. Further research will be required to improve the performance of the grit-blast and silane treatment on titanium to levels observed for aluminium.
DTIC
Epoxy Compounds; Titanium Alloys; Adhesive Bonding; Fighter Aircraft; Fatigue (Materials)

20030013626 NASA Langley Research Center, Hampton, VA USA
A Collection of Nonlinear Aircraft Simulations in MATLAB
Garza, Frederico R., George Washington Univ., USA; Morelli, Eugene A., NASA Langley Research Center, USA; January 2003; 92p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 728-30-30-03
Report No.(s): NASA/TM-2003-212145; NAS 1.15:212145; L-18259; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Nonlinear six degree-of-freedom simulations for a variety of aircraft were created using MATLAB. Data for aircraft geometry, aerodynamic characteristics, mass / inertia properties, and engine characteristics were obtained from open literature publications documenting wind tunnel experiments and flight tests. Each nonlinear simulation was implemented within a common framework in MATLAB, and includes an interface with another commercially-available program to read pilot inputs and produce a three-dimensional (3-D) display of the simulated airplane motion. Aircraft simulations include the General Dynamics F-16 Fighting Falcon, Convair F-106B Delta Dart, Grumman F-14 Tomcat, McDonnell Douglas F-4 Phantom, NASA Langley Free-Flying Aircraft for Sub-scale Experimental Research (FASER), NASA HL-20 Lifting Body, NASA / DARPA X-31 Enhanced Fighter Maneuverability Demonstrator, and the Vought A-7 Corsair II. All nonlinear simulations and 3-D displays run in real time in response to pilot inputs, using contemporary desktop personal computer hardware. The simulations can also be run in batch mode. Each nonlinear simulation includes the full nonlinear dynamics of the bare airframe, with a scaled direct connection from pilot inputs to control surface deflections to provide adequate pilot control. Since all the nonlinear simulations are implemented entirely in MATLAB, user-defined control laws can be added in a straightforward fashion, and the simulations are portable across various computing platforms. Routines for trim, linearization, and numerical integration are included. The general nonlinear simulation framework and the specifics for each particular aircraft are documented.
Author
Flight Simulation; Nonlinearity; Degrees of Freedom; Computer Programs

20030013632 NASA Langley Research Center, Hampton, VA USA
Recommended Experimental Procedures for Evaluation of Abrupt Wing Stall Characteristics
Capone, F. J., NASA Langley Research Center, USA; Hall, R. M., NASA Langley Research Center, USA; Owens, D. B., NASA Langley Research Center, USA; Lamar, J. E., NASA Langley Research Center, USA; McMillin, S. N., NASA Langley Research Center, USA; [2003]; 29p; In English; 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0922; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a review of the experimental program under the Abrupt Wing Stall (AWS) Program. Candidate figures of merit from conventional static tunnel tests are summarized and correlated with data obtained in unique free-to-roll tests. Where possible, free-to-roll results are also correlated with flight data. Based on extensive studies of static experimental figures of merit in the Abrupt Wing Stall Program for four different aircraft configurations, no one specific figure of merit consistently flagged a warning of potential lateral activity when actual activity was seen to occur in the free-to-roll experiments. However, these studies pointed out the importance of measuring and recording the root mean square signals of the force balance.
Author
Aerodynamic Stalling; Wings; Figure of Merit; Experimentation; Aircraft Configurations

20030013754 NASA Langley Research Center, Hampton, VA USA
A Discussion of Aerodynamic Control Effectors (ACEs) for Unmanned Air Vehicles (UAVs)
Wood, Richard M., NASA Langley Research Center, USA; [2002]; 30p; In English; AIAA 1st Technical Conference and Workshop on Unmanned Aerospace Vehicle, Systems, Technologies, and Operations, 20-23 May 2002, Portsmouth, VA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-3494; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
A Reynolds number based, unmanned air vehicle classification structure has been developed which identifies four classes of unmanned air vehicle concepts. The four unmanned air vehicle (UAV) classes are; Micro UAV, Meso UAV, Macro UAV, and Mega UAV. In a similar fashion a labeling scheme for aerodynamic control effectors (ACE) was developed and eleven types of ACE concepts were identified. These eleven types of ACEs were laid out in a five (5) layer scheme. The final section of the paper correlated the various ACE concepts to the four UAV classes and ACE recommendations are offered for future design activities.
Author
Pilotless Aircraft; Effectors; Aerodynamic Characteristics; Aircraft Design; Reynolds Number; Control Surfaces

20030014073 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
F/A-18A/B/C/D Main Landing Gear Control Unit Hydraulic 2A Supply Line Pressure Spikes and Emergency Port Restrictor Ground and Flight Tests Evaluation
Picard, Mary; Nov. 17, 2002; 24p; In English; Original contains color images
Report No.(s): AD-A409130; NAWCADPAX/RTR-2000/191; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The F/A-18A-D fleet has been experiencing cracked brackets on the right main landing gear (MLG) wheel well hydraulic 2A (HYD 2A) pressure supply line. Investigations revealed that hydraulic pressure spikes in the HYD 2A supply line may be a contributing factor to the bracket failure. Some bracket failures have led to HYD 2A supply line failures. F/A-i 8E/F testing determined that landing gear circuit breaker resets and improper gear retractions following an emergency gear extension caused pressure spikes. A suspected but unproven cause of pressure spikes is the first engine start of the day. For this test, a production F/A-18A-D landing gear control unit (LGCU) was modified at NADEP north Island to accept a restrictor within the emergency port of the valve. The Boeing and Northrop Grumman developed restrictors were designed to control emergency spool movement and eliminate pressure spikes in the HYD 2A supply line. Three restrictors were designed with increasing levels of restriction (2000, 5500, and 9000 lohm). The elimination of pressure spikes is expected to reduce or eliminate the hydraulic line bracket failures that have been occurring in the USN/USMC fleet and FMS aircraft.
DTIC
Aircraft; Hydraulic Equipment; Landing Gear

20030014128 NASA Langley Research Center, Hampton, VA USA
Flow and Noise Control: Toward a Closer Linkage
Thomas, Russell H., NASA Langley Research Center, USA; Choudhari, Meelan M., NASA Langley Research Center, USA; Joslin, Ronald D., Office of Naval Research, USA; [2002]; 10p; In English; 23rd International Council of the Aeronautical Sciences, 8-13 Sep. 2002, Toronto, Canada; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Motivated by growing demands for aircraft noise reduction and for revolutionary new aerovehicle concepts, the late twentieth century witnessed the beginning of a shift from single-discipline research, toward an increased emphasis on harnessing the potential of flow and noise control as implemented in a more fully integrated, multidisciplinary framework. At the same time, technologies for developing radically new aerovehicles, which promise quantum leap benefits in cost, safety and performance benefits with environmental friendliness, have appeared on the horizon. Transitioning new technologies to commercial applications will also require coupling further advances in traditional areas of aeronautics with intelligent exploitation of nontraditional and interdisciplinary technologies. Physics-based modeling and simulation are crucial enabling capabilities for

synergistic linkage of flow and noise control. In these very fundamental ways, flow and noise control are being driven to be more closely linked during the early design phases of a vehicle concept for optimal and mutual noise and performance benefits.
Author
Noise Reduction; Flow Noise; Control Theory; Computational Fluid Dynamics; Civil Aviation; Jet Aircraft Noise

20030014137 NASA Ames Research Center, Moffett Field, CA USA
Classification of Aircraft Maneuvers for Fault Detection
Oza, Nikunj, NASA Ames Research Center, USA; Tumer, Irem Y., NASA Ames Research Center, USA; Tumer, Kagan, NASA Ames Research Center, USA; Huff, Edward M., NASA Ames Research Center, USA; [2002]; 10p; In English; Fourth International Workshop on Multiple Classifier Systems, Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Automated fault detection is an increasingly important problem in aircraft maintenance and operation. Standard methods of fault detection assume the availability of either data produced during all possible faulty operation modes or a clearly-defined means to determine whether the data provide a reasonable match to known examples of proper operation. In the domain of fault detection in aircraft, the first assumption is unreasonable and the second is difficult to determine. We envision a system for online fault detection in aircraft, one part of which is a classifier that predicts the maneuver being performed by the aircraft as a function of vibration data and other available data. to develop such a system, we use flight data collected under a controlled test environment, subject to many sources of variability. We explain where our classifier fits into the envisioned fault detection system as well as experiments showing the promise of this classification subsystem.
Author
Aircraft Maneuvers; Aircraft Maintenance; Fault Detection

20030014330 NASA Langley Research Center, Hampton, VA USA
Automated Transmission Loss Measurement in the Structural Acoustic Loads and Transmission Facility at NASA Langley Research Center
Klos, J., NASA Langley Research Center, USA; Brown, S. A., NASA Langley Research Center, USA; [2002]; 6p; In English; 2002 International Congress and Exposition on Noise Control Engineering, 19-21 Aug. 2002, Dearborn, MI, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A technique to measure the radiated acoustic intensity and transmission loss of panels is documented in this paper. This facility has been upgraded to include a test fixture that scans the acoustic intensity radiated from a panel on the anechoic receiving room side of the transmission loss window. The acoustic intensity incident on the panel from the reverberant side of the transmission loss window is estimated from measurements made using six stationary microphones in the reverberant source room. From the measured incident and radiated intensity, the sound power transmission loss is calculated. The setup of the facility and data acquisition system are documented. A transmission loss estimate of a typical panel is shown. The measurement-to-measurement and setup-to-setup repeatability of the transmission loss estimate are assessed. Conclusions are drawn about the ability to measure changes in transmission loss due to changes in panel construction.
Author
Transmission Loss; Automatic Control; Aircraft Noise; Sound Intensity; Panels; Test Facilities; Acoustic Fatigue

20030014332 NASA Langley Research Center, Hampton, VA USA
Dimensional Stability of Complex Shapes Manufactured by the VARTM Process
Hubert, Pascal, Old Dominion Univ., USA; Grimsley, Brian W., NASA Langley Research Center, USA; Cano, Roberto J., NASA Langley Research Center, USA; Pipes, R. Byron, Akron Univ., USA; [2002]; 5p; In English; ANTEC 2002: 60th Annual Technical Conference, 5-9 May 2002, San Francisco, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The vacuum assisted resin transfer molding (VARTM) process is a cost effective, innovative method that is being considered for manufacture of large aircraft-quality components where high mechanical properties and dimensional tolerance are essential. In the present work, carbon fiber SAERTEX fabric/SI-ZG-5A epoxy resin C-shaped laminates were manufactured by VARTM using different cure cycles followed by the same post-cure cycle. The final part thickness was uniform except at the corner were thinning was observed. The cure cycle selected is shown to significantly affect the part spring-in and a long cycle at 66 C followed by a 178 C post-cure produced a part with negligible spring-in.
Author
Dimensional Stability; Mechanical Properties; Resin Transfer Molding; Shapes; Vacuum; Manufacturing

20030014503 NASA Langley Research Center, Hampton, VA USA

Phase Synchronization and Desynchronization of Structural Response Induced by Turbulent and External Sound

Maestrello, Lucio, NASA Langley Research Center, USA; [2002]; 17p; In English; 8th AIAA/CEAS Aeroacoustics Conference, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-2566; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Acoustic and turbulent boundary layer flow loadings over a flexible structure are used to study the spatial-temporal dynamics of the response of the structure. The stability of the spatial synchronization and desynchronization by an active external force is investigated with an array of coupled transducers on the structure. In the synchronous state, the structural phase is locked, which leads to the formation of spatial patterns while the amplitude peaks exhibit chaotic behaviors. Large amplitude, spatially symmetric loading is superimposed on broadband, but in the desynchronized state, the spectrum broadens and the phase space is lost. The resulting pattern bears a striking resemblance to phase turbulence. The transition is achieved by using a low power external actuator to trigger broadband behaviors from the knowledge of the external acoustic load inducing synchronization. The changes are made favorably and efficiently to alter the frequency distribution of power, not the total power level. Before synchronization effects are seen, the panel response to the turbulent boundary layer loading is discontinuously spatio-temporally correlated. The stability develops from different competing wavelengths; the spatial scale is significantly shorter than when forced with the superimposed external sound. When the external sound level decreases and the synchronized phases are lost, changes in the character of the spectra can be linked to the occurrence of spatial phase transition. These changes can develop broadband response. Synchronized responses of fuselage structure panels have been observed in subsonic and supersonic aircraft; results from two flights tests are discussed.

Author

Aeroacoustics; Boundary Layer Flow; Turbulent Boundary Layer; Flexible Bodies; Loads (Forces); Dynamic Response

20030014504 NASA Langley Research Center, Hampton, VA USA

Options for Robust Airfoil Optimization under Uncertainty

Padula, Sharon L., NASA Langley Research Center, USA; Li, Wu, Old Dominion Univ., USA; [2002]; 11p; In English; 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, 4-6 Sep. 2002, Atlanta, GA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A robust optimization method is developed to overcome point-optimization at the sampled design points. This method combines the best features from several preliminary methods proposed by the authors and their colleagues. The robust airfoil shape optimization is a direct method for drag reduction over a given range of operating conditions and has three advantages: (1) it prevents severe degradation in the off-design performance by using a smart descent direction in each optimization iteration, (2) it uses a large number of spline control points as design variables yet the resulting airfoil shape does not need to be smoothed, and (3) it allows the user to make a tradeoff between the level of optimization and the amount of computing time consumed. For illustration purposes, the robust optimization method is used to solve a lift-constrained drag minimization problem for a two-dimensional (2-D) airfoil in Euler flow with 20 geometric design variables.

Author

Airfoils; Shape Optimization; Drag Reduction

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.

20030012704 NASA Langley Research Center, Hampton, VA USA

Projection Moire Interferometry for Rotorcraft Applications: Deformation Measurements of Active Twist Rotor Blades

Fleming, Gary A., NASA Langley Research Center, USA; Soto, Hector L., NASA Langley Research Center, USA; South, Bruce W., NASA Langley Research Center, USA; [2002]; 24p; In English; American Helicopter Society 58th Annual Forum, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Projection Moire Interferometry (PMI) has been used during wind tunnel tests to obtain azimuthally dependent blade bending and twist measurements for a 4-bladed Active Twist Rotor (ATR) system in simulated forward flight. The ATR concept offers a means to reduce rotor vibratory loads and noise by using piezoelectric active fiber composite actuators embedded in the blade structure to twist each blade as they rotate throughout the rotor azimuth. The twist imparted on the blades for blade control causes significant changes in blade loading, resulting in complex blade deformation consisting of coupled bending and twist. Measurement of this blade deformation is critical in understanding the overall behavior of the ATR system and the physical mechanisms causing the reduction in rotor loads and noise. PMI is a non-contacting, video-based optical measurement technique capable of obtaining spatially continuous structural deformation measurements over the entire object surface within the PMI system field-of-view. When applied to rotorcraft testing, PMI can be used to measure the azimuth-dependent blade bending and twist along the full span of the rotor blade. This paper presents the PMI technique as applied to rotorcraft testing, and provides results obtained during the ATR tests demonstrating the PMI system performance. PMI measurements acquired at select blade actuation conditions generating minimum and maximum rotor loads are provided to explore the interrelationship between rotor loads, blade bending, and twist.
Author
Moire Interferometry; Rotor Aerodynamics; Rotary Wing Aircraft; Deformation; Rotors; Wind Tunnel Tests

20030014333 NASA Langley Research Center, Hampton, VA USA
Sensor Technology for Integrated Vehicle Health Management of Aerospace Vehicles
Prosser, W. H., NASA Langley Research Center, USA; Brown, T. L., NASA Langley Research Center, USA; Woodard, S. E., NASA Langley Research Center, USA; Fleming, G. A., NASA Langley Research Center, USA; Cooper, E. G., NASA Langley Research Center, USA; [2002]; 8p; In English; 29th Review of Progress in Quantitative Nondestructive Evaluation, 14-19 Jul. 2002, Bellingham, WA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
NASA is focusing considerable efforts on technology development for Integrated Vehicle Health Management systems. The research in this area is targeted toward increasing aerospace vehicle safety and reliability, while reducing vehicle operating and maintenance costs. Onboard, real-time sensing technologies that can provide detailed information on structural integrity are central to such a health management system. This paper describes a number of sensor technologies currently under development for integrated vehicle health management. The capabilities, current limitations, and future research needs of these technologies are addressed.
Author
Aerospace Vehicles; Systems Health Monitoring; Sensors

20030014578 NASA Langley Research Center, Hampton, VA USA
Synthetic Vision Systems in GA Cockpit-Evaluation of Basic Maneuvers Performed by Low Time GA Pilots During Transition from VMC to IMC
Takallu, M. A., Lockheed Martin Corp., USA; Wong, D. T., NASA Langley Research Center, USA; Uenking, M. D., NASA Langley Research Center, USA; [2002]; 12p; In English; International Advanced Aviation Technologies Conference, 20-23 Aug. 2002, Anchorage, AK, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An experimental investigation was conducted to study the effectiveness of modern flight displays in general aviation cockpits for mitigating Low Visibility Loss of Control and the Controlled Flight Into Terrain accidents. A total of 18 General Aviation (GA) pilots with private pilot, single engine land rating, with no additional instrument training beyond private pilot license requirements, were recruited to evaluate three different display concepts in a fixed-based flight simulator at the NASA Langley Research Center's General Aviation Work Station. Evaluation pilots were asked to continue flight from Visual Meteorological Conditions (VMC) into Instrument Meteorological Conditions (IMC) while performing a series of 4 basic precision maneuvers. During the experiment, relevant pilot/vehicle performance variables, pilot control inputs and physiological data were recorded. Human factors questionnaires and interviews were administered after each scenario. Qualitative and quantitative data have been analyzed and the results are presented here. Pilot performance deviations from the established target values (errors) were computed and compared with the FAA Practical Test Standards. Results of the quantitative data indicate that evaluation pilots committed substantially fewer errors when using the Synthetic Vision Systems (SVS) displays than when they were using conventional instruments. Results of the qualitative data indicate that evaluation pilots perceived themselves to have a much higher level of situation awareness while using the SVS display concept.
Author
General Aviation Aircraft; Pilot Performance; Enhanced Vision; Situational Awareness; Display Devices; Cockpits; Aircraft Pilots

07
AIRCRAFT PROPULSION AND POWER

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

20030012759 Impact Technologies, LLC, Rochester, NY USA
Upgrading Engine Test Cells for Improved Troubleshooting and Diagnostics
Roemer, Michael J.; Orsagh, Rolf F.; Schoeller, Michael; Scheid, James; Friend, Richard; Jan. 2002; 10p; In English; Original contains color images
Report No.(s): AD-A408947; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Upgrading military engine test cells with advanced diagnostic and troubleshooting capabilities will play a critical role in increasing aircraft availability and test cell effectiveness while simultaneously reducing engine opening and maintenance costs. Sophisticated performance and mechanical anomaly detection and fault classification algorithms utilizing thermodynamic, statistical, and empirical engine models are now being implemented as part of a USA Air Force Advanced Test Cell Upgrade Initiative. Under this program, a comprehensive set of real-time and post-test diagnostic software modules, including sensor validation algorithms, performance fault classification techniques and vibration feature analysis are being developed. An automated troubleshooting guide is also being implemented to streamline the troubleshooting process for both inexperienced and experienced technicians. This artificial intelligence based tool enhances the conventional troubleshooting tree architecture by incorporating probability of occurrence statistics to optimize the troubleshooting path. This paper describes the development and implementation of the F404 engine test cell upgrade at the Jacksonville Naval Air Station.
DTIC
Engine Tests; Mathematical Models; Gas Turbines; Aircraft Maintenance; Artificial Intelligence; Military Technology

20030012777 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Evaluation of the Ramjet Propulsion at a Energy Pulse Supply
Zamuraev, V. P.; Kalinina, A. P.; Latypov, A. F.; Aug. 23, 2002; 6p; In English; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409185; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An attempt to model a working process of ramjet was made. A radiant energy in a pulse periodical regime is supplied in contrast to the classical scheme where the energy in a combustion chamber is supplied continuously by fuel burning. to simulate this problem the Euler equations in the ”channel” approximation for a plane case are solved numerically.
DTIC
Propulsion; Ramjet Engines; Mach Number

20030013622 NASA Glenn Research Center, Cleveland, OH USA
An Investigation of Surge in a High-Speed Centrifugal Compressor Using Digital PIV
Wernet, Mark P., NASA Glenn Research Center, USA; Bright, Michelle M., NASA Glenn Research Center, USA; Skoch, Gary J., Army Research and Technology Labs., USA; December 2002; 28p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 519-20-53
Report No.(s): NASA/TM-2002-211832; E-13281-1; NAS 1.15:211832; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Compressor stall is a catastrophic breakdown of the flow in a compressor, which can lead to a loss of engine power, large pressure transients in the inlet/nacelle and engine flameout. The implementation of active or passive strategies for controlling rotating stall and surge can significantly extend the stable operating range of a compressor without substantially sacrificing performance. It is crucial to identify the dynamic changes occurring in the flow field prior to rotating stall and surge in order to successfully control these events. Generally, pressure transducer measurements are made to capture the transient response of a compressor prior to rotating stall. In this investigation, Digital Particle Imaging Velocimetry (DPIV) is used in conjunction with dynamic pressure transducers to simultaneously capture transient velocity and pressure measurements in the non-stationary flow field during compressor surge. DPIV is an instantaneous, planar measurement technique which is ideally suited for studying transient flow phenomena in high speed turbomachinery and has been used previously to successfully map the stable operating

point flow field in the diffuser of a high speed centrifugal compressor. Through the acquisition of both DPIV images and transient pressure data, the time evolution of the unsteady flow during surge is revealed.
Author
Centrifugal Compressors; Rotating Stalls; Particle Image Velocimetry; Pressure Measurement; Dynamic Pressure

20030013952 California Univ., Irvine, CA USA
Performance of a Model Rich Burn-Quick Mix-Lean Burn Combustor at Elevated Temperature and Pressure
Peterson, Christopher O., California Univ., USA; Sowa, William A., California Univ., USA; Samuelsen, G. S., California Univ., USA; December 2002; 99p; In English
Contract(s)/Grant(s): NAG3-1110; RTOP 714-02-08
Report No.(s): NASA/CR-2002-211992; NAS 1.26:211992; E-13663; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
As interest in pollutant emission from stationary and aero-engine gas turbines increases, combustor engineers must consider various configurations. One configuration of increasing interest is the staged, rich burn - quick mix - lean burn (RQL) combustor. This report summarizes an investigation conducted in a recently developed high pressure gas turbine combustor facility. The model RQL combustor was plenum fed and modular in design. The fuel used for this study is Jet-A which was injected from a simplex atomizer. Emission (CO2, CO, O2, UHC, NOx) measurements were obtained using a stationary exit plane water-cooled probe and a traversing water-cooled probe which sampled from the rich zone exit and the lean zone entrance. The RQL combustor was operated at inlet temperatures ranging from 367 to 700 K, pressures ranging from 200 to 1000 kPa, and combustor reference velocities ranging from 10 to 20 m/s. Variations were also made in the rich zone and lean zone equivalence ratios. Several significant trends were observed. NOx production increased with reaction temperature, lean zone equivalence ratio and residence time and decreased with increased rich zone equivalence ratio. NOx production in the model RQL combustor increased to the 0.4 power with increased pressure. This correlation, compared to those obtained for non-staged combustors (0.5 to 0.7), suggests a reduced dependence on NOx on pressure for staged combustors. Emissions profiles suggest that rich zone mixing is not uniform and that the rich zone contributes on the order of 16 percent to the total NOx produced.
Author
Combustion Chambers; Gas Turbines; Contaminants; Burners; Nitrogen Oxides; Jet Mixing Flow; Exhaust Emission

20030013958 China Aerodynamics Research and Development Center, Mianyang, China
Methodical Aspects of Investigation of Kerosene Ignition and Combustion in Scramjet Model
Le, J. L.; Zhang, Z. C.; Bai, H. C.; Goldfeld, M. A.; Nestoulia, R. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with Russian Adademy of Sciences Inst. of Theoretical and Applied Mechanics, Novosibirsk
Report No.(s): AD-A409260; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
There have been studies on hydrocarbon-fueled vehicle concept in a range of Mach numbers. It is assumed that the upper bounds of using hydrocarbon fuels lie between Mach numbers 6-8. Many investigations of scramjets with a hydrogen fuel on models in wind tunnels of are known. But only few works are known, which concerned the study of hydrocarbon fuel combustion and especially combustion of liquid kerosene. Therefore, the investigation of liquid fuel combustion is very important. It is necessary to evaluate the possibility of full engine model tests in a hot-shot wind tunnel under flight conditions.
DTIC
Supersonic Combustion Ramjet Engines; Wind Tunnel Tests; Jet Engine Fuels; Ignition; Kerosene; Aircraft Models

20030014015 China Aerodynamics Research and Development Center, Mianyang, China
Pulse Combustion Facility and Its Prliminary Application in Scramjet Research
Le, Jia-Ling; Liu, Wei-Xiong; He, Wei; Tan, Yu; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409258; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A new, more efficient and economical facility (which is capable of simulating flight Mach number less than 7) of pulse combustion and short duration (more than 30 ms) was conceived and built two years ago in CARDC, based on our original experience in short duration techniques for simulating exhaust plumes at high altitude. Preliminary experimental results from hundreds of tests of combustor and model engine with fuel of hydrogen and hydrocarbon demonstrate that this kind of facility is suitable for scramjet research.
DTIC
Combustion Chambers; Pulse Duration; Supersonic Combustion Ramjet Engines; Research Facilities; Wind Tunnel Tests; Simulation

20030014590 NASA Glenn Research Center, Cleveland, OH USA

Realistic Subscale Evaluations of the Mechanical Properties of Advanced Disk Superalloys

Gabb, Timothy P., NASA Glenn Research Center, USA; Gayda, John, NASA Glenn Research Center, USA; Telesman, Jack, NASA Glenn Research Center, USA; Kantzos, Peter T., Ohio Aerospace Inst., USA; Konkel, William A., Konkel Material Consulting, USA; January 2003; 15p; In English; 2003 Annual Meeting and Exhibition, 2-6 Mar. 2003, San Diego, CA, USA; Sponsored by Minerals, Metals and Materials Society, USA

Contract(s)/Grant(s): RTOP 708-31-03

Report No.(s): NASA/TM-2003-212086; E-13739; NAS 1.15:212086; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

A series of experimental powder metallurgy disk alloys were evaluated for their processing characteristics and high temperature mechanical properties. Powder of each alloy was hot compacted, extruded, and isothermally forged into subscale disks. Disks were subsolvus and supersolvus heat treated, then quenched using procedures designed to reproduce the cooling paths expected in large-scale disks. Mechanical tests were then performed at 538, 704, and 815 C. Several alloys had superior tensile and creep properties at 704 C and higher temperatures, but were difficult to process and prone to quench cracking, chiefly due to their high gamma prime solvus temperature. Several other alloys had more favorable processing characteristics due to their lower gamma prime solvus temperature and balanced time-dependent properties at 704 C. Results indicate an experimental low solvus, high refractory alloy can build upon the best attributes of all these alloys, giving exceptional tensile and creep properties at high temperatures with good processing characteristics due to a low gamma prime solvus.

Author

Heat Treatment; Creep Properties; Tensile Creep; Heat Resistant Alloys; Rotation

20030014591 NASA Glenn Research Center, Cleveland, OH USA

Design-of-Experiments to Reduce Life-Cycle Costs in Combat Aircraft Inlets

Anderson, Bernhard H., NASA Glenn Research Center, USA; Baust, Henry D., Department of the Air Force, USA; Agrell, Johan, Swedish Defence Research Establishment, Sweden; January 2003; 17p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 708-92-21

Report No.(s): NASA/TM-2003-212017; E-13720; NAS 1.15:212017; AIAA Paper 2003-0652; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

It is the purpose of this study to demonstrate the viability and economy of Design- of-Experiments (DOE), to arrive at micro-secondary flow control installation designs that achieve optimal inlet performance for different mission strategies. These statistical design concepts were used to investigate the properties of ”low unit strength” micro-effector installation. ”Low unit strength” micro-effectors are micro-vanes, set a very low angle-of incidence, with very long chord lengths. They are designed to influence the neat wall inlet flow over an extended streamwise distance. In this study, however, the long chord lengths were replicated by a series of short chord length effectors arranged in series over multiple bands of effectors. In order to properly evaluate the performance differences between the single band extended chord length installation designs and the segmented multiband short chord length designs, both sets of installations must be optimal. Critical to achieving optimal micro-secondary flow control installation designs is the understanding of the factor interactions that occur between the multiple bands of micro-scale vane effectors. These factor interactions are best understood and brought together in an optimal manner through a structured DOE process, or more specifically Response Surface Methods (RSM).

Author

Aerodynamics; Propulsion; Fluid Dynamics; Cost Reduction; Experiment Design; Life Cycle Costs

20030014612 California Univ., Berkeley, CA USA

Simultaneous Laser Raman-Rayleigh-LIF Measurements and Numerical Modeling Results of a Lifted Turbulent H2/N2 Jet Flame in a Vitiated Coflow ***Final Report***

Cabra, R., California Univ., USA; Chen, J. Y., California Univ., USA; Dibble, R. W., California Univ., USA; Myhrvold, T., Norwegian Univ. of Science and Technology, Norway; Karpetis, A. N., Sandia National Labs., USA; Barlow, R. S., Sandia National Labs., USA; December 2002; 23p; In English; 29th International Symposium on Combustion, 21-26 Jul. 2002, Sapporo, Japan; Sponsored by Combustion Inst., Japan; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2103; RTOP 708-90-01

Report No.(s): NASA/CR-2002-212082; NAS 1.26:212082; E-13735; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

An experiment and numerical investigation is presented of a lifted turbulent H2/N2 jet flame in a coflow of hot, vitiated gases. The vitiated coflow burner emulates the coupling of turbulent mixing and chemical kinetics exemplary of the reacting flow in the recirculation region of advanced combustors. It also simplifies numerical investigation of this coupled problem by removing the complexity of recirculating flow. Scalar measurements are reported for a lifted turbulent jet flame of H2/N2 (Re = 23,600, H/d = 10) in a coflow of hot combustion products from a lean H2/Air flame ((empty set) = 0.25, T = 1,045 K). The combination of Rayleigh scattering, Raman scattering, and laser-induced fluorescence is used to obtain simultaneous measurements of temperature and concentrations of the major species, OH, and NO. The data attest to the success of the experimental design in providing a uniform vitiated coflow throughout the entire test region. Two combustion models (PDF: joint scalar Probability Density Function and EDC: Eddy Dissipation Concept) are used in conjunction with various turbulence models to predict the lift-off height (H(sub PDF)/d = 7,H(sub EDC)/d = 8.5). Kalghatgi's classic phenomenological theory, which is based on scaling arguments, yields a reasonably accurate prediction (H(sub K)/d = 11.4) of the lift-off height for the present flame. The vitiated coflow admits the possibility of auto-ignition of mixed fluid, and the success of the present parabolic implementation of the PDF model in predicting a stable lifted flame is attributable to such ignition. The measurements indicate a thickened turbulent reaction zone at the flame base. Experimental results and numerical investigations support the plausibility of turbulent premixed flame propagation by small scale (on the order of the flame thickness) recirculation and mixing of hot products into reactants and subsequent rapid ignition of the mixture.
Author
Burners; Combustion Chambers; Flames; Hydrogen; Laser Induced Fluorescence; Nitrogen; Raman Spectra; Turbulent Flames; Turbulent Jets; Gas Turbines; Numerical Analysis

20030014613 California Univ., Berkeley, CA USA
Simultaneous Raman-Rayleigh-LIF Measurements and Numerical Modeling Results of a Lifted H2/N2 Turbulent Jet Flame in a Vitiated Coflow ***Final Report***
Cabra, R., California Univ., USA; Chen, J. Y., California Univ., USA; Dibble, R. W., California Univ., USA; Hamano, Y., Ishikawajima-Harima Heavy Industries Co. Ltd., Japan; Karpetis, A. N., Sandia National Labs., USA; Barlow, R. S., Sandia National Labs., USA; December 2002; 20p; In English; 2001 Spring Joint Meeting, 26-28 Mar. 2001, Berkeley, CA, USA; Sponsored by California Univ., USA; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2103; RTOP 708-90-01
Report No.(s): NASA/CR-2002-212081; NAS 1.26:212081; E-13734; WSS/CI-2001-288; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
An experimental and numerical investigation is presented of a H2/N2 turbulent jet flame burner that has a novel vitiated coflow. The vitiated coflow emulates the recirculation region of most combustors, such as gas turbines or furnaces. Additionally, since the vitiated gases are coflowing, the burner allows for exploration of recirculation chemistry without the corresponding fluid mechanics of recirculation. Thus the vitiated coflow burner design facilitates the development of chemical kinetic combustion models without the added complexity of recirculation fluid mechanics. Scalar measurements are reported for a turbulent jet flame of H2/N2 in a coflow of combustion products from a lean ((empty set) = 0.25) H2/Air flame. The combination of laser-induced fluorescence, Rayleigh scattering, and Raman scattering is used to obtain simultaneous measurements of the temperature, major species, as well as OH and NO. Laminar flame calculation with equal diffusivity do agree when the premixing and preheating that occurs prior to flame stabilization is accounted for in the boundary conditions. Also presented is an exploratory pdf model that predicts the flame's axial profiles fairly well, but does not accurately predict the lift-off height.
Author
Combustion Physics; Flames; Laser Induced Fluorescence; Raman Spectra; Rayleigh Scattering; Fuel Sprays; Combustion Chambers; Burners; Numerical Analysis; Liquid Fuels; Methyl Alcohol

20030014624 NASA Glenn Research Center, Cleveland, OH USA
Aerodynamic Design Study of Advanced Multistage Axial Compressor
Larosiliere, Louis M., Army Research Lab., USA; Wood, Jerry R., NASA Glenn Research Center, USA; Hathaway, Michael D., Army Research Lab., USA; Medd, Adam J., Syracuse Univ., USA; Dang, Thong Q., Syracuse Univ., USA; December 2002; 41p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 714-03-27; DA Proj. 1L1-61102-AF-20
Report No.(s): NASA/TP-2002-211568; NAS 1.60:211568; E-13352; ARL-TR-2859; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
As a direct response to the need for further performance gains from current multistage axial compressors, an investigation of advanced aerodynamic design concepts that will lead to compact, high-efficiency, and wide-operability configurations is being

pursued. Part I of this report describes the projected level of technical advancement relative to the state of the art and quantifies it in terms of basic aerodynamic technology elements of current design systems. A rational enhancement of these elements is shown to lead to a substantial expansion of the design and operability space. Aerodynamic design considerations for a four-stage core compressor intended to serve as a vehicle to develop, integrate, and demonstrate aerotechnology advancements are discussed. This design is biased toward high efficiency at high loading. Three-dimensional blading and spanwise tailoring of vector diagrams guided by computational fluid dynamics (CFD) are used to manage the aerodynamics of the high-loaded endwall regions. Certain deleterious flow features, such as leakage-vortex-dominated endwall flow and strong shock-boundary-layer interactions, were identified and targeted for improvement. However, the preliminary results were encouraging and the front two stages were extracted for further aerodynamic trimming using a three-dimensional inverse design method described in part II of this report. The benefits of the inverse design method are illustrated by developing an appropriate pressure-loading strategy for transonic blading and applying it to reblade the rotors in the front two stages of the four-stage configuration. Multistage CFD simulations based on the average passage formulation indicated an overall efficiency potential far exceeding current practice for the front two stages. Results of the CFD simulation at the aerodynamic design point are interrogated to identify areas requiring additional development. In spite of the significantly higher aerodynamic loadings, advanced CFD-based tools were able to effectively guide the design of a very efficient axial compressor under state-of-the-art aeromechanical constraints.
Author
Aerodynamics; Computational Fluid Dynamics; Compressors; Computer Aided Design

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.

20030013634 NASA Langley Research Center, Hampton, VA USA
Optimal Aircraft Control Upset Recovery With and Without Component Failures
Sparks, Dean W., NASA Langley Research Center, USA; Moerder, Daniel D., NASA Langley Research Center, USA; [2002]; 6p; In English; 2002 American Control Conference, 8-10 May 2002, Anchorage, AK, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper treats the problem of recovering sustainable nondescending (safe) flight in a transport aircraft after one or more of its control effectors fail. Such recovery can be a challenging goal for many transport aircraft currently in the operational fleet for two reasons. First, they have very little redundancy in their means of generating control forces and moments. These aircraft have, as primary control surfaces, a single rudder and pairwise elevators and aileron/spoiler units that provide yaw, pitch, and roll moments with sufficient bandwidth to be used in stabilizing and maneuvering the airframe. Beyond this, throttling the engines can provide additional moments, but on a much slower time scale. Other aerodynamic surfaces, such as leading and trailing edge flaps, are only intended to be placed in a position and left, and are, hence, very slow-moving. Because of this, loss of a primary control surface strongly degrades the controllability of the vehicle, particularly when the failed effector becomes stuck in a non-neutral position where it exerts a disturbance moment that must be countered by the remaining operating effectors. The second challenge in recovering safe flight is that these vehicles are not agile, nor can they tolerate large accelerations. This is of special importance when, at the outset of the recovery maneuver, the aircraft is flying toward the ground, as is frequently the case when there are major control hardware failures. Recovery of safe flight is examined in this paper in the context of trajectory optimization. For a particular transport aircraft, and a failure scenario inspired by an historical air disaster, recovery scenarios are calculated with and without control surface failures, to bring the aircraft to safe flight from the adverse flight condition that it had assumed, apparently as a result of contact with a vortex from a larger aircraft's wake. An effort has been made to represent relevant airframe dynamics, acceleration limits, and actuator limits faithfully, since these contribute to the lack of agility and control power that plays an important role in defining what can be achieved with the vehicle when it is in extremis.
Author
Aircraft Control; Control Equipment; Control Surfaces; Controllability; Maneuverability; Flight Conditions; Failure Analysis; Engine Parts

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).

20030014598 NASA Langley Research Center, Hampton, VA USA

A Space-Based Point Design for Global Coherent Doppler Wind Lidar Profiling Matched to the Recent NASA/NOAA Draft Science Requirements

Kavaya, Michael J., NASA Langley Research Center, USA; Emmitt, G. David, Simpson Weather Associates, Inc., USA; Frehlich, Rod G., Colorado Univ., USA; Amzajerdian, Farzin, NASA Langley Research Center, USA; Singh, Upendra N., NASA Langley Research Center, USA; [2002]; 4p; In English; 21st International Laser Radar Conference, 8-12 Jul. 2002, Quebec, Canada; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An end-to-end point design, including lidar, orbit, scanning, atmospheric, and data processing parameters, for space-based global profiling of atmospheric wind will be presented. The point design attempts to match the recent NASA/NOAA draft science requirements for wind measurement.

Author

Doppler Radar; Optical Radar; Wind (Meteorology); Wind Profiles; NOAA Satellites; Space Based Radar; NASA Programs; Coherent Radar

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.

20030014643 NASA Glenn Research Center, Cleveland, OH USA

Vehicle and Mission Design Options for the Human Exploration of Mars/Phobos Using ”Bimodal” NTR and LANTR Propulsion

Borowski, Stanley K., NASA Glenn Research Center, USA; Dudzinski, Leonard A., NASA Glenn Research Center, USA; McGuire, Melissa L., Analex Corp., USA; December 2002; 54p; In English; 34th Joint Propulsion Conference, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations Contract(s)/Grant(s): NAS3-27186; RTOP 953-20-0C

Report No.(s): NASA/TM-1998-208834/REV1; NAS 1.15:208834/REV1; E-11445-1/REV1; AIAA Paper 98-3883/REV1; Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The nuclear thermal rocket (NTR) is one of the leading propulsion options for future human missions to Mars because of its high specific impulse (1sp is approximately 850-1000 s) capability and its attractive engine thrust-to-weight ratio (approximately 3-10). to stay within the available mass and payload volume limits of a ”Magnum” heavy lift vehicle, a high performance propulsion system is required for trans-Mars injection (TMI). An expendable TMI stage, powered by three 15 thousand pounds force (klbf) NTR engines is currently under consideration by NASA for its Design Reference Mission (DRM). However, because of the miniscule burnup of enriched uranium-235 during the Earth departure phase (approximately 10 grams out of 33 kilograms in each NTR core), disposal of the TMI stage and its engines after a single use is a costly and inefficient use of this high performance stage. by reconfiguring the engines for both propulsive thrust and modest power generation (referred to as ”bimodal” operation), a robust, multiple burn, ”power-rich” stage with propulsive Mars capture and reuse capability is possible. A family of modular bimodal NTR (BNTR) vehicles are described which utilize a common ”core” stage powered by three 15 klbf BNTRs that produce 50 kWe of total electrical power for crew life support, an active refrigeration / reliquification system for long term, zero-boiloff liquid hydrogen (LH2) storage, and high data rate communications. An innovative, spine-like ”saddle truss” design connects the core stage and payload element and is open underneath to allow supplemental ”in-line” propellant tanks and contingency crew consumables to be easily jettisoned to improve vehicle performance. A ”modified” DRM using BNTR transfer vehicles requires fewer transportation system elements, reduces IMLEO and mission risk, and simplifies space operations. by taking the next logical step--use of the BNTR for propulsive capture of all payload elements into Mars orbit--the power available

in Mars orbit grows to 150 kWe compared to 30 kWe for the DRM. Propulsive capture also eliminates the complex, higher risk aerobraking and capture maneuver which is replaced by a simpler reentry using a standardized, lower mass ”aerodescent” shell. The attractiveness of the ”all BNTR” option is further increased by the substitution of the lightweight, inflatable ”TransHab” module in place of the heavier, hard-shell hab module. Use of TransHab introduces the potential for propulsive recovery and reuse of the BNTR / Earth return vehicle (ERV). It also allows the crew to travel to and from Mars on the same BNTR transfer vehicle thereby cutting the duration of the ERV mission in half--from approximately 4.7 to 2.5 years. Finally, for difficult Mars options, such as Phobos rendezvous and sample return missions, volume (not mass) constraints limit the performance of the ”all LH2” BNTR stage. The use of ”LOX-augmented” NTR (LANTR) engines, operating at a modest oxygen-to-hydrogen mixture ratio (MR) of 0.5, helps to increase ”bulk” propellant density and total thrust during the TMI burn. On all subsequent burns, the bimodal LANTR engines operate on LH2 only (MR=0) to maximize vehicle performance while staying within the mass limits of two Magnum launches.
Author
Nuclear Propulsion; Mars Missions; In Situ Resource Utilization; High Thrust; Spacecraft Propulsion

13
ASTRODYNAMICS

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

20030012979 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA
Simulator Facility for Attitude Control and Energy Storage of Spacecraft ***Final Report***
Tsiotras, Panagiotis; Oct. 2002; 24p; In English; Original contains color images
Report No.(s): AD-A409057; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report concerns a designed and built experimental facility that will allow the conduction of experiments for validating advanced attitude control algorithms for spacecraft in a weightless environment. The acquired equipment and software will greatly enhance the capabilities of the School of Aerospace Engineering at the Georgia Institute of Technology for spacecraft-related research and education.
DTIC
Aeronautical Engineering; Energy Storage; Spacecraft Control; Attitude Control

20030014076 National Astronomical Observatory, Japan
Two New Technical Indices Synthesize Appraising Property of a Linear Multistep Methods for Orbital Integration
Xu, Ji-Hong, National Astronomical Observatory, Japan; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 34-39; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
In this paper, the varied factors restricting state of a linear multistep integration formula are stated briefly. Put forward two new technical indices synthesize appraising property of a linear multistep methods for orbital integration. For high precision, we suggest constructing and seeking the more suitable linear multistep integrators and corresponding integral way in the earlier stage of the topic.
Author
Decision Theory; Linearity

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).

20030014127 NASA Langley Research Center, Hampton, VA USA
ARIES: NASA Langley’s Airborne Research Facility
Wusk, Michael S., NASA Langley Research Center, USA; [2002]; 11p; In English; AIAA Aircraft Technology Integration and Operations Forum, 1-3 Oct. 2002, Los Angeles, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1994, the NASA Langley Research Center (LaRC) acquired a B-757-200 aircraft to replace the aging B-737 Transport Systems Research Vehicle (TSRV). The TSRV was a modified B-737-100, which served as a trailblazer in the development of glass cockpit technologies and other innovative aeronautical concepts. The mission for the B-757 is to continue the three-decade tradition of civil transport technology research begun by the TSRV. Since its arrival at Langley, this standard 757 aircraft has undergone extensive modifications to transform it into an aeronautical research ”flying laboratory”. With this transformation, the aircraft, which has been designated Airborne Research Integrated Experiments System (ARIES), has become a unique national asset which will continue to benefit the U.S. aviation industry and commercial airline customers for many generations to come. This paper will discuss the evolution of the modifications, detail the current capabilities of the research systems, and provide an overview of the research contributions already achieved.
Author
Research Facilities; Civil Aviation; Commercial Aircraft; Technology Utilization; Systems Integration; Aircraft Industry

20030014180 Shanghai Astronomical Observatory, China
Precise Determination of the Geocentric Coordinates of Two Chinese SLR Mobile Sites
Zhu, Yuan-Lan, Shanghai Astronomical Observatory, China; Feng, Chu-Gang, Shanghai Astronomical Observatory, China; Yang, Fu-Min, Shanghai Astronomical Observatory, China; Guo, Tang-Yong, State Seismological Bureau of China, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 5-11; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Using global SIR data to Lageos1, we have precisely determined the geocentric coordinates of two Chinese mobile SLR sites 7343, 7355 designed by China. The results show that the formal errors of estimated geocentric coordinates of 7343, 7355 sites reach cm magnitude, the maximum differences between solutions from different programs, and final residual rms of 7343, 7355 sites are about 2 cm, which are comparable to those of all the global data.
Author
Geocentric Coordinates; Dimensional Measurement

20030014189 Colorado Univ., Colorado Center for Astrodynamic Research, Boulder, CO USA
Future Advances in Global Gravity Field Modeling *Final Report*
Nerem, R. Steven, Colorado Univ., USA; Leuliette, E. W., Colorado Univ., USA; Born, G., Colorado Univ., USA; Beylkin, G., Colorado Univ., USA; Cramer, R., Colorado Univ., USA; Tapley, B. D., Texas Univ., USA; Dec. 31, 2002; 13p; In English
Contract(s)/Grant(s): NMA201-01-1-2004
Report No.(s): CU-1533716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Colorado Center for Astrodynamics Research has completed an analysis of applications of multiresolution techniques to problems in global gravity field modeling including high-resolution satellite gravity missions. The Gravity Recovery and Climate Experiment (GRACE) will return high-resolution measurements of the Earth’s gravity field for five years. This mission will produce dramatic increases in the accuracy of both the static geoid and monthly observations of the time-varying geoid. The spatial resolution of these measurements suggests that new mathematical techniques may be better suited for geophysical investigations. For certain applications, multiresolution representations of the geoid require much less computation than spherical harmonic analysis. For example, they are especially useful and efficient for preserving the accuracy of local geoid information. We have experimented with multiresolution decompositions of geoid models using B-splines mapped onto 1) a torus and 2) a cube. Multiresolution decompositions of three geoid models have been computed: EGM96, TEG4, GRIM5-C1. We have also investigated the application of a multiwavelet transformation for estimating the gravity field from GRACE observations.
Author
Earth Gravitation; Geoids; Models; Toruses; Cubes (Mathematics); Computation; Wavelet Analysis

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.

20030012727 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Investigation of the Unique Cryogenic Pumping System of the CHAFF-IV spacecraft-Thruster Interaction Facility
Ketsdever, Andrew D.; Young, Marcus P.; Jamison, Andrew; Eccles, Brian; Muntz, E. P.; Jul. 09, 2000; 9p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on

9-14 July 2000. See also ADM001341 for whole conference on cd-rom., The original document contains color images
Report No.(s): AD-A409037; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Chamber -IV of the Collaborative High Altitude Flow Facility was designed to obtain high fidelity spacecraft- thruster interaction data. CHAFF-IV uses a total chamber pumping concept by lining the entire chamber with an array of cryogenically cooled, radial fins. Details of Monte Carlo numerical simulation and experimental investigation of the radial fin target array pumping efficiency are presented.
DTIC
Cryogenics; Aerospace Vehicles; Pumps; Rocket Engines

20030012984 Nagoya Univ., Nagoya Japan
Experimental Study of Structure of Low Density Jet Impinging on Tilt Plate by LIF and PSP
Fujimoto, Tetsuo; Sato, Kimihiko; Naniwa, Shuji; Inoue, Tomoyuki; Nakashima, Kouji; Jul. 09, 2000; 8p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom., The original document contains color images
Report No.(s): AD-A409065; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The structure of low density jets impinging on a tilt plate is studied by hybrid use of LIF and PSP. The jet through an orifice flows into low pressure chamber of 0.12 Torr and impinges on to the tilt plate with angle from jet axis 45 or 60 or 90. A horizontal plane including the jet axis is visualized by LIF of seeded Iodine molecule, scanning a laser beam along the jet axis. On the other hand, the pressure distribution on the tilt plate is visualized by PSP. In comparing the results of the two methods, the shock wave system is analyzed. Deformation of the Mach disk and the barrel shock are confirmed.
DTIC
Attitude Control; Laser Induced Fluorescence; Laser Beams; Paints; Attitude (Inclination); Vacuum Chambers

20030012998 University of Southern California, Dept. of Aerospace and Mechanical Engineering, Los Angeles, CA USA
Maintaining Continuous Low Orbit Flight by Using In-Situ Atmospheric Gases for Propellant
Young, Marcus; Muntz, E. P.; Wang, Joseph; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409086; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An analysis is performed to determine the requirements for spacecraft propulsion systems operating in free-molecule flow and employing ambient atmospheric neutral gas as a propellant. It is concluded that some form of electric propulsion is required and the requirements for an electrostatic thruster system to be applied for this purpose are also discussed. An example thruster system based on an orbitron electrostatic electron trap is evaluated in several modes of operation. The selected configurations are shown to be unable to provide in any obvious way the required ionization fractions. The technological and physical limits that require solutions for this type of device are discussed.
DTIC
Gases; Thrustors; Atmospheric Chemistry; Propulsion System Performance; Propulsion System Configurations

20030013452 NASA Marshall Space Flight Center, Huntsville, AL USA
NASA 2nd Generation RLV Program Introduction, Status and Future Plans
Dumbacher, Dan L., NASA Marshall Space Flight Center, USA; [2002]; 10p; In English; 38th Joint Propulsion Conference, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-4570; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

The Space Launch Initiative (SLI), managed by the Second Generation Reusable Launch Vehicle (2ndGen RLV) Program, was established to examine the possibility of revolutionizing space launch capabilities, define conceptual architectures, and concurrently identify the advanced technologies required to support a next-generation system. Initial Program funds have been allocated to design, evaluate, and formulate realistic plans leading to a 2nd Gen RLV full-scale development (FSD) decision by 2006. Program goals are to reduce both risk and cost for accessing the limitless opportunities afforded outside Earth's atmosphere fo civil, defense, and commercial enterprises. A 2nd Gen RLV architecture includes a reusable Earth-to-orbit launch vehicle, an on-orbit transport and return vehicle, ground and flight operations, mission planning, and both on-orbit and on-the-ground support infrastructures All segments of the architecture must advance in step with development of the RLV if a next-generation system is to be fully operational early next decade. However, experience shows that propulsion is the single largest contributor to unreliability during ascent, requires the largest expenditure of time for maintenance, and takes a long time to develop; therefore,

propulsion is the key to meeting safety, reliability, and cost goals. For these reasons, propulsion is SLI's top technology investment area.
Author
Reusable Launch Vehicles; Spacecraft Launching; NASA Space Programs; Spacecraft Design; Technology Utilization

16
SPACE TRANSPORTATION AND SAFETY

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

20030012582 NASA Johnson Space Center, Houston, TX USA
STS-114 Crew Interview: Stephen Robinson
Jan. 22, 2003; In English; 39 min., 51 sec. playing time, in color, with sound
Report No.(s): JSC-1936D; NONP-NASA-VT-2003013992; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Stephen Robinson, Mission Specialist 2 (MS2), of the STS-114 space mission is seen during a prelaunch interview. He discusses his duties as flight engineer, Extravehicular Activity 2 (EVA 2) spacewalker, and medical officer. Robinson answers questions about his interests in spaceflight and the specific goals of the mission. He identifies this mission as the International Space Station Resupply Mission because supplies and experiments are brought to the International Space Station and Expedition 6 crew of Commander Kenneth Bowersox, and Flight Engineers Donald Pettit and Nikolai Budarin are returning to Earth. Lastly, he talks about the docking of the Space Shuttle Atlantis with the International Space Station. He looks forward to this experience in space.
CASI
International Space Station; Space Transportation System; Spacecraft Maintenance; Atlantis (Orbiter)

20030012583 NASA Johnson Space Center, Houston, TX USA
STS-114 Crew Interview: Soichi Noguchi
Jan. 22, 2003; In English; 32 min., 2 sec. playing time, in color, with sound
Report No.(s): JSC-1936C; NONP-NASA-VT-2003013988; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Soichi Noguchi, Mission Specialist 1 (MS1) representing Japan's National Space Development Agency (NASDA) is seen during a prelaunch interview. He discusses the main goals of this flight which are to take expedition 7 to the International Space Station and bring back expedition 6 to the Earth. He is also responsible for all Extravehicular (EVA) work on this mission. Expedition seven includes: Mission Specialist and Commander Yuri Malenchenko; NASA ISS Science Officer Edward Lu; and Flight Engineer Alexander Kaleri. Expedition Six includes: Commander Kenneth Bowersox; NASA ISS Science Officer Donald Petit; and Flight Engineer Nikolai Budarin. Noguchi explains the Utilization and Logistics Flight 1 (ULF1) Mission which entails the exchange of crewmembers, various supplies and experiments and the replacement of a control component on the International Space Station. This is also will be Soichi Noguchi's first spacewalk.
CASI
Extravehicular Activity; International Space Station; Space Transportation System; NASA Space Programs

20030012592 NASA Johnson Space Center, Houston, TX USA
STS-114 Crew Interview: James M. Kelly, PLT
Jan. 21, 2003; In English; 40 min., 50 sec. playing time, in color, with sound
Report No.(s): JSC-1936B; NONP-NASA-VT-2003013989; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Pilot James M. Kelly, Lieutenant Colonel USAF, is shown during a prelaunch interview. He expresses the major goals of the mission which are to replace the Expedition Six crew of the International Space Station (ISS), install the Raffello Multi-Purpose Logistics Module, deliver the External Stowage Platform to the ISS, and replace the Control Moment Gyroscope (CMG). The major task that he has is to be the backup pilot for Commander Eileen Collins. He talks about the three new research racks brought up to the International Space Station inside the U.S. Destiny Laboratory along with the Window Observational Research Facility (WORF), Human Research Facility 2 (HRF-2), and a Minus Eighty Degree Laboratory Freezer (MELF-1). Kelly also explains

how he uses the ISS' Robotic arm to lift the MPLM out of Atlantis' payload bay and attach it to the Unity node to unload hardware, supplies and maintenance items. This will be his second trip to the International Space Station.
CASI
Space Transportation System; Atlantis (Orbiter); Logistics; Destiny Laboratory Module; Research Facilities

20030012878 NASA Johnson Space Center, Houston, TX USA
STS-107 Flight Day 6 Highlights
Jan. 21, 2003; In English; 22 min., 57 sec. playing time, in color, with sound
Report No.(s): BRF-1437F; NONP-NASA-VT-2003009263; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

This video shows the activities of the STS-107 crew on flight day 6 of the Columbia orbiter's final mission. The crew members include: Rick Husband, Commander; William McCool, Pilot; Kalpana Chawla, David Brown, Michael Anderson, Laurel Clark; Mission Specialists; Ilan Ramon, Payload Specialist. The primary activities of flight day 6 are spaceborne experiments, and a conversation between Israeli Prime Minister Ariel Sharon, accompanied by the Israeli Minister of Education, and Israeli astronaut Ilan Ramon. Both the Israelis and their interpreter are audible on the tape. The video also features a bioreactor used to grow cancer cells in microgravity, and footage taken by the Mediterranean Israeli Dust Experiment (MEIDEX) of sprites, lightning in the lower ionosphere. Mission Specialist Anderson is shown working on the Laminar Soot Processes (LSP-2) experiment. Pilot McCool answers two questions from the public, and a view of Panama is shown.
CASI
Columbia (Orbiter); Spacecrews; Spaceborne Experiments; Israeli Space Program

20030012879 NASA Johnson Space Center, Houston, TX USA
STS-107 Flight Day 13 Highlights
Jan. 28, 2003; In English; 25 min. playing time, in color, with sound
Report No.(s): BRF-1437M; NONP-NASA-VT-2003010584; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

This video shows the activities of the STS-107 crew on flight day 13 of the Columbia orbiter's final mission. The crew members include: Rick Husband, Commander; William McCool, Pilot; Kalpana Chawla, David Brown, Michael Anderson, Laurel Clark, Mission Specialists; Ilan Ramon, Payload Specialist. The primary activities of flight day 13 are spaceborne experiments, including troubleshooting undertaken by Mission Specialist Chawla on the Water Mist Fire Suppression (MIST) experiment. Chawla performs troubleshooting tasks relayed to her by Mission Control. She shows Mission Control the location of air and water in a transparent hose that is part of the atomizer on the exterior of the combustion module. She also changes the atomizer head. All six Space Technology and Research Students (STARS) experiments are profiled in the video. These experiments are on ants, crystal growth in a chemical garden, fish embryos, carpenter bees, spiders, and silkworms. The video also includes a view of the southeast Texas coast near Houston, and a view of Portugal, Spain, Gibraltar, Morocco, and the Sahara Desert. The video ends with an explanation of roses at Mission Control which commemorate astronauts who have died on missions.
CASI
Columbia (Orbiter); Spacecrews; Spaceborne Experiments; Space Maintenance; Fire Extinguishers

20030012923 NASA Johnson Space Center, Houston, TX USA
STS-107 Flight Day 14 Highlights
Jan. 29, 2003; In English; 40 min., 18 sec. playing time, in color, with sound
Report No.(s): BRF-1437N; NONP-NASA-VT-2003013991; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

This video shows the activities of the STS-107 crew on flight day 14 of the Columbia orbiter's final mission. The crew includes Commander Rick Husband, Pilot William McCool, Mission Specialists Kalpana Chawla, David Brown, Michael Anderson, and Laurel Clark, and Payload Specialist Ilan Ramon. Most of the video shows a press conference on board Columbia featuring all seven astronauts. Reporters ask the crew members questions, who reply via a handset. Most of the questions cover life in space and the mission's spaceborne experiments. Each astronaut answers multiple questions, and in response to one of the questions, each of the seven describes an 'O Wow!' moment. The remainder of the video consists of a tour of the orbiter, including the flight deck, mid-deck, and the SpaceHab Research Double Module (RDM) in the payload bay. Mission Specialist Chawla

demonstrates eating at the shuttle's galley, and Commander Husband shows his toiletries. In the RDM, Mission Specialist Clark exercises on a machine for an experiment on respiration.
CASI
Columbia (Orbiter); Spacecrews; Spaceborne Experiments; Manned Space Flight

20030013001 NASA Langley Research Center, Hampton, VA USA
Aeroheating Environments for a Mars Smart Lander
Edquist, Karl T., NASA Langley Research Center, USA; Liechty, Derek S., NASA Langley Research Center, USA; Hollis, Brian R., NASA Langley Research Center, USA; Alter, Stephen J., NASA Langley Research Center, USA; Loomis, Mark P., NASA Ames Research Center, USA; [2002]; 14p; In English; AIAA Atmospheric Flight Mechanics Conference and Exhibit, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-4505; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A proposed Mars Smart Lander is designed to reach the surface via lifting-body atmospheric entry (alpha = 16 deg) to within 10 km of the target site. CFD (computational fluid dynamics) predictions of the forebody aeroheating environments are given for a direct entry from a 2005 launch. The solutions were obtained using an 8-species gas in thermal and chemical nonequilibrium with a radiative-equilibrium wall temperature boundary condition. Select wind tunnel data are presented from tests at NASA Langley Research Center. Turbulence effects are included to account for both smooth body transition and turbulence due to heatshield penetrations. Natural transition is based on a momentum-thickness Reynolds number value of 200. The effects of heatshield penetrations on turbulence are estimated from wind tunnel tests of various cavity sizes and locations. Both natural transition and heatshield penetrations are predicted to cause turbulence prior to the nominal trajectory peak heating time. Laminar and turbulent CFD predictions along the trajectory are used to estimate heat rates and loads. The predicted peak turbulent heat rate of 63 W/sq cm on the heatshield leeward flank is 70% higher than the laminar peak. The maximum integrated heat load for a fully turbulent heat pulse is 38% higher than the laminar load on the heatshield nose. The predicted aeroheating environments with uncertainty factors will be used to design a thermal protection system.
Author
Mars Probes; Aerodynamic Heating; Computational Fluid Dynamics; Turbulence Effects; Atmospheric Entry; Performance Prediction; Aeroshells; Turbulence Models

20030014481 NASA Johnson Space Center, Houston, TX USA
STS-107 Flight Day 15 Highlights
Jan. 30, 2003; In English; 27 min., 35 sec. playing time, in color, with sound
Report No.(s): BRF-1437O; NONP-NASA-VT-2003013986; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

This video shows the activities of the STS-107 crew on flight day 15 of the Columbia orbiter's final mission. The crew includes Commander Rick Husband, Pilot William McCool, Mission Specialists Michael Anderson, David Brown, Laurel Clark, and Kalpana Chawla, and Payload Specialist Ilan Ramon. The primary activities of flight day 15 are crew interviews, and operating the Water Mist Fire Suppression (MIST) experiment. Early in the video, astronauts McCool and Ramon respond together to a question. Much of the video is taken up by an interview of astronauts Brown, Anderson, and McCool. Two parts of the video show the MIST experiment in operation, operated the first time by astronaut Brown. Another part of the video is narrated by Mission Specialist Clark, who identifies views of Mount Vesuvius, and an atoll in the south Pacific. In this part, Payload Specialist Ramon is seen on an exercise machine, Commander Husband shows body fluid samples from the crew taken during the mission, and Clark demonstrates how the crew eats meals. The video ends with footage from earlier in the mission which shows a deployed radiator in the shuttle's payload bay that reflects an image of the Earth.
CASI
Columbia (Orbiter); Spacecrews; Spaceborne Experiments; Fire Extinguishers

20030014487 NASA Johnson Space Center, Houston, TX USA
STS-107 Flight Day 1 Highlights
Jan. 16, 2003; In English; 20 min. playing time, in color, with sound
Report No.(s): BRF-1437A; NONP-NASA-VT-2003009262; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

This video shows the activities of the STS-107 crew on flight day 1 of the Columbia orbiter's final mission. The crew includes Commander Rick Husband, Pilot William McCool, Mission Specialists Michael Anderson, David Brown, Laurel Clark, and Kalpana Chawla, and Payload Specialist Ilan Ramon. The video begins with a view of the space shuttle on its launch pad, while an announcer gives an overview of the mission, including its spaceborne experiments. The announcer then introduces the crew members, listing their previous experience. They are seen seated at a banquet table, and during suit up. The seating of the crew in the orbiter is shown, as are other prelaunch procedures. Dialog from during the launch is audible on the tape, and the video includes views of the ascent from different angles, as well as booster separation. The video ends with a view of Columbia in orbit, showing the Research Double Module (RDM) on the inside of its payload bay.
CASI
Columbia (Orbiter); Spacecrews; Spaceborne Experiments; Liftoff (Launching)

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.

20030012813 Georgia Inst. of Tech., School of Electrical and Computer Engineering, Atlanta, GA USA
Signal Processing Issues in Fourier Transform Spectrometers
Hayes, Monson H., Georgia Inst. of Tech., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 53; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

There are a number of interesting and challenging signal processing problems related to the design of a Fourier Transform Spectrometer (FTS). In this project, we look at a few of these problems in two different types of spectrometers-the Geostationary Imaging Fourier Transform Spectrometer (GIFTS), and a Far Infrared (FIR) FTS. One of the si nal processing challenges in GIFTS is the reduction of the massive data rate (2.4 x 10(exp 9) bps) to an affordable telemetry rate of less than 60 Mbps. Since the GIFTS interferograms are heavily over-sampled, the first step is to decimate (down-sample) the interferograms with minimal distortion while keeping the signal processing algorithms simple enough to be implemented in the GIFTS hardware. Therefore, the first problem we looked at was the design of the decimation filters. Specifically, we performed a detailed analysis of two competing approaches that were being considered. The first, proposed by the Space Dynamics Lab (SDL), was to use a double sideband (real) band-pass filter. The second, proposed by Lincoln Laboratories (LL), was to use a single sideband (complex) band-pass filter. What the study showed was that a complex filter (LL approach) results in a savings of about 25% in the filtering requirements for the long-wave band, while in the mid-wave band the savings are approximately 50%. As a result, the decision was made to use a complex filter. Once the decision to use a complex filter had been made, we looked at some of the consequences of this decision. The most significant of these was the discovery that, with a complex filter, it is possible to extend the long-wave IR band beyond the folding frequency of 1174/cm and recover the SO2 line at 1176.5/cm. What this requires is the design of a band-pass decimation filter with a wider passband, and consequently of higher order. Specifically, it was shown that with about 25% more filter operations, the elusive SO2 line, believed to be irretrievable, could in fact be recovered. While working on the decimation filtering requirements, an issue arose with respect to how the 16-bit long-wave interferogram data should be processed by a 15-bit USES chip. There were two approaches being considered, and each one had at least one serious drawback. Therefore, given the nature of the data that is to be processed by the USES chip, we developed an efficient loss-less encoder that is robust to errors, and is easily decoded. Since the encoder eliminates the drawbacks of the other two approaches, and greatly simplifies the signal processing requirements, the downlink board is currently being redesigned to include this encoder. The last problem that was looked at involved an investigation into the optimum sampling strategy in the design of a far infrared FTS. The problem was to minimize the amount of spectral noise that is induced by non-uniform mirror velocity.
Author
Signal Processing; Fourier Transformation; Spectrometers; Far Infrared Radiation

20030014587 NASA Glenn Research Center, Cleveland, OH USA
Interplay Between Thin Film Ferroelectric Composition, Microstructure and Microwave Phase Shifter Performance
Mueller, Carl H., Analex Corp., USA; VanKeuls, Frederick W., Ohio Aerospace Inst., USA; Romanofsky, Robert R., NASA Glenn Research Center, USA; Alterovitz, Samuel A., NASA Glenn Research Center, USA; Miranda, Felix A., NASA Glenn Research Center, USA; January 2003; 12p; In English; 13th International Symposium on Integrated Ferroelectrics, 28 May - 1 Jun. 2002, Nara, Japan; Sponsored by Ultrasonics, Ferroelectrics and Frequency Control Society, Unknown; Original contains color illustrations

Contract(s)/Grant(s): RTOP 755-08-0B
Report No.(s): NASA/TM-2003-211987; E-13426; NAS 1.15:211987; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

One of the keys to successfully incorporating ferroelectric films into Ku-band (12 to 18 GHz) phase shifters is to establish the composition, microstructure, and thickness required to meet the tuning needs, and tailor the film properties to meet these needs. Optimal performance is obtained when the film composition and device design are such that the device performance is limited by odd mode dielectric losses, and these losses are minimized as much as possible while still maintaining adequate tunability. The parameters required to maintain device performance will vary slightly depending on composition, but we can conclude that the best tuning-to-loss figures of merit (K-factor) are obtained when there is minimal variation between the in-plane and out-of-plane lattice parameters, and the full-width half maximum values of the BSTO (002) peaks are less than approximately 0.04 deg. We have observed that for phase shifters in which the ferroelectric crystalline quality and thickness are almost identical, higher losses are observed in films with higher BaISR ratios. The best performance was observed in phase shifters with Ba:SR = 30:70. The superiority of this composition was attributed to several interacting factors: the B a: SR ratio was such that the Curie temperature (180 K) was far removed from room temperature, the crystalline quality of the film was excellent, and there was virtually no difference between the inplane and out-of-plane lattice parameters of the film.
Author
Ferroelectricity; Microwaves; Adaptive Filters; Thin Films; Microstructure

20030014607 NASA Glenn Research Center, Cleveland, OH USA
Electrical Characterization of Polyaniline/Polyethylene Oxide Nanofibers for Field Effect Transistors
Mueller, Carl H., Analex Corp., USA; Theofylaktos, Noulie, NASA Glenn Research Center, USA; Pinto, Nicholas J., Puerto Rico Univ., Puerto Rico; Robinson, Daryl C., NASA Glenn Research Center, USA; Miranda, Felix A., NASA Glenn Research Center, USA; December 2002; 9p; In English; 2003 Nanotechnology Conference and Trade Show, 23-27 Feb. 2003, San Francisco, CA, USA; Sponsored by Nanoscience and Technology Inst., USA; Original contains color illustrations
Contract(s)/Grant(s): NCC3-963; RTOP 274-00-00
Report No.(s): NASA/TM-2002-212016; E-13707; NAS 1.15:212016; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Nanofibers comprised of polyaniline/polyethylene oxide (PANI/PEO) are being developed for novel logic devices. We report the electrical conductivity of PANI/PEO nanofibers with diameters in the 100 to 200 nm range. We measured conductivity values of approx. 0.3 to 1.0 S/cm, which is higher than the values reported for thicker nanofibers, but less than the bulk value of PANI. The electrical measurements were performed by depositing the fibers on pre-electroded, oxidized silicon (Si) substrates. The excellent adherence of the nanofibers to the SiO2 as well as the gold (Au) electrodes may be useful in the design of future devices.
Author
Polyethylenes; Electrical Measurement; Electrical Resistivity; Field Effect Transistors

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.

20030012912 Lawrence Livermore National Lab., Livermore, CA USA
Results of W-87/Mk21 Deployment Separation Shock Tests
Avalle, C. A.; Apr. 21, 1999; 30p; In English
Report No.(s): DE2002-792423; UCRL-ID-134043; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report summarizes results of the W-87/Mk21 Deployment Separation Shock Tests conducted at the Survivability and Vulnerability Integration Center (SVIC) Hill Air Force Base in Ogden, Utah, from 10/5/98 to 10/8/98. Specific details regarding the test plan and procedures can be found in the Master Test Plan listed in the references.
NTIS
Deployment; Shock Tests; Accelerometers

20030014120 Universitaet der Bundeswehr Muenchen, Neubiberg Germany

A Liquid Nutation Damper for the Satellite EQUATOR-S ***Ein Fluessigkeitsnutationsdaempfer fuer den Satellit EQUATOR-S***

Hausler, Bernd; Eidel, Werner; Jan. 2001; 58p; In German

Report No.(s): AD-A409246; LRT-WE-9-FB-1(2001); No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For the layout of a nutation damper for the EQUATOR-S satellite, a nutation damper with two identically symmetrical liquid dampers was observed. The damper consists of two pipes with a circular diameter. At the satellite's given moments of inertia, as well as at its spin frequency, certain restrictions with regard to the damper's geometry were calculated so that a good nutation damping with booms swinging both inward and outward was ensured. The dampers were constructed along these parameters and tested in an air-set pendulum. The theoretical damping on the pendulum was measured and compared with the experiment, with the results concurring to a great degree.

DTIC

Damping; Nutation Dampers; Artificial Satellites

20030014267 Colorado Univ., CO USA

A Method to Quantify the Thrust Degradation Effects of Structural Wrinkles in Solar Sails

Mikulas, Martin M., Colorado Univ., USA; [2002]; 3p; In English

Contract(s)/Grant(s): NSF EIA-02-20130; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Solar sail designs with concentrated load suspension systems are often prone to the formation of structural wrinkles. It has been hypothesized that these wrinkles will degrade the thrust performance of a sail sufficiently that they should be avoided. The work conducted during the past year concentrated on an analytical method to characterize the thrust degradation effects of structural wrinkles in solar sails. The potential for double-reflection was also evaluated. Many authors have warned that structural wrinkles (caused by concentrated load suspension systems) could degrade a solar sail's reflective performance sufficiently that it is prudent to avoid them. The design alternatives proposed to avoid wrinkles (i.e. catenaries, scalloped sail edges, spinning sails or engineered billows) each have unique advantages and disadvantages such that a compromise exists between mitigating wrinkles to maintain reflective performance and allowing for an otherwise better sail, somewhat mired by wrinkles. Before this research, a simple analytical method to predict the thrust effects of structural wrinkles was not available, thwarting optimal sail design. However, herein is described a novel analysis technique that overcomes the intractability of predicting the thrust effects of wrinkles. A method to characterize sail wrinkles, enabling quantification of their thrust effects, was developed. For the square architecture sail considered in this study, structural wrinkles are predicted to degrade thrust by at most 0.016% at the point of most severe wrinkling. This negligible effect indicates sails without the hindrance of specialized suspension devices (i.e. catenaries and scallops) are feasible.

Author

Degradation; Solar Sails; Wrinkling; Structural Analysis; Thrust Augmentation

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.

20030014592 NASA Glenn Research Center, Cleveland, OH USA

Space Station Power Generation in Support of the Beta Gimbal Anomaly Resolution

Delleur, Ann M., NASA Glenn Research Center, USA; Propp, Timothy W., Boeing Co., USA; January 2003; 16p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 575-15-69

Report No.(s): NASA/TM-2003-212012; NAS 1.15:212012; E-13701; AIAA Paper 2003-0758; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The International Space Station (ISS) is the largest and most complex spacecraft ever assembled and operated in orbit. The first U.S. photovoltaic (PV) module, containing two solar arrays, was launched, installed, and activated in early December 2000.

After the first week of continuously rotating the U.S. solar arrays, engineering personnel in the ISS Mission Evaluation Room (MER) observed higher than expected electrical currents on the drive motor in one of the Beta Gimbal Assemblies (BGA), the mechanism used to maneuver a U.S. solar array. The magnitude of the motor currents continued to increase over time on both BGA's, creating concerns about the ability of the gimbals to continue pointing the solar arrays towards the sun, a function critical for continued assembly of the ISS. A number of engineering disciplines convened in May 2001 to address this on-orbit hardware anomaly. This paper reviews the ISS electrical power system (EPS) analyses performed to develop viable operational workarounds that would minimize BGA use while maintaining sufficient solar array power to continue assembly of the ISS. Additionally, EPS analyses performed in support of on-orbit BGA troubleshooting exercises is reviewed. EPS capability analyses were performed using SPACE, a computer code developed by NASA Glenn Research Center (GRC) for the ISS program office. Author

International Space Station; Solar Arrays; Space Station Power Supplies; Gimbals

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.

20030012818 Pennsylvania State Univ., Dept. of Mechanical and Nuclear Engineering, University Park, PA USA

Static and Dynamic Analysis of Stretched Membrane Lenses for Lightweight Space Solar Arrays

Mockensturm, Eric M., Pennsylvania State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 58; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

NASA and ENTECH, Inc. have been developing space photovoltaic arrays using refractive concentrator technology since 1986. These refractive concentrators use Fresnel lenses in a unique arch shape to minimize the effects of shape errors. In 1994, silicone Fresnel lenses where used in the SCARLET(Registered Trademark) solar array developed by ENTECH and AEC-ABLE. In this array the 200-micron-thick lenses were laminated to 75-micron-thick, thermally shaped, ceria-doped glass arches. These glass arches forced the flexible lenses into the optimal arch shape. The arrays constructed using these lenses achieved over 200 W/sq m areal power and 45 W/kg specific power and are currently powering both the spacecraft and the ion engine on the NASA/JPL Deep Space One probe. to further reduce weight and increase areal and specific power, the next generation of solar concentrator arrays will eliminate the glass arch and lens frame. The flexible lenses will be stretched as membranes between optimally shaped, supporting end arches. This patented stretched lens array will also use redesigned composite radiator sheets to reduce the weight of the SCARLET panels by a factor of four. In addition, by eliminating optical losses caused by the glass arches and lens frames, the SLA performance is higher than SCARLET. The SLA is the first solar array panel of any kind to simultaneously achieve over 300 W/sq m areal power and 300 W/kg specific power. While the optical properties of the stretched lenses are excellent, they must be analyzed structurally to ensure that they perform at their optimal levels. Lens parameters such as backing thickness, lens tension, and effective length can be altered to change the structural response of the lens without affecting the optical performance. In particular, the lenses must be designed to maintain the arch shape specified by the end support along the entire length. Because the lenses are flat in their natural state, they resist being bent into the desired arched shape and noticeable flattening can occur away from the end supports. While the optical shape intolerance designed into the lenses prevents this flattening from greatly affecting performance, flattening does reduce efficiency and should be minimized. In addition to characterizing the static shape of the stretched lenses, it is also important to prevent dynamic deformations of the lenses which can also degrade optical performance. Thus, it is important to understand the dynamic response of these lenses so they can be designed to minimize vibration. In this study, flat plate theory is used to characterize the static flattening of the lenses. Analytical solutions are obtained to determine the effect of backing thickness, strain, and effective length on the shape of the lenses away from the supports. Cylindrical shell theory is then used to determine the natural frequencies and mode shapes of the lenses in various configurations.

Author

Solar Arrays; Membranes; Lenses; Dynamic Response; Photovoltaic Cells; Refractivity

20030012939 Swales and Associates, Beltsville, MD USA

Development of a Novel Free Molecule Rocket Plume Model

Woronowicz, Michael; Jul. 09, 2000; 9p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD)

22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on CD-ROM. The original document contains color images
Report No.(s): AD-A409197; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes development of a set of analytic point source transient free molecule equations generated to model behavior ranging from molecular effusion to rocket plumes. A brief review of model performance for step function mass expulsion will be followed by presentation of physical extensions to include the effects of an ellipsoidal molecular distribution to account for certain types of thermal nonequilibrium and response to sources described by pulse as well as step function behavior.
DTIC
Rocket Exhaust; Exhaust Gases

20030014646 NASA Glenn Research Center, Cleveland, OH USA
The Revamping of an Ignition Test Facility
Kearns, Kimberly A., NASA Glenn Research Center, USA; December 2002; 15p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-48-04
Report No.(s): NASA/TM-2002-212095; E-13747; NAS 1.15:212095; AIAA Paper 2003-7362; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The revamping of an Ignition Test Facility, located in the Research Combustion Laboratory at the NASA Glenn Research Center, is presented. The history of how the test cell has adapted efficiently to a variety of test programs is discussed. The addition of a second test stand for ignition and small-scale rocket testing is detailed. An overview of the facility and the current test programs is offered. Planned upgrades for the future are outlined.
Author
Test Facilities; Test Stands; Ignition

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.

20030012567 Lawrence Livermore National Lab., Livermore, CA USA
Improved Reflectance and Stability of Mo/Si Multilayers
Bajt, S.; Alameda, J.; Barbgee, T.; Clift, M.; Folta, J. A.; Oct. 22, 2001; 18p; In English
Report No.(s): DE2002-802924; UCRL-JC-145925; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Commercial EUV lithographic systems require multilayers with higher reflectance and better stability then that published to date. Interface-engineered MoISi multilayers with 70% reflectance at 13.5 nm wavelength (peak width of 0.545 nm) and 71% at 12.7 nm wavelength (peak width of 0.49 nm) were developed. These results were achieved with 50 bilayers. These new multilayers consist of Mo and Si layers separated by thin boron carbide layers. Depositing boron carbide on interfaces leads to reduction in silicide formation on the Mo-on-Si interfaces. Bilayer contraction is reduced by 30% implying that there is less intermixing of Mo and Si to form silicide. As a result the Mo-on-Si interfaces are sharper in interface-engineered multilayers than in standard Mo/Si multilayers. The optimum boron carbide thicknesses have been determined and appear to be different for Mo-on-Si and Si-on-Mo interfaces. The best results were obtained with 0.4 nm thick boron carbide layer on the Mo-on-Si interface and 0.25 nm thick boron carbide layer on the Si-on-Mo interface. Increase in reflectance is consistent with multilayers with sharper and smoother interfaces.
NTIS
Laminates; Reflectance; Lithography

20030012718 Planar Systems, Inc., Beaverton, OR USA

Development of a Manufacturable Blue Electroluminescent (EL) Phosphor Process for the Production of White Monochrome Thin Film Electroluminescent (TFEL) and Full Color Active Matrix Electroluminescent (AMEL) Displays ***Final Report, Apr. 2000-Apr 2002***

Sun, Sey-Shing; Nov. 2002; 24p; In English; Original contains color images

Contract(s)/Grant(s): DAAD16-00-C-9235

Report No.(s): AD-A408952; NATICK-TR-03/004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the effort for scaling up and integrating the strontium sulfide doped with copper (SRS:Cu) vapor deposition process developed at Georgia Tech Research Institute (GTRI) for the manufacturing of color active matrix electroluminescent (AMEL) displays at Planar Systems. The development consisted of three major tasks: 1) investigate processing issues such as substrate type/morphology and sulfur annealing and their effect on the reliability and luminance performance of SRS:Cu blue phosphor. 2) install a new process infrastructure to perform post deposition processes, e.g., photolithography and etching of 1.4 inch-square substrates for the fabrication of AMEL displays, 3) investigate and identify tools for manufacturing SRS:Cu-based full color AMEL with high yield. Each of these tasks will be described with details in this report. Several SRS:Cu- based white monochrome AMEL displays were produced at the end of this program and they exhibited a factor of six increase in blue luminance (through color filter) over strontium sulfide doped with cerium (SRS:Ce) -based white monochrome displays current production. All these efforts form the basis for producing cost effective and high performance full color AMEL displays for military and civilian applications.

DTIC

Electroluminescence; Manufacturing; Military Technology; Thin Films; Phosphors; Fabrication; Doped Crystals

20030012779 Academy of Sciences of the Ukraine, Frantzevich Inst. for Problems in Materials Science, Ukraine

Materials and Coatings for Extreme Performances: Investigations, Applications, Ecologically Safe Technologies for Their Production and Utilization

Sep. 2002; 675p; In English

Contract(s)/Grant(s): F61775-02-WF038

Report No.(s): AD-A409046; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The Final Proceedings for Materials and Coatings for Extreme Performances: Investigations, Applications, Ecologically Safe Technologies for Their Production and Utilization, 16 September 2002 - 20 September 2002 Principles of designing materials and coatings for operation in extreme conditions; scientific fundamentals and computer models for processing materials and coatings for operation in extreme conditions; advanced technologies for production and joining materials and products for operation in extreme conditions; structure and properties of materials and coatings for operation in extreme conditions; experimental data obtained from performance of materials and coatings in extreme conditions; and, potential technologies for recycling industrial waste aimed to production of structural, heat-insulation, facing and other materials.

DTIC

Coatings; Performance Prediction; Ecology; Safety; Recycling

20030012893 Tetra Tech, Inc., Owings Mills, MD USA

Field Sampling Plan for the National Study of Chemical Residues in Lake Fish Tissue

Sep. 2002; 42p; In English

Report No.(s): PB2003-101934; EPA/823/R-02/004; No Copyright; Avail: National Technical Information Service (NTIS)

The National Fish Tissue Study broadens the scope of the 1987 study (USEPA 1992) which focused on chemical residues in fish tissue near point source discharges. This new study will: provide information on the national distribution of selected persistent, bioaccumulative, and toxic (PBT) chemical residues in game fish and bottom dwelling fish in lakes and reservoirs of the coterminous USA (excluding the Great Lakes and the Great Salt Lake); include lakes and reservoirs selected according to a probability design; involve the collection of fish from those randomly selected lakes and reservoirs over a four-year survey period (1999-2002); not be used to set fish consumption advisories; however, states and Native American tribes may choose to initiate a detailed fish study in a particular lake based on the screening contaminant concentrations provided by the National Fish Tissue Study, and include the analysis of fish tissue for PBT chemicals selected from USEPA's multimedia candidate PBT list of 451 chemicals and from a list of 130 chemicals from several contemporary fish and bioaccumulation studies. A final target analyte list of 274 PBT chemicals (including breakdown products and PCB congeners) was compiled based on input from study design workshop participants and a review team of analytical experts convened in October 1998 and March 1999, respectively.

NTIS

Pesticides; Water Pollution; Fishes; Sampling; Residues; Contaminants; Lakes; Tissues (Biology); Investigation

20030014322 Lawrence Livermore National Lab., Livermore, CA USA
UV-Shifted Durable Silver Coating for Astronomical Mirrors
Thomas, N.; Wolfe, J.; Jun. 01, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792715; UCRL-JC-136508; No Copyright; Avail: National Technical Information Service (NTIS)
Silver has the highest reflectance of all of the metals, but it tarnishes in the presence of sulfides, chlorides, and oxides in the atmosphere. Also, the silver reflectance is very low at wavelengths below 400 nm making aluminum more desirable mirror coating for the UV region. This UV-shifted durable coating provides a valuable alternative to the aluminum coating for telescope mirror coatings where high throughput and durability are important considerations.
NTIS
Silver; Mirrors; Telescopes; Protective Coatings

20030014488 NASA Ames Research Center, Moffett Field, CA USA
Oxidation Behavior of HfB2-SiC Materials in Dissociated Environments
Ellerby, Don, NASA Ames Research Center, USA; Irby, Edward, NASA Ames Research Center, USA; Johnson, Sylvia M., NASA Ames Research Center, USA; Beckman, Sarah, Eloret Corp., USA; Gusman, Michael, Eloret Corp., USA; Gasch, Matthew, Eloret Corp., USA; Nov. 20, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr. 2003, Nashville, TN, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Hafnium diboride based materials have shown promise for use in extremely high temperature applications, such as sharp leading edges on future reentry vehicles. During reentry, the oxygen and nitrogen in the atmosphere are dissociated by the shock layer ahead of the sharp leading edge such that surface reactions are determined by reactions of monatomic oxygen and nitrogen rather than O2, and N2. Simulation of the reentry environment on the ground requires the use of arc jet (plasma jet) facilities that provide monatomic species and are the closest approximation to actual flight conditions. Simple static or flowing oxidation studies under ambient pressures and atmospheres are not adequate to develop an understanding of a materials behavior in flight. Arc jet testing is required to provide the appropriate stagnation pressures, heat fluxes, enthalpies, heat loads and atmospheres encountered during flight. This work looks at the response of HfB2/SiC materials exposed to various simulated reentry environments.
Author
Hafnium Compounds; Borides; Oxidation; Reentry Shielding

24
COMPOSITE MATERIALS

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

20030012578 NASA Langley Research Center, Hampton, VA USA
Size Effects in Impact Damage of Composite Sandwich Panels
Dobyns, Alan, Sikorsky Aircraft, USA; Jackson, Wade, NASA Langley Research Center, USA; [2003]; 10p; In English; American Helicopter Society 58th Annual Forum, 11-13 Jun. 2002, Montreal, Quebec, Canada; Sponsored by American Helicopter Society, Inc., USA
Contract(s)/Grant(s): NCC2-9019; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Panel size has a large effect on the impact response and resultant damage level of honeycomb sandwich panels. It has been observed during impact testing that panels of the same design but different panel sizes will show large differences in damage when impacted with the same impact energy. to study this effect, a test program was conducted with instrumented impact testing of three different sizes of sandwich panels to obtain data on panel response and residual damage. In concert with the test program. a closed form analysis method was developed that incorporates the effects of damage on the impact response. This analysis method will predict both the impact response and the residual damage of a simply-supported sandwich panel impacted at any position on the panel. The damage is incorporated by the use of an experimental load-indentation curve obtained for the face-sheet/honeycomb and indentor combination under study. This curve inherently includes the damage response and can be obtained quasi-statically from a rigidly-backed specimen or a specimen with any support conditions. Good correlation has been obtained between the test data and the analysis results for the maximum force and residual indentation. The predictions can be improved by using a dynamic indentation curve. Analyses have also been done using the MSC/DYTRAN finite element code.
Author
Composite Structures; Impact Damage; Impact Tests; Panels; Size (Dimensions); Sandwich Structures

20030012605 NASA Langley Research Center, Hampton, VA USA

VARTM Process Modeling of Aerospace Composite Structures

Song, Xiao-Lan, Virginia Polytechnic Inst. and State Univ., USA; Grimsley, Brian W., NASA Langley Research Center, USA; Hubert, Pascal, McGill Univ., Canada; Cano, Roberto J., NASA Langley Research Center, USA; Loos, Alfred C., Virginia Polytechnic Inst. and State Univ., USA; [2003]; 10p; In English; American Society for Composites 17th Technical Conference, 21-23 Oct. 2002, West Lafayette, IN, USA; Sponsored by American Society for Composites, USA

Report No.(s): Paper-123; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A three-dimensional model was developed to simulate the VARTM composite manufacturing process. The model considers the two important mechanisms that occur during the process: resin flow, and compaction and relaxation of the preform. The model was used to simulate infiltration of a carbon preform with an epoxy resin by the VARTM process. The model predicted flow patterns and preform thickness changes agreed qualitatively with the measured values. However, the predicted total infiltration times were much longer than measured most likely due to the inaccurate preform permeability values used in the simulation. Author

Composite Structures; Manufacturing; Three Dimensional Models; Computerized Simulation; Resin Transfer Molding; Void Ratio; Vacuum Systems; Aerospace Engineering

20030012819 New Mexico State Univ., Dept. of Chemical Engineering, Las Cruces, NM USA

Characterization of Semi-Crystalline Polyimide/Organosilicate Nanocomposites

Munson-McGee, Stuart H., New Mexico State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 59; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

As part of a program to develop materials with enhanced mechanical and barrier properties for potential use in the fabrication of cryogenic fuel tanks and solar sails, nanocomposi tes prepared from a semi-crystalline polyimide (LaRC(Trademark) CPI) and organosilicates were investigated. The organosilicates evaluated in this work were montmorrillonite clay treated with various organic salts to aid in its exfoliation in the polyimide. The polymer was prepared in the presence of the organosilicate for form an initial poly(amide acid)/organosilicate hybrid solution which was subsequently used to cast thin films that were imidized thermally in flowing air. The cured films were characterized for the effect of clay loading on the thermal and mechanical properties and completeness of exfoliation in the polymer matrix. In general, the films appeared transparent; however, incomplete exfoliation was apparent as determined by X-ray diffraction spectra. Increases in tensile modulus were obtained along with decrease in strength and elongation. The mechanical and thermal properties and clay exfoliation of these materials will be discussed. Author

Cryogenic Fluid Storage; Polyimides; Thermodynamic Properties; X Ray Diffraction; Crystallinity

20030012840 Arizona State Univ., Dept. of Civil and Environmental Engineering, Tempe, AZ USA

Thermal/Mechanical Response and Damage Growth in Polymeric Matrix Composites at Cryogenic Temperatures

Zhu, Han, Arizona State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 80; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The next generation of space transportation systems may require both reusable launch vehicles (RLVs) and expendable launch vehicles (ELVs) to satisfy mission requirements. Regardless of the vehicle type, these new space transportation vehicles will require advances in lightweight structural materials and design to meet the increased demands on performance. One potential source for significant structura1 weight reduction is the replacement of traditional metallic cryogenic fuel tanks with new designs for polymeric matrix composite (PMC) tanks. The research is undertaken to help understand this problem of damage development in cryogenic environments and relate this data to material permeability. Specifically, the experimental results provide data on the residual mechanical properties and damage state of a high-performance PMC tested at cryogenic temperatures and pre-conditioned using combinations of mechanical and thermal loading. This data was then used as both input to and verification of a thermal/mechanical analysis of composite laminates for a range of loading conditions and laminate configurations. The study presented here then aims to correlate changes in material properties with the development of microcracks in a PMC material subjected to an extreme environment. Materials characterization and the development of data that leads to an understanding of the damage mechanisms of PMC's at cryogenic temperatures requires the appropriate test methods suitable for extreme environments. One method, for example, is to load coupons in tension while undergoing a temperature change from room temperature to -269 C. The test program evaluated residual stiffness and strength properties as a function of both cryogenic test temperatures and pre-test cryogenic aging conditions and damage, as measured by microcrack density, was quantified at each stage of the test program. The test specimens were made of a carbon fiber polymeric matrix composite, IM7/PETI-5, and five

different specimen ply lay-ups were chosen for study. It was recognized that a broad spectrum of factors influence the development of damage in PMC's including material selection, composite fabrication and handling, aging or preconditioning, specimen preparation, laminate layup, test procedures, etc. This study will focus on preconditioning methods and laminate configuration as the primary test variables. Coupon specimens are isothermally aged first and then received the mechanical load till they fail. Matrix cracks are optically observed in those coupons, and the crack density is evaluated by counting crack numbers over per inch length. The information of crack density will provide the understanding and quantification of how the temperature and mechanical load may change the performance of composites iq a cryogenic environment.
Author
Polymer Matrix Composites; Cryogenic Temperature; Mechanical Properties; Reusable Launch Vehicles; Space Transportation; Isothermal Processes

20030012999 NASA Langley Research Center, Hampton, VA USA
Structural Efficiency of Stitched Composite Panels with Stiffener Crippling
Jegley, Dawn C., NASA Langley Research Center, USA; [2002]; 12p; In English; 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 22-25 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-1728; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

The structural efficiency of blade-stiffened stitched specimens is compared to determine their weight saving potential if blades were allowed to buckle at less than or equal to design ultimate load. Analytical and experimental results from four configurations of crippling specimens are presented. Specimen skin and blades were held together with through-the-thickness stitches prior to curing. No mechanical fasteners were used for the assembly. Tests were conducted with and without low-speed impact damage. Failure modes are discussed. Finite element and experimental results agree for the response of the structures. For some specimen configurations, improved structural efficiency can be obtained by allowing stiffeners to buckle at design limit load rather than requiring that buckling not occur prior to design ultimate load. A parametric study is presented herein which describes the possible weight savings with this approach.
Author
Airfoils; Composite Structures; Buckling; Loads (Forces); Failure Modes; Failure Analysis; Weight Reduction; Structural Design; Wing Panels

20030013000 NASA Langley Research Center, Hampton, VA USA
Application of Interface Technology in Progressive Failure Analysis of Composite Panels
Sleight, D. W., NASA Langley Research Center, USA; Lotts, C. G., NASA Langley Research Center, USA; [2002]; 11p; In English; 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 22-25 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-1743; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A progressive failure analysis capability using interface technology is presented. The capability has been implemented in the COMET-AR finite element analysis code developed at the NASA Langley Research Center and is demonstrated on composite panels. The composite panels are analyzed for damage initiation and propagation from initial loading to final failure using a progressive failure analysis capability that includes both geometric and material nonlinearities. Progressive failure analyses are performed on conventional models and interface technology models of the composite panels. Analytical results and the computational effort of the analyses are compared for the conventional models and interface technology models. The analytical results predicted with the interface technology models are in good correlation with the analytical results using the conventional models, while significantly reducing the computational effort.
Author
Wing Panels; Composite Structures; Failure Analysis; Finite Element Method; Crack Initiation; Structural Analysis; Mathematical Models

20030014014 Universitaet der Bundeswehr Muenchen, Fakultaet fuer Luft- und Raumfahrttechnik, Neubiberg Germany
Crack Progress in Carbon Fibre Reinforced Carbon ***Rissfortschritt in kohlenstoffaserverstaerktem Kohlenstoff***
Weber, Thorsten; Jan. 2001; 153p; In German
Report No.(s): AD-A409257; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The subject of this work is the examination of the crack propagation of carbon-fiber-reinforced carbon. CFRC, which principally is not a fiber-reinforced ceramic, although it is often deemed so due to its brittle behavior. The study first notes the current state of research on the matter, poses its problem, and then begins to describe the experiments undertaken. The questions ultimately discussed are: the behavior of CFRC based on the production-conditioned matrix contraction strain; the behavior of CFRC in consideration to a power train in interface through rubbing; the behavior of CFRC in consideration to a spongiosis of the matrix after the additional warming above 1000 degrees centigrade.
DTIC
Crack Propagation; Carbon-Carbon Composites; Carbon Fibers; Ceramics; Mechanical Properties

20030014102 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
Damage Mechanisms and Crack Growth in a Particulate Composite Material
Liu, C. T.; Ho, H.; May 19, 1998; 4p; In English
Contract(s)/Grant(s): AF Proj. 1011
Report No.(s): AD-A409285; AFRL-PR-ED-T-P-1998-085; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
In recent years, fibrous composite materials have been widely used in aerospace and automobile industries due to their high modulus and strength to weight ratio. Particulate composites, though not as effective as the continuous fibrous composites in improving modulus and strength of the matrix materials, are also widely used in construction and commodity industries for their improved performance over the matrix material in, for example, thermal and electrical conductivities, friction and wear resistance, machinability, surface hardness, and cost effective. However, much of the studies about the particle reinforced polymeric composites are on the derivation of the effective elastic properties and the development of the constitutive models of the materials. In recent years, a considerable amount of work has been done in studying the crack growth behavior in highly filled polymeric materials. These materials consist of hard particles contained in a soft elastomeric binder. Experimental results indicate that power law relationships exist between the crack growth rate and the Mode I stress intensity factor which are consistent with the theories developed by Knauss and Schapery in their study of crack growth in viscoelastic materials.
DTIC
Composite Materials; Crack Propagation; Particulates; Stress Intensity Factors

20030014142 Department of the Navy, Washington, DC USA
Ceramic Composite
Li, Chou H., Inventor; Feb. 23, 1999; 27p; In English; Supersedes PAT-APPL-301 582
Patent Info.: Filed 7 Sep. 1994, patented 23 Feb. 1999; US-Patent-Appl-SN-301582
Report No.(s): AD-D020045; PATENT-5 874 175; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A method of coating a substrate with particles of a ceramic selected from the group consisting of diamond, carbon, graphite, and graphite or carbon-carbon composite comprising: providing the substrate and at least one of the ceramic particles: selecting at least a carbide forming substance consisting principally of an element which is other than Ni, Cr, and Co and is capable of forming a carbide to provide a coating material: applying said coating material onto at least one component of the substrate and at least one ceramic particle: placing the at least one ceramic particle on the substrate: and heating the product of step (D) at a temperature sufficient to form a liquid-diffusion formed carbide coating on the at least one - ceramic particle. The ceramic particles are then coated with strong, adherent, microscopically substantially defect-free and thermomechanically shock resistant metallized layers which are capable of practical uses over 630 deg C.
DTIC
Carbon-Carbon Composites; Thermodynamics; Ceramic Coatings; Methodology

20030014160 Northwestern Univ., Dept. of Chemistry, Evanston, IL USA
Nanostructured Materials for 3-D Powerstructures ***Final Report, 1 Dec. 1998-30 Sep. 2001***
Mirkin, Chad A.; Nguyen, SonBinh T.; Nov. 13, 2002; 11p; In English
Contract(s)/Grant(s): F49620-99-1-0071; AF Proj. 2303
Report No.(s): AD-A409244; AFRL-SR-AR-TR-02-0409; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have been able to make the necessary compounds and nanoparticles in the synthetic portion of the proposal. We were able, for the first time, to successfully link DNA to organic polymers and study their interaction. Further, we have been able to manipulate the resulting structures to incorporate gold nanoparticles. We are in the process of applying these building blocks to build up a 3-D structure using DNA-recognition and DPN-based patterning.
DTIC
Composite Materials; Nanostructure (Characteristics)

20030014611 NASA Ames Research Center, Moffett Field, CA USA

HfB2-SiC Materials for Sharp Leading Edges

Johnson, Sylvia M., NASA Ames Research Center, USA; Ellerby, Don, NASA Ames Research Center, USA; Irby, Edward, NASA Ames Research Center, USA; Beckman, Sarah, Eloret Corp., USA; Gusman, Michael, Eloret Corp., USA; Gasch, Matthew, Eloret Corp., USA; Nov. 02, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr.2003, Nashville, TN, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Future reentry vehicles will need better maneuverability to improve safety and performance. Vehicles with sharp leading edges, as opposed to the blunt nose and leading edges on the current space shuttle, can provide improved lift-to-drag and thus improved maneuverability. Materials capable of operating at temperatures in excess of 2000 C are required. Ultrahigh temperature ceramics (UHTCs) are one class of material being investigated for this application. These materials are diborides of hafnium or zirconium with a second phase of sic. The benefits of using these materials will be discussed as developments in the processing of HfB2/SiC.

Author

Sharp Leading Edges; Hafnium; Borides; Silicon Carbides; Ceramics; Reentry Vehicles

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.

20030012569 Lawrence Livermore National Lab., Livermore, CA USA

Dimensional Stability and Microstructure Evolution in Irradiated Systems with Complex Kinetics

Diaz de la Rubia, T.; Caturla, M. J.; Fluss, M. J.; Oct. 11, 1999; 16p; In English

Report No.(s): DE2002-793932; UCRL-ID-136235; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A material undergoing irradiation with energetic particles (e.g. neutrons, ions, or alpha-decay processes) evolves in time. This evolution is a result of the interaction among the produced defects and the pre-existing microstructure, and is a complex function of irradiation temperature, dose (time), and dose rate (flux). The multiple microstructural features that develop such as self-interstitial (I) and vacancy loops, He- vacancy (HeV) complexes (voids, bubbles, etc.), and other defect clusters each follow their own complex kinetics. It is therefore interesting to investigate whether scaling laws may be formulated that relate the rate of damage accumulation to the irradiation temperature and flux. Is a particular feature of the microstructural state reached after a certain dose independent of dose rate, and if not, what are the scaling laws that allow comparisons to be made of experiments under different kinetic conditions.

NTIS

Microstructure; Kinetics; Stability

20030012571 Lawrence Livermore National Lab., Livermore, CA USA

Desorption Kinetics of H(2)O from Cab-O-Sil-M-7D and Hi-Sil-233 Silica Particles

Dinh, L. N.; Balooch, M.; LeMay, J. D.; Jan. 26, 2000; 36p; In English

Report No.(s): DE2002-792441; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The M97 series silicone is composed of polysiloxane gumstock (67.6 wt. %), fumed silica filler Cab-O-Sil M-7D (21.6 wt. %), precipitated silica filler Hi-Sil 233 (4 wt. %), and processing aid, chemically an ethoxy endblocked polysiloxane (6.8 wt. %). Silica occupies (25.6 wt. %) in these silicones, and silica surfaces are well known to have a good affinity for water adsorption. Absorbed water may play an important role on the bonding between SiO2 particles and the silicone matrix. The outgassing of water may change the nature of the silica/silicone bonding, even possibly the mechanical behavior of the materials. It may also present a compatibility issue in scaled systems containing M97 type silicones.

NTIS

Desorption; Kinetics; Silicon Dioxide; Hydrogen

20030012572 Pacific Northwest National Lab., Richland, WA USA
SX Solver: A Computer Program for Analyzing Solvent-Extraction Equilibria, 3.0
Lumetta, G. J.; Jan. 2002; 26p; In English
Report No.(s): DE2002-15001169; PNNL-13760; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Equilibria phenomena are of central importance to solvent-extraction science. Such phenomena have been investigated for many decades. Two primary methods are employed in studying solvent-extraction equilibria-graphical methods (slope analysis) and numerical methods (computer modeling). Despite the widespread availability of computers, graphical methods are still extensively used. A few years ago, we introduced a Visual Basic Application for Microsoft Excel (registered) designed for analyzing solvent-extraction equilibria. This program was named the SX Solver. The SX Solver program takes advantage of the graphical user-interface of Excel(registered), so it is designed to be user-friendly. However, the initial version of the SX Solver had several limitations. The program has been upgraded to overcome many of these. The latest version contains the following enhancements: Activity coefficients for mixed electrolyte systems can be calculated; the coextraction of acid with the metal ion can be included in the model; aqueous-phase metal complexation can be incorporated into the model; and in addition, minor enhancements to the user interface have been introduced.
NTIS
Solvent Extraction; Computer Programs

20030012613 North Dakota Univ., Energy and Environmental Research Center, Grand Forks, ND USA
Subtask 6.4-Improved Corrosion Resistance for Alumina Refractory ***Final Report, 15 Apr. 1998 - 30 Apr. 1999***
Hurley, J. P.; Kleven, P. L.; Apr. 1999; 16p; In English
Report No.(s): DE2002-778409; REPT-99-EERC-04-08; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to increase the efficiency of advanced coal-fired power systems, higher working fluid temperatures must be reached. Some system surfaces will have to be protected by covering them with corrosion-resistant refractories. Corrosion is the degradation of the material surfaces or grain boundaries by chemical reactions with melts, liquids, or gases causing loss of material and, consequently, a decrease in the strength of the structure. In order to develop methods of reducing corrosion, the microstructure that is attacked must be identified along with the mechanism and rates of attack. Earlier tests with several commercially available high-temperature castable refractories showed that the fused-alumina aggregate grains within the materials had the highest corrosion resistance of any of the castable materials. However, the cement holding the grains was easily attacked. Therefore, to improve the corrosion resistance and thermomechanical properties of alumina-based refractories, we attempted to change the cement to a more corrosion- and erosion-resistant bonding material through the addition of rare-earth oxides (REO).
NTIS
Corrosion Resistance; Refractories; Aluminum Oxides

20030012778 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Special Features of Using N2O For Heating of The Test Gas in A Hot-Shot Wind Tunnel
Yarozlavtsev, M. I.; Jul. 2002; 5p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409183; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The study of heat and mass supply in gas-dynamics models with combustion involves the necessity of modeling not only aerodynamic criteria of similarity (M, Re, St, etc.) but also natural values of stagnation pressures and temperatures, since the conditions of self-ignition of the fuel, heat release in time and space, and chemical reaction rate depend significantly on P(sub 0) and T(sub 0). These or similar conditions can be obtained in short-duration facilities, in particular, hot-shot wind tunnels.
DTIC
Combustion; Nitrous Oxides; Wind Tunnels; Gas Dynamics

20030012786 Engineering Research and Consulting, Inc., Edwards AFB, CA USA
Singlet Delta Oxygen Production from a Gas-Solid Reaction
Alfano, Angelo J.; Christe, Karl O.; Feb. 14, 2002; 14p; In English; Prepared in cooperation with Loker Hydrocarbon Research Institute, University of Southern California, Los Angeles, CA
Contract(s)/Grant(s): F04611-99-C-0025; AF Proj. DARP
Report No.(s): AD-A408972; AFRL-PR-ED-TP-2002-029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spontaneous reactions between solid alkali metal or alkaline earth peroxides and hydrogen (deuterium) halide gases demonstrate the efficient production of singlet delta oxygen in a non-liquid medium. These reactions occur under ambient

conditions without the need for any external energy source. The production of singlet delta oxygen was verified by direct emission spectroscopy at 1.27 microns with a calibrated optical multi-channel analyzer. These reactions overcome the severe quenching problems encountered in liquid-phase reactions and the dangers involved in the use of potentially hazardous starting materials, such as basic hydrogen peroxide.
DTIC
Alkali Metals; Gas-Solid Interactions; Halides; Oxygen Production; Chemical Reactions

20030012823 Pennsylvania State Univ., Dept. of Chemistry, Sharon, PA USA
On-Line Real-Time X-Ray Fluorescence Oil-Monitoring
Pollock, Ronald J., Pennsylvania State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 63; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

X-ray fluorescence, XRF, can determine the presence and quantity of all metals except lithium and beryllium under normal conditions. XRF equipment is continuously being reduced in size and is becoming available in smaller units. The miniaturization and feasibility of this method to continuously test for oil condition, contamination, and engine wear is the purpose of the ASEE 2001 Summer Project. XRF testing is particularly promising because it not only monitors the lubricant, but more importantly it can determine the wear of equipment. The specific location of engine wear can be ascertained by correlating the XRF-identified metals with the composition of engine parts. This will save unnecessary costly repairs and valuable downtime. Testing time is in seconds, and the response to problems is rapid. Early detection can prevent major system failure and costly accidents. Continuous monitoring establishes engine history, trends, and personality of the engine. This is an ideal means for providing additional Black Box information for in-flight recordings. Developing miniaturized XRF equipment also can be used in NASA's space mission for exploration in our solar system. There are several problems that must be resolved before XRF monitoring can be used for military and commercial aeronautics. These are the problems investigated in the ASEE 2001 Summer Program. Presently, a radioactive source is used to produce X-rays. This poses problems with regulatory licensing, with public sentiment, with safety, and with accidents. An effective long-life, miniaturized, non-radioactive x-ray source must be developed. Computer analysis of detected metals and other contaminates in the lubricant must be correlated with a catalog of parts and materials present in the engine. This is needed before interpreting the information and suggesting a correction. The x-ray source, the detector, the energy dispersive multi-channel analyzer, and the software for collecting data and interpreting results must be optimized as a complete unit. The capabilities of this combination are not fully developed, and were the subject of our investigation this summer. This unit can possible be used to determine the particles present by the scattering of x-rays. This can be accomplished because the shorter wavelengths of x-rays are scattered more than the longer wavelengths of laser light, producing a means for determining the number and size of particles in the lubricant. The placement of the XRF monitor and proper in-line sampling design is important to optimize the monitoring. XRF monitoring is versatile, gives insight to the engine itself, has a greater range of analysis than is presently available, and is a promising means for guaranteeing safer and less costly air travel.
Author
X Ray Fluorescence; On-Line Systems; Real Time Operation; Oils; Monitors

20030012880 Illinois Univ., Talbot Lab., Urbana, IL USA
Modeling of Physical Processes
Buckmaster, John; Apr. 2002; 11p; In English
Contract(s)/Grant(s): F49620-99-1-0017
Report No.(s): AD-A408985; AFRL-SR-AR-TR-02-0430; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The combustion group in Talbot Laboratory at the University of Illinois (J. Buckmaster AAE, M. Short TAM, D. S. Stewart TAM. T. L. Jackson TAM (adjunct)) took the opportunity presented by the First Joint Meeting of the U.S. Sections of the Combustion Institute, held at the George Washington University, Washington DC. March 14-17. 1999, to further the visibility of the group. The PI was a coauthor on the following papers presented at that meeting, printed in the book of abstracts (no ISBN number): (1) Why do pg candle-flames oscillate' by J. Buckmaster and Vi Zliaug. (2) Non-premixed periodic flames relevant to propellant combustion' by T. L. Jackson and J. Buckmaster (3) 'The effects of time-periodic shear on a diffusion flame anchored to a propellant by J. Buckmaster and T. L. Jackson. (4) Cellular instabilities, sub-limit structures and edge-flames in premixed counterflows' by J. Buckmaster and M. Short. All of this work has been reported elsewhere as full length papers.
DTIC
Propellant Combustion; Solid Propellant Rocket Engines; Diffusion Flames; Premixed Flames; Stoichiometry; Mathematical Models

20030012961 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR

Numerical Modeling of Heat-Mass Transfer in Radial Flow Plasma-Chemical Reactor with Multicomponent Kinetics CF4/02

Grigoryev, Yu N.; Gorobchuk, A. G.; Aug. 23, 2002; 7p; In English; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409088; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The binary gas mixture CF4/O2 is widely used in industrial production of semiconductor devices to increase the etching rate of silicon wafers. The number of papers devoted to mathematical modeling of silicon etching in CF4/O2 plasma is relatively small. Moreover, the numerical modeling of silicon etching with simplifying kinetics of the gas phase and heterogeneous chemical reactions predicts a maximum of the etching rate near the 50% fraction of O2 in the parent gas mixture 1. This is inconsistent with experimental data where the maximum etching rate detected was at the 15-30% range of O2. In this paper, the results of numerical optimization of a radial flow plasma-chemical reactor depending on the binary gas composition CF4/O2 are presented. Quantitative estimations of oxygen chemisorption and adsorption of CF2 CF3 contributions to the etching rate are obtained.

DTIC

Heat Transfer; Chemical Reactions; Mass Transfer; Chemisorption

20030012977 Naval Research Lab., Washington, DC USA

Fiery Ice from the Seas - The First Workshop of the International Committee on Methane Hydrates ***Final Report, 7-9 Mar. 2001***

Masutani, Stephen M.; Coffin, Richard B.; Oct. 29, 2002; 73p; In English

Report No.(s): AD-A409054; NRL/MR/6110--02-8646; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This document reviews an expert workshop on methane hydrates, held in Honolulu, Hawaii, at the International Imin Conference Center of the East West Center on March 7-9, 2001. The workshop was organized by the Hawaii Natural Energy Institute of the University of Hawaii and the Environmental Quality Sciences Section of U.S. Naval Research Laboratory, in cooperation with the Hokkaido National Industrial Research Institute of Japan's Agency of Industrial Science and Technology, and Inha University of Korea. Fifty-eight participants from the USA, Japan, Korea, Canada, Norway, Russia, and the United Kingdom attended the workshop. Participation was by invitation only. Attendees included some the world's leading researchers in methane hydrates, and representatives from government agencies and the private sector. The principal workshop objectives were: (1) review past, ongoing, and planned methane hydrates R&D projects and programs; (2) share information on budgets and research resources and priorities in different countries; and (3) establish linkages for domestic and international partnering. The program of the 2-1/2 day workshop included plenary lectures, panel discussions, small group breakout meetings, and a poster session. It was conducted as a working event where all participants conferred to develop a roadmap for future collaborative studies of methane hydrates.

DTIC

Hydrates; Methane; Sea Ice

20030012993 Academy of Sciences (USSR), Inst. of Theoretical and Applied Physics, Novosibirsk, USSR

Method Cars for Measurement of High Pressure Burning Temperature

Boyarshinov, B. F.; Fedorov, S. Yu.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409079; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The aim of this paper is the development of a two-frequency CARS method for burning temperature measurement of stochiometric mixture of ammonium dinitramid with poly-caproamide. This model fuel contains nitrogen in exhaust. Time of burning of a one sample is 0.5 s at the pressure of 4.0 MPa in measuring volume.

DTIC

Measurement; Combustion; Ammonium Compounds; Temperature Measurement; Pressure Measurement

20030012994 Chile Univ., Departamento de Fisica, Santiago Chile

A 1-D Granular Gas as a Knudsen Gas

COrdero, Patricio; Pasini, Jose M.; Ramirez, Rosa; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom

Report No.(s): AD-A409082; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We study a one-dimensional system of inelastic hard particles driven by thermal walls. For low dissipation in collisions the system may be treated as a perturbation on a non-interacting system, being thus conceptually similar to a Knudsen gas. When the

quasielastic system is subjected to gravity a kinetic theory approach is suitable, giving a faithful description of results stemming from Newtonian molecular dynamics simulations. Effects derived from the finite size of the particles nay be taken into account without invalidating the rarefied system assumption. When the system is not subject to gravity and held between two thermal walls, the boundary conditions determine whether the system will be fluidized or clusterized. The transition from the clustering regime to the fluidized state is described.
DTIC
Dissipation; Gases; Molecular Dynamics; Boundary Conditions; Knudsen Flow

20030013650 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
Kinetics of OH Reactions with N2H4, CH3NHNH2 and (CH3)2NNH2 in the Gas Phase
Vaghjiani, Ghanshyam L.; Oct. 25, 2000; 29p; In English
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A409315; AFRL-PR-ED-AB-2000-208; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The gas phase reaction kinetics of OH with three di-amine rocket fuels; N(2)H(4), CH(3)NHNH(2) and (CH3)2NNH2 was studied in a discharge flow-tube apparatus and a pulsed- photolysfs reactor under pseudo-first-order conditions in OH. Direct laser-induced fluorescence monitoring 9f the OH temporal profiles in a known excess of the DI-AMINE yielded the following absolute second-order OH rate coefficient expressions; k(I) = (2.17 plus or minus 0.39) x 10(exp -11) e(160 plus or minus 30)/T, k(2) = (4.59 plus or minus 0.83) x 10(exp -11) e(85 plus or minus 35)/T and k(3) = (3.35 plus or minus 0.60) x 10(exp -11) e(175 plus or minus 25)/T cu cm molec-1 s(-1), respectively, for reactions with N(2) H(4), CH(3)NHNH(2) and (CH3)(2)NNH(2) in the temperature range 232-637 K. All three reactions did not show any discemable pressure dependence on He or N(2) buffer gas pressure of up to 530 torr. The magnitude, and the weak temperature and the lack of pressure effects of the OH + N(2)H(4) reaction rate coefficient suggests that a simple direct metathesis of H-atom may not be important compared to addition of the OH to one of the N-centers of the di-amine skeleton, followed by rapid dissociation of the intermediate into products. Our findings on this reaction are qualitatively consistent with a previous ab-initio study Armstrong et al. J Phys Chem A 1997, 101, 4761. However, in the alkylated di-amines, direct H-abstraction from the methyl moiety can not be completely ruled out.
DTIC
Chemical Reactions; Reaction Kinetics; Vapor Phases; Hydroxides; Diamines; Rocket Propellants

20030013756 NASA Ames Research Center, Moffett Field, CA USA
Variations in the Strength of the Infrared Forbidden 2328.2 cm-1 Fundamental of Solid N2 in Binary Mixtures
Bernstein, Max P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; [2002]; 52p; In English
Contract(s)/Grant(s): RTOP 344-37-44-01; RTOP 344-38-12-04; Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
We present the 2335-2325 cm(exp -1) infrared spectra and band positions, profiles, and strengths (A values) of solid nitrogen and binary mixtures of N2 with other molecules at 12 K. The data demonstrate that the strength of the infrared forbidden N2 fundamental near 2328 cm(exp -1) is moderately enhanced in the presence of NH3, strongly enhanced in the presence of H2O and very strongly enhanced in the presence of CO2, but is not significantly affected by CO, CH4, or O2. The mechanisms for the enhancements in N2-NH3 and N2-H2O mixtures are fundamentally different from those proposed for N2-CO2 mixtures. In the first case, interactions involving hydrogen-bonding are likely the cause. In the latter, a resonant exchange between the N2 stretching fundamental and the O-18=C-12 asymmetric stretch of O-18C-12O-16 is indicated. The implications of these results for several astrophysical issues are briefly discussed.
Author
Binary Mixtures; Infrared Spectra; Methane; Solid Nitrogen; Carbon Dioxide; Astrophysics

20030014066 National Cheng Kung Univ., Tainan, Taiwan, Province of China
The Performance of a Hybrid Rocket With Swirling GOx Injection
Lee, Tsong-Sheng; Potapkin, A.; Jul. 2002; 8p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images. Prepared in cooperation with Ru
Report No.(s): AD-A409123; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
With the developed HTPB curing process a 10-Kg thrust hybrid rocket was built and passed several static firing tests here in ASTRC. The motor was designed similar to the classical one with an aft-mixing chamber. The purpose of preset study is then

to develop the enhancement mechanism for oxidizer and fuel vapor mixing and flame holding to assess the necessity of aft-mixing chamber that is usually employed in a classical hybrid rocket design.
DTIC
Combustion; Hybrid Rocket Engines

20030014071 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Peculiarities of Ramjet Combustion Chamber Work with Resonator Under Condition of Vibration Fuel Combustion
Potapkin, A. V.; Pavlov, A. A.; Moskvichev, D. Yu.; Jul. 2002; 8p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409132; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An optical measurement and registration system of electronic radiation of electron-excited radicals OH in flames is presented in this work. to investigate diffusion hydrogen-air torches the mentioned system was used. The obtained experimental data were used for analysis of a thrust formation of the ramjet ejector combustor with acoustic resonator by vibrating burning of hydrogen. It was offered a way to determine geometrical parameters of ejector system and hydrogen consumptions providing the largest thrust values.
DTIC
Combustion; Ramjet Engines

20030014114 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Comment On: An Intermolecular Potential for Nitrogen from a Multi-Property Analysis
Wysong, Ingrid J.; Heck, E. L.; Feb. 23, 1999; 7p; In English
Contract(s)/Grant(s): AF Proj. 2308
Report No.(s): AD-A409267; AFRL-PR-ED-TP-FY99-0052; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A recent paper by Cappelletti et al. (CVPHD) makes use of classical trajectory (CT) effective kinetic cross sections on an optimized potential energy surface to predict Z for nitrogen gas over a range of temperatures. It is suggested here that an alternative method of conversion between the calculated cross sections and the rotational relaxation quantities (eta nu, the volume viscosity, and Z, the rotational collision number) may give more physically meaningful results.
DTIC
Nitrogen; Potential Energy; Intermolecular Forces; Collisions

20030014167 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
An Optical Study of Processes in Hydrogen Flame in a Tube
Mironov, S. G.; Potapkin, A. V.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409119; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In the present study, to investigate into hydrogen combustion in an air flow, we registered the radiation intensity due to electron-excited OH radicals in the wavelength range 280-340 nm. We examined correlation- and autocorrelation spectra for the local pulsations of glow intensity and acoustic pulsations produced by the flame. Gaseous hydrogen was fed into injector, which was positioned in a vertically installed transparent quartz tube. The diameter of the injector hole was d=1 mm. The rate of the hydrogen flow was determined from the pressure drop across a hydroresistance included into the hydrogen supply system. to monitor the emission intensity due to OH radicals, we used an optical system that contained a narrowband optical filter, a quartz lens, and a photomultiplier FEU-39A. The transmission factor of the quartz tube in the UV spectral region was no less than 90%. The flame noise was measured by a piezoceramic sensing element I4310 that was located near the lower end of the quartz tube. Between the tube and the optical system, an opaque screen was installed with a horizontal slot of 3-mm height. The screen could exert displacements along the tube on a traversing gear with a rheochord, which enabled us to scan the emission intensity along the tube length. The output electric signals generated by the optical system, acoustic emission detector, rheochord, and hydrogen flow meter were simultaneously recorded by a multi-channeled magnetograph (NO 67) with a channel bandwidth of 20 kHz. The spectral and correlative analyses were carried out on a personal computer using the recorded data.
DTIC
Hydrogen; Combustion

20030014171 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Coordinated Development of DSMC Plume and Contamination Models
Levine, Jay; Wysong, Ingrid; Jan. 27, 2000; 15p; In English; Presented at the AFOSR Meeting. Contains viewgraphs only
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A409114; AFRL-PR-ED-TP-2000-015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract available
Author
Mathematical Models; Rocket Engines; Missile Defense

20030014181 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Measurement of Quenching Rates of CO(a sup 3Pi, v=0) Using Laser Pump-and-Probe Technique
Wysong, Ingrid J.; Nov. 30, 1999; 11p; In English
Report No.(s): AD-A409111; AFRL-PR-ED-TP-1999-0230; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Measurements are presented of rates of electronic quenching of CO(a, v=O) by several gases. A pump-and-probe technique is used; CO(a) is created by pumping the spin-forbidden (a-X) transition at 206 nm. Measured rate coefficients at room temperature are: k(sub Q)(CO) = 5.7 +/- 1.2, k(sub Q)(NO) = 17 +/- 6, k(sub Q)(N2) = 1.4 +/- 0.6, k(sub Q)(O2) = 6 +/- 2, k(sub Q)(H2) = 2.6 +/- 1.0, k(sub Q)(H2O) = 33 +/- 12 in units of 10(exp -11) cu cm/s.
DTIC
Quenching; Carbon Monoxide

20030014184 Battelle Pacific Northwest Labs., Richland, WA USA
Detection and Measurement of Explosives in Groundwater Using In Situ Electrochemical Sensors *Final Report*
Olsen, Khris B.; Wang, Joseph; May 2002; 27p; In English
Contract(s)/Grant(s): DE-AC06-76RL01830
Report No.(s): AD-A409108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The results of this study demonstrate that remotely-deployable submersible sensors are capable of monitoring explosive compounds both temporally and spatially in groundwater and can be more cost effective than conventional sampling and analysis. Such new remote-sensing capability can bring significant changes to the way in which nitro-based explosives are monitored. At this time, this technology can be deployed in standard groundwater wells that are 1.5 inches or greater in diameter. Future modification of the sensor probe could decrease the probe size to less than 3/4 inch to accommodate installation with minimally invasive direct-push technologies, ml such as cone penetrometer or GeoProbe system. Furthermore, the sensor measurement frequency can be easily changed from a remote location, enabling the investigator to tailor the measurement cycle to the speed at which the parameter in question is or may be changing. During the course of this SERDP SEED project, various working electrode materials and voltammetric waveforms were compared, and relevant experimental parameters were optimized. Based on initial testing we developed a submersible electrochemical probe, using a carbon-fiber electrode assembly, connected to a 50-foot-long shielded cable, for the real-time monitoring of nitro-organic explosives in natural water. The facile reduction of the nitro moiety group allowed convenient and rapid square-wave voltammetric measurements of trace levels of nitroaromatic explosives (TNT, TNB, and Tetryl) down to levels of 50 to 100 pb. A newly developed SERDP, SERDP Collection, groundwater, remote sensing, electrochemical detection, nitroaromatic explosives, nitroamine explosives.
DTIC
Electrochemistry; Explosives; Ground Water; Remote Sensors

20030014486 NASA Langley Research Center, Hampton, VA USA
Phenylethynyl Containing Reactive Additives
Connell, John W., Inventor, NASA Langley Research Center, USA; Smith, Joseph G., Jr., Inventor, NASA Langley Research Center, USA; Hergenrother, Paul M., Inventor, NASA Langley Research Center, USA; Aug. 27, 2002; 16p; In English; Division of US-Patent-Appl-SN-290295, filed 13 Apr. 1999
Patent Info.: Filed 28 Nov. 2000; NASA-Case-LAR-15543-2-1; US-Patent-6,441,099; US-Patent-Appl-SN-726297; US-Patent-Appl-SN-290295; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Phenylethynyl containing reactive additives were prepared from aromatic diamine, containing phenylethvnvl groups and various ratios of phthalic anhydride and 4-phenylethynviphthalic anhydride in glacial acetic acid to form the imide in one step or in N-methyl-2-pvrrolidinone to form the amide acid intermediate. The reactive additives were mixed in various amounts (10% to 90%) with oligomers containing either terminal or pendent phenylethynyl groups (or both) to reduce the melt viscosity and thereby enhance processability. Upon thermal cure, the additives react and become chemically incorporated into the matrix and

effect an increase in crosslink density relative to that of the host resin. This resultant increase in crosslink density has advantageous consequences on the cured resin properties such as higher glass transition temperature and higher modulus as compared to that of the host resin.
Official Gazette of the U.S. Patent and Trademark Office
Acetic Acid; Additives; Glass Transition Temperature; Methyl Compounds

20030014589 NASA Glenn Research Center, Cleveland, OH USA
Ternary Precursors for Depositing I-III-VI2 Thin Films for Solar Cells Via Spray CVD
Banger, K. K., Ohio Aerospace Inst., USA; Hollingsworth, J. A., Washington Univ., USA; Jin, M. H.-C., Ohio Aerospace Inst., USA; Harris, J. D., Cleveland State Univ., USA; Duraj, S. A., Cleveland State Univ., USA; Smith, M., Ohio Aerospace Inst., USA; Scheiman, D., Ohio Aerospace Inst., USA; Bohannan, E. W., Missouri Univ., USA; Switzer, J. A., Missouri Univ., USA; Buhro, W. E., Washington Univ., USA; December 2002; 13p; In English
Contract(s)/Grant(s): NCC3-947; RTOP 755-A4-01
Report No.(s): NASA/TM-2002-211994; E-13665; NAS 1.15:211994; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
The development of thin-film solar cells on flexible, lightweight, space-qualified substrates provides an attractive cost solution to fabricating solar arrays with high specific power (W/kg). Thin-film fabrication studies demonstrate that ternary single source precursors (SSP's) can be used in either a hot or cold-wall spray chemical vapour deposition (CVD) reactor, for depositing CuInS2, CuGaS2, and CuGaInS2 at reduced temperatures (400 to 450 C), which display good electrical and optical properties suitable for photovoltaic (PV) devices. X-ray diffraction studies, energy dispersive spectroscopy (EDS), and scanning electron microscopy (SEM) confirmed the formation of the single phase CIS, CGS, CIGS thin-films on various substrates at reduced temperatures.
Author
Thin Films; Solar Cells; Fabrication; Substrates; Vapor Deposition

26
METALS AND METALLIC MATERIALS

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

20030012564 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Modeling of Steel Behavior with Application to Armor Penetration
Hansson, H.; Skoglund, P.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101018; FOI-R-0201-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Problems involving interaction between armor and projectile are often studied with the aid of hydrocode softwares such as Autodyn. The numerical calculations require input data that among others describe the material response to large strains and high strain rates. One of the most frequently used models for metals subjected to the discussed conditions is the Johnson and Cook (J&C) equation. In this report the implementation of the J&C material strength model in Autodyn is considered. Further, material parameters for the J&C model for a novel high nitrogen alloyed steel (HNS) with potential as a future armor is presented. The results show that the implementation of the J&C model in Autodyn 2D 4.1.13 does not reproduce the strain rate dependency of the flow stress appropriately. A user subroutine developed at FOI is shown to improve the numerical solution. In the recent release of Autodyn 2D 4.2 the J&C model reproduces the strain rate dependency more accurate. Penetration simulations using a 5.56 mm AP projectile penetrating a HNS armor are performed, and the results are discussed and compared with experimental data. It is shown that the Lagrange formulation gives numerical problems and can not in general be used to predict the interaction between armor and projectile without experimental verification.
NTIS
Mechanical Properties; Mathematical Models; Penetration; Projectiles; Steels; Armor

20030012566 Lawrence Livermore National Lab., Livermore, CA USA
First-Principles Thermoeleasticity of Tantalum at High Pressures
Orlikowski, D.; Soederlind, P.; Moriarity, J. A.; Jun. 21, 2002; 30p; In English
Report No.(s): DE2002-803168; UCRL-JC-146692; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The thermoelastic properties of bcc tantalum have been investigated over a broad range of temperatures (up to 12000 K) and pressures (up to 10 Mbar) using first-principles methods that account for cold, electron-thermal, and ion-thermal contributions. Specifically, we have combined ab initio all electron electronic-structure calculations for the cold and electron-thermal contributions to the elastic moduli with phonon contributions for the ion-thermal part calculated using model generalized pseudopotential theory (MGPT).
NTIS
Tantalum; Thermoelasticity; Body Centered Cubic Lattices; High Pressure

20030012568 Argonne National Lab., IL USA
Fabrication of Spherical and Irregularly Shaped Powders of Li and Ba Titanates from Titanium Tetrachloride by Inorganic Sol-Gel Process
Deptula, A.; Olczar, T.; Lada, W.; Sartowska, B.; Alvani, C.; Apr. 2002; 18p; In English
Report No.(s): DE2002-799815; ANL/ET/CP-107493; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We report preparation procedures for some lithium and barium titanate compounds. The procedures utilize inexpensive, commercial superconductors in an aqueous HC1 solution. The main preparation steps consist of chloride elimination by distillation with nitric acid, addition of hydroxides of Li (or Ba), evaporation of sols to dry powders, and thermal treatment to titanates. Thermal and X-ray analyses indicate that the formation temperatures are lower than the corresponding temperatures necessary for conventional solid-state reactions. These temperatures can be further decreased by addition of ascorbic acid during formation of Ti nitrate sols. Spherical powders are obtained by solvent extraction of water from sol drops emulsified in 2-ethylheksanol-1. Final correction of the composition of the spherical powders is carried out by an impregnation process.
NTIS
Barium Compounds; Lithium Compounds; Titanium Chlorides

20030012616 Lawrence Livermore National Lab., Livermore, CA USA
Corrosion/Electrochemistry of Monocrystalline and Polycrystalline Beryllium in Aqueous Chloride Environment
Friedman, J. R.; Hanafee, J. E.; Jan. 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792322; UCRL-ID-137482; No Copyright; Avail: National Technical Information Service (NTIS)
Corrosion characteristics of high-purity polycrystalline beryllium as a function of pH and NaCl concentration were studied at 25 degrees C, using cyclic polarization tests. Single crystal beryllium specimens oriented close to the (0001), (1010), and (1120) planes using Laue back reflection techniques were studied using cyclic polarization tests in 0.01M NaCl with a nominal pH of 7. Pit morphology of the polycrystalline and single crystals was studied using conventional scanning electron microscopy. On the polycrystalline specimens, passivity appears to be more a function of solution pH than of chloride concentration. Single crystal studies show dramatic differences in cyclic polarization plots and SEM micrographs. The two prism planes (1010) and (1120) behave similarly while the basal plane (0001) behaved in a substantially different manner.
NTIS
Corrosion; Electrochemistry; Beryllium

20030012625 Argonne National Lab., IL USA
ANL/CRIEPI Collaborative Program for Evaluation of Irradiated EBR-II Stainless Steel *Final Report*
Allen, T.; Cole, J.; Tsai, H.; Jensen, R.; Bunde, K.; 2002; In English
Report No.(s): DE2002-801654; ANL-02/13; No Copyright; Avail: National Technical Information Service (NTIS)
The objective of this collaboration between Argonne National Laboratory (ANL) and the Central Research Institute of Electric Power Industry (CRIEPI) is to evaluate the effects of long-term, low-dose neutron exposure on the mechanical properties, dimensional stability, and associated microstructural changes of reactor structural materials. ANL believes that material data obtained from components irradiated in EBR-II provide valuable information that is useful for LWR plant life extension. The program was initiated in February of 1999. Samples were taken from two separate subassemblies, designated S1951 and S1952. These subassemblies were constructed of 20% cold-worked Type 316 stainless steel. The samples from these subassemblies were irradiated at temperatures from 371-390 C to doses up to 56 dpa. The examinations in this program included: immersion density, microhardness, microstructure, and tensile properties. The material history, test plan, results of measurements, and discussion of results are included in this report.
NTIS
Stainless Steels; Irradiation; Electric Power Plants

20030012788 Academy of Sciences of the Ukraine, Inst. of Materials Science Problems, Kiev, Ukraine
Science for Materials in the Frontier of Centuries: Advantages and Challenges, Volume 1
Skorokhod, Valery V.; Nov. 2002; 395p; In English
Contract(s)/Grant(s): F61775-02-W-F042
Report No.(s): AD-A408965; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche
The Final Proceedings for Science for Materials in the Frontier of Centuries: Advantages and Challenges, 4 Nov 02-8 Nov 02 I. Fundamental problems of materials science including phase transformations, reaction kinetics, deformation of materials, materials modeling, and surface phenomena. II. Prospective materials for functional and structural purposes as composites, ceramics, amorphous and nano-crystalline materials, quasi-crystals, fullerenes, nano-tubes, intermetallics, eutectic materials, hard alloys and cermets. III. Materials processing routes including materials synthesis in the bulk and dispersed states, self-propagating high-temperature synthesis, powder formation, sintering, joining, and coating. IV. Characterization of materials properties using non-destructive methods, microscopy, spectroscopy, acoustics, and X-ray.
DTIC
Conferences; Crystallinity; Intermetallics; Materials Science; Polymers; Nanotechnology

20030012898 Argonne National Lab., IL USA
Effect of Low Dose Rate Irradiation on the Tensile Properties and Microstructure of Austenitic Stainless Steels
Allen, T. R.; Tsai, H.; Cole, J. I.; Yoshitake, T.; Akasaka, N.; 2002; 16p; In English
Report No.(s): DE2002-801630; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
To assess the effects of long-term, low-dose-rate neutron exposure on mechanical strength and ductility, tensile properties were measured on 12% and 20% cold-worked Type 316 stainless steel. Samples were prepared from reactor core components retrieved from the EBR-II reactor following final shutdown. Sample locations were chosen to cover a dose range of 1-56 dpa at temperatures from 371-440DGC and dose rates from 0.5-5.8 x10-7 dpa/s. These dose rates are approximately an order of magnitude lower than those of typical EBR-II test sample locations. The tensile tests for the 12% CW material were performed at 380 deg C and 430 deg C while those for the 20% CW samples were performed at 370 deg C. In each case, the tensile test temperature approximately matched the irradiation temperature. to help understand the tensile properties, microstructural samples with similar irradiation history were also examined.
NTIS
Austenitic Stainless Steels; Reactor Cores; Irradiation; Microstructure; Tensile Properties

20030012907 Lawrence Livermore National Lab., Livermore, CA USA
Application of the Pegasus II Pulsed-Power Facility to the Study of Inertial Instability and Fracture of Cylindrical Tubes of Solid Aluminum
Chandler, E. A.; Egan, P. O.; Stokes, J.; Fulton, R. D.; Morgan, D. V.; Jun. 23, 1999; 10p; In English
Report No.(s): DE2002-793458; UCRL-ID-134657; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Understanding the surface stability of metals undergoing dynamic fracture at shock breakout is important to several applications in metals processing. The advantages of using the Pegasus II facility to investigate the phenomena occurring at shock break out are described. As an example of the data collected, we concentrate on brief descriptions of two experiments that compared the tensile failure, i.e. 'spall', patterns in the presence of sinusoidal perturbations seeded on the free inner surface of cylindrical samples of 3 types of Al. These samples were composed variously of soft Al 1100-0, structural grade Al 6061-T6, and ultra-pure 99.99% Al and were subjected to Taylor waves with shock pressures of 14 GPa. We show that the material behind the exiting surface undergoes a type of failure termed here 'microspall', resulting in the production of a significant volume of low-density, probably granular, material. The failure mechanism, combined with the forces that cause inertial instability, leads to rapid pattern growth in the failed material and subsequent pattern growth on the surface. Pattern growth was studied as a function of perturbation wavelength and amplitude.
NTIS
Aluminum; Fracture Mechanics; Inertia; Pulse Generators; Stability; Tubes

20030014139 Lawrence Livermore National Lab., Livermore, CA USA
High-Throughput Laser Peening of Metals Using a High-Average-Power Nd: Glass Laser System
Dane, C. B.; Hackel, L. A.; Halpin, J.; Daly, J.; Harrisson, J.; Nov. 1999; 18p; In English
Report No.(s): DE2002-792012; UCRL-JC-134266; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Laser shot peening, a surface treatment for metals, is known to induce residual compressive stresses to depths of over 1 mm providing improved component resistance to various forms of failure. Recent information also suggests that thermal relaxation

of the laser induced stress is significantly less than that experienced by other forms of surface stressing that involve significantly higher levels of cold work. We have developed a unique solid state laser technology employing Nd:glass amplifier slabs and SBS phase conjugation that enables this process to move into high throughput production processing.
NTIS
Shot Peening; Neodymium Lasers; Metals

20030014269 Lawrence Livermore National Lab., Livermore, CA USA
Influence of Base Pressure on FeMn Exchange Biased Spin-valve Films
Mao, M.; Cerjan, C.; Law, B.; Grabner, F.; Vaidya, S.; Aug. 13, 1999; 18p; In English
Report No.(s): DE2002-792014; UCRL-JC-134296; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Spin-valve films of structure NiFeCo/Co/Cu/NiFeCo(Co)/FeMn/Cu were deposited on Si substrates by DC planetary magnetron sputtering techniques. The influence of base pressure, P(sub b), on spin-valve properties was studied by varying P(sub b) over two decades from 3 x 10(sup -8) to 7 x 10(sup -6) Torr. The GMR ratio show a slight increase with increasing P(sub b) until a large decrease occurs at P(sub b) > 3.3 x 10(sup -6) Torr. Exchange bias field and blocking temperature remain constant in the base pressure range between 3 x 10(sup -8) and 5 x 10(sup -7) Torr before a large reduction begins. An upper bound base pressure, (sup u)P(sub b) (approx) 5 x 10(sup -7) Torr, is noted from the data, above which significant performance modification begins. The degradation in exchange bias field and blocking temperature, in particular, in spin-valve films using a NiFeCo pinned layer, is the result of deterioration in the crystallographic texture and can be understood due to the contamination both at the ferromagnetic/antiferromagnetic interface and in the bulk of FeMn layer.
NTIS
Magnetic Materials; Sputtering

20030014280 Westinghouse Savannah River Co., Aiken, SC USA
Vacuum Furnace Brazing Open Cell Reticulated Foam to Stainless Steel Tubing
Howard, S. R.; Korinko, P. S.; 2002; 14p; In English
Report No.(s): DE2002-801203; WSRC-MS-2002-00424; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A heat exchanging device for separating hydrogen isotopes was designed using open cell reticulated copper foam that was brazed to stainless steel tubing. It is anticipated that the copper foam in the annular space of a tube-in-tube (TnT) style heat exchanger would improve the thermal efficiency; it is further anticipated that brazing the foam to the inner tube that is alternately filled with heating and cooling fluid, would further improve the thermal efficiency of the process. This paper describes the intended application and development effort required to braze the copper foam to the stainless steel tubing.
NTIS
Brazing; Copper; Isotope Separation; Stainless Steels; Metal Foams; Pipes (Tubes)

20030014311 Lawrence Livermore National Lab., Livermore, CA USA
Material Failure and the Growth of Instabilities in Hollow Cylindrical Samples of Aluminum Shocked to 14Gpa and 50 Gpa
Chandler, E. A.; Egan, P. O.; Stokes, J.; Fulton, R. D.; Morgan, D. V.; Nov. 20, 1999; 10p; In English
Report No.(s): DE2002-792747; UCRL-JC-136618; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Understanding the surface stability of metals undergoing dynamic fracture at shock breakout is important to several applications in metals processing. The advantages of using the Pegasus II facility to investigate the phenomena occurring at shock break out are described. As an example of the data collected, we concentrate on brief descriptions of two experiments that compared the tensile failure, i.e. spall, patterns in the presence of sinusoidal perturbations seeded on the free inner surface of cylindrical samples made of structural grade Al 6061.T6. These samples were subjected to ramped waves with shock pressures of I4 GPa and 50 GPa to observe the effect of pressure on the production of a type of volumetric failure that is termed here microspall. This failed region behind the exiting surface of the shock wave is comprised of a significant volume of low-density, probably granular, material. The failure mechanism, combined with the forces that cause inertial instability, leads to rapid pattern growth in the failed material, observable as density variations, as well as to pattern growth on the surface. Pattern growth was observed to vary with perturbation amplitude, wavelength, and shock pressure.
NTIS
Aluminum; Fracture Mechanics

20030014313 Lawrence Livermore National Lab., Livermore, CA USA

Effect of Extrusion Temperatures on the Microstructural Development of a Powder Metallurgy Ti-47Al-2Cr-1Nb-1Ta Alloy

Hsiung, L. M.; Nieh, T. G.; Jun. 29, 2002; 24p; In English

Report No.(s): DE2002-792726; UCRL-JC-137615; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

TiAl-base aluminide alloys are appealing for use in high-temperature structural applications because of their low density, high specific modulus, and good strength retention at elevated-temperatures. However, the inherent poor ductility of titanium aluminides at ambient temperatures has limited their applications. Alloy design and development to improve their low-temperature ductility, while retaining their strength, have become the major challenge for this alloy system. Alloy and processing developments to improve their low-temperature ductility, while retaining their strength, have become the major challenge for this alloy system. The poor low-temperature ductility causes conventional manufacturing operations such as rolling, forging, drawing, or machining to be difficult for titanium aluminides.

NTIS

Microstructure; Powder Metallurgy; Aluminides

20030014314 Lawrence Livermore National Lab., Livermore, CA USA

Observation of Localized Corrosion of Ni-Based Alloys Using Coupled Orientation Imaging Microscopy and Atomic Force Microscopy

Bedrossian, P. J.; Schwartz, A. J.; Kumar, M.; King, W. E.; Nov. 24, 1999; 12p; In English

Report No.(s): DE2002-792714; UCRL-JC-136608; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present a method for assessing the relative vulnerabilites of distinct classes of grain boundaries to localized corrosion. Orientation imaging microscopy provides a spatial map which identifies and classifies grain boundaries at a metal surface. Once the microstructure of a region of a sample surface has been characterized, a sample can be exposed to repeated cycles of exposure to a corrosive environment alternating with topographic measurement by an atomic force microscope in the same region in which the microstructure had been mapped. When this procedure is applied to Ni and Ni-based alloys, we observe enhanced attack at random grain boundaries relative to special boundaries and twins in a variety of environments.

NTIS

Grain Boundaries; Nickel Alloys; Corrosion

20030014317 Argonne National Lab., Energy Technology Div., IL USA

Development of Fatigue Design Curve for Austenitic Stainless Steels in LWR Environments: A Review

Chopra, O. K.; 2002; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.

Report No.(s): DE2002-799831; No Copyright; Avail: National Technical Information Service (NTIS)

The ASME Boiler and Pressure Vessel Code provides rules for the construction of nuclear power plant components and specifies fatigue design curves for structural materials. However, the effects of light water reactor (LWR) coolant environments are not explicitly addressed by the Code design curves. Existing fatigue strain-vs-life (Sigma-N) data illustrate potentially significant effects of LWR coolant environments on the fatigue resistance of pressure vessel and piping steels. This paper reviews the existing fatigue Sigma-N data for austenitic stainless steels in LWR coolant environments. The effects of key material, loading, and environmental parameters, such as steel type, strain amplitude, strain rate, temperature, dissolved oxygen level in water, and flow rate, on the fatigue lives of these steels are summarized. Statistical models are presented for estimating the fatigue Sigma-N curves for austenitic stainless steels as a function of the material, loading, and environmental parameters. Two methods for incorporating environmental effects into the ASME Code fatigue evaluations are presented. Data available in the literature have been reviewed to evaluate the conservatism in the existing ASME Code fatigue design curves.

NTIS

Light Water Reactors; Stainless Steels; Fatigue (Materials); Design Analysis

20030014595 NASA Ames Research Center, Moffett Field, CA USA

Tensile Yielding of Multi-Wall Carbon Nanotube

Wei, Chenyu, NASA Ames Research Center, USA; Cho, Kyeongjae, Stanford Univ., USA; Srivastava, Deepak, NASA Ames Research Center, USA; Oct. 16, 2002; 11p; In English

Contract(s)/Grant(s): AS-03; RTOP 704-40-32; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The tensile yielding of multiwall carbon nanotubes (MWCNTs) has been studied using Molecular Dynamics simulations and a Transition State Theory based model. We find a strong dependence of the yielding on the strain rate. A critical strain rate has been predicted above/below which yielding strain of a MWCNT is larger/smaller than that of the corresponding single-wall carbon nanotubes. At experimentally feasible strain rate of 1% /hour and T = 300K, the yield strain of a MWCNT is estimated to be about 3-4 % higher than that of an equivalent SWCNT (Single Wall Carbon Nanotube), in good agreement with recent experimental observations.
Author
Carbon Nanotubes; Strain Rate; Walls

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.

20030012701 NASA Langley Research Center, Hampton, VA USA
Effects of Amine and Anhydride Curing Agents on the VARTM Matrix Processing Properties
Grimsley, Brian W., NASA Langley Research Center, USA; Hubert, Pascal, Old Dominion Univ., USA; Song, Xiaolan, Virginia Polytechnic Inst. and State Univ., USA; Cano, Roberto J., NASA Langley Research Center, USA; Loos, Alfred C., Virginia Polytechnic Inst. and State Univ., USA; Pipes, R. Byron, Akron Univ., USA; [2002]; 15p; In English; 47th International SAMPE Symposium and Exhibition, 12-16 May 2002, Anchorage, AK, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To ensure successful application of composite structure for aerospace vehicles, it is necessary to develop material systems that meet a variety of requirements. The industry has recently developed a number of low-viscosity epoxy resins to meet the processing requirements associated with vacuum assisted resin transfer molding (VARTM) of aerospace components. The curing kinetics and viscosity of two of these resins, an amine-cured epoxy system, Applied Poleramic, Inc. VR-56-4 1, and an anhydride-cured epoxy system, A.T.A.R.D. Laboratories SI-ZG-5A, have been characterized for application in the VARTM process. Simulations were carried out using the process model, COMPRO, to examine heat transfer, curing kinetics and viscosity for different panel thicknesses and cure cycles. Results of these simulations indicate that the two resins have significantly different curing behaviors and flow characteristics.
Author
Amines; Anhydrides; Curing; Resin Transfer Molding; Vacuum; Composite Structures; Epoxy Resins

20030012721 Technische Univ., Vienna Austria
Zirconium and Titanium Nanoclusters for Use as an Ablative for Solid Rocket Motor (SRM) Insulation ***Final Report, 6 May-6 Nov. 2002***
Schubert, Ulrich; Dec. 10, 2002; 5p; In English
Contract(s)/Grant(s): F61775-02-WE037
Report No.(s): AD-A409044; EOARD-SPC-02-4037; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report describes the synthesis of metal oxide nanoclusters with a reactive corona of methacrylate groups. The metal oxide clusters investigated include zirconium, hafnium and titanium metal oxide nanoclusters. Methods of synthesis of metal nanoclusters with nonreactive corona were also investigated. The relatively high melting point of these materials makes them of interest for possible motor insulation applications.
DTIC
Zirconium; Titanium; Ferroelectric Materials; Synthesis (Chemistry)

20030012740 North Dakota Univ., Energy and Environmental Research Center, Grand Forks, ND USA
Subtask 6.2-Hydrogen Separation Membranes ***Final Report***
McCollor, D. P.; Kay, J. P.; Aug. 1999; 16p; In English
Report No.(s): DE2002-778449; REPT-99-EERC-08-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Catalytic gasification of coal to produce H2- and CH4-rich gases for consumption in molten carbonate fuel cells is currently under development; however, to optimize the fuel cell performance and extend its operating life, it is desired to separate as much

of the inerts and impurities as possible from the fuel gas before they enter the fuel cell. In addition, the economics of the integrated gasification combined cycle (IGCC) can be improved by separating as much of the hydrogen as possible from the fuel gas, since hydrogen is a high-value product. Processes currently under development for accomplishing this gas separation and hot-gas cleanup involve gas separation membranes. These membranes are projected to operate at temperatures as high as 800 degrees C and pressures up to 300 psig. Previous approaches in the literature include membranes with relatively large pores, which inefficiently separate the undesired gases by operating in the Knudsen diffusion region of mass transport.
NTIS
Hydrogen; Separation; Membranes

20030012780 Kent State Univ., OH USA
Polymer-Stabilized Cholesteric Liquid Crystal Diffraction Gratings for Optical Switching and Sensor Applications ***Final Report, Jul. 1999-Dec. 2002***
Sprunt, Samuel N.; Chien, L. C.; Dec. 23, 2002; 9p; In English
Report No.(s): AD-A409045; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Low concentration polymer networks are used to stabilize various pattern-forming states of cholesteric liquid crystals. The resulting optical diffraction gratings operate with less than 70% efficiency in transmission (Raman-Nath mode) and are electrically switchable between diffracting and non-diffracting states for low applied voltages (3 - 30 V). A remarkable templating of spatio-orientational order, intrinsic to the liquid crystal pattern formation, is expressed in the polymer network. Based on preliminary results on a dopable polyacetylene, the liquid crystal-based templating effect holds promise as a low cost, simple processing approach to the assembly of micron and submicron, orientationally-ordered arrays of functional polymers.
DTIC
Liquid Crystals; Ferroelectric Materials; Gratings (Spectra); Polyacetylene; Electric Potential; Crystal Growth; Cholesterol

20030012811 Christopher Newport Univ., Dept. of Biology, Chemistry and Environmental Science, Newport News, VA USA
Rapid Assembly of a High Molecular Weight Protein Polymer Derived from a Cloned Oligopeptide Repeat Unit
Gray, Mark S., Christopher Newport Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 51; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
Synthesis of polymers of high molecular weight with absolute control of parameters such as size, composition, sequence topology, and stereochemistry, is not easily achieved with traditional methods of polymer synthesis. However, methods that utilize biosynthetic mechanisms, such as protein synthesis, hold great promise because of their natural ability to produce high molecular weight polypeptides with a high degree of sequence fidelity. Two 40 base-pair (bp) DNA cassette sequences encoding for elastin-mimetic oligopeptides with different crosslinking capabilities were independently cloned using the seamless cloning procedure and the polymerase chain reaction (PCR). Both methods utilized the specific properties of a recently characterized restriction endonuclease Eam1104. Cleavage of the 40bp DNA cassettes with Eam1104 generated nonpalandromic, complementary 5’ cohesive ends that were ligated head to tail, then cloned or amplified via PCR to produce DNA concatamer libraries based upon the two cassette sequences. Each library was screened to identify clones or PCR products possessing DNA concatamers several thousand bp in length. These highly repetitive DNA sequences will be cloned into a bacterial expression vector so that each of the repetitive DNA sequences will be under the control of a strong promoter and behave as inducible synthetic genes. Cells containing either of the synthetic gene sequences will be able to produce relatively high quantities of a high fidelity, high molecular weight polymer possessing uniform and predictable characteristics not achieved via other means of synthesis. Using recombinant DNA technology.
Author
High Polymers; Protein Synthesis; Biosynthesis; Molecular Weight; Polypeptides

20030012830 North Dakota State Univ., Dept. of Mechanical Engineering, Fargo, ND USA
Adhesion and Lamination Testing of Langley Research Center-Soluble Imide (LaRC-SI) Polyimide Films
Song, Sang Sub, North Dakota State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 70; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
This study was investigated the development, evaluation, design and fabrication of the methodology of self-adhesion by melt-bonding multilayers of Langley Research Center- Soluble Imide (LaRC-SI) polyimide films that are employed in the fabrication of multi- layer flexible circuits. Previous efforts at Langley Research Center have had successful bonding results, however there has been little time and effort to perform an adhesiveless-melt-bonding multiple layers of film into one

homogeneous material. The understanding of the structure, property, and processing relationships on self-adhesion of LaRC-SI polyimide films is important to their proper design and methodology. The experiment was performed with the use of three commercial polyimide films, two types of LaRC-SI films, and with an addition of film to copper bonding test. The fully imidized LaRC-SI polyimide films was joined together in a self-adhesion lamination process to form a structure that is flexible and has superior mechanical and thermal properties. The lamination processing variables was investigated depending upon parameters such as autoclave temperature, pressure, soak time and final ply thickness. Control conditions included initial film thickness, sole-source manufacture, and lot number, and the percentage offset used to manufacture the LaRC-SI film The evaluation of the structure film bonding was investigated in LaRC laboratories using scanning electron microscopy and photomicrography for morphology study, followed by mechanical and peel tests that are defined by ASTM standards. The thermal characterizations were performed using differential scanning calorimetry, and thermal gravity analyzer. In addition, the electrical parameter measurements were performed including dielectric constant, dissipation factor, strength, and resistivity.
Author
Adhesive Bonding; Laminates; Polyimides; Photomicrography

20030012835 Kansas State Univ., Dept. of Mechanical and Nuclear Engineering, Manhattan, KS USA
Modulus of Polymer Network and Carbon Nano-Tube Reinforced Polymer Network (From non-continuum mechanics to continuum mechanics)
Wang, Youqi, Kansas State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 75; In English; Also announced as 20030012804; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The goal of the research is to use a nano-scale finite element approach to predict the modulus of polymers and of nano-tube reinforced polymers. The research includes four parts: 1. Generate a polymer network using the Monte Carlo method. Polymer chains are created through the addition of monomers onto existing chains. Firstly, N monomers are distributed randomly within the material domain. More monomers are then randomly added onto the ends of these polymers under the restriction that chain length must be within a certain range. Interactions between monomers and polymer chains are analyzed as the polymer network is relaxed using a force relaxation process. Consequently, an equilibrium atomic field is generated within the polymer network; 2. Use of the nano-scale finite element approach to determine the modulus of the polymer network. As shown in Fig. 1, the polymer chain is modeled by a chemical bond element chain, which is connected by elastic joints. The chemical bond element supports axial load like a spring element and supports bending moments like a beam element with infinite rigidity. The van der Waal attraction between polymer chains are modeled by a spring element with piecewise linear stiffness; 3. Generate a carbon nano-tube reinforced polymer field. This is divided into three steps. Firstly, a carbon nano-tube and N monomers are embedded in the material domain. Then, the N polymer chains grow from the N monomers using the Monte Carlo method. Finally, the polymer field is relaxed; and 4. Calculating the modulus of the carbon nano-tube reinforced polymer network.
Author
Polymer Matrix Composites; Chemical Bonds; Finite Element Method; Molecular Chains; Carbon Nanotubes

20030013638 NASA Langley Research Center, Hampton, VA USA
Adhesive and Composite Properties of a New Phenylethynyl Terminated Imide
Thompson, C. M., National Academy of Sciences - National Research Council, USA; Connell, J. W., NASA Langley Research Center, USA; Hergenrother, P. M., NASA Langley Research Center, USA; [2002]; 13p; In English; 47th International SAMPE Symposium and Exhibition, 12-16 May 2002, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A relatively new phenylethynyl terminated imide oligomer (PETI) from the reaction of 2,3,’,4’- biphenyltetracarboxylic dianhydride, 4,4’-oxydianiline and endcapped with 4- phenylethynylphthalic anhydride at a calculated number average molecular weight of 5000 g/mole was evaluated as an adhesive and composite matrix. The asymmetric dianhydride imparts a low melt viscosity to the oligomer and a high glass transition temperature to the cured resin. Preliminary adhesive work with titanium (6Al-4V) adherend gave good room temperature (RT) tensile shear strengths and excellent retention of RT strength at 260 C. Preliminary composite work using unsized IM7 carbon fiber provided moderate to high mechanical properties. The chemistry, mechanical, and physical properties of the new PETI in neat resin, adhesive and composite form are presented.
Author
Imides; Adhesives; Laminates; Phenyls; Oligomers; Mechanical Properties; Physical Chemistry

20030013639 NASA Langley Research Center, Hampton, VA USA

Modeling the Formation of Polyimide Microspheres

Pipes, R. B., Akron Univ., USA; Weiser, E. S., NASA Langley Research Center, USA; Gonsoulin, B., Old Dominion Univ., USA; Hubert, P., Old Dominion Univ., USA; [2002]; 12p; In English; 47th International SAMPE Symposium and Exhibition, 12-16 May 2002, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High temperature polyimide microspheres have been developed from polyimide solid residuum by a simple inflation process. Microspheres have been fabricated from several polyimide precursors through the use of a circulating air oven. Microsphere formation and final physical property characterization have been limited to simple mechanical and thermal testing. The present paper focuses on developing an understanding of microsphere formation through simple geometric rules for an incompressible polymeric material and microscopic observations of precursor residuum inflation. Inflation kinematics of the hollow polyimide microspheres as a function of time and temperature is discussed.

Author

Fabrication; Microparticles; Polyimides; Synthesis (Chemistry); Mathematical Models; Physical Properties

20030013640 NASA Langley Research Center, Hampton, VA USA

High Temperature Transfer Molding Resins Based on 2,3,3',4'-Biphenyltetracarboxylic Dianhydride

Smith, J. G., Jr., NASA Langley Research Center, USA; Connell, J. W., NASA Langley Research Center, USA; Hergenrother, P. M., NASA Langley Research Center, USA; Yokota, R., Institute of Space and Astronautical Science, Japan; Criss, J. M., Lockheed Martin Aeronautical Systems, USA; [2002]; 12p; In English; 47th International SAMPE Symposium and Exhibition, 12-16 May 2002, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of an ongoing effort to develop materials for resin transfer molding (RTM) processes to fabricate high performance/high temperature composite structures, phenylethynyl containing imides have been under investigation. New phenylethynyl containing imide compositions were prepared using 2,3,3',4'-biphenyltetracarboxylic dianhydride (a-BPDA) and evaluated for cured glass transition temperature (Tg), melt flow behavior, and for processability into flat composite panels via RTM. The a-BPDA imparts a unique combination of properties that are desirable for high temperature transfer molding resins. In comparison to its symmetrical counterpart (i.e. 3,3',4,4'-biphenyltetracarboxylic dianhydride), a-BPDA affords oligomers with lower melt viscosities and when cured, higher Tgs. Several candidates exhibited the appropriate combination of properties such as a low and stable melt viscosity required for RTM processes, high cured Tg, and moderate toughness. The chemistry, physical, and composite properties of select resins will be discussed.

Author

Anhydrides; Composite Structures; Fabrication; High Temperature; Resin Transfer Molding; Imides

20030013734 National Central Univ., Dept. of Mechanical Engineering, Taoyuan Taiwan, Province of China

Thermal Properties of Phenolic Foam Insulation

Tseng, Chung-Jen, National Central Univ., Taiwan, Province of China; Kuo, Kuang-Te, National Central Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 753-758; In English; Copyright; Avail: Issuing Activity

This paper presents experimental results concerning thermal properties of phenolic foams, with or without activated carbon. Effective thermal conductivity (k(sub eff)) of various samples is measured using heat flow thermal conductivity testers that comply with ASTM C518. Transmittance spectra are taken using FTIR for samples of various densities. Extinction coefficient spectra are obtained by applying Beer's law. The Rosseland mean extinction coefficients and radiative thermal conductivities are then obtained for various temperatures. Results show that k(sub eff) increases with temperature, Furthermore, it takes only approximately 2 hours for the sample to become saturated with moisture. The k(sub eff) of saturated samples is about 20% higher than that of the dry samples. Addition of activated carbon shows no appreciable effect on k(sub eff). The extinction coefficient increases with sample density. Radiation accounts for approximately 15% of the total heat transfer for phenolic foams at near room temperatures.

Author

Thermodynamic Properties; Thermal Conductivity; Foams; Phenols; Insulation; Heat Transmission; Activated Carbon

20030013749 National Cheng Kung Univ., Dept. of Engineering Science, Tainan, Taiwan, Province of China

A New Fabrication Process for a Flexible Skin with Temperature Sensor Array

Lee, Gwo-Bin, National Cheng Kung Univ., Taiwan, Province of China; Wu, Ji-How, National Cheng Kung Univ., Taiwan,

Province of China; Miau, Jiun-Jih, National Cheng Kung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 619-625; In English
Contract(s)/Grant(s): NSC-88-2212-E-006-080; Copyright; Avail: Issuing Activity

In the present study, a new technique for fabrication of a flexible skin with 64 sensors inside a 7 x 7 sq mm area is reported. Each sensor has a dimension of 110 microns 110 x 100 microns. A simplified fabrication process using platinum resistors as sensing materials and polyimide layers as flexible substrates is developed. Systematic investigation of the performance of the sensors has been conducted, including sensors on rigid and flexible substrates for comparison. Sensors on rigid substrates have a sensitivity of 74.6 mV/C with a cut-off frequency of 90 kHz using a constant-current circuit. Sensors on the flexible skin have been experimentally proven to have the same sensitivity as those on the rigid substrate. Moreover, the frequency response has been improved due to lower inertia for sensors on the flexible skin. The flexible skin with a temperature sensor array could be easily attached on a highly curved surface to detect temperature distribution inside a small area. The development of the temperature sensor array on the flexible skin could be crucial for temperature measurement in the fields of aerodynamics, space exploration, automaking etc.

Author

Detection; Fabrication; Frequency Response; Surface Temperature; Temperature Measurement; Temperature Sensors

20030013755 NASA Langley Research Center, Hampton, VA USA

Constitutive Modeling of Nanotube-Reinforced Polymer Composites

Odegard, G. M., NASA Langley Research Center, USA; Gates, T. S., NASA Langley Research Center, USA; Wise, K. E., National Academy of Sciences - National Research Council, USA; [2002]; 13p; In English; 43rd AIAA/ASME/ASCE/AHS Structures, Structural Dynamics and Materials Conference, 22-25 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-1427; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

In this study, a technique is presented for developing constitutive models for polymer composite systems reinforced with single-walled carbon nanotubes (SWNT). Because the polymer molecules are on the same size scale as the nanotubes, the interaction at the polymer/nanotube interface is highly dependent on the local molecular structure and bonding. At these small length scales, the lattice structures of the nanotube and polymer chains cannot be considered continuous, and the bulk mechanical properties can no longer be determined through traditional micromechanical approaches that are formulated by using continuum mechanics. It is proposed herein that the nanotube, the local polymer near the nanotube, and the nanotube/polymer interface can be modeled as an effective continuum fiber using an equivalent-continuum modeling method. The effective fiber serves as a means for incorporating micromechanical analyses for the prediction of bulk mechanical properties of SWNT/polymer composites with various nanotube shapes, sizes, concentrations, and orientations. As an example, the proposed approach is used for the constitutive modeling of two SWNT/LaRC-SI (with a PmPV interface) composite systems, one with aligned SWNTs and the other with three-dimensionally randomly oriented SWNTs. The Young's modulus and shear modulus have been calculated for the two systems for various nanotube lengths and volume fractions.

Author

Carbon Nanotubes; Continuum Mechanics; Mathematical Models; Mechanical Properties; Molecular Structure; Micromechanics

20030013956 NASA Langley Research Center, Hampton, VA USA

Polyimide Foams from Friable Balloons

Weiser, Erik S., NASA Langley Research Center, USA; Grimsley, Brian W., NASA Langley Research Center, USA; Pipes, R. Bryon, Akron Univ., USA; Williams, Martha K., NASA Kennedy Space Center, USA; [2002]; 12p; In English; 47th International SAMPE Symposium and Exhibition, 12-15 May 2002, Long Beach, CA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent advancements in high temperature polymeric materials at NASA Langley Research Center have led to the development of new polyimide foam systems with attractive properties. These foam materials have application as insulation for the cryogenic fuel tanks for the next generation reusable launch vehicles, commercial and defense marine ships and commercial aircraft. While the first foaming process developed consisted of thermal cycling the polymer precursor residuum and allowing the inflation of the particles to interact to create the foam. An innovative foaming process has been developed that begins with partially inflated microspheres with incomplete polymer molecular weight gain. Termed, "friable balloons," this new precursor form can be poured into a mold to "foam in place" the desired geometry. In addition, the new foaming concept produces a wide

range of foam products with varying degrees of open and closed cell structure, compressive strength and tensile strength. Foamed in place Nomex honeycomb core materials are tested to evaluate the enhancements achieved by the addition of this new polyimide foam to the core material. The addition of the polyimide foam to the Nomex honey comb resulted in an increase in compressive strength by as much as 25% over the unfilled core.
Author
Foams; Polyimides; Plastics; Balloons; Compressive Strength; Inflating

20030014003 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Quasi-Static Uniaxial Tension Characteristics of Plain-Woven Kevlar KM2 Fabric ***Final Report, Jun. 2001-Jul. 2002***
Raftenberg, Martin N.; Mulkern, Thomas J.; Dec. 2002; 42p; In English; Original contains color images
Contract(s)/Grant(s): Proj-1L162618AH80
Report No.(s): AD-A409229; ARL-TR-2891; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Quasi-static uniaxial tension tests were conducted on 30.8-mm-wide single-ply specimens of plain-woven DuPont Keviar KM2 aramid fabric (style 706). Six specimens were pulled along the warp direction, and six were pulled along the fill direction. The strength was found to range from 2.07 to 2.33 GPa, with a mean of 2.23 GPa in the warp direction and from 2.47 to 2.77 GPa, with a mean of 2.67 GPa in the fill direction. A bilinear, an exponential, and a quartic fit were obtained to the fabric stress-crosshead displacement curve from each test, with the quartic fit generally found to be the closest.
DTIC
Mechanical Properties; Tensile Stress; Fabrics; Kevlar (Trademark); Armor

20030014095 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Nanostructured Hybrid Organic/Inorganic Materials. Silsesquioxane Modified Plastics
Haddad, Tim; Phillips, Shawn; Dec. 17, 1998; 4p; In English; Prepared in collaboration with Raytheon Corp., and Hybrid Plastics, Fountain Valley, CA
Contract(s)/Grant(s): AF Proj. 2303
Report No.(s): AD-A409298; AFRL-PR-ED-TP-FY99-0029; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The design of new materials with enhanced properties continues to be a driver for the investigation of hybrid inorganic/organic polymers. As hybrid materials are copolymers based on inorganic and organic comonomers, they display enhanced properties by bridging the property space between two dissimilar types of compounds. A typical hybrid material will contain a crosslinked inorganic phase bound (often covalently) with an organic phase. Depending on the relative amounts of the two components, the properties of the resulting hybrid are intermediate between those of an inorganic and an organic polymer. Such methodology can be used to create either plastic inorganics or toughened plastics, and is superior to traditional blending methods. However, because such materials are crosslinked networks, they are difficult to study and control at the molecular level and are also difficult to process.
DTIC
Organic Materials; Inorganic Materials; Plastics; Copolymers

20030014096 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
The Synthesis of Hybrid Materials by the Blending of Polyhedral Oligosilsesquioxanes into Organic Polymers
Blanksi, Rusty L.; Phillips, Shawn H.; Chaffee, Kevin; Lichtenhan, Joseph; Lee, Andre; Apr. 17, 2000; 16p; In English; Presented at Materials Research Society Meeting, held in
Contract(s)/Grant(s): AF Proj. 2303
Report No.(s): AD-A409297; AFRL-PR-ED-TP-2000-070; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The goal of this research was to study the interaction and solubility of polyhedral Oligosilsesquioxane (POSS) molecules containing various organic side groups with the polymer matrix. Polystyrene was chosen since it is readily available and can easily be solvent cast with the POSS molecules for TEM studies.
DTIC
Oligomers; Polystyrene; Molecules; Solubility; Solvents

20030014111 Uniax Corp., Goleta, CA USA

Flexible Polymer LEDs Using Lanthanide/Polymer Blends: A route to Flexible Three-Color Displays ***Final Report, 1 Aug. 1999-31 Aug 2001***

Mar. 01, 2002; 39p; In English

Contract(s)/Grant(s): F49620-99-C-0055; Proj-STTR

Report No.(s): AD-A409271; AFRL-SR-AR-TR-02-0422; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

PLEDs fabricated on flexible substrates offer advantages over the current standard glass substrates. Flexible display devices are lighter weight than their glass counterparts, fracture-resistant and have a thinner profile making them of particular interest for military land vehicle applications. Flexibility eases placement in instrument panels in tightly confined spaces, while resistance to fracture when accidentally struck by personnel is also a plus. Manufacturing costs should ultimately be lower than with glass substrates. The long-range goal of flexible 3-color displays offers the possibility of lightweight laptop computer screens and roll-up flat panel displays among other applications. During Phase II we increased the efficiency of the polymer/ lanthanide blends by 20% over Phase I performance by the synthesis and incorporation into PLEDs of a new europium complex. We patterned more complex structures on plastic substrates and built, packaged and drove plastic yellow-green polymer displays with more than 6,000 pixels. Limited lifetimes kept blue and red emitting systems from being incorporated into the final plastic displays.

DTIC

Polymers; Glass; Flat Panel Displays; Display Devices; Polymer Blends; Flexibility

20030014129 Argonne National Lab., Chemical Technology Div., IL USA

Glass Dissolution Rates from Static and Flow-Through Tests

Jeong, S. -Y.; Ebert, W. L.; Aug. 2002; 14p; In English

Report No.(s): DE2002-799829; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We measured the dissolution rate of a simple five-component glass at 70 degrees C using static tests and single-pass flow through (SPFT) tests with pH buffers at pH values of 6.2, 8.3, and 9.6. The two methods yielded similar rates; however, the measured rates are about 10X higher than the rates measured previously for a glass having the same composition using an SPFT test method. Differences are attributed to how the effect of the solution flow rate on the glass dissolution rate was taken into account and how the surface area of crushed glass was estimated. The differences indicate the need to standardize the SPFT test procedure. In the model, the glass dissolution rate depends on temperature, pH, and the compositions of the glass and solution.

NTIS

Glass; Reaction Kinetics; Dissolving

20030014163 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

The Synthesis of Hybrid Materials by the Blending of Polyhedral Oligosilsesquioxanes into Organic Polymers

Blanski, Rusty L.; Phillips, Shawn H.; Chaffee, Kevin; Lichtenhan, Joseph; Lee, Andre; Apr. 17, 2000; 8p; In English; Prepared in cooperation with Michigan State Univ., East Lansing, MI and Hybrid Plastics, Fountain Valley, CA

Contract(s)/Grant(s): AF Proj. 2303

Report No.(s): AD-A409240; AFRL-PR-ED-TP-2000-071; MRS-35790; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The study of organic/inorganic hybrid materials has become an increasingly widespread research focus. The advantage derived from such materials is the combining of two very different compounds which may result in something that bridges the performance gap between the two systems. We have previously reported such hybrid systems prepared by incorporating polyhedral oligosilsesquioxanes (POSS(TM)) into traditional organic polymers by the copolymerization of POSS(TM) monomers and organic monomers. This presentation will discuss a more convenient method of incorporating POSS(TM) into a polymer: the blending of POSS(TM) into organic polymers. The research discussion will focus on the development of the POSS(TM) macromers used in our studies as well as the POSS(TM) polymer blends synthesized. One important property enhancement observed is the increase in surface hardness for a POSS(TM)/polystyrene sample.

DTIC

Polymers; Synthesis (Chemistry)

20030014178 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA

Preparation and Properties of Polyhedral Oligosilsesquioxanes/Polymers Blends

Blanski, Rusty L.; Phillips, Shawn; Lee, Andre; Dec. 22, 2000; 3p; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A409335; AFRL-PR-ED-AB-2000-237; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The synthesis of silsesquioxane/polymer blends and copolymers has expanded greatly in recent years. These materials have the advantage of combining a well defined ceramic type molecule with an organic polymer which can result in a material that may bridge the performance gap between the two systems. Earlier, we reported that the organic side groups of polyhedral oligosilsesquioxanes (POSS) have an enormous influence on the solubility of POSS in polystyrene with the phenethyl POSS being the most soluble. We now report that phenethyl POSS is dispersible in a wide range of aromatic ring- containing polymers (polycarbonate, SB rubber, etc.) resulting in a clear blend. We also report that aliphatic POSS compounds are also dispersible in high density polyethylene. The synthesis of POSS/polymer blends as well as some physical properties will be discussed.
DTIC
Copolymers; Synthesis (Chemistry); Polymer Blends; Oligomers; Physical Properties; Organic Compounds

20030014323 Lawrence Livermore National Lab., Livermore, CA USA
Excess Weapons Plutonium Immobilization in Russia. A Review of LLNL Contract Work
Jardine, L. J.; Borisov, G. B.; Apr. 15, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792689; UCRL-ID-13861; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Opening Session; Russian Engineering and Industrial Site Plutonium Immobilization Contract Activities; Research and Development Plutonium Immobilization Contact Activities; Closing Session; Meeting Summary and Appendices.
NTIS
Ceramics; Plutonium; Waste Disposal; Radioactive Wastes

20030014331 NASA Langley Research Center, Hampton, VA USA
Thermo-Mechanical Analyses of Dynamically Loaded Rubber Cylinders
Johnson, Arthur R., NASA Langley Research Center, USA; Chen, Tzi-Kang, NASA Langley Research Center, USA; [2002]; 18p; In English; Fall Meeting on the Rudder Division: American Chemical Society, 8-11 Oct. 2002, Pittsburgh, PA, USA; Original contains color illustrations
Report No.(s): Paper-36; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Thick rubber components are employed by the Army to carry large loads. In tanks, rubber covers road wheels and track systems to protect roadways. It is difficult for design engineers to simulate the details of the hysteretic heating for large strain viscoelastic deformations. In this study, an approximation to the viscoelastic energy dissipated per unit time is investigated for use in estimating mechanically induced viscoelastic heating. Coupled thermo-mechanical simulations of large cyclic deformations of rubber cylinders are presented. The cylinders are first compressed axially and then cyclically loaded about the compressed state. Details of the algorithm and some computational issues are discussed. The coupled analyses are conducted for tall and short rubber cylinders both with and without imbedded metal disks.
Author
Viscoelasticity; Rubber; Thermodynamics; Algorithms; Cylinders; Dynamic Loads; Mechanical Properties

20030014490 NASA Langley Research Center, Hampton, VA USA
Terrain Portrayal for Head-Down Displays Experiment
Hughes, Monica F., NASA Langley Research Center, USA; Takallu, M. A., Lockheed Martin Corp., USA; [2002]; 12p; In English; International Advanced Aviation Technologies Conference, 20-23 Aug. 2002, Anchorage, AK, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The General Aviation Element of the Aviation Safety Program's Synthetic Vision Systems (SVS) Project is developing technology to eliminate low visibility induced General Aviation (GA) accidents. SVS displays present computer generated 3-dimensional imagery of the surrounding terrain on the Primary Flight Display (PFD) to greatly enhance pilot's situation awareness (SA), reducing or eliminating Controlled Flight into Terrain, as well as Low-Visibility Loss of Control accidents. SVS-conducted research is facilitating development of display concepts that provide the pilot with an unobstructed view of the outside terrain, regardless of weather conditions and time of day. A critical component of SVS displays is the appropriate presentation of terrain to the pilot. An experimental study has been conducted at NASA Langley Research Center (LaRC) to explore and quantify the relationship between the realism of the terrain presentation and resulting enhancements of pilot SA and pilot performance. Composed of complementary simulation and flight test efforts, Terrain Portrayal for Head-Down Displays (TP-HDD) experiments will help researchers evaluate critical terrain portrayal concepts. The experimental effort is to provide data to enable design trades that optimize SVS applications, as well as develop requirements and recommendations to facilitate the certification process. This paper focuses on the experimental set-up and preliminary qualitative results of the TP-HDD

simulation experiment. In this experiment a fixed based flight simulator was equipped with various types of Head Down flight displays, ranging from conventional round dials (typical of most GA aircraft) to glass cockpit style PFD's. The variations of the PFD included an assortment of texturing and Digital Elevation Model (DEM) resolution combinations. A test matrix of 10 terrain display configurations (in addition to the baseline displays) were evaluated by 27 pilots of various backgrounds and experience levels. Qualitative (questionnaires) and quantitative (pilot performance and physiological) data were collected during the experimental runs. Preliminary results indicate that all of the evaluation pilots favored SVS displays over standard gauges, in terms of terrain awareness, SA, and perceived pilot performance. Among the terrain portrayal concepts tested, most pilots preferred the higher-resolution DEM. In addition, with minimal training, low-hour VFR evaluation pilots were able to negotiate a precision approach using SVS displays with a tunnel in the sky guidance concept.
Author
Flight Instruments; Situational Awareness; Display Devices; Terrain; General Aviation Aircraft; Flight Simulation; Pilot Performance; Aircraft Pilots

20030014498 NASA Langley Research Center, Hampton, VA USA
Evaluating Thermally Damaged Polyimide Insulated Wiring (MIL-W-81381) with Ultrasound
Madaras, Eric I., NASA Langley Research Center, USA; Anastasi, Robert F., Army Research Lab., USA; [2002]; 10p; In English; 6th Joint FAA/DOD/NASA Aging Aircraft Conference, 16-19 Sep. 2002, San Francisco, CA, USA; Sponsored by Federal Aviation Administration, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A series of experiments to investigate the use of ultrasound for measuring wire insulation have been conducted. Initial laboratory tests were performed on MIL-W-81381/7,/12, and /21 aviation wire, a wire that has polyimide (Kapton Registered Trademark) layers for insulation. Samples of this wiring were exposed to 370C temperatures for different periods of time to induce a range of thermal damage. For each exposure, 12 samples of each gauge (12, 16, and 20 gauges) were processed. The velocity of the lowest order axisymmetric ultrasonic guided mode, a mode that is sensitive to the geometry and stiffness of the wire conductor and insulation, was measured. The phase velocity for the 20-gauge MIL-W-81381/7 wire had a baseline value of 3023 +/- 78 m/s. After exposure to the high temperatures, the wire's phase velocity rapidly increased, and reached an asymptotic value of 3598 +/- 20 m/s after 100 hours exposure. Similar behavior was measured for the 16 gauge MIL-W-81381/21 wire and 12 gauge MIL-W-81381/12 wire which had baseline values of 3225 +/- 22 m/s and 3403 +/- 33 m/s respectively, and reached asymptotic values of 3668 +/- 19 m/s, and 3679 +/- 42 m/s respectively. These measured velocity changes represent changes of 19, 14, and 8 percent respectively for the 20, 16, and 12 gauge wires. Finally, some results for a wire with an ethylene tetrafluoroethylene insulation are reported. Qualitatively similar behaviors are noted ultrasonically.
Author
Ultrasonic Flaw Detection; Nondestructive Tests; Temperature Effects; Phase Velocity; Electric Wire; Electrical Insulation; Wave Propagation

20030014601 NASA Ames Research Center, Moffett Field, CA USA
Thermal Protection System Evaluation Using Arc-jet Flows: Flight Simulation or Research Tool?
Stewart, David A., NASA Ames Research Center, USA; Nov. 20, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr. 203, Nashville, TN, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The arc-jet has been used to evaluate thermal protection systems (TPS) and materials for the past forty years. Systems that have been studied in this environmerd include ablators, active, and passive TPS concepts designed for vehicles entering planetary and Earth atmospheres. The question of whether arc-jet flow can simulate a flight environment or is it a research tool that provides an aero-thermodynamic heating environment to obtain critical material properties will be addressed. Stagnation point tests in arc-jets are commonly used to obtain material properties such as mass loss rates, thermal chemical stability data, optical properties, and surface catalytic efficiency. These properties are required in computational fluid dynamic codes to accurately predict the performance of a TPS during flight. Special facilities have been developed at NASA Ames Research Center to approximate the flow environment over the mid-fuselage and body flap regions of proposed space-planes type vehicles. This paper compares flow environments generated in flight over a vehicle with those created over an arc-jet test articles in terms of scale, chemistry, and fluid dynamic properties. Flight experiments are essential in order to validate the material properties obtained from arc-jet tests and used to predict flight performance of any TPS being considered for use on a vehicle entering the Earth atmosphere at hypersonic speed.
Author
Thermal Protection; Flight Simulation; Arc Jet Engines; Jet Flow; Computational Fluid Dynamics; Aerothermodynamics

20030014602 NASA Ames Research Center, Moffett Field, CA USA

Reusable Surface Insulation Tile Thermal Protection Materials: Past, Present and the Future

Leiser, Daniel B., NASA Ames Research Center, USA; Stewart, David A., NASA Ames Research Center, USA; Nov. 20, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr. 2003, Nashville, TN, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Silica (LI-900) Reusable Surface Insulation (RSI) tile have been used on the majority of the Shuttle since its initial flight. Its overall performance with Reaction Cured Glass (RCG) coating applied will be reviewed. Improvements in insulations, Fibrous Refractory Composite Insulation (FRCI-12) and Alumina Enhanced Thermal Barrier (AETB-8) and coatings/surface treatments such as Toughened Uni-Piece Fibrous Insulation (TUFI) have been developed and successfully applied. The performance of these enhancements on the Shuttle Orbiters over the past few years along with the next version of tile materials, High Efficiency Tantalum-based Ceramic (HETC) with even broader applicability will also be discussed.

Author

Reusable Heat Shielding; Thermal Protection; Tiles; Thermal Insulation; Ceramics

20030014605 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Tropospheric Chemistry Studies using Observations from GOME and TOMS ***Final Report, 1 Jan. 1999 - 30 Sep. 2002***

Chance, Kelly, Smithsonian Astrophysical Observatory, USA; Spurr, Robert J. D., Smithsonian Astrophysical Observatory, USA; Kurosu, Thomas P., Smithsonian Astrophysical Observatory, USA; Jacob, Daniel J., Harvard Univ., USA; Gleason, James F., NASA Goddard Space Flight Center, USA; January 2003; 10p; In English

Contract(s)/Grant(s): NAG1-2153; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Studies to quantitatively determine trace gas and aerosol amounts from the Global Ozone Monitoring Experiment (GOME) and the Total Ozone Monitoring Experiment (TOMS) and to perform chemical modeling studies which utilize these results are given. This includes: 1. Analysis of measurements from the GOME and TOMS instruments for troposphere distributions of O3 and HCHO; troposphere enhancements of SO2, NO2 and aerosols associated with major sources; and springtime events of elevated BrO in the lower Arctic troposphere. 2. Application of a global 3-dimensional model of troposphere chemistry to interpret the GOME observations in terms of the factors controlling the abundances of troposphere ozone and OH.

Derived from text

Atmospheric Chemistry; Total Ozone Mapping Spectrometer; Troposphere; Observation; Aerosols; Gas Composition; Volatile Organic Compounds; Satellite Observation

20030014610 NASA Ames Research Center, Moffett Field, CA USA

Alternative Processing Methods for Ultra High Temperature Ceramics

Gusman, Michael, Eloret Corp., USA; Beckman, Sarah, Eloret Corp., USA; Gasch, Matthew, Eloret Corp., USA; Ellerby, Don, NASA Ames Research Center, USA; Lau, Kai-Hung, SRI International Corp., USA; Sanjurjo, Angel, SRI International Corp., USA; Johnson, Sylvia M., NASA Ames Research Center, USA; Nov. 20, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr. 2003, Nashville, TN, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Ultra High Temperature Ceramics (UHTCs) are being developed for possible use in a number of structural applications including hypersonic vehicles, engines, plasma arc electrodes and high temperature shielding. Alternative methods of processing Ultra High Temperature Ceramics (UHTCs) will be discussed. Techniques that may improve oxidation resistance, strength, and reduce the processing temperature of the UHTCs will be presented. Hot-pressed UHTCs made using either milled/uncoated powders or non-milled coated powders will be compared.

Author

Ceramics; Hot Pressing; Refractory Coatings; Mechanical Properties

20030014623 Eloret Corp., Moffett Field, CA USA

Morphologies, Processing and Properties of Ceramic Foams from Pre-Ceramic Foams from Pre-Ceramic Polymer Routes

Stackpoole, Mairead, Eloret Corp., USA; Simoes, Conan R., Washington Univ., USA; Nov. 21, 2002; 1p; In English; 105th Annual Meeting and Exposition of the American Ceramic Society, 27-30 Apr. 2003, Nashville, TN, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The current research is focused on processing ceramic foams that have potential as a thermal protection material. Ceramic foams with different architectures were formed from the pyrolysis of pre-ceramic polymers at 1200 C in different atmospheres. In some systems a sacrificial polyurethane was used as the blowing agent. We have also processed foams using sacrificial fillers to introduce controlled cell sizes. Each sacrificial filler or blowing agent leads to a unique morphology. The effect of different

fillers on foam morphologies will be presented. The presentation will also focus on characterization of these foams in terms of mechanical and thermal properties. Foams processed using these approaches having bulk densities ranging from 0.15 to 0.9 g per cubic centimeter and a cell sizes from 5 to 500 micrometers. Compression strengths ranged from 2 to 7 MPa for these materials. Author

Ceramics; Foams; Morphology; Thermal Protection; Thermodynamic Properties; Mechanical Properties; Polymers

20030014634 NASA Glenn Research Center, Cleveland, OH USA

Fractional-Order Viscoelasticity (FOV): Constitutive Development Using the Fractional Calculus: First Annual Report ***Annual Report***

Freed, Alan, NASA Glenn Research Center, USA; Diethelm, Kai, Technische Univ., Germany; Luchko, Yury, European Univ. Viadrina, Germany; December 2002; 138p; In English

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

Report No.(s): NASA/TM-2002-211914; NAS 1.15:211914; E-13607; Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

This is the first annual report to the U.S. Army Medical Research and Material Command for the three year project ”Advanced Soft Tissue Modeling for Telemedicine and Surgical Simulation” supported by grant No. DAMD17-01-1-0673 to The Cleveland Clinic Foundation, to which the NASA Glenn Research Center is a subcontractor through Space Act Agreement SAA 3-445. The objective of this report is to extend popular one-dimensional (1D) fractional-order viscoelastic (FOV) materials models into their three-dimensional (3D) equivalents for finitely deforming continua, and to provide numerical algorithms for their solution. Author

Medical Science; Telemedicine; Elastic Properties; Numerical Differentiation; Numerical Integration; Viscoelasticity

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.

20030012604 Lawrence Livermore National Lab., Livermore, CA USA

High Efficiency Steam Electrolyzer

Pham, A. Q.; Jun. 19, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-792600; UCRL-ID-138838; No Copyright; Avail: National Technical Information Service (NTIS)

A novel steam electrolyzer has been developed. In conventional electrolyzers, oxygen produced from electrolysis is usually released in the air stream. In our novel design, natural gas is used to replace air in order to reduce the chemical potential difference across the electrolyzer, thus minimizing the electrical consumption. The oxygen from the electrolysis is consumed in either a total oxidation or a partial oxidation reaction with natural gas.

NTIS

Hydrogen; Energy Conversion Efficiency

20030012612 EnerTech Environmental, Inc., Atlanta, GA USA

Co-Utilization of Coal and E-Fuel from EnerTech’s SlurryCarb Process ***Progress Report***

2000; 20p; In English

Report No.(s): DE2002-778389; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objectives of the project were to design, construct, and operate a fully integrated Process Design Facility (PDF) incorporating the SlurryCarb technology to generate a carbonized fuel from MSS or other organic wastes and to conduct combustion testing of the product slurry fuel in co-firing applications with coal. Project Definition consisted of six tasks and had an overall objective to provide for project baselining in order to minimize the technical and economic risk associated with the performance of the project. Risk minimization was accomplished by establishing satisfactory management, coordination, and controls essential to the conduct of the project and successfully completing the NEPA review in a timely manner.

NTIS

Coal; Slurries

20030012618 Lawrence Livermore National Lab., Livermore, CA USA
PBX 9501 Outgas Analysis by SPME/GC/MS
Chambers, D. M.; Dec. 11, 2000; In English
Report No.(s): DE2002-792331; UCRL-ID-136988; No Copyright; Avail: National Technical Information Service (NTIS)
We used equilibrium headspace gas chromatography/mass spectrometry (GC/MS) to monitor volatile and semivolatile species that are expected to migrate through PBX 9501 under environmentally relevant conditions. In this work we screened 11 samples taken from deployed parts. Although a number of chemical permeates were identified, the antioxidant signature provided the most information with regard to decomposition aging. Specifically, we were able to monitor butylated hydroxytoluene (BHT) and other antioxidants, which are apparently added to either the Estane adipate or MDI precursor by the manufacturer. We found that in those parts where diphenylamine (DPA) was used as a stabilizer, BHT response was significantly lower than in those formulations stabilized with Irganox 1010 (Irganox). These results imply that DPA is less efficient as a radical scavenger than Irganox. This lower efficiency might be related to the lack of oxygen in the weapon environment, which is initially less than 0.1%. With regard to DPA, it has been reported that radical scavenging activity is proportional to the oxygen pressure. At this time we are uncertain whether the low DPA efficiency is mainly attributed to the oxygen level or if there is another rate limiting step that would lead to the preferential consumption of BHT.
NTIS
Chemical Reactions; Propellant Explosions

20030012621 Lawrence Livermore National Lab., Livermore, CA USA
Toward Unraveling the Photochemistry of TATB
Manaa, M. R.; Schmidt, R.; Overturf, G.; Watkins, B.; Fried, L.; Nov. 02, 1999; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792425; UCRL-ID-134559; No Copyright; Avail: National Technical Information Service (NTIS)
A combined theoretical and experimental chemical analysis has been conducted to unravel the mechanism underlying the color change of yellow TATB (1,3,5, triamino- trinitro-benzene) to green upon UV irradiation. There is strong evidence to conclude that the process is photochemical in nature and due to the formation of the mono nitroso derivative. We have identified a chemical synthesis by which this derivative compound can be produced in the laboratory, thus allowing for direct testing and determination of its chemical and physical properties. Calculations also show only a slight decrease in the sensitivity and performance of the irradiated materials, attributed to the formation of this previously unidentified species.
NTIS
Explosives; Photochemical Reactions

20030012746 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Fluidized-bed Incineration of Explosives-Contaminated Waste ***Destruktion av Explosivaemnesavfall i Fluidiserad Baedd***
Carlsson, T.; Oct. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2003-101033; FOI-R-0229-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Due to the armed forces' excess of ammunition today, large amounts of ammunition are sent to disposal. Valuable components, e.g. metals and explosives, are recycled for civil applications. The recycle processes are not closed processes; however, and generates industrial waste just like any conventional industrial process. The difference is that this waste often is contaminated with explosives. Therefore, it cannot be sent to a conventional waste incineration plant, but has to be disposed of on site. Today, this is achieved by open burning, hence, resulting in uncontrolled emissions of air pollutants. In this report, methods to dispose of explosives-contaminated waste is demonstrated. by first wet-grinding the waste, mixing it with water and adding stabilizers, a non-detonable, non-setting, pumpable slurry can be formed. The slurry can then be pumped into a fluidized bed, where it burns. This enables cleaning of the exhaust gases and prevents emissions of hazardous pollutants.
NTIS
Industrial Wastes; Explosives; Pollution Control; Air Pollution

20030012960 Air Products and Chemicals, Inc., Allentown, PA USA
Alternative Fuels and Chemicals from Synthesis Gas ***Progress Report***
2001; 10p; In English
Report No.(s): DE2002-801221; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The overall objectives of this program are to investigate potential technologies for the conversion of synthesis gas to oxygenated and hydrocarbon fuels and industrial chemicals, and to demonstrate the most promising technologies at DOE's

LaPorte, Texas, Slurry Phase Alternative Fuels Development Unit (AFDU). The program will involve a continuation of the work performed under the Alternative Fuel from Coal-Derived Synthesis Gas Program and will draw upon information and technologies generated in parallel current and future DOE-funded contracts.
NTIS
Synthesis Gas; Conversion; Fossil Fuels; Clean Fuels; Coal Derived Gases; Coal Gasification; Synthetic Fuels

20030013738 Lawrence Livermore National Lab., Livermore, CA USA
Tensile and Compressive Mechanical Properties of Billet Pressed LX17-1 as a Function of Temperature and Strain Rate
Groves, S.; Cunningham, B.; Jan. 26, 2000; 58p; In English
Report No.(s): DE2002-802097; UCRL-ID-137477; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report documents mechanical property test data on LX 17-1, a plastic bonded explosive. The data was generated using equipment and test facilities situated at the High Explosives Test Facility (HEAF), Lawrence Livermore National Laboratory, Livermore, California. The report contains uniaxial tensile and compressive stress-strain data derived from tests performed at several temperatures and strain-rates. In addition, the report contains a number of scanning electron microscope images that show some of the structural aspects of the subject material.
NTIS
Explosives; Plastics; Tensile Tests; Compressive Strength

20030013988 Sierra Engineering, Inc., Carson City, NV USA
The Performance of Hydrocarbon Fuels with H2O2 in a Uni-Element Combustor. An Abstract for the 2003 AIAA/JPC
Muss, Jeff; Johnson, Curtis; Kruse, William; Cohn, Richard; Nov. 12, 2002; 3p; In English; Prepared in cooperation with TRW, Redondo Beach, CA. Contains an abstract only
Contract(s)/Grant(s): F04611-01-C-0010; AF Proj. BMDO
Report No.(s): AD-A409178; AFRL-PR-ED-AB-2002-282; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A team including Sierra Engineering, AFRL, and TRW tested several different hydrocarbon fuels in a 1200 pound thrust hydrogen peroxide hydrocarbon rocket unielement combustor at the AFRL propulsion directorate Edwards AFB research site. Tests were conducted with a variety of hydrocarbon fuels, including JP-8, RP-1-, JP-10, toluene quadricyclane, and turpentine as well as a several mixtures of these listed fuels. The combustor used decomposed hydrogen peroxide at concentrations of 90% as the oxidizer. The water-cooled combustion chamber included significant fuel film cooling with an overall mixture ratio between 4 and 6. All testing was conducted at a chamber pressure of approximately 780 psia.
DTIC
Combustion Chambers; Hydrocarbon Fuels; Hydrogen Peroxide; Liquid Cooling

20030014085 Arizona State Univ., Center for Solid State Science, Tempe, AZ USA
Atomic Level Imaging of CO2 Disposal as a Carbonate Mineral: Optimizing Reaction Process Design ***Annual Report***
McKelvy, M. J.; Sharma, R.; Chizmeshya, A. V. G.; Bearat, H.; Carpenter, R. W.; Sep. 1999; In English
Report No.(s): DE2002-778329; No Copyright; Avail: National Technical Information Service (NTIS)
Fossil fuels, especially coal, can support the energy demands of the world for centuries to come, if the environmental problems associated with CO(sub 2) emissions can be overcome. Permanent and safe methods for CO(sub 2) capture and disposal/storage need to be developed. Mineralization of stationary-source CO(sub 2) emissions as carbonates can provide such safe capture and long-term sequestration. Mg(OH) (sub 2) carbonation is a leading process candidate, which generates the stable naturally occurring mineral magnesite (MgCO(sub 3)) and water. Key to process cost and viability are the carbonation reaction rate and its degree of completion. This process, which involves simultaneous dehydroxylation and carbonation is very promising, but far from optimized. In order to optimize the dehydroxylation/carbonation process, an atomic-level understanding of the mechanisms involved is needed. Since Mg(OH) (sub 2) dehydroxylation is intimately associated with the carbonation process, its mechanisms are also of direct interest in understanding and optimizing the process.
NTIS
Carbonates; Waste Disposal; Fossil Fuels; Air Pollution; Pollution Control

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.

20030014593 NASA Glenn Research Center, Cleveland, OH USA
Experimental Methods in Reduced-Gravity Soldering Research
Pettegrew, Richard D., National Center for Microgravity Research on Fluids and Combusiton, USA; Struk, Peter M., NASA Glenn Research Center, USA; Watson, John K., NASA Johnson Space Center, USA; Haylett, Daniel R., National Center for Microgravity Research on Fluids and Combusiton, USA; December 2002; 13p; In English; Second International Brazing and Soldering Conference, 17-19 Feb. 2003, San Diego, CA, USA; Sponsored by American Society for Metals, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 101-58-0F
Report No.(s): NASA/TM-2002-211993; NAS 1.15:211993; E-13664; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The National Center for Microgravity Research, NASA Glenn Research Center, and NASA Johnson Space Center are conducting an experimental program to explore the influence of reduced gravity environments on the soldering process. An improved understanding of the effects of the acceleration environment is important to application of soldering during current and future human space missions. Solder joint characteristics that are being considered include solder fillet geometry, porosity, and microstructural features. Both through-hole and surface mounted devices are being investigated. This paper focuses on the experimental methodology employed in this project and the results of macroscopic sample examination. The specific soldering process, sample configurations, materials, and equipment were selected to be consistent with those currently on-orbit. Other apparatus was incorporated to meet requirements imposed by operation onboard NASA's KC-135 research aircraft and instrumentation was provided to monitor both the atmospheric and acceleration environments. The contingent of test operators was selected to include both highly skilled technicians and less skilled individuals to provide a population cross-section that would be representative of the skill mix that might be encountered in space mission crews.
Author
Microgravity; Gravitational Effects; Soldering; Joints (Junctions); Fluxes

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.

20030012602 Helsinki Univ. of Technology, Ship Hydrodynamics Lab., Espoo, Finland
Annual Report 1997 (Ship Hydromechanics Laboratory, Delft University of Technology) ***Annual Report 1997***
De Heer, P. W.; Sep. 1998; 56p; In English
Report No.(s): PB2003-101224; Copyright; Avail: National Technical Information Service (NTIS)

This report contains an overview of the organization and activities of the Department of Ship Hydromechanics of the division of Marine Technology of the Delft University of Technology. The division of Marine Technology is part of the Faculty of Mechanical Engineering and Marine Technology. Other departments in Marine Technology are the Ship Design department, the Ship Strength and Construction department and the Shipbuilding department. All four departments are jointly responsible for the education and research in the field of Marine Technology.
NTIS
Hydromechanics; Organizations

20030012634 Technische Univ., Ship Hydromechanics Lab., Delft, Netherlands
Annual Report 1996 (Ship Hydromechanics Laboratory, Delft University of Technology)
De Heer, P. W.; Dec. 1997; 38p; In English
Report No.(s): PB2003-101210; REPT-1084; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report contains an overview of the organization and activities of the Department of Ship Hydromechanics of the division of Marine Technology of the Delft University of Technology. The division of Marine Technology is part of the Faculty of

Mechanical Engineering and Marine Technology. Other departments in Marine Technology are the Ship Design department, the Ship Strength and Construction department and the Shipbuilding department. All four departments are jointly responsible for the education and research in the field of Marine Technology.
NTIS
Hydromechanics; Organizations

20030012895 Environmental Protection Agency, Office of Water, Washington, DC USA
Cruise Ship Plume Tracking Survey Report
Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM and in paper copy
Report No.(s): PB2003-101931; EPA/842/R-02/001; No Copyright; Avail: National Technical Information Service (NTIS)
The U. S. Environmental Protection Agency (EPA) is developing a Cruise Ship Discharge Assessment Report in response to a petition the agency received in March 2000. The petition requested that EPA assess and where necessary control discharges from cruise ships. Comments received during public hearings, in 2000, resulted in the EPA agreeing to conduct a survey to assess the discharge plumes resulting from cruise ships, operating in ocean waters off the Florida coast and to compare the results to the Alaska dispersion models. This survey report describes the daily activities of August 2001 Cruise Ship Plume Tracking Survey, and provides a synopsis of the observations from the survey. It also provides data that can be used to assess dispersion of cruise ship wastewater discharges, while in transit. A description of the survey methods is provided in Section 2. Survey results are presented in Section 3. Findings and conclusions are discussed in Section 4.
NTIS
Water Pollution; Plumes; Effluents; Ships; Environment Protection; Disposal

20030013959 National Cheng Kung Univ., Dept. of Civil Engineering, Tainan, Taiwan, Province of China
A Mechanical Decision-Making Device for Structural Control
Hsu, Deh-Shiu, National Cheng Kung Univ., Taiwan, Province of China; Hou, Chien-Yuan, Diwan Coll., Taiwan, Province of China; Yeh, Ming-Chang, National Cheng Kung Univ., Taiwan, Province of China; Yeh, Chiu-Shang, National Cheng Kung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 669-677; In English
Contract(s)/Grant(s): NSC-84-2621-P-006-029B; NSC-85-2621-P-006-027; Copyright; Avail: Issuing Activity
In the present study a new. mechanical. decision-making device is proposed for structural control. When a structure is excited by external loadings or around accelerations, the structural sides-way can be detected by the device, and control forces are provided or released if pre-defined conditions are fulfilled. Mathematical results show that structures mounted with the device exhibit less dynamic response when the structures are Subjected to earthquake excitations. Preliminary model test results showed that tile device is useful. Howe it has a much less efficiency than predicted by the mathematical model. This device is more reliable and is cost saving because the device is a machine without complex and expensive electronic facilities.
Author
Decision Making; Automatic Control; Dynamic Structural Analysis

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.

20030012555 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Code Division Multiplexing in Networks of Inteferometric Optical Fiber Sensors
Kullander, F.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101032; FOI-R-0315-SE; No Copyright; Avail: National Technical Information Service (NTIS)
Code Division Multiplexing (CDM) is found less suitable than other multiplexing methods, e.g. time division multiplexing or frequency division multiplexing, for high resolution interferometric sensor networks since optical field cross-correlation products yield noise that cannot be separated from the sensor signals. Calculations based on a fundamental approach have been used to simulate the output intensity from networks of interferometric sensors. We have applied the formalism both to a simple

optical network, an unbalanced Mach Zehnder interferometer, and to a more complicated nested network of interferometers. The first case was used to show generally how the laser noise convert to intensity noise and to provide insight into how the sensor signal to noise ratio in more complicated networks is related to the laser and network parameters. The more complicated nested network was simulated since it had been intended for use in large scale all optical underwater hydrophone networks. CDM was applied to the network and the output intensity characteristics were investigated. We have performed the numerical calculations with various combinations of laser and network parameters.
NTIS
Code Division Multiplexing; Interferometry; Optical Fibers; Sensors; Formalism; Frequency Division Multiplexing

20030012557 Swedish Defence Research Establishment, Sensor Technology, Linkoeping Sweden
Mine Detection using Ground Penetrating Radar: Development of New Antenna Concepts ***Minsokning med Markradarantenner. Utveckling av nya Antennkoncept.***
Gunnarsson, R.; Erickson, R.; Dec. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101037; FOI-R-0268-SE; No Copyright; Avail: National Technical Information Service (NTIS)
This report summarizes studies and development of conceivable antenna concepts for handheld and vehicle-mounted mineradar systems. The study has concentrated on TEM-horns and dielectric rod antennas. Possibilities and limitations of TEM-horn antennas adapted for impulse radar are demonstrated. An antenna for impulse radar involves conflicting requirements of high momentary bandwidth, high antenna gain, small size, possible crossed transmitting and receiving antennas et cetera, and that considerable compromise has to be made. This compromise implies that it isn't possible to simultaneously achieve high antenna gain and large bandwidth with a single small antenna. Measurements performed with a demonstrator antenna MPAX proved that the antenna can detect metallic mines, anti-tank mines and shrapnel, metal spheres and to some extent anti-personnel mines that are buried in sand and soil.
NTIS
Radar Antennas; Mine Detectors; Ground Penetrating Radar; Dielectrics; Mines (Ordnance)

20030012570 Lawrence Livermore National Lab., Livermore, CA USA
ASCI Program 4Q: Unclassified Projects ***Quarterly Report, FY 1999***
Pierce, R.; Christensen, R.; Nov. 01, 1999; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-793931; UCRL-ID-136215; No Copyright; Avail: National Technical Information Service (NTIS)
Problem Solving Environment (PSE) is made up of four technical areas, ASCI Simulation Development Environment (ASDE), Data Exploration and Management (DEM), Data Transfer and Storage (DTS), and Distributed Systems (DS). The goal of ASDE is to create a truly scalable simulation development environment across ASCI platforms. Specific objectives are to improve the environment to accelerate application development, to improve reliability of codes, and to enable better scalable performance. DEM's effort is to provide an interactive environment for efficiently and visualizing massive amounts of data. WE are working to help scientists spend more time concentrating on data understanding by providing tools that both enhance interactions and minimize unnecessary manipulations of data. The goal of DTS is to provide multiple gigabytes/sec parallel data transfer, multiple petabytes of archival mass storage, and new architectures for end-to-end I/O all helping to ensure the highest utilization of ASCI resources. DS consists of secure networking, secure distributed computing, and resource management for ASCI platforms. These three research and development activities are fundamental to the creation of the basic infrastructure for the ASCI computing environment.
NTIS
Data Management; Computer Programs; Computerized Simulation; Problem Solving; Computer Networks

20030012599 Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Edinburgh, Australia
Ad Hoc Networks: Headline 2000 Communications Analysis
Blair, W. D., Defence Science and Technology Organisation, Australia; Reynolds, A. B., Defence Science and Technology Organisation, Australia; June 2002; 45p; In English; Original contains color illustrations
Report No.(s): DSTO-TR-1317; DODA-AR-012-358; Copyright; Avail: Issuing Activity
This report examines unit location data and terrain from Headline 2000 to investigate communications networks within the maneuver units. Within the Enhanced Combat Force timeframe, such units would be supported by a Tactical Data Distribution Sub-system (TDDS). This is envisaged as an ad hoc network changing its topology as units maneuver across the battlespace. The report describes approaches that can be applied to Headline 2000 and other data to characterize the nature of the network topology,

both statically and as it changes over time, in order to explore the impact on the TDDS network capacity and hence to hence to assist in elucidating consequent requirements of a candidate TDDS.
Author
Combat; Communication Networks; Topology

20030012628 General Accounting Office, Washington, DC USA
Telecommunications: Additional Federal Efforts Could Help Advance Digital Television Transition
Nov. 2002; 62p
Report No.(s): PB2003-100659; GAO-03-7; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The transition to broadcast digital television(DTV) will provide new television services and the improved picture quality of 'high definition television'. It will also allow some portions of the radiofrequency spectrum used for broadcasting to be returned for public safety and commercial uses. The Congress set December 2006 as the target date for completing the DTV transition and turning the analog broadcast signals. However, this date can be extended if fewer than 85 percent of households in a market are able to receive the digital signals. GAO (General Accounting Office) was asked to assess issues related to the DTV transition.
NTIS
Telecommunication; Digital Systems; Pulse Communication; Broadcasting; Television Equipment

20030012635 National Defence Research Establishment, Dept. of Comand and Control Warfare Technology, Linkoeping, Sweden
Spatial TDMA for Multi-Hop Radio Networks
Groenkvist, J.; Englund, E.; Hansson, A.; Joensson, C.; Sep. 1999; 38p; In English
Report No.(s): PB2003-101213; FOA-R-99-01223-504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Spatial reuse TDMA is a fixed assignment access scheme for multi-hop radio networks. The idea is to increase network capacity by letting several radio terminals use the same time slot when the interferences caused are not too severe. We consider two methods of generating traffic controlled reuse schedules. One method uses the full interference environment to generate schedules. The other method uses a graph representation of the network, assuming limited knowledge of the interferences. Using simulations, we evaluate the proposed methods in terms of average delay. We use a digital terrain model and a diffraction method to estimate the link characteristics.
NTIS
Communication Networks; Radio Communication

20030012836 Morgan State Univ., Dept. of Electrical and Computer Engineering, Baltimore, MD USA
Computational Numerical Electromagnetics for the Solution of Guided-Wave and Radiating Problems
Wilkins, Gregory M., Morgan State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 76; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
Electronic packaging encompasses several different scientific and engineering disciplines. These range from applied physics, which may address the stress analysis of the materials within the package, to thermal engineering, which probes the heat transfer between individual components. In the current research we are interested in the electrical aspects since our concern is to focus attention on the design of the components and the corresponding electromagnetic field behavior within the component, and to investigate the factors which may limit the performance of very-large-scale-integrated (VLSI) circuits. Much work is being done in the area of electromagnetic modeling, particularly in the higher frequencies of operation such as those involved in the use of microwave and millimeter wave integrated circuits (MIC, MMIC, respectively) for electromagnetic systems. Although we need to observe the electromagnetic effects on the individual circuit elements themselves, we must also take into account the effects due to materials and other parameters which support and connect these elements to one another. It is of great importance that we do not neglect the interconnections, and their environments, and that we incorporate this type of information into our design procedure. Failure to do so may greatly affect the outcome of our electronic device design. The current study focuses on applications of several computational electromagnetics methodologies to electromagnetic systems. The following are examples of examples to current technology: 1. Adaptive mesh refinement is essential in the study of small discontinuities such as an iris or a thin slot. to adequately model the behavior in these regions, the discretization must be on the order of the size of the discontinuity; 2. An alternative to adaptive mesh refinement may be the use of non-standard mesh element configurations. In thin-layer regions with high field activity, standard discretization configurations such as triangle mesh elements for two-dimensional problems and tetrahedral mesh elements for three-dimensional problems may be replaced by configurations which more easily conform to the geometry of interest; and 3. Research topics may be applied in the characterization of advance

material layer properties for thin-layer metallized membranes and meshes which are subsequently used for shielding. This may require first obtaining experimental results for reflection and transmission coefficients and using this information to determine permittivity and permeability of material layers.
Author
Computational Electromagnetics; Electronic Packaging; Electromagnetic Fields; Very Large Scale Integration; Millimeter Waves; Computational Grids

20030012913 National Science and Technology Council, Washington, DC USA
Information Technology for the Twenty-First Century: A Bold Investment in America's Future
Jun. 1999; 86p
Report No.(s): PB2003-101767; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
With this Information Technology for the Twenty First Century (IT2) initiative, the Federal Government is making an important re-commitment to fundamental research in information technology. The IT2 initiative proposes $366 million in increased investments in computing, information, and communications research and development (R&D) to help expand the knowledge base in fundamental information science, advance the Nations capabilities in cutting edge research, and train the next generation of researchers who will sustain the Information Revolution well into the 21st Century.
NTIS
Research and Development; Federal Budgets; Computer Networks

20030012918 National Telecommunications and Information Administration, Assistant Secretary for Communications and Information, Washington, DC USA
Iterated Nested Least-Squares Algorithm for Fitting Multiple Data Sets
Voran, S. D.; Oct. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101416; NTIA-TM-03-397; No Copyright; Avail: National Technical Information Service (NTIS)
A multiple data set fitting problem often arises in conjunction with the development of objective estimators of perceived audio or video quality. In such development work, the authors often seek the best linear relationship between a set of objective audio or video quality estimation parameters and a set of subjective audio or video quality scores. In order to find the most robust and reliable relationship, the authors prefer to perform a least-squares fit using as many audio or video data points as possible. This motivates the authors to combine scores from different subjective tests. Unfortunately, scores from different subjective tests or data sets can differ in significant ways due to differing test procedures, environments, languages, and other sources. The authors develop a solution to this multiple data set fitting problem: the iterated nested least-squares (INLS) algorithm.
NTIS
Algorithms; Least Squares Method; Data Bases

20030012966 National Telecommunications and Information Administration, Assistant Secretary for Communications and Information, Washington, DC USA
Estimation of System Gain and Bias Using Noisy Observations with Known Noise Power Ratio
Voran, S. D.; Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101522; NTIA-02-395; No Copyright; Avail: National Technical Information Service (NTIS)
The identification of linear systems from input and output observations is an important and well-studied topic. When both the input and output observations are noisy, the resulting problem is sometimes called the 'errors in variables' problem. Existing work on this problem deals with the identification of multivariate systems and thus results in algorithms that are necessarily somewhat complex and often involve iteration. In this report we treat an important special case of the problem: estimation of a system bias and a system gain from noisy observations of system input and output. In addition, we invoke an input-output noise power ratio constraint. This constraint can also be interpreted as a parameter that moves the problem in a continuous fashion between two limiting cases, each of which is a conventional least-squares problem. We do not model the input signal, and we place minimal restrictions on the input and output observation noises. We develop five different low-complexity closed-form solutions to the problem. The final two are the most satisfying and we explore these further through simulations. Our original motivation for working on this problem came through the need to calibrate objective and subjective estimates of perceived video or speech

quality. We expect that our solutions may also find applications in remote sensing, active noise reduction, echo cancellation, channel estimation, and channel equalization.
NTIS
Bias; Input; Amplification

20030013743 General Accounting Office, Washington, DC USA
Defense Acquisitions: Factors Affecting Outcomes of Advanced Concept Technology Demonstrations
Dec. 2002; 36p
Report No.(s): PB2003-101786; GAO-03-52; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Since the ACTD (Advanced Concept Technology Demonstrations) program was started in 1994, a wide range of products have been tested by technology experts and military operators in realistic settings-from unmanned aerial vehicles, to friend-or-foe detection systems, to biological agent detection systems, to advanced simulation technology designed to enhance joint training. Many of these have successfully delivered new technologies to users. Though the majority of the projects that were examined, transitioned technologies to users, there are factors that hamper the ACTD process. For example: Technology has been too immature to be tested in a realistic setting, leading to cancellation of the demonstration. Military services and defense agencies have been reluctant to fund acquisition of ACTD-proven technologies, especially those focusing on joint requirements, because of competing priorities. ACTD's military utility may not have been assessed consistently. Some of the barriers identified can be addressed through efforts DOD (Department of Defense) now has underway, including an evaluation of how the ACTD process can be improved; adoption of criteria to be used to ensure technology is sufficiently mature; and placing of more attention on the end phase of the ACTD process. Other barriers, however, will be much more difficult to address in view of cultural resistance to joint initiatives and the requirements of DOD's planning and funding process.
NTIS
Technology Transfer; Effectiveness

20030013746 Urban Mass Transportation Administration, Washington, DC USA
Cell Phone Ring Suppression and HUD Caller ID: Effectiveness in Reducing Momentary Driver Distraction under Varying Workload Levels
Nowakowski, C.; Friedman, D.; Green, P.; Oct. 2001; 62p; In English
Report No.(s): PB2003-101782; UMTRI-2001-29; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of the current experiment is to provide a preliminary driving simulator assessment of several hands-free design solutions with regard to the task of answering the phone while driving. Specifically, the following questions were examined: (1) Does the location of a caller ID display and the phone buttons (two HUD (Head Up Display) locations vs. phone cradle) affect either the time to answer the phone or driving performance; (2) Does the presence or absence of a ring affect either the time to answer the phone or driving performance; (3) Does increased driving workload (visual demand) affect either the time to answer the phone or driving performance; (4) What were the initial driver reactions to a HUD-based call timer.
NTIS
Wireless Communication; Noise Reduction; Operators (Personnel); Telephones; Streets

20030014001 North Carolina Univ., Charlotte, NC USA
Wavelet-Based Signal and Image Processing for Target Recognition ***Annual Report, 1 Dec. 2001-30 Nov. 2002***
Sherlock, Barry G.; Nov. 30, 2002; 5p; In English
Contract(s)/Grant(s): N00014-02-1-0022
Report No.(s): AD-A409223; Rept-2975-02-0065-YEAR1; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The PI visited NSWC Dahlgren, VA, for six weeks in May-June 2002 and collaborated with scientists in the G33 TEAMS facility, and with Marilyn Rudzinsky of T44 Technology and Photonic Systems Branch. During this visit the PI also presented six educational seminars to NSWC scientists on various aspects of signal processing. Several items from the grant proposal were completed, including (1) wavelet-based algorithms for interpolation of 1-d signals and 2-d images; (2) Discrete Wavelet Transform domain based algorithms for filtering of image data; (3) wavelet-based smoothing of image sequence data originally obtained for the CRITTIR (Clutter Rejection Involving Temporal Techniques in the Infra-Red) project. The PI visited the University of Stellenbosch, South Africa to collaborate with colleagues Prof. B.M. Herbst and Prof. J. du Preez on the use of wavelet image processing in conjunction with pattern recognition techniques. The University of Stellenbosch has offered the PI partial funding to support a sabbatical visit in Fall 2003, the primary purpose of which is to enable the PI to develop and enhance his expertise in Pattern Recognition. During the first year, the grant supported publication of 3 referred papers, presentation of

9 seminars and an intensive two-day course on wavelet theory. The grant supported the work of two students who functioned as research assistants.
DTIC
Signal Processing; Image Processing; Target Recognition; Tracking (Position)

20030014079 Shanghai Astronomical Observatory, China
Development of Real Time System for Data Communication Based on SCO UNIX
Hua, Ying-Min, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 129-134; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
The real time system based on SCO UNIX has the multiple tasks properties as on other UNIX system. The costs is lower than other UNIX system. In this paper the usage of multiple serial communication and UDP communication is mainly introduced. The data housekeeping and system monitor are described.
Author
Real Time Operation; Data Systems; Computer Programs

20030014187 Patent Office, Washington, DC USA
Encryption Devices for Use in a Conditional Access System
Pinder, Howard G., Inventor; Palgon, Michael S., Inventor; Jul. 23, 2002; 57p; In English; Original contains color images
Patent Info.: Filed 23 Jul. 2002; US-Patent-Appl-SN-464794
Report No.(s): AD-A409103; PATENT-6 424 717; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A cable television system provides conditional access to services. The cable television system includes a headend from which service 'instances', or programs, are broadcast and a plurality of set top units for receiving the instances and selectively decrypting the instances for display to system subscribers. The service instances are encrypted using public and/or private keys provided by service providers or central authorization agents. Keys used by the set tops for selective decryption may also be public or private in nature, and such keys may be reassigned at different times to provide a cable television system in which piracy concerns are minimized.
DTIC
Cryptography; Patent Applications

20030014259 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden
Handling Conflicts in Multi Hop Networks *Knoflikthantering i Flerhoppsnaet*
Frisell, J.; Sennerbrant, A.; Mar. 2002; 64p; In Swedish
Report No.(s): PB2003-101215; FOA-R-00-01453-504; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Tactical mobile radio communications must be independent of communications infrastructure and fixed installations. This means that all units in the network should be able to move freely and be independent of fixed base stations. One of the most challenging problems in tactical mobile radio networks is to handle frequent changes that mobility causes. The presentation given here, considers the problem of handling the changes of the interference situation, i.e. communication problems that occur when several radio stations are allowed to transmit simultaneously. When these problems occur it is necessary to take appropriate measures so that several radio stations still can transmit simultaneously. During the work, a number of different methods to handle problems that occur have been examined. In the report, we present two algorithms that can be used to make communication possible in a mobile radio network when several radio stations are allowed to transmit simultaneously.
NTIS
Radio Communication; Communication Networks; Mobility

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

20030012594 National Inst. of Standards and Technology, Technology Administration, Gaithersburg, MD USA
Effect of Anisotropic Surface Energy on the Rayleigh Instability
Gurski, J. F.; McFadden, G. B.; Nov. 2002; 36p; In English
Report No.(s): PB2002-107933; NISTIR-6892; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The authors determine the linear stability of a rod or wire subject to capillary forces arising from an anisotropic surface energy. The rod is assumed to be smooth with a uniform cross section given by a 2-D equilibrium shape. The stability analysis is based on computing the sign of the second variation of the total energy, which is examined by solving an associated eigenvalue problem.
NTIS
Anisotropy; Surface Energy; Stability Tests; Rayleigh Scattering; Nanotechnology

20030012622 Lawrence Livermore National Lab., Livermore, CA USA
Radiation Hardening of CMOS Microelectronics
McCarthy, A.; Sigmon, T. W.; Feb. 20, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792429; UCRL-ID-137663; No Copyright; Avail: National Technical Information Service (NTIS)
A unique methodology, silicon transfer to arbitrary substrates, has been developed under this program and is being investigated as a technique for significantly increasing the radiation insensitivity of limited quantities of conventional silicon microelectronic circuits. In this approach, removal of the that part of the silicon substrate not required for circuit operation is carried out, following completion of the circuit fabrication process. This post-processing technique is therefore applicable to state-of-the-art ICs, effectively bypassing the 3-generation technology/performance gap presently separating today's electronics from available radiation-hard electronics. Also, of prime concern are the cost savings that result by eliminating the requirement for costly redesign of commercial circuits for Rad-hard applications. Successful deployment of this technology will result in a major impact on the radiation hard electronics community in circuit functionality, design and software availability and fabrication costs.
NTIS
Chips (Electronics); Radiation Effects; Silicon; Transferring

20030012623 Lawrence Livermore National Lab., Livermore, CA USA
Integration of Radiation-Heard Magnetic Random Access Memory with CMOS ICs
Cerjan, C.; Sigmon, T. W.; Feb. 15, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792430; UCRL-ID-137666; No Copyright; Avail: National Technical Information Service (NTIS)
The research undertaken in this LDRD-funded project addressed the joint development of magnetic material-based nonvolatile, radiation-hard memory cells with Sandia National Laboratory. Specifically, the goal of this project was to demonstrate the intrinsic radiation-hardness of Giant Magneto- Resistive (GMR) materials by depositing representative alloy combinations upon radiation-hardened silicon-based integrated circuits. All of the stated goals of the project were achieved successfully. The necessary films were successfully deposited upon typical integrated circuits; the materials retained their magnetic field response at the highest radiation doses; and a patterning approach was developed that did not degrade the as-fabricated properties of the underlying circuitry. These results establish the feasibility of building radiation-hard magnetic memory cells.
NTIS
Integrated Circuits; Radiation Effects

20030012702 NASA Langley Research Center, Hampton, VA USA
Characterization of 2219 Aluminum Produced by Electron Beam Freeform Fabrication
Taminger, Karen M. B., NASA Langley Research Center, USA; Hafley, Robert A., NASA Langley Research Center, USA; [2002]; 8p; In English; 13th Solid Freeform Fabrication Symposium, 5-7 Aug. 2002, Austin, TX, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Researchers at NASA Langley Research Center are developing a new electron beam freeform fabrication (EB F(sup 3)) technique to fabricate metal parts. This process introduces metal wire into a molten pool created by a focused electron beam. Potential aerospace applications for this technology include ground-based fabrication of airframe structures and on-orbit construction and repair of space components and structures. Processing windows for reliably producing high quality 2219 aluminum parts using the EB F(sup 3) technique are being defined. The effects of translation speed, wire feed rate, and beam power on the resulting microstructures and mechanical properties are explored. Tensile properties (ultimate tensile strength, yield strength, and elongation) show little effect over the range of processing conditions tested. Basic processing-microstructure-property correlations are drawn for the EB F(sup 3) process.
Author
Fabrication; Electron Beams; Aluminum; Wire

20030012711 NASA Johnson Space Center, Houston, TX USA
Development of a Prototype Low-Voltage Electron Beam Freeform Fabrication System
Watson, J. K., NASA Johnson Space Center, USA; Taminger, K. M., NASA Langley Research Center, USA; Hafley, R. A., NASA Langley Research Center, USA; Petersen, D. D., NASA Johnson Space Center, USA; [2002]; 8p; In English; 13th Solid Freeform Fabrication Symposium, 5-7 Aug. 2002, Austin, TX, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
NASA's Langley Research Center and Johnson Space Center are developing a solid freeform fabrication system utilizing an electron beam energy source and wire feedstock. This system will serve as a testbed for exploring the influence of gravitational acceleration on the deposition process and will be a simplified prototype for future systems that may be deployed during long-duration space missions for assembly, fabrication, and production of structural and mechanical replacement components. Critical attributes for this system are compactness, minimal mass, efficiency in use of feedstock material, energy use efficiency, and safety. The use of a low-voltage (less than 15kV) electron beam energy source will reduce radiation so that massive shielding is not required to protect adjacent personnel. Feedstock efficiency will be optimized by use of wire, and energy use efficiency will be achieved by use of the electron beam energy source. This system will be evaluated in a microgravity environment using the NASA KC-135A aircraft.
Author
Electron Beams; Low Voltage; Fabrication; Electric Wire

20030012735 Lawrence Livermore National Lab., Livermore, CA USA
Digital Display Integration Project. Project Outline 2.0
Bardsley, J. N.; Nov. 01, 1999; 14p; In English
Report No.(s): DE2002-792257; UCRL-ID-136727; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The electronic display industry is changing in three important ways. First, the dominance of the cathode ray tube (CRT) is being challenged by the development of flat panel displays (FPDs). This will lead to the availability of displays of higher performance, albeit at greater cost. Secondly, the analog interfaces between displays that show data and the computers that generate the data are being replaced by digital connections. Finally, a high-resolution display is becoming the most expensive component in computer system for homes and small offices. It is therefore desirable that the useful lifetime of the display extend over several years and that the electronics allows the display to be used with many different image sources. Hopefully, the necessity of having three or four large CRTs in one office to accommodate different computer operating systems or communication protocols will soon disappear. Instead, we hope to see a set of flat panels that can be switched to show several independent images from multiple sources or a composite image from a single source.
NTIS
Digital Systems; Display Devices

20030012806 Washington Univ., Dept. of Aeronautics and Astronautics, Seattle, WA USA
Damage Detection in Electrically Conductive Structures
Anderson, Todd A., Washington Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 46; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
High-technology systems are in need of structures that perform with increased functionality and a reduction in weight, while simultaneously maintaining a high level of performance and reliability. to accomplish this, structural elements must be designed more efficiently and with increased functionality, thereby creating multifunctional structures (MFS). Through the addition of carbon fibers, nanotubes, or particles, composite structures can be made electrically conductive while simultaneously increasing

their strength and stiffness to weight ratios. Using the electrical properties of these structures for the purpose of damage detection and location for health and usage monitoring is of particular interest for aerospace structures. One such method for doing this is Electrical Impedance Tomography (EIT). With EIT, an electric current is applied through a pair of electrodes and the electric potential is recorded at other monitoring electrodes around the area of study. An inverse solution of the governing Maxwell equations is then required to determine the conductivities of discrete areas within the region of interest. However, this method is nearly ill-posed and computationally intensive as it focuses on imaging small changes in conductivity within the region of interest. For locating damage in a medium with an otherwise homogeneous conductivity, an alternative approach is to search for parameters such as the damage location and size. Towards those ends, this study develops an Artificial Neural Network (ANN) to determine the state of an electrically conductive region based on applied reference current and electrical potentials at electrodes around the periphery of the region. A significant benefit of the ANN approach is that once trained, the solution of an inverse problem does not require costly computations of the inverse problem. This method also takes advantage of the pattern recognition abilities of neural networks and is a robust solution method in the presence of signal noise. The network is based on a two-tier approach where the coarse location of the damage is first located within given regions using a Learning Vector Quantization (LVQ) network. Once the approximate location is known, the second step is to apply a more refined feed-forward back-propagation (FFBP) ANN that utilizes the current and electric potential electrodes that focus on that region. In this manner, the resolution of the prediction scheme is increased. to train both the LVQ and FFBP networks, instead of time consuming and perhaps for large space structures, unfeasible experiments, a computational model is developed. The training function for the ANN is based on a finite element solution of the region and the applied boundary conditions. The inputs to the network are thus the location of the current electrodes and the corresponding electric potential values around the periphery and the network targets are the damage location and size. Future work will focus on the further development of the two-tier ANN, extension of the scheme for plural defects, and on the experimental validation of the computational training model for materials with isotropic and anisotropic conductivity.
Author
Large Space Structures; Electrical Properties; Composite Structures; Boundary Conditions; Conductivity; Damage; Structural Engineering

20030012910 Lawrence Livermore National Lab., Livermore, CA USA
Glass, Plastic & Semiconductors: Packaging Techniques for Miniature Optoelectronic Components
Pocha, M. D.; Garrett, H. E.; Patel, R. R.; Jones, L. M.; Larson, M. C.; Dec. 20, 1999; 18p; In English
Report No.(s): DE2002-792602; UCRL-JC-134864; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
At Lawrence Livermore National Laboratory, we have extensive experience with the design and development of miniature photonic systems which require novel packaging schemes. Over the years we have developed silicon micro-optical benches to serve as a stable platform for precision mounting of optical and electronic components. We have developed glass ball lenses that can be fabricated in-situ on the microbench substrate. We have modified commercially available molded plastic fiber ribbon connectors (MT) and added thin film multilayer semiconductor coatings to create potentially low-cost wavelength combiners and wavelength selective filters. We have fabricated both vertical-cavity and in-plane semiconductor lasers and amplifiers, and have packaged these and other components into several miniature photonics systems.
NTIS
Packaging; Optoelectronic Devices; Miniature Electronic Equipment

20030012920 NASA Langley Research Center, Hampton, VA USA
Microwave Power for Smart Membrane Actuators
Choi, Sang H., NASA Langley Research Center, USA; Song, Kyo D., Norfolk State Univ., USA; Golembiewski, Walter T., Norfolk State Univ., USA; Chu, Sang-Hyon, Institute for Computer Applications in Science and Engineering, USA; King, Glen C., NASA Langley Research Center, USA; [2002]; 6p; In English; 37th Intersociety Energy Conversion Engineering Conference, 28 Jul. - 1 Aug. 2002, Washington, DC, USA; Original contains color illustrations
Contract(s)/Grant(s): NCC1-280
Report No.(s): IECEC-2002-Paper-20100; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The concept of microwave-driven smart membrane actuators is envisioned as the best option to alleviate the complexity associated with hard-wired control circuitry. A large, ultra-light space structure, such as solar sails and Gossamer spacecrafts, requires a distribution of power into individual membrane actuators to control them in an effective way. A patch rectenna array with a high voltage output was developed to drive smart membrane actuators. Networked patch rectenna array receives and converts microwave power into a DC power for an array of smart actuators. to use microwave power effectively, the concept of a power allocation and distribution (PAD) circuit is developed and tested for networking a rectenna/actuator patch array. For the

future development, the PAD circuit could be imbedded into a single embodiment of rectenna and actuator array with the thin-film microcircuit embodiment. Preliminary design and fabrication of PAD circuitry that consists of a sixteen nodal elements were made for laboratory testing.
Author
Actuators; Membrane Structures; Large Space Structures

20030012958 Michigan Univ., Ann Arbor, MI USA
AASERT 98: Ultrafast GaAs Photoconductivity and Applications for Radiation-Hard Electronics ***Final Report, 1 Apr. 1998-31 Dec. 2001***
Whitaker, John F.; Dec. 2001; 21p; In English
Contract(s)/Grant(s): F49620-98-1-0365
Report No.(s): AD-A409018; AFRL-SR-AR-TR-02-0420; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Finally, in the last year of the AASERT and during a no-cost extension period, an effort was made to demonstrate how pulsed, single-cycle terahertz beams generated and detected by nonstoichiometric-GaAs dipole antennas - could be employed as a tool for the imaging of metal and dielectric objects. This was accomplished through the use of the time-reversal and back-propagation of time-domain signals scattered from objects through off-axis diffraction. Experimental methods were devised and applied to the reconstruction of one- and two-dimensional objects in both transmissive and reflective geometries. The images produced in both simulation and experiment were able to resolve features less than both the peak and mcan wavelengths of the broadband THz pulses. It was empirically illustrated that this technique should be able to produce images rivaling those of an ideal diffraction-limited imaging system. Images comparable to those produced by conventional, direct (non-scattering) 1Hz imaging systems were also produced. These results from the time-domain, THz, off-axis imaging have 2 great deal of potential and hold promise that objects can be identified not just by their scattered time-domain signatures, but actually by their reconstructed shapes.
DTIC
Gallium Arsenides; Radiation Hardening; Photoconductivity

20030012971 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Homogenization Modeling for Mechanical Properties of Composite Conductor With Cooling Channel ***Final Report, Oct. 2002-Jun. 2002***
Sun, We; Tzeng, Jerome T.; Nov. 2002; 30p; In English; Original contains color images
Report No.(s): AD-A409027; ARL-TR-2872; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An electrical composite conductor may consist of a metallic core with a cooling channel and a multilayered insulating material. A model was developed to predict the mechanical properties of the composite conductor based on two-level homogenization hierarchies. A composite cylinder assembly model was developed in the level 1 homogenization for metallic core with a cooling channel, in which the cooling channel was analogized as a fiber void with null material properties. The effective mechanical properties of the composite insulation layers were homogenized by smearing the properties of the multiple polymer coatings and fiber-reinforced composite. In the level 2 homogenization, combined homogenization sequences were used based on the requirement of the displacement-or the traction-prescribed continuity. The developed model can calculate the nine effective mechanical constants of the conductor made of a metallic core and any angle (+00) plain-woven glass-fiber composite. The model predictions were compared well with the results obtained from the finite element analyses. The developed model provides a theoretical basis and an accurate calculation for effective mechanical constants that are often difficult to be accurately determined through an experimental approach due to the structural heterogeneity and material anisotropy of the composite conductor.
DTIC
Composite Structures; Electric Conductors

20030013646 Seoul National Univ., School of Electrical Engineering, Korea, Republic of
CMOS Compatibility of a Micromachining Process Developed for Semiconductor Neural Probe
An, S. K.; Oh, S. J.; Kim, S. J.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society: October 25-28, 2001 held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom.
Report No.(s): AD-A409320; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Neural probes are made on silicon substrate using a micromachining process with low temperature steps only. A deep silicon etch (”Boschh”) process was used for the probe shaping. CMOS compatibility of the process was checked and reported in this paper. Test transistor patterns generated using standard CMOS fabrication line were exposed to a post-CMOS probe making process including dielectric deposition, gold metalization and the dry etching step, while changes of test transistor characteristics

were monitored. Threshold voltage was found virtually unchanged for both n- and p-type MOS transistors. When excess plasma exposure was done, however, non-trivial shift in p-MOS threshold was observed.
DTIC
CMOS; Micromachining; Semiconductors (Materials); Metallizing; Dielectrics; Compatibility; Fabrication

20030014006 Quantum Applied Science and Research, Inc., San Diego, CA USA
Development and Test of Free Space Electric Field Sensors with Microvolt Sensitivity
Krupka, M. A.; Matthews, R.; Say, C.; Hibbs, A. D.; Delory, G. D.; Sep. 2001; 11p; In English; Original contains color illustrations; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference on CD-ROM
Contract(s)/Grant(s): MDA972-00-C-0062
Report No.(s): AD-A409234; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have developed a new solid state electric potential sensor that has over an order of magnitude lower voltage noise than prior state-of-the-art technology. The sensor uses a novel input feedback circuit that enables it to be stable down to DC, and have frequency independent detection sensitivity from 0. 01 Hz to 10 kHz.
DTIC
Detectors; Solid State; Electric Potential

20030014008 Naval Research Lab., Washington, DC USA
Study Plan for an Investigation of Target Acquisition With a Radar-Aided Electro-Optical Missile
Thompson, H. E.; Feb. 1967; 32p; In English
Report No.(s): AD-A409248; NRL-1770; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Naval Research Laboratory has been engaged in a study program to investigate techniques for missile guidance that are compatible with the use of a high resolution radar in the launch aircraft. Previous work accomplished under this program has dealt with the detection and acquisition of targets from high resolution radar data, an analysis of high resolution radar target location accuracy, and an error analysis of various missile midcourse guidance schemes.
DTIC
Electro-Optics; Missile Control; Target Acquisition; Midcourse Guidance

20030014092 SRS Technologies, Huntsville, AL USA
Fabrication of Thin Film Concentrators for Solar Thermal Propulsion Applications
Gierow, Paul A.; Jan. 1991; 9p; In English
Report No.(s): AD-A409327; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Development of Solar Powered Rocket Engine systems depends heavily on demonstrating the technology for lightweight space-deployable solar concentrators. Large elliptically-shaped thin film reflectors can be packaged with other solar-powered propulsion elements and deployed in low earth orbit. A significant step in demonstrating the feasibility of fabricating large lightweight deployable concentrators has been accomplished. Thin film casting and coating techniques for fabricating thin film concentrators have been demonstrated. These techniques have significant promise for extrapolation to large highly accurate concentrators. The concentrators achieve a low weight/area ratio and high concentration ratio by utilization of spin casting and subsequent creep and/or relaxation forming processes. These processes use newly developed polyimide materials supplied by Langley Research Center (LaRO). This paper will summarize continuing research to develop methods to fabricate parabolic thin film membranes. The research has included selecting candidate thin film materials through a materials testing and evaluation program. Reflector fabrication and forming techniques were evaluated. Analytical models to represent forming techniques were developed. Thin film polyimide membranes using the selected techniques were fabricated. The facilities and equipment for constructing the spin cast concentrators are also presented.
DTIC
Concentrators; Fabrication; Mathematical Models; Solar Thermal Propulsion; Thin Films; Forming Techniques

20030014108 Academy of Sciences (Russia), IOFFE Physical-Technical Inst., Saint Petersburg, Russia
Research and Development of Silicon Carbide (SiC) Junction Recovery Diodes for Picosecond Range, High Power Opening Switches ***Final Report, 1 Aug. 2001-31 Jul. 2002***
Grekhov, Igor V.; Jul. 2002; 44p; In English; Original contains color images
Report No.(s): AD-A409276; EOARD-ISTC 00-7040; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Ioffe Institute as follows: The purpose of the proposed project is to develop, fabricate, test, and characterize silicon carbide power semiconductor opening switches operating in the picosecond range of switch time. Special SiC diode structures will be fabricated and investigated, including Junction Recovery Diodes (JRD). The operation of such diodes is founded on the superfast recovery of the junction's blocking ability after switching the device from forward to reverse bias conditions. Our estimations show that the parameters of JRD devices can be substantially improved in case of SiC devices, compared to both Si and GaAs capabilities. We expect i) to increase the speed of switch operation, the specific commutated power, and the operation frequency repetition; ii) to reduce the weight and size of pulse devices; and iii) to achieve better reliability of the devices due to the unique thermal conductivity and radiation hardness of SiC.
DTIC
Electric Switches; Silicon Carbides; Junction Diodes

20030014143 Department of the Navy, Washington, DC USA
Heat-Resistant Electronic Systems and Circuit Boards with Heat Resistant Reinforcement Dispersed in Liquid Metal
Li, Chou H., Inventor; May 07, 2002; 14p; In English; Supersedes PAT-APPL-09 334 565
Patent Info.: Filed 21 Jun. 1999, patented 7 May 2002; US-Patent-Appl-SN-09334565
Report No.(s): AD-D020044; PATENT-6 384 342; No Copyright; Avail: US Patent and Trademark Office, Microfiche
A heat resistant system have electronic circuit components fusion bonded onto a circuit board substrate with a heat-resistant composite material. The composite material consists essentially of a solid heat-resistant reinforcement dispersed in a liquid metal matrix of the composite material. The heat-resistant reinforcement differs in density by substantially uniformly and stably distribute in the liquid composite matrix, with substantially no tendency to either sink down or float up therein. This stably uniform distribution enures improved uniformly, reproducibility and heat resistance of the circuit board.
DTIC
Circuit Boards; Composite Materials; Thermal Resistance; Liquid Metals; Dispersing

20030014182 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Unique Hollow Cathode as a Candidate Non-Magnetic Ion Thruster
Young, Marc; Muntz, E. P.; Ketsdever, Andrew D.; Jun. 14, 1999; 15p; In English; Prepared in collaboration with the Univ. of Southern California, Dept. of Aerospace Engineering, Los Angeles, CA
Contract(s)/Grant(s): Proj-2308
Report No.(s): AD-A409110; AFRL-PR-ED-TY-FY99-0141; AIAA 99-2854; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The applicability of a unique discharge chamber, previously studied by VI Miljevic, as the ion source for a meso-scale ion thruster was investigated. The discharge chamber geometry was chosen due to promising reported results which appeared to alleviate the requirement of external magnetic fields while achieving an adequate degree of ionization. The earlier results from spectroscopic studies on the discharge chamber indicated a high degree of ionization, making it a candidate configuration for an ion thruster. An estimate of the degree of ionization using a simple model of the discharge indicated a low achievable ionization, which stimulated further examination of Miljevic's work. The previous spectroscopic studies were repeated and discrepancies were found. Additional spectroscopic and Langmuir probe measurements were made in the plume to determine the degree of ionization of the discharge chamber for several operating conditions. The degree of ionization was experimentally shown to be 0. 06-0.15%. A simple extraction ring increases the degree of ionization by roughly a factor of 3.
DTIC
Ionization; Ion Engines

20030014183 Naval Research Lab., Washington, DC USA
Photoresist Removal in LAPPS *Interim Report*
Leonhardt, D.; Walton, S. G.; Blackwell, D. D.; Murphy, D. P.; Fernsler, R. F.; Nov. 27, 2002; 55p; In English
Report No.(s): AD-A409109; NRL/MR/6750--02-8649; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The ability of LAPPS to remove standard semiconductor photoresist (PR) was studied. Both material removal rates ('ashing') and anisotropy ('etching') were determined with respect to various conditions, including gas composition, substrate temperature, plasma duty factor, and substrate RF-induced self-bias level. At room temperature, the removal rate increased linearly with substrate bias, with reasonable anisotropic pattern transfer improving above -50 V self-bias. Little change in material removal was seen as gas composition went from pare oxygen to 80% argon, implying the PR removal mechanism in LAPPS was

ion-driven, or more specifically ion-energy driven. Construction and modification details of the equipment and diagnostics used in these experiments are given in detail.
DTIC
Photoconductors; Plasma Physics

20030014188 Naval Postgraduate School, Monterey, CA USA
Department of Electrical and Computer Engineering
Knorr, Jeffrey B.; Tummals, Murali; Jan. 2000; 105p; In English
Report No.(s): AD-A409098; NPS-09-011; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report contains project summaries of the research projects in the Department of Electrical and Computer Engineering. A list of recent publications is also included, which consists of conference presentations and publications, books, contributions to books, published journal papers, and technical reports. Thesis abstracts of students advised by faculty in the Department are also included.
DTIC
Computers; Military Technology; Research and Development

20030014302 Institute of Space Medico-Engineering, Beijing, China
The Application of CY7C09449 in Interface between DSP and the PCI Bus
Li, Qi-jie, Institute of Space Medico-Engineering, China; Yan, Hong, Institute of Space Medico-Engineering, China; Jiao, Xue-jun, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 381-382; In Chinese; Copyright; Avail: Issuing Activity
Objective. to introduce the usage of CY7C09449 in the interface between DSP and the PCI bus. Method. The function of a system using CY7C09449 was introduced. Result. The data transmission between PCI bus and DSP was realized. It is proved that the maximum data rate reaches 65Mb/s. Conclusion. It is showed convenient to realize the connection to DSP with EY7C09449 and the peripheral circuits is simple.
Author
Data Acquisition; Circuits

20030014335 Helsinki Univ. of Technology, Engineering Lab. of Electromechanics, Espoo, Finland
Advanced Utilization of Macro Elements that Replace the Multi-Conductor Windings in the Finite Element Analysis of Rotating Electrical Machines
Szuecs, A.; Arkkio, A.; Jokinen, T.; 2001; 16p; In English
Report No.(s): PB2003-101226; Rept-66; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
In the finite element analysis of electrical machines, macro elements can be created by the elimination of 'inner nodes' from the finite element model of the stator winding and certain circuit equations. Macro elements can not only increase computation speed but with advanced use they can have many other advantages such as the significant decrease of the required computer memory. Macro elements allow us to divide the problem into smaller parts and to solve them separately while still maintaining a strong coupling between them. With the advanced use of macro elements this fact can be utilized in several ways, which are presented in this publication. This study also deals shortly with the applicability of the macro element technique when modeling movement, modeling connected macro elements or modeling 3D finite element problems. A short comparison of the macro element technique and a similar and well-known method called sub-structuring is also presented.
NTIS
Eddy Currents; Finite Element Method; Rotating Electrical Machines

20030014582 NASA Ames Research Center, Moffett Field, CA USA
Method and Apparatus for Evaluating the Visual Quality of Processed Digital Video Sequences
Watson, Andrew B., Inventor, NASA Ames Research Center, USA; Dec. 10, 2002; 18p; In English
Patent Info.: Filed 12 Mar. 1999; NASA-Case-ARC-14236-1; US-Patent-6,493,023; US-Patent-Appl-SN-266962; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A Digital Video Quality (DVQ) apparatus and method that incorporate a model of human visual sensitivity to predict the visibility of artifacts. The DVQ method and apparatus are used for the evaluation of the visual quality of processed digital video sequences and for adaptively controlling the bit rate of the processed digital video sequences without compromising the visual quality. The DVQ apparatus minimizes the required amount of memory and computation. The input to the DVQ apparatus is a pair of color image sequences: an original (R) non-compressed sequence, and a processed (T) sequence. Both sequences (R) and

(T) are sampled, cropped, and subjected to color transformations. The sequences are then subjected to blocking and discrete cosine transformation, and the results are transformed to local contrast. The next step is a time filtering operation which implements the human sensitivity to different time frequencies. The results are converted to threshold units by dividing each discrete cosine transform coefficient by its respective visual threshold. At the next stage the two sequences are subtracted to produce an error sequence. The error sequence is subjected to a contrast masking operation, which also depends upon the reference sequence (R). The masked errors can be pooled in various ways to illustrate the perceptual error over various dimensions, and the pooled error can be converted to a visual quality measure.
Official Gazette of the U.S. Patent and Trademark Office
Digital Television; Discrete Cosine Transform; Video Compression; Imaging Techniques; Visual Discrimination; Sequencing

34
FLUID MECHANICS AND THERMODYNAMICS

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

20030012576 NASA Langley Research Center, Hampton, VA USA
Flow Control Research at NASA Langley in Support of High-Lift Augmentation
Sellers, William L., III, NASA Langley Research Center, USA; Jones, Gregory S., NASA Langley Research Center, USA; Moore, Mark D., NASA Langley Research Center, USA; 2002; 15p; In English; AIAA Biennial International Powered Lift Conference, 5-7 Nov. 2002, Williamsburg, VA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-6006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The paper describes the efforts at NASA Langley to apply active and passive flow control techniques for improved high-lift systems, and advanced vehicle concepts utilizing powered high-lift techniques. The development of simplified high-lift systems utilizing active flow control is shown to provide significant weight and drag reduction benefits based on system studies. Active flow control that focuses on separation, and the development of advanced circulation control wings (CCW) utilizing unsteady excitation techniques will be discussed. The advanced CCW airfoils can provide multifunctional controls throughout the flight envelope. Computational and experimental data are shown to illustrate the benefits and issues with implementation of the technology.
Author
Active Control; Lift Augmentation; Flow Distribution; Research and Development; Computational Fluid Dynamics; Aircraft Models; NASA Programs

20030012590 National Inst. of Standards and Technology, Materials Science and Engineering Lab., Gaithersburg, MD USA
Databases for Computational Thermodynamics and Diffusion Modeling
Kattner, U. R.; Boettinger, W. J.; Morral, J. E.; Nov. 2002; 134p; In English
Report No.(s): PB2003-101347; NISTIR-6927; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Databases for computational thermodynamics and diffusion modeling can be applied to predict phase diagrams for alloy design and alloy behavior during processing and service. Databases that are currently available to scientists, engineers and students need to be expanded and improved. The approach of the workshop was to first identify the database and information delivery tool needs of industry and education. The workshop format was a series of invited talks given to the group as a whole followed by general discussions of needs and benefits to provide a roadmap of future activities.
NTIS
Data Bases; Diffusion; Thermodynamics; Mathematical Models

20030012699 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Inst. for Fluid Mechanics, Goettingen, Germany
Numerical Investigation of Hydrogen Plumes and Comparison with Experiments in STG
Rosenhauer, Mathis; Plahn, Klaus; Hannemann, Klaus; Jul. 09, 2000; 7p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on CD-ROM
Report No.(s): AD-A409190; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Hydrogen plumes gained much interest from the fact that H (sub 2) is an important reaction product of a hydrazine thruster. H (sub 2) shows strong and temperature dependent rotational relaxation which quickly leads to nonequilibrium between

translational and rotational temperature in expanding flows. In a hybrid calculation of the whole flowfield, both methods (Navier-Stokes and DSMC) must model rotational relaxation consistently. Jeans' equation was used for Navier-Stokes, and for DSMC the Borgnakke-Larsen model with constant and with energy-dependent relaxation probability was used. The comparison with free molecule probe measurements of hydrogen plumes in the DLR High Vacuum Facility STG provides insight into the accuracy of the numerical models.
DTIC
Hydrogen; Plumes; Navier-Stokes Equation; Monte Carlo Method

20030012724 Academy of Sciences (USSR), Novosibirsk Inst. of Thermophysics, Novosibirsk, USSR
Free Molecular Flow in the Holweck Pump
Skovorodko, Petr A.; Jul. 09, 2000; 4p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409041; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The numerical algorithm for simulation the free molecular flow in the Holweck pump based on test particle Monte Carlo method is developed. The results obtained by this method for real cylindrical geometry of the pump taking into account the rotation of the rotor with multi-grooved channels are in good agreement with measured results for low-pressure conditions. The critical analysis of the model, proposed in ref. for the flow in the pump that is based on the plane representation of the pump geometry, is made.
DTIC
Numerical Analysis; Free Molecular Flow; Rotors; Algorithms

20030012726 Urals A. M. Gorky State Univ., Inst. of Physics and Applied Mathematics, Sverdlovsk, USSR
Surface Composition Influence on Internal Gas Flow at Large Knudsen Numbers
Sazhin, Oleg V.; Borisov, Sergei F.; Jul. 09, 2000; 6p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409038; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An experimental study of the gas molecule conductivity for cylindrical channel with the surface prepared by metal spray technique has been carried out. The dramatically change of a gas conductivity value is observed at the process of residual gas adsorption on a clean metal surface. Vast experimental material on molecular beam scattering and theoretical approach for description of a gas molecules scattering on the solid state surface are used for comparison and interpretation of the received experimental data. A satisfactory agreement between experimental results and numerical simulation of the effect is achieved.
DTIC
Gas Flow; Kinetic Theory; Knudsen Flow; Composition (Property); Surface Layers

20030012738 Lawrence Livermore National Lab., Livermore, CA USA
Numerical Experiments with a Turbulent Single-Mode Rayleigh-Taylor Instability
Cloutman, L. D.; Apr. 01, 2000; 46p; In English
Report No.(s): DE2002-791953; UCRL-ID-138595; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Direct numerical simulation is a powerful tool for studying turbulent flows. Unfortunately, it is also computationally expensive and often beyond the reach of the largest, fastest computers. Consequently, a variety of turbulence models have been devised to allow tractable and affordable simulations of averaged flow fields. Unfortunately, these present a variety of practical difficulties, including the incorporation of varying degrees of empiricism and phenomenology, which leads to a lack of universality. This unsatisfactory state of affairs has led to the speculation that one can avoid the expense and bother of using a turbulence model by relying on the grid and numerical diffusion of the computational fluid dynamics algorithm to introduce a spectral cutoff on the flow field and to provide dissipation at the grid scale, thereby mimicking two main effects of a large eddy simulation model. This paper shows numerical examples of a single-mode Rayleigh-Taylor instability in which this procedure produces questionable results. We then show a dramatic improvement when two simple subgrid-scale models are employed. This study also illustrates the extreme sensitivity to initial conditions that is a common feature of turbulent flows.
NTIS
Numerical Flow Visualization; Taylor Instability; Turbulent Flow; Turbulence Models

20030012781 Woods Hole Oceanographic Inst., MA USA
Development of a Six-Degree of Freedom Simulation Model for the REMUS autonomous Underwater Vehicle
Prestero, Timothy; Nov. 2002; 7p; In English; Original contains color images

Contract(s)/Grant(s): N00014-97-1-0787
Report No.(s): AD-A409034; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the development and verification of a six degree of freedom, non-linear simulation model for the REMUS AUV, the first such model for this platform. In this model, the external forces and moments resulting from hydrostatics, hydrodynamic lift and drag, added mass, and the control inputs of the vehicle propeller and fins are all defined in terms of vehicle coefficients. This paper briefly describes the derivation of these coefficients. The equations determining the coefficients, as well as those describing the vehicle rigid-body dynamics, are left in non-linear form to better simulate the inherently non-linear behavior of the vehicle. Simulation of the vehicle motion is achieved through numeric integration of the equations of motion. The simulator output is then verified against vehicle dynamics data collected in experiments performed at sea. The simulator is shown to accurately model the motion of the vehicle. The paper concludes with recommendations for future model validation experiments.

DTIC

Mathematical Models; Underwater Vehicles; Simulation; Measure and Integration

20030012782 Kyoto Univ., Dept. of Aeronautics and Astronautics, Japan

One-Way Flow of a Rarefied Gas Induced in a Circular Pipe with a Periodic Temperature Distribution

Aoki, K.; Sone, Y.; Takata, S.; Takahashi, K.; Bird, G. A.; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409033; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The steady behavior of a rarefied gas in a circular pipe with a saw-like temperature distribution increasing and decreasing periodically in the direction of the pipe axis is investigated numerically by means of the direct simulation Monte Carlo method. It is shown that a steady one-way flow is induced in the pipe without the help of a pressure gradient for a wide range of the Knudsen number when a series of ditches is dug periodically in the part of the pipe wall with decreasing (or increasing) temperature. The features of the flow are clarified in detail. It is also shown that the flow has a pumping effect. In particular, some data that give the estimate of the maximum compression ratio attained by a pipe consisting of a large number of periods are presented. The present study is the continuation of the previous study in the case of a two-dimensional channel. It is found that although the induced one-way flow is stronger for the two-dimensional channel, the pumping effect is stronger for the circular pipe.

DTIC

Pressure Gradients; Temperature Gradients; Rarefied Gases; Thermodynamic Properties; Pipes (Tubes); Circular Tubes

20030012787 Manchester Univ., UK

Theoretical Prediction of the Hypersonic Boundary-Layer Over a Row of Microcavities ***Final Report, 13 Jun. 2001-13 Jun 2002***

Duck, Peter; Sep. 2002; 26p; In English
Contract(s)/Grant(s): F61775-01-W-E046
Report No.(s): AD-A408970; EOARD-SPC-01-4046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking University of Manchester as follows: The key deliverable will be the ability to provide an improved integral condition for calculations in the main body of the flow. Given the plethora of parameters (M, Re, m, d, d/D, d/s), only a small subset of parameter space will be investigated within the available year; however a theoretical approach provides a fast means to investigate certain parameter regimes. Particular attention will be focused on the choice of (boundary) conditions to be imposed inside the cavity. Various asymptotic limits to the problem will be considered analytically, where appropriate, including the limit of very narrow and also very deep cavities. The possibility of modeling the cavity flow as incompressible will be thoroughly investigated. Also, the sensitivity of some of the underlying assumptions will be investigated. Once the micro' detail of the pressure field has been determined (through analytic and/or numerical means), a study will be undertaken to determine the best/most appropriate manner in which to construct a surface integral condition for use within the outer flow calculations. Progress of the proposed work will be monitored by means of one intermediate and one final report.

DTIC

Boundary Layers; Mathematical Models; Hypersonic Flow; Cavity Flow; Independent Variables

20030012802 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR

An Experimental and Numerical Study of A Supersonic-Jet Shock-Wave Structure

Zapryagaev, V. I.; Kudryavtsev, A. N.; Lokotko, A. V.; Solotchin, A. V.; Hadjadj, A.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul

2002. Prepared in cooperation with LMFN-CORIA, INSA de Rouen, St. Etienne du Rouvray, France
Report No.(s): AD-A409192; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The investigation of the shock-wave structure and numerical characteristics of supersonic-jet shear layer is of great importance due to numerous applications of supersonic jets in aerospace engineering. In the present work, a detailed study of a supersonic non-isobaric jet aimed at validation and further development of numerical algorithms for jet flow prediction has been carried out. The difficulties in numerical simulation of supersonic non-isobaric jets stem from the necessity of accurate resolution of various flow scales and from the occurrence of multiple shock waves and subsonic pockets interacting with each other.
DTIC
Numerical Analysis; Supersonic Jet Flow; Shock Waves

20030012816 California Univ., Dept. of Mechanical and Aerospace Engineering, Irvine, CA USA
Faster and More Accurate Numerical Methods for Flutter and Nonlinear Aeroelasticity
Liu, Feng, California Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 56; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Computational Fluid Dynamics (CFD) has proven to be a useful tool for the simulation and prediction of buffet, flutter, and Limit Cycle Oscillation (LCO) phenomena of aero-elastic systems. Methods ranging from the linear double-lattice method to methods that solve the full Navier-Stokes equations have been developed. The CAPTSD-V is a NASA computer code that is the most widely known and used. The CAPTSD code has many advantages over other codes. However, experiences have shown the need for increased robustness and enhanced accuracy in the presence of flow separation for CAPTSD-V or any method of the Interactive Boundary Layer (IBL) type in order to make them dependable tools. The goal of this research has been to explore methods that will improve the CAPTSD-V code and in general to develop faster and more accurate numerical methods for flutter and nonlinear aeroelastic phenomena. The author has studied the CAPTSD-V code and examined carefully the integrated boundary layer method under the guidance of LaRC researchers. Strategies have been proposed to improve the CAPTSD-V code for better efficiency, accuracy, and robustness. New methods are also proposed for following up collaborative research between the faculty fellow NASA Langley Research Center. We will start by developing an accurate and robust Interactive Boundary Layer (IBL) method building on the existing strength of CAPTSD-V. This includes the addition of the time-dependent term in the integral boundary layer method and improved coupling method for interaction between the potential flow and the boundary layer solutions. We then propose the development of an Euler method based on small perturbation boundary conditions and new novel methods for coupling Euler and boundary layer solutions. Finally, other advanced methods based on the Euler and the Navier-Stokes equations are proposed for potential future topics.
Author
Aeroelasticity; Flutter Analysis; Computational Fluid Dynamics; Prediction Analysis Techniques; Boundary Layer Separation

20030012824 University of South Florida, Dept. of Mathematics, Tampa, FL USA
Shock Trains in Constant Area Ducts
Rimbey, Scott E., University of South Florida, USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 64; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Back-pressuring supersonic internal duct flows leads to the development of shock trains within the duct. The length of the shock train increases with both the incoming Mach number of the flow and the ratio of the back pressure to the incoming pressure. For a given incoming Mach number, the upper limit on the ratio is generally slightly less than the normal shock pressure ratio. Achieving this upper limit typically requires a duct whose length is many times its height. Shorter ducts will only achieve some fraction of the maximum possible. The development of a shock train is problematic in ramjet engines, where the back pressure is due to combustion and shock trains of sufficient length can unstart the inlet. to prevent unstart, an isolator is inserted into the engine flowpath between the inlet and the combustor to protect the inlet from the combustion-induced shock train effect. Since the inclusion of such an isolator undesirably increases the weight of the engine, it is important to quantify the length of the shock train as a function of the incoming Mach number and the pressure ratio. This was the purpose of this study. The first phase of the study was to acquire a database of shock train cases for two different Mach numbers, 1.8 and 2.2. This database was generated using the CFD code VULCAN, written by Jeff White of NASA Langley. Several different pressure ratios were run at each Mach number; all cases used a rectangular grid with a length-to-height ratio of 20. The goal was to determine the highest allowable back pressure at which the shock train could be contained within the duct. The second phase of the study was to analyze the CFD database using one-dimensional conservation equations that include distortion. This analysis is ongoing, but it appears to be a

promising technique for predicting the features of the shock train that most significantly affect the performance of a ramjet engine. Such predictive capabilities would provide a useful enhancement to engine performance cycle codes.
Author
Ducts; Internal Flow; Pressure Ratio; Computational Fluid Dynamics; Pressure

20030012825 Mount Olive Coll., Mount Olive, NC USA
CFD Verification and Validation: Survey of Technology and Practice
Rose, Ollie J., Mount Olive Coll., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 65; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Results of an intensive literature survey in Verification and Validation of Computational Fluid Dynamics are discussed. Background concepts, including recommended distinctions between verification, validation, calibration and reconciliation are presented. Selected examples of Software Quality Engineering and N-version testing of computational solutions are presented and interpreted. The need for CFD V & V is emphasized by the results from these examples. An in-depth assessment of current technology and practice is given. A review of current V & V research areas and emerging technology is discussed. A research framework for exploiting existing and emerging technology is suggested.
Author
Computational Fluid Dynamics; Proving; Computer Programs

20030012885 Academy of Sciences (USSR), Unst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
A Study of Hypersonic Compression-Corner Flow at High Reynolds Numbers
Vetlutsky, V. N.; Ganimedov, V. L.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409149; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To numerically solve the problem for the ramp flow at high Reynolds number, it is justified to use the classical Prandtl model and to part the flow into an inviscid region and a thin boundary layer. This model is based on a rigorous asymptotic theory and describes the flow the more accurately, the higher the Reynolds number is. Since a flow separation in a compression corner may occur, the present work deals with unsteady boundary-layer equations. The approximation error in discretization of boundary-layer equations is always smaller than the value of viscid terms since the Reynolds number can be eliminated from the equations by a suitable substitution of variables. Besides, the requirement for the sufficient number of points in the cross-flow direction can be fulfilled in the case of middle-class computers since the solution is being built in a narrow near-wall region.
DTIC
Asymptotic Series; Corner Flow; High Reynolds Number; Hypersonic Flow; Navier-Stokes Equation

20030012887 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Numerical Investigation of Interaction of Oblique Shock and Detonation Waves in a Steady Supersonic Flow of a Chemical Reactive Gaseous Mixture
Trotsyuk, A. V.; Kudryavtsev, A. N.; Ivanov, M. S.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409142; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The main objective of the present work is to study the flow structure with reflection of oblique SW and DW in a steady supersonic flow of a chemically reacting mixture and the transition from regular to Mach reflection.
DTIC
Detonation Waves; Gas Mixtures; Oblique Shock Waves; Steady Flow; Supersonic Flow; Chemical Reactions; Numerical Analysis

20030012891 Academy of Sciences of the Ukraine, Inst. of Technical Thermophysics, Kiev, Ukraine
Methods of Bypass Transition Diagnostics
Epik, E. Ya.; Suprun, T. T.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409090; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Bypass laminar-turbulent transition (BLTT) taking place in flows with disturbances of different nature is widely spread in various technical applications. However only during the last decade the intensive investigations of BLTT were begun in reference to needs of turbomachinery thermal power installations and internal flows in technological equipment. On the basis of detailed

analysis of literature devoted to BLTT we can confidently say flat the earliest experimental investigations on this problem were started in IET NASU in the beginning of the seventies and their results were broadly used for understanding the BLTT mechanism aspects by a number of researchers.
DTIC
Boundary Layer Transition; Turbogenerators; Internal Flow; Bypasses

20030012892 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Brunswick, Germany
Modelling of N2-Thruster Plumes Based on Experiments in STG
Plaehn, Klaus; Dettleff, Georg; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409089; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In the DLR- high vacuum plume test facility STG experiments have been performed with the aim to validate the available plume flow model. For this purpose fully expanding simulated plumes with N2 as test gas have been chosen as simplest case (no chemical reactions, constant ratio of specific heats). The essential parameter to be varied was the nozzle flow Reynolds number, the quantities to be measured were the Pitot pressure at the nozzle exit and the molecule number flux in the plume. It turned out that a new model had to be written taking into account in a more appropriate way the development of the boundary layer in the nozzle and the initial plume spreading. The result is a code which describes the plume flow in satisfying agreement with the experimental data.
DTIC
Plumes; Thrust Control; Thrustors; Reynolds Number; Nozzle Flow

20030012930 NASA Langley Research Center, Hampton, VA USA
Flow-Field Measurement of Device-Induced Embedded Streamwise Vortex on a Flat Plate
Yao, Chung-Sheng, NASA Langley Research Center, USA; Lin, John C., NASA Langley Research Center, USA; Allan, Brian G., Institute for Computer Applications in Science and Engineering, USA; [2002]; 17p; In English; 1st AIAA Flow Control Conference, 24-27 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-3162; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
Detailed flow-field measurements were performed downstream of a single vortex generator (VG) using an advanced Stereo Digital Particle Image Velocimetry system. Thc passive flow-control devices examined consisted of a low-profile VG with a device height, h, approximately equal to 20 percent of the boundary-layer thickness, sigma, and a conventional VG with h is approximately sigma. Flow-field data were taken at twelve cross-flow planes downstream of the VG to document and quantify the evolution of embedded streamwise vortex. The effects of device angle of attack on vortex development downstream were compared between the low-profile VG and the conventional VG. Key parameters including vorticity, circulation, trajectory, and half-life radius - describing concentration, strength, path, and size, respectively--of the device-induced streamwise vortex were extracted from the flow-field data. The magnitude of maximum vorticity increases as angle of attack increases for the low-profile VG, but the trend is reversed for the conventional VG, probably due to flow stalling around the larger device at higher angles of attack. Peak vorticity and circulation for the low-profile VG decays exponentially and inversely proportional to the distance downstream from the device. The device-height normalized vortex trajectories for the low-profile VG, especially in the lateral direction, follow the general trends of the conventional VG. The experimental database was used to validate the predictive capability of computational fluid dynamics (CFD). CFD accurately predicts the vortex circulation and path; however, improvements are needed for predicting the vorticity strength and vortex size.
Author
Computational Fluid Dynamics; Flat Plates; Flow Distribution; Vortices; Vortex Generators; Boundary Layer Separation; Angle of Attack

20030012936 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Investigation of the 3-D Hydrogen Flame Structure in a Supersonic High-Temperature Air Flow by Optical Methods
Vorontsov, S. S.; Zabaikin, V. A.; Pickalov, V. V.; Postnov, A. V.; Smogolev, A. A.; Jul. 2002; 4p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409201; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
In this work the experimental results of research of a plume structure at axial hydrogen injection in a supersonic high-temperature air jet are presented. Two levels of temperatures are compared. One of them (1500-2000 K) is usually achieved

in the ground experimental facility with a long period of action. The other level of temperature (2500-2700 K) is characteristic for installations with a short period of action.
DTIC
Flow Visualization; Hydrogen; Supersonic Combustion

20030012937 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Influence of a Binder Layer on the Response Time of Pressure-Sensitive Coatings
Zharkova, G. M.; Khachaturyan, V. M.; Malov, A. N.; Lopatkina, A. A.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409199; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The present work describes an experimental study of pressure-sensitive luminescent coatings containing phosphors prepared on different substrates. Data are presented concerning measurements of luminescence intensity and luminescence decay kinetics at different pressures and temperatures.
DTIC
Flow Visualization; Pressure Sensitive Paints; Luminescence; Phosphors

20030012940 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Streamwise Vortex Structures in a Supersonic Jet Shear Layer
Zapryagaev, V. I.; Kiselev, N. P.; Solotchin, A. V.; Jul. 2002; 6p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409195; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Such an intricate behavior of the increment with the azimuthal wavenumber may be a consequence of nonlinear character of the interaction between different flow modes. Another reason may lie in the more complex radial amplitude distribution of individual modes corresponding to the streamwise vortices. The present work describes a detailed study of the radial amplitude distribution of various azimuthal modes in an underexpanded supersonic jet.
DTIC
Vortices; Supersonic Jet Flow

20030012942 Academy of Sciences (USSR), Inst. of Thermophysics, Novosibirsk, USSR
Flow Structure and Mass Transfer Investigation of the Turbulized Boundary Layer with Ethanol Evaporation and Diffusion Combustion
Volchkov, E. P.; Boyarshinov, B. F.; Titkov, V. I.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409151; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Uncertainty of evaluation of each factor (separation laminar-turbulent transition combustion and turbulization) hinders mathematical simulation of the joint effect on gas dynamic and thermal characteristics of the boundary layer. The characteristics may be most reliably determined experimentally. The work objective is the experimental study of the boundary layer structure comparison of the fields of temperature velocity and its pulsation with data on heat and mass transfer.
DTIC
Combustion; Diffusion; Ethyl Alcohol; Evaporation; Mass Transfer; Turbulent Boundary Layer; Thermodynamic Properties; Gas Dynamics

20030012962 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Effect of Turbulizing Grid Near Wake on a Boundary Layer on a Wedge
Brylyakov, A. P.; Zanin, B. Yu.; Zharkova, G. M.; Sboev, D. S.; Jul. 2002; 6p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409081; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The problem of flow about bodies with high free stream turbulence is very important for engineering, because these flows are frequently met in different technical devices and turbo-machines. The recent researches showed that a stationary system of longitudinal structures arose on the winward side of the wing from increasing level of free stream turbulence to 1%. Characteristic transversal size of these structures exceeded the boundary layer thickness in many times. The number of the structures was found to be dependent on the angle of attack and the distance from the wind tunnel nozzle. Those experiments were carried in the open

test section and the flow about the wing was complicated because of transversal spread of the flow. The present work is an experimental investigation of a similar phenomenon which takes place in a boundary layer on the winward surface of two-dimensional wedge in close test section.
DTIC
Turbulence; Wedges; Boundary Layer Thickness; Angle of Attack

20030012963 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Numerical and Experimental Simulation of Medium Compression Effect at Flowing Around A Wing Profile
Aulchenko, S. M.; Zaprjagaev, V. I.; Kornilov, V. I.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409068; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Simplified theoretical models are quite often used in aerodynamical investigations to solve the problems of flowing around the aircraft elements with a compressed flow in particular the model of incompressible liquid based on using of the known correction factor which is a function of the Mach number. The similar approaches have a whole series of restrictions with conditional and interdependent limits. by this, a trusty information made in the frames of models verification, such as a pressure distribution on the surface, or nicer characteristics, for example, flow downwards, even by flowing around bodies of a non-complicated form is not exhaustive by no means. This work is to make up a deficiency, in which on the example of flowing in the vicinity of a symmetrical wing profile with a relative thickness of 12% the numerical and experimental data have been obtained. These data allow to evaluate an adequacy level of different modeling ways of the compressed medium effects.
DTIC
Wings; Wing Profiles; Compressible Flow

20030012974 Kyoto Univ., Dept. of Aeronautics and Astronautics, Japan
Experiment on a One-Way Flow of a Rarefied Gas Through a Straight Circular Pipe Without Average Temperature and Pressure Gradients
Sone, Y.; Fukuda, T.; Hokazono, T.; Sugimoto, H.; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409032; X5; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
It is demonstrated experimentally that a one-way flow of a slightly rarefied gas is induced in a circular straight pipe of a uniform diameter with its two ends being kept at an equal temperature and pressure by beating the middle pan along the pipe and by putting up a shelf or shelves inside of a half pan of the pipe on one side of the beater. The experiment is done in a small vacuum chamber of a glass bell jar, and the flow is detected by a small windmill. A one-way flow is induced from the pan of the pipe with a shelf or shelves to that without it or them. The mechanism of the flow is explained by the difference of dependence on the cross sectional area between the thermal transpiration and Poiseuille flow.
DTIC
Pressure Gradients; Rarefied Gases; Thermodynamic Properties

20030012975 Central Research Inst. of Tech. and Machine Building, Kaliningrad, Moscow, Russia
Experimental Study of Thermal/Force Loads on Samples in a Subsonic Channel
Lagutin, V. I.; Murzinov, I. N.; Plevako, N. B.; Zolotarev, S. L.; Karpov, V. A.; Aug. 23, 2002; 6p; In English; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409049; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A Big Subsonic Channel as a part of the U-15T-2 set is intended to investigate the behavior of heat protection large-scale samples (^3OO mm in length) in the environment of high-energy gas flow at turbulent boundary layer conditions.
DTIC
Thermodynamic Properties; Subsonic Flow

20030012981 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Streaky Structures in a Wing Boundary Layer at High Free Stream Turbulence and Modelling of the Transition in Such Flow
Ablaev, A. R.; Grek, G. R.; Kozlov, V. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia, 1-7 Jul 2002
Report No.(s): AD-A409061; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Raised interest of researchers to a problem of the laminar-turbulent transition at high free stream turbulence can be observed recently. The given interest is connected to a lot of reasons both of the scientific nature and requirements of the modern engineering with point of view its new opportunities. It is known that laminar-turbulent transition at low free stream turbulence is occurred caused by the process of generation and development of the instability waves so-called Tollmien-Schlichting (TS) waves. This type of transition was in details investigated by many researchers and continues to be studied in nowadays. A more complex way of understanding of the laminar flow breakdown mechanism into the turbulent state for the wall shear layers where the boundary layer flow modulated by longitudinal localized in spanwise direction structures. In this case the classical scenario of transition due to the mechanism of spatial evolution of a TS wave ceases to work and it is necessary to understand what processes result in occurrence of longitudinal structures and what mechanism of their breakdown. by one of such transition mechanisms is the transition mechanism at high free stream turbulence. Experiments in the natural conditions were shown that the flat plate boundary layer at high free stream turbulence was modulated by streaky structures in spanwise direction. It was shown that the spanwise scale of these structures correlated with a boundary layer thickness. On the other hand all researchers observed the turbulent spots origination at last stages of transition. However the more detailed development characteristics of the given structures as well as the mechanism of their generation development and breakdown was not investigated.
DTIC
Boundary Layer Transition; Wings; Boundary Layer Flow; Tollmien-Schlichting Waves

20030012982 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Effects of Pressure Waves Applying on Filtration
Akhmetov, A. T.; Gubaidullin, A. A.; Shnaider, A. V.; Jul. 2002; 5p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia, 1-7 Jul 2002
Report No.(s): AD-A409063; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
During experimental investigations on the vertical shock tubes of shock-wave loadings influence on the filtration a number of effects were detected. Quantitative and qualitative interpretation of these effects is given within the framework of the mechanics of multiphase systems. Filtration of distilled water under action of a hydrostatic pressure of a column of this liquid above the core is considered. The core was preliminary saturated with air. In experiments a considerable (on the order) reduction of fluid flow rate through the core with the increase of time was observed. We have named this peculiarity filtration blockage. It is shown that at shock-wave loadings in the state of filtration various results are possible. During the action of the shock-wave loadings in a filtration blockage peak increase of fluid flow rate is observed. Repeated shock-wave loadings resulted in increasing of the average fluid flow rate level. During the action of waves at the initial stage of filtration (before blockage) the opposite result was observed: reduction (by 3-4 times) of liquid flow rate. Some results of experiments on the action of compression waves on a stationary filtration are published in 1-31.
DTIC
Filtration; Hydrostatic Pressure; Pressure Effects; Compression Waves; Flow Velocity

20030012983 Central Research Inst. of Tech. and Machine Building, Kaliningrad, Moscow, Russia
Hypersonic Flows Over Conical Bodies with Asymmetric Bluntness
Andreev, V. N.; Bachmanova, N. S.; Eremin, V. V.; Kozlovskii, V. A.; Lipnitskii, Yu. M.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409064; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The authors have also elaborated a program system for calculation of flows around such kind of body which includes programs for calculation of sub and supersonic flow regions using methods of transition to a steady state and calculation of X-hyperbolic flow region using different modifications of the Godunov method. Viscous effects in this program system are taken into account basing on auxiliary approach of the theory of boundary layer.
DTIC
Conical Bodies; Hypersonic Flow; Supersonic Flow; Viscous Flow

20030012985 Universite de Valenciennes et du Hainaut-Cambresis, France
Simplified Turbulent Boundary Layer Computation of Some Divergent Internal Flows
Askovic, R.; Aug. 23, 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409066; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
To calculate the flows of this type we are going to develop herein a simplified method by using a new variant of the phenomenologic semi-empiric turbulent boundary-layer theory that is founded on the analogy with the rheologic power-laws

largely utilized in foe study of non-Newtonian non-linear flows and on the use of foe Karman turbulence model. It is to note also that the viscous sublayer is neglected as well as foe layer situated over the zone for which the universal logarithmic law is usually used.
DTIC
Turbulent Boundary Layer; Internal Flow; Turbulence Models

20030012986 Academy of Sciences (USSR), Ist. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Experimental Study of 3D Localized Boundary-Layer Receptivity to Free-Stream Vortices by Means of Two-Source Method
Bake, S.; Borodulin, V. I.; Kachanov, Y. S.; Roschektayev, A. P.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409070; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The investigation of mechanisms of excitation of the boundary-layer instability waves by various external perturbations represents an important aspect of the laminar-turbulent transition problem and has a crucial significance for both basic research of transition and practical applications. A review of recent studies in this field related to 3D receptivity problems for 2D and 3D boundary layers can be found. Most of previous experimental investigations were devoted to the receptivity to surface perturbations (roughness and vibrations) and to acoustic waves. Meanwhile, the excitation of instability waves by free-stream turbulence can also play a very important role and influence the transition process. The present paper is devoted to an experimental investigation of the 3D receptivity of Blasius boundary layer to non-stationary vortical free-stream disturbances due to their scattering on localized (in streamwise and spanwise directions) surface vibrations. There is only one available quantitative experimental study of a similar receptivity problem performed for unsteady free-stream vortices. A scattering of a weak vortex street (with 2D spanwise vorticity) on a localized two-dimensional surface roughness has been studied in this work in the Blasius flow. The results of this experiment were found to be in a good agreement with the 2D receptivity theory. Three-dimensional receptivity to non-stationary free-stream vortices has not been studied in previous experiments at all. The scattering of free-stream vortices on surface vibrations was not studied even for purely two-dimensional case.
DTIC
Boundary Layer Transition; Sound Waves; Blasius Flow; Wave Excitation

20030012987 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
The Effect of Porous Blowing and Suction on Aerodynamics and Heat Transfer in Separated Laminar Flow in Duct Behind of Backward-Facing Step
Batenko, S. R.; Grechanova, A. P.; Terekhov, V. I.; Jul. 2002; 7p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409071; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Being a powerful intensifier of friction and of heat transfer in gas and liquid flows the flow separation plays a vital part in kinetics of exchanging processes in nature and in technical applications. The porous blowing and suction are also powerful factors that determine the characteristics of these processes. In present work the influence of these factors on friction and on heat transfer in separated laminar flow in duct behind of backward-facing step is investigated in numerical experiment.
DTIC
Aerodynamic Heat Transfer; Boundary Layer Separation; Liquid Flow; Gas Flow

20030012988 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Further Development of the Spark Tracing Technique for Flow Visualization
Boiko, V. M.; Zapryagaev, V. I.; Kornilov, V. I.; Petrov, A. P.; Solotchin, A. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409073; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The spark tracing technique allows one to measure both steady-state and non-steady flows and reveal their characteristic features such as shock waves flow separation regions reverse-flow regions etc. Setting with precise accuracy tie interval between spark discharges and measuring distance between successive photographed images of spark-discharge channels enable one to built the flow velocity field in the flow region covering by sparks. The present study was aimed at further development of the spark

tracing technique for probing flows with periodic spark discharges and an automated system for processing the flow patterns obtained by this method.
DTIC
Velocity; Measurement; Boundary Layer Separation; Flow Visualization; Flow Distribution

20030012989 Royal Inst. of Tech., Stockholm, Sweden
Thermophoresis of Axially Symmetric Bodies
Borg, Karl I.; Soederholm, Lars H.; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409074; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Thermophoresis of axially symmetric bodies is investigated to first order in the Knudsen-number, Kn. The study is made in the limit where the typical length of the immersed body is small compared to the mean free path. It is shown that in this case, in contrast to what is the case for spherical bodies, the arising thermal force on the body is not in general antiparallel to the temperature gradient. It is also shown that the gas excerts a torque on the body, which in magnitude and direction depends on the body geometry. Equations of motion describing the body movement are derived. Asymptotic solutions are studied.
DTIC
Equations of Motion; Temperature Gradients; Axisymmetric Flow; Thermophoresis; Knudsen Flow

20030012992 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Experimental Investigation of a Resonant Mechanism of Amplification of Continuous-Spectrum Disturbances in an APG Boundary Layer by Means of a Deterministic Noise Method
Borodulin, V. I.; Kachanov, Y. S.; Koptsev, D. B.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409077; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The paper is devoted to an experimental study of the laminar-turbulent transition in a self-similar boundary layer with an adverse pressure gradient (APG). The main attention is paid to dominating mechanisms of weakly-nonlinear interactions between the wide-band frequency-wavenumber spectrum of Tollmien-Schlichting (TS) waves (i.e. the noise-like instability waves) and a 2D primary TS-wave. In previous experiments devoted to weakly-nonlinear stages of the APG boundary-layers transition only resonant interactions of deterministic TS-waves were investigated. Moreover the resonant amplification of the purely controlled (as in the present experiment) wide-band perturbations has not been studied yet even in non-gradient (Blasius) boundary layer despite there is a great amount of investigations performed for this flow.
DTIC
Resonance; Boundary Layer Transition; Frequency Distribution; Turbulent Boundary Layer

20030012996 Sung Kyun Kwan Univ., Suwon, Korea, Republic of
Molecular Transition and Slip Flows in Rotating Helical Channels of Drag Pump
Hwang, Young-Kyu; Heo, Joong-Sik; Jul. 09, 2000; 8p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409084; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Numerical and experimental investigations are performed for the rarefied gas flows in pumping channels of a helical-type drag pump. Modern turbomolecular pumps include a drag stage in the discharge side, operating roughly in the pressure range of 10 (exp -2) ^ 1OTorr. The flow occurring in the pumping channel develops from the molecular transition to slip flow traveling downstream. Two different numerical methods are used in this analysis: the first one is a continuum approach in solving the Navier-Stokes equations with slip boundary conditions, and the second one is a stochastic particle approach through the use of the direct simulation Monte Carlo (DSMC) method. The flows in pumping channels are three-dimensional (3D), and the main difficulty in modeling a 3D case comes from the rotating frame of reference. Thus, trajectories of particles are no longer straight lines. In the present DSMC method, trajectories of particles are calculated by integrating a system of differential equations including the Coriolis and centrifugal forces. Our study is the first instance to analyze the rarefied gas flows in rotating frame in the presence of noninertial effects.
DTIC
Gas Flow; Rarefied Gases; Numerical Analysis

20030012997 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR

Peculiarities of 3-D Flow Development at Impinged and Swept Shock Wave/ Surface Interactions

Derunov, E. K.; Zheltovodov, A. A.; Maksimov, A. I.; Jul. 2002; 8p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409085; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Shock-wave/boundary-layer interactions (SWBLI) arise both in an external supersonic flow around various control surfaces of flying vehicles and in inlet ducts. Numerous situations with 3-D separated turbulent flows are especially complex and actively studied now. Accurate definition of their specific features and search of general properties are important for deeper understanding of their physics and development of computational models. Complex 3-D SWBLI are observed for example in the supersonic flow around the double-fin configuration (DF) mounted on a plate that models an inlet with three-dimensional compression and around the double-body of revolution (DR) over the surface. Interaction of swept crossing shock waves (SCSW) and expansion fans is realized in the first case. The second case is characterized by interaction of similar impinged disturbances with the surface. The objective of present study is a comparison of the features in development of such flows under a change of shock waves strength or a distance between the bodies. One of the effective techniques to specify the features of 3-D separation appearance and evolution is an analysis of the surface flow pattern visualization in the interaction regions (obtained by coating the test model surface with an oil film) because their topological properties can be theoretically grounded. For example a theorem is known that defines the number and type of singular points associated with separation and reattachment points as well as vortexes centers. Position of the coalescence and divergence lines which are associated with the boundaries of 3-D separation zones is defined by initial structure of these singular points.

DTIC

Turbulent Flow; Fins; Flow Distribution; Wave Interaction; Shock Wave Interaction; Flow Visualization

20030013003 NASA Langley Research Center, Hampton, VA USA

A New Forced Oscillation Capability for the Transonic Dynamics Tunnel

Piatak, David J., NASA Langley Research Center, USA; Cleckner, Craig S., NASA Langley Research Center, USA; [2002]; 18p; In English; 40th AIAA Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-0171; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A new forced oscillation system has been installed and tested at NASA Langley Research Center's Transonic Dynamics Tunnel (TDT). The system is known as the Oscillating Turntable (OTT) and has been designed for the purpose of oscillating, large semispan models in pitch at frequencies up to 40 Hz to acquire high-quality unsteady pressure and loads data. Precisely controlled motions of a wind-tunnel model on the OTT can yield unsteady aerodynamic phenomena associated with flutter, limit cycle oscillations, shock dynamics, and non-linear aerodynamic effects on many vehicle configurations. This paper will discuss general design and components of the OTT and will present test data from performance testing and from research tests on two rigid semispan wind-tunnel models. The research tests were designed to challenge the OTT over a wide range of operating conditions while acquiring unsteady pressure data on a small rectangular supercritical wing and a large supersonic transport wing. These results will be presented to illustrate the performance capabilities, consistency of oscillations, and usefulness of the OTT as a research tool.

Author

Transonic Wind Tunnels; Unsteady Aerodynamics; Wind Tunnel Models; Wing Oscillations; Performance Tests; Wind Tunnel Apparatus; Wind Tunnel Tests

20030013624 NASA Ames Research Center, Moffett Field, CA USA

Efficient Low Dissipative High Order Schemes for Multiscale MHD Flows

Sjoegreen, Bjoern, Royal Inst. of Tech., Sweden; Yee, Helen C., NASA Ames Research Center, USA; Nov. 15, 2002; 2p; In English; AIAA CFD Conference, 23-26 Jun. 2003, Orlando, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Accurate numerical simulations of complex multiscale compressible viscous flows, especially high speed turbulence combustion and acoustics, demand high order schemes with adaptive numerical dissipation controls. Standard high resolution shock-capturing methods are too dissipative to capture the small scales and/or long-time wave propagations without extreme grid refinements and small time steps. An integrated approach for the control of numerical dissipation in high order schemes for the compressible Euler and Navier-Stokes equations has been developed and verified by the authors and collaborators. These schemes are suitable for the problems in question. Basically, the scheme consists of sixth-order or higher non-dissipative spatial difference

operators as the base scheme. to control the amount of numerical dissipation, multiresolution wavelets are used as sensors to adaptively limit the amount and to aid the selection and/or blending of the appropriate types of numerical dissipation to be used. Magnetohydrodynamics (MHD) waves play a key role in drag reduction in highly maneuverable high speed combat aircraft, in space weather forecasting, and in the understanding of the dynamics of the evolution of our solar system and the main sequence stars. Although there exist a few well-studied second and third-order high-resolution shock-capturing schemes for the MHD in the literature, these schemes are too diffusive and not practical for turbulence/combustion MHD flows. On the other hand, extension of higher than third-order high-resolution schemes to the MHD system of equations is not straightforward. Unlike the hydrodynamic equations, the inviscid MHD system is non-strictly hyperbolic with non-convex fluxes. The wave structures and shock types are different from their hydrodynamic counterparts. Many of the non-traditional hydrodynamic shocks are not fully understood. Consequently, reliable and highly accurate numerical schemes for multiscale MHD equations pose a great challenge to algorithm development. In addition, controlling the numerical error of the divergence free condition of the magnetic fields for high order methods has been a stumbling block. Lower order methods are not practical for the astrophysical problems in question. We propose to extend our hydrodynamics schemes to the MHD equations with several desired properties over commonly used MHD schemes.
Author
Multiscale Models; Magnetohydrodynamic Flow; Dissipation; Viscous Flow

20030013728 Academy of Sciences (USSR), Inst. of Thermophysics, Novosibirsk, USSR
Numerical Simulation of a Hydrogen Combustion in a Boundary Layer with a Different Blowing Parameters
Volchkov, E. P.; Terekhov, V. V.; Terekhov, B. I.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409167; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The current paper presents results of simulation for a turbulent flow with hydrogen blowing into the boundary layer. Since the process has many parameters, the main emphasis was put on analysis of dynamic parameters velocity profiles integral scales and surface friction.
DTIC
Boundary Layers; Combustion; Hydrogen; Blowing; Computerized Simulation

20030013729 Academy of Sciences (Russia), Civil Aviation Academy, Saint Petersburg, Russia
Numerical Simulation of Organized and Self-Organized Separated Flows in the Framework of Multiblock Computational Technologies
Isaev, S. A.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409166; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The vortex intensification mechanism of heat transfer on the dimpled surfaces and crossed flow control of the bodies with additional construction elements like forward disks and vortex cells is analyzed by numerical methods. Self-organizing 3D vortex structures generating within dimple enhance the heat transfer from the wall and the effect on the boundary layer by bleeding-suction or rotating central body of the vortex cell results in diminishing of the separation effect influence accompanied by the reduction of the body drag and increasing of lift force. 3D vortex like toroid generated in the gap between forward disk and leading body edge is responsible for the pressure deficit at this region and as a sequence additional thrust that almost compensates the forward disk drag vortex strain at the forward separation region at the angle of attack different from zero causes the effect of head stability for the cylinder with forward disc.
DTIC
Separated Flow; Laminar Flow; Three Dimensional Flow; Vortices; Numerical Analysis; Multiblock Grids; Technologies

20030013730 Air Force Research Lab., Edwards AFB, CA USA
Computation of Neutral Gas Flow from a Hall Thruster into a Vacuum Chamber
Boyd, Iain D.; Cai, Chunpei; Walker, Mitchell .; Gallimore, Alec D.; Oct. 18, 2002; 10p; In English
Report No.(s): AD-A409165; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The finite pressure present in vacuum chamber testing of space propulsion systems such as Hall thrusters can have a number of undesirable effects. For example, the thrust generated by the thruster is higher and the plume divergence angle larger in ground tests in comparison to space operation. to try to quantify these effects, the direct simulation Monte Carlo method is applied to model a cold flow of xenon gas expanding from a Hall thruster into a vacuum chamber. The simulations are performed for the P5 Hall thruster operating in a large vacuum tank at the University of Michigan. Comparison of the simulation results is made

with experimental measurements of pressure obtained with a series of ion gauges. The mass flow rate through the thruster and the total pumping speed of the vacuum chamber are varied. A key physical parameter in the simulations concerns the probability that a xenon atom incident on a cryogenic pumping panel actually sticks to the panel. For a reasonable range of values for the sticking coefficient, excellent agreement between simulation and experiment is obtained for several different conditions.
DTIC
Gas Flow; Hall Thrusters; Vacuum Chambers; Ionization Gages; Spacecraft Propulsion

20030013732 Nagoya Univ., Nagoya Japan
Spectroscopic Study of REMPI for Rotational Temperature Measurement in Highly Rarefied Gas Flows
Mori, Hideo; Ishida, Toshihiko; Aoki, Yoshinori; Niimi, Tornohide; Jul. 09, 2000; 9p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom., ”The original document contains color images”
Report No.(s): AD-A409031; X5; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A measurement technique of thermodynamic variables with high sensitivity is strongly demanded for analyses of highly rarefied gas flows. REMPI (Resonantly Enhanced Multiphoton Ionization) is a powerful optical tool because of its high sensitivity even in high rarefied gas flows and ability to measure nonequilibrium among internal (translational, vibrational, and rotational) energy. In this study, to investigate fundamental properties of REMPI signal, the experimental apparatus of 2R+2 N(sub 2)-REMPI is constructed and the REMPI spectra are measured along the center hue of a free molecular jet. A method of Boltzmann plot using the spectral lines of both 0 and P branches is proposed, determining electronic transition dipole moments in Honl-London factors experimentally from the relative line strength of 0 and P branches. Then an effect of an experimental noise on a rotational temperature measured by the Boltzmann plot becomes smaller because the number of the lines used for the plot increases. by using the factors, simulated spectra agree well with experimental ones, suggesting feasibility of rotational temperature measurement by a spectral fitting.
DTIC
Optical Properties; Spectroscopy; Nonequilibrium Flow; Photoionization; Gas Flow

20030013752 National Taiwan Univ., Dept. of Mechanical Engineering, Taipei, Taiwan, Province of China
Valveless Pressure Regulation with a Submerged Micro-Hole
Chen, Ping-Hei, National Taiwan Univ., Taiwan, Province of China; Shyu, Jin-Cherng, National Taiwan Univ., Taiwan, Province of China; Cheng, Wen-Feng, National Taiwan Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 653-661; In English
Contract(s)/Grant(s): NSC-89-2212-E-002-117; Copyright; Avail: Issuing Activity
This study aims at controlling air pressure fluctuation in a chamber from which liquid is being drained continuously by using a submerged micro-hole. In practical applications. this test chamber is used to simulate the commercial ink cartridges of a thermal bubble ink-jet print-head. The chamber air pressure drops owing to liquid being drained from the chamber. and it rises again as bubbles are generated and detached from a submerged micro-hole connecting liquid and the atmosphere. The chamber air pressure fluctuation call be controlled in a designated range that depends Oil factors such as physical properties of liquid used in the chamber, micro-hole diameter, and liquid drain rate. In this study, both distilled water and 10% Wt. isopropanol solution are tested with micro-hole diameter ranging from 60 to 1200 microns. to simulate practical ink injection rates, the liquid drain rate ranges from 0.006 to 0.10 ml/s. For conditions tested in this study, Our measured results show that the chamber air pressure variation and detached bubble volume depend mainly on micro-hole diameter and physical properties of liquid, and only slightly oil liquid drain rate. Two correlations are proposed to Obtain both the detached bubble volume and chamber air pressure fluctuation from physical properties of liquid and micro-hole diameter.
Author
Bubble Chambers; Pressure Oscillations; Air; Variations; Test Chambers; Atmospheric Pressure

20030013985 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Digital Diagnostics of Multiphase Flows by the Pattern Recognition Techniques
Vorozhtsov, E. V.; Kiselev, V. P.; Kiselev, S. P.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409169; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
It should be noted that the methods of digital pattern recognition were applied only for the diagnostics of pure gas flows. At the same time, as is known from the theory of two-phase flows of the mixtures of gas and solid particles, the shock waves as well as of other singularities can arise in such flows, and the number of different types of singularities in two-phase flows even proved

to be larger than in the case of pure gas flows. A generalization of the algorithms for digital localization and classification of singularities described is proposed in the present work for the case of two-phase flows of the mixtures of gas and solid particles. The examples of the diagnostics of specific flows are presented.
DTIC
Multiphase Flow; Pattern Recognition; Algorithms; Flow Visualization

20030013986 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
On Pressure Measurements in a Volume with Unsteady Processes
Zamuraev, V. P.; Latypov, A. F.; Jul. 2002; 9p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409171; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Probes for pressure measurement in a pulse wind tunnels prechamber or in a ramjet combustion chamber are posed usually in face of a narrow duct adjoined to the tested volume. Therewith the pressure depends essentially on length of the used duct. At quick unsteady processes of pressure in long ducts is widely smeared in time and the pressure in short ducts has an oscillating character. At that a question on correspondence of a measured pressure to a real pressure in volume arises. This paper considers the problem for short ducts in the frames of the Euler equations.
DTIC
Pressure Measurement; Wind Tunnels; Combustion Chambers; Unsteady Flow

20030013995 Academy of Sciences (USSR), Inst. of Theoetical and Applied Mechanics, Novosibirsk, USSR
Parallel Modeling of Three-Dimensional Scramjet Combustor and Comparisons with Experiment's Results
Zheung, Zhong-Hua; Le, Jia-Ling; Aug. 23, 2002; 9p; In English; Original contains color images; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002, The original document contains color images
Report No.(s): AD-A409216; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In this paper a parallel simulation of an experimental dual-mode scramjet combustor configuration is presented. Turbulence is modeled with the kappa-epsilon two-equation turbulence model and a seven-species eight-equation kinetics model is used to model hydrogen/air combustion. The conservation from of the Navier-Stokes equations with finite-rate chemistry reactions is solved using a diagonal implicit finite-volume method. Using about 3,120,000 grid points the three-dimension flow-fields with equivalence ratio phi=0.0 and 0.35 have been respectively simulated on the parallel computer system obtaining more detailed flow properties than the experiment's results. Wall pressure comparisons between CFD (Computational Fluid Dynamics) and experiment show fair agreement. For phi=0.35 the fuel-penetrating height of the seven injectors are different because of the effects of the boundary layer and the shock wave in the combustor. According to numerical results, if adjusting the locations of the injectors the combustion efficiency could be improved.
DTIC
Turbulence; Navier-Stokes Equation; Supersonic Combustion Ramjet Engines; Parallel Processing (Computers); K-Epsilon Turbulence Model; Computational Fluid Dynamics

20030014005 Woods Hole Oceanographic Inst., MA USA
Eddys in the Arctic Ocean from IOEB ADCP Data
Krishfield, Richard A.; Plueddemann, Albert J.; Honjo, Susumu; Oct. 2002; 150p; In English
Contract(s)/Grant(s): N00014-97-1-0135; OPP-9815303
Report No.(s): AD-A409233; WHOI-2002-09; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Filtered and Earth-referenced ADCP data from the B92, B97 and S97 IOEBs were demodulated to remove inertial and near-inertial tidal frequencies, in order to highlight the low frequency components for examination of Arctic submesoscale eddys. This report describes the raw data, processing scheme, and numerical and graphical results of this analysis, which are also available at http://ioeb.whoi.edu/ioebeddys.htm. Using the demodulated time series of current profiles from each buoy, characteristics of 95 possible eddy encounters are quantified by (1) identifying anomalously large velocities associated with subsurface vortices, (2) determining the vortex centers and their drift, and (3) determining vortex properties as a functions of radius and depth. Out of 44 total months of observations, 81 of the encounters were determined to be subsurface eddies, and 29 were eddy core encounters. Only 14 of the confirmed subsurface encounters were cyclonic, versus 66 anticyclonic, and one indeterminate. Within the southern and central Canadian basin portion of the Beaufort Gyre, halocline eddys with maximum velocities between 10 and 45 cm/s, centered around 140 m depth, and over 100 m thick were prevalent. Over the Northwind Ridge, eddy encounters were absent from any time series. Farther north and west over the Chukchi Cap, encounters resumed, but were

generally smaller, more shallow and less intense (although these observations were mostly derived from a lower resolution transmitted data subset).
DTIC
Ocean Currents; Vortices; Arctic Ocean

20030014009 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Comparative Study of Coherent Vortex Structures in a Boundary Layer with Adverse Pressure Gradient by Means of a New Experimental Method
Borodulin, V. I.; Kachanov, Y. S.; Roschektayev, A. P.; Jul. 2002; 7p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409250; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
There are several kinds of coherent structures found in previous investigations in a transitional Blasius boundary layer. Spikes, A-vortices, 3D high-shear layers, and ring-like vortices are among them. These structures were observed in experimental and numerical (DNS) investigations. Very similar flow pattens were also found in other transitional near-wall shear flows, such as the plane channel flow and the pipe flow, and also in the developed wall turbulence. Based on these observations, it was suggested that these structures are very universal and represent an inherent feature of the process of turbulence production in all near-wall flows in both transitional and turbulent regimes. Moreover, the mechanism of formation and interaction of these structures can be regarded as a universal mechanism of turbulence production. The main goal of the present study is to check this idea for the case of the APG boundary-layer transition, whose late stages have never been studied experimental despite the great practical importance of this case. The only currently available study was performed numerically for a rather large APG (which is difficult to examine in the wind tunnel).
DTIC
Pressure Gradients; Boundary Layer Transition; Vortices; Wind Tunnel Tests; Boundary Layer Flow

20030014010 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Resonant Amplification of Instability Waves in Quasi-Subharmonic Triplets with Frequency and Wavenumber Detunings
Borodulin, V. I.; Kachanov, Y. S.; Koptsev, D. B.; Roschektayev, A. P.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409252; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Probably the first experimental evidence of an important role of the subharmonic resonance in the process of the laminar-turbulent transition in adverse pressure gradient (APG) boundary layers was obtained. Until recently the only available direct experimental study of the subharmonic resonant interactions in the APG boundary layer was performed for rather small values of the Hartree parameter (beta H -0.06 and -0.09). In agreement with the theoretical prediction a rapid growth and subsequent saturation of subharmonic amplitudes was found under controlled disturbance conditions. However the double-exponential growth predicted by theory has not been found and resonant interactions with frequency and wavenumber detunings have not been examined. Some new results were obtained were all main properties of tuned resonances were studied for a moderate Hartree parameter beta H -0.115. Optimal parameters of resonant triplets were found a strong dependence of the interaction on phase relationships was examined and the double-exponential growth was discovered. However, many questions are still open. The goal of the present experiments was to narrow the gaps existing in this area. In particular, we aimed to study the resonant interactions in the presence of frequency and spanwise-wavenumber detunings for quasi-subharmonic modes.
DTIC
Boundary Layer Transition; Pressure Gradients; Wave Propagation; Stability; Resonant Frequencies

20030014012 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Nonlinear Models for Evolution of Disturbances on the Supersonic Boundary Layer
Gapanov, S. A.; Terekhova, N. M.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409254; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In the present work the study of the action in the resonant triads including the stationary nodes and also the study of the second non-linear mechanism realization possibility-interaction in pairs; is conducted. Historically it was just this and more specifically the study of the finite amplitude waves self-action effects was the beginning of the near-wall nonlinearity simulation.
DTIC
Nonlinearity; Supersonic Boundary Layers; Simulation; Mathematical Models

20030014013 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Automatization System for Aerophysical Experiments
Gilyov, V .M.; Zapryagaev, V. I.; Zvegintsev, V. I.; Garkusha, V. V.; Pishchik, B. N.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409256; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In connection with the wide introduction of personal computers, as well with the obvious obsolescence and physical degradation of available data acquisition facilities, there was posed a problem to develop a next-generation automated system for aerophysical studies based on modern electronic modules, computers and telecommunication means and employing advanced software facilities and technologies.
DTIC
Data Acquisition; Telecommunication; Software Engineering; Methodology

20030014070 Academy of Sciences (USSR), Inst. of Thermophysics, Novosibirsk, USSR
Motion and Decay of Near-Wall Liquid Film at Its Outflow with Cocurrent Gas Flow from the Cylindrical Channel into Vacuum
Prikhodko, V. G.; Serov, A. F.; Nazarov, A. D.; Yarygin, I. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409134; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One of features of the considered problem consists in the fact that most of liquids at the outflow into vacuum become overheated even at room temperature that results in explosive rupture of a film with formation of a vapor phase and drops of a miscellaneous size. Other feature of the problem lies in strong effect of cocurrent gas flow on notion of the film inside the channel and at the outflow into vacuum.
DTIC
Liquids; Vacuum

20030014072 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Aerogasdynamics of Waveriders with Powder-Law Compression Surfaces
Mazhul, I. I.; Rakhimov, R. D.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409131; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Use of the well-known flows streamlines with specified properties to design spatial lifting configurations (waveriders) allows to simplify essentially an analysis of such form characteristics in the so-called design flow regimes which corresponds to their construction conditions. Waveriders using as the basis of a future hypersonic aircraft is widely discussed. Waveriders characteristics in the design regimes have been analyzed in a number of works. However, the off-design regimes applying to a hypersonic aircraft should be investigated. The investigations of such types are more limited, and for some classes of the waveriders they are absent at all. Hereinafter, the investigations results of the waveriders designed using the flows behind planar shock waves as basic flows are presented. A body surface is described by a power-law functions that allow to obtain a series of configurations with different cross-section shapes, including as a particular case, a widely known Nonweiler caret wing. Estimations of lift-to-drag ratio and integral heat fluxes to the surface in the design regimes are presented, and in the frames of the Euler equations the flow in the off-design regimes is numerically studied. It were considered flow patterns at both smaller and larger free-stream flow Mach numbers M of some design Md, at which the configuration was constructed.
DTIC
Aerodynamic Characteristics; Lift Devices

20030014074 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Short-Duration Gasdynamic Devices for Industrial Applications
Zvegintsev, V. I.; Chirkashenko, V. F.; Aug. 23, 2002; 6p; In English; Original contains color images; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409126; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During 30 years in the Institute of Theoretical and Applied Mechanics of the Siberian Branch of the Russian Academy of Sciences different pneumatic devices were developed and used for aerospace industry. These devices can produce an air flow with desired level of parameters within a small time lag (less than 0.1 seconds). The short creation time greatly reduces the complexity and cost of the device and allows one to reach extreme parameters of the flow, which are impossible to obtain in similar devices

of the stationary action. For example, in pulsed mode it is very easy to get an air flow rate equal to tens and even hundreds of kilograms per second, what is possible only by means of ultra big power compressor installations.
DTIC
Industries; Gas Dynamics

20030014100 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Unsteady Conjugate Heat Exchange of Oil-Gas Pipe Line in Soil
Pavljuchenko, A. M.; Papkov, A. N.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409287; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The problem of conjugate beat exchange of main gas-oil pipe lines is of special importance for pipelines laying in the permafrost regions, because the energy saving reliability and ecology problems ought to be solved. In this work, this complex mathematical task without allowance for a movable thawing bound was numerically simulated.
DTIC
Heat Transfer; Pipelines; Gas Pipes

20030014103 Technical Univ. of Munich, Lehrstuhl fuer Thermodynamik, Germany
Numerical Investigation of Fuel Mixing, Ignition and Flame Stabilization by A Strut Injector in A Scramjet Combustor
Lyubar, A.; Sattelmayer, T.; Jul. 2002; 7p; In English; Original contains color images; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. The original document contains color images
Report No.(s): AD-A409284; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In this work the simulation of the non-reacting supersonic flow is presented. The main task of the simulation was to prepare the non-reacting solution for the simulation of reacting flow in the second phase of the project. The flow in a scramjet with a strut injector was simulated. The shock system, temperature field and hydrogen distribution are presented subsequently. Preliminary simulations of the reactive flow were realized with the Finite Rate Model, which is included in 'Fluent 5', in order to investigate potential ignition zones. The model does not yet include the turbulence-chemistry interaction but can, nevertheless, be applied successfully for the initial analysis of the ignition process.
DTIC
Computational Fluid Dynamics; Ignition; Supersonic Flow

20030014105 Academy of Sciences (USSR), Inst. of Thermophysics, Novosibirsk, USSR
Peculiarities Research of the Turbulence in a Swirling Flow by the LDA method
Lebedev, V. P.; Lukashov, V. V.; Abdrakhmanov, R. Kh.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409280; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The vortex axis precession may have a sufficient influence on the measured values of the swirling flow turbulence characteristics. It was shown that up to 80% of the measured value of the velocity fluctuation in a vortex chamber nay be conditioned by the precession. A quasi-periodic low-frequency movement of the flow kernel is observed in different kinds of swirling flows. This may be the precession of the recirculation region in a flow with a strong swirl. For example in a vortex combustion chamber, the swirling movement spiral occurs. The quasi-periodical oscillation in vortex chamber were observed in our previous investigation. It was shown that the mean flow field was not axi-symmetrical: the lines of equal velocity values had the elliptical form. For turbulence measurement in swirling flow it is necessary to evaluate the contribution from quasi-periodical alteration of these parameters since this may overestimate the measured velocity fluctuation. A similar problem appears during the measurement of turbulence in a boundary layer subjected to oscillation in the main flow.
DTIC
Turbulence; Flow Characteristics; Flow Measurement; Flow Distribution; Combustion Chambers

20030014106 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Turbulence Modeling Validation for Afterbody Flows
Hadjadj, A.; Kudryavtsev, A. N.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with LMFN-CORIA, INSA de Rouen, Saint-Etienne du Rouvray, France
Report No.(s): AD-A409279; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this paper, we propose the introduction of several scales characterizing different process of turbulence interaction by using multi-scale model. The multi-scale turbulence modeling consists in partitioning the energy spectrum into several regions, each characterized by a different time scale. Thus different mechanisms such as the return to isotropy, dissipation, diffusion, and viscosity can be modeled using the various characteristic scales. In the simplified split-spectrum used by Kim, turbulent transport is described by using two time scales: the first one corresponds to the large eddies and describes generation of turbulent kinetic energy, and the second one corresponds to the smaller-scale eddies and describes dissipation rate. The turbulent energy can be partitioned into three regions: production region, characterized by the turbulent kinetic energy k(sub p) and the energy transfer rate epsilon(sub p), transfer region, characterized by the turbulent kinetic energy k(sub t) and the dissipation rate epsilon(sub t) and dissipation region, where the turbulent kinetic energy is dissipated into heat.
DTIC
Turbulence; Energy Transfer; Kinetic Energy; Vortices

20030014107 Academy of Sciences (USSR), Inst. of Computational Technologies, Novosibirsk, USSR
The Organized Vortex Structure in Relaxing Gas Flow
Grigoryev, Yu. N.; Ershov, I. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409277; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Data of the experiments correspond immediately to the nonlinear stage of transition in the turbulent regime at alpha = 7 It's known from the modern scenarios of the transition and generation of turbulence are flat these processes are essential nonlinear. They realize by means of origin evolution and decay of certain vortex structures. In boundary layers and pipes they are known gamma-structures, in two-dimension free shear flows and jets they are two-dimensional vortices extended on the transversal coordinate. Under this interpretation the generation of turbulence can be considered as the process of LTT which is stochastically repeated in space and time. This fact allows one to assume flat bulk viscosity influence on the development of perturbations at the nonlinear stage can be estimated by simulating the interaction of the solitary vortex structure with the basic (mean) flow. In this paper the simple model of the evolution of the spanwise vortex structure in a shear flow of non-equilibrium molecular gas is considered for such a purpose.
DTIC
Vortices; Gas Flow; Free Flow; Molecular Gases

20030014109 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Interaction of Hydrodynamic and Temperature External Disturbances with the Boundary Layer
Gaponov, S. A.; Yudin, A. V.; Jul. 2002; 8p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409275; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
At present in solving problems of turbulence arising in boundary layers the study of their receptivity to external disturbances acquires great significance. In this case disturbance generation in boundary layers is attributed to stationary and nonstationary factors (surface vibration acoustic waves external turbulence etc.). One of the first authors to treat this problem and to introduce the tern receptivity vas Morkovin. There are a number of experimental and theoretical studies of subsonic boundary-layer receptivity. Much less is known, however, about the receptivity of a supersonic boundary layer, with all the publications in this field being devoted to studies of interaction of acoustic waves with the boundary layer. At the same time, a supersonic flow may contain not only acoustic disturbances, but also vortical and entropy or heat waves. The interaction of those with a supersonic boundary layer has not yet been adequately investigated. The problem of receptivity of vortical disturbances at subsonic velocities has been analyzed in some publications, but there is no agreement among the authors about the mechanism of disturbance generation in the boundary layer. In this work, excitation of stationary and nonstationary waves by external hydrodynamic disturbances in subsonic and supersonic boundary layers was calculated.
DTIC
Boundary Layers; Turbulence; Vibration; Supersonic Boundary Layers

20030014110 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Numerical Simulation of the Shock Wave Interaction With a Near-Wall Fine Particle Layer
Fedorov, A. V.; Fedorova, N. N.; Fedorchenko, I. A.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409274; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The present paper focuses on numerical simulation of wave processes observed in near-wall fluidized layer under action of normal shock wave. The unsteady process of interaction is described for various shock wave intensities and layer densities. It is shown that shock wave intensity increases significantly in the dense layer and the gain factor does not depend on the shock wave Mach number and defined only by the density ratio. Two different schemes (regular and Mach) of shock reflections are observed in computations that lead to a principally distinguished scenarios of instability development in a dusty layer.
DTIC
Shock Waves; Dust; Shock Wave Interaction

20030014134 NASA Langley Research Center, Hampton, VA USA
Designing a Hybrid Laminar-Flow Control Experiment: The CFD-Experiment Connection
Streett, C. L., NASA Langley Research Center, USA; [2003]; 16p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0977; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The NASA/Boeing hybrid laminar flow control (HLFC) experiment, designed during 1993-1994 and conducted in the NASA LaRC 8-foot Transonic Pressure Tunnel in 1995, utilized computational fluid dynamics and numerical simulation of complex fluid mechanics to an unprecedented extent for the design of the test article and measurement equipment. CFD was used in: the design of the test wing, which was carried from definition of desired disturbance growth characteristics, through to the final airfoil shape that would produce those growth characteristics; the design of the suction-surface perforation pattern that produced enhanced crossflow-disturbance growth: and in the design of the hot-wire traverse system that produced minimal influence on measured disturbance growth. These and other aspects of the design of the test are discussed, after the historical and technical context of the experiment is described.
Author
Laminar Flow; Boundary Layer Control; Wind Tunnel Tests; Computational Fluid Dynamics

20030014146 Academy of Sciences (USSR), Inst. of Theromphysics, Novosibirsk, USSR
New Possibilities of the Electron Beam Method for Diagnostics of High-Temperature Supersonic Gas Stream of Complicated Molecular Composition
Gorchakova, N. G.; Chichenin, A. G.; Prikhodko, V. G.; Yarygin, V. N.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409093; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Today the electron beam diagnostics is one of the main methods for investigation of rarefied gas flows allowing to determine a number of local gas parameters such as density partial concentration temperatures of internal degrees of freedom etc. The relation between the intensities excited by electron beam spectra and local gas parameters is provided either theoretically or by a calibration curve. The aim of the present paper is an analysis of the possibilities of electron-beam diagnostics for partial density measurements of high temperature rarefied gases and their mixtures applying to the mixtures of N2 + CO2.
DTIC
Gas Flow; Density Measurement

20030014148 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Supersonic Inviscid Flows With Three-Dimensional Interaction of Shock Waves in Corners Formed by Intersecting Wedges
Goonko, Y. P.; Kudryavtsev, A. N.; Rakhimov, R. D.; Jul. 2002; 8p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409091; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Results of numerical and analytical investigations of inviscid steady supersonic flows in corners formed by intersecting wedges are presented. Despite the great number of papers dealing with such flows many features of the formation of complex systems of spatially interacting shock waves in corner configurations have not been adequately studied. Some of these problems are investigated in the present paper by consideration of the generic corner flows which are conical and symmetric about the bisector plane of a corner. These flows are numerically calculated by solving three-dimensional steady Euler equations with a marching method. Effects of the angle of inclination of the corner surfaces to the flee stream direction sweep angle of the leading edges and the dihedral angle of the corner are discussed.
DTIC
Reflection; Shock Waves; Wedges

20030014165 Chalmers Univ. of Technology, Goeteborg Sweden

Role of the Streaky Structures in a Transition Mechanism of the Boundary Layers and Jets

Litvinenko, M. V.; Chernorai, V. G.; Kozlov, V. V.; Grek, G. R.; Lofdal, L. L.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in collaboration with the Institute of Theoretical and Applied Mechanics.

Report No.(s): AD-A409124; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The role of streamwise structures during transition to turbulence both in near-wall and in free shear flows in many eases is determinative. The purpose of present study is the analysis of results of experimental researches of mechanisms of origin development and transition to turbulent state of the various shear flows with the streamwise structures which have been carried out of late.

DTIC

Boundary Layer Transition; Shear Flow

20030014166 Central Research Inst. of Machine Building, Moscow, Russia

Measurements of Transient Aerogasdynamic Forces and Moments

Lagutin, V. I.; Lapygin, V. I.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409122; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The examples of realization in TSNIIMASH of measurements short duration aerogasdynamic forces and moments in piston gasdynamic units U-11 and U-7, shock tube U-I 2 and vacuum chambers U-22 and U-22M are given in the present paper. The characteristic run duration in these facilities is 0,01-0,2 5, and loading measurements are carried out without consideration of inertial forces. Some methodical approaches of measuring transient aerodynamic forces and moments acted on models, hinged on aerodynamic strain-gage balances and capable to accomplish free angular oscillation (in pitch or yaw) with the large frequency in a working flow of wind tunnel, are presented too.

DTIC

Measurement; Aerodynamic Forces

20030014168 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia

Skin-Friction Measurements in An Incompressible Pressure-Gradient Turbulent Boundary Layer. Review of Techniques and Results

Kornilov, V. I.; Litvinenko, Yu. A.; Pavlov, A. A.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409118; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Experimental definition of the local and integral values of friction drag of an aircraft or its elements is one of the basic problems of applied aerodynamics. We also should note the undoubted significance of this value for the development of modern lifting profiles and other aircraft elements, the description of near-wall flows in a form of similarity laws and testing of the numerical techniques of computation of flow around such aircrafts. However, to define this value accurately, one should have a clear conception of the possibilities and efficiency of application of one or another technique for a special case of body flow around. Though any experimental work assumes application of a certain concrete technique, including one for skin friction finding, the available literature information is as a rule uncoordinated, i.e., this information reflects only the level of availability of the technique applied. For this reason the researches like devoted to the development of new techniques and investigation of the efficiency of the known ones under various experimental conditions, become very important. The simplified layout gives a pictorial view of the main techniques of skin friction measurement, existing at the present time. The present paper presents a comparative analysis of a number of direct and indirect measuring techniques when they are applied in a incompressible turbulent boundary layer of a flat plate under the conditions of formation of a unfavorable (positive) and favorable (negative) streamwise pressure gradients on the plate surface, and also in plate gradient-free flow around.

DTIC

Turbulent Boundary Layer; Skin Friction

20030014169 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia

Relaxation Features of a Turbulent Boundary Layer in an Unfavorable Pressure Gradient

Kornilov, V. I.; Litvinenko, Yu. A.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002

Report No.(s): AD-A409117; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The relaxation of a shear flow (the process of an equilibrium state recovery) caused by the presence of a disturbance source such as a wall fence roughness elements or obstacle in a turbulent boundary layer is a slow process which can not be predicted at least accurately even on the basis of current turbulence models. Previous investigations are devoted to the study of the process of the boundary-layer relaxation under the conditions of gradient-free streamwise flow. However the majority of practical cases which deal for example, with the development of optimum design of heat exchanger channels, of elements and units of airspace technology, is related to the class of nonequilibrium (by Clauser) flows forming in unfavorable pressure gradient. to the authors knowledge, paper is the only which is actually devoted to the study of the turbulent boundary layer relaxation under the conditions of unfavorable pressure gradient for the case of flow around a obstacle of height h. Nearby the equilibrium state has not been reached right up to the last measuring cross section. It is quite evident that the studying in the conditions mentioned above of the behavior of a nonequilibrium turbulent boundary layer disturbed by the presence of a source of any geometry, is more actual problem.
DTIC
Turbulent Boundary Layer; Relaxation

20030014190 Technical Univ. of Munich, Lehrstuhl fuer Thermodynamik, Muchen, Germany
Application of Spontaneous Raman Scattering to the Flowfield in a Scramjet Combustor
Sander, T.; Sattelmayer, T.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409290; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
For the investigation of the ignition and reaction of fuel injected into the combustor of a Scramjet at a flight Mach number of 8 high temperature test air at supersonic speed is required. One economic possibility to simulate these inlet conditions experimentally is the use of vitiators which preheat the air by the burning of hydrogen. Downstream of the precombustor the flow is accelerated in a Laval nozzle to a Mach number of 2.15 and enters the combustor. For the numerical simulation of a supersonic reacting flow precise information concerning the physical properties during ignition and reaction are required. Optical measurements are best suited for delivering this information as they do not disturb the supersonic flow like probes and as their application is not limited by thermal stress. Raman scattering offers the possibility of measuring the static temperature and the concentration of majority species.
DTIC
Supersonic Flow; Raman Spectra; Reacting Flow

20030014283 NASA Langley Research Center, Hampton, VA USA
Plume Modeling and Application to Mars 2001 Odyssey Aerobraking
Chavis, Zachary Q., George Washington Univ., USA; Wilmoth, Richard G., NASA Langley Research Center, USA; [2002]; 11p; In English; 8th AIAA/ASME Joint Thermophysics and Heat Transfer Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A modified source flow model was used to calculate the plume flowfield from a Mars Odyssey thruster during aerobraking. The source flow model results compared well with previous detailed CFD results for a Mars Global Surveyor thruster. Using an iso-density surface for the Odyssey plume, DSMC simulations were performed to determine the effect the plumes have on the Odyssey aerodynamics. A database was then built to incorporate the plume effects into 6-DOF simulations over a range of attitudes and densities expected during aerobraking. 6-DOF simulations that included the plume effects showed better correlation with flight data than simulations without the plume effects.
Author
Computational Fluid Dynamics; Aerobraking; 2001 Mars Odyssey; Computerized Simulation; Rocket Exhaust; Flow Distribution; Mathematical Models

20030014586 NASA Glenn Research Center, Cleveland, OH USA
Results From the Physics of Colloids Experiment on ISS
Weitz, David, Harvard Univ., USA; Bailey, Arthur, Scitech Instruments, Inc., Canada; Manley, Suliana, Harvard Univ., USA; Prasad, Vikram, Harvard Univ., USA; Christianson, Rebecca, Harvard Univ., USA; Sankaran, Subramanian, National Center for Microgravity Research on Fluids and Combusiton, USA; Doherty, Michael, NASA Glenn Research Center, USA; Jankovsky, Amy, NASA Glenn Research Center, USA; Lorik, Tibor, ZIN Technologies, Inc., USA; Shiley, William, ZIN Technologies, Inc., USA; December 2002; 14p; In English; 53rd International Astronautical Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by International Astronautical Federation, Unknown; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2284; RTOP 400-32-30-02
Report No.(s): NASA/TM-2002-212011; E-13700; NAS 1.15:212011; IAC-02-J.6.04; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

The Physics of Colloids in Space (PCS) experiment was accommodated within International Space Station (ISS) EXpedite the PRocessing of Experiments to Space Station (EXPRESS) Rack 2 and was remotely operated from early June 2001 until February 2002 from NASA Glenn Research Center's Telescience Support Center (TSC) in Cleveland, Ohio, and from the remote site at Harvard University in Cambridge, Massachusetts. PCS was launched on 4/19/2001 on Space Shuttle STS-100. The experiment was activated on 5/31/2001. The entire experimental setup performed remarkably well, and accomplished 2400 hours of science operations on-orbit. The sophisticated instrumentation in PCS is capable of dynamic and static light scattering from 11 to 169 degrees, Bragg scattering over the range from 10 to 60 degrees, dynamic and static light scattering at low angles from 0.3 to 6.0 degrees, and color imaging. The long duration microgravity environment on the ISS facilitated extended studies on the growth and coarsening characteristics of binary crystals. The de-mixing of the colloid-polymer critical-point sample was also studied as it phase-separated into two phases. Further, aging studies on a col-pol gel, gelation rate studies in extremely low concentration fractal gels over several days, and studies on a glass sample, all provided valuable information. Several exciting and unique aspects of these results are discussed here.
Author
Microgravity; Colloids; Experimentation; Data Acquisition

20030014588 NASA Glenn Research Center, Cleveland, OH USA
Overview of NASA Multi-Dimensional Stirling Convertor Code Development and Validation Effort
Tew, Roy C., NASA Glenn Research Center, USA; Cairelli, James E., NASA Glenn Research Center, USA; Ibrahim, Mounir B., Cleveland State Univ., USA; Simon, Terrence W., Minnesota Univ., USA; Gedeon, David, Gedeon Associates, USA; December 2002; 14p; In English; Space Technology and Applications International Forum, 2-6 Feb. 2003, Albuquerque, NM, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-1A-14
Report No.(s): NASA/TM-2002-211997; E-13669; NAS 1.15:211997; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

A NASA grant has been awarded to Cleveland State University (CSU) to develop a multi-dimensional (multi-D) Stirling computer code with the goals of improving loss predictions and identifying component areas for improvements. The University of Minnesota (UMN) and Gedeon Associates are teamed with CSU. Development of test rigs at UMN and CSU and validation of the code against test data are part of the effort. The one-dimensional (1-D) Stirling codes used for design and performance prediction do not rigorously model regions of the working space where abrupt changes in flow area occur (such as manifolds and other transitions between components). Certain hardware experiences have demonstrated large performance gains by varying manifolds and heat exchanger designs to improve flow distributions in the heat exchangers. 1-D codes were not able to predict these performance gains. An accurate multi-D code should improve understanding of the effects of area changes along the main flow axis, sensitivity of performance to slight changes in internal geometry, and, in general, the understanding of various internal thermodynamic losses. The commercial CFD-ACE code has been chosen for development of the multi-D code. This 2-D/3-D code has highly developed pre- and post-processors, and moving boundary capability. Preliminary attempts at validation of CFD-ACE models of MIT gas spring and "two space" test rigs were encouraging. Also, CSU's simulations of the UMN oscillating-flow fig compare well with flow visualization results from UMN. A complementary Department of Energy (DOE) Regenerator Research effort is aiding in development of regenerator matrix models that will be used in the multi-D Stirling code. This paper reports on the progress and challenges of this
Author
Stirling Cycle; Engine Design; Computer Programs; Simulation; Flow Distribution; Heat Exchangers

20030014599 California Univ., Dept. of Mechanical and Aerospace Engineering, Los Angeles, CA USA
Investigations of Mechanisms Associated with Nucleate Boiling Under Microgravity Conditions ***Final Report, May 1996 - May 2000***
Dhir, Vijay K., California Univ., USA; Hasan, M., California Univ., USA; [2003]; 6p; In English
Contract(s)/Grant(s): NAG3-1832; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this work a building block type of approach is used so that a basic understanding of the processes that contribute to nucleate boiling heat fluxes under microgravity conditions can be developed. This understanding will lead to development of a mechanistic model for nucleate boiling heat transfer which could eventually be used as a design tool in space applications. Task Description Task 1: Fabrication of the Experimental Setup. Under this task, the test section and liquid holding and viewing chambers will be

fabricated. Artificial cylinder cavities will be formed on silicon wafers. A single cavity and two or four cavities, with a prescribed spacing and size, will be formed. The desired nucleation wall superheat will be used to determine the size of the mouth of the cavities. Task 2: Experiments. The basic experiments for flow and temperature field around single and multiple (2 or 4 separated or merged bubbles growing on downward facing or inclined surfaces) will be carried out under normal gravity conditions. The experiments will be conducted at one atmosphere pressure, but liquid subcooling will be varied from 0 to 30C. Water and PF-5050 will be used as test liquids. Task 3: Analytical/Numerical Models. In this task, transient temperature and flow field in vapor and liquid will be determined during growth of a single bubble. Analysis will include the evolution of the vapor-liquid interface and development of microlayer underneath the bubbles. For merged bubbles, detailed calculations of flow and temperature field will be carried out for transient shapes of vapor stems supporting a large bubble and the corresponding evaporation rate. Flow and temperature field for a bubble sliding along a heated wall will also be determined. Microgravity conditions will be simulated and a framework of a numerical tool for prediction of nucleate boiling heat fluxes under microgravity conditions will be developed. Task 4: Experiments in a KC-135. to understand bubble growth and detachment behavior of single or large merged bubbles, boiling experiments will be conducted under low gravity (10-2 g) conditions of the aircraft. In these experiments, 'designed' surfaces will be used. Visual observations and heat transfer data will be taken, but holography will not be used. The apparatus used for laboratory experiments will also be employed for experiments in the aircraft. Task 5: Experiments in the Space Shuttle. Effort will be devoted for defining a boiling experiment to be conducted on a 'designed' surface. The experiment will provide microgravity data on bubble growth and departure. These data are needed for development of a credible model for nucleate boiling heat fluxes under microgravity conditions. The heat transfer data will also be obtained and will be used to validate the models. Author

Nucleate Boiling; Heat Transfer; Microgravity; Thin Films; Heating Equipment; Fabrication; Mathematical Models

35
INSTRUMENTATION AND PHOTOGRAPHY

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

20030012562 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Particle Cloud Detection Using Coherent Laser Radar Systems Step One

Kullander, F.; Carlsson, T.; Letalick, D.; Lindgren, M.; Nov. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-101020; FOI-R-0217-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Biological and chemical agents are spread out in the atmosphere in the form of particle clouds. Hence, a method to detect and localize such clouds remotely is desired. The authors report some initial experiments performed with a recently developed coherent laser radar (CLR) system wherein the results direct their future work. The CLR was used to detect particles in motion at a distance of about 25 m in a laboratory environment. These initial tests have revealed that particles are detectable by the use of a CLR and that their velocity distribution can be measured. In coming studies the authors are going to use particles with known size distribution and measure the concentration of the generated clouds/particle streams. The detection capability of the CLR system will then be determined as a function of distance and particle cloud characteristics. The goal will be to describe the conditions under which the CLR can perform as a detector of various types of clouds.

NTIS

Coherent Radar; Optical Radar; Clouds (Meteorology); Detection; Biological Weapons

20030012593 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden

Sensor Management for Information Fusion: A Review

Xiong, N.; Svensson, P.; Jul. 2001; 54p; In English

Report No.(s): PB2003-101006; FOI-R-0158-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Multi-sensor management concerns the control of environment perception activities by managing or coordinating the usage of multiple sensor resources. It is an emerging research area, which has become increasingly important in research and development of modern multi-sensor systems. This article presents a comprehensive review of multi-sensor management in

relation to multi-sensor information fusion, describing its place and role in the larger context, generalizing main problems from existing application needs, and highlighting problem solving methodologies.
NTIS
Detectors; Multisensor Fusion; Information Management

20030012619 NASA Glenn Research Center, Cleveland, OH USA
An Investigation of Surge in a High-Speed Centrifugal Compressor Using Digital PIV
Wernet, Mark P., NASA Glenn Research Center, USA; Bright, Michelle M., NASA Glenn Research Center, USA; Skoch, Gary J., Army Research Lab., USA; Journal of Turbomachinery; April 2001; Volume 123, pp. 418-428; In English
Contract(s)/Grant(s): RTOP 519-20-53; Copyright; Avail: Issuing Activity
Compressor stall is a catastrophic breakdown of the flow in a compressor, which con lead to a loss of engine power, large pressure transients in the inlet/nacelle, and engine flameout. The implementation of active or passive strategies for controlling rotating stall and surge can significantly extend the stable operating range of a compressor without substantially sacrificing performance. It is crucial to identify the dynamic changes occurring in the flow field prior to rotating stall and surge in order to control these events successfully. Generally, pressure transducer measurements are made to capture the transient response of a compressor prior to rotating stall. In this investigation, Digital Particle Imaging Velocimetry (DPIV) is used in conjunction with dynamic pressure transducers to capture transient velocity and pressure measurements simultaneously in the nonstationary flow field during compressor surge. DPIV is an instantaneous, planar measurement technique that is ideally suited for studying transient flow phenomena in highspeed turbomachinery and has been used previously to map the stable operating point flow field in the diffuser of a high-speed centrifugal compressor. Through the acquisition of both DPIV images and transient pressure data, the time evolution of the unsteady flow during surge is revealed.
Author
Centrifugal Compressors; High Speed; Particle Image Velocimetry; Surges; Digital Techniques

20030012725 Sung Kyun Kwan Univ., School of Mechanical Engineering, Suwon, Korea, Republic of
Numerical and Experimental Investigations of Channel Flows in a Disk-Type Drag Pump
Hwang, Young-Kyu; Heo, Joong-Sik; Choi, Wook-Jin; Jul. 09, 2000; 9p; In English; Original contains color images; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom., The original document contains color images
Report No.(s): AD-A409040; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Pumping performance of a disk-type drag pump is studied numerically and experimentally. Molecular transition and slip flows that arise in a spiral channel on the rotating disk are simulated by using particle and continuum methods. The particle approach employs the direct simulation Monte Carlo (DSMC) method, and the continuum approach solves the Navier-Stokes (N-S) equations. A new DSMC code that can handle noninertial effects existing in the rotating frame of reference is developed. In this DSMC code, particular attention is paid to matching the solutions obtained by the N-S method in the slip flow regime. In the experimental study, the inlet pressures are measured for various outlet pressures of a test pump. Comparison between the experimental data and the numerical results reveals that the DSMC method provides the more accurate solution of the rarefied channel flow for the range of Knudsen number Kn greater than 0.02 than does the N-S method.
DTIC
Numerical Analysis; Pumps; Channel Flow; Data Acquisition; Experimentation; Disks (Shapes); Knudsen Flow

20030012758 BAE Systems, Advanced Systems and Technology, Nashua, NH USA
Dual Mode (MWIR AND LADAR) Seeker for Missile Defense
DeFlumere, Michael E.; Fong, Michael W.; Stewart, Hamilton M.; Jul. 29, 2002; 6p; In English; Original contains color images; See Also ADM201460. Papers from Unclassified Proceedings from the 11th Annual AIAA/MDA Technology Conference held 29 July - 2 August 2002 in Monterey, CA., The original document contains color images
Report No.(s): AD-A408948; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This paper identifies the key weapon system requirements of a dual mode seeker solution that performs mission critical target discrimination, tracking and aimpoint selection during stressing conditions. System level trades made to integrate ladar into a current generation MD seeker are summarized. Proof of concept hardware was developed to both demonstrate feasibility and collect field data on simulated threats and decoys. The packaging, thermal and bore sight of separate focal planes are addressed. Operationally the seeker is cued by ground based radar to the location and direction of the threat cloud (threats and non-threats). The IR seeker tracks these objects (when separated) and provides a prioritized location map for the ladar. The ladar is used to sequentially and periodically interrogate these objects to separated CSO's and extract micro-dynamic information used for

discrimination. The paper details why a Geiger mode flash ladar was selected for this application and how its output is used in discrimination. Dual mode images of threat and decoy objects are presented at various signal levels and resolutions to simulate a typical engagement timeline. This dual mode seeker will be used to gather captive carry signature data on near future MD tests.
DTIC
Missile Defense; Weapon Systems; Optical Radar; Homing Devices; Hybrid Propulsion

20030012808 Bethel Coll., Dept. of Physics, Saint Paul, MN USA
Preliminary Analysis of the Advantages and Limitations of a Stationary Imaging Fourier Transform Spectrometer
Beecken, Brian P., Bethel Coll., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 48; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Passive atmospheric remote sensing is an essential ingredient in climate studies, stratospheric chemistry, and tropospheric weather forecasting. Of crucial importance are observations of the unexplored far-infrared spectral region. Data in such regions are vital for understanding, modeling, and predicting future climate. Currently, spectroscopic measurements of the atmosphere are done with one of two basic types of instruments: the diffraction grating spectrometer and the Michelson interferometer. The Michelson interferometer has two basic advantages. First, the Jacquinot advantage allows for a large energy throughput because it is possible to use a large aperture. The second, the Fellgett multiplex advantage, derives from the simultaneous processing of the entire spectral range during a single scan. Unfortunately, the Michelson interferometer is a complex instrument, requiring moving parts and laser metrology for determining mirror positions. The result is a relatively massive instrument that requires a significant amount of power. These requirements diminish the utility of the Michelson for many applications. In particular, space-based systems have severe power and mass limitations. As a result, there is an effort at Langley Research Center to build and study a new type of stationary interferometer called SIFTS (Stationary Imaging Fourier Transform Spectrometer). This new type of sensor has no moving parts. It builds on the large format, two-dimensional detector arrays being produced by rapidly emerging detector technology. The crucial question of this study is what effect the transition from a scanning interferometer to a stationary interferometer will have on the instrument's performance. Clearly, one important consideration is whether the traditional Jacquinot throughput and the Fellgett multiplex advantages of the interferometer will be maintained. The analysis is not yet complete. However, it is clear that although the stationary interferometer retains a throughput advantage it must be calculated differently. As for the multiplex advantage, it has been referred to by some authors as a disadvantage for stationary interferometers. Apparently, this advantage becomes a disadvantage when the detector array is of sufficiently high quality to be photon-noise-limited. Since the proposed detector arrays for SIFTS are detector-noise-limited, the multiplexing is unlikely to be a problem. Nevertheless, further work in this area would be prudent.
Author
Fourier Transformation; Michelson Interferometers; Imaging Spectrometers; Weather Forecasting; Atmospheric Chemistry; Remote Sensing

20030012881 Arizona Univ., Tucson, AZ USA
Atomic Lithography: Forcing Epitaxial Growth Using X-ray Standing Waves ***Final Report, 1 Apr. 2000-30 Nov. 2001***
Falco, Charles M.; Nov. 06, 2002; 9p; In English
Contract(s)/Grant(s): F49620-00-1-0218; AF Proj. 2305
Report No.(s): AD-A408986; AFRL-SR-AR-TR-02-0417; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Over the last year we made considerable progress towards demonstrating an effect of an x-ray standing wave on the deposition of a Ge film. In the presence of the standing wave we observed a change in the film morphology of Ge grown on Si(III) below the temperature needed for epitaxial growth. Beam-exposed regions appear flat and resemble the Si(III) substrate, while unexposed regions are rough and display polycrystalline morphology similar to that seen for Ge growth on amorphous substrates. Consistent with our expectations, at higher deposition temperatures the effect is no longer observable. Similarly, for the deposition conditions we have been able to investigate to date on amorphous substrates we do not see any difference in the morphology between beam-on and beam-off regions. This is consistent with an effect arising from a weak coupling between the standing wave field and the Ge atoms on the surface which, at the x-ray intensities we can achieve without modifications to our optical geometry, is insufficient to modify the growth by itself, but when coupled with the periodic potential due to the substrate can push the Ge atoms into a new stable configuration. We found this to be very promising development toward our ultimate goal of atomic lithography. Below, we discuss in more detail the experimental approach to these recent standing wave depositions and their results.
DTIC
Lithography; Standing Waves; X Rays; Amorphous Materials; Atomic Layer Epitaxy; Morphology; SOI (Semiconductors)

20030012949 Logicon Technical Services, Inc., Dayton, OH USA

Luminance Contrast Requirements for Colored Symbols in Helmet-Mounted Displays ***Final Report, Apr. 2001-Sep. 2002***

Martinsen, Gary L.; Having, Paul R.; Heft, Eric L.; LaCreta, John M.; Post, David L.; Nov. 2002; 16p; In English

Report No.(s): AD-A408998; AFRL-HE-WP-TR-2002-0233; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Previously, we presented an experiment in which we defined minimum, but not sufficient, luminance contrast ratios for color recognition and legibility for helmet-mounted display (HMD) use. In that experiment, observers made a subjective judgment of their ability to recognize a color by stopping the incremental increase in contrast ratio of a static display. For some target color/background combinations, there were extremely high error rates and in these cases sufficient contrast ratios were not achieved. In the present experiment, we randomly presented one of three target colors on one of five backgrounds. The contrast ratio of the target on the background ranged from 1.025:1 up to 1.3:1 in steps of 0.025. As before, we found that observers could accurately identify the target colors at very low contrast ratios. In addition, we defined the range in which color recognition and legibility became sufficient (3 95% correct). In a second experiment we investigated how well observers did when more than one color appeared in the symbology at one time. This allowed observers to compare target colors against each other on the five backgrounds. We discuss our results in terms of luminance contrast ratio requirements for both color recognition as well as legibility in HMDs.

DTIC

Color; Helmet Mounted Displays; Luminance; Pattern Recognition

20030013651 NVE Corp., Eden Prairie, MN USA

Shape Biased Low Power Spin Dependent Tunneling Magnetic Field Sensors

Tondra, Mark; Qian, Zhenghong; Wang, Dexin; Nordman, Cathy; Anderson, John; Oct. 05, 2001; 9p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole con

Report No.(s): AD-A409311; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Spin Dependent Tunneling (SDT) devices are leading candidates for inclusion in a number of Unattended Ground Sensor applications. Continued progress at NVE has pushed their performance to 1OOs of pT I rt. Hz 1 Hz. However, these sensors were designed to use an applied field from an on-chip coil to create an appropriate magnetic sensing configuration. The power required to generate this field (^100mW) is significantly greater than the power budget (^lmW) for a magnetic sensor in an Unattended Ground Sensor (UGS) application. Consequently, a new approach to creating an ideal sensing environment is required. One approach being used at NVE is ”shape biasing.” This means that the physical layout of the SDT sensing elements is such that the magnetization of the sensing film is correct even when no biasing field is applied. Sensors have been fabricated using this technique and show reasonable promise for UGS applications. Some performance trade-offs exist. The power is easily tinder 1 MW, but the sensitivity is typically lower by a factor of 10. This talk will discuss some of the design details of these sensors as well as their expected ultimate performance.

DTIC

Magnetic Fields; Shapes; Fabrication; Response Bias; Electron Tunneling; Power Supplies; Display Devices

20030013991 Bucknell Univ., Dept. of Electrical Engineering, Lewisburg, PA USA

Issues and Algorithms for Tracking Multiple Sources with a Network of Sensors

Kozick, Richard J.; Sadler, Brian M.; Feb. 25, 2002; 20p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference on cd-rom

Report No.(s): AD-A409181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents issues and algorithms for the problem of multiple source tracking with a network of aeroacoustic sensors. We study fusion of data from sensors that are widely separated, and we give particular attention to the important issues of limited communication bandwidth between sensor nodes, effects of source motion, coherence loss between signals measured at different sensors, signal bandwidth, and noise. We compare the tracking performance of various schemes, including joint (coherent) processing of all sensor data, as well as data-reduction schemes that employ distributed computation and reduced communication bandwidth with a fusion center. Our analysis provides a quantification of the potential gain in source tracking accuracy that is achievable with greater communication bandwidth and joint processing of sensor data. We show that the potential gain in accuracy depends critically on the scenario, as determined by the source motion parameter, signal coherence between sensors, bandwidth of the source signals, and noise level. For scenarios that admit increased accuracy with joint processing, we present a

bandwidth-efficient algorithm that involves beamforming at small-aperture sensor arrays combined with time-delay estimation between widely-spaced sensor arrays.
DTIC
Aeroacoustics; Algorithms; Sensors; Communication Networks

20030013992 International Society for Optical Engineering, USA
Biomarkers and Biological Spectral Imaging *Final Report*
Bearman, Gregory H.; Bornhop, Darryl J.; Levenson, Richard M.; Jan. 23, 2001; 174p; In English
Contract(s)/Grant(s): F49620-01-1-0153
Report No.(s): AD-A409182; AFRL-SR-AR-TR-02-0427; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
This proceedings contains papers on the following topics: spectral imaging data, multivariate data processing exogenous optical contrast agents, imaging of ions and metabolites by fluorescence microscopy.
DTIC
Biomarkers; Data Processing; Imaging Techniques; Microscopy; Infrared Imagery

20030013996 Quantum Magnetics, Inc., San Diego, CA USA
Magnetic Detection and Tracking of Military Vehicles
Czipott, Peter V.; Perry, Alexander R.; Whitecotton, Brian R.; Dalichaouch, Yacine; Walsh, David O.; Feb. 25, 2002; 14p; In English; Original contains color images; Prepared in collaboration with Vista Clara, Everett, WA
Report No.(s): AD-A409217; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Under the Next Generation Scatterable Mines (NGSM) program led by the U.S. Army TACOM-ARDEC (Technical Agent Tank-automotive and Armaments Command - Army Research, Development and Engineering Center) and as a subcontractor to IITRI (IIT (Illinois Institute of Technology) Research Institute), Quantum Magnetics (QM) has participated in several rounds of field experiments in magnetic detection and tracking of military vehicles. Field data were acquired by three generations of magnetoresistive (MR) magnetic tensor gradiometers and analyzed by QM and Vista Clara. Successive gradiometer design generations mark a path to meeting NGSM form factor constraints. Magnetic gradiometry can detect and unambiguously locate magnetic targets, even in magnetically contaminated environments, as shown by results presented below.
DTIC
Military Vehicles; Tracking (Position); Magnetic Measurement

20030014000 Boston Univ., Coll. of Engineering, Boston, MA USA
A Miniature Acoustic Sensor that Mimics Mammalian Sound Processing
Hubbard, Allyn; Bifano, Tom; Boura, Jihad; Chen, Fangyi; Cherry, Andrew; Oct. 05, 2001; 13p; In English; Original contains color illustrations; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference on CD-ROM
Report No.(s): AD-A409222; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We are developing a miniature acoustic sensor that contains mechanical and electrical counterparts to the auditory processing subsystems used by mammals. The overall plan is to mimic the mammalian processing scheme, eventually to the point of achieving mammal-like recognition of auditory objects. The expected device is currently in development stages. The device is envisioned to consist of a mechanical frequency analysis stage, a subsystem for extracting both envelope and temporal information and converting analog information to events, and a digital subsystem that extracts features. Features currently slated for extraction are pitch and bearing, however the entire feature extraction subsystem is designed in a way that is amenable to modification for enhanced capability.
DTIC
Auditory Signals; Acoustic Measurement

20030014004 State Univ. of New York, Binghamton, NY USA
Design of a Biologically Inspired Directional Acoustic Sensor
Miles, R. N.; Tan, Lin; Sundermurthy, Sanjaykumar; Feb. 25, 2002; 11p; In English; Original contains color images
Report No.(s): AD-A409231; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The development of a novel, biologically inspired acoustic sensor will be presented. The primary goal of this effort is to construct a miniature device that is capable of detecting the orientation of an incident sound source with an accuracy of 2 deg. The design approach follows from our investigation of the mechanics of directional hearing in the parasitoid fly, Ormia ochracea. This animal has been shown to be able to detect changes in the line of bearing as small as 2 deg. The tympanal structures of the

ears of this animal suggest a novel approach to designing very small directionally sensitive microphones. Candidate microphone diaphragm designs are presented that are being fabricated using silicon microfabrication technology. Model results indicate that the design can achieve significant performance improvements over the conventional approach of making directional microphones. This includes a nearly 20 dB reduction in self-noise, and roughly a factor of 10 improvement in low frequency sensitivity.
DTIC
Sound Detecting and Ranging; Direction Finding; Microphones; Diaphragms (Mechanics)

20030014069 Visidyne, Inc., Burlington, MA USA
Photonic Magnetic Field Sensor
Wyntjes, Geert; Feb. 25, 2002; 7p; In English
Report No.(s): AD-A409236; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Small, in-line polarization rotators or isolators to reduce feedback in fiber optic links can be the basis for excellent magnetic field sensors. Based on the giant magneto-optical (GMO) or Faraday effect in iron garnets, they with a magnetic field of a few hundred Gauss, (20 mT) for an interaction length for an optical beam of a few millimeters achieve a polarization rotation or phase shift of 45 deg (1/8 cycle). When powered by a small laser diode, with the induced linear phase shift recovered at the shot noise limit, we have demonstrated sensitivities at the 3.3 nT/Hz1/2 level for frequencies from less than 1 Hz to frequencies into the high kHz range. Through further improvements; an increase in interaction length, better materials and by far the greatest factor, the addition of a flux concentrator, sensitivities at the pT/Hz1/2 level appear to be within reach. We will detail such a design and discuss the issues that may limit achieving these goals.
DTIC
Magnetic Fields; Magnetic Measurement

20030014091 California Univ., Lawrence Livermore Lab., Berkeley, CA USA
Calorimetric Determinations of the Heat and Products of Detonation for Explosives: October 1961 to April 1982
Ornellas, D. L.; Apr. 05, 1982; 87p; In English
Contract(s)/Grant(s): W-7405-ENG-48
Report No.(s): AD-A409329; UCRL-52821; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This report is a compilation of heat-of-detonation and product-composition data obtained at Lawrence Livermore National Laboratory during the last 21 years. In each determination, a 25-g high-explosive charge was detonated in a bomb calorimeter; a complete calorimetric measurement was made in 1 to 2 h with a precision of 0.3%. Data were interpreted using thermodynamic and hydrodynamic computer calculations. For unconfined or lightly confined charges, the released energy is largely retained in the products, which are subsequently shocked considerably off the Chapman-Jouguet isentrope by reflections from the bomb wall. For heavily confined charges, the detonation energy is largely converted to kinetic and internal energy of the confining case, and the products expand with minimal reshock along the Chapman-Jouguet isentrope.
DTIC
Detonation; Thermodynamics; Bomb Calorimeters; Explosives; Kinetic Energy

20030014093 Army Research Lab., Sensors Directorate, Adelphi, MD USA
The MEMS Flux Concentrator: A Device for Minimizing 1/f Noise in Magnetic Sensors
Edelstein, Alan S.; Fischer, Gregory A.; Feb. 25, 2002; 8p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference on cd-rom
Report No.(s): AD-A409302; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Magnetic sensors typically have a considerable amount of 1/f noise that limits their performance in detecting slow-moving military vehicles. Here we describe a Micro Electro-Mechanical Systems (MEMS) flux concentrator, which is a new device that can minimize 1/f noise in magnetic sensors by modulating the magnetic field at the position of the sensor. The modulation is accomplished by a periodic motion of flux concentrators on each side of the magnetic sensor. Modulating the sensor field shifts

the operating frequency to higher frequencies where the 1/f noise can be one or two orders of magnitude smaller. We will also present magnetic and mechanical modeling results on a design that will operate at 29 kHz.
DTIC
Microelectromechanical Systems; Modulation; Concentrators

20030014101 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Tensosensitivity of the Hot-Wire Probe
Pak, A. Yu.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409286; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The contribution due to false electric signals may depend on the probe-overheating factor and on the manner in which the electric power is supplied to the probe i.e., on the anemometer type. In a constant current anemometer, it is possible to measure and separate out the noise moving to the electric circuit of the anemometer, it is not the case with hot-wire anemometers of other types. to separate out the strain-induced component from the total signal is a very difficult task since this component arises alongside with the useful signal and directly at the hot wire. Therefore, in order to develop a way for diminishing the detrimental component moving to the strain gage effect or have a possibility to apply a proper connection for it, it is necessary to analyze the influence of different flow quantities, hot-wire probe properties and specific features of different types of hot-wire anemometers on probe tensosensitivity.
DTIC
Hot-Wire Anemometers; Circuits

20030014104 Polatomic, Inc., Richardson, TX USA
Battlefield Applications for the Polatomic 2000 Magnetometer/Gradiometer
Kuhlman, G.; Slocum, R.; Manning, J.; Feb. 25, 2002; 11p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference on cd-rom
Report No.(s): AD-A409283; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper describes proposed battlefield applications for the POLATOMIC 2000 (P-2000), an optically pumped He(4) scalar magnetometer/gradiometer. A major innovation in the P-2000 helium magnetometer is the introduction of a laser pump source to replace the conventional RF discharge helium lamp used in the Navy AN/ASQ-81/208 MAD Set for airborne submarine detection. The P-2000 scalar magnetometer developed at Polatomic under sponsorship from ONRINAVAIR achieves a sensitivity improvement of a factor of 25 to 30 over the AN/ASQ-81/ 208. Results are discussed for Polatomic 2000 magnetometers operated on the Earth's surface as short baseline gradiometers demonstrating a magnetometer sensitivity approaching 0.1 pTrms/ square Hz for detecting small signals in the frequency band from 0.01 Hz to 120 Hz.
DTIC
Laser Pumping; Gradiometers; Magnetometers; Laser Outputs

20030014482 Technische Hochschule, Inst. fuer Aerodynamik und Gasdynamik, Germany
On the Total Temperature Sensitivity of Constant-Temperature Anemometers
Weiss, J.; Knauss, H.; Wagner, S.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409293; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In this paper we review some results concerning the total temperature sensitivity of constant-temperature anemometers in supersonic flows. In particular the non-linear response at low overheat ratio first presented by Smits & Perry and Smits et al. is discussed.
DTIC
Anemometers; Temperature Effects

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.

20030012957 International Society for Optical Engineering, USA
Laser-Time Interaction XII: Photochemical, Photothermal, and Photomechanical ***Final Report, 18 Jan. 2001-17 Jan 2002***
Duncan, Donald D.; Jacques, Steven L.; Johnson, Peter C.; Jan. 2001; 498p; In English
Contract(s)/Grant(s): F49620-01-1-0153
Report No.(s): AD-A409012; AFRL-SR-AR-TR-02-0426; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche
This proceedings contains papers on the following topics: photodynamic therapy, immunotherapy, pulsed laser effects, polarized light interactions, photochemical interactions, occular laser effects,thermal interactions, laser shaping of cartilage.
DTIC
Polarization; Photochemical Reactions; Pulsed Lasers

20030012967 Boston Univ., Boston, MA USA
Advances in Fiber Lasers ***Final Report, 1 Jan. 2000-31 May 2002***
Morse, T. F.; May 2002; 20p; In English
Contract(s)/Grant(s): F49620-00-1-0122
Report No.(s): AD-A409019; AFRL-SR-AR-TR-02-0415; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A laboratory has been established in the Photonics Center at Boston University to investigate novel processes for high power optical fiber lasers, the performance of the lasers themselves, and various laser based optical fiber sensors. Work has been focused on a novel aerosol process for the fabrication of rare earth doped fiber lasers. We have recently proposed a new concept in laser cavity design that permits a large number of end pumping ports in a traveling wave configuration. This makes use of a yttrium vanadate polarizing prism used in conjunction with multiple gain sources, pumps and 1/4 wave phase retarders.
DTIC
Fiber Optics; Laser Cavities; Optical Materials

20030013739 Lawrence Livermore National Lab., Livermore, CA USA
Short Pulse Laser Production of Diamond Thin Films
Banks, P. S.; Stuart, B. C.; Dinh, L.; Feit, M. D.; Rubenchik, A. M.; Mar. 20, 1998; 28p; In English
Report No.(s): DE2002-802091; UCRL-ID-130327; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The use of diamond thin films has the potential for major impact in many industrial and scientific applications. These include heat sinks for electronics, broadband optical sensors, windows, cutting tools, optical coatings, laser diodes, cold cathodes, and field emission displays. Attractive properties of natural diamond consist of physical hardness, high tensile yield strength, chemical inertness, low coefficient of friction, high thermal conductivity, and low electrical conductivity. Unfortunately, these properties are not completely realized in currently produced diamond thin films. Chemical vapor deposition, in its many forms, has been the most successful to this point in producing crystalline diamond films microns to millimeters in thickness which are made up of closely packed diamond crystals microns in physical dimension. However, high purity films are difficult to realize due to the use of hydrogen in the growth process which becomes included in the film matrix. These impurities are manifest in film physical properties which are inferior to those of pure crystalline diamond. Pulsed laser deposition (PLD) is attractive due to its ability to produce high purity films-limited only by the purity of the target. For diamond film production, high purity carbon can be ablated directly by lasers and deposited as thin films at ambient temperatures. Growth rates for PLD have been prohibitively slow until recently with the advent of high average power, high rep-rate lasers.
NTIS
Thin Films; Diamonds; Pulsed Lasers; Pulsed Laser Deposition; Vapor Deposition

20030014119 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Modeling of Metal Laser Cutting Processes in Supersonic Jet in Inert Gas
Kovalev, O. B.; Orishich, A. M.; Fomin, V. M.; Shulyatev, V. B.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409261; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Up-to-date CO2 lasers are widely used in laser treatment of materials (drilling, welting, cutting). Technical achievements of laser methods both in Russia and abroad are limited and have been applied only for some types of ferrous metals until now (iron, steel, stainless steel, electrical steel). A number of works, cannot describe satisfactory the processes of gas-laser metal cutting, and this fact implies consideration of a great number of complex and interrelated processes.
DTIC
Laser Applications; Gas Flow

20030014133 Lawrence Livermore National Lab., Livermore, CA USA
Mercury and Beyond: Diode-Pumped Solid-State Lasers for Inertial Fusion Energy
Dec. 01, 1999; 10p; In English
Report No.(s): DE2002-792334; UCRL-JC-133970-REV-1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We have begun building the Mercury laser system as the first in a series of new generation diode-pumped solid-state lasers for inertial fusion research. Mercury will integrate three key technologies: diodes, crystals, and gas cooling, within a unique laser architecture that is scalable to kilojoule and megajoule energy levels for fusion energy applications.
NTIS
Lasers; Mercury (Metal); Thermonuclear Power Generation

20030014138 Defence Science and Technology Organisation, Systems Sciences Lab., Edinburgh, Australia
Mode-Partition Noise in Semiconductor Lasers
Nguyen, Linh V. T., Defence Science and Technology Organisation, Australia; September 2002; 53p; In English; Original contains color illustrations
Report No.(s): DSTO-TR-0244; DODA-AR-012-452; Copyright; Avail: Issuing Activity
The primary goal of this research activity is to understand a range of applicability of different types of lasers to a variety of electronic warfare (EW) applications. This work helps by providing a detailed understanding of mode-partition noise (MPN) in multi-mode Fabry-Perot (FP) semiconductor lasers. MPN in semiconductor lasers describes how the intensities of all longitudinal optical modes fluctuate as they compete with each other for a common injected-carrier population. The results presented in this report include both numerical simulations and experimental measurements. The numerical simulations are based on a noise-driven 21-mode rate-equation laser model, which enables multiple mode partition to be modelled. The formulation of the laser model allows for variation of laser parameters to investigate their effect on moderation noise. to the authors best knowledge, only studies with variation of trivial laser parameters have been reported previously. The results in this report go beyond these existing studies in the literature. Experimental measurements are used to verify simulations where possible. The main difficulty in this work is having laser devices with different parameters as in the simulations. In addition, the available laser device operates in different regimes as a function of injected current, making it difficult to extract parameters with good certainty to simulate the device.
Author
Extraction; Semiconductor Lasers; Noise (Sound)

20030014156 Shanghai Astronomical Observatory, China
A Checking System for Satellite Laser Ranging Equipment (1)
Zhang, Zhong-Ping, Shanghai Astronomical Observatory, China; Yang, Fumin, Shanghai Astronomical Observatory, China; Fu, Pin-Yi, Shanghai Jiao Tong Univ., China; Chen, Ju-Ping, Shanghai Jiao Tong Univ., China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 90-93; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
One checking system for SIR equipment is described. The system can check six main parts in SIR system, with independence each other. The checking results can provide more information for operator to solve the problems.
Author
Satellite Laser Ranging; Equipment

20030014268 Lawrence Livermore National Lab., Livermore, CA USA
Development of a Laser Driven Photocathode Injector and Femtosecond Scale Laser Electron Synchronization for Next Generation Light Sources
Le Sage, G.; Cowan, T.; Ditmire, T.; Rosenzweig, J.; Feb. 24, 2000; 20p; In English
Report No.(s): DE2002-792433; UCRL-ID-137853; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A high brightness photoinjector has been developed at LLNL. This injector combined with the 100 TW FALCON laser and the LLNL 100 MeV S-Band RF lirrac will enable development of a high brightness, femtosecond-scale, tunable, hard x-ray probe for timeresolved material measurements, based on Thomson scattering. Short pulse x-rays enable time-resolved characterization of shock dynamics, and examination of materials under extremes of pressure and temperature. Examples include Equation of State characterization on high-density materials, Crystal disorganization and re-growth in shocked and heated materials, and measurement of short time scale phase transition phenomena. Single shot evaluation, requiring high peak flux, is important for complex experiments such as probing of laser shocked actinides. A low emittance electron beam synchronized with femtosecond accuracy to an intense laser will revolutionize x-ray dynamics studies of materials. This project will lead development of ultrafast x-ray dynamics research on problems important in physics, chemistry, biology, and materials.
NTIS
Lasers; Photocathodes; Electron Beams

20030014604 NASA Langley Research Center, Hampton, VA USA
Raman Lidar Profiling of Aerosols Over the Central US; Diurnal Variability and Comparisons with the GOCART Model
Ferrare, R. A., NASA Langley Research Center, USA; Chin, M., NASA Goddard Space Flight Center, USA; Clayton, M., Science Applications International Corp., USA; Turner, D., Pacific Northwest National Lab., USA; [2002]; 4p; In English; 21st International Laser Radar Conference, 8-12 Jul. 2002, Quebec, Canada; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We use profiles of aerosol extinction, water vapor mixing ratio, and relative humidity measured by the ARM SGP Raman lidar in northern Oklahoma to show how the vertical distributions of aerosol extinction and water vapor vary throughout the diurnal cycle. While significant (20-30%) variations in aerosol extinction occurred near the surface as well as aloft, smaller (approximately 10%) variations were observed in the diurnal variability of aerosol optical thickness (AOT). The diurnal variations in aerosol extinction profiles are well correlated with corresponding variations in the average relative humidity profiles. The water vapor mixing ratio profiles and integrated water vapor amounts generally show less diurnal variability. The Raman lidar profiles are also used to evaluate the aerosol optical thickness and aerosol extinction profiles simulated by the GOCART global aerosol model. Initial comparisons show that the AOT simulated by GOCART was in closer agreement with the AOT derived from the Raman lidar and Sun photometer measurements during November 2000 than during September 2000. For both months, the vertical variability in average aerosol extinction profiles simulated by GOCART is less than the variability in the corresponding Raman lidar profiles.
Author
Aerosols; Diurnal Variations; Optical Radar; Atmospheric Models; Raman Spectra; Ozone

37
MECHANICAL ENGINEERING

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

20030012728 Iwaki Meisei Univ., Coll. of Science and Engineering, Iwaki, Japan
3D Flow Simulation of a Spiral-Grooved Turbo-Molecular Pump
Igarashi, Saburo; Jul. 09, 2000; 8p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409035; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A spiral-grooved turbo-molecular pump is widely used in vacuum technology. Available rotational speed of a rotor becomes larger and larger and reaches 18, 000 to 50,000 rpm. The clearance effect between a rotor and its casing is one of the important problems for the performance prediction of turbo- molecular pump which operates under very high speed of revolution. Now the pumping performance can be predicted from the computation of the three-dimensional flows. In the present paper a flow in a spiral groove of turbo-molecular pump is simulated on the basis of the NS equations to cover a wide range of pressure ratio and mass flow late. A fully three-dimensional analysis is made to take account of the effect of a gap between a rotor and its casing as well as the centrifugal and Coriolis forces. The pumping performance is shown in comparison with that of the no-gap flow and the channel flow approximations.
DTIC
Computational Fluid Dynamics; Channel Flow; Three Dimensional Flow; Vacuum Pumps; Centrifugal Force; Simulation

20030012733 Lawrence Livermore National Lab., Livermore, CA USA

Horizontal Air Bearing Experiment Number 1

Clauson, T. L.; Aug. 31, 1999; 30p; In English

Report No.(s): DE2002-792317; UCRL-ID-135915; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Horizontal Air Bearing Experiment No. l is a series of tests intended to further the understanding of rotational dynamics. A simple experimental assembly is rotated using the Horizontal Air Bearing and allowed to spin freely as the internal rotational damping is measured. The low friction of the bearing effectively isolates the test assembly, allowing the internal damping of the test object to be evaluated.

NTIS

Bearings; Rotor Dynamics

20030012837 Old Dominion Univ., Dept. of Mechanical Engineering, Hampton, VA USA

Laser-Assisted Stir Welding of 25-mm-Thick HSLA-65 Plate

Williamson, Keith M., Old Dominion Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 77; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Laser-assisted stir welding is a hybrid process that combines energy from a laser with functional heating and mechanical energy to join materials in the solid state. The technology is an adaptation of friction stir welding which is particularly suited for joining thick plates. Aluminum plates up to 75 mm thick have been successfully joined using friction stir welding. Since joining occurs in the solid state, stir technology offers the capability for fabricating full penetration joints in thick plates with better mechanical properties and less weld distortion than is possible by fusion processes. Currently friction stir welding is being used in several industries to improve productivity, reduce weight, and increase the strength of welded structures. Examples include: (a) the aircraft/aerospace industry where stir technology is currently being used to fabricate the space shuttle's external tank as well as components of the Delta family of rockets; (b) the shipping industry where container manufacturers are using stir technology to produce lighter containers with more payload capacity; and (c) the oil industry where offshore platform manufactures are using automated stir welding plants to fabricate large panels and structures up to 16 meters long with widths as required. In all these cases, stir technology has been restricted to aluminum alloys; however, stainless and HSLA 65 steels have been recently stir welded with friction as the primary heat source. One of the difficulties in adapting stir welding to steel is tool wear aggravated by the high tool rubbing velocities needed to provide frictional heat input into the material. Early work showed that the tool shoulder reached temperatures above 1000 C and the weld seam behind the tool stayed within this temperature range for up to 25 mm behind the tool. Cross sections of stir welded samples showed that the heat-affected zone is relatively wide and follows the profile of the tool shoulder. Besides minimizing the tool wear by increasing the energy into the material, another benefit of the proposed Laser Assisted Stir Welding (LASW is to reduce the width of the heat affected zone which typically has the lowest hardness in the weld region. Additionally, thermal modeling of the friction stir process shows that the heat input is asymmetric and suggests that the degree of asymmetry could improve the efficiency of the process. These asymmetries occur because the leading edge of the tool supplies heat to cold material while the trailing edge provides heat to material already preheated by the leading edge. As a result, flow stresses on the advancing side of the joint are lower than corresponding values on the retreating side. The proposed LASW process enhances these asymmetries by providing directional heating to increase the differential in flow stress across the joint and improve the stir tool efficiency. Theoretically the LASW process can provide the energy input to allow the flow stresses on the advancing side to approach zero and the stir efficiency to approach 100 percent. Reducing the flow stresses on the advancing side of the weld creates the greatest pressure differential across the stir weld and eliminates the possibility of voids on the advancing side of the joint. Small pressure differentials result in poor stir welds because voids on the advancing side are not filled by the plastic flow of material from the retreating side.

Author

Laser Welding; Friction Stir Welding; Welded Joints; Welded Structures; Thick Plates

20030012911 Lawrence Livermore National Lab., Livermore, CA USA

Stability Issues in Ambient-Temperature Passive Magnetic Bearing Systems

Post, R. F.; Feb. 17, 2000; 24p; In English

Report No.(s): DE2002-792426; UCRL-ID-137632; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The ambient-temperature passive magnetic bearing system developed at the Lawrence Livermore National Laboratory achieves rotor-dynamic stability by employing special combinations of levitating and stabilizing elements. These elements, energized by permanent magnet material, create the magnetic and electrodynamic forces that are required for the stable levitation of rotating systems, such as energy-storage flywheels. Stability criteria, derived from theory, describe the bearing element

parameters, i.e., stiffnesses and damping coefficients, that are required both to assure stable levitation (Earnshaw-stability), and stability against whirl-type rotor-dynamic instabilities.
NTIS
Magnetic Bearings; Stability

20030013631 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., Army Research Lab., USA; Jackson, Karen E., Army Research Lab., USA; [2002]; 12p; In English; AHS International 58th Annual Forum and Technology, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA; Original contains color illustrations; 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
Impact Tests; Simulation; Drop Tests; Fuselages; Seats; Dummies

20030014136 NASA Langley Research Center, Hampton, VA USA
Generating Fatigue Crack Growth Thresholds with Constant Amplitude Loads
Forth, Scott C., NASA Langley Research Center, USA; Newman, James C., J., Mississippi State Univ., USA; Forman, Royce G., NASA Johnson Space Center, USA; [2002]; 8p; In English; Fatigue 2002: 8th International Fatigue Congress, 2-7 Jun. 2002, Stockholm, Sweden; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The fatigue crack growth threshold, defining crack growth as either very slow or nonexistent, has been traditionally determined with standardized load reduction methodologies. Some experimental procedures tend to induce load history effects that result in remote crack closure from plasticity. This history can affect the crack driving force, i.e. during the unloading process the crack will close first at some point along the wake, reducing the effective load at the crack tip. One way to reduce the effects of load history is to propagate a crack under constant amplitude loading. As a crack propagates under constant amplitude loading, the stress intensity factor, K, will increase, as will the crack growth rate, da/dN. A fatigue crack growth threshold test procedure is developed and experimentally validated that does not produce load history effects and can be conducted at a specified stress ratio, R.
Author
Fatigue (Materials); Crack Propagation; Loads (Forces); Thresholds

20030014153 Shanghai Astronomical Observatory, China
The Modified on the Driving System for the 25m Antenna of Shanghai Observatory
Wang, Hu-Sheng, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 135-143; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

This paper analyses the improvements concerning driving system for 25m antenna of Shanghai Astronomical Observatory. and the problems of azimuth rotational speed and employ more motor driving at the same time are discussed.
Author
Radio Telescopes; Mechanical Drives; Revisions

20030014316 Lawrence Livermore National Lab., Livermore, CA USA
Electron Beam Welding of a Depleted Uranium Alloy to Niobium Using a Calibrated Electron Beam Power Density Distribution
Elmer, J. W.; Teruya, A. T.; Terrill, P. E.; Aug. 21, 2000; 14p; In English
Report No.(s): DE2002-792707; UCRL-ID-141043; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Electron beam test welds were made joining flat plates of commercially pure niobium to a uranium-6wt%Nb (binary) alloy. The welding parameters and joint design were specifically developed to minimize mixing of the niobium with the U-6%Nb alloy. A Modified Faraday Cup (MFC) technique using computer-assisted tomography was employed to determine the precise power

distribution of the electron beam so that the welding parameters could be directly transferred to other welding machines and/or to other facilities.
NTIS
Niobium; Uranium Alloys; Electron Beam Welding

20030014600 NASA Ames Research Center, Moffett Field, CA USA
Sol-Gel Derived Hafnia Coatings
Feldman, Jay D., Eloret Corp., USA; Stackpoole, Mairead, Eloret Corp., USA; Blum, Yigal, SRI International Corp., USA; Sacks, Michael, Georgia Inst. of Tech., USA; Ellerby, Don, NASA Ames Research Center, USA; Johnson, Sylvia M., NASA Ames Research Center, USA; Nov. 20, 2002; 1p; In English; 225th American Chemical Society National Meeting, 23-27 Mar. 2003, New Orleans, LA, USA; Sponsored by American Ceramic Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Sol-gel derived hafnia coatings are being developed to provide an oxidation protection layer on ultra-high temperature ceramics for potential use in turbine engines (ultra-efficient engine technology being developed by NASA). Coatings using hafnia sol hafnia filler particles will be discussed along with sol synthesis and characterization.
Author
Fillers; Sol-Gel Processes; Hafnium; Ceramic Coatings

20030014603 NASA Langley Research Center, Hampton, VA USA
Comparison of Ultrasound with Tensile Testing of Thermally Damaged Polyimide Insulated Wiring (MIL-W-81381)
Madaras, Eric I., NASA Langley Research Center, USA; Anastasi, Robert F., Army Research Lab., USA; [2002]; 8p; In English; 29th Annual Review of Progress in Quantitative Nondestructive Evaluation, 14-19 Jul. 2002, Bellingham, WA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Ultrasonic measurements were performed on MIL-W-81381/7, /12, and /21 wire, a polyimide (Kapton) insulated wire. The phase velocity for the 20-gauge MIL-W-81381/7 wire had a baseline value of 3023 plus or minus 78 m/s. After exposure to high temperatures, the wire's phase velocity rapidly increased, and reached an asymptotic value of 3598 plus or minus 20 m/s after 100 hours exposure. Similar responses were measured in other gauges. The baseline measurements of Young's moduli resulted in values of 5636 plus or minus 486, 7714 plus or minus 505, and 8767 plus or minus 292 KSI for the 20 ga, 16 ga, and 12 ga. wires respectively.
Author
Polyimides; Ultrasonics; Wire; Tensile Tests; Damage; High Temperature; Thermal Insulation

38
QUALITY ASSURANCE AND RELIABILITY

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

20030012832 Sage Junior Coll. of Albany, Dept. of Physics and Astronomy, Albany, NY USA
Determination of the Composition of the Atmospheres in the Enclosures Containing the Charters of Freedom
Tucker, George F., Sage Junior Coll. of Albany, USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 72; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In the early 1950s, the USA Constitution, the Bill of Rights, and the Declaration of Independence, collectively known as the "Charters of Freedom," were encased in specially designed enclosures. As a protective measure the enclosures were filled with moist helium and sealed. Currently a project is underway to remove the Charters from these encasements and re-encase them in modem enclosures. Before these cases are opened, conservationists at the National Archives and Records Administration (NARA) wish to know if air has leaked into the cases and what the relative humidity is. In 1998 NARA contacted NASA to request assistance with this problem. by adapting the NASA Diode Laser Hygrometer (DLH), an airborne sensor based on the absorption of infrared radiation at 1.4 microns by water vapor, the cases containing the second and third pages of the Constitution were non-invasively analyzed in 1999. Approximate relative humidity values were obtained. In addition, because the width of the absorption line is dependent on the other gases present it was possible to determine that the seals had not leaked. During the summer of 2001, the remaining documents were removed from public display and were made available for analysis. to increase the sensitivity of the DLH to the presence of air, for the 2001 measurements a stronger water vapor absorption line was chosen, however this required locating a laser that operated at the wavelength of this stronger line. In this work a number of diode lasers were characterized and a suitable one was identified and installed in the DLH. A series of laboratory measurements of the chosen

absorption line were performed to determine spectroscopic parameters including line strength, and helium broadening, air broadening, and self-broadening coefficients. The DLH was then reconfigured from its normal aircraft configuration to one more suitable for the Charters measurements. This involved installing it in a different housing, one specifically designed in 1998 for the Charters investigation, and installing all its associated electronics in a portable rack. From July 23 to July 26,2001, measurements were performed at the National Archives II in College Park, Maryland. The data are still being analyzed, but preliminary results indicate that the seals on the remaining documents are intact and the relative humidity values are in the expected range. Further analysis is expected to result in more accurate relative humidity values and will also establish an upper bound on the amount of air contamination in the enclosures.
Author
Documents; Contamination; Humidity; Hygrometers; Water Vapor

20030014248 Fluor Daniel Hanford, Inc., Richland, WA USA
Total Measurement Uncertainty for Nondestructive Assay of Transuranic Waste at the WRAP Facility
Wills, C. E.; 2002; 52p; In English
Report No.(s): DE2002-801107; HNF-4050-R3; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The report examines the contributing factors to NDA measurement uncertainty at WRAP. The significance of each factor on the TMU is analyzed and a final method is given for determining the TMU for NDA measurements at WRAP. As more data becomes available and WRAP gains in operational experience, this report will be reviewed semi-annually and updated as necessary.
NTIS
Nondestructive Tests; Radioactive Wastes

20030014249 Fluor Daniel Hanford, Inc., Richland, WA USA
Quality Assurance Objectives for Nondestructive Assay at the Waste Receiving and Processing Facility
Wills, C. E.; 2002; 66p; In English
Report No.(s): DE2002-801108; HNF-4051-R3; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report summarizes the validation of the WRAP NDA systems against the various quality assurance objectives (QAOs). A brief description of each test and any significant conclusions is included Variables which may have affected test outcomes are examined. This report will be reviewed semi-annually and updated as necessary.
NTIS
Proving; Quality Control; Nondestructive Tests

20030014250 CH2M/Hill, Inc., Richland, WA USA
Engineering Task Plan for the Ultrasonic Inspection of Hanford Double-Shell Tanks-FY2000
Jensen, C. E.; 2002; 48p; In English
Report No.(s): DE2002-801143; RPP-5583; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In May 1996 the Tank Waste Remediation System (TWRS) Decision Board recommended, and Department of Energy, Richland Lab (RL) agreed, that the condition of the double-shell tanks (DSTs) should be determined by ultrasonic (UT) mpechon of a limited area in six of the 28 DSTs. The Washington State Department of Ecology (WDOE) has agreed wth the strategy of limited ultrasonic inspection of six DSTs. Data collected during the UT inspections will be used to assess the condition of the tank, judge the effects of past corrosion control practices, and satisfy a regulatory requirement to periodically assess the integrity of waste tanks.
NTIS
Ultrasonic Tests; Tanks (Containers); Radioactive Wastes; Waste Disposal

20030014251 CH2M/Hill, Inc., Richland, WA USA
Formal Design Review Foot Clamp Modification
Oten, T. C.; 2002; 26p; In English
Report No.(s): DE2002-801148; RPP-5628; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report documents the Design Review performed for the foot clamp modification. The report documents the acceptability of the design, identifies the documents that were reviewed, the scope of the review and the members of the review team.
NTIS
Clamps; Design Analysis

20030014287 Argonne National Lab., IL USA

Current and Ultimate Limitations of Scanning X-ray Nanotomography

McNulty, I.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-799821; No Copyright; Avail: National Technical Information Service (NTIS)

X-ray nanotomography has developed into a powerful new tool for three-dimensional structural analysis. The scanning approach offers capabilities that are competitive with full-field imaging. Current and ultimate limitations of nanotomography are examined in light of recent work.

NTIS

Computer Aided Tomography; Structural Analysis; Scanning; X Ray Imagery

20030014303 Institute of Space Medico-Engineering, Beijing, China

A Design of Ultrasonic Tele-diagnosis and Quality Control System

Wang, Long, Institute of Space Medico-Engineering, China; Li, De-yu, Institute of Space Medico-Engineering, China; Zhao, Shu-kui, Institute of Space Medico-Engineering, China; Yin, Li-xue, Institute of Space Medico-Engineering, China; Zhen, Chang-qiong, Institute of Space Medico-Engineering, China; Wang, Tian-fu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 369-373; In Chinese; Copyright; Avail: Issuing Activity

Objective. to study the method for constructing an ultrasonic tele-diagnosis and quality control system. Method. The standard of Internet/Intranet technology was used for the system. The compression and uploading component based on wavelet and the software platform of ultrasound image processing were developed to suit the ultrasound image characteristics. The information exchange and storage (DICOM) was studied for the compatibility between the system and the Hospital Information System(HIS). Both of them were combined to form an integrated system. Result. WWW server, relevant case history managing and image processing software were constructed in the system. Conclusion. It is feasible to establish a low cost and maintainable system for ultrasound tele-diagnosis and quality control system based on Internet/Intranet technology.

Author

Quality Control; Design Analysis; Ultrasonics; Diagnosis; Image Processing; Telecommunication

20030014338 Ohio Univ., Center for International Studies, Athens, OH USA

Field Verification of Structural Performance of Thermoplastic Pipe Under Deep Backfill Conditions ***Final Report***

Sargand, S.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only

Report No.(s): PB2003-101568; No Copyright; Avail: National Technical Information Service (NTIS)

This report provides information regarding the structural performance of thermoplastic pipes under relatively deep soil cover conditions. The eighteen (12 HDPE, 6 PVC) thermoplastic pipes, with diameter ranging from 30 to 60 in., were instrumented with sensors, embedded with granular backfill in shallow trenches, and subjected to 20-ft or 40-ft high soil fill for about 10 months. Their installation plans involved two types of backfill soil, three relative compactions, and varying bedding thickness to study the effects of these installation parameters on the pipe performance. Once the field performance of each test pipe was presented and discussed, comparative cross examinations of the entire field data were made to identify the effects of various installation parameters on the pipe deformations/deflections and soil pressure against pipe. A comprehensive set of soil testing was performed in the laboratory to characterize each of the three soil types that existed in the field. Results from the shear strength tests were analyzed further to obtain hyperbolic model parameter values for these soils. Three analytical methods (modified Iowa formula, elastic solutions, and finite element) were applied to evaluate their abilities to predict the field performance of the thermoplastic pipes under relatively deep soil cover. In their applications, material properties measured in the laboratory were utilized as much as possible.

NTIS

Pipes (Tubes); Thermoplasticity; Structural Reliability; Soils

39
STRUCTURAL MECHANICS

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

20030012585 NASA Langley Research Center, Hampton, VA USA
Evaluation of the Structural Response and Failure of a Full-Scale Stitched Graphite-Epoxy Wing
Jegley, Dawn C., NASA Langley Research Center, USA; Bush, Harold G., NASA Langley Research Center, USA; Lovejoy, Andrew E., Analytical Services and Materials, Inc., USA; [2001]; 12p; In English; AHS Structures Specialists' Meeting, 30 Oct. - 1 Nov. 2001, Williamsburg, VA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Analytical and experimental results for an all-composite full-scale wing box are presented. The wing box is representative of a section of a 220-passenger commercial transport aircraft wing box and was designed and constructed by The Boeing Company as part of the NASA Advanced Subsonics Technology (AST) program. The semi-span wing was fabricated from a graphite-epoxy material system with cover panels and spars held together using Kevlar stitches through the thickness. No mechanical fasteners were used to hold the stiffeners to the skin of the cover panels. Tests were conducted with and without low-speed impact damage, discrete source damage and repairs. Upbending, down-bending and brake roll loading conditions were applied. The structure with nonvisible impact damage carried 97% of Design Ultimate Load prior to failure through a lower cover panel access hole. Finite element and experimental results agree for the global response of the structure.
Author
Structural Failure; Graphite-Epoxy Composites; Wings

20030012908 Lawrence Livermore National Lab., Mechanical Engineering Dept., Livermore, CA USA
Modeling of Anisotropic Inelastic Behavior
Nikkel, D. J.; Nath, D. S.; Brown, A. A.; Casey, J.; Feb. 25, 2000; 18p; In English
Report No.(s): DE2002-793453; UCRL-ID-137748; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An experimental capability, developed at Lawrence Livermore National Laboratory (LLNL), is being used to study the yield behavior of elastic-plastic materials. The objective of our research is to develop better constitutive equations for polycrystalline metals. We are experimentally determining the multidimensional yield surface of the material, both in its initial state and as it evolves during large inelastic deformations. These experiments provide a more complete picture of material behavior than can be obtained from traditional uniaxial tests. Experimental results show that actual material response can differ significantly from that predicted by simple idealized models. These results are being used to develop improved constitutive models of anisotropic plasticity for use in continuum computer codes.
NTIS
Yield Strength; Elastic Media; Plastic Anisotropy

20030013642 NASA Langley Research Center, Hampton, VA USA
Structural Acoustic Response of a Shape Memory Alloy Hybrid Composite Panel (Lessons Learned)
Turner, Travis L., NASA Langley Research Center, USA; SPIE; [2002]; Volume 4701; 12p; In English; SPIE's 9th Annual International Symposium on Smart Structures and Materials, 17-21 Mar. 2002, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; Original contains color illustations
Report No.(s): SPIE Paper 4701-60; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study presents results from an effort to fabricate a shape memory alloy hybrid composite (SMAHC) panel specimen and test the structure for dynamic response and noise transmission characteristics under the action of thermal and random acoustic loads. A method for fabricating a SMAHC laminate with bi-directional SMA reinforcement is described. Glass-epoxy unidirectional prepreg tape and Nitinol ribbon comprise the material system. Thermal activation of the Nitinol actuators was achieved through resistive heating. The experimental hardware required for mechanical support of the panel/actuators and for establishing convenient electrical connectivity to the actuators is presented. Other experimental apparatus necessary for controlling the panel temperature and acquiring structural acoustic data are also described. Deficiency in the thermal control system was discovered in the process of performing the elevated temperature tests. Discussion of the experimental results focuses on determining the causes for the deficiency and establishing means for rectifying the problem.
Author
Composite Structures; Fabrication; Hybrid Composites; Shape Memory Alloys; Panels; Dynamic Response; Acoustics

20030013733 NASA Langley Research Center, Hampton, VA USA

Probabilistic and Possibilistic Analyses of the Strength of a Bonded Joint

Stroud, W. Jefferson, NASA Langley Research Center, USA; Krishnamurthy, T., NASA Langley Research Center, USA; Smith, Steven A., NASA Langley Research Center, USA; CMES; 2002; Volume 3, No. 6, pp. 755-772; In English; Copyright; Avail: Issuing Activity

The effects of uncertainties on the predicted strength of a single lap shear joint are examined. Probabilistic and possibilistic methods are used to account for uncertainties. A total of ten variables are assumed to be random, with normal distributions. Both Monte Carlo Simulation and the First Order Reliability Method are used to determine the probability of failure. Triangular membership functions with upper and lower bounds located at plus or minus three standard deviations are used to model uncertainty in the possibilistic analysis. The alpha cut (or vertex) method is used to evaluate the possibility of failure. Linear and geometrically nonlinear finite element analyses are used calculate the response of the joint; fracture in the adhesive and material strength failure in the strap are used to evaluate its strength. Although probabilistic and possibilistic analyses provide significantly more information than do conventional deterministic analyses, they are computationally expensive. A novel scaling approach is developed and used to substantially reduce the computational cost of the probabilistic and possibilistic analyses. The possibilistic approach for treating uncertainties appears to be viable during the conceptual and preliminary design stages when limited data are available and high accuracies are not needed. However, this viability is mixed with several cautions that are discussed herein.
Author

Bonded Joints; Lap Joints; Probability Theory; Fracture Strength; Mechanical Properties

20030013748 Tamkang Univ., Dept. of Aerospace Engineering, Taipei, Taiwan, Province of China

Dynamic Full-Field Analysis of a Surface Crack Subjected to an Antiplane Moving Loading

Ing, Yi-Shyong, Tamkang Univ., Taiwan, Province of China; Lin, Jui-Ting, Tamkang Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 639-651; In English
Contract(s)/Grant(s): NSC-89-2212-E-032-006; Copyright; Avail: Issuing Activity

In this study, the transient full-field solution of a surface crack subjected to a dynamic anti-plane moving loading is investigated. The solution is determined by superposition of proposed fundamental solutions in the Laplace transform domain. The fundamental solutions to be used are the problems for applying exponentially distributed traction and screw dislocations on the crack faces and along the crack tip line, respectively. The exact transient solutions of shear stresses and displacement are obtained and expressed in compact formulations. The solutions are valid for an infinite length of time and have accounted for the contributions of an infinite number of diffracted and reflected waves. Numerical calculations for both moving and stationary loading cases are evaluated and discussed in detail. The results indicate that the stresses will approach steady-state or static Solutions after the first few waves have passed through the receiver.
Author

Surface Cracks; Laplace Transformation; Diffraction; Crack Tips; Numerical Analysis

20030013753 National Taiwan Univ. of Science and Technology, Dept. of Mechanical Engineering, Taipei, Taiwan, Province of China

Vibration Suppression of a CLD Treated Plate Subject to a Harmonic Traveling Load

Yu, Shann-Chewn, National Taiwan Univ. of Science and Technology, Taiwan, Province of China; Huang, Shyh-Chin, National Taiwan Univ. of Science and Technology, Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 627-638; In English; Copyright; Avail: Issuing Activity

The vibrations of an annular plate with constrained layer damping (CLD) treatment subject to a traveling load are investigated. The equation of motion. after employing the assumed-mode method, Donnell-Mushtari-Vlasov assumption and the Hamilton principle yielded terms of three plates' displacements. The response is eventually, for each n, in terms of a single degree of freedom (SDOF) linear Oscillator with hysteretic damping. The solution to a harmonic traveling load is then solved and discussed. Numerical results showed that the CLD treatment imposed significant damping onto the plate, especially as the plate reached its resonance. The interaction of harmonic driving frequency and traveling speed was also looked into. The results showed that to have the best damping effect. a relatively thin Visco Elastic Material (VEM) layer was enough Lind the damping was the most significant for n = 0 and n = 1 modes.
Author

Vibration; Frequencies; Equations of Motion; Damping; Annular Plates; Vibration Isolators

20030013955 Texas Univ., San Antonio, TX USA

Probabilistic Analysis and Density Parameter Estimation Within Nessus

Godines, Cody R., Texas Univ., USA; Manteufel, Randall D., Texas Univ., USA; December 2002; 275p; In English

Contract(s)/Grant(s): NAG3-2297

Report No.(s): NASA/CR-2002-212008; NAS 1.26:212008; E-13696; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This NASA educational grant has the goal of promoting probabilistic analysis methods to undergraduate and graduate UTSA engineering students. Two undergraduate-level and one graduate-level course were offered at UTSA providing a large number of students exposure to and experience in probabilistic techniques. The grant provided two research engineers from Southwest Research Institute the opportunity to teach these courses at UTSA, thereby exposing a large number of students to practical applications of probabilistic methods and state-of-the-art computational methods. In classroom activities, students were introduced to the NESSUS computer program, which embodies many algorithms in probabilistic simulation and reliability analysis. Because the NESSUS program is used at UTSA in both student research projects and selected courses, a student version of a NESSUS manual has been revised and improved, with additional example problems being added to expand the scope of the example application problems. This report documents two research accomplishments in the integration of a new sampling algorithm into NESSUS and in the testing of the new algorithm. The new Latin Hypercube Sampling (LHS) subroutines use the latest NESSUS input file format and specific files for writing output. The LHS subroutines are called out early in the program so that no unnecessary calculations are performed. Proper correlation between sets of multidimensional coordinates can be obtained by using NESSUS' LHS capabilities. Finally, two types of correlation are written to the appropriate output file. The program enhancement was tested by repeatedly estimating the mean, standard deviation, and 99th percentile of four different responses using Monte Carlo (MC) and LHS. These test cases, put forth by the Society of Automotive Engineers, are used to compare probabilistic methods. For all test cases, it is shown that LHS has a lower estimation error than MC when used to estimate the mean, standard deviation, and 99th percentile of the four responses at the 50 percent confidence level and using the same number of response evaluations for each method. In addition, LHS requires fewer calculations than MC in order to be 99.7 percent confident that a single mean, standard deviation, or 99th percentile estimate will be within at most 3 percent of the true value of the each parameter. Again, this is shown for all of the test cases studied. For that reason it can be said that NESSUS is an important reliability tool that has a variety of sound probabilistic methods a user can employ; furthermore, the newest LHS module is a valuable new enhancement of the program.

Author

Education; Students; Reliability Analysis; Probability Density Functions; Probability Theory; Parameter Identification; Applications Programs (Computers)

20030014099 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA

Degradation of Nylon-6/Clay Nanocomposites in NO(x)

Shelley, J. S.; Devries, K. L.; Apr. 24, 2000; 6p; In English

Contract(s)/Grant(s): AF Proj. 1011

Report No.(s): AD-A409288; AFRL-PR-ED-TP-2000-084; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Nylon-6 is an important engineering polymer that, in its fully spherulitic (bulk) form, has many applications in gears, rollers, and other long life cycle components. In 1993, Toyota commercialized a nylon-6/clay nanocomposite out of which it produced the timing belt cover for the 1993 Camry. Although these hybrid nanocomposites show significant improvements in their mechanical response characteristics, including yield strength and heat distortion temperature, little is known about the degradation of these properties due to environmental pollutants like NOx. Nylon-6 fibers are severely degraded by interaction with NOx and other pollutants, showing a strong synergism between applied load and environmental degradation. While the nanocomposites show a significant reduction in permeability of gases and water due to the incorporation of lamellar clay, their susceptibility to non-diffusional mechano-chemical degradation is unknown. The fracture toughness of these nylon-6/day nanocomposites increases, not as a function of clay content, but as a function of the volume of nylon-6 polymer chains influenced by the clay lamellar surfaces. Both the clay and the constrained volume offer the nanocomposites some protection from the deleterious effects of NOx. The time-to-failure at a given stress intensity factor as a function of clay content and constrained volume will be discussed along with fracture toughness of the materials.

DTIC

Degradation; Polymers; Fracture Strength; Chemical Properties

42
GEOSCIENCES (GENERAL)

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

20030012591 Nebraska Univ., Lincoln, NE USA
Use of Water Chemistry, Isotopes, and Chlorofluorocarbons to Investigate the Sources of Ground Water Beneath Loup City, Central Nebraska, 2000
Steele, G. V.; Harvey, F. E.; 2002; In English
Report No.(s): PB2003-101062; WRIR-02-4049; No Copyright; Avail: National Technical Information Service (NTIS)
The purpose of this report is to present the results of the study to determine if the probable sources of the study to determine if the probable sources of ground water beneath Loup City, Nebraska, are from Sherman Reservoir or other surface-water features. This report describes (1) methods used to select and install monitoring wells for water-level and water-quality data collection, (2) results of the water-level, water-quality, age-dating, and water isotopic analyses, and (3) a discussion of the possible sources of the ground water beneath Loup City.
NTIS
Ground Water; Surface Water

20030012627 Environmental Protection Agency, Washington, DC USA
Application of a 1-D Heat Budget Model to the Columbia River System
May 2001; 132p
Report No.(s): PB2003-100556; EPA/910/R-01-00; No Copyright; Avail: National Technical Information Service (NTIS)
The objective of the Clean Water Act (as amended by the Water Quality Act of 1987, Public Law 100-4) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Each state has developed standards for water quality that are used to judge how well the objectives of the Clean Water Act are being achieved. The water quality standards consist of the designated beneficial uses of the water and the water quality criteria necessary for achieving and maintaining the beneficial uses.
NTIS
Water Quality; Water; Rivers; Public Law; Heat Budget

20030012631 Geological Survey, Water Resources Div., Albuquerque, NM USA
Relations for Estimating Unit-Hydrograph Parameters in New Mexico
Waltemeyer, S. D.; 2001; 32p; In English
Report No.(s): PB2003-101072; USGS/WRI-01-4154; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Data collected from 20 U.S. Geological Survey streamflow-gaging stations, most of which were operated in New Mexico between about 1969 and 1977, were used to define hydrograph characteristics for small New Mexico streams. Drainage areas for the gaging stations ranged from 0.23 to 18.2 square miles. Observed values for the hydrograph characteristics were determined for 87 of the most significant rainfall-runoff events at these gaging stations and were used to define regional regression relations with basin characteristics. Regional relations defined lag time (t sub(l)), time of concentration (t sub(c)), and time to peak (t sub(p)) as functions of stream length and basin shape. The regional equation developed for time of concentration for New Mexico agrees well with the Kirpich equation developed for Tennessee. The Kirpich equation is based on stream length and channel slope, whereas the New Mexico equation is based on stream length and basin shape. Both equations, however, underestimate t(sub c) when applied to larger basins where t(sub c) is greater than about 2 hours.
NTIS
Watersheds; Measuring Instruments

20030012632 Geological Survey, Trenton, NJ USA
Relation of Environmental Characteristics to the Composition of Aquatic Assemblages along a Gradient of Urban Land Use in New Jersey, 1996-98. National Water-Quality Assessment Program
Kennen, J. G.; Ayers, M. A.; 2002; In English
Report No.(s): PB2003-101093; USGS/WRI-02-4069; No Copyright; Avail: National Technical Information Service (NTIS)
This report evaluates the most sensitive environmental and biological features in impaired basins, develops predictive models of stream degradation for urban watersheds, and identifies the important environmental factors that affect the distribution of fish, invertebrate, and algal assemblages along an urban land-use gradient. It includes a description of field, analytical, and statistical

methods, lists of the fish, invertebrate, and algal assemblages sampled, and evaluates the relation of aquatic-assemblage structure to a suite of environmental parameters (that is, hydrology, water quality, physical habitat, and surrounding landscape features).
NTIS
Water Pollution; New Jersey; Land Use; Gradients

20030012633 Geological Survey, Water Resources Div., Montgomery, AL USA
Investigation of Water Quality and Aquatic-Community Structure in Village and Valley Creeks, City of Birmingham, Jefferson County, Alabama, 2000-01
McPherson, A. K.; Abrahamsen, T. A.; Journey, C. A.; 2002; In English
Report No.(s): PB2003-101094; USGS/WRI-02-4182; No Copyright; Avail: National Technical Information Service (NTIS)
The U.S. Geological Survey conducted a 16-month investigation of water quality, aquatic-community structure, bed sediment, and fish tissue in Village and Valley Creeks, two urban streams that drain areas of highly intensive residential, commercial, and industrial land use in Birmingham, Alabama. Water-quality data were collected between February 2000 and March 2001 at four sites on Village Creek, three sites on Valley Creek, and at two reference sites near Birmingham-Fivemile Creek and Little Cahaba River, both of which drain less-urbanized areas. Stream samples were analyzed for major ions, nutrients, fecal bacteria, trace and major elements, pesticides, and selected organic constituents. Bed-sediment and fish-tissue samples were analyzed for major ions, nutrients, fecal bacteria, trace and major elements, pesticides, and selected organic constituents. Bed-sediment and fish-tissue samples were analyzed for trace and major elements, pesticides, polychlorinated biphenyls, and additional organic compounds. Aquatic-community structure was evaluated by conducting one survey of the fish community and in-stream habitat and two surveys of the benthic-invertebrate community.
NTIS
Streams; Water Quality; Water Pollution

20030012731 Lawrence Livermore National Lab., Livermore, CA USA
Effects of Fluid Distribution on Measured Geophysical Properties for Partially Saturated, Shallow Subsurface Conditions
Berge, P. A.; Bonner, B. P.; Roberts, J. J.; Wildenschild, D.; Aracne Ruddle, C. M.; Aug. 03, 2000; 10p; In English
Report No.(s): DE2002-792356; UCRL-ID-137130; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Our goal is to improve geophysical imaging of the vadose zone. We will achieve this goal by providing new methods to improve interpretation of field data. The purpose of this EMSP project is to develop relationships between laboratory measured geophysical properties and porosity, saturation, and fluid distribution, for partially saturated soils. Algorithms for relationships between soil composition, saturation, and geophysical measurements will provide new methods to interpret geophysical field data collected in the vadose zone at sites such as Hanford, WA.
NTIS
Geophysics; Fluid Flow; Soils; Vadose Water

20030012732 Lawrence Livermore National Lab., Livermore, CA USA
Global Modeling Initiative Assessment Model: Model Description, Integration and Testing of the Transport Shell
Rotman, D. A.; Tannahill, J. R.; Kinnison, D. E.; Connell, P. S.; Bergmann, D.; Apr. 25, 2000; 68p; In English
Report No.(s): DE2002-792332; UCRL-ID-137286; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We describe the three dimensional global stratospheric chemistry model developed under the NASA Global Modeling Initiative (GMI) to assess the possible environmental consequences from the emissions of a fleet of proposed high speed civil transport aircraft. This model was developed through a unique collaboration of the members of the GMI team. Team members provided computational modules representing various physical and chemical processes, and analysis of simulation results through extensive comparison to observation. The team members' modules were integrated within a computational framework that allowed transportability and simulations on massively parallel computers. A unique aspect of this model framework is the ability to interchange and intercompare different submodules to assess the sensitivity of numerical algorithms and model assumptions to simulation results. In this paper, we discuss the important attributes of the GMI effort, describe the GMI model computational framework and the numerical modules representing physical and chemical processes. As an application of the concept, we illustrate an analysis of the impact of advection algorithms on the dispersion of a NOy-like source in the stratosphere which mimics that of a fleet of commercial supersonic transports (High-Speed Civil Transport (HSCT)) flying between 17 and 20 kilometers.
NTIS
Three Dimensional Models; Atmospheric General Circulation Models; Meteorological Parameters

20030012742 Geological Survey, Water Resources Div., Oklahoma City, OK USA

Statistical Analysis of Stream Water-Quality Data and Sampling Network Design near Oklahoma City, Central Oklahoma, 1977-1999

Brigham, M. E.; Payne, G. A.; Andrews, W. J.; Abbott, M. M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM

Report No.(s): PB2003-101047; USGS-WRI-02-4111; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes water-quality data collected in cooperation with the City of Oklahoma City by the U.S. Geological Survey (USGS) from Bluff, Deer, and Chisholm Creeks from 1993-99 and from the North Canadian River from 1988-99 and evaluates the sampling program. Trends in selected constituents in the North Canadian River since 1977 also are described. This report presents: (1) statistical summaries of selected constituent concentrations, (2) descriptions of similarities and differences in constituent concentrations between sites, (3) descriptions of the occurrence of pesticides in surface water and pesticide use on cropland in the area, (4) comparisons to Federal and State water-quality standards, (5) descriptions of trends with time of constituent concentrations and streamflow, (6) descriptions of land uses and possible sources of contaminants in the basins above the sites, and (8) an evaluation of the sampling network.

NTIS

Water Quality; Statistical Analysis; Volatile Organic Compounds

20030012744 Geological Survey, Water Resources Div., Helena, MT USA

Metal Concentrations and Sources in the Miller Creek Watershed, Park County, Montana, August 2000

Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM

Report No.(s): PB2003-101043; USGS-WRI-02-4148; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to characterize metal concentrations and identify possible sources contributing metals to Miller Creek during low flow. This study was conducted during August 28-31, 2000. Surface-water samples were collected at 55 mainstem and inflow sites along Miller Creek (fig. 2) and analyzed for pH, major ions, and metals. Streambed-sediment samples were collected at 16 sites and analyzed for metal concentrations.

NTIS

Metals; Contaminants; Water Pollution

20030012745 Geological Survey, Water Resources Div., Nashville, TN USA

Water Quality of the Mississippian Carbonate Aquifer in Parts of Middle Tennessee and Northern Alabama, 1999

Kingsbury, J. A.; Shelton, J. M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM

Report No.(s): PB2003-101042; USGS-WRI-02-4083; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the occurrence and distribution of nutrients, fecal-indicator bacteria, pesticides, and VOCs (Volatile Organic Compounds) from 34 ground-water sites sampled in the Eastern Highland Rim subunit of the LTEN. In addition to summarizing data for these constituents, the purpose of this report is to qualitatively characterize the susceptibility of ground water in the study area to contamination by comparing these data to data collected for similar NAWQA studies across the Nation. This report also describes the effects of natural setting (site characteristics, hydrogeology, and soil properties) and human activities (land use) on ground-water quality.

NTIS

Water Quality; Aquifers; Volatile Organic Compounds

20030012753 Forest Service, Pacific Northwest Research Station, Portland, OR USA

Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative Workshop

Johnson, A. C.; Haynes, R. W.; Monserud, R. A.; Nov. 2002; In English

Report No.(s): PB2003-101814; PNW-GTR-563; No Copyright; Avail: National Technical Information Service (NTIS)

The Wood Compatibility Initiative (WCI) addresses options that may increase the compatibility between wood production and other societal values derived from forestlands. The set of 25 papers included in this proceedings presents the summaries of WCI-related research, compiled from a workshop held December 4-7th 2001 at the Skamania Lodge in Stevenson, Washington. The workshop proceedings papers are grouped into six general topics: (1) workshop keynote papers, (2) aquaticrelated studies, (3) issues relating to scale, (4) silviculture studies, (5) nontimber forest products related research, and (6) social/ economic studies.

These papers set the context for scientific and management inferences as well as illustrate the complex and diverse array of information needed in the development of land management strategies at different spatial scales.
NTIS
Forest Management; Conferences

20030012756 Geological Survey, Scientific Assessment and Strategy Team, Washington, DC USA
Blueprint for Change Part 5. Science for Floodplain Management into the 21st Century
Jun. 1994; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101498; No Copyright; Avail: National Technical Information Service (NTIS)
This preliminary report of the Scientific Assessment and Strategy Team (SAST) is Part V of the Interagency Floodplain Management Review Committee (FMRC) report, Sharing The Challenge: Floodplain Management Into The 21st Century The preliminary report documents much of the scientific information provided by the SAST for use by the full FMRC in its deliberations and summarizes SAST activities to date. The scientific assessments and analyses presented in this report are preliminary and have not received full critical scientific review. A comprehensive report is planned that provides detailed documentation of the analysis, mapping, and database activities conducted by the SAST. The level of detail in thk preliminary report is uneven as a result of different levels of detail that were required for FMRC deliberations on specific topics and time limitations imposed on the FMRC. The preparation of this preliminary report is in partial completion of the goals and objectives of the SAST. A partial list of the other scientific and technical products provided to aid FMRC analysis is included at the end of this document (Appendix A.).
NTIS
River Basins; Flood Plains; Flood Control

20030012766 Geological Survey, Water Resources Div., Anchorage, AK USA
Water Quality of the Tlikakila River and Five Major Tributaries to Lake Clark, Lake Clark National Park and Preserve, Alaska, 1999-2001
Brabets, T. P.; 2002; In English
Report No.(s): PB2003-101249; USGS/WRI-02-4127; No Copyright; Avail: National Technical Information Service (NTIS)
The Tlikakila River Basin, located in Lake Clark National Park and Preserve, drains an area of 622 square miles. This watershed comprises about 21 percent of the Lake Clark Basin, making it one of the major tributaries to Lake Clark. Due to a sharp decline in sockeye salmon population and the lack of hydrologic data, the Tlikakila River and five other major tributaries to Lake Clark were studies during the summer runoff months (May through September) from 1999 through 2001 as part of a cooperative study with the National Park Service.
NTIS
Water Quality; Rivers; National Parks; Alaska

20030012767 Geological Survey, Water Resources Div., Austin, TX USA
Simulation of Flow and Water Quality of the Arroyo Colorado, Texas, 1989-99
Raines, T. H.; Miranda, R. M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101247; No Copyright; Avail: National Technical Information Service (NTIS)
A model parameter set for use with the Hydrological Simulation Program-FORTRAN watershed model was developed to simulate flow and water quality for selected properties and constituents for the Arroyo Colorado from the city of Mission to the Laguna Madre, Texas. The model simulates flow, selected water-quality properties, and constituent concentrations. The model can used to estimate a total maximum daily load for selected properties and constituents in the Arroyo Colorado. The model was calibrated and tested for flow with data measured during 1989-99 at three streamflow-gaging stations.
NTIS
Computerized Simulation; Water Quality; Hydrology

20030012768 Geological Survey, Water Resources Div., Carson City, NV USA
Ground-Water Flow and Numerical Simulation of Recharge from Streamflow Infiltration near Pine Nut Creek, Douglas County, Nevada
Maurer, D. K.; 2002; 48p; In English
Report No.(s): PB2003-101242; USGS/WRI-02/4145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the simulation of groundwater flow near the infiltration site at Pine Nut Creek. Available data on streamflow, water levels, and aquifer properties near the alluvial fan of Pine Nut Creek were compiled and used to construct a numerical model of the ground-water flow system. The model was used to simulate recharge from a hypothetical infiltration basin near the infiltration site at Pine Nut Creek, and subsequent pumping from hypothetical wells near the infiltration basin at two different rates.
NTIS
Ground Water; Direct Numerical Simulation; Hydrology Models; Fluid Flow

20030012769 Geological Survey, Water Resources Div., Baton Rouge, LA USA
Trace Elements and Organic Compounds in Bed Sediment from Selected Streams in Southern Louisiana, 1998. National Water-Quality Assessment Program
Skrobialowski, S. C.; 2002; 52p; In English
Report No.(s): PB2003-101241; USGS/WRI-02-4089; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Bed-sediment samples from 21 selected streams in southern Louisiana were collected and analyzed for the presence of trace elements and organic compounds during 1998 as part of the U.S. Geological Survey National Water-Quality Assessment Program. Concentrations of selected trace elements and organic compounds were compared on the basis of sediment-quality criteria, land use, and grain size; concentrations of selected trace elements also were compared with concentrations from previous studies.
NTIS
Trace Elements; Organic Compounds; Water Quality; Streams; Sediments

20030012770 Geological Survey, Water Resources Div., Austin, TX USA
Hydrogeology and Simulation of Ground-Water Flow and Land-Surface Subsidence in the Chicot and Evangeline Aquifers, Houston Area, Texas
Kasmarek, M. C.; Strom, E. W.; 2002; 72p; In English
Report No.(s): PB2003-101240; USGS/WRI-02-4022; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In November 1997, the U.S. Geological Survey, in cooperation with the City of Houston Utilities Planning Section and the City of Houston Department of Public Works and Engineering, began an investigation of the Chicot and Evangeline aquifers in the greater Houston area in Texas to better understand the hydrology, flow, and associated land-surface subsidence. The principal part of the investigation was a numerical finite-difference model (MODFLOW) developed to simulate ground-water flow and land-surface subsidence in an 18,100-square-mile area encompassing greater Houston.
NTIS
Aquifers; Ground Water; Hydrogeology; Land Management

20030012771 Geological Survey, Water Resources Div., Mounds View, MN USA
Simulation of Ground-Water Flow and Delineation of Areas Contributing Recharge within the Mt. Simon-Hinckley Aquifer to Well Fields in the Prairie Island Indian Community, Minnesota
Ruhl, J. F.; 2002; 20p; In English
Report No.(s): PB2003-101239; USGS/WRI-02/4155; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of this report is: (1) to describe the development, construction, and application of a groundwater flow model of the Mt. Simon-Hinckley aquifer in the study area to use the flow simulation results for delineation of 10-and 50-year areas within the aquifer that contribute recharge to two community well fields. A calibrated numerical ground-water flow model of the Mt. Simon-Hinckley aquifer combined with a particle-tracking program provided the basis for delineation of the recharge areas. The particle tracking program used hydraulic heads and flow-distribution output from the ground-water flow model and assumed pumping conditions based on recent water-use records from one of the well field (water-use records were not available for the other well field, which was not yet operational).
NTIS
Ground Water; Computerized Simulation; Water Flow; Aquifers; Minnesota

20030012790 Forest Service, Pacific Northwest Region, Portland, USA
Compatibility Between Wood Production and Other Values and Uses on Forested Lands: A Problem Analysis
Peterson, C. E.; Monserud, R. A.; Nov. 2002; 62p; In English
Report No.(s): PB2003-101815; PNW-GTR-564; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
We provide background documentation for the Pacific Northwest Research Station's Wood Compatibility Initiative, a 5-year multidisciplinary research effort that began in response to 1997 Congressional direction. This problem analysis was the initial

effort to examine the state of knowledge regarding compatibility between wood production and other values and to develop a framework for directing a research initiative (Wood Compatibility Initiative) that examines the central question: Can we as a society produce wood commodities and other forest values in an environmentally acceptable and sustainable manner. Forest policy issues are often framed as two-dimensional debates such as jobs versus the environment. That framework assumes that forest management is a zero-sum enterprise, in which actions such as timber harvest inevitably mean substantial tradeoffs for other forest values such as wildlife habitat, clean water, and recreation. The debate ignores the possibility that instead of direct tradeoffs, opportunities exist for compatible changes that can provide more of both. The research challenge is to determine if, and at what level, timber harvest and other forest services and products can complement one another. Compatibility is seen as the degree to which we can manage for wood production without impairing other values.
NTIS
Forest Management; Timber Inventory

20030012792 Geological Survey, Water Resources Div., Hartford, CT USA
Arsenic Concentrations in Bedrock Wells in Colchester, East Hampton, and Woodstock, Connecticut
Brown, C. J.; Chute, S. K.; 2002; In English
Report No.(s): PB2003-101250; No Copyright; Avail: National Technical Information Service (NTIS)
Arsenic concentrations in water from bedrock wells differed considerably between two areas in eastern Connecticut, where water samples were collected to evaluate the relative importance of bedrock type and redox chemistry on the occurrence and mobility of arsenic in ground water. Arsenic concentrations were low in samples from wells in the Colchester area, and showed little or no difference in samples from wells in the Hebron Formation-known to have a high occurrence of arsenic in supply wells in northeastern Connecticut-and the Brimfield Schist, which is sulfidic and is more likely to contain arsenic. Concentrations of dissolved oxygen were lower and concentrations of dissolved iron and manganese were higher in samples from the Brimfield Schist than in samples from the Hebron Formation. In the Woodstock area, where arsenic concentrations in water from bedrock wells historically have been high, water samples from eight wells had dissolved arsenic concentrations greater than the detection limits from two laboratories. Six of these wells are in the Hebron Formation in southeast Woodstock.
NTIS
Arsenic; Wells; Potable Water

20030012798 Geological Survey, Water Resources Div., Albuquerque, NM USA
Summary of Flow Loss Between Selected Cross Sections on the Rio Grande in and Near Albuquerque, New Mexico
Veenhuis, J. E.; 2002; 40p; In English
Report No.(s): PB2003-101248; USGS/WRI-02-4131; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report presents the results of a flow-loss study in the Albuquerque reach of the Rio Grande during the winter nonirrigation season from December 1996 to February 2000 and compares these results with two previous flow-loss investigations. These two investigations were conducted on the Bernalillo to Isleta, New Mexico, reach of the Rio Grande. In addition, the quantity of water riverside drains intercept, the quantity of water that returns to the river, and stage differences between the riverside drains and the river were measured.
NTIS
River Basins; Fluid Flow; Flow Measurement

20030012874 Forest Service, Pacific Northwest Research Station, Portland, OR USA
Midscale Analysis of Streamside Characteristics in the Upper Grande Ronde Subbasin, Northeastern Oregon
Hemstrom, M. A.; Smith, T.; Evans, D.; Clifton, C.; Crowe, E.; Dec. 2002; In English; Available on CD-ROM and in paper copy only
Report No.(s): PB2003-102016; FSRN-PNW-534; No Copyright; Avail: National Technical Information Service (NTIS)
Riparian or streamside areas are the focus of considerable management and public interest in the interior Northwest. Unfortunately, the vegetation and geomorphic characteristics of streamside areas are difficult to assess across large landscapes because streamside areas are geographically small in much of the arid interior. However, managers and scientists need methods to assess streamside conditions across large landscapes for land management planning, watershed analysis, and landscape simulation modeling. We present proposed methods for characterizing streamside vegetation and topography by using geographic information systems, terrain models, and photointerpreted vegetation maps. We propose application of resulting information for

restoration planning and linkage to landscape wildlife and aquatic habitat models in the upper Grande Ronde subbasin of northeastern Oregon.
NTIS
Characterization; Oregon; Vegetation; Streams; Arid Lands; Land Management

20030012901 Michigan Technological Univ., Houghton, MI USA
Using Recent Advances in 2D Seismic Technology and Surface Geochemistry to Economically Redeveloped a Shallow Shelf Carbonate Reservoir: Vernon Field, Isabella County, MI ***Annual Report, 21 Mar. 01 - 20 Mar. 02***
Wood, J. R.; Bornhorst, T. J.; Harrison, W. B.; Quinlan, W.; Sep. 2002; 32p; In English
Report No.(s): DE2002-801441; DOE/BC/15122-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The fault study continues to find more faults and develop new techniques to visualize them. Data from the Dundee Formation was used to document 11 major faults in the Michigan Basin which have now been verified using data from other horizons. These faults control the locations of many of the large anticlinal structures in the Michigan Basin and likely controlled fluid movements as well.
NTIS
Geochemistry; Oil Fields; Reservoirs; Geological Faults; Engineering

20030012904 Fluor Daniel Hanford, Inc., Richland, WA USA
Verification and Validation of VAM3DF, Version 1 00(FFS Version 1 00)
Finfrock, S. H.; 2002; 90p; In English
Report No.(s): DE2002-801128; HNF-5769; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
VAM3DF, a three-dimensional vadose zone/groundwater flow and transport code, has been approved for use at Hanford. VAM3DCF is substantially the same as the earlier version VAM3DCG but with the addition of some significant new features.
NTIS
Proving; Environment Effects; Radioactive Isotopes; Computer Programs; Vadose Water

20030013740 Lawrence Livermore National Lab., Livermore, CA USA
Deep Borehole Instrumentation Along San Francisco Bay Bridges
Hutchings, L.; Kasameyer, P.; Turpin, C.; Long, L.; Hoddfelder, J.; Mar. 01, 2000; 48p; In English
Report No.(s): DE2002-802090; UCRL-ID-132137-00; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is a progress report on the Bay Bridges downhole network. Between 2 and 8 instruments have been spaced along the Dumbarton, San Mateo, Bay, and San Rafael bridges in San Francisco Bay, California. The instruments will provide multiple use data that is important to geotechnical, structural engineering, and seismological studies. The holes are between 100 and 1000 ft deep and were drilled by Caltrans. There are twenty-one sensor packages at fifteen sites. The downhole instrument package contains a three component HS-1 seismometer and three orthogonal Wilcox 731 accelerometers, and is capable of recording a micro g from local M = 1.0 earthquakes to 0.5 g strong ground motion form large Bay Area earthquakes. Preliminary results on phasing across the Bay Bridge, up and down hole wave amplification at Yerba Buena Island, and sensor orientation analysis are presented. Events recorded and located during 1999 are presented. Also, a senior thesis on the deep structure of the San Francisco Bay beneath the Bay Bridge is presented as an addendum.
NTIS
Boreholes; Seismology; Accelerometers; Bridges (Structures); San Francisco Bay (CA)

20030014252 Geological Survey, Water Resources Div., Hartford, CT USA
Water Resources Data Connecticut Water Year 2001 ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Morrison, J.; Provencher, P. L.; Martin, J. W.; Norris, J. R.; Jun. 2002; 376p; In English
Report No.(s): PB2003-100467; USGS/WDR/CT-01/1; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche
This report includes records on both surface and ground water in the State. Specifically, it contains: (1) discharge records for 50 streamflow-gaging stations, and for 39 partial-record streamflow stations and miscellaneous sites; (2) stage-only records for 4 tidal gaging stations; (3) water-quality records for 16 streamflow-gaging stations, for 19 ungaged stream sites, and temperature at 1 reservoir site; and (4) water-level records for 71 observation wells. Additional data were collected at various sites not part of the systematic data-collection program and are published as miscellaneous sites.
NTIS
Connecticut; Surface Water; Ground Water; Hydrology; Water Resources

20030014257 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Investigation of the Effect of Number of Time Steps on Ice Shapes Calculated by an Ice Accretion Code ***Final Report***
Riley, J.; McDowall, R.; Apr. 2002; In English
Report No.(s): PB2003-101088; No Copyright; Avail: CASI; C01, CD-ROM
A brief investigation was conducted of the effect of the number of time steps used by the ice accretion code LEWICE 2.0 in determine an ice shape. The investigation included a study of the LEWICE 2.0 validation database and approximately 30 additional LEWICE 2.0 runs.
NTIS
Ice Formation; Computer Programs

20030014258 Geological Survey, Water Resources Div., Denver, CO USA
Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory: Arsenic Speciation in Natural-Water Samples Using Laboratory and Field Methods
Garbarino, J. R.; Bedner, A. J.; Burkhardt, M. R.; 2002; 50p
Report No.(s): PB2003-101097; USGS-WRI-02-4144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Analytical methods for the determination of arsenite (As(III)), arenate (As(V)), dimethylarsinate (DMA), mono-methylarsonate (MMA), and roxarsone in filtered natural-water samples are described. This report describes the following: Laboratory-speciation methods for the determination of As(III), As(V), DMA, MMA, and roxarsone in natural water; A field-speciation method for the separation of As(III) and As(V) in natural-water samples in the field; Different arsenic speciation preservation techniques; The bias and variability of results for ground-water, surface-water, acid mine drainage, and reference-material samples; and The advantages and disadvantages of the speciation methods.
NTIS
Analyzing; Arsenic; Water Sampling

20030014260 Lawrence Livermore National Lab., Livermore, CA USA
Ultrasonic Velocities in Unconsolidated Sand/Clay Mixtures at Low Pressures
Aracne-Ruddle, C. M.; Bonner, B. P.; Trombino, C. N.; Hardy, E. D.; Berge, P. A.; Oct. 15, 1999; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792605; UCRL-JC-135621; No Copyright; Avail: National Technical Information Service (NTIS)
Effective seismic interrogation of the near subsurface requires that measured parameters, such as compressional and shear velocities and attenuation, be related to important soil properties. Porosity, composition (clay content), fluid content and type are of particular interest. The ultrasonic (100-500 kHz) pulse transmission technique was used to collect data for highly attenuating materials appropriate to the vadose zone. Up to several meters of overburden were simulated by applying low uniaxial stress of 0 to about 0.1 MPa to the sample. The approach was to make baseline measurements for pure quartz sand, because the elastic properties are relatively well known except at the lowest pressures. Clay was added to modify the sample microstructure and ultrasonic measurements were made to characterize the effect of the admixed second phase. Samples were fabricated from Ottawa sand mixed with a swelling clay (Wyoming bentonite).
NTIS
Ultrasonics; Sands; Clays; Low Pressure; Velocity

20030014321 Lawrence Livermore National Lab., Livermore, CA USA
Geological and Geobotanical Studies of Long Valley Caldera, CA, USA, Utlizing New 5m Hyperspectral Imagery
Martini, B. A.; Silver, E. A.; Potts, D. C.; Pickles, W. L.; Jul. 01, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792730; UCRL-JC-139781; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Geobotany; Geology; Earthquakes; California

20030014324 Lawrence Livermore National Lab., Livermore, CA USA
Preliminary Definition of Geophysical Regions in Western Eurasia
Bhattacharyya, J.; Walter, W. R.; Flanagan, M. P.; O'Boyle, J.; Pasyanos, M. E.; Apr. 03, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792688; UCRL-ID-138402; No Copyright; Avail: National Technical Information Service (NTIS)

We present a regionalized crustal model of Western Eurasia, WEA. The model is constructed using results from published studies and maps of geological and geophysical parameters in this region, and was developed in conjunction with the updated regionalization of Middle East and North Africa by Walter et al. (2000). As this is the first realization of our Eurasian modeling effort, we have limited ourselves to only twelve broad regions. Particular attention has been given to identifying the boundaries for each region. The main use of this model will be to assist in monitoring the Comprehensive Nuclear Test Ban Treaty (CTBT). Specifically, this model will help us to calibrate and predict the travel time and amplitudes of various regional seismic phases and to locate events accurately. Our model based approach allows us to readily calibrate both the seismic and the aseismic parts of western Eurasia. Each region is specified by an one- dimensional model of compressional and shear velocities, densities and layer thicknesses.
NTIS
Geophysics; Calibrating; Earthquakes; Seismology; Europe; Asia

20030014326 Geological Survey, Water Resources Div, Tallahassee, FL USA
Factors Affecting Ground-Water Exchange and Catchment Size for Florida Lakes in Mantled Karst Terrain
Lee, T. M.; 2002; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): PB2003-101089; USGS/WRI-02-4033; No Copyright; Avail: National Technical Information Service (NTIS)
This report presents the results of numerical ground-water flow modeling of hypothetical lake basins with a range of basin characteristics typical of mantled karst terrain. In this report, steady-state and transient ground-water flow modeling is used to simulate how recharge, hydrogeologic setting, and basin geometry affect the size of the ground-water catchment and the magnitude of ground-water inflow. Modeling results are summarized and used to make generalizations about the potential for different archetypal lake basins to generate ground-water inflow to Florida lakes.
NTIS
Ground Water; Numerical Analysis

20030014327 National Health and Environmental Effects Research Lab., Western Ecology Div., Corvallis, OR USA
Episodic Acidification of Lakes in the Sierra Nevada *Final Report*
Stoddard, J. L.; Sickman, J. O.; Leydecker, A.; Melack, J.; May 2002; 152p; In English
Report No.(s): PB2003-100847; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The lakes and streams of the Sierra Nevada mountains are vulnerable to acidic deposition because of the predominance of granitic rocks and thin acidic soils in their catchments, and the large quantities of precipitation in the region. Ten lakes and their watersheds were chosen for intensive monitoring. During two snowmelt and summer runoff seasons, automated samplers were installed at each lake outlet, along with stream gauging equipment and automated data recorders. Outlet samples were collected for chemical analysis, and discharge measurements were recorded. This study confirmed that nitrate is the key elements controlling episodic acidification in Sierran watersheds. This study also found that episodic acidification can occur in high elevation Sierran watersheds, but only in the most extreme conditions. Lake watersheds most likely to be affected by episodic acidification have extreme elevation, little or no soil development, low summer acid neutralizing capacity, and extensive granitic talus.
NTIS
Chemical Analysis; Lakes; Acid Rain; Sierra Nevada Mountains (CA)

20030014339 Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI USA
Limnological Monitoring on the Upper Mississippi River System, 1993-1996: Long Term Resource Monitoring Program. Havana Field Station
Soballe, D. M.; Wright, R. H.; Stenzel, S. W.; Nov. 2002; 130p; In English
Report No.(s): PB2003-101576; LTRMP-2002-P005; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Since 1988, the Long Term Resource Monitoring Program (LTRMP) staff have performed basic limnological field measurements in the Upper Mississippi River System. The period of this report (1993-96) includes a major revision of the LTRMP sampling design in 1993 that added randomization, broader spatial coverage, and increased monitoring of tributaries and locations that allow monitoring of material transport. Two significant floods (1993 and 1995) occurred in the reporting period. In 1993, the La Grange reach of the Illinois River was above the 1940-96 mean river stage for most of the year and was below flood stage for only three brief periods. The flood in spring 1995 receded sooner than in 1993; however, the 137 m (450.66 feet) peak on May

31, 1995, was the third highest river elevation recorded at Havana, Illinois. Low dissolved oxygen levels in the main channel were also notable in 1993-96, with concentrations at or below 5 mg/L observed each year.
NTIS
Limnology; Mississippi River (US)

20030014496 Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI USA
Limnological Monitoring on the Upper Mississippi River System, 1993-1996: Long Term Resource Monitoring Program. Bellevue Field Station
Soballe, D. M.; Gould, D. E.; Gritters, S. A.; Gent, R. D.; Steuck, M. J.; Oct. 2002; 138p; In English
Report No.(s): PB2003-101579; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Since 1988, the Long Term Resource Monitoring Program (LTRMP) staff has performed basic limnological field measurements in the Upper Mississippi River System. The period of this report (1993-96) includes a major revision of the LTRMP sampling design in 1993 that added randomization, broader spatial coverage, and increased monitoring of tributaries and locations that allow monitoring of material transport. Several short-term trends were noted during 1993-96. Total nitrogen, nitrate-nitrite nitrogen, soluble reactive phosphorus, total phosphorus, and turbidity generally decreased while ammonia increased in all study pools (12, 13, and 14). Sediment and plant nutrient concentrations were higher in two tributaries (the Maquoketa and Wapsipinicon Rivers, Iowa) than in the main channel of the Mississippi River.
NTIS
Limnology; Data Acquisition; Water Quality; Mississippi River (US)

20030014500 Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI USA
Limnological Monitoring on the Upper Mississippi River System, 1993-1996: Long Term Resource Monitoring Program. Onalaska Field Station
Soballe, D. M.; Fischer, J. R.; Hodge-Richardson, L. A.; Clemment, T. L.; Oct. 2002; 140p; In English
Report No.(s): PB2003-101578; LTRMP-2002-P003; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Since 1988, the Long Term Resource Monitoring Program (LTRMP) staff have performed basic limnological field measurements in the Upper Mississippi River System. The period of this report (1993-96) includes a major revision of the LTRMP sampling design in 1993 that added randomization, broader spatial coverage, and increased monitoring of tributaries and locations that allow monitoring of material transport. Personnel from the LTRMP Onalaska (Wisconsin) Field Station made about 1,300 visits to fixed limnological sampling sites and 2,100 visits to stratified random sites in the vicinity of Navigation Pool 8 from 1993 through 1996. An extended, late-season flood in summer 1993 coincided with some of the highest nutrient and lowest dissolved oxygen (DO) concentrations recorded during the report period. Decreases in nutrient concentrations (particularly nitrogen) and increases in water clarity occurred over the 4-year period. Midday DO concentrations were above 5 mg/L throughout most of the year and across most of Pool 8, with localized exceptions during periods of now cover. Pool 8 and its watershed are a net source of sediment to the Mississippi River; main channel suspended solids concentrations were greater downstream than upstream, and concentrations in the tributaries were typically higher than in the main channel.
NTIS
Water Quality; Mississippi River (US); Data Acquisition; Nitrogen; Sediments; Sampling

20030014505 Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI USA
Limnological Monitoring on the Upper Mississippi River System, 1993-1996: Long Term Resource Monitoring Program. Pool 26 Field Station
Soballe, D. M.; Ratcliff, E.; Kerans, B.; Mihuc, T.; Oct. 2002; 146p; In English
Report No.(s): PB2003-101577; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Since 1988, the Long Term Resource Monitoring Program (LTRMP) staff has performed basic limnological field measurements in the Upper Mississippi River System. The period of this report (1993-96) includes a major revision of LTRMP sampling design in 1993 that added randomization, broader spatial coverage, and increased monitoring of tributaries and locations that allow monitoring of material transport. The 1993-96 water quality data for the Pool 26 area show long-term declines in the concentrations of total nitrogen, nitrate-nitrite nitrogen, and soluble reactive phosphorus after the large flood in 1993. The data also indicate that continguous backwaters have unique water quality among the sampling strata, characterized by higher turbidity, volatile suspended solids, and fluorometric chlorophyll a, and lower total nitrogen and nitrate-nitrite nitrogen.
NTIS
Water Quality; Data Acquisition; Mississippi River (US)

20030014507 Geological Survey, Water Resources Div., Honolulu, HI USA

Water Resources Data Hawaii and other Pacific Areas, Water Year 2001, Volume 1, Hawaii ***Annual Report, 1 Oct..00 - 30 Sep.t. 01***

Taogoshi, R. I.; Wong, M. F.; Nishimoto, D. C.; Teeters, P. C.; Oct. 21, 2001; 402p; In English

Report No.(s): PB2003-101554; USGS-WDR-HI-01-1; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Water resources data for the 2001 water year for Hawaii consist of records of stage, discharge, and water quality of streams and springs; water levels and quality of water wells; and rainfall totals. Water discharge for 71 gaging stations on streams, springs, and ditches; Discharge data for 92 crest-stage partial-record stations; Water-quality data for 5 streams, 24 partial-record stations, and 103 wells; and Rainfall data for 38 rainfall stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal, State, and other local agencies in Hawaii.

NTIS

Hawaii; Ground Water; Hydrology; Water Resources; Surface Water; Data Flow Analysis

20030014508 Geological Survey, Water Resources Div., Guaynabo, Puerto Rico

Water Resources Data Puerto Rico and the U.S. Virgin Islands Water Year 2001 ***Annual Report, 1 Oct. 00 - 30 Sep.t. 01***

Diaz, P. L.; Aquino, Z.; Figueroa-Alamo, C.; Garcia, R.; Sanchez, A. V.; Oct. 10, 2002; 648p; In English

Report No.(s): PB2003-101553; USGS-WDR-PR-01-1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

Water resources for surface-water, quality-of-water, and ground-water records for the 2001 water year for Puerto Rico and the U.S. Virgin Islands consists of records of discharge, water quality of streams, and water levels of wells. This report contains discharge records for 95 streamflow-gaging stations; daily sediment records for 23 streamflow stations; 20 partial record or miscellaneous streamflow stations; stage records for 18 reservoirs; water-quality records for 17 streamflow-gaging stations, 42 ungaged streamsites, 11 lake sites, 2 lagoons, and 1 bay; and water-level records for 103 observation wells. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating local and Federal agencies in Puerto Rico and the U.S. Virgin Islands.

NTIS

Ground Water; Surface Water; Hydrology; Data Acquisition

20030014509 Geological Survey, Water Resources Div., Denver, CO USA

Three-Dimensional Numerical Model of Predevelopment Conditions in the Death Valley Regional Ground-Water Flow System, Nevada and California

D'Agnese, F. A.; O'Brien, G. M.; Faunt, C. C.; Belcher, W. R.; San Juan, C.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and paper only

Report No.(s): PB2003-101244; USGS/WRI-02/4102; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of the report is to document progress to date of the numerical steady-state ground-water flow model being developed as part of the Death Valley regional ground-water flow system project. The ground-water flow model simulates assumed predevelopment conditions. This ground-water flow model has been constructed from a data set synthesized from the previous two DOE regional ground-water model investigations. The results of the flow model will change as modifications are made to incorporate additional hydrogeologic data.

NTIS

Hydrogeology; Mathematical Models; Ground Water; Water Flow; Three Dimensional Models

20030014511 Geological Survey, Water Resources Div., Albany, NY USA

Water Resources Data New York, Water Year 2001, Volume 2, Long Island ***Annual Report, 1 Oct. 00 - 30 Sep. 01***

Spinello, A. G.; Busciolano, R.; Pena-Cruz, G.; Winowitch, R. B.; Jun. 2002; 276p; In English

Report No.(s): PB2003-101552; USGS-WDR-NY-01-2; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Water resources data for the 2001 water year for New York consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; stage and water quality of estuaries; and water levels and water quality of ground-water wells. This volume contains records for water discharge at 19 gaging stations; lake stage at 6 gaging stations; tide stage at 2 gaging stations; and water data were collected at various sites not involved in the systematic data collection program, and are published as miscellaneous measurements and analyses. These data, together with the data in Volume 1 and 3 represent

that part of the National Water Data system operated by the U.S. Geological Survey in cooperation with State, Federal, and other agencies in New York.
NTIS
Ground Water; Data Acquisition; Hydrology; Surface Water

20030014614 NASA Ames Research Center, Moffett Field, CA USA
Ectomycorrhizal Community Structure and Soil Characteristics of Mature Lodgepole Pine (Pinus Contorta) and Adjacent Stands of Old Growth Mixed Conifer in Yellowstone National Park, Wyoming USA
Douglas, Robert B., Mendocino Redwood Co., USA; Parker, V. Thomas, San Francisco State Univ., USA; Cullings, Kenneth W., NASA Ames Research Center, USA; Jan. 01, 2003; 42p; In English
Contract(s)/Grant(s): NSF DEB-94-20141; NSF DEB-97-26404; RTOP 972-64-04; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

Forest development patterns following disturbance are known to influence the physical and chemical attributes of soils at different points in time. Changes in soil resources are thought to have a corresponding effect on ectomycorrhizal (ECM) community structure. We used molecular methods to compare below-ground ECM species richness, composition, and abundance between adjacent stands of homogenous lodgepole pine and old growth mixed conifer in Yellowstone National Park (YNP). In each stand-type we collected soil cores to both identify mycorrhizae and assess soil chemistry. Although no statistical difference was observed in the mean number of ECM root tips per core between stand types, the total number of species identified (85 versus 35) and the mean number of species per core (8.8 +/- 0.6 versus 2.5 +/- 0.3) were significantly higher in lodgepole pine. Differences between the actual and estimated species richness levels indicated that these forest types support a high number of ECM species and that undersampling was severe. Species compositions were widely disparate between stands where only four species were shared out of a total of 116. Soil analysis also revealed that mixed conifer was significantly lower in pH, but higher in organic matter, potassium, phosphorus, and ammonium when compared to lodgepole pine stands. Species richness per core was correlated with these chemical data, however, analysis of covariance indicated that stand type was the only statistically significant factor in the observed difference in species richness. Our data suggest that ECM fungal richness increases as homogenous lodgepole pine stands grow and mature, but declines after Engelmann spruce and subalpine fir colonize. Despite difficulties linking species composition with soil chemistry, there are a variety of physical and chemical factors that could be influencing ECM community structure. Future field experiments are necessary to test some of the mechanisms potentially operating within this system.
Author
Conifers; Fungi; Soils; Plant Roots

43
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.

20030012558 Geological Survey, Water Resources Div., Rolla, MO USA
Stratigraphy and Vertical Hydraulic Conductivity of the St. Francois Confining Unit in Townships 25-27 N. and Ranges 01-02 W., Southeastern Missouri
Kleeschulte, M. J.; Seeger, C. M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101084; USGS-WRI-01-4270; No Copyright; Avail: National Technical Information Service (NTIS)

The St. Francois confining unit (Derby-Doerun Dolomite and Davis Formation) lies beneath the Ozark aquifer (Jefferson City Dolomite to the Potosi Dolomite) and impedes the circulation of water between the overlying Ozark aquifer and the underlying St. Francois aquifer (Bonneterre Formation and Lamotte Sandstone). The Bonneterre Formation is the potential host formation for lead-zinc deposits in the area. There is concern that mine dewatering could lower water levels in the Ozark aquifer. to address this concern, the vertical hydraulic conductivity of the St. Francois confining unit in six townships (T. 25-27 N. and R. 01-02 W.) of Oregon, Carter, and Ripley Counties of southeastern Missouri was evaluated by describing the stratigraphy and measuring the vertical hydraulic conductivity of core samples.
NTIS
Stratigraphy; Conductivity; Geology; Missouri; Aquifers; Dolomite (Mineral); Hydraulic Fluids

20030012559 Geological Survey, Water Resources Div., Trenton, NJ USA

Simulation of Transient Ground-Water Flow in the Valley-Fill Aquifers of the Upper Rockaway River Basin, Morris County, New Jersey

Gordon, A. D.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-101253; USGS-WRI-01-4174; No Copyright; Avail: National Technical Information Service (NTIS)

More than 90 percent of the public water supply in the upper Rockaway River Valley in Morris County, New Jersey, is obtained from ground-water withdrawals from the valley-fill aquifers. During 1997, an average of 9.6 million gallons per day of ground water was withdrawn from these aquifers. The aquifer system consists of an unconfined aquifer (upper aquifer) and a locally confined aquifer (lower aquifer), which are composed of sands and gravels. These aquifers are separated by a discontinuous confining unit that consists mostly of silt and clay. Increases in ground-water withdrawals can induce movement of water from streams to wells, increase flow from the upper aquifer to the lower aquifer, and reduce base flow in the Rockaway River downstream.

NTIS

Aquifers; Ground Water; New Jersey; River Basins; Water Flow; Simulation

20030012560 Geological Survey, Water Resources Div., Rapid City, SD USA

Hydrology of the Black Hills Area, South Dakota

Driscoll, D. G.; Carter, J. M.; Williamson, J. E.; Putnam, L. D.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-101258; USGS/WRI-02-4094; No Copyright; Avail: National Technical Information Service (NTIS)

The Black Hills Hydrology Study was initiated in 1990 to assess the quantity, quality, and distribution of surface water and ground water in the Black Hills area of South Dakota. This report summarizes the hydrology of the Black Hills area and the results of this long-term study. The Black Hills area of South Dakota and Wyoming is an important recharge area for several regional, bedrock aquifer systems and various local aquifers; thus, the study focused on describing the hydrologic significance of selected bedrock aquifers. The major aquifers in the Black Hills area are the Deadwood, Madison, Minnelusa, Minnekahta, and Inyan Kara aquifers. The highest priority was placed on the Madison and Minnelusa aquiers, which are used extensively and heavily influence the surface-water resources of the area.

NTIS

Black Hills (Sd-Wy); Surface Water; Aquifers; Hydrogeology

20030012606 Norfolk State Univ., B.E.S.T Lab, VA USA

Scientific Visualization & Modeling for Earth Systems Science Education ***Final Report***

Chaudhury, S. Raj, Norfolk State Univ., USA; Rodriguez, Waldo J., Norfolk State Univ., USA; [2003]; 6p; In English; 90th Indian Science Congress 2003 Session: Earth System Sciences, USA

Contract(s)/Grant(s): NAG5-6298; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Providing research experiences for undergraduate students in Earth Systems Science (ESS) poses several challenges at smaller academic institutions that might lack dedicated resources for this area of study. This paper describes the development of an innovative model that involves students with majors in diverse scientific disciplines in authentic ESS research. In studying global climate change, experts typically use scientific visualization techniques applied to remote sensing data collected by satellites. In particular, many problems related to environmental phenomena can be quantitatively addressed by investigations based on datasets related to the scientific endeavours such as the Earth Radiation Budget Experiment (ERBE). Working with data products stored at NASA's Distributed Active Archive Centers, visualization software specifically designed for students and an advanced, immersive Virtual Reality (VR) environment, students engage in guided research projects during a structured 6-week summer program. Over the 5-year span, this program has afforded the opportunity for students majoring in biology, chemistry, mathematics, computer science, physics, engineering and science education to work collaboratively in teams on research projects that emphasize the use of scientific visualization in studying the environment. Recently, a hands-on component has been added through science student partnerships with school-teachers in data collection and reporting for the GLOBE Program (GLobal Observations to Benefit the Environment).

Author

Virtual Reality; Remote Sensing; Earth Radiation Budget Experiment; Data Acquisition; Climate Change

20030012719 Army Soldier and Biological Chemical Command, Soldier Systems Center, Natick, MA USA

A Limited Assessment of Simulated Terrain for Supporting Near-Term Analysis Requirements for the Warrior Systems Modeling Technology Science and Technology Objective ***Final Report, Mar.-Sep. 2001***

Tucker, Dave; Schleper, Roger; Auer, Robert; Short, Paul; Nov. 2002; 24p; In English

Contract(s)/Grant(s): DAAD16-99-C-1003

Report No.(s): AD-A408951; NATICK/TR-03/009; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is a limited assessment of simulated terrain for the analysis requirements of the Warrior Systems Modeling Technology Science and Technology Objective. The report focuses on the terrain database formats and associated tools that enable effective soldier and small unit modeling in constructive, force-on-force environments; it analyzes available options, and it provides near- and mid-term recommendations. The near-term recommendation is to enhance and continue to use the Modular Semi-Automated Forces (ModSAF) Simulation Compact Terrain Database (CTDB). The mid-term recommendation is to provide a capability to use CTDB plus MultiGen OpenFlight in conjunction with the Synthetic Environment Data Representation and Interchange Specification (SEDRIS) Simulation environment tool. Additionally, it is recommended that subsequent versions of the Integrated Unit Simulation System (IUSS), Soldier and Biological Chemical Command's (SBCCOM) model of choice for high fidelity warrior systems modeling and analysis, incorporate changes necessary to support these recommendations.

DTIC

Data Bases; Terrain; Mathematical Models; Technology Utilization; Computerized Simulation

20030012915 Environmental Protection Agency, Office of Research and Development, Washington, DC USA

Lexicon of Cave and Karst Terminology with Special Reference to Environmental Karst Hydrology

Feb. 2002; 224p; In English

Report No.(s): PB2003-101677; EPA/600/R-02/003; No Copyright; Avail: National Technical Information Service (NTIS)

Several attempts to classify karst terminology in an organized manner have been attempted in the past. The last few glossaries of karst terminology were organized in the late 1960s and published in the early 1970s. Since that time, many new terms related to karst in general have come into use throughout the world while other older karst terms are seldom used nowadays. In the mid 1990s the British Cave Research Association (BCRA) published and updated a dictionary that covers the general area of karst and caves, but did not focus on environmental issues. Many of the more recent karst terms are related to the upsurge in environmentalism and the recognition among karst cognoscenti that karst terranes are much more sensitive to man-induced effects on the environment than are other types of landscapes. In an attempt to be as broad as possible in this glossary, terms related to general hydrology and hydrogeology, common karst rock and mineral types, and many of the descriptive terms used in speleology even where they relate to specific localities, have been included. No attempt was made to exclude foreign karst terms although many are no doubt, missing. This has led to a much larger manuscript than was originally intended when this project was initiated, but it has provided for a more comprehensive document. Because many non-karst professionals, whether working on basic research or on environmental problems, need to have a general working knowledge of karst terminology, this glossary was developed to provide an up-to-date reference for more modern definitions of karst terms both currently in usage and now defunct.

NTIS

Terminology; Dictionaries; Karst; Hydrology

20030012916 SRI International Corp., Menlo Park, CA USA

Characterization and Analysis of Temporal and Spatial Variations in Habitat and Macroinvertebrate Community Structure, Fountain Creek Basin, Colorado Springs and Vicinity, Colorado, 1998-2001

Bruce, J. F.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-101507; USGS-WRI-02-4093; No Copyright; Avail: National Technical Information Service (NTIS)

The Fountain Creek Basin in and around Colorado Springs, Colorado, is affected by various land- and water-use activities. Biological, hydrological, water-quality, and land-use data were collected at 10 sites in the Fountain Creek Basin from April 1998 through April 2001 to provide a baseline characterization of macro-invertebrate communities and habitat conditions for comparison in subsequent studies; and to assess variation in macroinvertebrate community structure relative to habitat quality

NTIS

Habitats; Invertebrates; Colorado

20030014097 Universitaet der Bundeswehr Muenchen, Fakultaet fuer Bauingerieur- UND Vermessungswesen, Neubiberg Germany

Process on the Precision Analysis for Old Maps ***Verfahren zur Genauigkeitsanalyse fuer Altkarten***

Beineke, Dieter; Jan. 2001; 161p; In German

Report No.(s): AD-A409292; Rept-71/2001; X5; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The dissertation pronounces its aim to be the establishment of a basis for continual and optimized solution processes on the precision analysis of old maps, which are defined as ”printed maps from the end of the 15th to the end of the 18 century” (3), with the following restrictions: 1) the realization of such a basis is purely by calculation, not manual, that is accessible as a normal, commercially available map plan might be; 2) only non-mobile points of reference have been taken into account, whereas changing parameters, such as coastlines, are not included; 3) only the old map in question is used, but measurements taken during that time period and their potential influence on the precision of the data do not configure in the study.

DTIC

Mapping; Precision

44
ENERGY PRODUCTION AND CONVERSION

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

20030012611 North Carolina Agricultural and Technical State Univ., Dept. of Chemical Engineering, Greensboro, NC USA

Development of Novel Electrocatalyst for Proton Exchange Membrane Fuel Cells ***Annual Report***

Illias, S.; Jan. 19, 2000; 14p; In English

Report No.(s): DE2002-778369; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Proton-exchange membrane fuel cell (PEMFC) is one of the strongest contenders as a power source for space & electric vehicle applications. Platinum catalyst is used for both fuel and air electrodes in PEMFCs. CO contamination of H(sub 2) greatly affects electrocatalysts used at the anode of polymer electrolyte fuel cells and decrease the cell performance. Pt-Ru catalyst had been recognized to alleviate this problem by showing better tolerance to CO poisoning than only Pt catalyst. This irreversible poisoning of the anode can be happened even in concentrations as little as a few ppm, and therefore, require expensive scrubbing to reduce the contaminant concentration to acceptable level. In order to commercialize this environmentally sound source of energy/power system, development of suitable impurity tolerant catalyst is needed.

NTIS

Fuel Cells; Electrocatalysts; Protons; Membranes

20030012765 Helsinki Univ. of Technology, Dept. of Engineering Physics and Mathematics, Espoo Finland

Advanced Energy Systems Annual Report 2001

May 2002; 88p; In English

Report No.(s): PB2003-101277; TKK-F-C193; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction; Research; New and Renewable Energy Systems; Fusion and Plasma Physics; Radiation Physics and Nuclear Engineering; Laser Physics and Applications; Public Relations; Teaching Activities; (Academic Degrees and Theses; Course Selection); Publications (Radiation Physics; New and Renewable Energy Systems; Laser Physics; Fusion and Plasma Physics); Scientific Visits and Professional Activities (Visitors to the Laboratory; Visits and Activities of the Staff).

NTIS

Energy Storage; Energy Technology

20030014145 Air Force Research Lab., Edwards AFB, CA USA

PL(OLAC)/RKAS Concentrator Information

Holmes, Michael R.; Feb. 11, 1993; 30p; In English

Report No.(s): AD-A409095; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The package discussed in this report contains information on the PL(OLAC)/ RKAS solar concentrator for those who need to do modeling or other calculations. It contains the original design drawings, a map showing damaged concentrator facets,

modeled solar flux, and a list of the approximate facet center positions. Measured flux data will be added to the package after the concentrator facets have been realigned.
DTIC
Solar Collectors; Mathematical Models

45
ENVIRONMENT POLLUTION

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

20030012580 Knox Coll., Dept. of Chemistry, Galesburg, IL USA
Calibration of EcoBadge Test-Strips for Ozone Measurement for GLOBE ***Final Report***
Bush, Linda C., Knox Coll., USA; [2003]; 12p; In English
Contract(s)/Grant(s): NAG1-02004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The majority of our work, therefore, centered on experiments at an extended exposure period at low ozone concentrations, creating and programming the necessary calibration curve into a Zikua reader. and verifying that the Zikua would use the curve reliably. Zikua is a device supplied by Vistanomics to 'read' the exposed EcoBadge cards and provide a read-out of measured ozone concentration in ppb. This device replaces the visual comparison to a calibrated color chart. For our initial studies, test papers were prepared by the usual method in small batches. Although testing would also eventually include Vistanomics' EcoBadge papers, we began with papers prepared in our lab so that we could be assured of the freshness of each batch. We felt this would allow us better comparison among our runs as we varied exposure time. At the outset, our target acceptable error was about +/- 10%. For example, if the actual ozone concentration was 20 ppb, then we hoped to be in the range 18-22 ppb. If the actual ozone concentration was 100 ppb. then we hoped to fall within 90-110 ppb in our measurements. Clearly a systematic error in the range of 3-4 ppb or more would significantly affect the lower exposure data.
Derived from text
Ozonometry; Calibrating; Gas Detectors; Exposure; Low Concentrations

20030012730 Kaiser Permanente Medical Center, Oakland, CA USA
Particulate Air Pollution and Morbidity in the California Central Valley: A High Particulate Pollution Region ***Final Report***
VanDenEeden, S. K.; Quesenberry, C. P.; Shan, J.; Lurmann, F.; Jul. 2002; 142p; In English
Report No.(s): PB2003-100867; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this study was to evaluate the relationship between particulate air pollution and morbidity among the Kaiser Permanente (KP) membership who reside in the Central Valley (CV) of California. Daily augmented particulate matter (PM) monitoring in the Central Valley was instituted as of November 1996 as part of a special monitoring program by the California Air Resources Board (CARB). The combination of the ambient air pollution data collected as part of the enhanced monitoring and the morbidity data from Kaiser Permanente provided an excellent opportunity to explore this relationship in an area with varied particulate matter.
NTIS
Air Pollution; Particulates; California; Public Health

20030012739 North Dakota Univ., Energy and Environmental Research Center, Grand Forks, ND USA
Task 1.2-Mercury Stability in the Environment ***Final Report***
Pavlish, J. H.; Jul. 1999; 28p; In English
Report No.(s): DE2002-778469; REPT-99-EERC-09-03; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The 1990 Clean Air Act Amendments (CAAAs) require the U.S. Environmental Protection Agency (EPA) to determine whether the presence of mercury and 188 other trace substances, referred to as air toxics or hazardous air pollutants (HAPs), in the stack emissions from fossil fuel-fired electric utility power plants poses an unacceptable public health risk. The EPA's conclusions and recommendations were presented in two reports: Mercury Study Report to Congress and Study of Hazardous Air Pollutant Emissions from Electric Utility Steam Generating Units - Final Report to Congress. The first congressional report addressed both human health and the environmental effects of anthropogenic mercury emissions, while the second report addressed the risk to public health posed by emissions of HAPs from steam electricity-generating units. The National Institute

of Environmental Health Sciences is also required by the CAAAs to investigate mercury and determine a safe threshold level of exposure.
NTIS
Mercury (Metal); Toxicity; Air Pollution; Environment Effects; Congressional Reports

20030012743 National Park Service, Air Resources Div., Denver, CO USA
Air Quality in the National Parks, Second Edition
Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2003-101046; No Copyright; Avail: National Technical Information Service (NTIS)
Many park resources are affected by air pollution. Some of the air pollutants affecting parks are emitted directly from sources such as industrial facilities and automobiles (primary pollutants) and some are formed as a result of chemical reactions in the atmosphere (secondary pollutants). The National Park Service air quality monitoring program acquires information about air pollutants that can impair visibility, harm human health, injure various species of trees and other plants, acidify streams and lakes, leach nutrients from soils, and erode buildings and monuments. The monitoring program focuses on visibility, acidic precipitation, and gaseous pollutant concentrations.
NTIS
National Parks; Air Quality; Precipitation (Meteorology)

20030012747 California Univ., Dept. of Community and Environmental Medicine, Irvine, CA USA
Toxicity of Chemical Constituents of PM10 in the South Coast Air Basin of California ***Final Report***
Bhalla, D. K.; Kleinman, M. T.; Phalen, R. F.; Mautz, W. J.; Menzel, D. B.; May 1993; 90p; In English
Report No.(s): PB2003-100875; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Adverse respiratory effects are associated with PM10 exposure, although the attribute(s) of PM10 and biological mechanisms responsible are unclear. This study evaluated airway epithelial cell morphometry, macrophage function, breathing pattern, and ventilation in rats exposed for four hr/d, four d/wk for eight weeks to components of PM10 (ammonium sulfate, ammonium nitrate, and road dust) singly, in combinations, and in mixtures including 0.20-ppm ozone (O3). There were no changes in goblet cells with any exposure. High and low concentrations of PM10 components, singly and combined with 0.2 ppm O3, reduced Fc-mediated phagocytic activity, suggesting an additive effect. Particles alone decreased respiratory burst activity, suggesting that these PM10 components can inhibit macrophage function, although when O3 was included, respiratory burst activity increased. High concentrations of both sulfate and nitrate significantly increased airway permeability, but low concentrations and mixtures of particulates and O3 had inconsistent effects. Changes in breathing pattern and minute ventilation consistent with mild pulmonary irritation occurred with exposure to all particle types at the high, but not the low, concentration. Addition of O3 to the exposure mixture induced breathing pattern responses indicative of an O3 effect, while exposure to high concentration multi-component mixtures of PM10 compounds and O3 induced effects suggesting interaction between PM10 and O3.
NTIS
Particulates; Air Pollution; Toxicity; Chemical Composition; Pollution

20030012748 Statewide Air Pollution Research Center, Riverside, CA USA
Atmospheric Chemistry of Selected Linear, Branched and Cyclic C10 Alkane Components of Mineral Spirits ***Final Report***
Atkinson, R.; Arey, J.; Aschmann, S. M.; Kwok, E. S.; Jan. 2001; 80p; In English
Report No.(s): PB2003-100871; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Ozone pollution in urban areas is the result of the reactions of volatile organic compounds, including alkanes, with oxides of nitrogen under the influence of sunlight. Alkanes are significant components of gasoline and diesel fuels and of vehicle exhaust, and alkanes containing 9-13 carbon atoms are important constituents of mineral spirits. In the atmosphere, alkanes react with the hydroxyl (OH) radical to form a suite of products, certain of which are presently difficult to identify and quantify. of particular interest because of their potential impact on ozone production is the formation of organic nitrates from the OH radical-initiated reactions of alkanes in the presence of NO-x. Because NO2 which would otherwise be photolyzed to form ozone is sequestered in the organic nitrates, accurate measurements of the amounts of organic nitrates formed, including hydroxyalkyl nitrates, is critical to predictions of ozone formation from alkane photoxidations. The formation yields of alkyl nitrates from n-hexane, n-heptane and n-octane were measured to be 0.141 plus or minus 0.020, 0.178 plus or minus 0.024, and 0.226 plus or minus 0.032, respectively. We then investigated the atmospheric chemistry of three representative linear, branched and cyclic C10 alkanes, n-decane, 3, 4-diethylhexane and n-butylcyclohexane.
NTIS
Air Pollution; Photochemical Reactions; Alkanes; Sampling

20030012757 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Economic Impact Analysis of Metal Can MACT Standards ***Final Report***
Sep. 2002; 74p; In English
Report No.(s): PB2003-101926; EPA/452/R-02/005; No Copyright; Avail: National Technical Information Service (NTIS)
The Clean Air Act's (CAA) purpose is to protect and enhance the quality of the nations air resources (Section 101(b)). Section 112 of the CAA Amendments of 1990 establishes the authority to determine a National Emissions Standards for Hazardous Air Pollutants (NESHAP) This report evaluates the economic impacts of pollution control requirements placed on metal can manufacturing establishments under these amendments. These control requirements are designed to reduce releases of HAPs into the atmosphere.
NTIS
Economic Impact; Air Pollution; Law (Jurisprudence)

20030012763 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Economic Impact Analysis of the Proposed Taconite Iron Ore NESHAP ***Final Report***
Nov. 2002; 94p; In English
Report No.(s): PB2003-101928; EPA/452/R-02/013; No Copyright; Avail: National Technical Information Service (NTIS)
Under Section 112 of the Clean Air Act (the Act), the U.S. Environmental Protection Agency (EPA) is developing national emission standards for hazardous air pollutants (NESHAP) for the taconite processing source category. Taconite processing involves separating and concentrating iron ore as well as creating and indurating (hardening) pellets. Taconite production in the U.S. is concentrated in a few counties in Minnesota and Michigan. to better control emissions of hazardous air pollutants (HAPs) during these processes, EPA expects that additional emission control equipments will be installed for indurating furnaces and other part of the operation, such as onsite crushing and handling and pellet handling.
NTIS
Iron Ores; Economic Impact; Air Pollution; Pollution Control

20030012764 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Economic Analysis for the National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and
Oct. 27, 1997; In English
Report No.(s): PB2003-101899; No Copyright; Avail: National Technical Information Service (NTIS)
The U.S. Environmental Protection Agency (EPA) promulgates water effluent discharge limits (effluent limitations guidelines and standards or 'effluent guidelines') and air emissions standards for industrial sectors. This Economic Analysis (EA) evaluates the costs and economic impacts of technologies that form the bases for setting these limits and standards for the pulp, paper, and paperboard industry. The report also examines and estimates the qualitative, quantitative, and monetized benefits from reduced pollution, and compares the benefits and costs of the promulgated rules. The report also describes the relative cost-effectiveness of the pollution control technologies and evaluates the costs and impacts of the regulations that significantly impact a substantial number of small businesses. Because EPA considered the air and water requirements jointly, they are known as the 'Cluster or Integrated Rules.'
NTIS
Effluents; Economic Analysis; Air Pollution; Water Pollution

20030012789 Little (Arthur D.), Inc., Irvine, CA USA
Refinement of Selected Fuel-Cycle Emissions Analyses, Volume 2 ***Final Report***
Unnasch, S.; Browning, L.; Kassoy, E.; Apr. 2001; 110p; In English
Report No.(s): PB2003-100838; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Three fuels were estimated to have fuel-cycle emissions close to electric vehicles (EVs): diesel fuel and liquefied petroleum gas for internal-combustion vehicles, and methanol, which can be used for fuel-cell-powered vehicles. In this study, the analysis for these three fuels was refined, and the emissions associated with EVs were reassessed, taking into consideration the post-1998 deregulation environment. The emissions data resulting from this study have been used to compare fuel-cycle emissions for these three fuels to the emissions associated with electricity generation for EVs and provide appropriate regulatory credit.
NTIS
Fuel Combustion; Exhaust Emission

20030012870 National Inst. for Occupational Safety and Health, Div. of Surveillance, Hazard Evaluations and Field Studies, Cincinnati, OH USA

Health Hazard Evaluation Report: HETA 2001-0059-2861, Boat America Corporation, Alexandria, Virginia

Gwin, K. K.; Feldman, D. M.; Sep. 2001; 26p; In English

Report No.(s): PB2003-102006; HETA-2001-0059-2861; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In November 2000, the National Institute for Occupational Safety and Health (NIOSH) received a confidential employee request for a health hazard evaluation (HHE) at the Boat America Corporation in Alexandria, Virginia. The request was prompted by health concerns, including severe nosebleeds, respiratory irritation, eye irritation, headaches, and nausea, suspected to be caused by the handling of the vinyl material used in the boat graphics department. On February 23, 2001, NIOSH investigators conducted an environmental evaluation which included two full shift personal breathing-zone (PBZ) air samples to assess worker exposure to toluene and ethyl acrylate. Six full-shift area air samples were also collected for volatile organic compounds (VOCs), toluene, and ethyl acrylate. Measurements of occupant comfort indicators (temperature, carbon dioxide (CO2), and relative humidity (RH)) were also collected. In addition, qualitative ventilation measurements were performed to determine airflow patterns. The medical evaluation consisted of confidential employee interviews and a review of OSHA 200 injury and illness logs and medical records.

NTIS

Environmental Surveys; Health; Hazards; Evaluation; Clinical Medicine

20030012872 National Inst. for Occupational Safety and Health, Surveillance, Hazard Evaluations and Field Studies, Cincinnati, OH USA

Health Hazard Evaluation Report: HETA 2002-0038-2870, Federal Buildings, 26 Federal Plaza, New York, New York

Mar. 2002; 46p; In English

Report No.(s): PB2003-102012; HETA-2002-0038-2870; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On November 7, 2001, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from Department of Health and Human Services (DHHS) representatives regarding indoor environmental quality (IEQ) problems at the Federal Office Building, 26 Federal Plaza, New York City (NYC), New York. This building is located approximately 5 blocks northeast of the World Trade Center (WTC) disaster site. DHHS employees in the building expressed concerns regarding potential exposures and health effects related to the attacks on, and subsequent collapse of, the WTC. Because of the immense impact the WTC attack had on the lives of NYC residents and workers, as well as the concerns of many employees about ongoing security issues, NIOSH investigators included an assessment of mental health symptoms in the HHE. On November 12-15, 2001, NIOSH investigators conducted a site visit at the Federal Office Building to perform an environmental survey and meet with employees. A second site visit for a questionnaire survey was performed on December 4-5, 2001, and a similar questionnaire survey among a comparison group of DHHS employees in Dallas, Texas, was performed on December 12, 2001.

NTIS

Environmental Surveys; Buildings; Health; Hazards; Evaluation; Reports; Environmental Quality; Medical Services

20030012896 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

Quality Management Plan for the National Air Toxics Trends Station Monitoring Program

Mikel, D.; Dec. 17, 2002; 78p; In English

Report No.(s): PB2003-101929; EPA/454/R-02/006; No Copyright; Avail: National Technical Information Service (NTIS)

There are currently 188 hazardous air pollutants (HAPs), or Air Toxics (AT), regulated under the Clean Air Act (CAA) that have been associated with a wide variety of adverse health effects, including cancer, neurological effects, reproductive effects and developmental effects, as well as ecosystem effects. These air toxics are emitted from multiple sources, including major stationary, area, and mobile sources, resulting in population exposure to these air toxics as they occur in the environment. While in some cases the public may be exposed to an individual HAP, more typically people experience exposures to multiple HAPs and from many sources. Exposures of concern result not only from the inhalation of these HAPs, but also, for some HAPs, from multipathway exposures to air emissions. For example, air emissions of mercury are deposited in water and people are exposed to mercury through their consumption of contaminated fish.

NTIS

Improvement; Management Planning; Environmental Monitoring; Air Quality; Contamination; Ecosystems; Air Pollution

20030013742 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Implications of Surface Seepage on the Effectiveness of Geologic Storage of Carbon Dioxide as a Climate Change Mitigation Strategy

Hepple, R. P.; Benson, S. M.; 2002; 10p; In English

Report No.(s): DE2002-802042; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The probability that long-term geologic storage or sequestration of carbon dioxide (CO2) will become an important climate change mitigation strategy will depend on a number of factors, namely (1) availability, capacity and location of suitable sites, (2) the cost of geologic storage compared to other climate change mitigation options, and (3) public acceptance. Whether or not a site is suitable will be determined by establishing that it can meet a set of performance requirements for safe and effective geologic storage (PRGS). To date, no such PRGS have been developed. Establishing effective PRGS must start with an evaluation of how much CO2 might be stored and for how long the CO2 must remain underground to meet goals for controlling atmospheric CO2 concentrations. These requirements then provide a context for addressing the issue of what, if any, is an acceptable surface seepage rate. This paper provides a preliminary evaluation of CO2 storage amounts, time-scales, and concordant performance requirements.

NTIS

Underground Storage; Carbon Dioxide; Seepage; Geology

20030014247 Westinghouse Hanford Co., Richland, WA USA

Technical Basis for Radiological Workplace Air Monitoring/Sampling for the River Corridor Project 300 Area

Hill, R. L.; Mantooth, D. S.; Jan. 2000; 126p; In English

Report No.(s): DE2002-801105; HNF-3258-R1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report documents the technical basis by which the workplace air monitoring and sampling program is operated in the 324 and 327 Buildings.

NTIS

Air Quality; Radiation Detectors

20030014253 California Univ., Davis, CA USA

Critical Review of the Particulate Matter Toxicology Literature for Senate Bill 25 Review of the Particulate Matter Standard *Final Report*

Pinkerton, K. E.; May 2002; 116p; In English

Report No.(s): PB2003-100842; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The critical toxicology literature review provided here is essential to assist ARB and OEHHA in completing the review of the particulate matter and sulfate standards by May 2002. Toxicological studies provide a critical tool to address both short-term and potential long-term effects of particulate matter exposure in humans. Although epidemiological studies can provide critical evidence of associations between human populations, air pollution exposure and adverse health impacts, only toxicological studies can provide the types of data needed to begin identifying which components or characters of PM may be most harmful or perhaps more directly related to observed adverse health effects. It is essential to identify which components or characteristics of PM are most harmful so that ambient air quality standards can be developed and/or revised as needed to protect health. It is also highly desirable to use toxicology studies to identify which components or characteristics of PM are most harmful or more directly associated with health impacts so that effective source control strategies can be developed. The following presents a critical review of the PM related toxicology literature designed to assist in the ambient air quality standards review process.

NTIS

Particulates; Sulfates; Toxicology

20030014254 California Univ., Center for Environmental Research and Technology, Riverside, CA USA

Development and Application of Improved Methods for Measurement of Ozone Formation Potentials of Volatile Organic Compounds *Final Report*

Carter, W. P. L.; Malkina, I.; May 2002; 112p; In English

Report No.(s): PB2003-100845; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This project was aimed at developing improved and lower-cost alternative experimental procedures for evaluating chemical mechanisms for predicting ozone impacts of volatile organic compounds (VOCs). More precise measurements of effects of VOCs on OH radicals in chamber experiments could be obtained if 1,3,5-trimethylbenzene is used instead of m-xylene as the radical tracer, but our ability to model reactions of 1,3,5-trimethylbenzene need improvement before the data will reduce uncertainties

in evaluations. The use of HONO + VOC irradiations to provide an alternative reactivity measurement to reduce ambiguities in mechanism evaluations, and extend the range of compounds that can be studied, was investigated.
NTIS
Chemical Analysis; Ozone; Reactivity; Volatile Organic Compounds

20030014255 California Univ., School of Public Health, Los Angeles, CA USA
Development and Validation of Databases for Modeling Biogenic Hydrocarbon Emissions in California's Airshed *Final Report*
Winer, A. M.; May 2001; 232p; In English
Report No.(s): PB2003-100846; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
Quantifying biogenic volatile organic compound (BVOC) emissions is critical in the development of effective ozone and fine particle control strategies in certain of California's airsheds. However, because of the diversity and complexity of California's vegetation (e.g. more than 6000 plant species), as well as the large areal extent of its airsheds, additional field data are needed to produce reliable gridded, speciated BVOC emission inventories from current and future ARB modeling efforts. The principal objectives of this field-based research project were to generate data needed to further develop predictive methods for BVOC emissions and leafmass for the large number of plant species relevant to California, and to further validate the vegetation landcover maps currently in use. to meet these objectives, the authors surveyed total BVOC emissions for more than 200 plant species not previously measured, using a photoionization detection system to identify emitters vs. non-emitters of BVOC for important California plant species; developed and tested methods for estimating leafmass, leaf area index, and leafmass densities for urban trees; conducted biomass sampling in a blue oak savanna to test leaf mass and leaf area index allometric relationships for this high-emitting species; conducted quantitative field-based analysis of the GAP GIS landcover vegetation database for the San Joaquin Valley; and continued to work collaboratively with ARB staff to further develop a state-of-the-science methodology for the generation of a quantitative statewide BVOC emission inventory for California.
NTIS
Hydrocarbons; Exhaust Emission; California; Volatile Organic Compounds; Data Bases

20030014256 Pacific Southwest Research Station, Riverside, CA USA
Ambient Ozone Patterns and Ozone Injury Risk to Ponderosa and Jeffery Pines in the Sierra Nevada *Final Report*
Arbaugh, M. J.; Bytnerowicz, A.; Preisler, H.; Fraczek, W.; Alonso, R.; Feb. 22, 2002; 72p; In English
Report No.(s): PB2003-100848; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Spatially explicit estimates of ambient ozone exposure to the Sierra Nevada were developed using data from an extensive survey of passive ozone monitors. The study area included the Sierra Nevada subregion, and extended from the Sequoia National Forest in the south through the Lassen National Forest in the north. Both Westside and Eastside forests were included in the ambient ozone survey. This survey provided data at a total of 94 locations across the Sierra Nevada, of which nine were collocated with active ozone monitors. In addition digital elevation maps, and spatial maps of temperatures and precipitation were developed as part of the analysis.
NTIS
Conifers; Ozone; Mountains

20030014270 California Inst. of Tech., Pasadena, CA USA
Thermodynamics of Organic Atmospheric Aerosols *Final Report*
Seinfeld, J. H.; Griffin, R. J.; Pun, B. K.; Seigneur, C.; Dabdub, D.; Mar. 2001; 170p; In English
Report No.(s): PB2003-100873; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Organic species are an important component of atmospheric particles. Particulate organic compounds, suspected to be a possible source of human health effects in inhaled particles, arise from both direct emissions and gas-to-particle conversion in the atmosphere. Those arising from gas-to-particle conversion, so-called secondary organic aerosols, transfer to particles based on equilibrium partitioning between the gas and particle phases. The ability to represent that partitioning is central to atmospheric models that can be used to predict organic aerosol levels. The goal of this project is to develop a general organic gas-particle partitioning model appropriate for use in three-dimensional atmospheric models and apply it to predict organic aerosol levels in the South Coast Air Basin. The partitioning model divides semi-volatile organic species (those with sufficiently low vapor pressure to condense, at least in part, to the aerosol phase) into hydrophobic and hydrophilic categories and then computes the partitioning of those molecules to satisfy thermodynamic equilibrium and total mass conservation.
NTIS
Thermodynamics; Atmospheric Models

20030014271 National Oceanic and Atmospheric Administration, Environmental Research Labs, Boulder, CO USA
Development and Field Test of a Two-Dimensional Vertically Scanning Ozone Lidar ***Final Report***
Zhao, Y.; Hardesty, R. M.; Jun. 1997; 104p; In English
Report No.(s): PB2003-100854; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The ETL ground-based ozone lidar was deployed in August 1995 near one of the major ozone transport corridors from the Los Angeles Air Basin to the Mojave Desert. A newly developed two-dimensional scanning system was added to the modified and ruggedized lidar system. The scanning system provides the capability of showing horizontal inhomogeneity. Scanning data also serve as strong internal check of the lidar system itself, and that is a great advantage. The afternoon data on most days show a layer of higher ozone concentrations in the lower boundary layer, and another layer aloft. The two layers merge in mid afternoon but separate again later. Advection ozone fluxes are calculated using lidar profiles and wind profiler data. The results show more ozone is transported aloft, although higher ozone concentrations may exist in the lower altitude.
NTIS
California; Optical Radar; Air Pollution; Air Sampling

20030014272 California Univ., Dept. of Civil and Environmental Engineering, Berkeley, CA USA
Continuous, Real-Time, Miniature Ozone Monitor ***Final Report***
May 1999; 132p; In English
Report No.(s): PB2003-100843; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
In this study, a portable real-time ozone monitor has been developed. The ozone sensor consists of a piezoelectric quartz crystal coated with polybutadiene. The polybutadiene coating reacts irreversibly with ozone resulting in a mass increase on the surface of the crystal which, in turn, alters the natural oscillation frequency of the crystal. The rate of change in frequency is proportional to the concentration of ozone and is recorded by a datalogger with a time resolution of 10 minutes. Major effort was devoted to designing and optimizing the configuration of the ozone sensor.
NTIS
Ozone; Environmental Monitoring

20030014273 California Univ., Dept. of Mechanical and Aerospace Engineering, Irvine, CA USA
Chlorine Emissions from Activated Sea-Salt Aerosols and Their Potential Impact on Ozone ***Final Report***
Knipping, E. M.; Dabdub, D.; Mar. 2002; 90p; In English
Report No.(s): PB2003-100841; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
A photochemical modeling study is performed to determine whether urban photochemical models simulating sea-salt particle chemistry can predict observed chlorine levels and how such chlorine levels affect ozone formation. A host urban airshed model, employing a rich chemical mechanism and simulating aerosol dynamics, is augmented with current sea-spray generation functions, a comprehensive gas-phase chlorine chemistry mechanism and several heterogenous/multiphase chemical reactions considered key processes leading to reactive chlorine formation.
NTIS
Chlorine; Ozone; Photochemical Reactions

20030014279 California Univ., Dept. of Atmospheric Sciences, Los Angeles, CA USA
Investigation of Relationship between Total Non-Methane Organic Carbon and the Sum of Speciated Hydrocarbons and Carbonyls Measured by Standard GC/FID: Validation and Refinement of a New Instrument, and Measurements in the South Coast Air Basin ***Final Report***
Paulson, S.; Maris, C.; Chung, M.; Krischke, U.; Jun. 2002; 154p; In English
Report No.(s): PB2003-100869; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Here the authors describe development of a new instrument to measure the airborne total non-methane organic carbon concentration (TNMOC), and the ratio of this value to the sum of speciated volatile organic carbon (VOC's) measured by standard gas chromatography. The approach is to make a measurement that minimizes sample contact, cryo-trapping whole air samples with minimal trapping of carbon dioxide, carbon monoxide and methane. Samples are processed by an oxidation catalyst to generate carbon dioxide that is measured as TNMOC. Simultaneously, a standard speciated VOC's measurement is made with the same instrument.
NTIS
Carbon; Carbonyl Compounds; Hydrocarbons; Air Sampling; Measuring Instruments; Gas Chromatography; Structural Basins; Organic Compounds; Coasts

20030014307 California Univ., Kearney Agricultural Center, Parlier, CA USA
Factors in Plant Survival for Revegetation in the Antelope Valley for Particulate Matter Control ***Final Report***
Grantz, D. A.; Vaughn, D. L.; Nov. 2001; 130p; In English
Report No.(s): PB2003-100860; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Research projects conducted to address these problems have identified feasible and affordable land use practices that suppress fugitive dust. Results at this time are preliminary. A project goal is to develop recommendations that will be robust, and apply in this and other low rainfall areas of the arid west. In previous research efforts the authors have demonstrated the long term dust mitigation benefits of revegetation with perennial species. The authors have previously documented the difficulties and uncertainties of successfully reestablishing shrub vegetation in this harsh environment-both cold winters and hot and dry summers. The current project, reported here, documents effects of site modification techniques on plant microenvironment, and examines plant physiological response to the imposed site modifications. Some minimal site modification is likely to be required to enhance the probability of successful establishment to the native shrubs under study. This enhanced probability of success will be essential prior to recommendations to land managers to implement the revegetation protocols under development.
NTIS
Plants (Botany); Pollution Control; Air Pollution; Vegetation

20030014318 Lawrence Livermore National Lab., Livermore, CA USA
LLNL NESHAPs 1999 Annual Report
2002; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792794; UCRL-ID-113867-00; No Copyright; Avail: National Technical Information Service (NTIS)

This annual report is prepared pursuant to the National Emissions Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 61, Subpart H; Subpart H governs radionuclide emissions to air from Department of Energy (DOE) facilities.
NTIS
Emission; Environmental Monitoring; Air Pollution

20030014329 California Univ., Center for Environmental Research and Technology, Riverside, CA USA
Emissions and Demonstration of an Emissions Control Technology for Small 2-Stroke Utility Engines ***Final Report***
Durbin, T.; Williams, W.; Oct. 2001; 34p; In English
Report No.(s): PB2003-100844; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Small utility engines contribute to emission inventories in California that are disproportionately high on brake-specific basis (mass of pollutants produced per unit work performed). The California Air Resources Board (ARB) has established emissions standards for handheld and non-handheld equipment powered by these small utility engines. A number of technologies have the potential for meeting these emissions standards, including four-stroke engines, fuel-injected two-stroke engines, stratified scavenging two-stroke engines, and two-stroke engines with catalytic after-treatment devices. Manufacturers, however, have expressed concerns about the ability to achieve the desired performance in a cost-effective way. In an effort to add to our knowledge regarding emissions from two-stroke utility engines and to demonstrate a potential control technology, the University of California, Riverside, Bourns College of Engineering - Center for Environmental Research and Technology (CE-CERT) tested four small two-stroke utility engines: a 46 cc Tanaka (string trimmer), a 46 cc BKM-F1 modified Tanaka (string trimmer), a Stihl (string trimmer), and an Echo PB-210E (leaf blower).
NTIS
Exhaust Emission; Pollution Control; Internal Combustion Engines

20030014337 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Evaluation of TRIM.FaTE, Volume 1, Approach and Initial Findings
Maddalena, R.; Bennett, D. H.; McKone, T. E.; Lyon, B. F.; Efroymson, A.; Sep. 2002; 160p; In English
Report No.(s): PB2003-101532; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

TRIM.FaTE is a predictive environmental fate and transport model designed to support decisions on programmatic policy and regulation for multimedia air pollutants. These decisions can have far-reaching human health, environmental, and economic implications. It is important that an assessment of how well the model is expected to perform the tasks for which it was designed is incorporated within the model development process. In other words, the trustworthiness of models used to determine policy or to attest to public safety should be ascertained (Oreskes et al. 1994). This report describes the model evaluation activities performed to date to assess TRIM.FaTE's quality and acceptability. In short, it describes the progress made to date in fulfilling the Evaluation Plan laid out in Chapter 6 of the November 1999 TRIM Status Report (U.S. EPA 1999a). The Evaluation Report

is composed to two volumes. This volume, Volume 1, presents conceptual, mechanistic, and structural complexity evaluations of various aspects of the model (e.g., inputs, process models).
NTIS
Evaluation; Air Pollution; Predictions; Models

20030014510 Ohio Univ., Dept. of Civil Engineering, Athens, OH USA
Parallel Barrier Effects for Distant Receivers *Final Report*
Herman, L.; Ghent, J.; Lin, K.; Nadella, S.; Jul. 2002; 102p; In English
Report No.(s): PB2003-101363; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The research described in this report determined the effects of parallel noise barriers as a contributing factor to the perception of increased noise levels by distant receivers. The results of the investigation support the hypothesis that many of these distant receivers realized little barrier attenuation following noise barrier construction.
NTIS
Walls; Noise (Sound); Acoustic Velocity; Noise Intensity

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.

20030012927 Test Wing (0046th), Eglin AFB, FL USA
Seismic-Acoustic Hybrid Sensor and Its Applications
Sledge, John; Feb. 25, 2002; 13p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole con
Report No.(s): AD-A409205; No Copyright; Avail: Defense Technical Information Center (DTIC)
The need for instrumentation to gather seismic-acoustic signatures under unusual conditions requires the use of low cost, simple design, and robust sensors. In some instances, the sensors must adapt and mold to the environmental medium to provide proper coupling for data collection purposes. This paper explains how the idea of a hybrid seismic-acoustic sensor originated and initially implemented. Testing shows the device performs as a seismic and acoustic signature-gathering sensor. The data product from the hybrid sensor is similar to those sensors available through commercial sources. Further evolution of the hybrid sensor and additional commercial applications for the device are discussed.
DTIC
Acoustics; Signatures; Seismic Waves

20030013647 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
3-D Characterization of Seismic Properties at the Smart Weapons Test Range, YPG
Miller, Richard D.; Anderson, Thomas S.; Davis, John C.; Steeples, Don W.; Moran, Mark L.; Oct. 2001; 19p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole conference.
Report No.(s): AD-A409319; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Smart Weapons Test Range (SWTR) lies within the Yuma Proving Ground (YPG), Arizona. SWTR is a new facility constructed specifically for the development and testing of futuristic intelligent battlefield sensor networks. In this paper, results are presented for an extensive high-resolution geophysical characterization study at the SWTR site along with validation using 3-D modeling. In this study, several shallow seismic methods and novel processing techniques were used to generate a 3-D grid of earth seismic properties, including compressional (P) and shear (S) body-wave speeds (Vp and Vs), and their associated body-wave attenuation parameters (Qp, and Qs). These experiments covered a volume of earth measuring 1500 m by 300 m by 25 m deep (11 million cubic meters), centered on the vehicle test track at the SWTR site. The study has resulted in detailed characterizations of key geophysical properties. To our knowledge, results of this kind have not been previously achieved, nor have the innovative methods developed for this effort been reported elsewhere. In addition to supporting materiel developers with

important geophysical information at this test range, the data from this study will be used to validate sophisticated 3-D seismic signature models for moving vehicles.
DTIC
Seismology; Three Dimensional Models; Weapons; Detectors; Geophysics; Test Ranges

20030013731 Blackhawk Geoservices, Inc., Golden, CO USA
Integrated Geophysical Detection of DNAPL Source Zones ***Final Report, 1 Apr. 1998-31 Jul. 2001***
Nov. 28, 2001; 68p; In English
Contract(s)/Grant(s): F08637-98-C-6006
Report No.(s): AD-A409159; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Identification of subsurface organic contamination, particularly dense nonaqueous phase liquids (DNAPLs) is one of the highest priorities - and among the most difficult - for remediation of numerous sites, including those of the DOD and DOE. Complex resistivity (CR) is the only geophysical method that has been demonstrated in the laboratory to have high sensitivity to organic compounds, by detecting responses indicative of clay-organic electrochemistry. However, direct detection of organics in the field has been elusive, in part due to the difficulty of obtaining robust measurements at very low contaminant levels in the presence of heterogeneous geological materials and cultural interference (such as metallic utilities and remediation plumbing). This project sought to improve the capability to detect DNAPL by (1) better geophysical imaging of geological pathways that control DNAPL movement and (2) direct detection by detailed comparison of CR lab to field data using this improved imaging. For the first goal, algorithms were developed for the joint tomographic imaging of seismic and resistivity data. The method requires that an empirical relationship can be established between seismic and resistivity; if values are ultimately tied to specific lithologies, then the final tomographic product can be an actual geological cross-section. Because shallow subsurface investigations are now commonly performed using a cone penetrometer (CPT) a new vibratory seismic source was developed to identify sites with clay-organic reactions measurable in the lab from core samples, perform reconnaissance field surveys, and proceed to detailed 2D or 3D cross-hole imaging.
DTIC
Contamination; Detection; Geophysics; Liquid Phases; Organic Compounds; Fluid Flow

20030013750 National Taiwan Univ., Dept. of Civil Engineering, Taipei, Taiwan, Province of China
Pre-Computing the Sensitivity of a GPS Station for Crustal Deformation Monitoring
Hsu, Rong-Shin, National Taiwan Univ., Taiwan, Province of China; Hsiao, Kang-Wei, National Taiwan Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 715-722; In English
Contract(s)/Grant(s): NSC-89-2211-E-002-062; Copyright; Avail: Issuing Activity
A procedure is suggested to pre-compute the positional sensitivity of a GPS station in deformation monitoring. by applying the formula, which transforms a terrestrial vector to its local (station) coordinate system, the orientations of the marginal displacement vector detectable by GPS can be determined. The GPS network in southwestern Taiwan is used as an example.
Author
Crustal Fractures; Deformation; Displacement; Transformations (Mathematics)

20030013999 Naval Surface Warfare Center, Dahlgren, VA USA
Magnetic Signature Analysis and Validation System
VanDerVliet, Scott D.; Oct. 2001; 17p; In English; Original contains color images
Report No.(s): AD-A409220; No Copyright; Avail: Defense Technical Information Center (DTIC)
The Magnetic Signature Analysis and Validation (MAGSAV) System is a mobile platform that is used to measure, record, and analyze the perturbations to the earth's ambient magnetic field caused by object such as armored vehicles. MAGSAV was developed in order to efficiently obtain magnetic flux density maps of armored vehicles. The field maps have a spatial extent of 24.75 m by 24.75 m in a given horizontal plane above ground level (AGL). A field map is composed of a grid, or matrix, of 99 cells by 99 cells. Each cell has a spatial extent of 0.25 m by 0.25 m and possesses a single magnetic flux density value, in units of mgauss, which represents the total static field at a point in space relative to the target. The target center is registered in the grid center. The field measurement process is conducted at tour heights AGL and then intermediate planes are obtained through interpolations. The resultant "magnetic field cube" provides a three-dimensional matrix of magnetic flux density values spatially registered to the target.
DTIC
Magnetic Signatures; Military Vehicles

20030014077 Shanghai Astronomical Observatory, China

Comparison and Establishment of Three Absolute Plate Motion Models

Jin, Shuang-Gen, Shanghai Astronomical Observatory, China; Zhu, Wen-Yao, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 21-27; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

Three absolute models of plate motion: PRF - ITRF2000 derived from assumption that the Pacific ridge was fixed, HS2 - ITRF2000 based on the hotspot data, and NNR - ITRF2000 are presented in this paper. It is suggested that the PRF - ITRF2000 is probably an appropriate absolute reference frame.

Author

Models; Motion

20030014082 Shanghai Astronomical Observatory, China

Global Plate Motion Models Based on ITRF2000

Jin, Shuang-Gen, Shanghai Astronomical Observatory, China; Zhu, Wen-Yao, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 28-33; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

A new present - day plate motionmodel ITRF200OVEL is determinated basing on the ITRF2000 velocity field that is free of any additional tectonic plate model assumption. The total angular momentum of the tectonic plates shows the ITRF2000 is not sufficient accordant with the definition of CTRF. The inconsistency will influence the long - term maintenance and highly accurate application of ITRF2000 as well as long - term variation of the Earth rotation parameters.

Author

Angular Momentum; Earth Rotation; Tectonics; Velocity Distribution

20030014115 State Univ. of New York, Dept. of Mechanical Engineering, Binghamton, NY USA

A Biological Model for Directional Sensing of Seismic Vibration

Miles, R. N.; Cocroft, R. B.; Feb. 25, 2002; 9p; In English; Papers from 2001 Meeting of the MSS Specialty Group on Battlefield Acoustic and Seismic Sensing, Magnetic and Electric Field Sensors, Volume 1: Special Session held 23 Oct 2001. See also ADM001434 for whole con

Report No.(s): AD-A409266; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There are many applications for a compact device that is capable of indicating the direction of propagation of substrate vibration. In order to develop effective devices for this purpose, it can be helpful to examine biological systems that have evolved specialized sensory systems for finding a vibration source. We are studying an insect model of vibration localization that provides an approach to directional vibration sensing over very small spatial scales. The treehopper Umbonia crassicornis communicates using vibrational signals transmitted along plant stems in the form of bending waves. The insect detects these substrate vibrations using sensors in the legs. Because the legs in this small species span a distance along the stem of only 5 mm, the insect is faced with a difficult localization problem: time-of-arrival differences between receptors on different legs are in the microsecond range, and wavelengths are an order of magnitude larger than the insect's own dimensions. to study this system we constructed a simulator that mimics the surface motion of propagating bending waves, then used the simulator to explore directional sensing mechanisms. Using laser vibrometry, we characterized the dynamic response of the insect's body (analogous to a mass on a set of springs) when driven with vibration of the substrate. We found a remarkable mechanical directionality in the response of the insect's body to substrate vibration, in which small time differences are converted to large amplitude differences across the insect's body. Preliminary evidence suggests that directionality results from the interaction of two modes of vibration in the insect's body: one that responds to the spatial gradient of the vibrational signal, and one that responds to the spatial average of the signal over the region sampled. This system generates a marked directionality in the amplitude response of the insect's body while sampling only 5 mm of a vibration gradient.

DTIC

Vibration; Insects; Surface Waves; Seismic Waves

20030014152 Shanghai Astronomical Observatory, China

On the Modeling of the Residual Effects of the Clock Behavior and the Atmosphere Effects in the Analysis of VLBI Data

Bo, Zhang, Shanghai Astronomical Observatory, China; Li, Jin-Ling, Shanghai Astronomical Observatory, China; Wang, Guan-Gli, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 40-45; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

We checked the dependence of the estimation of parameters on the choice of piecewise interval in the continuous piecewise linear modeling of the residual clock and atmosphere effects by single analysis of 27 VLBI experiments involving Shanghai station (Seshan 25m). The following are tentatively shown: (1) Different choices of the piecewise interval lead to differences in the estimation of station coordinates and in the weighted root mean squares (wrms) of the delay residuals, which can be of the order of centimeters or dozens of picoseconds respectively. So the choice of piecewise interval should not be arbitrary . (2) The piecewise interval should not be too long, otherwise the short - term variations in the residual clock and atmospheric effects can not be properly modeled. While in order to maintain enough degrees of freedom in parameter estimation, the interval can not be too short, otherwise the normal equation may become near or solely singular and the noises can not be constrained as well. Therefore the choice of the interval should be within some reasonable range. (3) Since the conditions of clock and atmosphere are different from experiment to experiment and from station to station, the reasonable range of the piecewise interval should be tested and chosen separately for each experiment as well as for each station by real data analysis. This is really arduous work in routine data analysis. (4) Generally speaking, with the default interval for clock as 60min, the reasonable range of piecewise interval for residual atmospheric effect modeling is between 10min to 40min, while with the default interval for atmosphere as 20min, that for residual clock behavior is between 20min to 100min.

Author

Atmospheric Effects; Clocks; Very Long Base Interferometry; Mean Square Values; Selection

20030014155 Shanghai Astronomical Observatory, China

Preliminary Results of Multi - Format Compatibility Tests of CVN Correlator

Shu, Feng-Chun, Shanghai Astronomical Observatory, China; Zhang, Xiuz-Hong, Shanghai Astronomical Observatory, China; Zheng, Wei-Min, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 107-114; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

Chinese VLBI network (CVN) consists of one correlator and 3 stations located at Shanghai, Urumqi and Kunmin respectively. Shanghai and Urumqi stations have been upgraded to use thin tape only and MK4 tape format, but Kunmin station has only a S2 terminal. In order to make CVN operational , the correlator was modified to compatible with MK3A, VLBA, and part of MK4 and S2 tape format. A series of experiments for testing the correlator were conducted, and the preliminary results of those experiments were presented and analyzed. Capability of the correlator after upgrade was summarized, and the future work of the correlator were discussed.

Author

Very Long Base Interferometry; Correlators; Compatibility

20030014157 Shanghai Astronomical Observatory, China

Effects of Different Chandler Periods and Q on Estimates of the Excitation Function and Their Comparisons

Liao, De-Chun, Shanghai Astronomical Observatory, China; Liao, Xin-Hao, Shanghai Astronomical Observatory, China; Zhou, Yong-Hong, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 12-20; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

By using the data series of the polar coordinates and atmospheric angular momentum (AAM) during 1984 approx. to 1999, effects of different Chandler periods and quality factor Q on the estimates of power spectral density (psd) of the observed polar motion excitation, and of squared coherence and coherent phases between the observed excitation and the AAM excitation are analyzed. Results show large differences in psd of the observed excitation, and in squared coherence between the observed excitation and the AAM excitations for different Chandler periods and Q. Thus, when comparing the observed polar motion excitation with one of the geophysical excitations (e.g. AAM excitation) , one should not choose the Chandler period by a better approximation of the observed one to the geophysical one, because the observed excitation is a comprehensive results of various geophysical excitation sources.

Author

Chandler Wobble; Estimates; Polar Wandering (Geology); Q Factors

20030014597 NASA Langley Research Center, Hampton, VA USA

Characterization of Upper Troposphere Water Vapor Measurements during AFWEX using LASE

Ferrare, R. A., NASA Langley Research Center, USA; Browell, E. V., NASA Langley Research Center, USA; Ismail, S., NASA Langley Research Center, USA; Kooi, S., Science Applications International Corp., USA; Brasseur, L. H., Science Applications International Corp., USA; Brackett, V. G., Science Applications International Corp., USA; Clayton, M., Science Applications International Corp., USA; Barrick, J., NASA Langley Research Center, USA; Linne, H., Max-Planck-Inst. fuer Meteorologie, Germany; Lammert, A., Max-Planck-Inst. fuer Meteorologie, Germany; 20020701; 4p; In English; 21st International Laser Radar Conference, 8-12 Jul. 2002, Quebec, Canada; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Water vapor profiles from NASA's Lidar Atmospheric Sensing Experiment (LASE) system acquired during the ARM/FIRE Water Vapor Experiment (AFWEX) are used to characterize upper troposphere water vapor (UTWV) measured by ground-based Raman lidars, radiosondes, and in situ aircraft sensors. Initial comparisons showed the average Vaisala radiosonde measurements to be 5-15% drier than the average LASE, Raman lidar, and DC-8 in situ diode laser hygrometer measurements. We show that corrections to the Raman lidar and Vaisala measurements significantly reduce these differences. Precipitable water vapor (PWV) derived from the LASE water vapor profiles agrees within 3% on average with PWV derived from the ARM ground-based microwave radiometer (MWR). The agreement among the LASE, Raman lidar, and MWR measurements demonstrates how the LASE measurements can be used to characterize both profile and column water vapor measurements and that ARM Raman lidar, when calibrated using the MWR PWV, can provide accurate UTWV measurements.

Author

Troposphere; Water Vapor; Atmospheric Moisture

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20030012584 NASA Langley Research Center, Hampton, VA USA

Convection Weather Detection by General Aviation Pilots with Convectional and Data-Linked Graphical Weather Information Sources

Chamberlain, James P., NASA Langley Research Center, USA; Latorella, Kara A., NASA Langley Research Center, USA; October 2001; 12p; In English; 20th Digital Avionics Systems Conference, 14-18 Oct. 2001, Daytona Beach, FL, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study compares how well general aviation (GA) pilots detect convective weather in flight with different weather information sources. A flight test was conducted in which GA pilot test subjects were given different in-flight weather information cues and flown toward convective weather of moderate or greater intensity. The test subjects were not actually flying the aircraft, but were given pilot tasks representative of the workload and position awareness requirements of the en route portion of a cross country GA flight. On each flight, one test subject received weather cues typical of a flight in visual meteorological conditions (VMC), another received cues typical of flight in instrument meteorological conditions (IMC), and a third received cues typical of flight in IMC but augmented with a graphical weather information system (GWIS). The GWIS provided the subject with near real time data-linked weather products, including a weather radar mosaic superimposed on a moving map with a symbol depicting the aircraft's present position and direction of track. At several points during each flight, the test subjects completed short questionnaires which included items addressing their weather situation awareness and flight decisions. In particular, test subjects were asked to identify the location of the nearest convective cells. After the point of nearest approach to convective weather, the test subjects were asked to draw the location of convective weather on an aeronautical chart, along with the aircraft's present position. This paper reports preliminary results on how accurately test subjects provided with these different weather sources could identify the nearest cell of moderate or greater intensity along their route of flight. Additional flight tests are currently being conducted to complete the data set.

Author

Convection; Weather; Pilot Performance; General Aviation Aircraft; Cockpit Weather Information Systems; Graphical User Interface; Flight Control

20030012703 NASA Langley Research Center, Hampton, VA USA

New CERES Data Examined for Evidence of Tropical Iris Feedback

Chambers, Lin H., NASA Langley Research Center, USA; Lin, Bing, NASA Langley Research Center, USA; Young, David F., NASA Langley Research Center, USA; [2002]; 4p; In English; 11th Conference on Atmospheric Radiation, 3-7 Jun. 2002, Ogden, UT, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

New data products are available from the CERES instrument, a part of the NASA Earth Observing System. The Single Scanner Footprint (SSF) product combines radiative fluxes with extensive information on the cloud conditions in the footprint, which are retrieved using the co-orbiting imager instrument. These data have been analyzed to more accurately define the radiative properties for the various regions of the recently-proposed adaptive infrared Iris. A variety of ways of defining the cloudy moist region were examined. According to CERES, the net radiative flux for the cloudy moist region ranges between 28 and 54 W/m2 depending on the specific definition used. This is in contrast to the value of 123 W/m2 which was somewhat subjectively assigned by LCH. This simple model may miss many feedbacks in the climate system, but it should provide a rough range of the climate variations if the physics of the Iris is correct. There is some question whether the change in cloudy moist area with cloud-weighted SST actually represents a useful quantity, and whether extrapolating it from a regional variation to a global response to warmer climate is appropriate. Regardless, the current results show that the proposed Iris feedback is very much weaker when objectively-determined radiative properties are used in the model.

Derived from text

Earth Observing System (EOS); Feedback; Satellite-Borne Instruments; Radiance; Footprints

20030012729 California Inst. of Tech., Pasadena, CA USA

Thermodynamics of Organic Atmospheric Aerosols *Final Report*

Seinfeld, J. H.; Griffin, F. J.; Pun, B. K.; Seigneur, C.; Dabdub, D.; Feb. 2002; 170p; In English

Report No.(s): PB2003-100870; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Organic species are an important component of atmospheric particles. Particulate organic compounds, suspected to be a possible source of human health effects in inhaled particles, arise from both direct emissions and gas-to-particle conversion in the atmosphere. Those arising from gas-to-particle conversion, so-called secondary organic aerosols, transfer to particles based on equilibrium partitioning between the gas and particle phases. The ability to represent that partitioning is central to atmospheric models that can be used to predict organic aerosol levels. The goal of this project is to develop a general organic gas-particle partitioning model appropriate for use in three-dimensional atmospheric models and apply it to predict organic aerosol levels in the South Coast Air Basin. The partitioning model divides semi-volatile organic species (those with sufficiently low vapor pressure to condense, at least in part, to the aerosol phase) into hydrophobic and hydrophilic categories and then computes the partitioning of those molecules to satisfy thermodynamic equilibrium and total mass conservation.

NTIS

Aerosols; Atmospheric Models; Organic Materials; Thermodynamic Equilibrium

20030012815 Old Dominion Univ., Norfolk, VA USA

An User Evaluation of the ARNAV Weather Information System

Karande, Kiran W., Old Dominion Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 55; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Weather is a factor in approximately 30% of aviation accidents. Weather is also responsible for approximately two-thirds of air carrier delays- a four billion dollar cost, of which 1.7 billion dollars are considered avoidable. The goal of NASA's AWIN (Aviation Weather Information Network) program is to provide improved weather information to users in the National Airspace System, and to foster the improved usage of this information (http://awin.larc.nasa.gov). One of the avenues pursued by AWN is to improve the availability of weather information in cockpits of general aviation aircrafts. NASA funded a project by ARNAV Systems Inc. for the development of a system that provides graphical and text weather information in the cockpit of general aviation aircraft. Our study investigates how ARNAV weather system users evaluate their weather information system. The dimensions used for evaluation are based upon discussions with researchers at NASA Langley Research Center and the human factors literature, and include usability criteria such as efficiency, satisfaction, memorability, and errors, as well as design criteria such as the display size, location, symbols, functionality, information content and quality. In-depth interviews were carried out with seven pilots from the Virginia Department of Aviation in Richmond. Results helped identify design improvements that would

enhance the usability of the weather information system. Findings of this study are important because they will lead to improved system design and also offer directions for future research.
Author
Information Systems; Weather; National Airspace System; Air Transportation

20030012947 Naval Pacific Meteorology and Oceanography Center/Joint Typhoon Warning Center, Pearl Harbor, HI USA
2001 Annual Tropical Cyclone Report ***Annual Report, Jul. 2000-Dec. 2001***
Grandau, Frank J.; Engel, Greg T.; Dec. 2001; 324p; In English; Original contains color images
Report No.(s): AD-A408995; No Copyright; Avail: Defense Technical Information Center (DTIC)
Annual publication summarizing tropical cyclone activity in the Western Pacific and Indian Oceans is presented. A best track is provided for each significant tropical cyclone together with a summary of events associated with the cyclone. Forecast verification data and statistics for the JTWC are also included in this report.
DTIC
Cyclones; Tropical Storms; Weather Forecasting; Meteorological Satellites; Documents

20030013637 NASA Langley Research Center, Hampton, VA USA
Graphical Weather Information System Evaluation: Usability, Perceived Utility, and Preferences from General Aviation Pilots
Latorella, Kara A., NASA Langley Research Center, USA; Chamberlain, James P., NASA Langley Research Center, USA; [2002]; 20p; In English; SAE General Aviation Technology Conference and Exhibition, 16-18 Apr. 2002, Wichita, KS, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Original contains color illustrations
Report No.(s): SAE Paper 2002-01-1521; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Weather is a significant factor in General Aviation (GA) accidents and fatality rates. Graphical Weather Information Systems (GWISs) for the flight deck are appropriate technologies for mitigating the difficulties GA pilots have with current aviation weather information sources. This paper describes usability evaluations of a prototype GWIS by 12 GA pilots after using the system in flights towards convective weather. We provide design guidance for GWISs and discuss further research required to support weather situation awareness and in-flight decision making for GA pilots.
Author
Aircraft Accidents; Weather; Aircraft Pilots; General Aviation Aircraft; Information Systems; Air Traffic Control

20030013737 Lawrence Livermore National Lab., Livermore, CA USA
Comparison of Variability of the Monthly Mean Temperature of the ECMWF and NCEP Reanalyses and CCM3 and CSM Simulations
Boyle, J. S.; Mar. 01, 2000; 46p; In English
Report No.(s): DE2002-802098; UCRL-ID-137580-REV-1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The low frequency variation in the three dimensional air temperature fields of two reanalyses and two model simulations are described. The data sets used are the monthly mean temperature fields for the NCAR Climate Simulation Model (CSM, Boville and Gent, 1998) 300 year run, a NCAR Community Climate Model version 3 (CCM3, Kiehl et al., 1998) AMIP type simulation, and the NCEP/NCAR and ECMWF (ERA) reanalysis data sets. The variances and correlations are computed for the anomalies from the annual cycle for each data set. In general the reanalyses and models agree fairly well on the structure of the temperature variance.
NTIS
Climate Models; Computerized Simulation; Atmospheric Temperature

20030013741 Lawrence Livermore National Lab., Livermore, CA USA
Interannual Variations in Simulated and Observed MSU-2 Temperatures
Boyle, J. S.; Aug. 16, 2000; 56p; In English
Report No.(s): DE2002-802086; UCRL-ID-140133; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Microwave Sounding Unit (MSU) channel 2 temperatures are computed for three sets of model experiments and their interannual variation is compared to that of the observed. The models used are: (1) an ensemble of ten integrations of the NCAR CCM3 using prescribed SSTs for 1979 to 1995, (2) A 300 year integration of the NCAR/DOE Parallel Climate Model (which has the CCM3 as the atmospheric model) and (3) a 300 year integration of the ECHAM4/OPYC coupled model at the Max Planck Institute for Meteorology. In addition Nino34 and AO indices were computed from SST and MSLP of each data set. The observed

data spanned the period of 1979 to 1998. The CCM3 integrations used the observed SSTs from 1979 to 1995. The 300 year coupled runs were divided into non-overlapping 20 year segments and each segment was processed independently. The EOFs of the zonally averaged, monthly mean MSU-2 anomalies were computed.
NTIS
Climate Models; Meteorology; Computerized Simulation; Annual Variations; Precipitation

20030014086 Pacific Northwest National Lab., Richland, WA USA
Hanford Site Climatological Data Summary 2001 with Historical Data
Hoitink, D. J.; Burk, K. W.; Ramsdell, J. V.; Shaw, W. J.; May 2002; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM
Report No.(s): DE2002-15001312; PNNL-13859; No Copyright; Avail: National Technical Information Service (NTIS)
This document presents the climatological data measured at the U.S. Department of Energy's Hanford Site for calendar year 2001. Pacific Northwest National Laboratory1 operates the Hanford Meteorology Station and the Hanford Meteorological Monitoring Network from which these data were collected. This report contains updated historical information for temperature, precipitation, normal and extreme values of temperature and precipitation, and other miscellaneous meteorological parameters. Further, the data are adjunct to and update Hoitink et al. and Hoitink and Burk, however, data from Appendix B - Wind Climatology are excluded.
NTIS
Meteorology; Climatology

20030014125 NASA Langley Research Center, Hampton, VA USA
Tropospheric Airborne Meteorological Data Reporting (TAMDAR) Sensor Development
Daniels, Taumi S., NASA Langley Research Center, USA; [2002]; 16p; In English; 2002 SAE General Aviation Technology Conference, 16-18 Apr. 2002, Wichita, KS, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Original contains color illustrations
Report No.(s): SAE Paper 2002-01-1523; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In response to recommendations from the National Aviation Weather Program Council, the National Aeronautics and Space Administration (NASA) is working with industry to develop an electronic pilot reporting capability for small aircraft. This paper describes the Tropospheric Airborne Meteorological Data Reporting (TAMDAR) sensor development effort. NASA is working with industry to develop a sensor capable of measuring temperature, relative humidity, magnetic heading, pressure, icing, and average turbulence energy dissipation. Users of the data include National Centers for Environmental Prediction (NCEP) forecast modelers, air traffic controllers, flight service stations, airline operation centers, and pilots. Preliminary results from flight tests are presented.
Author
Troposphere; Data Acquisition; Sensors; Meteorological Parameters; Weather Forecasting; Air Traffic Control; Meteorological Instruments

20030014179 Universitaet der Bundeswehr Muenchen, Inst. fuer Wasserwesen, Neubiberg Germany
Drainage Calculation with the Help of Neural Nets ***Abflussberechnung mit Hilfe Neuronaler Netze***
Huegel, Thomas; Jan. 2000; 149p; In German
Report No.(s): AD-A409333; 71/2000; X5-X5; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The study revolves around Artificial Neural Nets (KNN) and seeks to answer six main questions: 1) How is meteorological input treated? 2) How is spatial information integrated into KNN? 3) How are the flowtimes in the collection area broken down? 4) How does information regarding land use from the National Oceanic and Atmospheric Administration (NOAA) and the Advanced Very High Resolution Radiometer (AVHRR) have to be treated and processed? 5) How is the learning process represented? 6) How is the net topology represented? The goal is to link the information-rich, highly resolved, and detailed observation of the planar Precipitation-Drainage-Processes with the simple breaking-down of the equally strongly non-linear functions by means of KNN.
DTIC
Drainage; Neural Nets; Precipitation (Meteorology); Topology; Artificial Intelligence

20030014312 Lawrence Livermore National Lab., Livermore, CA USA

ARM/GCSS Single Column Model (SCM) Intercomparison Procedures for Case 3: Summer 1997 SCM IOP

Cederwall, R. T.; Krueger, S. K.; Xie, S. C.; Yio, J. J.; Dec. 14, 2000; 26p; In English

Report No.(s): DE2002-792737; UCRL-ID-141823; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Atmospheric Radiation Measurement (ARM) Program is a multi-laboratory, interagency program that was created in 1989 with funding from the U.S. Department of Energy (DOE). The ARM Program is part of DOE's effort to resolve scientific uncertainties about global climate change with a specific focus on improving the performance of general circulation models (GCMs) used for climate research and prediction. These improved models will help scientists better understand the influences of human activities on the earth's climate.

NTIS

Atmospheric General Circulation Models; Meteorology; Climatology

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.

20030012755 National Marine Fisheries Service, Santa Cruz Lab., Santa Cruz, CA USA

Physical Oceanography off the Central California Coast During May-June, 2000: A Summary of CTD Data from Pelagic Juvenile Rockfish Surveys

Sakuma, K. M.; Schwing, F. B.; Pickett, M. H.; Roberts, D.; Ralston, S.; Mar. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2003-101525; NOAA/TM/NMFS/SWFSC-318; No Copyright; Avail: National Technical Information Service (NTIS)

Hydrographic conditions during three periods of approximately ten days each from mid-May through mid-June 2000 in the coastal ocean bounded by Cypress Pt. (36deg35'N) and Pt. Reyes, California (38deg10'N), and from the coast to about 75 km offshore, are summarized in a series of horizontal maps and vertical sections. A total of 217 standard conductivity-temperature-depth (CTD) casts were obtained during the NOAA R/V David Starr Jordan cruise DSJ0002 over the course of three consecutive sweeps of the region. Data products contained in this report include (1) a master list of CTD stations during the cruise; (2) surface meteorological time series from the region's four National Data Buoy Center (NDBC) meteorological buoys; (3) horizontal maps of sea surface temperatures (SST) from AVHRR satellite; (4) acoustic Doppler current profiler (ADCP) data; (5) horizontal maps of temperature, salinity, and density (sigma-theta (O0)) at depths of 2 m, 10 m, 30 m, 100 m, 200 m, 300 m, and 500 m; (6) temperature, salinity and O0 along four cross-shelf vertical transects; and (7) dynamic height topography (0/500 m and 200/500 m) in the survey region.

NTIS

Oceanography; Fishes; Coastal Water

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.

20030012712 NASA Langley Research Center, Hampton, VA USA

Human Factors and Information Operation for a Nuclear Power Space Vehicle

Trujillo, Anna C., NASA Langley Research Center, USA; Brown-VanHoozer, S. Alenka, Oak Ridge National Lab., USA; [2002]; 6p; In English; International Conference on Advanced Nuclear Power Plants, 9-13 Jun. 2002, Hollywood, FL, USA

Contract(s)/Grant(s): DE-AC05-00OR-22725; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes human-interactive systems needed for a crewed nuclear-enabled space mission. A synthesis of aircraft engine and nuclear power plant displays, biofeedback of sensory input, virtual control, brain mapping for control process and

manipulation, and so forth are becoming viable solutions. These aspects must maintain the crew's situation awareness and performance, which entails a delicate function allocation between crew and automation.
Author
Human Factors Engineering; Nuclear Propulsion; Spacecraft; Man Machine Systems; Space Missions; Display Devices

20030012716 Simulation Technologies, Inc., Dayton, OH USA
Development of a Dynamic Nutrition Model (DYNUMO) ***Final Report, Feb.-Dec. 2000***
Doherty, Tammy J.; Nov. 2002; 91p; In English
Contract(s)/Grant(s): DAAD16-99-C-1003
Report No.(s): AD-A408957; NATICK-TR-03/006; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Performance of the warrior system depends to a great extent on the physical and cognitive capabilities of the warfighter. Metabolic fuel status is one factor that can be directly linked to those performance capabilities. This report describes the development of a dynamic nutrition model (DYNUMO) that simulates body metabolic fuel levels over time, in response to nutrient intake and energy expenditure. DYNUMO is a simplification of the digestive and metabolic processes in the human body. Ingested food is absorb into the blood. From there, absorbed nutrients may be stored in adipose tissue as triglycerides, stored in the liver or muscle as glycogen, converted to other metabolic fuels in the liver or utilized for energy. A regulatory system maintains blood glucose at near constant levels and conserves carbohydrate stores. Model algorithms are based on known physiology and biochemistry, with parameter values derived from existing experimental data. Although insufficient data were available for formal model validation, the model currently provides reasonable predictions of blood glucose levels following a single ingestion of a carbohydrate solution and of muscle glycogen levels following a single exercise bout. The model has not been fully tested, however, and it is likely that parameter values and the level of model detail will require adjustment in the future.
DTIC
Nutrition; Dynamic Models; Metabolism; Human Body; Biochemistry; Digestive System; Military Operations

20030012883 Mount Sinai School of Medicine, New York, NY USA
Increasing Pain Related Communication Skills to Improve Pain Management in Metastatic Breast Cancer Patients ***Annual Report, 1 Jul. 2001-1 Jul 2002***
Duhamel, Katherine N.; Aug. 2002; 78p; In English
Contract(s)/Grant(s): DAMD17-99-1-9304
Report No.(s): AD-A408989; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The goal of the study is to improve the management of pain related to metastatic breast cancer (MBC) through a psycho-social intervention. Although clinical guidelines for the treatment of pain have been issued, under-treatment of pain in MBC patients remains a problem. This study builds upon prior research which has identified poor patient-provider communication as a key barrier to adequate cancer pain management. MBC patients are randomly assigned to either a pain communication skills (PCS) intervention or a nutrition education control condition. The impact of the PCS intervention will be evaluated by comparing the misconceptions about pain and pain treatment, level of pain, psychological adjustment, and quality of life of MBC patients who receive the PCS intervention to those who receive the nutrition education. Patients undergo four interviews using standardized measures before and after receiving the PCS intervention or nutrition education. to date, twenty-seven patients have been recruited. Preliminary results indicate that study participants have moderate to severe pain and have many misconceptions about pain and pain treatment. These misconceptions are most prevalent among Latinas. The study results will indicate the impact of a PCS intervention on MBC patients' misconceptions, level of pain, psychological distress, and quality of life.
DTIC
Patients; Mammary Glands; Cancer; Metastasis; Communication; Pain Sensitivity

20030012884 Georgetown Univ., Medical Center, Washington, DC USA
Insulin Like Growth Factor 1 Receptor Function in Estrogen Receptor Negative Breast Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 2002***
Dougherty, Michele K.; Jul. 2002; 17p; In English
Contract(s)/Grant(s): DAMD17-99-1-9194
Report No.(s): AD-A408990; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Estrogen receptor (ER) negative breast cancer is associated with perturbations of growth regulatory pathways. Three in vitro models of ER+ and ER- breast cancer were evaluated for expression and activation of MAP kinase. Despite decreased activation of MAP kinase in ER-cells, these cells are still dependent on MAP kinase to maintain normal proliferation as evidenced by the lack of proliferation in the presence of UO 126, a MAP kinase inhibitor. Data presented in this report demonstrates that inhibition

of the PI-3 kinase pathway is only growth inhibitory for ER+ cells, further evidence of the importance of MAP kinase signaling for growth. A second MAP kinase family member, ERK 5, was evaluated for expression and activation by western blot. Two of the three ER-cell lines upregulate activation of ERKS, potentially through the erbB2 receptor, and ERK 5 activity was inhibited in the presence of UOl26 and LY294002. These results demonstrate upregulation of growth factor signaling pathways is critical for proliferation of ER- breast cancer cells and further validate the MAP kinase pathway as a target for therapeutic intervention.
DTIC
Cancer; Estrogens; Insulin; Mammary Glands; Receptors (Physiology); Cells (Biology)

20030012924 National Inst. for Longevity Sciences, Aichi, Japan
A Tele-Instruction System for Ultrasound Probe Operation Based on Shared AR Technology
Suenaga, T.; Nambu, M.; Kuroda, T.; Oshiro, O.; Tamura, T.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom.,
Report No.(s): AD-A409211; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper proposes a tele-instruction system for ultrasound probe operation, based on shared Augmented Reality (AR) technology. Telemedicine, a strategy to diminish geographic gaps in the quality of medical service, is fashionable. However, existing medical-data transmission systems cannot convey the skills of physicians, so they cannot eliminate the problem of geographic gaps. This research developed a telemedicine system that transports physicians' skills over a shared AR space. The shared AR technology provides an environment where users can exchange spatial information, and facilitates smooth communication. This research concentrates on interfaces for physicians and technicians at the patient site. The proposed system provides intuitive and unrestricted interfaces for the physician and technician, using a data projector and an LCD tablet. At the patient site, instructions for the technician are projected directly onto the patient's body, using a data projector. The physician site allows the physician to send instructions on probe operation using an LCD (Liquid Crystal Display) tablet. This information is displayed as a "web-mark", which provides spatial information for ultrasound probe operation. Furthermore, the system sends environmental information about the patient to the physician, such as the technician's behavior and patient's posture, via an immersive display. The proposed system was tested with a physician using real tele- diagnosis. The results demonstrated the effectiveness of the proposed method in providing smooth communication in telemedicine.
DTIC
Telemedicine; Ultrasonics; Medical Services; Diagnosis

20030012944 Wisconsin Univ., Madison, WI USA
The Role of A1B1 in Estrogen-Dependent Breast Tumor Cell Growth ***Final Report, 1 Jul. 2001-30 Jun. 2002***
Murdoch, Fern E.; Jul. 2002; 6p; In English
Contract(s)/Grant(s): DAMD17-01-1-0658
Report No.(s): AD-A408992; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

AlEl, a p160 coactivator, binds to estrogen receptor (ER) and increases estrogen-dependent transcription. It is overexpressed in 64% of primary breast tumors. We hypothesize that genes required for estrogen-dependent growth utilize AlEl for their transcription. Our hypothesis predicts that decreasing A1B1 should inhibit estrogen-dependent growth and transcription. Our experimental goal was to design inhibitors to AlEl, introduce them into MCF-7 cells, and assay cell proliferation and progesterone receptor (PgR) expression as end-points. We designed two types of inhibitors. The first was a small polypeptide that contained the 11 amino acids of the HTV TAT protein that have been shown to transduce proteins into cells, and the 19 amino acids from the AlEl LXXLL box 2 that has been shown to bind to ER. The idea was that this polypeptide would compete with the endogenous, full-length AlEl for binding to ER and thereby disrupt function. However, this polypeptide had no affect on estrogen-dependent growth or PgR expression. We have created MCE-7 Tet-Off cell lines and are stably transfecting a second inhibitor under a TEE-promoter that contains all three nuclear receptor interaction boxes of the A1Bl. Affects on estrogen-dependent growth and transcription in these cells are not yet known for this inhibitor.
DTIC
Cell Division; Estrogens; Mammary Glands; Gene Expression; Tumors; Transcription (Genetics)

20030012945 Utah Univ., Salt Lake City, UT USA

Agonist-Occupied PRA Represses PRB via Interactions with Coactivators or Corepressors ***Final Report, 1 Jul. 2001-30 Jun. 2002***

Lim, Carol S.; Jul. 2002; 9p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0659

Report No.(s): AD-A408993; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Hypothesis: the ability of agonist-occupied PRA (progesterone receptor A form) to act as a dominant negative inhibitor of many other receptors including progesterone receptor B form (PRB),) is due to PRA's capacity to sequester away a common coactivator or recruit a common corepressor. Likely candidates for interaction include the coactivators SRC-l and TIF-2; corepressor candidates include NCoR and SMRT. Color variants of green fluorescent protein (GFP) were utilized for tagging PRA, PRB, SRC-l, TIF-2, NCoR, and SMRT. GFP-tagged proteins were then used in colocalization and confocal microscopy interaction studies. The purpose of this work was to find differential interactions between PRA and PRB and the above listed coactivators and corepressors. An extension of this project is cellular kinetic studies of drug-receptor complexes in living cells. The hypothesis of this part of the project was to correlate the rate of import into the nucleus of drug-occupied PRB with the dose of drug and hence the transcriptional activity of the drug. The global scope of this project was to better understand the precise roles of PRA and PRB with other cellular factors, as this is critical for finding better therapeutic targets and improved treatments for steroid-associated breast cancers.

DTIC

Cells (Biology); Proteins; Mammary Glands; Cancer; Receptors (Physiology); Microscopy; Hormones

20030012946 Massachusetts General Hospital, Boston, MA USA

Evaluation of Response to Induction Therapy in Breast Cancer with Phosphorus-31 Magnetic Resonance ***Annual Report, 10 Jul. 2001-9 Jul 2002***

Ackerman, Jerome L.; Aug. 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-00-1-0254

Report No.(s): AD-A408994; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of the proposed research is to develop IR-decoupled 31P magnetic resonance spectroscopy (MRS) techniques for measuring non-invasively the response of breast cancer to induction or preoperative chemotherapy. We hypothesize that the quantitative assessment of the effectiveness of a treatment using 31P MRS will be clinically feasible at 3.OT. During this reporting period, a double tuned breast RF coil was built and tested. The coil was based on a commercial coil body, and tuning elements appropriate for the 3.0T field strength were installed. The clinical scanner, nominally designed as a proton-only instrument, was converted to operate on the phosphorus frequency by suitable modification of the transmitter and receiver electronics. The coil may therefore be used to obtain proton scout images, and then switched to phosphorus for reception of spectra.

DTIC

Cancer; Chemotherapy; Magnetic Resonance; Mammary Glands; Phosphorus Isotopes; Spectroscopy

20030012948 University of Southern California, Los Angeles, CA USA

Breast Cancer Susceptibility Genes in High Risk Women ***Annual Report, 1 Jul. 2001-30 Jun. 2002***

Hamilton, Ann S.; Jul. 2002; 17p; In English

Contract(s)/Grant(s): DAMD17-00-1-0431

Report No.(s): AD-A408997; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A positive family history, present in about 30% of breast cancer cases, has been shown to double a woman's risk of breast cancer. The genetic factors responsible are largely unknown, although the autosomal dominant, relatively high penetrant genes BRCAl/2 may account for 3%. It has been hypothesized that susceptibility genes of lower penetrance may also affect breast cancer risk, and a likely group of such genes are those that regulate the production, intracellular transport, and metabolism of estrogen. Previous studies of these susceptibility genes have not been conducted with women with high familial risk. This study is being conducted with identical twins with differing genetic risks (i.e. concordant for breast cancer pairs vs. discordant pairs) as well as unaffected controls. We have chosen to focus on those genes related to estrogen metabolism and carcinogen metabolism. In the estrogen metabolism pathway, polymorphisms have been described related to the CYP 17 gene, the CYP 19 gene, the COMT gene, and the HSD 17B1 gene. Genes related to carcinogen metabolism which have been linked to breast cancer risk include GSTMl and Pt and CYPIAl. We will compare the frequency of selected polymorphisms in these genes in 200 breast cancer concordant, 200 discordant, and 200 control women. We currently have tissue or buccal smears and informed consents from 85 concordant,

108 discordant, and 101 control women. Preliminary laboratory analyses of the CYPl7 gene indicate that this gene is not associated with a high genetic risk. underway.
DTIC
Mammary Glands; Oncogenes; Females; Polymorphism

20030012950 Burnham Inst., La Jolla, CA USA
DNA Methylation Alterations in Breast Cancer ***Final Report, 1 Jul. 1999-30 Jun. 2002***
Yamamoto, Fumiichiro; Jul. 2002; 20p; In English
Contract(s)/Grant(s): DAMD17-00-1-9095
Report No.(s): AD-A408999; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have performed the NotI-MseI MS-AFLP experiments using normal and tumor DNA from breast cancer patients and determined the identity of bands exhibiting consistent changes in breast cancer DNA fingerprints. One band, which exhibited a conspicuous increase in band intensity, contained a satellite DNA sequence in the pericentromeric regions of chromosomes. We have shown that this intensity change is frequently observed in breast cancer tissues and breast carcinoma cell lines and that it is caused by hypomethylation. Because the centromere plays a role in chromosome segregation during cell division, this satellite DNA hypomethylation may be important in carcinogenesis, predisposing cells to structural and numerical chromosomal aberrations through the altered interaction with centromere binding proteins. We have also observed frequent alterations in DNA methylation in homeobox genes and related gene sequences. Some of these changes were found to be associated with alterations in gene expression. Because regulated cell growth and differentiation are the basis of development and cancer results from uncontrolled growth of undifferentiated cells, we speculate that activation/inactivation of certain homeobox genes may contribute to carcinogenesis.
DTIC
Deoxyribonucleic Acid; Methylation; Cancer; Mammary Glands

20030012951 Miami Univ., School of Medicine, FL USA
Massage Therapy for Reducing Stress Hormones and Enhancing Immune Function in Breast Cancer Survivors ***Annual Report, 1 Aug. 2001-31 Jul. 2002***
Ironson, Gail; Aug. 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-99-1-9292
Report No.(s): AD-A409001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objectives of this study were to examine massage and relaxation therapy effects for women with early stages of breast cancer for 1) reducing anxiety, stress and stress hormones, 2) decreasing depressed mood and increasing serotonin (a biochemical that diminishes with depression) and 3) increasing Natural Killer cell number and cytotoxicity (immune measures that fight tumors and viruses). During the course of the three-year study, 60 women diagnosed with Stage 1 and 2 breast cancer were to be recruited and assigned to massage (n=20), relaxation (n=20) or control groups (n=20). Women in the massage and relaxation therapies were to receive 3 sessions a week for 5 weeks. On the first and last days of the 5-week period and at a follow-up period, measures were to be collected on anxiety and depression, and urine and blood samples were to be assayed for treatment effects on stress hormones and immune measures. At this point, we have screened and enrolled 56 women into the study. Women in the massage therapy group showed 1) reduced anxiety, 2) improved mood, 3) increased serotonin and dopamine levels, and 4) increased Natural Killer cell numbers and lymphocytes; For the relaxation group, findings included 1) reduced anxiety and improved mood after the first session, 2) decreased norepineplirine (catecholamine stress marker) and 3) increased NK cell cytotoxicity. These findings support the hypotheses that massage and relaxation therapies enhance mood and immune function for women with breast cancer. A follow-up study is inconclusive at this point as not enough women have been seen. We have asked for an extension of one-year to complete the follow-up.
DTIC
Hormones; Mammary Glands; Cancer; Stress (Physiology)

20030012978 Cleveland Clinic Foundation, Cleveland, OH USA
EOSinophils as Mediators of DNA Oxidative Damage in Breast Cancer ***Final Report***
Hazen, Stanley L.; Jul. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-99-1-9133
Report No.(s): AD-A409055; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The overall goal of this proposal were to test the hypothesis that eosinophils promote DNA oxidative damage in breast carcinoma. DNA oxidative damage is linked to mutation, transformation and cancer development and eosinophil peroxidase

(EPO), a hemoprotein secreted from eosinophils, is present in the majority of breast cancer biopsies. Our initial aim was to determine whether EPO promotes oxidative damage of cellular DNA through formation of mutagenic hydroxyl radical (DN)-generated bases. We have shown (Biochemistry, (2000) 39:5474) that activated leukocytes can oxidatively damage DNA, ANA and the nucleotide pool through halide-dependent formation of OH. 0H-dependent damage of DNA was quantified by monitoring the content of 8-hydroxyguanine (SOND), an established OH-specific DNA oxidation product that is mutagenic and implicated in breast cancer de:development and progression to metastatic disease. to test the hypothesis that EPO promotes DNA oxidative damage in human breast carcinoma, we have identified a family of novel brominated DNA oxidation products. These may serve as ”molecular fingerprints” for DNA damage by the EPO pathway of eosinophils. Results of our studies identifying brominated bases by mess spectrometry ware recently published (Biochemistry, (2001) 40:2041-2051) . Nest recently we have shown that markers of nitric oxide-derived oxidants, species formed by eosinophils, are correlated microvascular density in breast carcinoma (Breast Cancer Research and Treatment (2002) 74:271-278). We are presently performing studies aimed at quantifying these EPD-specific brominated bases in a well-characterized repository of breast carcinoma and microscopically normal breast tissue specimens.
DTIC
Oxidation; EOSinophils; Cancer

20030012990 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
Health Effects of Uranium Exposure
Stodilka, Robert Z.; Jun. 22, 2001; 54p; In English
Report No.(s): AD-A409075; DREO-TR-2001-044; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This manuscript summarises the risks associated with uranium exposure. Experimental data is available from genetics, tissue culture, and animal and human models. Studies include solubility of different uranium compounds, kinetic properties inside the body, and short- and long-term health effects both from acute and chronic exposures. The potential for uranium entry into the body is highly dependent upon its chemical and physical properties. Inhalation and dermal contact afford the most rapid route of entry, while gastrointestinal absorption is often minimal. The kidneys are efficient at clearing uranium dissolved in the blood, usually within days. Insoluble forms of uranium such as imbedded slrrapnel can remain in the body for many years, resulting in persistent elevated levels of uranium in urine. The most important potential for uranium toxicity lies with its chemical properties - not its radiological properties. The most probable health outcomes for uranium toxicity are kidney disease and cancer. Limited data suggests that cumulative pulmonary exposure up to 25 cGy probably does not increase the risk of lung cancer. Nevertheless, there are many gaps in the understanding of the toxicological profile of uranium. Filling these gaps requires monitoring exposed individuals for long periods of time due to the range of latency periods between exposure and health outcome diagnosis.
DTIC
Health; Uranium; Exposure; Toxicity

20030013644 Dynamac Corp., Cocoa Beach, FL USA
Analysis of Wading Bird use of Impounded Wetland Habitat on the Kennedy Space Center/Merritt Island National Wildlife Refuge, 1987-1998
Stolen, Eric D., Dynamac Corp., USA; Breininger, David R., Dynamac Corp., USA; Smith, Rebecca B., Dynamac Corp., USA; June 2002; 73p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS10-02001
Report No.(s): NASA/TM-2002-211173; NAS 1.15:211173; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report summarizes results of the first eleven years of monthly aerial surveys of wading bird use of foraging habitats within impoundments on the Kennedy Space Center/Merritt Island National Wildlife Refuge. Some impoundments were used much more heavily by wading birds than were others. Analysis suggests that an increase in interspersion of open water and vegetated habitats is preferred foraging habitat. Many wading bird species increased their use of vegetated habitat in Fall and Winter when impoundments were flooded. The mean number of wading birds per survey was greatest during the Pre-nesting and Nesting seasons, declined during Post-nesting season, and was lowest during Winter when water levels within impoundments were high. During these times, shallow habitat along the IRL shoreline provided alternative habitats for wading birds. Various measures of monthly precipitation and impoundment water level were well correlated with the numbers of wading birds observed. Numbers of nesting attempts was steady during the study period, with the exception of an unusually high number of attempts in 1990. White Ibis accounted for over half of all wading bird nests counted. The mean number of nests per colony decreased during the study period, and the number of individual colonies increased.
Author
Habitats; Wildlife; Birds; Merritt Island (FL); Marshlands

20030013649 Tokyo Denki Univ., Japan

Cytomagnetometric Measurement of the Energy of the Intracellular Movements

Nemoto, I.; Takahashi, T.; Matsuzaki, T.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom

Report No.(s): AD-A409316; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Magnetic particles were given to macrophage-like cultured cells J774A.1 to perform cytomagnetometry in which the magnetic field from the cells was measured and the mechanical parameters of the cytoplasm and the energy E, of the intracellular movement were estimated. The response of the cells to ATP-synthesis inhibitor MIA measured by cytomagnetometry was intriguing; the energy E, became larger contrary to our expectation. We have been searching for the reason for this phenomenon by the immunofluorescent microscopy and the use of other drugs and cell types. The results have yielded some clue to the question, which we discuss in the present paper.

DTIC

Magnetic Fields; Fluorescence; Cytoplasm; Magnetometers; Energy; Macrophages

20030013993 Orleans Univ., Lab. Vision et Robotique, Bourges France

Formulation of Maximized Weighted Averages in URTURIP Technique

Migeon, Bruno; Deforge, Philippe; Marche, Pierre; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on CD-ROM

Report No.(s): AD-A409212; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The existing methods developed in URTURIP Technique (Ultrasound Reflection-mode Tomography Using Radial Image Processing) can be considered as a part of a reconstruction family called Maximized Weighted Averages Technique, and it is the object of this paper. It is shown that a reconstruction can be viewed as a filter and that the three commonly used methods can be rewritten with the same formulation. Moreover, interesting new methods can be developed by using other adapted filters.

DTIC

Ultrasonics; Computer Aided Tomography

20030013994 Zagreb Univ., Faculty of Physical Education, Zagreb, Croatia

Teaching Instrumentation and Methodology in Human Motion Analysis

Medved, V.; Oct. 25, 2001; 3p; In English; Papers from the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on CD-ROM

Report No.(s): AD-A409214; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Applying technical devices of varying degree of complexity and sophistication with the purpose of diagnostics and treatment has been a hallmark of modern western medicine. Todays' medical praxis, for instance, relays heavily on CT (Computed Tomography), MRI (Magnetic Resonance Imaging), ultrasound, and other complex devices. One example, ever more present during the last decade, is the instrumentation for biomechanical (kinematic, kinetic and EMG (Electromyography) motion measurements and analysis. The paper describes some contributions in this realm at the University of Zagreb including the publishing of a comprehensive textbook on the subject and also the introduction of teaching curricula to implement the appropriate knowledge. Problems are discussed of educating professionals and disseminating knowledge of this kind to the interdisciplinary audience including biomedical engineers, medical doctors, kinesiologists, physical therapists, etc.

DTIC

Biodynamics; Electromyography; Imaging Techniques

20030014011 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA

BRCA2 is an Essential Component of the Rad51-Dependent DNA Repair Complex ***Final Report, 1 Jul. 2001-30 Jun. 2002***

Chen, David J.; Jul. 2002; 10p; In English

Contract(s)/Grant(s): DAMD17-01-1-0542

Report No.(s): AD-A409253; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The BRCA2 gene is associated with hereditary tendency to breast cancer. Mutations in BRCA2 cause a dominantly inherited predisposition to breast cancer. Recent evidence has indicated that BRCA2 protein plays a role in genome stability and in DNA repair mediated by homologous recombination. The BRCA2 protein has been shown to physically interact with Rad5l, the key protein for DNA recombinational repair. In these BRCA2-deficient cells, formation of Rad5l foci is severely impaired. The

evidence for the functions of BRCA2 in DNA repair has suggested a new concept for their role in predisposition to breast cancer. BRCA2 consists of two Rad5l-binding domains, eight BRC repeats and a C-terminal region. These eight conserved BRC repeats (designated as BRCl to BRC8), located in the central portion of the protein, are encoded by exon 11 and cover nearly a third of the protein. to demonstrate that BRCA2 is an essential component of the Rad5l-dependent DNA repair complex and understand how BRCA2 regulates homologous recombinational repair (HRR), we have made construct of BRCL-4, BRC5-8 and BRCL-8 fragments of BRCA2 and to determine how it would affect the complex formation of Rad5l paralogs and in vitro biochemical activities of Rad5l.
DTIC
Deoxyribonucleic Acid; Genome; Biochemistry; Cancer; Mammary Glands

20030014075 Shanghai Normal Univ., Dept. of Physics, China
The Influence of the Variation of Gravitational Constants on the Secular Variation of Rotation of the Earth
Li, Lin-Sen, Shanghai Normal Univ., China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 46-51; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
The influence of the various theories of variation of gravitational constants on the secular variation of angular velocity and daily length of rotation of the Earth are investigated. The various theories of variation of gravitational constants include the aspects of the influence of the variation of gravitational constants with time, space, velocity, temperature and distance. The effects of the various theories of variation of gravitational constants on the rotation of the Earth are estimated. In which some effects are meaningful for investigating the theory of the variation of rotation of the Earth.
Author
Gravitational Constant; Secular Variations; Angular Velocity; Earth Rotation

20030014094 University of Southern Illinois, Carbondale, IL USA
American Ginseng in the Prevention and Treatment of Human Breast Cancer ***Final Report, 1 Aug. 1999-31 Jul. 2002***
Murphy, Laura L.; Sep. 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-99-1-9380
Report No.(s): AD-A409299; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The effects of ginseng on the prevention and treatment of breast cancer has not been studied. This research project was designed to examine the effects of American ginseng on breast cancer using well-established in vitro and in vivo experimental models. It is our hypothesis that ginseng, and its ginsenosides in particular, would inhibit the proliferation and growth of human breast cancer cells. Our results have shown that an extract of American ginseng inhibited MCF-7 and MDA-MB-231 cell proliferation in a dose dependent manner. Furthermore, ginseng extract in the drinking water of female nude mice significantly decreased human breast cancer tumor growth. We have identified several different ginsenosides in ginseng extract and determined that only ginsenosides Rc and Rh2 potently inhibited breast cancer cell proliferation in vitro. These findings are the first to suggest that these ginsenosides may be responsible for the anti-proliferative actions of ginseng extract on human breast cancer cell proliferation. More recent data suggested that ginsenoside Rc may inhibit breast cancer cell cycle progression, whereas ginsenoside Rh2, especially at higher doses, is cytotoxic. Thus, different ginsenosides may have very different mechanisms of action.
DTIC
Cancer; In Vitro Methods and Tests; Regeneration (Physiology); Plants (Botany)

20030014172 Air Force Inst. of Tech., School of Engineering, Wright-Patterson AFB, OH USA
Post-Processing of Low Dose Mammography Images
Kim, Jesung; May 2002; 91p; In English; Original contains color images
Report No.(s): AD-A409113; AFIT/GE/ENG/02-35; No Copyright; Avail: Defense Technical Information Center (DTIC)
In mammography, X-ray radiation is used in sufficient doses to be captured on film for cancer diagnosis. A problem lies in the inherent nature of X-rays to cause cancer. The resolution of the images obtained on film is directly related to the radiation dosage. Thus, a trade off between image quality and radiation exposure is necessary to ensure proper diagnosis without causing cancer. A possible solution is to decrease the dosage of radiation and improve the image quality of mammograms using post-processing methods applied to digitized film images. Image processing techniques that may improve the resolution of images captured at lower doses include crispening, denoising, histogram equalization, and pattern recognition methods. The Wright Patterson Air Force Base Hospital Radiology Department sponsored this research and provided digitized images of the American College of Radiology (ACR) phantom, which is a model for mammogram image quality and classification. Side by side comparisons were performed of high dose images and low-dose images post-processed using the methods mentioned. The result

was improved- resolution on mammography images for lower radiation doses. Thus, this research represents progress towards solving a problem that currently plagues mammography: exposure of patients to high doses of cancer-causing radiation to obtain quality mammography images. by improving the image quality of mammography images at lower radiation doses, the problem of cancer induced by high radiation exposure is alleviated.
DTIC
Image Processing; Mammary Glands; Diagnosis; Cancer

20030014186 Walter Reed Army Inst. of Research, Silver Spring, MD USA
Effect of Time of Menstrual Cycle on Drug Pharmacokinetics and Pharmacodynamics ***Final Report, 1 Sep. 1997-1 May 2001***
Kamimori, Gary H.; May 2001; 108p; In English
Report No.(s): AD-A409105; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Gender has been shown to influence a number of pharmacokinetic variables including, serum protein binding (1), absorption rate (2), peak plasma concentration and area under the curve (3), and drug clearance (4) - A number of factors may contribute to gender differences in drug disposition including, differences in body composition, the use of oral contraceptives, plasma levels of the sex hormones, and the phases of the menstrual cycle (5,6). to date very few studies have actually examined the effects of the time of the menstrual cycle (follicular, ovulatory, luteal) on the pharmacokinetics and concomitant pharmacodynamics of a drug.
DTIC
Pharmacology; Menstruation

20030014263 Institute of Space Medico-Engineering, Beijing, China
Effects of Dietary n-3 Polyunsaturated Fatty Acid on Lipid Metabolism in Rats under Simulated Weightlessness
Wang, Lei, Institute of Space Medico-Engineering, China; Bai, Shu-min, Institute of Space Medico-Engineering, China; Huang, Ji-ming, Institute of Space Medico-Engineering, China; Shi, Jie-ping, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 347-350; In Chinese; Copyright; Avail: Issuing Activity
Objective. to study the effect of dietary n-3 polyunsaturated fatty acid (PUFA) on the lipid metabolism of tall-suspended rats. Method. 49 male Sprague-Dawley rats were divided into five groups: tail-suspension group I, fed with 10 wt % corn oil, tail-suspension groups II, III, IV were fed with three levels of fish oil (0.5, 1.5 or 3.0 wt %; low, middle and high level of fish oil, respectively). Group V fed with 10 wt % corn oil served as normal control. Result. Viscoelasticity of cell membrane in group III was significantly higher than that of group I (P less than 0.01). Vascular endothelial cells (VEC) was less in group II compared to group I. Serum total cholesterol (TC) and triglyceride (TG), serum lipoprotein were lower in groups II , III , IV compared to group I, the higher fish oil content in diet, the lower serum lipid concentration in micro-gravity. Conclusion. Dietary n-3 PUFA do have distinguished effect on lipid metabolism and n-3 PUFA have certain effects on prevention of atherosclerotic disease and coronary heart disease in rats.
Author
Oils; Microgravity; Lipoproteins; Lipid Metabolism; Heart Diseases; Fatty Acids; Cardiovascular System; Arteriosclerosis

20030014264 Institute of Space Medico-Engineering, Beijing, China
Influences of Repeated Lower +Gz Exposures on High +Gz Exposure Induced Brain Injury in Rats
Li, Jin-sheng, Institute of Space Medico-Engineering, China; Sun, Xi-qing, Institute of Space Medico-Engineering, China; Wu, Xing-yu, Institute of Space Medico-Engineering, China; Rao, Zhi-ren, Institute of Space Medico-Engineering, China; Liu, Hui-ling, Institute of Space Medico-Engineering, China; Xie, Xiao-ping, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 339-342; In Hindi; Copyright; Avail: Issuing Activity
Objective. to explore the influence of repeated lower +Gz exposures on high +Gz exposure induced brain injury in rats. Method. Forty SD male rats were randomly divided into: control group(5 rats), +10 Gz/5 min group (5 rats), +4 Gz exposure one time , three times and five times group(10 rats each group). After 1 d or 6 d of +4 Gz exposure each group were exposed to +10 Gz again. Three days after +10 Gz exposure the neuron damage was observed by light microscope in HE stained section. Result. There was no brain damage after repeated +4 Gz/3 min exposure 5 times so it was reasonable to use this exposure intensity as ischemia stimulation. +10 Gz/5 min exposure could result in irreversible neuron damage such as neuron degeneration and coagulation necrosis. The experiment results suggested that after +10 Gz/5 min exposure there were degenerated neurons in cortex, hippocampus and thalamus. The number of degenerated neurons were obviously decreased in cortex, hippocampus and

thalamus when exposed to +10 Gz/5 min again after repeated +4 Gz/3 min 3 - 5 times. Conclusion. The degree of neuron damage was obviously slight at the time of exposure to +10 Gz/5 min again after repeated +4 Gz/3 min 3 - 5 times. The ischemia tolerance at the time of exposure to +Gz was similar to other brain ischemia.
Author
Brain Damage; Coagulation; Stimulation; Neurons; Ischemia; Injuries

20030014265 Institute of Space Medico-Engineering, Beijing, China
Effects of Qiang Gu Kang Wei Compound on Hemorheology in Tail-suspended Rats
Li, Yong-zhi, Institute of Space Medico-Engineering, China; Shi, Hong-zhi, Institute of Space Medico-Engineering, China; Fan, Quan-chun, Institute of Space Medico-Engineering, China; Bai, Gui-e, Institute of Space Medico-Engineering, China; Duan, Yuan-ru, Institute of Space Medico-Engineering, China; Xie, Jun-shui, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 327-330; In Chinese; Copyright; Avail: Issuing Activity
Objective. to investigate the effects of Qiang Gu Kang Wei compound on hemorheology in tail-suspended rats. Method. Rats were tail-suspended (- 30 deg) for 21 d to simulate weightlessness. The effect of the compound on erythrocyte sedimentation rate (ESR), hematocrit value (HCT), plasma fibrinogen content (PFC), blood viscosity, red blood cells deformability and erythrocytes aggregation were examined. Result. PFC, whole blood reducing viscosity(eta(sub h)) whole blood Viscosity(eta(sub b)) erythrocyte rigid index (IR) and maximum aggregation index(MAXD) increased significantly (P less than 0.01 or P less than 0.05) and maximum deformity index (DI(sub max))(P less than 0.01) decreased significantly in suspended rats as compared with the normal control. Different doses of the compound showed different effects. The small dose group 10 g/kg) inhabited eta(sub h) and eta(sub b)(P less than 0.01 or P less than 0.05) of all shear rates, abnormal IR and MAXD(P less than 0.01. The middle dose group (20 g/kg) decreased PFC (P less than 0.01). The big dose group (30 g/kg) inhabited eta(sub h) and eta(sub b)(P less than 0.01 or P less than 0.05) of high shear rates, decreased IR(P less than 0.01) and improved DI(sub maz)(P less than 0.01). Conclusion. This compound could improve hemorheology in tail-suspended rats. But there was no concentration - dependence.
Author
Abnormalities; Blood Plasma; Dosage; Viscosity

20030014266 Xian Jiaotong Univ., Dept. of Physiology, China
Acetylcholinesterase Activity in Soleus Muscle Intrafusal and Extrafusal Fibres in Tail Suspended Rats
Tang, Bin, Xian Jiaotong Univ., China; Fan, Xiao-li, Xian Jiaotong Univ., China; Wu, Su-di, Xian Jiaotong Univ., China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 317-321; In English
Contract(s)/Grant(s): NSF-30070830; Copyright; Avail: Issuing Activity
Objective. to explore the mechanisms involved in muscle atrophy and conversion of the fiber types induced by simulated weightlessness. Method. Weightlessness was simulated by tail suspension of female rats. Intrafusal and extrafusal fibers of soleus muscles in the rat were examined histochemically for their activity of acetylcholinesterase (AChE) and succinic dehydrogenase (SDH) in 7 d, 14 d,21 d tail-suspended groups and control groups. Result. Staining for succinic dehydrogenase showed that simulated weightlessness caused obvious atrophy and change in fiber type composition in soleus muscle, with decrease of the proportion of type I fiber and increase of type 11 fiber. acetylcholinesterase activities of intrafusal and extrafusal fibers were both decreased significantly after 21 d tail suspension. Conclusion. Simulated weightlessness could induce decrease of AChE activity In neuromuscular junctions, which might be linked with decrease in motor neuron activity.
Author
Acetyl Compounds; Cholinesterase; Neuromuscular Transmission; Muscles; Weightlessness Simulation

20030014292 Institute of Space Medico-Engineering, Beijing, China
A Study on Gene Expression of Angiotensin Receptors in Arteries from Tail-suspended Rats
Zhang, Le-ning, Institute of Space Medico-Engineering, China; Meng, Qing-jun, Institute of Space Medico-Engineering, China; Zhang, Li-fan, Institute of Space Medico-Engineering, China; Ma, Jin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 343-346; In Chinese; Copyright; Avail: Issuing Activity
Objective. to investigate whether simulated microgravity can result in alterations of mRNA expression of angiotensin receptors in rat arteries. Method. Rats were divided into simulated microgravity group and synchronous control group. Simulated microgravity rats were subjected to tall-suspension for 4-wk to simulate the effect of weightlessness. Result. Results from RT-PCR demonstrated that mRNAs of angiotensin II receptors, AT(sub 1a) and AT(sub 1b) were expressed in carotid arteries, abdominal aorta and femoral arteries, whereas only mRNAs of AT(sub 1a) and AT(sub 1b) were expressed in basilar arteries. There were

no significant differences between the simulated-microgravity and control rats in the expression of mRNAs of AT(sub 1a), AT(sub 1b) and AT(sub 2) in these arteries. Conclusion. Angiotensin II receptors may play no regulatory role in the occurrence of the differentiated vascular adaptation during simulated microgravity.
Author
Gene Expression; Arteries; Cardiovascular System; Weightlessness

20030014293 Institute of Space Medico-Engineering, Beijing, China
Effects of +Gx Stress on Contractility of Rat Diaphragm and its Mechanism
Wu, Bin, Institute of Space Medico-Engineering, China; You, Guang-xing, Institute of Space Medico-Engineering, China; Lu, Sheng-qiang, Institute of Space Medico-Engineering, China; Xue, Yue-ying, Institute of Space Medico-Engineering, China; Liu, Xing-hua, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 335-338; In Chinese; Copyright; Avail: Issuing Activity

Objective. to observe the effect of sustained + Gx exposure on contractility of rat diaphragm and explore its mechanism. Method. Forty-two male Wistar rats were randomly divided into control group (underwent +1 Gx exposure, n = 21) and experiment group (underwent +15 Gx for 3 min, n = 21). The tension of rat diaphragm in vivo, contents of nucleoside phosphates and lactic acid in diaphragm and ultrastructure of diaphragm were measured and observed respectively. Result. 1. Compared with pre- +Gx, low-frequency tension of diaphragm of experiment group decreased significantly (P less than 0.0 1), whereas high-frequency tension did not significantly decrease after +Gx (P greater than 0.05). As to the control group, however, the tension of diaphragm tested at a wide range of frequencies was almost unchanged (P greater than 0.05). 2. Compared with control group, ATP decreased (P less than 0.01), while ADP and lactic acid contents in diaphragm increased significantly (P less than 0.05 and P less than 0.01 after +Gx in experiment group. In addition, ratios of ADP/AMP and AMP/ATP increased significantly (P less than 0.01). 3. After +Gx exposure, hypoxic changes in ultrastructure of rat diaphragm occurred in experiment group, but not in control group. Conclusion. Sustained +Gx exposure could cause diaphragm muscle fatigue, which was possibly due to changes in energy metabolism and ultrastructure of rat diaphragm induced by hypoxia under +Cx stress.
Author
Exposure; Nucleosides; Muscles; Adenosine Triphosphate; Stress (Biology)

20030014294 Institute of Space Medico-Engineering, Beijing, China
Effects of Active Fractions from Lycopus Lucidus L. F04 on Erythrocyterheology
Shi, Hong-zhi, Institute of Space Medico-Engineering, China; Gao, Nan-nan, Institute of Space Medico-Engineering, China; Li, Yong-zhi, Institute of Space Medico-Engineering, China; Yu, Jing-guang, Institute of Space Medico-Engineering, China; Fan, Quan-chun, Institute of Space Medico-Engineering, China; Bai, Gui-e, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 331-334; In Chinese; Copyright; Avail: Issuing Activity

Objective. to study the effects of active fractions from Lycopus lucidus (L.F04) on erythrocyterheology so as to investigate its mechanism of promoting blood circulation and removing blood stasis. Method. The effects of L.F04 on erythrocytes deformability, aggregation, liquidity of membrane were examined in the present study and the blood stasis animal model of rats made by injecting high molecular weight dextran (HMWD) was used. Result. HMWD injection decreased red blood cells deformability (P less than 0.05) and liquidity of membrane(P less than 0.01) and increased erythrocytes aggregation(P less than 005). Compared with the model, both L.F04 0.612 g/kg and 0.306 g/kg improved red blood cells deformability (P less than 0.05), inhibited erythrocytes aggregation (P less than 0.05), and showed the trend of improving liquidity of membrane. But there was no concentration-dependence. Conclusion. L.F04 can significantly improve the deviant erythrocyterheology characteristics.
Author
Blood Circulation; Dextrans; Erythrocytes; Molecular Weight

20030014295 Xian Jiaotong Univ., Dept. of Physiology, China
Effects of Simulated Weightlessness on Calbindin D-28K-immunoreactivity in Rat Soleus Muscle Spindle
Wu, Su-di, Xian Jiaotong Univ., China; Fan, Xiao-li, Xian Jiaotong Univ., China; Tang, Bin, Xian Jiaotong Univ., China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 313-316; In English
Contract(s)/Grant(s): NSF-30070830; Copyright; Avail: Issuing Activity

Objective. to analyze the mechanism involved in muscle spindle deterioration during simulated weightlessness. Method Using the immunoperoxidase reaction utilizing the ABC (avidin-biotin-complex) method, Calbindin D28K-like immunoreactivity(CaBP-LI) of intrafusal fibres in soleus muscle were detected in 7 d, 14 d tail-suspended rats and compared with control rats. Result. The extrafusal muscle fibres and nerve fibres did not exhibit immunoreactivity to CaBP. CaBP-LI was found

in some of the intrafusal muscle fibres in all the muscle spindles. After 14 d suspension, the immunoreactivity to CaBP of the intrafusal fibres decreased markedly. Conclusion. Simulated weightlessness could induce changes in the immunoreactivity of rat soleus muscle spindle to CaBP, which may contribute to the deterioration of muscle spindle.
Author
Weightlessness Simulation; Muscles; Deterioration

20030014299 Naval General Hospital, Dept. of Cardiology, Beijing, China
Vascular Endothelial Growth Factor Gene Expression Regulated by Protein Kinase C Pathway in Endothelial Cells during Hypoxia
Zhou, Zhi, Naval General Hospital, China; Yang, Xi-ming, Naval General Hospital, China; Xie, Yin-zhi, Institute of Hygine and Environmental Medicine, China; Yin, Zhao-yun, Institute of Hygine and Environmental Medicine, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 322-326; In English; Copyright; Avail: Issuing Activity
Objective. to investigate the relationship between Vascular endothelial growth factor(VEGF) gene expression and protein kinase C (PKC) activity. Method. 1. Rat's primary pulmonary artery endothelial cells (PAEC) were cultured under hypoxia condition (1% O2). Changes of PKC activity and VEGF mRNA in PAEC were detected at 0(control), 1, 3, 6, and 12 h in the hypoxic condition of culture. 2. After addition of PKC inhibitor (staurosporine) in culture medium and culturing PAEC in hypoxic condition immediately, PKC activity and VEGF mRNA in PAEC were measured at the same time. VEGF protein in culture medium under the two conditions above were also detected. Result. PKC activity in PAEC were obviously elevated at I h during hypoxia as compared with the control(P less than 0.05; VEGF mRNA expression in PAEC and VEGF protein level in culture medium were increased significantly (P less than 0.01) at 3 h and 6 h during hypoxia respectively as compared with the control(P less than 0.01); After addition of PKC inhibitor in culture medium and culturing cells in hypoxia condition immediately, PKC activity in PAEC decreased significantly as compared with that at 0 h(P less than 0.01), and there were no significant changes of VEGF mRNA in PAEC and VEGF protein level in culture medium at any time(P greater than 0.05). Conclusion. The results demonstrate that hypoxia stimulates pulmonary arterial vascular endothelial cells to secrete VEGF, and PKC may be one of the factors that up-regulate VEGF gene expression during hypoxia.
Author
Cardiovascular System; Gene Expression; Proteins

20030014301 Institute of Space Medico-Engineering, Beijing, China
Research Progresses of Cell Culture Apparatus
Tan, Ying-jun, Institute of Space Medico-Engineering, China; Yuan, Xiu-gan, Institute of Space Medico-Engineering, China; Rui, Jia-bai, Institute of Space Medico-Engineering, China; Yu, Jian-ru, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 383-386; In Chinese; Copyright; Avail: Issuing Activity
Cell culture apparatus (CCA) is necessary to space medicine research and space life-science research. With development of technology, CCA has been fully developed. Nowadays, CCA has been used in scientific research and production widely. In addition, space cell culture apparatus has become an indispensable tool in correlative space research. In this paper, a variety of apparatus used on ground and in space are summarized.
Author
Cells (Biology); Culture Techniques; Aerospace Medicine

20030014305 Institute of Space Medico-Engineering, Beijing, China
Effects of Acute Moderate Hypoxia on Plasma Angiotensin II and Adrenomedullin in Pilots
Liu, Yu, Institute of Space Medico-Engineering, China; Qin, Shi-zhen, Institute of Space Medico-Engineering, China; Li, Wen-bin, Institute of Space Medico-Engineering, China; Hao, Wei-wei, Institute of Space Medico-Engineering, China; Ma, Gui-xi, Institute of Space Medico-Engineering, China; Yu, Qi-fu, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 359-361; In Chinese; Copyright; Avail: Issuing Activity
Objective. to study the effect of acute moderate hypoxia on plasma angiotensin II (A II) and adrenomedullin (ADM) content in pilots. Method. The concentration of plasma A II and ADM was measured by radioimmunoassay in 16 healthy male pilots in the early morning(6:00), following acute moderate hypoxic exposure(10:00) and 6 h after returned to the ground(16:00). Sixteen healthy male ground crews were set as control group, and their plasma A II and ADM content was assayed at corresponding time. Result. 1. Plasma A II and ADM content of pilot group and that of the control group was not different(P greater than 0.05). 2.

Plasma A II and ADM content immediately after acute moderate hypoxic exposure in the pilot group was significantly higher than that of before hypoxia(P les than 0.05), and it returned to normal level 6 h after hypoxia. Conclusion. Acute moderate hypoxia can induce temporarily increase of plasma A II and ADM in pilots.
Author
Hypoxia; Plasma Chemistry; Radioimmunoassay; Peptides

20030014306 Institute of Space Medico-Engineering, Beijing, China
Effects of Ca(2+) and Mg(2+) on the Enzymatic Properties of Cardiac Muscle Myosin
Zhu, Bin, Institute of Space Medico-Engineering, China; Wan, Chao-min, Institute of Space Medico-Engineering, China; Liu, Rong-tao, Institute of Space Medico-Engineering, China; Sun, Ai-min, Institute of Space Medico-Engineering, China; Huang, Sun, Institute of Space Medico-Engineering, China; Wang, Zheng-rong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 355-358; In Chinese; Copyright; Avail: Issuing Activity

Objective. to study the influence of Ca(2+) and Mg(2+) on the enzymatic properties of cardiac muscle myosin. Method. A convenient method for the purification myosin from the left ventricle of rabbit heart was described. The Km and V(sub max) of Ca(2+) - activated and M(2+) - activated ATPase and the effects on the enzymatic properties of myosin ATPase in different ionic concentration and different pH range were determined from the rate of Pi release in enzymatic reaction. Result. The Km values of Ca(2+), Mg(2+) - activated myosin ATPase at high ironic strength were 5.27 +/- 2.10 mmol, 7.04 +/- 2.06 mmol and the V(sub max) values were 1.10 +/- 0.13 micron mol/mg. min, 0 617 +/- 0.09 micron mol/mg min respectively. The Km of Ca(2+) - activated ATPase was higher than that of Mg(2+) - activated ATPase. But the ATPase activity of Ca(2+) was influenced by the concentrations of MgCl2. The effect of Ca(2+) - activated ATPase increase was found at lower MgCl2 concentrations. As the MgCl2 concentration increased above 6 mmol/L, Ca(2+), sensitivity was decreased. The pH-activity profiles showed that Mg(2+) - activated myosin ATPase activity was more stable than that of Ca(2+) - activated. Conclusion. The mechanism of Ca(2+) and Mg(2+) effect on myosin ATPase were different. Mg(2+) is essential to maintain the conformation of enzymatic activity of myosin in cardiac muscle contraction. Ca(2+) is likely acted as a role conducting signals and regulating function.
Author
Calcium Isotopes; Magnesium Isotopes; Enzyme Activity; Heart; Muscles

20030014492 NASA Ames Research Center, Moffett Field, CA USA
Life in Extreme Environments
Rothschild, Lynn, NASA Ames Research Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Each recent report of liquid water existing elsewhere in the solar system has reverberated through the international press and excited the imagination of humankind. Why? Because in the last few decades we have come to realize that where there is liquid water on Earth, virtually no matter what the physical conditions, there is life. What we previously thought of as insurmountable physical and chemical barriers to life, we now see as yet another niche harboring 'extremophiles'. This realization, coupled with new data on the survival of microbes in the space environment and modeling of the potential for transfer of life between celestial bodies, suggests that life could be more common than previously thought. Here we critically examine what it means to be an extremophile, the implications of this for evolution, biotechnology, and especially the search for life in the cosmos.
Author
Extraterrestrial Life; Microorganisms

20030014583 NASA Johnson Space Center, Houston, TX USA
Evaluation of Biofilms and the Effects of Biocides Thereon
Pierson, Duane L., Inventor, NASA Johnson Space Center, USA; Koenig, David W., Inventor, NASA Johnson Space Center, USA; Mishra, Saroj K., Inventor, NASA Johnson Space Center, USA; Dec. 24, 2002; 26p; In English
Patent Info.: Filed 18 May 1999; NASA-Case-MSC-22679-1; US-Patent-6,498,862; US-Patent-Appl-SN-316913; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Biofilm formation is monitored by real-time continuous measurement. Images are formed of sessile cells on a surface and planktonic cells adjacent the surface. The attachment of cells to the surface is measured and quantitated, and sessile and planktonic cells are distinguished using image processing techniques. Single cells as well as colonies are monitored on or adjacent a variety

of substrates. Flowing streams may be monitored. The effects of biocides on biofilms commonly isolated from recyclable water systems are measured.
Official Gazette of the U.S. Patent and Trademark Office
Biofilms; Poisons; Cells (Biology); Plankton

20030014647 NASA Ames Research Center, Moffett Field, CA USA
A Large-Magnitude Biological Source of H2 to the Archaean Atmosphere?
Hoehler, Tori M., NASA Ames Research Center, USA; Bebout, Brad M., NASA Ames Research Center, USA; DesMarais, David J., NASA Ames Research Center, USA; Jan. 25, 2002; 1p; In English; 2nd Astrobiology Science Conference, 7-11 Apr. 2002, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only
The appearance of photosynthetic microbial communities on Earth was a critical juncture in the chemical evolution of the oceans and atmosphere. The use of sunlight as an energy source frees life from a dependence on geochemical energy sources; global biospheric productivity, as well as the biological influence on planetary chemistry, can be greatly enhanced as a result. To understand the potential biogeochemical impacts of the transition to a photosynthetic biosphere, we examined chemical cycling in potential modern analogs of these Archaean photosynthetic communities - microbial mats from Baja California, Mexico. The primary role of photosynthetic members in the mat community is to extract reducing power (electrons) from water and use it to 'fix' carbon dioxide into organic carbon (biomolecules); however, when exposed to a simulated Archaean atmosphere of very low oxygen content, these organisms divert a substantial fraction of the captured reducing power into the production of molecular hydrogen. Globally, this mechanism of hydrogen production could have outstripped geologic sources by 2 to 4 orders of magnitude. A large-magnitude H2 flux to the environment offers the potential to enhance the global distribution and productivity of H2-consuming organisms, and also to contribute significantly to oxidation of the oceans and atmosphere by via escape to space.
Author
Microorganisms; Biosphere; Chemical Evolution; Biogeochemistry; Hydrogen Production; Atmospheric Models

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.

20030012926 Louisville Univ., Dept. of Computer Science and Engineering, KY USA
Hybrid Optimization for Ultrasound and Multimodal Image Registration
Wachowiak, Mark P.; Smolfkova, Renata; Elmaghraby, Adel S.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on CD-ROM
Report No.(s): AD-A409208; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Optimization of similarly metrics is an important component of many biomedical image registration applications that greatly affects registration outcome. Selection of an optimization approach is dependent on the modalities being registered, the characteristics of the similarly function, and available computational resources. This paper addresses optimization approaches for 2D (two dimensional) and 3D (three dimensional) rigid body intra- and multimodal ultrasound registration. Stochastic and direct techniques are compared for mutual information and correlation ratio functions. A new direct/stochastic hybrid approach based on the tabu search is also proposed, Visualization and experimental results suggest the usefulness of such an approach. Results also show that the tabu hybrid technique compares favorably with traditional techniques, based on accuracy and number of function evaluations,
DTIC
Ultrasonics; Image Processing; Pattern Registration

20030014065 Army Research Lab., Sensors Directorate, Adelphi, MD USA
Design of a Heart Sound Extraction Algorithm for an Acoustic-Based Health Monitoring System ***Progress Report, 1 Jan. 2000-30 Jul. 2001***
Murrill, Steven R.; Scanlon, Michael V.; Oct. 2002; 63p; In English
Report No.(s): AD-A409127; ARL-MR-517; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The U.S. Army Research Laboratory is developing sensor technology to monitor the soldier's physiological variables and motor activities by gathering and analyzing acoustic data. The sensor/transducer consists of a fluid or gel contained within a small, conformable. rubber bladder or pad that also includes a hydrophone. This enables the collection of high signal-to-noise-ratio (SNR) cardiac. respiratory, voice, and other physiological data. The pad minimizes interference from ambient noise because it couples poorly with airborne noise. A heart sound interbeat interval extraction algorithm has been developed using only basic concepts and techniques generally known/available to first-semester Discrete-Time Signal Processing course graduates. The algorithm appears to yield good performance in environments where the in-band SNR is greater than roughly 10 dB and no more than one high-energy, in-band noise burst occurs within the timeframe of the IBI extraction 'region of interest.' The algorithm has been shown to be capable of effectively rejecting fairly intense breath sound events. Although no deliberate attempt was made to introduce voice signals into the acoustic environment, most of the energy content of the human voice (above approximately 80 Hz) would be eliminated by the 20- to 50-Hz linear-phase, band-pass filter utilized in this algorithm.
DTIC
Human Body; Stress (Physiology)

20030014281 Institute of Space Medico-Engineering, Beijing, China
Effects of Pamidronate Disodium (Bonin) Combined with Chemotherapy on Bone Pain in Multiple Myeloma
Leng, Yun, Institute of Space Medico-Engineering, China; Chen, Shi-lun, Institute of Space Medico-Engineering, China; Shi, Hong-zhi, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 377-378; In Chinese; Copyright; Avail: Issuing Activity
Objective. to evaluate the therapeutic effects of Disodium Pamidronate (Bonin) on bone pain in multiple myeloma. Method. 18 patients received only chemotherapy and 16 patients with addition of Bonin were compared. Result. The bone pain was significantly relieved both in chemotherapy alone group and in the combination group of Bonin with chemotherapy after treatment(P less than 0.01, as compared with before therapy). However, the effects of combination group were more dramatically than that of the other group (P less than 0.05). No obvious side-effects were observed except mild fever in one patient in the combination group. Conclusion. Bonin, as a safe and effective Bisphosphonates preparation, could relieve bone pain in multiple myeloma more effectively when combined with chemotherapy.
Author
Chemotherapy; Pain; Bones

20030014296 Institute of Space Medico-Engineering, Beijing, China
DNA Chip Technology and its Application in Toxiology
Li, Shu-guang, Institute of Space Medico-Engineering, China; Liang, Hong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 387-390; In Chinese; Copyright; Avail: Issuing Activity
DNA chip is a new molecular biology technology rapidly developed in recent years. It fixes thousands of oligonucleotide on a silicon chip of 1sq cm, hybridizes the measuring materials marked with fluorescein or isotope with probe in DNA chip,and gets the fluorescent signal of hybridized probe through the scan of confocal microscope. This technology has been extensively used in HGP, DNA sequencing, transcript analysis, gene diagnosis etc. Toxiology is an important branch of life science. DNA chip can be extensively used in the toxiological field. This paper reviewed the DNA chip technology in mechanism, manufacturing method, signal check, advantages and application prospect in toxiology.
Author
Deoxyribonucleic Acid; Chips; Molecular Biology; Diagnosis

20030014298 Institute of Space Medico-Engineering, Beijing, China
Effects of Different Frequency Electromagnetic Fields on the Differentiation of Midbrain Neural Stem Cells
Li, Yi, Institute of Space Medico-Engineering, China; Zhao, Lun, Institute of Space Medico-Engineering, China; Xing, Xuan, Institute of Space Medico-Engineering, China; Lou, Shu-jie, Institute of Space Medico-Engineering, China; He, Cheng, Institute of Space Medico-Engineering, China; Lu, Chang-lin, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 374-376; In Chinese; Copyright; Avail: Issuing Activity
Objective. to examine the effect of electromagnetic fields (EMF) (20 Hz, 8 mT; 5 Hz, 8 mT) on the neuron - orientated differentiation of neural stem cells (NSCs) from midbrains of new-born rats. Method. Differentiated NSCs were exposed to EMF for 2 x 15 min per day lasting for 1 d, 5 d, or 10 d. The sham-exposure controls were correspondingly established. Cells were fixed and processed for immunofluorescent staining using the antibody against neuron-specific marker MAP(sub 2), then the

percentage of MAP(sub 2, sup +) cells was calculated. Result. The two EMFs promoted the differentiation of a neuronal fate in different ways. Both of them came into effect even after 1 d exposure. When cells exposed to the 20 Hz EMF, the percentage of neuron-orientated cells gradually increased with longer-term exposure and the most significant effect appeared in 10 d group while that happened in 5 d group under the condition of 5 Hz EMF. The effect contrasted horizontally, significant differences between the two EMFs were observed only at 10 d groups, 20 Hz EMF having more favorable effect than 5 Hz EMF. Conclusion. 20 Hz and 5 Hz EMF could promote the differentiation of midbrain NSCs to a neuronal phenotype in different ways, suggesting that the physical induction might be another strategy to manipulate the differentiation of NSCs.
Derived from text
Electromagnetic Fields; Neurophysiology; Frequencies; Exposure; Antibodies

53
BEHAVIORAL SCIENCES

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

20030014289 Beijing Univ. of Aeronautics and Astronautics, Dept. of Flight Vehicle Design and Applied Mechanics, Beijing, China
Characteristics of Eye Movement and Cognition during Simulated Landing of Aircraft
Liu, Zhong-qi, Beijing Univ. of Aeronautics and Astronautics, China; Yuan, Xiu-gan, Beijing Univ. of Aeronautics and Astronautics, China; Liu, Wei, Beijing Univ. of Aeronautics and Astronautics, China; Wang, Rui, Beijing Univ. of Aeronautics and Astronautics, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 379-380; In English; Sponsored in part by the China Doctor Research Fund
Contract(s)/Grant(s): CDRF-1999000619; 59099; Copyright; Avail: Issuing Activity
Objective. to examine how the subject scans different parts of display panels and how the attention is distributed through the analysis of the eye movement principle and the cognition of the brain. Method. An experiment was conducted to simulate the airplane's landing course and eye movement data were recorded with eye movement measure system (EMMS). Result. There were three regions of interest(ROI) on which the subject's attention was concentrated. The subject's visual activity was active in the three ROIS and attention's shifting and distribution was between ROIS. Conclusion. Eye movement were driven by the top-down processing and the distribution of the attention. The consequence of the eye movement makes the subject maintain a continuous situation awareness.
Author
Eye Movements; Aircraft Landing; Brain

20030014291 Institute of Space Medico-Engineering, Beijing, China
Study on Core Test Characteristics of Neuro-behavior in Aircrew
Shen, Xing-yun, Institute of Space Medico-Engineering, China; Zhou, Feng-shu, Institute of Space Medico-Engineering, China; Hu, Shang-feng, Institute of Space Medico-Engineering, China; Zhang, Yan-ping, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 351-354; In Chinese; Copyright; Avail: Issuing Activity
Objective. to analyze the characteristics of neuro-behavior in aircrew, interception personnel, and postgraduate students majored in command and to provide basis for the selection and training of aircrew members, as well as to serve as a methodology reference for the personnel selection in space flight. Method. 82 test subjects were divided into three groups and NCTB tests were conducted according to the neuro-behavior function core test of the World Health Organization(WHO). Then the results were analyzed and compared among the three groups. Result. Aircrew members were obviously better in neuro-behavior function with six indices superior to and three indices inferior to those majored in interception, while compared with the post graduates in command major, there are three superior indices and two inferior indices. Conclusion. The order of neurobehavior function among the three groups is aircrew, postgraduates majored in command, and the students majored in interception. WHO NCTB is an ideal method in the neuro - behavior function selection.
Author
Core Sampling; Human Performance; Flight Crews; Neurophysiology

20030014644 Colorado Univ., CO USA
Stress and Cognition: A Cognitive Psychological Perspective ***Final Report***
Bourne, Lyle E., Jr., Colorado Univ., USA; Yaroush, Rita A., Colorado Univ., USA; Feb. 01, 2003; 121p; In English
Contract(s)/Grant(s): NAG2-1561; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Complex operations can be performed successfully in Space by human beings, but more slowly than doing the same tasks on Earth, Fowler, et al. (2000) and Manzey (2000) propose two hypotheses to account for this performance degradation-(1) the direct effects of microgravity on the central nervous system and the motor system of the body and (2) the non-specific effects of multiple stressors. Evidence available to date is consistent with both hypotheses and further experiments are required to settle this question. The issue has practical implications because the countermeasures needed to ameliorate or prevent performance deficits will differ according to which hypothesis is correct. Understanding and ameliorating performance deficits will surely help ensure safer operations aboard the International Space Station and during a mission to Mars.
Author
Aerospace Environments; Astronaut Performance; Psychological Factors; Physiological Factors; Central Nervous System; Microgravity; Mental Performance; Stress (Physiology); Countermeasures

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20030012873 National Inst. for Occupational Safety and Health, Pittsburgh Research Lab., Pittsburgh, PA USA
Self-Contained Self-Rescuer Field Evaluation: Seventh Phase Results
Kyriazi, N.; Shubilla, J. P.; Mar. 2002; 24p; In English
Report No.(s): PB2003-102014; NIOSH-RI-9656; DHHS/PUB/NIOSH-2002-127; No Copyright; Avail: National Technical Information Service (NTIS)

The National Institute for Occupational Safety and Health, National Personal Protective Technology Laboratory, has undertaken a study to determine how well self-contained self-rescuers (SCSRs), deployed in accordance with Federal regulations (30 CFR 75.1714), hold up in the underground environment with regard to both physical damage and aging. This report presents findings regarding laboratory-tested SCSRs in the seventh phase of testing from May 1999 to August 2000. The SCSRs were tested on human subjects and on a breathing and metabolic simulator. The results indicate that most of the apparatus, if they pass their approved inspection criteria, perform satisfactorily. The deployed CSE SR-100s, however, exhibited significantly higher inhaled carbon dioxide (CO2) levels than new units, as they did in the previous two phases. Several Draeger OXY K-Pluses that rattled when shaken were found to have potassium superoxide (KO2) particles throughout the breathing circuit, including the mouthpiece. Draeger investigated the problem and developed a shake test to detect damaged units. The durations of new Ocenco M-20s were statistically significantly longer than those of deployed units, although only by 2 min.
NTIS
Safety Devices; Mining; Breathing Apparatus; Evaluation; Health; Inspection; Regulations

20030012980 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Final Report of the Lower Extremity Assessment Program (LEAP 99-2). Volume 2 ***Final Report***
Harris, Robert M.; Rountree, Mark S.; Griffin, Lanny V.; Hayda, Roman A.; Bice, Terry; Aug. 2000; 145p; In English; Original contains color images
Report No.(s): AD-A409059; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Research conducted by Department of Defense laboratories and facilities, collaborating with leading academic institutions, has demonstrated that currently available landmine protective footwear does not prevent severe injury. This footwear potentially reduces injury severity against some antipersonnel mines. Volume II of the Lower Extremity Assessment Program (LEAP 99-2) discusses the change of injury pattern in a cadaver model wearing mine protective footwear during an antipersonnel blast mine detonation. Our analytical methodology developed to assess mine-protective footwear and injury severity associated with blast mines across the spectrum of threat is presented.
DTIC
Protective Clothing; Mines (Ordnance)

20030014117 Nuclear Energy Unit, Tenaga Nasional Univ., Malaysia

An Electronically Guided Walking Stick for the Blind

Debnath, Niranjan; Hailani, Zul A.; Jamaludin, Sakinah; Aljunid, Syed A.; Oct. 25, 2001; 4p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom

Report No.(s): AD-A409264; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Mobility for the blind is always a great problem. Just like a sighted, blind also needs to travel around inside a closed premises like house, factory, office, school etc. They may also like to go for shopping, visiting friends and other places of their interest Presently available electronic travelling aids like sonic path finder, sonic torch etc. are not suitable for using inside a closed premises such as school, factory, office etc. In this paper an electronically guided walking stick that can be used conveniently inside a closed premises has been discussed.

DTIC

Electronic Equipment; Schools; Mobility

20030014304 Institute of Space Medico-Engineering, Beijing, China

Numerical Simulation of Dynamic Characteristic of Exhalation Valve Plate in Pressure Oxygen Mask

Zhang, Da-lin, Institute of Space Medico-Engineering, China; Fang, Xian-de, Institute of Space Medico-Engineering, China; Zhang, Xiao, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 362-365; In Chinese; Copyright; Avail: Issuing Activity

Objective. to find out the reason of ”dithering” of exhalation valve plate in pressure oxygen mask under high overpressure condition. Method. Dynamic model of the exhalation valve plate in pressure oxygen mask was established. Aerodynamic force on the plate was determined by flowfield computing. The dynamic characteristic of the exhalation valve plate was analyzed by experimental measurement integrated with numerical simulation. Result. The movement of valve plate could be simulated with the method proposed, and the course of the” dithering” was found out. Conclusion. The ”dithering” of the valve plate can be averted by cutting down the area of the film or increasing the diameter of the valve pedestal moderately.

Author

Oxygen Masks; Dynamic Models; Exhalation; Dynamic Characteristics

55
EXOBIOLOGY

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

20030013628 NASA Ames Research Center, Moffett Field, CA USA

Molecules from Space and the Origin of Life

Bernstein Max P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; [1999]; 16p; In English

Contract(s)/Grant(s): RTOP 344-38-12-04; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

There is a growing concensus among space scientists that frozen molecules from space helped to make the Earth the pleasant place that it is today, and helped Life start on Earth, and perhaps elsewhere. The chain of logic that led scientists to posit a connection between extraterrestrial molecules and the origin of life is as follows. 1) The rapidity with which life arose demands that conditions on Earth were conducive to the formation of life very early on. 2) There is reason to believe that comets and meteorites fell oil the Earth from its inception. 3) We now know that comets and meteorites are replete with complex organic compounds, some of which resemble those in living systems. 4) Perhaps the input of molecules from comets and meteorites provided crucial constituents to the primordial soup and Jump started life on Earth. 5) These molecules formed out in deep space long before the Earth ever existed, by processes that we can reproduce in the laboratory. 6) The fact that organic molecules are seen by astronomers throughout our galaxy and in others makes it seem likely that they were (and are) available to help start life in other planetary systems.

Author

Biological Evolution; Molecules; Deep Space; Organic Compounds; Solar System

20030014579 NASA Ames Research Center, Moffett Field, CA USA

Energy Requirements of Hydrogen-Utilizing Microbes: Boundary Condition for Subsurface Life

Hoehler, Tori M., NASA Ames Research Center, USA; Alperin, Marc J., NASA Ames Research Center, USA; Albert, Daniel B., NASA Ames Research Center, USA; Martens, Christopher S., NASA Ames Research Center, USA; Jan. 25, 2002; 1p; In English; 2nd Astrobiology Science Conference, 7-11 Apr. 2002, Moffett Field, CA, USA

Contract(s)/Grant(s): RTOP 344-38-32-03; No Copyright; Avail: Issuing Activity; Abstract Only

For planetary bodies with surface conditions that are too harsh to permit continuous occupation by life, the deep subsurface offers a potentially stable and habitable niche. For organisms occupying this niche, the spectrum of possible metabolisms must be limited to those which do not include sunlight as an energy source or oxygen as a chemical reagent - generally, low-energy anaerobic oxidation-reduction processes. The quantity of energy released in such processes is critical, because currently understood mechanisms of biological energy conservation indicate that energy is only 'useful' to an organism when it is available at a certain minimum level - the 'biological energy quantum'. The mere existence of a BEQ implies that a significant fraction of the chemical energy present in the environment cannot be exploited by life; similarly, the absolute magnitude of the BEQ must be a key variable in determining the potential viability and distribution of subsurface microbial communities. Laboratory culture studies suggest that organisms require an energy of about -20 kJ/mol to grow. However, we find that hydrogen-utilizing microorganisms in an energy-limited natural ecosystem are active with energy yields as low as -10 kJ/mol. A lower BEQ would mean a significantly expanded range of energetically viable subsurface habitat for life.

Author

Microorganisms; Energy Requirements; Extraterrestrial Life; Exobiology; Hydrogen; Chemical Evolution

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.

20030013744 Helsinki Univ. of Technology, Lab. for Theoretical Computer Science, Espoo, Finland

Helsinki University of Technology Laboratory for Theoretical Computer Science. Annual Report for the Year 2001

Varpaaniemi, K.; 2002; 40p

Report No.(s): PB2003-101785; HT-TCS-Y2001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the educational and research activities of the Laboratory for Theoretical Computer Science at Helsinki University of Technology during the year 2001.

NTIS

Education; Research and Development; Computers

20030014489 NASA Langley Research Center, Hampton, VA USA

Adapting Digital Libraries to Continual Evolution

Barkstrom, Bruce R., NASA Langley Research Center, USA; Finch, Melinda, NASA Langley Research Center, USA; Ferebee, Michelle, NASA Langley Research Center, USA; Mackey, Calvin, NASA Langley Research Center, USA; [2002]; 2p; In English; 2002 Joint Conference on Digital Libraries, 24-28 Jul. 2002, Portland, OR, USA

Report No.(s): ACM-1-58113-345-6/01/0006; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this paper, we describe five investment streams (data storage infrastructure, knowledge management, data production control, data transport and security, and personnel skill mix) that need to be balanced against short-term operating demands in order to maximize the probability of long-term viability of a digital library. Because of the rapid pace of information technology change, a digital library cannot be a static institution. Rather, it has to become a flexible organization adapted to continuous evolution of its infrastructure.

Author

Libraries; Data Management; Information Systems

20030014493 Center for Mathematics and Computer Science, Amsterdam Netherlands

Grey-Scale Morphology Based on Fuzzy Logic. Probability, Networks, and Algorithms (PNA)

Deng, T. Q.; Heijmans, H. J. A. M.; Oct. 2002; 30p

Report No.(s): PB2003-101958; PNA-R0012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There exist several methods to extend binary morphology to grey-scale images. One of these methods is based on fuzzy logic and fuzzy set theory. Another approach starts from the complete lattice framework for morphology and the theory of adjunctions. In this paper, both approaches are combined. The basic idea is to use (fuzzy) conjunctions and implications which are adjoint in the definition of dilations and erosions, respectively. This gives rise to a large class of morphological operators for grey-scale images. It turns out that this class includes the often used grey-scale Minkowski addition and subtraction.
NTIS
Mathematical Models; Morphology; Fuzzy Sets; Algorithms; Fuzzy Systems

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.

20030012563 Swedish Defence Research Establishment, Div. of Systems Technology, Stockholm, Sweden
Validation/Verification of the Similation Part of the Software System SILVA 9.0 ***Validering/Verifiering av Simuleringsdelen till Programsystemet SILVIA 9.0***
Hansson, M. B.; Oct. 2001; 38p; In English
Report No.(s): PB2003-101019; FOI-R-0214-SE; No Copyright; Avail: National Technical Information Service (NTIS)
SILVIA has been restructured and converted to ADA 95. FMV has from FOI ordered a validation of SILVIA against the old UNIX-version to accredit functionality and credibility of the new version. In the order both the simulation part and the MMI should be validated. This is the report from the validation of the simulation part. The order from FMV has been to simulate new scenarios to look at the functionality of the model. Comparison has been made with the scenarios made for the validation of SILVIA against the FOCUS exercise 1994. From this scenario some functionality tests have also been made. The simulations have shown that SILVIA seems to be as correct as before. The two versions often give the same outcome and respond equivalently. There are some differences giving different outcome, but the differences are often small. Often the old question marks mean more for the outcome than model version. There are some new question marks but the old ones make more for the average outcome. The usefulness of the SILVIA model is still intact, i.e. the ability to change the model before using it. That ability is also the reason for the difficulties using it, i.e. to know how parameters will affect the outcome.
NTIS
Software Engineering; Computer Systems Design; Computerized Simulation; Air Defense; Program Verification (Computers)

20030012589 Technical Research Centre of Finland, Electronics, Espoo, Finland
Quality-Driven Architecture Design and Quality Analysis Method. A Revolutionary Initiation Approach to a Product Line Architecture
Matinlassi, M.; Niemelae, E.; Dobrica, L.; 2002; 144p
Report No.(s): PB2003-101230; VTT-PUB-456; Copyright; Avail: National Technical Information Service (NTIS)
The role of software architecture had changed. The use of modern software technologies and practices enables turning the focus of system development to the quality aspects of software instead of functional properties. Architecture addresses the quality issues of software and, therefore, it must be developed and documented properly. In particular, there is a need for high level architectural descriptions. The top down nature of software architecture design induces this need. In this report, the authors introduce a quality-driven architecture design and analysis (QADA) method. Quality-driven is about utilizing architectural styles and patterns as a means of designing high-quality architectures. QADA takes a revolutionary approach to the initiation process of a new product line. That is, the development of a complete product-line architecture and a set of components before developing the first product in a new domain. QADA considers architecture on two levels of abstraction: conceptual and concrete.
NTIS
Software Development Tools; Software Engineering; Architecture (Computers)

20030012617 Lawrence Livermore National Lab., Livermore, CA USA
Programming Models for Shared Memory Clusters ***Final Report***
May, J.; de Supinski, B.; Pudliner, B.; Taylor, S.; Baden, S.; Jan. 04, 2000; In English
Report No.(s): DE2002-792330; UCRL-ID-137002; No Copyright; Avail: National Technical Information Service (NTIS)
Most large parallel computers now built use a hybrid architecture called a shared memory cluster. In this design, a computer consists of several nodes connected by an interconnection network. Each node contains a pool of memory and multiple processors

that share direct access to it. Because shared memory clusters combine architectural features of shared memory computers and distributed memory computers, they support several different styles of parallel programming or programming models.
NTIS
Computer Programming; Architecture (Computers)

20030012737 Lawrence Livermore National Lab., Livermore, CA USA
DYNA3D Code Practices and Developments
Lin, J.; Zywicz, E.; Raboin, P.; Apr. 21, 2000; 22p; In English
Report No.(s): DE2002-791974; UCRL-ID-138654; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
DYNA3D is an explicit, finite element code developed to solve high rate dynamic simulations for problems of interest to the engineering mechanics community. The DYNA3D code has been under continuous development since 1976 by the Methods Development Group in the Mechanical Engineering Department of Lawrence Livermore National Laboratory. The pace of code development activities has substantially increased in the past five years, growing from one to between four and six code developers. This has necessitated the use of software tools such as CVS (Concurrent Versions System) to help manage multiple version updates. While on-line documentation with an Adobe PDF manual helps to communicate software developments, periodically a summary document describing recent changes and improvements in DYNA3D software is needed. The first part of this report describes issues surrounding software versions and source control. The remainder of this report details the major capability improvements since the last publicly released version of DYNA3D in 1996. Not included here are the many hundreds of bug corrections and minor enhancements, nor the development in DYNA3D between the manual release in 1993 and the public code release in 1996.
NTIS
Mechanical Engineering; Finite Element Method; Software Engineering

20030012776 University of Southern California, Information Sciences Inst., Marina del Rey, CA USA
Natural Interaction With Pedagogical Agents in Virtual Environments ***Final Report, 1 Jun. 1997-14 Jul. 2000***
Johnson, W. L.; Nov. 19, 2002; 22p; In English
Contract(s)/Grant(s): N00014-97-1-0598
Report No.(s): AD-A409186; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The USC / Information Sciences Institute (ISI), in collaboration with Lockheed Martin and USC Behavior Technology Laboratory, conducted a research project named Virtual Environments for Training (VET) between October 1995 and February 1999. VET developed an integrated prototype of an intelligent virtual reality-based training system. ISI's main contribution to this project was the development of the Steve pedagogical agent, an embodied agent that can participate in training simulations, as a virtual coach or a virtual team member. In support of this grant ISI received a supplemental AASERT award, entitled "Natural Interaction with Pedagogical Agents in Virtual Environments." Funding for this work began in June of 1997 and continued through August of 2000. The overall purpose of this project was to improve the naturalness and effective of interaction between humans and the Steve pedagogical agent, both during lesson authoring and lesson execution. Several students were supported by this award. This report summarizes the work of each student who was supported by the grant.
DTIC
Software Engineering; Systems Integration; Computer Graphics

20030012820 Old Dominion Univ., Dept. of Civil and Environmental Engineering, Norfolk, VA USA
Optimal Design of Electromagnetics Engineering Systems Using Genetic Algorithms
Nguyen, Duc T., Old Dominion Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 60; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
In this work, various strategies used in the genetic algorithms (GA) are discussed. Computer implementation of the developed FORTRAN code, and its application for optimum design of electromagnetics systems are emphasized. The second objective for this work is to parallelize the developed "sequential" GA code, using Message Passing Interface (MPI) for numerical intensive electromagnetics research problems.
Author
Applications Programs (Computers); FORTRAN; Genetic Algorithms; Electromagnetism

20030012829 Hampton Univ., Dept. of Mathematics, VA USA

Clustering in the Discovery and Simulation of Emergent Patterns in Data

Socolovsky, Eduardo A., Hampton Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 69; In English; Also announced as 20030012804; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We developed a new more effective computational algorithm for the Clustering of Data in Vector Form based a parametric Pearson product-moment correlation measure of similarity. This type of clustering is necessary for the detection and tracking of data features, as used in Information Flocking and Multi-Agent Referral Systems for Matchmaking. This work is part of the research project on Swarming, a multi-agent computational paradigm for the discovery, design and simulation of emergent patterns in data. Clustering is a widely used statistical analysis tool, which in the context of this project will be one of the underlying algorithms for feature and pattern extraction in wind tunnel and CFD data sets. The algorithm designed to overcome the O(N(exp 2)) inner products required to obtain a similarity measure matrix,and also improve on the performance of ad-hoc Forward-Backward algorithms. The algorithm is based on a quasi-metric property of projections, Householder transformations and geometrical properties.

Author

Statistical Analysis; Cluster Analysis; Algorithms; Tracking (Position)

20030012914 Executive Office of the President, Office of Science and Technology Policy, Washington, DC USA

High Confidence Software and Systems Research Needs

Jan. 10, 2001; 52p

Report No.(s): PB2003-101765; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This White Paper presents a survey of high confidence software and systems research needs. It has been prepared by the High Confidence Software and Systems Coordinating Group (HCSS CG) of the Interagency Working Group in Information to the need for a radical new approach. Technology Trends: Increasing reliance on software for critical functions Technology Research and Development (IWG/IT R&D). The IWG, which functions under the White House National Science and Technology Council, coordinates Federal multiagency IT R&D efforts. The HCSS CG agencies are: DARPA, NASA, NIH, NIST, NSA, NSF, and OSD/URI.

NTIS

Research and Development; Software Development Tools

20030012925 Instituto Tecnologico Autonomo de Mexico, Mexico City, Mexico

Anatomical Models for Virtual Reality and Web-Based Applications

Villasenor, M. A.; Flores, F.; Algorri, M. E.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on CD-ROM

Report No.(s): AD-A409209; No Copyright; Avail: Defense Technical Information Center (DTIC)

We present a methodology for the creation, manipulation and transmission of 3D (three dimensional) anatomical models starting from stacks of medical images. The anatomical information for the models is first segmented from the images and then used by a surface reconstruction algorithm to create 3D meshes that accurately represent the surface of the organs being modeled. The meshes are then exported in an open format for manipulation in a graphics platform. Using high-end graphics algorithms we render and texture-map our meshes. We can also deform the meshes and assign physical and material properties to them. Our models can be used for virtual reality applications and can also be transmitted over the Internet for remote interactive visualization and retrieval.

DTIC

Internets; Virtual Reality; Anatomy; Computer Graphics; Programming Languages

20030012934 NASA Langley Research Center, Hampton, VA USA

Extreme Programming in a Research Environment

Wood, William A., NASA Langley Research Center, USA; Kleb, William L., NASA Langley Research Center, USA; [2002]; 11p; In English; XP Agile Universe Conference, 4-7 Aug. 2002, Chicago, IL, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This article explores the applicability of Extreme Programming in a scientific research context. The cultural environment at a government research center differs from the customer-centric business view. The chief theoretical difficulty lies in defining the customer to developer relationship. Specifically, can Extreme Programming be utilized when the developer and customer are the

same person? Eight of Extreme Programming's 12 practices are perceived to be incompatible with the existing research culture. Further, six of the nine 'environments that I know don't do well with XP' apply. A pilot project explores the use of Extreme Programming in scientific research. The applicability issues are addressed and it is concluded that Extreme Programming can function successfully in situations for which it appears to be ill-suited. A strong discipline for mentally separating the customer and developer roles is found to be key for applying Extreme Programming in a field that lacks a clear distinction between the customer and the developer.
Author
Computer Programming; Research Facilities

20030012941 California Univ., San Diego, Office of Contract and Grant Administration, La Jolla, CA USA
System Software Support for Mobile-Agent Computing ***Final Report, 15 Apr. 1998-14 Nov. 2001***
Pasquale, Joseph; Sep. 2002; 6p; In English
Contract(s)/Grant(s): F49620-98-1-0439
Report No.(s): AD-A409193; AFRL-SR-AR-TR-02-0412; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We investigated new system software architectures that support mobile code, based on network (and distributed) computing. The primary goal was to support an application's reliance on network resources, rather than local ones (which are often scarce in defense mobile-computing situations), to meet their communication and computational demands. We have developed a powerful extension of the client/server model, which we call the Extended Client/Server (ECS) model of distributed computing. Rather than a client sending requests to a server and receiving its reply as in the traditional client/server model, the client produces a mobile code object called an active extension, which then carries out the request/response interaction with the server. This active extension can execute at the server, at the client, or (most importantly) at another location where, presumably, it can interact with the server more advantageously (e.g., with higher performance, higher reliability, or higher security) than if it was co-located with the client We explored the design (and implementation) space for the ECS model, we completed multiple prototypes, implemented independently by different students, all of which provide basic support for remote computing, but each focusing on different areas of concern, such as security, resource allocation, client/agent and agent/server protocols, etc.
DTIC
Software Engineering; Computer Networks

20030012976 Southern Polytechnic State Univ., Marietta, GA USA
Female Recruit Size Selection Methodology ***Final Report, 1 Sep. 2000-30 Jun. 2002***
Ring, Carol; Jun. 30, 2002; 93p; In English; Original contains color images
Contract(s)/Grant(s): SPO100-95-D-1005
Report No.(s): AD-A409051; ARN-002; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This project had the objective of developing preliminary size selection algorithms necessary to generate computer software for determining the size clothing reguired for a specific military recruit. Body measurement information generated by a 3D full human body scanner provided the input to drive the size selection software. Southern Polytechnic State University worked with Cyberware, Inc in support of this effort for the Apparel Research Network (ARN).
DTIC
Computer Programs; Clothing; Females; Algorithms

20030012991 Kent State Univ., OH USA
Inactive Display Models for Information Visualization in Virtual Reality ***Final Report, 1 Jun. 2001-30 Sep. 2002***
Maletic, Jonathan I.; Sep. 2002; 6p; In English
Contract(s)/Grant(s): N00014-01-1-0917
Report No.(s): AD-A409076; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The research is investigating the use of Virtual Reality Environments (VE) to visualize complex data and information. Virtual Reality (VR) combines 3D views with animation to allow the user to navigate through the visualization. This application differs greatly from representing real worlds in VR for say training or demonstration. A generic display model for visualizing information in a VR is being developed. This model will extend previous research on 2D and 30 models. Information visualization is vital to the day-to-day operations of Navy personnel planning, distribution, and assignment.
DTIC
Information Systems; Virtual Reality; Display Devices

20030013635 NASA Langley Research Center, Hampton, VA USA

Solid Freeform Fabrication: An Enabling Technology for Future Space Missions

Taminger, Karen M. B., NASA Langley Research Center, USA; Hafley, Robert A., NASA Langley Research Center, USA; Dicus, Dennis L., NASA Langley Research Center, USA; [2002]; 10p; In English; 2002 International Conference on Metal Powder Deposition for Rapid Manufacturing, 8-10 Apr. 2002, San Antonio, TX, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The emerging class of direct manufacturing processes known as Solid Freeform Fabrication (SFF) employs a focused energy beam and metal feedstock to build structural parts directly from computer aided design (CAD) data. Some variations on existing SFF techniques have potential for application in space for a variety of different missions. This paper will focus on three different applications ranging from near to far term to demonstrate the widespread potential of this technology for space-based applications. One application is the on-orbit construction of large space structures, on the order of tens of meters to a kilometer in size. Such structures are too large to launch intact even in a deployable design; their extreme size necessitates assembly or erection of such structures in space. A low-earth orbiting satellite with a SFF system employing a high-energy beam for high deposition rates could be employed to construct large space structures using feedstock launched from Earth. A second potential application is a small, multifunctional system that could be used by astronauts on long-duration human exploration missions to manufacture spare parts. Supportability of human exploration missions is essential, and a SFF system would provide flexibility in the ability to repair or fabricate any part that may be damaged or broken during the mission. The system envisioned would also have machining and welding capabilities to increase its utility on a mission where mass and volume are extremely limited. A third example of an SFF application in space is a miniaturized automated system for structural health monitoring and repair. If damage is detected using a low power beam scan, the beam power can be increased to perform repairs within the spacecraft or satellite structure without the requirement of human interaction or commands. Due to low gravity environment for all of these applications, wire feedstock is preferred to powder from a containment, handling, and safety standpoint. The energy beams may be either electron beam or laser, and the developments required for either energy source to achieve success in these applications will be discussed.

Author

Space Manufacturing; Computer Aided Design; Beams (Radiation); Large Space Structures; Aerospace Environments; Low Gravity Manufacturing; Laser Applications

20030013953 NASA Langley Research Center, Hampton, VA USA

Issues in Software System Safety: Polly Ann Smith Co. versus Ned I. Ludd

Holloway, C. Michael, NASA Langley Research Center, USA; [2002], pp. 76-84; In English; 20th International System Safety Conference, 5-9 Aug. 2002, Denver, CO, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper is a work of fiction, but it is fiction with a very real purpose: to stimulate careful thought and friendly discussion about some questions for which thought is often careless and discussion is often unfriendly. to accomplish this purpose, the paper creates a fictional legal case. The most important issue in this fictional case is whether certain proffered expert testimony about software engineering for safety critical systems should be admitted. Resolving this issue requires deciding the extent to which current practices and research in software engineering, especially for safety-critical systems, can rightly be considered based on knowledge, rather than opinion.

Author

Software Reliability; Software Engineering; Computer Program Integrity; Safety

20030014002 Naval Research Lab., Washington, DC USA

Towards a Methodology and Tool for the Analysis of Security-Enhanced Linux Security Policies

Archer, Myla; Leonard, Elizabeth; Pradella, Matteo; Aug. 16, 2002; 45p; In English

Report No.(s): AD-A409228; NRL/MR/5540--02-8629; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Security-Enhanced (SE) Linux, released by NSA in January 2001, is a version of Linux that adds security features by superimposing the Flask architecture on its kernel. In this architecture, a security server decides whether to grant particular subjects (i.e., processes) pernaissions to particular objects. The decisions are based on a combination of type enforcement (TE), role-based access control (RBAC), and multilevel security (MLS) rules. SE Linux includes a policy language for defining these parts of the security policy. Because the policy language forces detailed specification of which access permissions may be granted, the relation of a policy definition to high level security goals is not obvious. The length and complexity of policy definitions (thousands of rules is typical) precludes proving a high level security property by inspection. For policy analysis, tool support is clearly needed. to be effective in practice, this tool support needs to be usable by members of the open source software community.

This paper reports progress made towards adapting the theorem-proving tool TAME to the analysis of SE Linux security policies, and making it usable to open source developers.
DTIC
Software Engineering; Computer Information Security; Operating Systems (Computers)

20030014087 Helsinki Univ. of Technology, Lab. for Theoretical Computer Science, Espoo, Finland
Symmetry Reduction Algorithms for Data Symmetries
Junttila, T.; 2002; 60p; In English
Report No.(s): PB2003-101877; HUT-TCS-A72; REPT-72; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The core problem in the symmetry reduction method for state space analysis is to decide whether two states are symmetric or to produce a symmetric representative state for a state. This report presents algorithms for the problem under data symmetries. The setting covers systems described in the language or in terms of high-level Petri nets. The first two algorithms are based on refining ordered partitions by using symmetry respecting invariants. The last algorithm exploits existing graph isomorphism algorithms that are then applied on characteristic graphs of states, i.e. graphs corresponding to the states in a symmetry respecting way. Some experimental results are also reported.
NTIS
Symmetry; Algorithms

20030014088 Helsinki Univ. of Technology, Lab. for Theoretical Computer Science, Espoo, Finland
Bounded Model Checking for Verifying Concurrent Programs
Jussila, T.; 2002; 66p; In English
Report No.(s): PB2003-101872; HUT-TCS-A73; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A simple, parallel programming language is introduced and an operational semantics for it is developed. The language combines the syntax of C and Java together with the communication primitives taken from PROMELA. A verification method for specifications given in the language is developed for detecting the violation of temporal reachability and safety properties. The method is known as Bounded Model Checking (BMC) where the idea is to reduce the model checking problem to propositional satisfiability. A compact boolean encoding of parallel programs is devised, together with the proofs of its soundness and completeness. Encoding of the reachability and safety properties is developed and finally semantical models for strengthening the encoding are discussed.
NTIS
Programming Languages; Program Verification (Computers)

20030014113 Elizabeth City State Univ., NC USA
Nurturing ECSU Research Talent Technical Report
Hayden, Linda; Nov. 26, 2002; 9p; In English; Original contains color images
Contract(s)/Grant(s): N00014-99-1-0990; N00014-98-1-0749
Report No.(s): AD-A409268; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This report contains program highlights and summer 2002 Research Abstracts.
DTIC
Navy; Research Management; Students

20030014130 Argonne National Lab., IL USA
Automated Real-Time Testing (ARTT) for Embedded Control Systems (ECS)
Hawkins, J.; Howard, R. B.; Nguyen, H. V.; 2002; 20p; In English
Report No.(s): DE2002-799785; ANL/AOD/CP-104609; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this paper, we presented an example of how Vali/Test Pro testing methodology was used to structure test for a Personnel Safety System. We constructed validation matrixes to map PSS system requirements to their respective unit level of tests in order to measure the system's test coverage. We integrated a suite of four software-testing tools into a single computer platform with a fifth tool working separately on a separate notebook computer.
NTIS
Safety Management; Personnel

20030014131 Lawrence Livermore National Lab., Livermore, CA USA
Experiences Using a Meta-Data Based Integration Infrastructure
Critchlow, T.; Musick, R.; Slezak, T.; Jul. 08, 1999; 10p; In English
Report No.(s): DE2002-792597; UCRL-JC-134854; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
One of the classic challenges in bio-informatics has been the integration of multiple community data sources into a single, consistent data repository. Over the years, there have been several attempts to address this problem. So far, none have been entirely successful. The task is a daunting one: integrate large amounts of complex data, obtained from autonomous, heterogeneous, distributed data sources which change their data representation regularly, and present it in a consistent and intuitive way. In this paper, we discuss our experiences using the meta-data infrastructure developed as part of the DataFoundry project at LLNL. First, we present the DataFoundry architecture, including both the meta-data representation and how it is used, in Section 2. Section 3 describes our experiences using the meta-data infrastructure to integrate two genomic data sources into our warehouse, outlines some of the problems initially encountered, and contrasts the process to the traditional, manual approach. Finally, we briefly summarize the current status and future directions of the project.
NTIS
Data Systems; Data Acquisition

20030014140 Lawrence Livermore National Lab., Livermore, CA USA
ROSE: The Design of a General Tool for the Independent Optimization of Object-Oriented Frameworks
Davis, K.; Phillip, B.; Quinian, D.; May 18, 1999; 18p; In English
Report No.(s): DE2002-792011; UCRL-134259; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
ROSE represents a programmable preprocessor for the highly aggressive optimization of C++ object-oriented frameworks. A fundamental feature of ROSE is that it preserves the semantics, the implicit meaning, of the object-oriented framework's abstractions throughout the optimization process, permitting the framework's abstractions to be recognized and optimizations to capitalize upon the added value of the framework's true meaning. In contrast, a C++ compiler only sees the semantics of the C++ language and thus is severely limited in what optimizations it can introduce. The use of the semantics of the framework's abstractions avoids program analysis that would be incapable of recapturing the framework's full semantics from those of the C++ language implementation of the application or framework.
NTIS
Computer Programming; C++ (Programming Language); Optimization

20030014154 Shanghai Astronomical Observatory, China
The User_Partial Feature in VLBI Data Analysis Software Package CALC/SOLVE
Zhang, Bo, Shanghai Astronomical Observatory, China; Li, Jin-Ling, Shanghai Astronomical Observatory, China; Wang, Guang-Li, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 125-128; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Based on the practical needs in the astrometric and geodetic VLBI data analysis, the user - partial feature of the astrometric and geodetic VLBI data analysis software package CALC/SOLVE is described, and a real application case is demonstrated.
Author
Very Long Base Interferometry; Applications Programs (Computers)

20030014185 Naval Research Lab., Bay Saint Louis, MS USA
User's Manual for the Simulating Waves Nearshore Model (SWAN)
Allard, Richard; Rogers, Erick; Carroll, Suzanne N.; Nov. 15, 2002; 171p; In English
Report No.(s): AD-A409107; NRL/MR/7320--02-8286; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The Simulating WAves Nearshore (SWAN) model is a numerical wave model used to obtain realistic estimates of wave parameters in coastal areas, lakes, and estuaries from given wind, bottom, and current conditions. The model is based on the wave action balance equation (or energy balance in the absence of currents) with sources and sinks. SWAN is a third-generation wave model with first-, second-, and third-generation options.
DTIC
Computer Programs; Mathematical Models; Wave Propagation

20030014261 Lawrence Livermore National Lab., Livermore, CA USA
Measurement of Low Level Explosives Reaction in the Two-Dimensional Steven Impact Test
Forbes, J. W.; Tarver, C. M.; Chidester, S. K.; Garcia, F.; Greenwood, D. W.; Oct. 10, 2000; In English; This document is color

dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792354; UCRL-JC-132716; No Copyright; Avail: National Technical Information Service (NTIS)

The two-dimensional Steven impact test has been developed to be reproducible and amenable to computer modeling. This test has a hemispherical projectile traveling at tens of m/s impacting a metal cased explosive target. To assist in the understanding of this safety test, two-dimensional shock wave gauge techniques were used to measure pressures of a few kilobars and times of reactions less than a millisecond. This work is in accord with a long-term goal to develop two-dimensional shock diagnostic techniques that are more than just time of arrival indicators. Experiments were performed where explosives were impacted at levels below shock initiation levels but caused low level reactions. Carbon foil and carbon resistor pressure gauges were used to measure pressures and time of events.
NTIS
Explosives; Shock Waves; Impact Tests

20030014483 NASA Ames Research Center, Moffett Field, CA USA
Scaling NASA Applications to 1024 CPUs on Origin 3K
Taft, Jim, NASA Ames Research Center, USA; Jun. 13, 2002; 22p; In English; National Research Council (NRC) Demo Presentations, 13 Jun. 2002, Unknown
Contract(s)/Grant(s): RTOP 704-00-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The long and highly successful joint SGI-NASA research effort in ever larger SSI systems was to a large degree the result of the successful development of the MLP scalable parallel programming paradigm developed at ARC: 1) MLP scaling in real production codes justified ever larger systems at NAS; 2) MLP scaling on 256p Origin 2000 gave SGl impetus to productize 256p; 3) MLP scaling on 512 gave SGI courage to build 1024p O3K; and 4) History of MLP success resulted in IBM Star Cluster based MLP effort.
Derived from text
Parallel Programming; Central Processing Units; NASA Programs; Applications Programs (Computers)

20030014484 NASA Ames Research Center, Moffett Field, CA USA
Visual Inference Programming
Wheeler, Kevin, NASA Ames Research Center, USA; Timucin, Dogan, NASA Ames Research Center, USA; Rabbette, Maura, Bay Area Environmental Research Inst., USA; Curry, Charles, QSS Group, Inc., USA; Allan, Mark, QSS Group, Inc., USA; Lvov, Nikolay, QSS Group, Inc., USA; Clanton, Sam, QSS Group, Inc., USA; Pilewskie, Peter, NASA Ames Research Center, USA; Jun. 13, 2002; 17p; In English; National Research Council (NRC) Demo Presentations, 13 Jun. 2002, Unknown
Contract(s)/Grant(s): RTOP 704-00-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of visual inference programming is to develop a software framework data analysis and to provide machine learning algorithms for inter-active data exploration and visualization. The topics include: 1) Intelligent Data Understanding (IDU) framework; 2) Challenge problems; 3) What's new here; 4) Framework features; 5) Wiring diagram; 6) Generated script; 7) Results of script; 8) Initial algorithms; 9) Independent Component Analysis for instrument diagnosis; 10) Output sensory mapping virtual joystick; 11) Output sensory mapping typing; 12) Closed-loop feedback mu-rhythm control; 13) Closed-loop training; 14) Data sources; and 15) Algorithms. This paper is in viewgraph form.
CASI
Machine Learning; Scientific Visualization; Software Engineering; Computer Programming; Inference

20030014485 NASA Ames Research Center, Moffett Field, CA USA
Virtual Flight Rapid Integration Test Environment and Virtual Laboratory Demonstration
Jun. 13, 2002; 4p; In English; National Research Council (NRC) Demo Presentations, 13 Jun. 2002, Unknown
Contract(s)/Grant(s): RTOP 704-00-00; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper presents, in viewgraph form, the virtual flight rapid integration test environment and a demonstration of the virtual laboratory.
CASI
Flight Tests; Systems Integration; Virtual Reality; Flight Simulation

20030014497 NASA Ames Research Center, Moffett Field, CA USA
Intelligent Virtual Station (IVS)
Jun. 13, 2002; 4p; In English; National Research Council (NRC) Demo Presentations, 13 Jun. 2002, Unknown
Contract(s)/Grant(s): RTOP 704-00-00; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Intelligent Virtual Station (IVS) is enabling the integration of design, training, and operations capabilities into an intelligent virtual station for the International Space Station (ISS). A viewgraph of the IVS Remote Server is presented.
CASI
Virtual Reality; Artificial Intelligence; Systems Integration; Remote Control

20030014594 Defence Science and Technology Organisation, Maritime Operations Div., Edinburgh, Australia
Situation Description Language
Greenhill, S., Curtin Univ. of Technology, Australia; Venkatesh, S., Curtin Univ. of Technology, Australia; Pearce. A., Melbourne Univ., Australia; Ly, T. C., Defence Science and Technology Organisation, Australia; September 2002; 50p; In English
Report No.(s): DSTO-GD-0332; DODA-AR-012-415; Copyright; Avail: Issuing Activity
SDL is a Situation Description Language intended for use in situation assessment problems. SDL provides knowledge modelling and inference facilities for reasoning with information. The SDL includes an object-oriented data model with single inheritance. It provides a forward-chaining inference system using a RETE-based pattern matcher. SDL includes special data types to deal with time, space, and uncertainty. A hypothesis system allows the system to deal with multiple concurrent hypotheses in a systematic way. This document provides details required by programmers or knowledge engineers intending to use the SDL system.
Author
Object-Oriented Programming; Programming Languages; Knowledge; Inference; Models

20030014596 NASA Ames Research Center, Moffett Field, CA USA
Experiments with Test Case Generation and Runtime Analysis
Artho, Cyrille, Eidgenoessische Technische Hochschule, Switzerland; Drusinsky, Doron, Naval Postgraduate School, USA; Goldberg, Allen, Kestrel Technology, LLC, USA; Havelund, Klaus, Kestrel Technology, LLC, USA; Lowry, Mike, NASA Ames Research Center, USA; Pasareanu, Corina, Kestrel Technology, LLC, USA; Rosu, Grigore, Illinois Univ., USA; Visser, Willem, Research Inst. for Advanced Computer Science, USA; [2003]; 18p; In English; 10th International Workshop on Abstract State Machines, 3-7 Mar. 2003, Taormina, Italy; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
Software testing is typically an ad hoc process where human testers manually write many test inputs and expected test results, perhaps automating their execution in a regression suite. This process is cumbersome and costly. This paper reports preliminary results on an approach to further automate this process. The approach consists of combining automated test case generation based on systematically exploring the program's input domain, with runtime analysis, where execution traces are monitored and verified against temporal logic specifications, or analyzed using advanced algorithms for detecting concurrency errors such as data races and deadlocks. The approach suggests to generate specifications dynamically per input instance rather than statically once-and-for-all. The paper describes experiments with variants of this approach in the context of two examples, a planetary rover controller and a space craft fault protection system.
Author
Program Verification (Computers); Software Engineering; Run Time (Computers); Automation

20030014616 Kestrel Technology, LLC, Moffett Field, CA USA
Program Instrumentation and Trace Analysis
Havelund, Klaus, Kestrel Technology, LLC, USA; Goldberg, Allen, Kestrel Technology, LLC, USA; Filman, Robert, Research Inst. for Advanced Computer Science, USA; Rosu, Grigore, Research Inst. for Advanced Computer Science, USA; [2002]; 2p; In English; Monterey Workshop 2002: Radical Innovations of Software and Systems Engineering in the Future, 2002, Venice, Italy
Contract(s)/Grant(s): NAS2-00065; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Several attempts have been made recently to apply techniques such as model checking and theorem proving to the analysis of programs. This shall be seen as a current trend to analyze real software systems instead of just their designs. This includes our own effort to develop a model checker for Java, the Java PathFinder 1, one of the very first of its kind in 1998. However, model checking cannot handle very large programs without some kind of abstraction of the program. This paper describes a complementary scalable technique to handle such large programs. Our interest is turned on the observation part of the equation: How much information can be extracted about a program from observing a single execution trace? It is our intention to develop a technology that can be applied automatically and to large full-size applications, with minimal modification to the code. We present a tool, Java PathExplorer (JPaX), for exploring execution traces of Java programs. The tool prioritizes scalability for completeness, and is directed towards detecting errors in programs, not to prove correctness. One core element in JPaX is an

instrumentation package that allows to instrument Java byte code files to log various events when executed. The instrumentation is driven by a user provided script that specifies what information to log. Examples of instructions that such a script can contain are: 'report name and arguments of all called methods defined in class C, together with a timestamp'; 'report all updates to all variables'; and 'report all acquisitions and releases of locks'. In more complex instructions one can specify that certain expressions should be evaluated and even that certain code should be executed under various conditions. The instrumentation package can hence be seen as implementing Aspect Oriented Programming for Java in the sense that one can add functionality to a Java program without explicitly changing the code of the original program, but one rather writes an aspect and compiles it into the original program using the instrumentation. Another core element of JPaX is an observation package that supports the analysis of the generated event stream. Two kinds of analysis are currently supported. In temporal analysis the execution trace is evaluated against formulae written in temporal logic. We have implemented a temporal logic evaluator on finite traces using the Maude rewriting system from SRI International, USA. Temporal logic is defined in Maude by giving its syntax as a signature and its semantics as rewrite equations. The resulting semantics is extremely efficient and can handle event streams of hundreds of millions events in few minutes. Furthermore, the implementation is very succinct. The second form of even stream analysis supported is error pattern analysis where an execution trace is analyzed using various error detection algorithms that can identify error-prone programming practices that may potentially lead to errors in some different executions. Two such algorithms focusing on concurrency errors have been implemented in JPaX, one for deadlocks and the other for data races. It is important to note, that a deadlock or data race potential does not need to occur in order for its potential to be detected with these algorithms. This is what makes them very scalable in practice. The data race algorithm implemented is the Eraser algorithm from Compaq, however adopted to Java. The tool is currently being applied to a code base for controlling a spacecraft by the developers of that software in order to evaluate its applicability.
Author
Java (Programming Language); Program Verification (Computers); Computer Programs

62
COMPUTER SYSTEMS

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

20030012834 Crownpoint Inst. of Tech., Dept. of Applied Computers, Crownpoint, NM USA
EEE Parts Www Database Project/Research, Summer 2001
Voegele, Donald H., Crownpoint Inst. of Tech., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 74; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Ultimate goal of project: For EEE Parts to have a dynamic Web site Database FORM where various groups of users may display, insert, update, and delete data or Query according to that group's needs. An EEE Parts dynamic World Wide Web Site interacts with a database FORM to provide each EEE Parts group with an up-to-date record for each part. Each group (example: Design) updates their own data fields for their particular records and FORM. Parts groups are NASA wide and beyond. Previously a comprehensive LaRC NASA EEE Parts on-line Database did not exist. This project is a start in that direction. Strengths: The advantage of such a database FORM is its ease of use to access to information on all EEE parts. Software being used: Web Development Tool: Microsoft Visual Interdev 6, provides a vast array of capabilities for creating powerful Web applications. Database: Microsoft SQL Server; a high-end client/server database. Web Site Creation and Management, HTML Editor: Microsoft Front Page, tools to create, control and grow your Web Site. Operating System: Windows 2000: a Microsoft product and that has the best integration with Ms Visual InterDev, Ms SQL Server, and Ms Front Page. Windows 2000 includes a robust security system. This project remains to be continued, "completed," and constantly updated. It is unfinished in the following areas: Linking and access control for each group's Form to the Web Site and server, and Data or field content entry for each EEE part or record. It is "on-track" in User Groups, Fields and FORMS for each User Group to access, and a Web Page. Each FORM (containing the fields), with one record for each part is for each User Group to use for monitoring and updating parts data. Such an up-to-date, Web accessed, parts database will be very useful to the EEE parts group, and associated NASA wide (and beyond) functions and projects. For me the most valuable aspects of this ASEE summer project/ research are: 1) The research project itself, the opportunity to work with this database-driven Web site with its new challenged ideas and software variety, and the working for and with a highly experienced LaRC NASA associate. 2) The LaRC NASA work environment of engineers, scientists, technicians, and support staff, a collaborative effort for research. The ASEE lectures and tours were wonderful. 3) The context of LaRC: Hampton Roads/ Tidewater, Virginia, is a beautiful, lush, green, coastal multicultural, historic area with restaurants,

shopping and tourist opportunities. Overall I feel very comfortable at LaRC. I am a Vietnam era USAF veteran and the LaRC environment, people and resources, reminds me of the best of my Air Force experience. This has been the most beneficial (much learned), enjoyable and unique summer of my teaching career! People at LaRC and in Virginia have generally been so helpful and personable. I am honored to participate in the ASEE LaRC NASA summer faculty fellow program.
Author
Data Bases; Education; World Wide Web; Websites; On-Line Systems; Access Control

20030012954 Army Construction Engineering Research Lab., Engineer Research and Development Center, Champaign, IL USA
A Suggested Methodology for the Computation of Imagery-Based Terrain Data Reliability and Implementation into Tactical Decision Models ***Final Report***
Solcum, Kevin R.; Dec. 2002; 34p; In English
Report No.(s): AD-A409009; ERDC/TEC-TR-02-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The issue of data uncertainty and its impact on model output is discussed in this report under three topic areas. Modifiable methodologies for implementation of data reliability are provided for each topic. The first topic addresses the fact that new digital terrain data are created daily that directly supports tactical decision-making. It is common for decisions to be made without the full understanding of the contributing terrain data quality. Data are treated as spatially invariable in quality and devoid of any metric measuring the underlying certainty of feature classification. Commercial-off-the- shelf (COTS) image processing packages provide an opportunity to identify terrain classification reliability along with the class assignments. However, this opportunity for capturing reliability information is typically neither passed along into the final terrain class map output nor is it stored as a supplementary metadata file. Training sample contingency table scores are used to assign terrain feature class theme, or layer, reliability scores, and distance to class means computed using a Mahalanobis distance technique is used for assignment of within-terrain theme individual pixel reliability scores. For topic two, the value of reliability pixel scores being carried forward into a tactical decision-modeling environment is considered. Reliability from every pixel contributes to a final decision-model product reliability score at the pixel level. An example is provided. In topic three, terrain data layer contribution to model output for HLZ and BlV area tactical decision aids is evaluated on the basis of assessing importance (or weights) for individual or combined terrain layers. Kappa values designating terrain variable contribution are suggested as objective surrogate weights available for use in the HLZ and BIV modeling process.
DTIC
Image Processing; Digital Systems; Decision Making; Data Management; Terrain

20030012964 Lockheed Martin Corp., Hanford Corp., Richland, WA USA
Z-Plant Material Information Tracking System (ZMITS) Alternatives Analysis
Jul. 22, 1999; 28p; In English
Report No.(s): DE2002-798035; HNF-4672-REV-0; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document provides an alternatives analysis for software and interface development governing the implementation of ZMITS. It addresses the ZMITS/LANMAS Interface and software development.
NTIS
Analyzing; Interfaces; Software Engineering; Information Systems

20030013745 Executive Office of the President, Office of Science and Technology Policy, Washington, DC USA
Workshop on New Visions for Large-Scale Networks: Research and Applications
Mar. 2001; 64p
Report No.(s): PB2003-101784; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This paper documents the findings of the March 12-14, 2001 Workshop on New Visions for Large-Scale Networks: Research and Applications. The workshops objectives were to develop a vision for the future of networking (10 to 20 years out) and to identify needed Federal networking research to enable that vision. The meeting was sponsored by the Large Scale Networking Coordinating Group (LSN CG) of the Interagency Working Group in Information Technology Research and Development (IWG/IT R&D). The IWG, which functions under the White House National Science and Technology Council, coordinates Federal multiagency IT R&D efforts. The LSN CG agencies are DARPA, DOE, NASA, NIH, NIST, and NSF. The Network Research Team (NRT) of the LSN CG coordinated the workshop.
NTIS
Conferences; Computer Networks; Large Scale Integration

20030014141 Naval Undersea Warfare Center, Newport, RI USA
A Spatial Image Processor
Woodall, Roger L., Inventor; Dec. 19, 2002; 91p; In English
Patent Info.: US-Patent-Appl-SN-10-853932
Report No.(s): AD-D020046; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
A spatial image processor neural network for processing image data to discriminate between first and second spatial configurations of component objects includes a photo transducer input array for converting an input image to pixel data and sending the data to a localized gain network (LGN) module, a parallel memory processor and neuron array for receiving the pixel data and processing the pixel data into component recognition vectors and chaotic oscillators for receiving the recognition vectors and sending feedback data to the LGN module as attention activations. The network further includes a temporal spatial retina for receiving both the pixel data and temporal feedback activations and generating temporal spatial vectors, which are processed by a temporal parallel processor into temporal component recognition vectors. A spatial recognition vector array receives the temporal component recognition vectors and forms an object representation of the first configuration of component objects.
DTIC
Image Processing; Neural Nets; Parallel Processing (Computers); Computer Networks

20030014274 Transportation Research Board, Transit Cooperative Research Program, Washington, DC USA
Public Transportation Security: Volume 1. Communication of Threats: A Guide. Transit Cooperative Research Program (TCRP) Report 86
Balog, J. N.; Devost, M. G.; Sullivan, J. P.; 2002; 56p; In English
Report No.(s): PB2003-100209; TCRP-86; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Contents include the following: Introduction; Current Practice and Operational Needs; Communication of Threats Survey; Operational Parameters: Threat Information Forum; Technologies for Threat Information Dissemination; System Functional Requirements; Supplemental Issues; Conclusion; References; Appendix A: Acronym List; Appendix B: Public Transportation Systems Personnel Sent Survey Research Instruments; Appendix C: Survey Instrument and Transmittal Letter; Appendix D: Homeland Security Advisory System (HSAS) Conditions; Appendix E: Proposed Next Steps; Appendix F: Survey Results.
NTIS
Communication; Security; Transportation

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

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

20030013623 NASA Goddard Space Flight Center, Greenbelt, MD USA
A Convex Approach to Fault Tolerant Control
Maghami, Peiman G., NASA Goddard Space Flight Center, USA; Cox, David E., NASA Langley Research Center, USA; [2002]; 9p; In English; AIAA/AAS GN&C Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-4940; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
The design of control laws for dynamic systems with the potential for actuator failures is considered in this work. The use of Linear Matrix Inequalities allows more freedom in controller design criteria than typically available with robust control. This work proposes an extension of fault-scheduled control design techniques that can find a fixed controller with provable performance over a set of plants. Through convexity of the objective function, performance bounds on this set of plants implies performance bounds on a range of systems defined by a convex hull. This is used to incorporate performance bounds for a variety of soft and hard failures into the control design problem.
Author
Convexity; Fault Tolerance; Control Theory; Control Systems Design

20030014144 Department of the Navy, Washington, DC USA
Color Sensor
Woodall, Roger L., Inventor; Dec. 16, 2002; 35p; In English

Patent Info.: Filed 5 Oct. 2001; US-Patent-Appl-SN-09853921
Report No.(s): AD-D020040; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A color sensor for generating color information defining colors of an image includes an input section, a color processing section, a color comparison section, a color boundary processing section and a memory processing section. The input section includes an array of transducer pairs, each pair defining one of a plurality of pixels. Each transducer pair generates two peak outputs, one for the selected color of each transducer of the pair. A plurality of pixel processors in the color processing section each receives the outputs from one of the transducer pairs. The color processing section generates a color feature vector representative of the brightness of the light incident on the pixels and a color value corresponding to the ratio of outputs from the transducers comprising the transducer pair associated with the pixels. The color boundary processing section generates a plurality of color boundary feature vectors, each representing the difference between the color value for a pixel and its neighboring pixels. The color comparator processor measures and compares the reflective color of two objects and the memory processor section provides a process to recognize a color, a boundary of color and/or a comparison of colors.
DTIC
Color; Image Processing; Neural Nets; Comparators; Sensors

64
NUMERICAL ANALYSIS

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

20030012713 Mississippi Univ., University, MS USA
Applications of Random Methods in Combinatories and Scheduling Problems ***Final Report, 1 Jul. 2001-30 Sep. 2002***
Denley, Tristan; Reid, Talmage J.; Wu, Haidong; Dec. 19, 2002; 5p; In English
Contract(s)/Grant(s): N00014-01-1-0917
Report No.(s): AD-A408961; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Randomized Graph Coloring research aims to provide an efficient randomized algorithm for solving a specific NP-Hard problem, that of graph 3-coloring problem. The simulations are designed to test the practical behavior of the algorithm. Research in graphs and matroids will provide results publishable in top journals in Discrete Mathematics that generalize the existing literature. The objective of the connectivity research is to provide results about longest cycles and contractible edges in graphs and matroids. Such results have applications in combinatorial optimization problems.
DTIC
Algorithms; Combinatorial Analysis; Optimization; Discretization (Mathematics)

20030012797 NASA Langley Research Center, Hampton, VA USA
Eigenvalues of Rectangular Waveguide Using FEM With Hybrid Elements
Deshpande, Manohar D., NASA Langley Research Center, USA; Hall, John M., Lockheed Martin Corp., USA; [2002]; 4p; In English; 2002 IEEE International Symposium on Antennas and Propagation, 16-21 Jun. 2002, San Antonio, TX, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A finite element analysis using hybrid triangular-rectangular elements is developed to estimate eigenvalues of a rectangular waveguide. Use of rectangular vector-edge finite elements in the vicinity of the PEC boundary and triangular elements in the interior region more accurately models the physical nature of the electromagnetic field, and consequently quicken the convergence.
Author
Eigenvalues; Rectangular Waveguides; Finite Element Method

20030012800 NASA Langley Research Center, Hampton, VA USA
A Meshless Local Petrov-Galerkin Method for Euler-Bernoulli Beam Problems
Raju, I. S., NASA Langley Research Center, USA; Phillips, D. R., George Washington Univ., USA; [2002]; 6p; In English; International Conference on Computational Engineering and Science, 31 Jul. - 2 Aug. 2002, Reno, NV, USA
Contract(s)/Grant(s): NCC1-384; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An accurate and yet simple Meshless Local Petrov-Galerkin (MLPG) formulation for analyzing beam problems is presented. In the formulation, simple weight functions are chosen as test functions. The use of these functions shows that the weak form can be integrated with conventional Gaussian integration. The MLPG method was evaluated by applying the formulation to a variety

of patch test and thin beam problems. The formulation successfully reproduced exact solutions to machine accuracy when test functions with C2 continuity and an appropriate order of basis functions are used.
Author
Euler-Bernoulli Beams; Galerkin Method; Mathematical Models; Functions (Mathematics)

20030012801 NASA Langley Research Center, Hampton, VA USA
Multi-Variable Model-Based Parameter Estimation Model for Antenna Radiation Pattern Prediction
Deshpande, Manohar D., NASA Langley Research Center, USA; Cravey, Robin L., NASA Langley Research Center, USA; [2002]; 4p; In English; 2002 IEEE International Symposium on Antennas and Propagation, 9-13 Jun. 2002, San Antonio, TX, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A new procedure is presented to develop multi-variable model-based parameter estimation (MBPE) model to predict far field intensity of antenna. By performing MBPE model development procedure on a single variable at a time, the present method requires solution of smaller size matrices. The utility of the present method is demonstrated by determining far field intensity due to a dipole antenna over a frequency range of 100-1000 MHz and elevation angle range of 0-90 degrees.
Author
Antenna Radiation Patterns; Dipole Antennas; Models

20030012921 NASA Langley Research Center, Hampton, VA USA
Stochastic Estimation and Non-Linear Wall-Pressure Sources in a Separating/Reattaching Flow
Naguib, A., Michigan State Univ., USA; Hudy, L., Michigan State Univ., USA; Humphreys, W. M., Jr., NASA Langley Research Center, USA; [2002]; 6p; In English; 2002 Joint US ASME-European Fluids Engineering Division Summer Meeting, 14-18 Ju. 2002, Montreal, Quebec, Canada; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Report No.(s): FEDSM2002-31418; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Simultaneous wall-pressure and PIV measurements are used to study the conditional flow field associated with surface-pressure generation in a separating/reattaching flow established over a fence-with-splitter-plate geometry. The conditional flow field is captured using linear and quadratic stochastic estimation based on the occurrence of positive and negative pressure events in the vicinity of the mean reattachment location. The results shed light on the dominant flow structures associated with significant wall-pressure generation. Furthermore, analysis based on the individual terms in the stochastic estimation expansion shows that both the linear and non-linear flow sources of the coherent (conditional) velocity field are equally important contributors to the generation of the conditional surface pressure.
Author
Stochastic Processes; Wall Pressure; Separated Flow

20030012970 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Distance Metrics and Band Selection in Hyperspectral Processing with Applications to Material Identification and Spectral Libraries
Keahava, N.; Dec. 18, 2002; 93p; In English; Original contains color images
Contract(s)/Grant(s): F19628-00-C-0002
Report No.(s): AD-A409023; PR-HTAP-12; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
In this report, we investigate and exploit the properties of distance metrics in hyperspectral processing to achieve superior algorithm performance as well as dimension reduction. Distance metrics are mathematical operators that provide a scalar measure of similarity for two hyperspectral (vector) signals, and they are at the nucleus of many application algorithms. The similarity between two signals, however, can be measured by various means, and different distance metrics offer distinct notions of similarity. Consequently, a thorough understanding of the mathematical and physical properties of distance metrics is crucial to the accurate and efficient processing of hyperspectral data.
DTIC
Mathematics; Libraries; International System of Units

20030013751 National Central Univ., Dept. of Civil Engineering, Taoyuan Taiwan, Province of China
Study of a Hodograph Transformation and its Applications
Lei, Hin-Chi, National Central Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 707-714; In English; Copyright; Avail: Issuing Activity

A hodograph transformation found useful in linearizing equations in civil engineering is studied in this paper. The characteristics of the linearizable systems associated with the hodograph transformation are calculated. The general expressions of the linearizable parabolic and hyperbolic systems associated with the hodograph transformation are derived. The link between the hodograph transformation and the reciprocal transformation proposed by Kingston and Rogers is also studied and the merits of the hodograph transformation are pointed out. A new application of the hodograph transformation, namely, the reduction of the order of some nonlinear second order partial differential equations, is also presented. Two new examples are given for the linearization of nonlinear partial differential equation by the hodograph transformation.
Author
Hodographs; Transformations (Mathematics); Nonlinear Equations

20030013997 Technische Hochschule, Stuttgart, Germany
Virtual Nonlinear Multibody System, Volume 1
Schiehlen, Werner; Valasek, Michael; Jul. 2002; 276p; In English, 23 Jun. - 3 Jul. 2002, Prague, Czechoslovakia
Contract(s)/Grant(s): N62358-02-M-6031
Report No.(s): AD-A409218; ARDSG-R/D 9315-AN-02-Vol-1; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Multibody system dynamics is based on classical mechanics and its engineering applications ranging from mechanisms, gyroscopes, satellites and robots to biomechanics and vehicle engineering. Multibody systems dynamics is characterized by algorithms or formalisms, respectively, ready for computer implementation. The simulation of multibody systems demands for adequate dynamic models and takes into account various phenomena. Classical dynamics does not regard all nonlinear effects that appear as a result of the action of multibody systems, as well as their mutual interaction. The virtual prototyping and dynamic modeling of such systems are, from an economical point of view, perspective fields of scientific investigations having in mind the huge expenses for their design and manufacturing. Complex multibody systems composed of rigid and flexible bodies performing spatial motion and various complex tasks are up-to-date objects of virtual prototyping. As a result simulation and animation featuring virtual reality are most important. Recent research fields in multibody dynamics include standardization of data, coupling with CAD systems, parameter identification, real-time animation, contact and impact problems, extension to electronic and mechatronic systems, optimal system design, strength analysis and interaction with fluids. Further, there is a strong interest on multibody systems in analytical and numerical mathematics resulting in reduction methods for the rigorous treatment of simple models and special integration codes for Ordinary Differential Equation (ODE) and Differential Algebraic Equation (DAE) representations supporting the numerical efficiency. New software engineering tools with modular approaches improve the efficiency still required for the more demanding needs in biomechanics, robotics and vehicle dynamics.
DTIC
Nonlinear Systems; Virtual Reality

20030014282 Lawrence Livermore National Lab., Livermore, CA USA
AMR vs High Order Schemes, Wavelets as a Guide
Jameson, L.; Oct. 18, 2000; 30p; In English
Report No.(s): DE2002-792709; UCRL-ID-140768; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The final goal behind any numerical method is give the smallest wall-clock time for a given final time error or, conversely, the smallest run-time error for a given wall clock time, etc. Here a comparison will be given between adaptive mesh refinement schemes and non-adaptive schemes of higher order. It will be shown that in three dimension calculations that in order for AMR schemes to be competitive that the finest scale must be restricted to an extremely, and unrealistic, small percentage of the computational domain.
NTIS
Numerical Analysis; Computer Programming

20030014491 NASA Ames Research Center, Moffett Field, CA USA
Dynamical Approach Study of Spurious Numerics in Nonlinear Computations
Yee, H. C., NASA Ames Research Center, USA; Dec. 12, 2002; 1p; In English; Short Course in Numerical Methods in Mechanics, 10-13 Feb. 2003, Tullahoma, TN, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The last two decades have been an era when computation is ahead of analysis and when very large scale practical computations are increasingly used in poorly understood multiscale complex nonlinear physical problems and non-traditional fields. Ensuring a higher level of confidence in the predictability and reliability (PAR) of these numerical simulations could play a major role in furthering the design, understanding, affordability and safety of our next generation air and space transportation systems, and systems for planetary and atmospheric sciences, and in understanding the evolution and origin of life. The need to

guarantee PAR becomes acute when computations offer the ONLY way of solving these types of data limited problems. Employing theory from nonlinear dynamical systems, some building blocks to ensure a higher level of confidence in PAR of numerical simulations have been revealed by the author and world expert collaborators in relevant fields. Five building blocks with supporting numerical examples were discussed. The next step is to utilize knowledge gained by including nonlinear dynamics, bifurcation and chaos theories as an integral part of the numerical process. The third step is to design integrated criteria for reliable and accurate algorithms that cater to the different multiscale nonlinear physics. This includes but is not limited to the construction of appropriate adaptive spatial and temporal discretizations that are suitable for the underlying governing equations. In addition, a multiresolution wavelets approach for adaptive numerical dissipation/filter controls for high speed turbulence, acoustics and combustion simulations will be sought. These steps are corner stones for guarding against spurious numerical solutions that are solutions of the discretized counterparts but are not solutions of the underlying governing equations.
Author
Numerical Analysis; Nonlinearity; Computation

20030014581 NASA Ames Research Center, Moffett Field, CA USA
Comparison of Evolutionary (Genetic) Algorithm and Adjoint Methods for Multi-Objective Viscous Airfoil Optimizations
Pulliam, T. H., NASA Ames Research Center, USA; Nemec, M., Toronto Univ., Canada; Holst, T., NASA Ames Research Center, USA; Zingg, D. W., Toronto Univ., Canada; Nov. 14, 2002; 12p; In English; 41st Aerospace Sciences Meeting, 6-10 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0298; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

A comparison between an Evolutionary Algorithm (EA) and an Adjoint-Gradient (AG) Method applied to a two-dimensional Navier-Stokes code for airfoil design is presented. Both approaches use a common function evaluation code, the steady-state explicit part of the code,ARC2D. The parameterization of the design space is a common B-spline approach for an airfoil surface, which together with a common griding approach, restricts the AG and EA to the same design space. Results are presented for a class of viscous transonic airfoils in which the optimization tradeoff between drag minimization as one objective and lift maximization as another, produces the multi-objective design space. Comparisons are made for efficiency, accuracy and design consistency.
Author
Viscosity; Airfoils; Genetic Algorithms

20030014606 NASA Glenn Research Center, Cleveland, OH USA
MAC/GMC 4.0 User's Manual: Keywords Manual, Volume 2
Bednarcyk, Brett A., Ohio Aerospace Inst., USA; Arnold, Steven M., NASA Glenn Research Center, USA; December 2002; 160p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-73-16; RTOP 708-87-05
Report No.(s): NASA/TM-2002-212077/VOL2; E-13725-2/VOL2; NAS 1.15:212077/VOL2; Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

This document is the second volume in the three volume set of User's Manuals for the Micromechanics Analysis Code with Generalized Method of Cells Version 4.0 (MAC/GMC 4.0). Volume 1 is the Theory Manual, this document is the Keywords Manual, and Volume 3 is the Example Problem Manual. MAC/GMC 4.0 is a composite material and laminate analysis software program developed at the NASA Glenn Research Center. It is based on the generalized method of cells (GMC) micromechanics theory, which provides access to the local stress and strain fields in the composite material. This access grants GMC the ability to accommodate arbitrary local models for inelastic material behavior and various types of damage and failure analysis. MAC/GMC 4.0 has been built around GMC to provide the theory with a user-friendly framework, along with a library of local inelastic, damage, and failure models. Further, applications of simulated thermo-mechanical loading, generation of output results, and selection of architectures to represent the composite material have been automated in MAC/GMC 4.0. Finally, classical lamination theory has been implemented within MAC/GMC 4.0 wherein GMC is used to model the composite material response of each ply. Consequently, the full range of GMC composite material capabilities is available for analysis of arbitrary laminate configurations as well. This volume describes the basic information required to use the MAC/GMC 4.0 software, including a 'Getting Started' section, and an in-depth description of each of the 22 keywords used in the input file to control the execution of the code.
Author
User Manuals (Computer Programs); Micromechanics; Plastic Properties; Elastic Properties

20030014609 NASA Ames Research Center, Moffett Field, CA USA

Kernel Partial Least Squares for Nonlinear Regression and Discrimination

Rosipal, Roman, NASA Ames Research Center, USA; [2002]; 12p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper summarizes recent results on applying the method of partial least squares (PLS) in a reproducing kernel Hilbert space (RKHS). A previously proposed kernel PLS regression model was proven to be competitive with other regularized regression methods in RKHS. The family of nonlinear kernel-based PLS models is extended by considering the kernel PLS method for discrimination. Theoretical and experimental results on a two-class discrimination problem indicate usefulness of the method.

Author

Hilbert Space; Kernel Functions; Mathematical Models; Nonlinearity; Regression Analysis

65
STATISTICS AND PROBABILITY

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

20030012720 Sparta, Inc., Huntsville, AL USA

A Methodology for Assessing and Ranking Ballistic Missile Defense Technologies Using a System Performance Index

McDonanld, William C.; Haight, Jeffrey; Jul. 29, 2002; 11p; In English; Original contains color images; See Also ADM201460. Papers from Unclassified Proceedings from the 11th Annual AIAA/MDA Technology Conference held 29 July - 2 August 2002 in Monterey, CA., The original document contains color images

Report No.(s): AD-A408950; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The question of where to best invest limited research and development funds is a major concern. In missile defense the problem is exacerbated by the diversity of technologies that may be employed. Frequently, subjective methods such as the Delphi method and various weighting schemes are employed to rank choices. This paper introduces an objective methodology that avoids the problems encountered in subjective weighting schemes. It utilizes a System Performance Index (SPI) based on the physics of the problem as a unifying measure for assessing and ranking diverse technologies. The SPI is coupled with five other measures resources, cost, return on investment, technology readiness level, and time of insertion to completely characterize the technology with respect to a baseline. The SPI is calculated as the summation of the product of the Probability of Zero Leakage and the Value of the target area over the entire defended region. The methodology utilizes an abstract system model that embodies the physics of the problem and operates with Critical Performance Parameters that can be derived for the technologies using well-established analytical models and processes. Available tools for implementing the methodology and shortcomings are discussed, and the methodology is demonstrated through and example.

DTIC

Ballistic Missiles; Mathematical Models; Missile Defense; Technology Assessment; Methodology

20030012723 Memphis Univ., Memphis, TN USA

Classification and Selection for Personnel Applications Using a Data Envelopment Analysis Approach ***Final Report, 1 Jun. 2001-30 Sep. 2002***

Retzlaff-Roberts, Donna; Dula, Jose H.; Van Scotter, James; Dec. 31, 2002; 6p; In English; Prepared in cooperation with School of Business, Univ. of Mississippi, University, MS

Contract(s)/Grant(s): N00014-01-1-0917; Proj-3712

Report No.(s): AD-A409042; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project develops and tests a new approach for improving the effectiveness of personnel selection and classification decisions There are three main data characteristics that cause difficulty for existing classification methods: (1) unbalanced group sizes, (2) unequal misclassification costs, and (3) non-normal data Preliminary research suggests a hybrid method incorporating data envelopment analysis (DEA) and linear programming discriminant analysis (DEA/DA) is effective in this difficult situation and outperforms other methods Research is conducted to fully develop and test this promising methodology. Results suggest ways DEA/DA may help alleviate long-standing selection and classification problems.

DTIC

Linear Programming; Discriminant Analysis (Statistics); Personnel Selection; Classifications

20030012938 Tsentralni Aerogidrodinamicheskii Inst., Zhukovsky, Russia
Comparison of Monte-Carlo Modeling and Experimental Results of UV-Emission from Engine Exhaust Plume Interacting with Upper Atmosphere
Erofeev, Alexander I.; Friedlander, Oscar G.; Karabadzhak, George F.; Plastinin, Yurii A.; Jul. 09, 2000; 8p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on CD-ROM
Report No.(s): AD-A409198; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Approximate method for Monte Carlo modeling of interaction of high-altitude engine exhaust plume with atmosphere has been developed. The method was applied for analysis of recent experimental data on Russian spacecraft Soyuz plume glow. In particular, sensitivity of computed glow radiation to the choice of elastic collision cross-section of atmospheric oxygen with plume molecules and its reaction cross-section with water molecules in the plume is analyzed. Conclusions are made about these cross-sections values.
DTIC
Monte Carlo Method; Rocket Exhaust; Ultraviolet Emission; Upper Atmosphere

20030014116 Nebraska Univ., Dept. of Computer Science, Omaha, NE USA
Nonmonotonic Extrapolation of Causal Relations for Knowledge-Based Decision Support Using a Bayesian Network Approach *Final Report, 1 Apr. 1999-31 Sep. 2002*
Zhu, Qiuming; Sep. 2002; 32p; In English
Contract(s)/Grant(s): F49620-99-1-0211
Report No.(s): AD-A409265; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This research focuses on an investigation of a new computational model for providing reliable decision support in military operations. The PT used a Bayesian network representation and a human-centered reasoning technique to extrapolate the causal relations between the available data sets stored in heterogeneous databases and the phenomena implications coherent to real world situations. The PT had developed a software agent interface for integrating the data mining and decision support operations. A nonmonotonic reasoning paradigm for derivation of causal relations was implemented in an integration of relevant software modules. The agent interface was featured with an interactive graphics setting for display and manipulation of, the Bayesian Network representations, for multiple database accesses, and for belief propagation. An interactive and iterative knowledge acquisition and Bayesian reasoning system prototype was developed on top of the agent interface.
DTIC
Software Engineering; Bayes Theorem; Data Mining; Computer Graphics; Computer Programs

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20030012774 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Parallel Volume Rendering Algorithms for Computational Flow Imaging
Wu, Yingchuan; Le, Jialing; He, Anzhi; Aug. 23, 2002; 7p; In English; See also ADM001433, Conference held International Conference on Methods of Aerophysical Research (11th) Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409188; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Computational flow imaging (CFI) uses theoretical predictions of the interaction and transmission of optical waves through theoretical flowfield to generate digital pictures that simulate real observations, but visualizing three-dimensional unstructured data from aerodynamics calculations is challenging because the associated meshes are typically larger in size and irregular in both shape and resolution. The goal of this research is to develop a fast, efficient parallel volume rendering algorithm of computational flow imaging (corresponding to shadowgraph, schlieren and interferometer) tor parallel distributed-memory supercomputers consisting of a large number of powerful processors. We use a preprocessing procedure that the whole flow field is divided into new regular regions in which the vowels are distributed by x and y coordinates so that the ray-casting and field reconstructing can provide maximum flexibility in the data distribution and rendering steps.
DTIC
Flow Distribution; Mathematical Models; Parallel Flow; Computational Fluid Dynamics

20030012784 Hochschule der Bundeswehr, Inst. fuer Angewandte Systemforschung und Operations Research, Neubiberg Germany

Applications of Game Theory ***Anwendungen der Spieltheorie***

Avenhaus, Rudolf; Lehmann, Fritz; Wolling, Andreas; Jan. 1997; 277p; In German

Report No.(s): AD-A408977; BERICHT-S-9703; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Games Theory applications are put forth in a series of contributive papers on various aspects: economic, political and social, arms control and disarmament, biology, and information technologies. Approximately half of the study covers the more general economic, political and social spheres, which is typical, since Game Theory is not purely mathematical nor scientific, but deals with human conflict and decision-making as well. The two contributions on the relation of Game Theory to Evolution, however, belie this commonly held notion.

DTIC

Game Theory; Disarmament; Economics; Military Operations

20030012972 Mississippi Univ., University, MS USA

Modeling and Solution Procedures for Diversity Maximization ***Final Report, 1 Apr. 2000-31 Mar. 2002***

Kochenberger, Gary; Glover, Fred; Alidaee, Bahram; Womer, Keith; Jul. 01, 2002; 8p; In English

Contract(s)/Grant(s): N00014-00-1-0598

Report No.(s): AD-A409029; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Many important problems involve selecting a subset from a larger population such that the aggregate diversity of the subset selected is a large as possible. This problem, known as the diversity maximization problem, is known to be NP-hard. As such, it is very challenging from a computational point of view and only very small (toy) problems can be solved to optimality. Accordingly, most research into the important area has focused on various heuristic approaches. In this research, we report on a new tabu search-based approach to the diversity maximization (MD) problem. We also indicate how additional considerations (constraints) can be folded into the MD model and readily accommodated. Our results are very attractive in terms of both effectiveness and efficiency as we are now quickly solving problems many times larger than previously reported in the literature. Moreover, the solution method we developed for MD has application to a wide variety of other problem areas for which a common thread with MD had not previously been noted in the literature. Thus we are able to greatly leverage the work pioneered here to provide solution procedures for other problems.

DTIC

Heuristic Methods; Computer Programs

20030013987 Naval Research Lab., Bay Saint Louis, MS USA

Software Design Description for the Simulating Waves Nearshore Model (SWAN)

Allard, Richard; Rogers, Erick; Carroll, Suzanne N.; Rushing, Kate V.; Nov. 15, 2002; 219p; In English

Report No.(s): AD-A409177; NRL/MR/7320--02-8285; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Simulating WAves Nearshore (SWAN) is a third-generation numerical wave model developed for wave computations in coastal regions and inland waters. The model is based on an Ealerian formulation of the discrete spectral balance of action density that accounts for refractive propagation over arbitrary bathymetry and current fields. SWAN is driven by boundary conditions and local winds. The processes of wind generation, whitecapping, quadruplet wave-wave interactions, bottom dissipation, triad wave-wave interactions, and depth-induced wave breaking are represented explicitly, though SWAN does not account for diffraction. SWAN's numerical propagation scheme is implicit; thus the model is most efficient (relative to other models) when applied to cases with relatively high geographic resolution (i.e., cases of smaller scale). SWAN has been validated by comparisons with analytical solutions, and laboratory and field observations. SWAN is the state-of-the art phase-averaged coastal wave model (at the time of this writing). As a third-generation model, SWAN models propagation and dissipation explicitly. it also allows for simple integration of future developments in formulations for the physical processes mentioned above, as SWAN is a strictly and logically modular program.

DTIC

Mathematical Models; Software Engineering; Wave Propagation; Computerized Simulation

20030014194 Kyushu Univ., Dept. of Aeronautics and Astronautics, Fukuoka, Japan

Numerical Simulation of Rarefied Nozzle Plume Impingements

Hyakutake, Toru; Nishide, Michio; Jul. 09, 2000; 7p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom

Report No.(s): AD-A409112; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes numerical simulation of rarefied nozzle plume impingements. Two different reservoir pressures 400 kPa and 4 kPa are considered, In the case of 400 kPa, the simulation of the nozzle flow was conducted by using the Navier-Stokes equation and then the analysis of the plume flow was carried out by the DSMC method employing the nozzle exit conditions obtained by Navier-Stokes equation. On the other hand, for 4 kPa both the nozzle flow and the plume impingement have been calculated using the DSMC method. Concerning the angle between the nozzle axis and the flat plate, three kinds of angle are selected, that is 90 degrees, 45 degrees and 0 degrees. In addition, we considered the case where there exists a flat plate behind the nozzle. Simulated results have been compared with the existing experiments for the pressure and shear stress distributions on the flat plate. A good agreement between the DSMC results and the experiments are shown. In the case of the oblique and parallel impingements, the location of the impingement pressure peak and the stagnation point shifted upstream with increasing rarefaction.
DTIC
Mathematical Models; Numerical Analysis; Nozzles; Plumes; Computational Fluid Dynamics; Navier-Stokes Equation

67
THEORETICAL MATHEMATICS

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

20030012722 Paris VI Univ., France
Kinetic Description for a Suspension of Inelastic Spheres: Boltzmann and BGK Equations
Croizet, Cedric; Gatignol, Renee; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom
Report No.(s): AD-A409043; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The problem of a two-phase dispersed medium is studied within the kinetic theory. In the case of small and undeformable spheres that have all the same radius, a model for the collision operator of the Boltzmann equation is proposed. The collisions are supposed instantaneous, binary and inelastic. The obtained collision operator allows, to prove the existence of an H theorem in several configurations according to the assumptions made about the particles and particularly in the case of a diluted suspension of weakly inelastic collisions. Because of the complexity of the non linear structure of the collision integral, the Boltzmann equation is very difficult to solve and to analyze. It is therefore interesting to introduce a BGK model equation to study qualitatively its solution. In order to be physically realistic and consistent with the assumptions related to the collisions, a collision frequency depending on the particles velocities is chosen. Moreover, the collision frequency is expected to vary strongly with the particles velocities. Taking this into account, a BGK model is written. All the basic properties of the original operator are retained.
DTIC
Mathematical Models; Nonlinear Systems; Kinetic Theory; BGK Model; Boltzmann Transport Equation; Spheres; Inelastic Collisions

20030013648 Columbia Univ., Dept. of Biomedical Engineering, New York, NY USA
MRI Scan Time Reduction through K-Space Data Sharing in Combo Acquisitions with a Spin Echo Sequence
Mekle, R.; Wu, E. X.; Laine, A. F.; Oct. 25, 2001; 5p; In English; Papers from the 23rd Annual International Conference of the IEEE engineering in Medicine and Biology Society, October 25-28, 2001, held in Istanbul, Turkey. See also ADM001351 for entire conference on cd-rom
Report No.(s): AD-A409317; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We propose a technique to reduce scan time for magnetic resonance imaging (MRI) through sharing of k-space data between images, As a proof of concept, we ran simulations of MRI experiments based on Bloch equations using a spin echo sequence. We generated images of a realistic brain phantom containing the tissues: white matter, gray matter, and cerebrospinal fluid. A set of k-space data was acquired while varying, two acquisition parameters: repetition time (TR) and echo time (TE). This data set was then used to reconstruct multiple images of different contrasts. Customized variation of TR and TE allowed us to obtain different contrast weightings of signal values. We present results for 2-contrast and 3-contrast combo acquisitions and compare them with images from acquisitions with fixed TR and TE. Scan time reductions of 30%- 52% were achieved. Artifacts stemming from non-uniform and tissue-dependent data weighting in the Fourier domain were minimized through systematic optimization of the order of phase encoding and of variation schemes for TR and TE. No obvious degradation of image quality and resolution was

observed. In addition, we quantitatively analyzed preservation of contrast, image profiles of sharp tissue boundaries, and signal-to-noise-ratios.
DTIC
Imaging Techniques; Magnetic Resonance; Repetition; Echoes; Fourier Analysis

70
PHYSICS (GENERAL)

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

20030012565 Lawrence Livermore National Lab., Livermore, CA USA
Nuclear Excitation by Electronic Transition - NEET
Becker, J. A.; Jun. 10, 2002; 12p; In English
Report No.(s): DE2002-803174; UCRL-JC-149000; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Nuclear excitation by electronic transition (NEET) is a rare decay mode for excited atomic states resulting in nuclear excitation. (Atomic states ordinarily decay via x-ray emission and Auger emission.) NEET requirements include energy degeneracy between the atomic and nuclear states, and the same transition multipolarity between the states. The development on intense beams of synchrotron radiation has enabled experiments designed to measure the probability of NEET (PNEET) induced by synchrotron radiation in nuclei where the NEET conditions are met. Rare as the phenomenon is, observation of NEET induced by synchrotron radiation has been reported by Kishimoto, et al. The focus of this manuscript is on describing the process, some recent experiments, and some ideas for future experiments.
NTIS
Excitation; Electron Transitions

20030012603 Argonne National Lab., IL USA
Flavor Structure of the Nucleon as Revealed at Hermes
Jackson, H. E.; 2002; In English
Report No.(s): DE2002-801582; No Copyright; Avail: National Technical Information Service (NTIS)
The flavor structure of the nucleon as revealed in parton distributions (PDF's) is central to understanding the partonic structure of the nucleon. Recent data on unpolarized PDF's and their implications for the flavor-dependent quark helicity distributions are discussed. Results are presented for spin asymmetries in inclusive and semi-inclusive cross sections for production of pions, and kaons measured by the HERMES experiment in deep-inelastic scattering of polarized positrons on proton and deuterium Targets. A full 5 component extraction of polarized quark distributions for u, d, (bar u), (bar d), and <s+(bars)greaterthanisrepoted.
NTIS
Nucleons; Cross Sections; Spin

20030012626 Fermi National Accelerator Lab., Batavia, IL USA
CDF Status and B Physics Prospects
Miller, J. S.; Oct. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): DE2002-802077; FERMILAB-CONF-02/232-E; No Copyright; Avail: National Technical Information Service (NTIS)
With extensive upgrades to the detector and electronics, CDF has started collecting data with Run II of the Tevatron. The enhanced silicon coverage and the use of silicon based tracks in the trigger, make CDF well suited for a broad program of B hadron measurements. We present the current status of the experiment and prospects for measurements in Run II.
NTIS
Data Acquisition; Hadrons; Particle Accelerators; Silicon

20030012717 Aerospace Corp., Space Systems Div., El Segundo, CA USA
Vibration of Pressurized Thin-Walled Cylinder Induced by Pulsed Laser
Mirels, Harold; Zondervan, Kevin L.; Jul. 29, 2002; 12p; In English; See Also ADM201460. Papers from Unclassified Proceedings from the 11th Annual AIAA/MDA Technology Conference held 29 July - 2 August 2002 in Monterey, CA

Contract(s)/Grant(s): F04701-00-C-0009
Report No.(s): AD-A408955; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Differential equations are presented that describe wall oscillations of a gas-pressurized thin-walled cylinder for cases where variations in the axial direction are negligible. A linear stress/strain relation is assumed. Harmonic solutions are obtained. Limiting forms of these solutions are given for cases where the mode number, n = 0, 1, 2,..., is moderate and for cases where the mode number is large. In the former case, curvature effects are important. In the latter case, the vibrations behave locally like those on a flat plate. The applicability of the harmonic solutions, for evaluating the hoop stress induced by a high energy pulsed laser beam, is discussed. The maximum stress induced during the initial transient is investigated. An estimate is given for the maximum stress perturbation induced by a ”slab” type (no axial variation) beam with uniform fluence and width equal to the cylinder diameter. In this case, the estimate for the maximum value of the laser induced hoop stress perturbation sigma sub m, is found from sigma sub m/sigma sub i = (CF/pa)(E’/p) sup 1/2 where sigma sub i, C, F, P, a, E’, and p are initial pressure induced hoop stress, coupling coefficient, fluence, cylinder internal pressure, cylinder radius, effective wall modulus of elasticity, and wall density, respectively. The maximum stress perturbation induced by slab and circular cross-section laser beams, with non-uniform profiles and widths which are small compared with cylinder radius, are also estimated. For the case of a narrow slab beam, the upper bound on the laser induced hoop stress is found from sigma sub m/sigma sub i - 0.5(CF sub 0/pa) exp 2(E’/p) where F sub 0 is center line fluence.
DTIC
Pulsed Lasers; Thin Walls; Vibration; Pressurizing; Harmonics; Cylindrical Bodies; High Power Lasers

20030012762 Impact Technologies, LLC, Rochester, NY USA
Examination of Successful Modal Analysis Techniques Used for Bladed-Disk Assemblies
Orsagh, R. F.; Roemer, M. J.; Jan. 2002; 13p; In English; Original contains color images
Report No.(s): AD-A408923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Modal testing of bladed-disk assemblies in turbomachines is used to identify the critical natural frequencies and mode shape information used for avoiding the per-rev resonant conditions that cause high cycle fatigue (HCF) leading to premature blade and disk failures. In order to obtain the high quality modal data necessary for accurate modal identification, experience plays a major role in understanding the strengths and weaknesses associated with the variety of testing techniques. Application-specific concerns such as the blade-root disk interface connectivity, tiewire looseness and cover band design must be understood prior to test. Choices such as pre-test bladed-disk preparation, modal excitation driving point location, hammer versus shaker force excitation methods, shaker driving signal approaches, accelerometer type and location, and windowing are all important aspects that must be considered when testing specific bladed-disk configurations. Turbomachinery-specific modal analysis techniques including extraction of harmonic content and use of interference diagrams for identification of resonance conditions are also presented. The mentioned concepts are described in detail with reference to examples, which highlight the importance of the modal testing techniques implemented for a variety of applications.
DTIC
Turbomachinery; Vibration Mode; Turbine Blades; Mechanical Properties

20030012899 Lund Univ., Sweden
Multi-hadron Final States
Loennblad, L.; Respond, J.; Zielinski, M.; Aug. 30, 2002; 24p; In English
Report No.(s): DE2002-801572; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This summary aims to highlight major results and insights gained from recent studies of hadronic final states in ep, p(bar p), e(sup +)e(sup -), as well as relevant theoretical developments, presented in the Multi-hadron final states parallel sessions of the DIS2002 workshop held in Krakow, Poland in May 2002.
NTIS
Hadrons; Scattering; Inelastic Scattering

20030012900 Fermi National Accelerator Lab., Batavia, IL USA
Hopf’s Limiting Cycle: A Method to Measure the Electron Cooling Force
Ng, K. Y.; Sep. 2002; 16p; In English
Report No.(s): DE2002-801549; FERMILAB-TM-2186; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The longitudinal phase space structure of protons in the presence of an electron drag force is studied. Depending on the relative difference in average proton velocity and electron velocity, the fixed point near the center of the phase space can be stable

or unstable. When it is unstable, a stable Hopf's limit cycle exists. by measuring the appearance and size of the Hopf's limit cycle, the electron cooling force can be deduced.
NTIS
Cooling; Drag; Electrons; Protons

20030012902 Oak Ridge National Lab., TN USA
Results of the Cryogenic Testing of the SNS Prototype Cryomodule
Campisi, I. E.; Ciovati, G.; Daly, E.; Davis, G. K.; Delayen, J. R.; 2002; 7p; In English
Report No.(s): DE2002-801209; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Jefferson Lab has developed a prototype of the medium beta SNS cryomodule. Tests were recently performed on the module, which includes three 805 MHz cavities of beta=0.61, with coaxial power couplers and frequency tuners (mechanical and piezoelectric). The cavities exceeded accelerating gradients of 16 MV/m (design value 10.5 MV/m) with Q(sub 0)'s of about 10(sup 10) at the design field. One of the power couplers has been tested up to peak powers of over 700 kW. Results of the tests are reported in this paper.
NTIS
Linear Accelerators; Cryogenics

20030012903 Jefferson (Thomas) Lab. Computer Center, Newport News, VA USA
Operation of an Optical Klystron with Small Dispersion
Benson, S.; 2002; 14p; In English
Report No.(s): DE2002-801206; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The IR Upgrade design at Jefferson Lab uses an optical klystron in order to enhance the flexibility of the free-electron laser system and to match the efficiency to the energy recovery lattice. Most optical klystrons operate with a strong dispersion section. The IR upgrade design requires operation with a dispersion of only a few periods in order to allow the full range of efficiency of the FEL to be explored. This paper will study the details of an optical klystron in this small dispersion limit. The peak gain vs. dispersion section strength has an oscillatory behavior, suggesting that the dispersion section strength should be adjusted in unit steps rather than continuously. The gain vs. the effective number of periods is calculated and found to be, on average, in good agreement with theory. Finally, some comments on the relative merits of using an optical klystron or a uniform wiggler in a high power FEL will be presented.
NTIS
Klystrons; Design; Operations

20030012909 Lawrence Livermore National Lab., Livermore, CA USA
Optical Constants of Beryllium from Photoabsorption Measurements for X-Ray Optics Applications
Soufli, R.; Bajt, S.; Gullikson, E. M.; Sep. 30, 1999; 14p; In English
Report No.(s): DE2002-792603; UCRL-JC-134896; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Beryllium (Be) has been recently receiving considerable attention as the key material for a range of potential applications in the extreme ultraviolet (EUV) and x-ray region. Most notably, it has been successfully implemented as the spacer material in beryllium-based multilayer mirrors for EUV lithography, achieving experimental reflectivities of about 70% at wavelengths around 11.4 nm. Knowledge of the absorptive and dispersive properties of this material thus becomes important for the modeling of these optics. Experimental photoabsorption results in the region 40-250 eV, derived from transmission measurements on free-standing beryllium foils, are presented in this work.
NTIS
Beryllium; Photoabsorption; Optical Properties

20030012973 Air Force Research Lab., Sensors Directorate, Hanscom AFB, MA USA
Space Fed Subarray Synthesis Using Displaced Feed Location
Mailloux, Robert J.; Jan. 15, 2002; 4p; In English
Report No.(s): AD-A409030; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Wideband space-fed subarray systems are often proposed for large airborne or spaceborne scanning array applications. These systems allow the introduction of time delay devices at the subarray input terminals while using phase shifters in the array face. This can sometimes reduce the number of time delayed controls by an order of magnitude or more. The implementation of this technology has been slowed because the feed network, usually a Rotman Lens or Butler Matrix, is bulky, heavy and often has significant RF loss. In addition, the large lens aperture is necessarily filled with phase shifters, and so it introduces further loss,

weight, and perhaps unacceptable phase shifter control power. These systems are currently viewed with increased interest because combination of low loss, low power MEMS phase shifters in the main aperture and solid state T/R modules in the feed might lead to large scanning arrays with much higher efficiency then previously realizable. Unfortunately, the conventional system design imposes an extremely large dynamic range requirement when used in the transmit mode, and requires very high output power from the T/R modules. This paper presents one possible solution to this problem using a modified feed geometry.
DTIC
Arrays; Beamforming

20030013735 Brookhaven National Lab., Physics Dept., Upton, NY USA
Transiting Topological Sectors with the Overlap
Creutz, M.; Sep. 04, 2002; 10p; In English
Report No.(s): DE2002-802883; BNL-69347; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The overlap operator provides an elegant definition for the winding number of lattice gauge field configurations. Only for a set of configurations of measure zero is this procedure undefined. Without restrictions on the lattice fields, however, the space of gauge fields is simply connected. I present a simple low dimensional illustration of how the eigenvalues of a truncated overlap operator flow as one travels between different topological sectors.
NTIS
Eigenvalues; Lattices (Mathematics); Topology

20030014068 Tera Research, Inc., Sunnyvale, CA USA
Exploiting MO Crystals and Faraday Effect in Magnetic Sensing
White, Robert C.; Feb. 25, 2002; 6p; In English; Original contains color images
Report No.(s): AD-A409237; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Magneto-optics (MO) technology is believed to be far more advanced in the former Soviet Union when compared to the US. This is evidenced by the existence of factories geared for the production of Yttrium Iron Garnet (YIG) wafers. The potential advantages to MO Crystal Technology over other magnetic sensing technologies are (1) light weight and compact construction, (2) low cost, and (3) low power implementation concepts. A candidate sensor consists of a low power laser, polarizers, sensors, and housing. Such components can be combined in a fashion to keep weight down by using light-weight construction in the housing. Cost can be reduced by mass producing components. Tera Research purchased a wafer for evaluation. This wafer yielded over 100 crystals for individual use. When mass produced, the engineering recurring cost will be far less. The other components will be commercial off the shelf parts that when ordered in bulk quantities will be inexpensive as well. The required power is determined by the laser supply, processing computer and any necessary signal generators. The first two can easily be manufactured from low power semiconductor components. The latter is a separate engineering task which can exploit low data rates and low background noise transponder frequencies or modulations.
DTIC
Magneto-Optics; Magnetic Measurement

20030014275 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the Branching Fraction for B(+or-) --> XcoK(+or-)
Jul. 24, 2002; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-799966; SLAC-PUB-9316; No Copyright; Avail: National Technical Information Service (NTIS)
We present preliminary results for the measurement of the branching fraction of the decay B(sup plus or minus) yields c0K(sup plus or minus) from a sample of 75 million BsinglebarB pairs collected by the BABAR detector at the PEP-II asymmetric-energy B Factory at SLAC. The Xc0 meson is reconstructed through its two-body decays to pi(sup +)pi(sup -) and K(sup +)K(sup -).
NTIS
Branching (Mathematics); Fractions; Meson-Meson Interactions

20030014285 Stanford Linear Accelerator Center, Stanford, CA USA
Spear2 RF Operation: A Bridge to Spear3
Park, S.; Aug. 2002; 8p; In English
Report No.(s): DE2002-799914; SLAC/PUB-8868; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The present schedule calls for the Spear2 RF system operation until March of 2003, when it will be dismantled to make room for the Spear3. While any new investment to improve the system is discouraged for this limited-time operation, efforts are focused

on maintaining the system reliability and accommodating any changes necessitated by new construction in preparation for the Spear3.
NTIS
Reliability; Radio Frequencies

20030014308 Lawrence Livermore National Lab., Livermore, CA USA
Calculation of (239)Pu(n,2n) Cross Section by the Subtraction and the Ratio Methods
Navratil, P.; McNabb, D. P.; Sep. 28, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792742; UCRL-ID-140697; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Plutonium 239; Uranium 235; Uranium 238; Cross Sections

20030014315 Lawrence Livermore National Lab., Livermore, CA USA
Historical Background of Ultrahigh Pressure Shock Compression Experiments at LLNL: 1973 to 2000
Nellis, W. J.; Oct. 09, 2000; 24p; In English
Report No.(s): DE2002-792708; UCRL-ID-140923; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
My purpose is to recount the historical development of ultrahigh pressure shock compression experiments at LLNL, which I experienced in the period 1973 to 2000. I used several experimental techniques: shock-impedance-match experiments using planar shock waves driven by nuclear explosives (NIMs), the Janus Laser, a railgun, and a two-stage light-gas gun. Two things have motivated me: (1) the interaction between programmatic needs and scientific understanding (i.e., there are lots of scientifically interesting things to do here which are important programmatically) and (2) accurate experimental data are required to develop accurate theoretical models (or as Feynman said, 'If it (theory) disagrees with experiment, it is wrong'). The iteration between experiment and theory is commonly known as the scientific method. I arrived at LLNL with a PhD in Condensed Matter Physics (thesis on measuring thermal and electrical conductivities of rare-earth single crystals), postdoctoral experience (measuring electrical and magnetic properties of Pu, Np, and U intermetallic compounds and alloys), three years experience teaching 7-8 different undergraduate physics courses while running the college's computer terminal, a belief in the scientific method, and an intense interest in understanding materials physics. I managed to get one of the few jobs available in physics in 1973.
NTIS
Projectiles; High Pressure

20030014328 California Univ., Dept. of Physics, Santa Cruz, CA USA
Changes of the local distortions and Colossal Magnetoresistive Properties of La(.7)Ca(.3)MnO(3) induced by Ti or Ga Defects
Bridges, F.; Cao, D.; Anderson, M.; Ramirez, A. P.; Olapinski, M.; 2002; 12p; In English
Report No.(s): DE2002-799649; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Magnetization; Magnetoresistivity

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.

20030012554 Swedish Defence Research Establishment, Div. of Systems Technology, Stockholm, Sweden
Inversion of Seabed Parameters in the Stockholm Archipelago
Abrahamsson, L.; Andersson, B. L.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101031; FOI-R-0300-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this work was to apply acoustic inversion to a bay in the Stockholm archipelago with strong variations of the bottom both vertically and horizontally. The inversions were based on measurements undertaken in May 2001 of transmission loss over a 2.5 km long track. The bottom parameters were estimated by minimizing the difference between simulated and measured data. The parabolic wave equation was used as a wave propagation model and the inversions were carried out by a genetic algorithm. They resulted in a relatively good fit. The inverted bottom parameters were also evaluated by model predictions against a control data set of other frequencies than those of the inversion. The agreement between the estimated and measured parameters was good.
NTIS
Archipelagoes; Genetic Algorithms; Wave Propagation; Mathematical Models; Underwater Acoustics

20030012608 Florida State Univ., Dept. of Mathematics, Tallahassee, FL USA
Airframe-Jet Engine Integration Noise ***Final Report, 1 Jan. 1999 - 31 Dec. 2001***
Tam, Christopher, Florida State Univ., USA; Jan. 22, 2003; 6p; In English
Contract(s)/Grant(s): NAG1-2145; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
It has been found experimentally that the noise radiated by a jet mounted under the wing of an aircraft exceeds that of the same jet in a stand-alone environment. The increase in noise is referred to as jet engine airframe integration noise. The objectives of the present investigation are, (1) To obtain a better understanding of the physical mechanisms responsible for jet engine airframe integration noise or installation noise. (2) to develop a prediction model for jet engine airframe integration noise. It is known that jet mixing noise consists of two principal components. They are the noise from the large turbulence structures of the jet flow and the noise from the fine scale turbulence. In this investigation, only the effect of jet engine airframe interaction on the fine scale turbulence noise of a jet is studied. The fine scale turbulence noise is the dominant noise component in the sideline direction. Thus we limit out consideration primarily to the sideline.
Author
Aeroacoustics; Jet Engines; Mathematical Models; Aerodynamic Noise

20030012714 Army Engineer Research and Development Center, Environmental Lab., Vicksburg, MS USA
Advanced Digital Processing of Echo Sounder Signals for Characterization of Very Dense Submersed Aquatic Vegetation ***Final Report***
Sabol, Bruce M.; Burczynski, Janusz; Hoffman, Joel; Sep. 2002; 25p; In English; Original contains color images
Report No.(s): AD-A408960; ERDC/EL-TR-02-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Characterizing submersed aquatic vegetation (SAV) is important for a variety of purposes including ecological assessments, impact analyses of human activities, and planning control operations to manage nuisance aquatic plants. Until recently, the standard techniques for characterizing SAV distribution and conditions were by manual means (grab and rake samples, and diver observation and collection) and remote optical techniques (aerial photography and digital satellite image analysis). Manual techniques provided detailed and accurate information, but only for very limited areas. Remote optical techniques provide a large-area synoptic view of SAV distribution but only in limited detail. These techniques are limited by water clarity, commonly underestimating extent of SAV in deeper waters. Recently, an automated digital technique was developed that employs a digital echo sounder, global positioning system, and digital signal processing on a PC in near real time. This technique fills the void in methodology by rapidly providing high-resolution information on SAV canopy geometry from a small survey boat.
DTIC
Vegetation; Aquatic Plants; Signal Processing; Aerial Photography; Echo Sounding; Digital Techniques; Satellite Imagery

20030012799 NASA Langley Research Center, Hampton, VA USA
A New Time Domain Formulation for Broadband Noise Predictions
Casper, J., NASA Langley Research Center, USA; Farassat, F., NASA Langley Research Center, USA; International Journal of Aeroacoustics; 2002; Volume 1, No. 3, pp. 207-240; In English; Original contains color illustrations; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A new analytic result in acoustics called ”Formulation 1B,” proposed by Farassat, is used to compute the loading noise from an unsteady surface pressure distribution on a thin airfoil in the time domain. This formulation is a new solution of the Ffowcs Williams-Hawkings equation with the loading source term. The formulation contains a far field surface integral that depends on the time derivative and the surface gradient of the pressure on the airfoil, as well as a contour integral on the boundary of the airfoil surface. As a first test case, the new formulation is used to compute the noise radiated from a flat plate, moving through a sinusoidal gust of constant frequency. The unsteady surface pressure for this test case is analytically specified from a result based on linear airfoil theory. This test case is used to examine the velocity scaling properties of Formulation 1B and to demonstrate its

equivalence to Formulation 1A of Farassat. The new acoustic formulation, again with an analytic surface pressure, is then used to predict broadband noise radiated from an airfoil immersed in homogeneous, isotropic turbulence. The results are compared with experimental data previously reported by Paterson and Amiet. Good agreement between predictions and measurements is obtained. Finally, an alternative form of Formulation 1B is described for statistical analysis of broadband noise.
Author
Broadband; Aeroacoustics; Functions (Mathematics); Time Domain Analysis; Noise Prediction (Aircraft); Unsteady Aerodynamics; Formulations

20030012809 Hampton Univ., Dept. of Electrical Engineering, VA USA
Digital Signal Processing System for Active Noise Reduction
Edmonson, William W., Hampton Univ., USA; Tucker, Jerry, Virginia Commonwealth Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 49; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Over the years there has been a need to improve the comfort of passengers in flight. One avenue for increasing comfort is to reduce cabin noise that is attributed to the engine and the vibration of fuselage panels that radiate sound. High frequency noise can be abated using sound absorbing material. Though, for low frequency noise the sound absorption material would have to very thick, thereby reducing the cabin size. to reduce these low frequency disturbances, active noise control systems (ANC) is being developed that utilizes feedback for cancellation of the disturbance. The active noise control system must be small in size, be a low power device, and operate in real-time. It must also be numerically stable i.e. insensitive to temperature and pressure variations. The ANC system will be a module that consists of digital signal processor (DSP), analog-digital and digital-analog converters, power converters, an actuator and sensors. The DSP will implement the feedback control algorithm that controls the actuators. This module will be attached to panels on the inside of the fuselage for actively eliminating resonant modes of the structure caused by turbulent flow across the fuselage Skin. A hardware prototype of the ANC system must be able to eliminate broadband noise consisting of a bandwidth between 100 Hz and 1500 Hz, which requires a sample rate of 5000 Hz. The analog/digital converters output accuracy is 16 bits with a 2's-compliment format and a very short acquisition time. This will also yield the appropriate dynamic range. Similar specifications are required of the digital/analog converter. The processor section of the system integrates a digital signal processor (TI TMS320C33) with analog/digital (Burr-Brown ADS8320) and digital/analog signal (DAC853 1) converters. The converters with associated power conditioning circuitry and test points reside on a daughter board that sits on top of a Spectrum Digital evaluation module. This will have the ability to test different adaptive noise cancellation algorithms and provide an operational prototype to understand the behavior of the system under test. DSP software was required to interface the processor with the data converters using interrupt routines. The goal is to build a complete ANC system that can be placed on a flexible circuit with added memory circuitry that also contains the power supply, sensors and actuators. This work on the digital signal processing system for active noise reduction was completed in collaboration with another ASEE Fellow, Dr. Jerry Tucker from Virginia Commonwealth University, Richmond, VA.
Author
Active Control; Signal Processing; Digital Systems; Noise Reduction

20030012827 Morgan State Univ., Dept. of Physics and Engineering Physics, Baltimore, MD USA
Measurement of the Background Noise in Piezoresistive and Electret Condenser Microphones
Serbyn, M. Roman, Morgan State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 67; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A typical microphone calibration must include tests of its sensitivity, frequency response, harmonic distortion, and background noise. While measurements of the first three parameters have become almost routine, the measurement of background noise requires special instrumentation and facility, and is more difficult to perform. Nonetheless, background-noise information is critical for all research and field applications of microphones relevant to the NASA mission. Responding to this demand, A.J. Zuckerwar of the Langley Research Center developed an acoustic isolation vessel for measurement of the background noise in microphones. [K.C.T. Ngo and A.J. Zuckerwar, J.Acoust.Soc. Am. 93, 2974-2980 (1993)]. As a summer faculty fellow, M.R. Serbyn has participated in the upgrading of that facility by improving its sound and vibration isolation and extending the frequency range of the measurements (1-100 kHz). The improved system, which is unique to the Langley Research Center, has been fully tested and interfaced with a PC for further processing of collected data. The background noise of several microphone types has already been measured, with more data to be collected on piezoresistive, electret-condenser, and piezoelectric microphones. These results will be helpful in constructing theoretical models for the prediction of background noise in the various microphones and in comparing their l/f noise characteristics. of particular interest are microphones to be employed in the so-called MEMS systems.

When completed, the results of this study will help guide planners and test designers in the selection of microphones for applications requiring a large number of them.
Author
Microphones; Background Noise; Piezoelectricity; Microelectromechanical Systems; Acoustic Measurement; Noise Measurement

20030012828 New River Community Coll., Dept. of Electronics Technology, Dublin, VA USA
Driver Module for Noise Cancellation System
Shirvani, Mir S., New River Community Coll., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 68; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Driver module is an integral part of the noise cancellation system, which was my primary objective to research, design, and prototype during the tenure in NASA Langley research center. The function of the driver module is to actuate a panel that is constructed with a smart material and invented in NASA-LaRC. The bandwidth and amplitude of the actuation of the panel correlates the undesirable structural bandwidth and amplitude of the applied object. The undesirable structural bandwidth is relatively narrow and the undesirable amplitude is relatively large. A highly stable, low distortion, linear monolithic integrated circuit was used as a variable frequency and amplitude function generator. In order to elevate the amplitude of the output waveform of the generator to a sufficient magnitude a pair of high voltage monolithic MOSFET operational amplifiers were implemented. The amplifiers connected in a bipolar bridge configuration for a higher efficiency. In order to reduce the required external Supply voltages and make the driver capable to be operated by a battery a pair of ultra miniature high-output voltage dc to dc converters are also used. The driver module tested with the noise cancellation panel, the required data was acquired, and the result was promising. After examining all the options the driver module was designed and prototyped.
Author
Linear Integrated Circuits; Field Effect Transistors; Bandwidth; Electric Potential

20030012833 Virginia Commonwealth Univ., Dept. of Electrical Engineering, Richmond, VA USA
Feedback Control for Noise Reduction Program
Tucker, Jerry H., Virginia Commonwealth Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 73; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

As part of Langley Research Center's continuing noise reduction program, an active noise control system (ANC) is being developed to suppress noise inside an aircraft cabin. This interior noise reduction system consists of the following major components: 1. Several accelerometers. 2. An input amplifier. 3. A digital signal processor (DSP) system that includes an analog to digital converter (ADC) and a digital to analog converter (DAC). 4. A high voltage power amplifier. 5. PZT actuators. 6. Power supply and distribution. The accelerometers detect interior panel vibrations. The accelerometer signals are fed to the input amplifier where they are conditioned prior to being sent to the ADC. The DSP receives the digitized signals form the ADC, processes these signals, and sends the result to the DAC. The DAC's analog output is used as input to the high voltage power amplifier. The power amplifier drives the PZT actuators to cancel noise form 50 to 1,300 Hz. The specific area of concern for this work was development of a DSP system that could be used for an actual flight demonstration. It was decided to base the system on a commercially available DSP board, the Spectrum Digital eZdsp. This was complicated by the fact that the ADC and DAC capabilities available on the eZdsp board were not sufficient to meet the system specification. Designing and fabricating a special ADC and DAC daughter card for the eZdsp circumvented this problem. The DSP system hardware has been successfully tested and is currently being integrated into the complete noise reduction system. This work has been completed in collaboration with another ASEE Fellow, Dr.William Edmonson from Hampton University and was conducted under the direction of the principle investigator, Dr. Qamar A. Shams of the Instrumentation Systems Development Branch, as part of a continuing noise reduction program.
Author
Feedback Control; Active Control; Noise Reduction; Analog to Digital Converters; Voltage Amplifiers

20030012839 University of South Alabama, Dept. of Mechanical Engineering, Mobile, AL USA
Modeling for Airframe Noise Prediction Using Vortex Methods
Zheng, Z. Charlie, University of South Alabama, USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 79; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Various components of the airframe are known to be a significant source of noise. With the advent of technology in quieting modern engines, airframe generated noise competes and, in certain instances, surpasses the engine noise. Airframe noise is most pronounced during aircraft approach when the engines are operating at reduced thrust, and airframe components such as high-lift devices and landing gears are in deployed conditions. Recent experimental studies have reaffirmed that the most significant sources of high-lift noise are from the leading-edge slat and the side edges of flaps. Studies of flow field around these structures have consistently shown that there are complicated unsteady vortical flows such as vortex shedding, secondary vortices and vortex breakdown, which are susceptible to far-field radiated sound. The near-field CFD computational data have been used to calculate the far-field acoustics by employing Ffowcs-Williams/Hawkings equation using Lighthill's analogy. However, because of the limit of current computing capacity, it is very time consuming to generate unsteady Navier-Stokes (N-S) computational data for aeroacoustics. Although the N-S simulations are probably necessary to reveal many complex flow phenomena that are unsteady and fully nonlinear, these simulations are not feasible to be used for parametric design. purposes. The objective of this study is thus to develop theoretical models for airframe noise predictions which have quick turn-around computing time. Since it is known that vorticity is a major mechanism responsible for noise generation on high-lift devices, vortex methods have been chosen as modeling tools. Vortex methods are much faster in comparison with other numerical methods, yet they are able to incorporate nonlinear interactions between vortices. Obviously, as with any theoretical model, assumptions have to be made and justified when such models are used in complex flow. The merit and applicability of the models for aeroacoustics applications will be investigated. Issues related with conservation of vorticity, unsteady Kutta conditions and nonlinear frequency response to vortex shedding will be addressed.
Author
Aircraft Noise; Airframes; Noise Prediction; Vortex Breakdown; Frequency Response

20030012886 Stanford Univ., Edward L. Ginzton Lab. of Physics, Stanford, CA USA
Acoustic Sensing with Capacitive Micromachined Membranes and Radio Frequency Detection
Hansen, Sean T.; Ergun, A. S.; Khuri-Yakub, Butrus T.; Oct. 2001; 10p; In English; Original contains color images
Report No.(s): AD-A409144; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
No abstract.
DTIC
Capacitance; Detection; Micromachining; Radio Frequencies; Acoustics

20030012922 NASA Langley Research Center, Hampton, VA USA
Broadband Noise Predictions for an Airfoil in a Turbulent Stream
Casper, J., NASA Langley Research Center, USA; Farassat, F., NASA Langley Research Center, USA; Mish, P. F., Virginia Polytechnic Inst. and State Univ., USA; Devenport, W. J., Virginia Polytechnic Inst. and State Univ., USA; [2003]; 13p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2002, Reno, NV, USA
Contract(s)/Grant(s): NAG1-2272
Report No.(s): AIAA Paper 2003-0366; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Loading noise is predicted from unsteady surface pressure measurements on a NACA 0015 airfoil immersed in grid-generated turbulence. The time-dependent pressure is obtained from an array of synchronized transducers on the airfoil surface. Far field noise is predicted by using the time-dependent surface pressure as input to Formulation 1A of Farassat, a solution of the Ffowcs Williams - Hawkings equation. Acoustic predictions are performed with and without the effects of airfoil surface curvature. Scaling rules are developed to compare the present far field predictions with acoustic measurements that are available in the literature.
Author
Aeroacoustics; Acoustic Measurement; Airfoils; Turbulent Flow; Noise Prediction (Aircraft); Broadband

20030012929 NASA Langley Research Center, Hampton, VA USA
A Comparison of Ffowcs Williams-Hawkings Solvers for Airframe Noise Applications
Lockard, David P., NASA Langley Research Center, USA; [2002]; 12p; In English; 8th AIAA/CEAS Aeroacoustics Conference, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-2580; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
This paper presents a comparison between two implementations of the Ffowcs Williams and Hawkings equation for airframe noise applications. Airframe systems are generally moving at constant speed and not rotating, so these conditions are used in the current investigation. Efficient and easily implemented forms of the equations applicable to subsonic, rectilinear motion of all

acoustic sources are used. The assumptions allow the derivation of a simple form of the equations in the frequency-domain, and the time-domain method uses the restrictions on the motion to reduce the work required to find the emission time. The comparison between the frequency domain method and the retarded time formulation reveals some of the advantages of the different approaches. Both methods are still capable of predicting the far-field noise from nonlinear near-field flow quantities. Because of the large input data sets and potentially large numbers of observer positions of interest in three-dimensional problems, both codes utilize the message passing interface to divide the problem among different processors. Example problems are used to demonstrate the usefulness and efficiency of the two schemes.
Author
Frequency Domain Analysis; Time Domain Analysis; Aerodynamic Noise; Sound Generators; Wave Propagation; Flow Distribution; Nonlinearity; Airframes

20030012932 NASA Langley Research Center, Hampton, VA USA
In Search of the Physics: The Interplay of Experiment and Computation in Airframe Noise Research: Flap-Edge Noise
Streett, C. L., NASA Langley Research Center, USA; Lockard, D. P., NASA Langley Research Center, USA; Singer, B. A., NASA Langley Research Center, USA; Khorrami, M. R., NASA Langley Research Center, USA; Choudhari, M. M., NASA Langley Research Center, USA; [2003]; 13p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0979; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The LaRC investigative process for airframe noise has proven to be a useful guide for elucidation of the physics of flow-induced noise generation over the last five years. This process, relying on a close interplay between experiment and computation, is described and demonstrated here on the archetypal problem of flap-edge noise. Some detailed results from both experiment and computation are shown to illustrate the process, and a description of the multi-source physics seen in this problem is conjectured.
Author
Aeroacoustics; Aerodynamic Noise; Airframes; Wing Flaps

20030012968 Naval Undersea Warfare Center, Newport Div., Newport, RI USA
Analysis of a Fluid-Loaded Thick Plate
Hull, Andrew J.; Oct. 01, 2002; 42p; In English
Report No.(s): AD-A409021; NUWC-NPT-TR-11389; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The physics of a thick plate with fluid loading on both sides provides the theoretical basis for insertion loss and echo reduction tests, both of which are typically used to determine how efficiently a material transmits or reflects energy. Such testing is conducted by insonifying a submerged, slab-shaped sample and then measuring the transmitted and reflected sound pressure. Based on the sound pressure level of the incident field, the insertion loss and echo reduction quantities can be calculated. when these experiments are performed in a small tank, the wall motion of the sample is sometimes measured, with the fluid pressure then calculated based on this displacement. The above measurements and corresponding theory are important to the U.S. Navy because they help designers develop the most effective acoustic sonar windows, sonar and ship baffles, and anechoic marine coatings.
DTIC
Plates; Protective Coatings

20030013630 NASA Langley Research Center, Hampton, VA USA
In Search of the Physics: The Interplay of Experiment and Computation in Slat Aeroacoustics
Khorrami, Mehdi R., NASA Langley Research Center, USA; Choudhari, Meelan, NASA Langley Research Center, USA; Singer, Bart A., NASA Langley Research Center, USA; Lockard, David P., NASA Langley Research Center, USA; Streett, Craig L., NASA Langley Research Center, USA; [2003]; 11p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2002, Reno, NV, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0980; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The synergistic use of experiments and numerical simulations can uncover the underlying physics of airframe noise sources. We focus on the high-lift noise component associated with a leading-edge slat; flap side-edge noise is discussed in a companion paper by Streett et al. (2003). The present paper provides an overview of how slat noise was split into subcomponents and analyzed with carefully planned complementary experimental and numerical tests. We consider both tonal and broadband aspects of slat noise. The predicted far-field noise spectra are shown to be in good qualitative (and, to lesser extent, good quantitative agreement)

with acoustic array measurements. Although some questions remain unanswered, the success of current airframe noise studies provides ample promise that remaining technical issues can be successfully addressed in the near future.
Author
Direct Numerical Simulation; Aeroacoustics; Leading Edges; Aircraft Noise; Noise Spectra; Noise Prediction (Aircraft); Acoustic Measurement

20030013633 NASA Langley Research Center, Hampton, VA USA
Development of a Free-to-Roll Transonic Test Capability (Invited)
Capone, F. J., NASA Langley Research Center, USA; Owens, D. B., NASA Langley Research Center, USA; Hall, R. M., NASA Langley Research Center, USA; [2003]; 18p; In English; 41st AIAA Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2003-0749; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
As part of the NASA/Navy Abrupt Wing Stall Program, a relatively low-cost, rapid-access wind-tunnel free-to-roll rig was developed. This rig combines the use of conventional models and test apparatuses to evaluate both transonic performance and wing-drop/rock tendencies in a single tunnel entry. A description of the test hardware as well as a description of the experimental procedures is given. The free-to-roll test rig has been used successfully to assess the static and dynamic characteristics of three different configurations--two configurations that exhibit uncommanded lateral motions, (pre-production F/A-18E and AV-8B), and one that did not (F/A-18C).
Author
Wind Tunnel Tests; Wind Tunnel Apparatus; Wind Tunnel Models; Fighter Aircraft; Aerodynamic Stalling; Wing Rock; Safety Management

20030013990 Textron Systems Corp., Wilmington, MA USA
Wind Tunnel Measurements of Windscreen Performance
Maniet, Edward R., Jr; Oct. 2001; 8p; In English; Original contains color images
Report No.(s): AD-A409180; No Copyright; Avail: Defense Technical Information Center (DTIC)
Wind noise is recognized as one the primary environmental factors that limits the performance of battlefield acoustic sensors. Microphone windscreens are regularly used to reduce wind noise and the characterization of their performance is an important component of the acoustic sensor design, Textron Systems has extensive experience studying the performance of windscreens and have developed test methodology that allows for repeatable measurements in a controlled environment. Wind noise measurements are performed using a high-speed/laminar-flow, low-noise wind tunnel with an anechoic test section. A special test section is added to the wind tunnel to generate a turbulent flow. The turbulent wind velocity spectrum is measured using multi-axis hot wire anemometers. Comparative performance measurements of several windscreen designs are presented.
DTIC
Wind Tunnel Tests; Windshields; Acoustic Properties; Signal Detectors

20030014118 Technische Hochschule, Inst. fuer Aerodynamik und Gasdynamik, Germany
Experimental Study of Essentially Non-Stationary Acoustic Receptivity of a Boundary Layer on an Airfoil Due to Surface Non-Uniformities
Ivanov, A. V.; Wuerz, W.; Herr, S.; Wagner, S.; Kachanov, Y. S.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with Russian Academy of Sciences Inst. of Theoretica
Report No.(s): AD-A409262; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The case when acoustic and surface vibrations have comparable frequencies has not been studied at all despite such situation seems very realizable at flight conditions. The important peculiarity of this receptivity mechanism is that both participating frequencies (f(sub ac) and f(sub v)), may lie in the range of stable frequencies and do not produce in the boundary layer any amplified perturbations but the resulting TS-wave may lie in the range of unstable frequencies and can provoke earlier transition. This work is intended to study systematically the vibration-acoustic mechanism of TS-wave production and to compare the obtained receptivity results with a roughness case.
DTIC
Vibration; Boundary Layers; Flight Conditions

20030014147 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA
Acoustic Intensity in the Interaction Region of a Parametric Sonar
Gabrielson, Thomas B.; Lauchle, Gerald C.; McConnell, James A.; Van Tol, David J.; Kottke, Nelson F.; Dec. 2002; 32p; In English
Contract(s)/Grant(s): N00014-00-G-0058/0024
Report No.(s): AD-A409092; TR-02-017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The fundamental goal of this project was to measure acoustic intensity in the strong interaction region of a parametric source. The expected benefits of such a measurement are (1) a clear definition of the source-generation region, and (2) an ability to separate local generation (the reactive field) from propagation (the real or active field). The fundamental goal of this project was to measure acoustic intensity in the strong interaction region of a parametric source. The expected benefits of such a measurement are (1) a clear definition of the source-generation region, and (2) an ability to separate local generation (the reactive field) from propagation (the real or active field).
DTIC
Sonar; Acoustic Emission

20030014290 Institute of Space Medico-Engineering, Beijing, China
A Modified Least Mean Square (LMS) Algorithm with Variable Step-size for an Adaptive Noise Canceller
Gao, Hui, Institute of Space Medico-Engineering, China; Niu, Cong-min, Institute of Space Medico-Engineering, China; Wu, Wei, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; October 2002; ISSN 1002-0837; Volume 15, No. 5, pp. 366-368; In Chinese; Copyright; Avail: Issuing Activity
Objective. to study a modified Least Mear Square(LMS) algorithm that can be applied in aerospace and aviation fields. Method. A modified LMS algorithm was proposed and step-size was calculated by estimated signal noise ratio(SNR) of input signal. Parameters of filter were adjusted automatically until optimal estimation of disturbed speech was obtained. Result. Output SNR of estimated speech was increased respectively to 18.2 dB, 22.1 dB and 25.2 dB, when input SNR of disturbed speech was - 6 dB, 0 dB, 6 dB. Conclusion. The performance of the modified algorithm has obvious advantages over that of NLMS algorithm. The results may be advantageous to related application of adaptive noise canceller (ANC) in aerospace and aviation fields.
Author
Algorithms; Signal to Noise Ratios; Computation

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.

20030012783 Rochester Univ., Dept. of Physics and Astronomy, NY USA
Spatial-Coherence Effects in Spectroscopy
Wolf, Emil; Dec. 2002; 17p; In English
Contract(s)/Grant(s): F49620-00-1-0125
Report No.(s): AD-A408980; AFRL-SR-AR-TR-02-0429; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In this report account is presented of research carried out during the period December 1, 1999 - November 30, 2002 under the sponsorship of the Air Force Office of Scientific Research under grant F49620-00l-l-0125. Our research covered many areas of modern optical physics, especially wave propagation in random media, inverse scattering, coherence properties of light, correlation-induced spectral changes, partially coherent beams, focusing of waves of arbitrary state of coherence, partially coherent solitons, spreading of partially coherent beams in random media, diffraction tomography and singular optics with polychromatic light. We believe that of special significance are some new results that we have obtained concerning the propagation of partially coherent beams in the turbulent atmosphere. The results indicate that in certain situations it is preferable to employ partially coherent beams rather than fully coherent ones for communication, tracking and guiding, for example. These results are preliminary and we are pursuing the subject further. In the field of singular optics we have opened up a new direction for progress in the field by having shown that some new and unexpected effects take place in the neighborhood of phase singularities in optical fields, when the light is polychromatic rather than monochromatic (studied previously). Specifically we have demonstrated that drastic changes of the spectrum of light take place in the immediate vicinity of the singular points. The

results of our investigations were reported in 43 publications. They are listed on pages 3 to 5. Summaries of these publications are given on pages 6 - 14. Scientists who have participated in this research are listed on page 15.
DTIC
Spectroscopy; Diffractive Optics; Light Scattering; Optical Properties; Coherence; Spatial Dependencies

20030012889 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Reaction Kinetics of O(3P) and OH With Diamine Rocket Fuels
Vaghjiani, Ghanshyam L.; Jul. 08, 1998; 13p; In English; Pres: 34th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 13-15 Jul 1998, Cleveland, OH
Contract(s)/Grant(s): AF Proj. 2308
Report No.(s): AD-A409137; AFRL-PR-ED-TP-1998-144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The gas phase kinetics of O((sup 3)P) and OH reactions with the three diamine fuels; N2H4, CH3NHNH2 and (CH3)2NNH2 has been studied in a discharge flow-tube apparatus. The reactions were studied in 2 torr of He under pseudo-first-order conditions in the transient species concentration with a known excess of diamine concentration. The steady-state concentration temporal profiles of the transient species were directly monitored by fluorescence techniques to deduce the absolute second-order reaction rate coefficients. The Arrhenius expressions; (7.35 +/- 2.16) x 10(exp -13) e(640 +/- 60)/T, (2.71 +/-0.04) x 10(exp -11) e-(190 +/- 50)/T and (1.96 +/- 0.29) x 10(exp -11) e(20 +/-40)/T cu cm/molec/s in the temperature range 252-640 K were obtained for reactions of O((sup 3)P) with N2H4, CH3NHNH2 and (CH3)2NNH2, respectively. The corresponding expressions; (1.25 +/- 0.19) x 10 (exp -11) e(315 +/- 55)/T, (2.88 +/- 0.04) x 10(exp -11) e(210 +/- 55)/T and (2.00 +/- 0.30) x 10(exp -11) e(330 +/- 80)/T cu cm/molec/s in the range 232-374 K were determined for the OH reactions. Our recent measurement of the total yield of OH(X(sup 2)II) formation in the O +/- N2H4 reaction of (0.15 +/- 0.05) at 298 K (of which ^50% was found to be produced hot with vibrational excitation up to the limit of reaction exothermicity) and the present observed experimental kinetic trends suggest that the initial addition of O((sup 3)P) and OH to the hydrazine molecule followed by rapid dissociation to products is an important process. Alkylation in the diamine molecule also allows direct H-abstraction mechanism to operate in these reaction systems.
DTIC
Reaction Kinetics; Alkylation; Aircraft Fuels; Hydroxides; Diamines; Oxygen; Atomic Interactions

20030013002 NASA Glenn Research Center, Cleveland, OH USA
Controlling Electron Backstreaming Phenomena Through the Use of a Transverse Magnetic Field
Foster, John E., NASA Glenn Research Center, USA; Patterson, Michael J., NASA Glenn Research Center, USA; Journal of Propulsion: Technical Notes; August 2002; ISSN 0748-4658; Volume 18, No. 6, pp. 1308-1311; In English; Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
DEEP-SPACE mission propulsion requirements can be satisfied by the use of high specific impulse systems such as ion thrusters. For such missions. however. the ion thruster will be required to provide thrust for long periods of time. To meet the long operation time and high-propellant throughput requirements, thruster lifetime must be increased. In general, potential ion thruster failure mechanisms associated with long-duration thrusting can be grouped into four areas: (1) ion optics failure; (2) discharge cathode failure; (3) neutralizer failure; and (4) electron backstreaming caused by accelerator grid aperture enlargement brought on by accelerator grid erosion. The work presented here focuses on electron backstreaming. which occurs when the potential at the center of an accelerator grid aperture is insufficient to prevent the backflow of electrons into the ion thruster. The likelihood of this occurring depends on ion source operation time. plasma density, and grid voltages, as accelerator grid apertures enlarge as a result of erosion. Electrons that enter the gap between the high-voltage screen and accelerator grids are accelerated to the energies approximately equal to the beam voltage. This energetic electron beam (typically higher than 1 kV) can damage not only the ion source discharge cathode assembly. but also any of the discharge surfaces upstream of the ion acceleration optics that the electrons happen to impact. Indeed. past backstreaming studies have shown that near the backstreaming limit, which corresponds to the absolute value of the accelerator grid voltage below which electrons can backflow into the thruster, there is a rather sharp rise in temperature at structures such as the cathode keeper electrode. In this respect operation at accelerator grid voltages near the backstreaming limit is avoided. Generally speaking, electron backstreaming is prevented by operating the accelerator grid at a sufficiently negative voltage to ensure a sufficiently negative aperture center potential. This approach can provide the necessary margin assuming an expected aperture enlargement. Operation at very negative accelerator grid voltages, however, enhances ion charge-exchange and direct impingement erosion of the accelerator grid. The focus of the work presented here is the mitigation of electron backstreaming by the use of a magnetic field. The presence of a magnetic field oriented perpendicular to the thruster axis can significantly decrease the magnitude of the backflowing electron current by significantly reducing the electron diffusion coefficient. Negative ion sources utilize this principle to reduce the fraction of electrons in the negative ion beam. The focus of

these efforts has been on the attenuation of electron current diffusing from the discharge plasma into the negative ion extraction optics by placing the transverse magnetic field upstream of the extraction electrodes. In contrast. in the case of positive ion sources such as ion thrusters, the approach taken in the work presented here is to apply the transverse field downstream of the ion extraction system so as to prevent electrons from flowing back into the source. It was found in the work presented here that the magnetic field also reduces the absolute value of the electron backstreaming limit voltage. In this respect. the applied transverse magnetic field provides two mechanisms for electron backstreaming mitigation: (1) electron current attenuation and (2) backstreaming limit voltage shift. Such a shift to less negative voltages can lead to reduced accelerator grid erosion rates.
Author
Magnetic Fields; Diffusion Coefficient; Electron Diffusion; Ion Engines; Failure Analysis; Electric Potential; Ion Accelerators

20030014288 Sandia National Labs., Albuquerque, NM USA
Theoretical Analysis of the CH(3)+H Reaction: Isotope Effects, the High Pressure Limit, and Transition State Recrossing
Klippenstein, S. J.; Georgievskii, Y.; Harding, L. B.; 2002; 24p; In English
Report No.(s): DE2002-799818; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The reaction of methyl radicals with hydrogen atoms is studied with a combination of ab initio quantum chemistry, variational transition state theory, and classical trajectory simulations. The interaction between the two radicals, including the umbrella mode of the methyl radical, is examined at the CAS+1+2 level using an augmented correlation consistent polarized valence triple zeta basis set.
NTIS
Atoms; Hydrogen; Radicals

20030014320 Lawrence Livermore National Lab., Livermore, CA USA
Modeling and Computer Simulation: Molecular Dynamics and Kinetic Monte Carlo
Wirth, B. D.; Caturla, M. J.; Diaz de la Rubia, T.; Oct. 10, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792741; UCRL-ID-140987; No Copyright; Avail: National Technical Information Service (NTIS)
This article describes the atomistic modeling techniques of molecular dynamics (MD) and kinetic Monte Carlo (KMC), and an example of their application to radiation damage production and accumulation in metals. It is important to note at the outset that the primary objective of atomistic computer simulation should be obtaining physical insight into atomic-level processes.
NTIS
Molecular Dynamics; Computerized Simulation

74
OPTICS

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

20030012614 Lawrence Livermore National Lab., Livermore, CA USA
Unconverted Light Management on the NIF-Wedged Lens Configuration
Kalantar, D. H.; Mar. 31, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792095; UCRL-ID-138690; No Copyright; Avail: National Technical Information Service (NTIS)
This document provides information on the distribution of unconverted light in the National Ignition Facility (NIF) target chamber with the wedged final focus lens that has been adopted by the NIF project. It includes a comparison of the wedged lens configuration with the color separation grating (CSG). There are significant benefits to the wedged lens design as it greatly simplifies experiment design.
NTIS
Lenses; Gratings (Spectra)

20030012624 Lawrence Livermore National Lab., Livermore, CA USA
LATIS3D: The Goal Standard for Laser-Tissue-Interaction Modeling
London, R. A.; Makarewicz, A. M.; Kim, B. M.; Gentile, N. A.; Yang, T. Y. B.; Mar. 16, 2000; In English
Report No.(s): DE2002-792432; UCRL-ID-137813; No Copyright; Avail: National Technical Information Service (NTIS)

The goal of this LDRD project has been to create LATIS3D-the world's premier computer program for laser-tissue interaction modeling. The development was based on recent experience with the 2D LATIS code and the ASCI code, KULL. With LATIS3D, important applications in laser medical therapy were researched including dynamical calculations of tissue emulsification and ablation, photothermal therapy, and photon transport for photodynamic therapy. This project also enhanced LLNL's core competency in laser-matter interactions and high-energy-density physics by pushing simulation codes into new parameter regimes and by attracting external expertise. This will benefit both existing LLNL programs such as ICF and SBSS and emerging programs in medical technology and other laser applications. The purpose of this project was to develop and apply a computer program for laser-tissue interaction modeling to aid in the development of new instruments and procedures in laser medicine.
NTIS
Laser Applications; Surgical Instruments

20030012741 Helsinki Univ. of Technology, Metrology Research Inst., Espoo Finland
All-Optical Atomic Clock Based on Coherent Population Trapping in 85Rb
Merimaa, M.; Lindvall, T.; Tittonen, I.; Ikonen, E.; 2001; 22p; In English
Report No.(s): PB2003-101231; MRI-19/2001; Copyright; Avail: National Technical Information Service (NTIS)
An all-optical RF-frequency standard based on coherent population trapping (CPT) in (sup 85)Rb has been developed. The CPT resonances are detected using an ordinary edge-emitting diode laser in a simple optical set-up. A buffer gas mixture has been carefully optimized to yield narrow resonances and reduced temperature dependence of the resonance frequency. With the developed system the authors have been able to measure ultra-narrow optically induced hyperfine CPT resonances below 20 Hz, apparently the narrowest ever measured and in good agreement with the linewidth calculated from the experimental parameters. The frequency of an RF-signal generator has been stabilized to the CPT resonance between the m(sub F)=0 magnetic sublevels.
NTIS
Atomic Clocks; Resonant Frequencies

20030012760 Michigan Univ., Ann Arbor, MI USA
100 GB/S Time Division Multiplex (TDM) Access Nodes and Regenerators Based on Novel Loop Mirrors with High Nonlinearity Fibers *Final Report, May 1997-May 2001*
Islam, Mohammed N.; Jul. 2002; 193p; In English; Original contains color images
Contract(s)/Grant(s): F30602-97-1-0202; DARPA Order C512
Report No.(s): AD-A408945; AFRL-IF-RS-TR-2002-157; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
This report covers work on the development of twisted and spun optical fiber for use in a polarization insensitive nonlinear optical loop mirror. Work is also described in the area of optical wavelength conversion based on parametric amplification in highly nonlinear fiber. In addition an optical time domain demultiplexer was demonstrated at 80 Gbps using the nonlinear optical loop mirror as part of its structure.
DTIC
Mirrors; Nonlinearity; Optical Fibers; Time Division Multiplexing; Regenerators; Nodes (Standing Waves)

20030012822 North Carolina State Univ., Dept. of Mechanical and Aerospace Engineering, Raleigh, NC USA
Development of Interpretation Algorithm for Optical Fiber Bragg Grating Sensors for Composite Structures
Peters, Kara, North Carolina State Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 62; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document
Increasingly, optical fiber sensors, and in particular Bragg grating sensors, are being used in aerospace structures due to their immunity to electrical noise and the ability to multiplex hundreds of sensors into a single optical fiber. This significantly reduces the cost per sensor as the number of fiber connections and demodulation systems required is also reduced. The primary objective of this project is to study the effects of mounting issues such as adhesion, surface roughness, and high strain gradients on the interpretation of the measured strain. This is performed through comparison with electrical strain gage benchmark data. The long-term goal is to integrate such optical fiber Bragg grating sensors into a structural integrity monitoring system for the 2nd Generation Reusable Launch Vehicle. Previously, researchers at NASA Langley instrumented a composite wingbox with both optical fiber Bragg grating sensors and electrical strain gages during laboratory load-to-failure testing. A considerable amount of data was collected during these tests. For this project, data from two of the sensing optical fibers (each containing 800 Bragg grating sensors) were analyzed in detail. The first fiber studied was mounted in a straight line on the upper surface of the wingbox far from any structural irregularities. The results from these sensors showed a relatively large amount of noise compared to the electrical strain gages, but measured the same averaged strain curve. It was shown that the noise could be varied through the choice

of input parameters in the data interpretation algorithm. Based upon the assumption that the strain remains constant along the gage length (a valid assumption for this fiber as confirmed by the measured grating spectra) this noise was significantly reduced. The second fiber was mounted on the lower surface of the wingbox in a pattern that circled surface cutouts and ran close to sites of impact damage, induced before the loading tests. As compared to the first fiber, data from these gages indicated highly non-uniform strain along the gage length. This is to be expected in such regions. In contrast to the electrical strain gage, however, which averages out the effects of local strain variations, the Bragg grating can be used to measure the strain distribution through analysis of its reflected spectrum. However, such changes in the reflected spectrum, if large enough, can cause difficulties in the interpretation algorithm used. Several cases were studied in detail for gratings located near the cutouts. Further, the effects of structural vibrations were also seen to influence the measured strain. Future work will be to incorporate one of several algorithms studied to invert the spectral response into the precise strain distribution along the gage into the grating analysis program.
Author
Composite Structures; Bragg Gratings; Algorithms; Adhesion; Surface Roughness; Strain Distribution

20030012933 NASA Langley Research Center, Hampton, VA USA
Fabrication of Extremely Short Length Fiber Bragg Gratings for Sensor Applications
Wu, Meng-Chou, NASA Langley Research Center, USA; Rogowski, Robert S., NASA Langley Research Center, USA; Tedjojuwono, Ken K., NASA Langley Research Center, USA; 2002; 7p; In English; IEEE Sensors 2002: The 1st International Conference on Sensor Applications, 12-14 Jun. 2002, Orlando, FL, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A new technique and a physical model for writing extremely short length Bragg gratings in optical fibers have been developed. The model describes the effects of diffraction on the spatial spectra and therefore, the wavelength spectra of the Bragg gratings. Using an interferometric technique and a variable aperture, short gratings of various lengths and center wavelengths were written in optical fibers. by selecting the related parameters, the Bragg gratings with typical length of several hundred microns and bandwidth of several nanometers can be obtained. These short gratings can be apodized with selected diffraction patterns and hence their broadband spectra have a well-defined bell shape. They are suitable for use as miniaturized distributed strain sensors, which have broad applications to aerospace research and industry as well.
Author
Bragg Gratings; Optical Fibers; Fabrication

20030012955 International Society for Optical Engineering, Bellingham, WA USA
Nanoparticles and Nanostructured Surfaces: Novel Reporters with Biological Applications ***Final Report, 18 Jan. 2001-17 Jan 2002***
Murphy, Catherine J.; Jan. 2001; 115p; In English
Contract(s)/Grant(s): F49620-01-1-0153
Report No.(s): AD-A409010; AFRL-SR-AR-TR-02-0425; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This proceedings contains papers on the following topics: quantum dots, Metallic nanoparticles and nanowires, nanoparticles for biology, nano-structured oxide surfaces.
DTIC
Quantum Theory; Luminescence; Semiconductor Devices

20030012956 International Society for Optical Engineering, USA
Laser and Noncoherent Light Ocular Effects: Epidemiology, Prevention, and Treatment ***Final Report, 18 Jan. 2001-17 Jan 2002***
Stuck, Bruce E.; Belkin, Michael; Jan. 22, 2001; 193p; In English
Contract(s)/Grant(s): F49620-01-1-0153
Report No.(s): AD-A409011; AFRL-SR-AR-TR-02-0424; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
This proceedings contains papers on the following topics: ocular hazards, ocular dynamics, ocular damage thresholds, optical coherence tomography, corneal exposures, corneal damage thresholds, laser eye protection research.
DTIC
Optical Properties; Coherence; Eye (Anatomy); Laser Applications; Safety Management

20030013989 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Assessment of Multiple Scattering Errors of Laser Diffraction Instruments
Strakey, P. A.; Nov. 06, 2002; 4p; In English

Contract(s)/Grant(s): AF Proj. 3058
Report No.(s): AD-A409179; AFRL-PR-ED-AB-2002-269; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Characterization of high-pressure rocket injector sprays often involves using commercial laser-based diagnostic instruments to measure droplet size in an environment well beyond the intended range of the instruments. Even in cold-flow measurements, this environment often involves very large number densities of droplets (N greater than 10 (exp 4)/cc) as well as refractive index gradients in the surrounding gas. As a result, optical attenuation and multiple scattering of the probe beam(s) and scattering signal is often the limiting factor in the ability to extract useable data.

DTIC

Laser Applications; Light Scattering; Measuring Instruments; Signal Processing; Diffraction; Instrument Errors

20030014083 Lawrence Livermore National Lab., Livermore, CA USA

Physics Basis for Optical Performance of the NIF Amplifiers

Jan. 11, 1999; In English
Report No.(s): DE2002-791837; UCRL-ID-132680; No Copyright; Avail: National Technical Information Service (NTIS)

This document describes extensive experiments and modeling performed during the late 1990s at Lawrence Livermore National Laboratory (LLNL) to characterize the optical performance of flashlamp-pumped, Nd:glass amplifiers for the National Ignition Facility (NIF). These analyses were undertaken to address three major aspects of amplifier performance: gain and gain uniformity, prompt pump-induced wavefront distortion, and long-term thermal wavefront recovery. The experiments consisted of performance measurements made on the NIF prototype amplifier, a four-aperture-high x two-aperture-wide multisegment amplifier with 40-cm-square apertures. 'Ilk prototype amplifier was nearly identical to the NIF amplifier design, with the same size flaSNamPS and laser slabs, nearly the same reflector shapes, similar antireflective (AR) coatings on the blast shields to improve pumping efficiency, and flowing gas to cool the flashlamps and to accelerate thermal wavefront recovery after shots. The prototype amplifier was tested as a one-, two-, and three-slab-long amplifier, so that the results could be extrapolated to accurately predict the performance of the five- and eleven-slab-long NIF amplifiers. Although the dimensions, internal positions, and shapes of the components in the NIF production amplifiers will be slightly different from the prototype, these differences were small, and our analyses suggest that only slight differences in performance may be expected.

NTIS

Optics; Amplifiers; Wave Fronts

20030014112 Montana State Univ., Dept. of Physics, Bozeman, MT USA

Advanced Coherent Transient Systems and Devices ***Final Report, 1 Apr. 1998-31 Dec. 2001***

Babbitt, W. R.; Jul. 29, 2002; 65p; In English
Contract(s)/Grant(s): F49620-98-1-0283
Report No.(s): AD-A409269; WRB02.01; AFRL-SR-AR-TR-02-0407; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The reported research explored non-traditional approaches to optical coherent transients applications and explored novel concepts designed to enhance optical coherent transient processing by exploiting the complex signal processing capabilities and non-linear behavior in optical coherent transient systems. The progress reported includes continuously programmed continuous processing optical coherent transient processor proposed and demonstrated; high efficiency echoes greater than 100% demonstrated; the theory and demonstration of the energy source of echoes; study of virtual echoes via a six wave mixing processes; BPSK and QPSK correlation demonstrating processing of multi-phase encoded information with optical-coherent transient; nutational echoes investigated and demonstrated; new methods for multi-GHz pulse shaping and arbitrary waveform generation using optical coherent transients are proposed and proof-of-concept demonstration was performed;. methods for obtaining high efficiency (58%) true-time-delay echoes using linear chirped programming are proposed; and optical control of geometric phase in an optical coherent transient system is experimentally demonstrated.

DTIC

Nonlinear Optics; Data Processing; Binary Phase Shift Keying; Linear Programming; Time Lag

20030014173 Michigan State Univ., Composite Materials Structures Center, East Lansing, MI USA

Ultraviolet Light Surface Treatment as an Environmentally Benign Process for Production, Maintenance and Repair of Military Composite Structures ***Final Report***

Drzal, Lawrence T.; Feb. 28, 2002; 35p; In English
Report No.(s): AD-A409097; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The principal objective of this work is to develop a low-cost, high-speed, environmentally benign, dry surface treatment method for production, and repair of military composite structures using ultraviolet (UV) light in ambient air. The potential advantage of this method is that it would eliminate volatile organic wastes (VOCs), reduce or eliminate the use of solutions and detergents, and provide a robust surface that would enhance or eliminate the use of solutions and detergents, and provide a robust surface that would enhance the wetting and spreading of paints, coatings and adhesives on polymeric and inorganic surfaces treated by this method. A manufacturing base for UV production equipment is in place although not for this application. There is a need for development of an environmentally friendly, cost effective as well as a robust surface treatment method that can clean a surface as well as create a beneficial chemistry for painting and produce optimum adhesive bonding of polymers, polymer composites and metal surfaces. With this in mind, three main technical objectives were sought in the work. The first objective was to determine the usefulness of UV and UV/O(3) to surface treatments to clean and chemically modify the surface of typical PMCs used in DOD systems. The second objective was to determine the effectiveness of this surface preparation for production and/or repair of adhesively bonded, painted and/or coated polymer matrix composite structures. Finally, a determination of the environmental and performance benefits of this method as a new environmentally benign processing method for the production and/or re air of adhesively SERDP, SERDP collection, robust surface, polymeric surface, inorganic surface, volatile organic compounds (VOC) emissions.
DTIC
Ultraviolet Radiation; Surface Properties; Hazardous Wastes

20030014309 Argonne National Lab., IL USA
Diffuse Scattering Sheets in Reciprocal Space Corresponding to Kiessig Fringes for X-ray Multilayers
Macrander, A. T.; Chu, Y.; Liu, C.; Mancini, D.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799809; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
X Ray Diffraction; X Ray Scattering; Diffusion

20030014325 NASA Marshall Space Flight Center, Huntsville, AL USA
MSFC/UAH Full Aperture Cryo-Figure AMSD Modal Characterization
Rogers, Ted, Alabama Univ., USA; Stahl, Phil, NASA Marshall Space Flight Center, USA; Geary, Joe, Alabama Univ., USA; [2002]; 1p; In English; 2nd Annual Technology Days, 22-24 May 2002, Huntsville, AL, USA
Contract(s)/Grant(s): NCC8-200; No Copyright; Avail: Issuing Activity; Abstract Only
A full-aperture, interferometric method for measuring the modal characteristics of the Advanced Mirror System Demonstrators (AMSDs) will be presented. The method involves stroboscopic surface figure measurement using an interferometer capable of simultaneous phase-shift measurements. Results of bread-board experiments will be presented as well as the plan for cryo measurements of the AMSDs.
Author
Mirrors; Cryogenic Cooling; Interferometry; Optical Measurement; Modes (Standing Waves); Breadboard Models

75
PLASMA PHYSICS

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

20030012615 Lawrence Livermore National Lab., Livermore, CA USA
Modeling Lasser and e-Beam Generated Plasma-Plume Experiments Using LASNEX
Ho, D. D. M.; Dec. 01, 1999; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792258; UCRL-ID-136726; No Copyright; Avail: National Technical Information Service (NTIS)
The hydrodynamics code LASNEX is used to model the laser and e-beam generated plasma-plume experiments. The laser used has a wavelength of 1 pm and the FWHM spot size is 1 mm. The total laser energy is 160 mJ. The simulation shows that the plume expands at a velocity of about 6 cm/Is. The e-beam generated from the Experimental Test Accelerator (ETA) has 5.5 MeV and FWHM spot size ranges from 2 to 3.3 mm. From the simulations, the plasma plume expansion velocity ranges from

about 3 to 6 mm/ps and the velocity increases with decreasing spot size. All the simulation results reported here are in close agreement with experimental data.
NTIS
Laser Targets; Electron Beams; Plasma Diagnostics

20030012734 Lawrence Livermore National Lab., Livermore, CA USA
Self-Smoothing of Laser Light in Plasmas
Baldis, H. A.; Rozmus, W.; Labaune, C.; Cohen, B.; Berger, R.; Feb. 22, 2000; 26p; In English
Report No.(s): DE2002-792259; UCRL-ID-135918; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The modification of the optical characteristics of a laser beam by a plasma is a key issue in laser-plasma coupling. It is critical to understand how this takes place, if we are ever to understand the interaction processes in the plasma corona as well as the coupling at super-high intensities--as when laser pulses approach Petawatt intensities. Interpreting and understanding parametric instabilities in laser-produced plasmas has been a problem of increasing complexity. Improvements in diagnostic capabilities in experimental studies, as well as refinements in the modeling (using different numerical techniques), are showing a complex scenario: strong interplay among instabilities, modification of the plasma conditions caused by the instabilities, and modification to the initial distribution of laser intensity inside the plasma.
NTIS
Laser Beams; Plasmas (Physics)

20030012906 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Calibration Facilities for NIF
Jun. 15, 2000; 24p; In English
Report No.(s): DE2002-793602; UCRL-JC-137942; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Calibration of diagnostics on National Ignition Facility (NIF) will be an essential activity that is still only in the planning process. This document starts to list some of the calibration facilities needed and the steps necessary for calibration of the various diagnostics. Numerous people have contributed to this document. These contributors include physicists and technicians who have been closely associated with experiments that have been carried out on the various Department of Energy experimental facilities.
NTIS
Diagnosis; Calibrating; Ignition; High Temperature Plasmas; Research Facilities

20030012965 Stanford Univ., Stanford, CA USA
Mechanisms of Ionizational Nonequilibrium in Air Plasmas ***Final Report, 1 May 1997-30 Sep. 2002***
Kruger, Charles H.; Oct. 2002; 125p; In English; Original contains color images
Contract(s)/Grant(s): F49620-97-1-0316; AF Proj. 3484
Report No.(s): AD-A409196; AFRL-SR-AR-TR-02-0418; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The goal of this MURI program was to discover physical mechanisms for significantly reducing the power budget required to create and sustain large volume atmospheric air plasmas at temperature below 2000K with electron number densities of the order of 10 13 cm -3. The Stanford consortium Experimentally demonstrated the generation of over 10 12 electrons/cm 3 in atmospheric pressure air at 2000K, with an average power of 12 W/cm 3, i.e. 250 times smaller than a DC discharge at 10 12/cm3.
DTIC
Plasmas (Physics); Plasma Diagnostics

20030013636 NASA Langley Research Center, Hampton, VA USA
Analysis of Optimum Heterodyne Receivers for Coherent Lidar Applications
Amzajerdian, Farzin, NASA Langley Research Center, USA; [2002]; 4p; In English; 21st International Laser Radar Conference, 8-12 Jul. 2002, Quebec, Canada; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A full analysis of the combined effects of all the noise sources of optical heterodyne receiver and the interaction between the competing control parameters of the receiver detector and pre-amplifier will be presented. This analysis provides the mean for true optimization of the coherent lidar receiver. The significance of the optimization of heterodyne receiver is shown for 2-micron coherent lidar.
Author
Optical Heterodyning; Electro-Optics; Optical Radar; Optimization; Coherent Radar; Receivers

20030014132 Lawrence Livermore National Lab., Livermore, CA USA

10 micrometer and 5 micrometer Pinhole-Assisted Point-Projection Backlit Imaging for NIF

Bullock, A. B.; Landen, O. L.; Bradley, D. K.; Jun. 05, 2000; 26p; In English

Report No.(s): DE2002-792367; UCRL-JC-137904; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

No abstract available.

NTIS

Ablation; Plasma Diagnostics; Lasers; Image Processing

20030014501 NASA Ames Research Center, Moffett Field, CA USA

The Delta x B = 0 Constraint Versus Minimization of Numerical Errors in MHD Simulations

Yee, H. C., NASA Ames Research Center, USA; Sjoegreen, Bjoern, Royal Inst. of Tech., Sweden; Nov. 15, 2002; 1p; In English; 5th International Congress of Industrial and Applied Mathematics, 7-11 Jul. 2003, Sydney, Australia; No Copyright; Avail: Issuing Activity; Abstract Only

The MHD equations are a system of non-strictly hyperbolic conservation laws. The non-convexity of the inviscid flux vector resulted in corresponding Jacobian matrices with undesirable properties. It has previously been shown by Powell et al. (1995) that an 'almost' equivalent MHD system in non-conservative form can be derived. This non-conservative system has a better conditioned eigensystem. Aside from Powell et al., the MHD equations can be derived from basic principles in either conservative or non-conservative form. The Delta x B = 0 constraint of the MHD equations is only an initial condition constraint, it is very different from the incompressible Navier-Stokes equations in which the divergence condition is needed to close the system (i.e., to have the same number of equations and the same number of unknown). In the MHD formulations, if Delta x B = 0 initially, all one needs is to construct appropriate numerical schemes that preserve this constraint at later time evolutions. In other words, one does not need the Delta x B condition to close the MHD system. We formulate our new scheme together with the Cargo & Gallice (1997) form of the MHD approximate Riemann solver in curvilinear grids for both versions of the MHD equations. A novel feature of our new method is that the well-conditioned eigen-decomposition of the non-conservative MHD equations is used to solve the conservative equations. This new feature of the method provides well-conditioned eigenvectors for the conservative formulation, so that correct wave speeds for discontinuities are assured. The justification for using the non-conservative eigen-decomposition to solve the conservative equations is that our scheme has a better control of the numerical error associated with the divergence of the magnetic condition. Consequently, computing both forms of the equations with the same eigen-decomposition is almost equivalent. It will be shown that this approach, using the non-conservative eigensystem when solving the conservative equations, also works well in the context of standard shock-capturing schemes.

Author

Magnetohydrodynamics; Errors; Optimization; Simulation

20030014502 NASA Ames Research Center, Moffett Field, CA USA

Extension of Low Dissipative High Order Hydrodynamics Schemes for MHD Equations

Yee, H. C., NASA Ames Research Center, USA; Sjoegreen, Bjoern, Royal Inst. of Tech., Sweden; Nov. 15, 2002; 1p; In English; International Conference on High Performance Scientific Computing, 10-14 Mar. 2003, Hanoi, Viet Nam; No Copyright; Avail: Issuing Activity; Abstract Only

The objective of this paper is to extend our recently developed highly parallelizable nonlinear stable high order schemes for complex multiscale hydrodynamic applications to the viscous MHD (magnetohydrodynamic) equations. These schemes employed multiresolution wavelets as adaptive numerical dissipation controls to limit the amount and to aid the selection and/or blending of the appropriate types of dissipation to be used. The new scheme is formulated for both the conservative and non-conservative form of the MHD equations in curvi-linear grids. The three features of the present MHD scheme over existing schemes in the open literature are as follows. First, the scheme is constructed for long-time integrations of shock/turbulence/combustion magnetized flows. Available schemes are too diffusive for long-time integrations and/or turbulence/combustion problems. Second, unlike existing schemes for the conservative MHD equations which suffer from ill-conditioned eigen-decompositions, the present scheme makes use of a well-conditioned eigen-decomposition to solve the conservative form of the MHD equations. This is due to, partly. the fact that the divergence of the magnetic field condition is a different type of constraint from its incompressible Navier-Stokes cousin. Third, a new approach to minimize the numerical error of the divergence free magnetic condition for high order scheme is introduced.

Author

Magnetohydrodynamics; Dissipation; Hydrodynamic Equations

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.

20030012577 NASA Langley Research Center, Hampton, VA USA
Dispersion of Single Wall Carbon Nanotubes by in situ Polymerization Under Sonication
Park, Cheol, Institute for Computer Applications in Science and Engineering, USA; Ounaies, Zoubeida, Institute for Computer Applications in Science and Engineering, USA; Watson, Kent A., Institute for Computer Applications in Science and Engineering, USA; Crooks, Roy E., Lockheed Martin Corp., USA; Smith, Joseph, Jr., NASA Langley Research Center, USA; Lowther, Sharon E., NASA Langley Research Center, USA; Connell, John W., NASA Langley Research Center, USA; Siochi, Emilie J., NASA Langley Research Center, USA; Harrison, Joycelyn S., NASA Langley Research Center, USA; St.Clair, Terry L., NASA Langley Research Center, USA; Chemical Physics Letters; Oct. 04, 2002; ISSN 0009-2614; Volume 364, pp. 303-308; In English; Copyright; Avail: Issuing Activity

Single wall nanotube reinforced polyimide nanocomposites were synthesized by in situ polymerization of monomers of interest in the presence of sonication. This process enabled uniform dispersion of single wall carbon nanotube (SWNT) bundles in the polymer matrix. The resultant SWNT-polyimide nanocomposite films were electrically conductive (antistatic) and optically transparent with significant conductivity enhancement (10 orders of magnitude) at a very low loading (0.1 vol%). Mechanical properties as well as thermal stability were also improved with the incorporation of the SWNT.
Author
Carbon Nanotubes; Walls; Polymerization; Nanocomposites; Monomers

20030012620 Lawrence Livermore National Lab., Livermore, CA USA
Atomic Structure and Deformation Behavior of Bulk Amorphous Alloys
Nieh, T. G.; Hsiung, L. M.; Choi, B. W.; Sep. 12, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792355; UCRL-ID-137132-R1; No Copyright; Avail: National Technical Information Service (NTIS)

The objective of this project was to gain a basic understanding of the atomic and defect structure of BAAs and of how structural stability affects their deformation behavior. We placed particular emphasis on understanding (1) shear-band formation, which is the dominant deformation mode at ambient temperature; and (2) Newtonian plastic flow, which is expected to be the dominant deformation mode at supercooled-liquid temperatures in BAAs. Such understandings would allow suppression of shear instability, promotion of homogeneous deformation at low temperatures, and improved formability at supercooled-liquid temperatures.
NTIS
Atomic Structure; Amorphous Materials; Alloys

20030012805 Christopher Newport Univ., Dept. of Biology, Chemistry, and Environmental Science, Newport News, VA USA
Synthesis of Carbon Nanotubes Using Sol Gel Route
Abdel-Fattah, Tarek, Christopher Newport Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 45; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Since 1990, carbon nanotubes were discovered and they have been the object of intense scientific study ever since. A carbon nanotube is a honeycomb lattice rolled into a cylinder. The diameter of a carbon nanotube is of nanometer size and the length is in the range of micrometer. Many of the extraordinary properties attributed to nanotubes, such as tensile strength and thermal stability, have inspired predictions of microscopic robots, dent-resistant car bodies and earthquake-resistant buildings. The first products to use nanotubes were electrical. Some General Motors cars already include plastic parts to which nanotubes were added; such plastic can be electrified during painting so that the paint will stick more readily. Two nanotube-based lighting and display products are well on their way to market. In the long term, perhaps the most valuable applications will take further advantage of nanotubes' unique electronic properties. Carbon nanotubes can in principle play the same role as silicon does in electronic circuits, but at a molecular scale where silicon and other standard semiconductors cease to work. There are several routes to synthesize carbon nanotubes; laser vaporization, carbon arc and vapor growth. We have applied a different route using sol gel chemistry to obtain carbon nanotubes. This work is patent-pending.
Author
Carbon Nanotubes; Sol-Gel Processes; Nanostructure Growth; Thermal Stability; Tensile Strength; Honeycomb Structures

20030012817 Pacific Lutheran Univ., Dept. of Physics, Tacoma, WA USA

Nanomanipulation and Lithography: The Building (and Modeling) of Carbon Nanotube Magnetic Tunnel Junctions

Louie, Richard Nam, Pacific Lutheran Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 57; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Aircraft fuselages suffer alternating stress during takeoffs and landings, and fatigue cracks begin to grow, usually at rivet holes. The detection of these fatigue cracks under installed fasteners in aging aircraft is a major goal of the nondestructive evaluation (NDE) community. The use of giant magnetoresistance (GMR) sensors in electromagnetic (EM) NDE has been increasing rapidly. For example, here at Langley Research Center, a Rotating Probe System (RPS) containing a GMR element has been incorporated into a product to detect deeply buried flaws in aerospace structures. In order to advance this eddy current probe application and many similar ones, research to create smaller, more sensitive and energy-efficient EM sensors has been aggressively pursued. Recent theoretical and experimental work on spin coherent transport supports the feasibility of carbon nanotube (CNT) based magnetic tunnel junctions. In this study, a spatial filtering scheme is presented that improves the signal to noise ratio of the RPS and does not significantly impact the number of false alarms. Signals due to buried flaws occur at higher frequencies than do signals due to rivet tilt or probe misalignment, and the strategy purposefully targets this fact. Furthermore, the spatial filtering scheme exploits decreases in the probe output that are observed immediately preceding and following the peak in output due to a fatigue crack. Using the new filters, an enhanced probability of flaw detection is expected. In the future, even tinier, more sensitive, low-power sensors are envisioned for the rotating probe and other nondestructive inspection systems. These may be comprised of single-walled carbon nanotubes (SWCNTs) that connect two ferromagnetic (FM) electrodes. Theoretical work has been done at Langley to model the electrical and magnetoconductance behavior of such junctions, for systems containing short ”armchair” nanotubes. The present work facilitates the modeling of more realistic system sizes, through the re-writing of a critical code segment that gives a hundredfold improvement in speed. Furthermore, the tight-binding model calculations are now generalized to include all types of nanotubes, not merely armchair tubes. On the experimental side, innovative junction fabrication procedures are investigated, including diamond-tip scanning probe lithography and e-beam lithography. Programs are written for the Nanometer Pattern Generation System to effect the creation of many junctions at once, to increase the chances of a CNT connecting two FM electrodes. As it is not prudent to rely solely on luck, the capability for tube nanomanipulation with an unprecedented level of control is also shown, and a procedure for controlled deposition upon chemically functionalized lithographic patterns is discussed. All of the techniques demonstrated can be used to create a magnetic tunnel junction to be refrigerated for extensive magnetoconductance studies.

Author

Carbon Nanotubes; Fuselages; Nondestructive Tests; Magnetoresistivity; Aircraft Structures; Cracks; Tunnel Junctions

20030012869 Tetra Tech, Inc., San Diego, CA USA

High Energy Electron Injection (E-Beam) Technology for the ’Ex-Situ’ Treatment of MtBE-Contaminated Groundwater

Venosa, A. D.; Sep. 2002; 88p; In English

Report No.(s): PB2003-102004; No Copyright; Avail: National Technical Information Service (NTIS)

This Innovative Technology Evaluation Report documents the results of a demonstration of the high-energy electron injection (E-Beam) technology in application to groundwater contaminated with methyl t-butyl ether (MtBE) and with benzene, toluene, ethylbenzene, and xylenes (BTEX). The E-beam technology destroys organic contaminants in groundwater through irradiation with a beam of high-energy electrons. The demonstration was conducted at the Naval Base Ventura County (NBVC) in Port Hueneme, California.

NTIS

Ground Water; Injection; Electron Beams; High Energy Electrons; Contamination; Water Pollution; Pollution Control

20030012905 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Study of the Effects of Disorder in the 2D Hubbard Model

Jun. 05, 2000; 20p; In English

Report No.(s): DE2002-793619; UCRL-JC-139246; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study the effects of disorder on long range antiferromagnetic correlations and the Mott gap in the half-filled, two dimensional, repulsive Hubbard model. We employ Hartree-Fock (HF) and Quantum Monte Carlo (QMC) techniques in our study of the bond and site disordered models. Results from mean field (HF) calculations are used to develop a qualitative picture of the physics and to guide our choice for input to the QMC methods. The basic properties of two QMC methods for correlated fermions are discussed, and the results from these different approaches are presented. This work was performed under the auspices of the

U.S. Department of Energy by the University of California and Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.
NTIS
Two Dimensional Models; Entropy; Antiferromagnetism

20030012959 Argonne National Lab., IL USA
Superconducting Phase Diagram of Single Crystal MgB(2)
Welp, U.; Rydh, A.; Karapetrov, G.; Kwok, W. K.; Crabtree, G. W.; Aug. 16, 2002; 18p; In English
Report No.(s): DE2002-801587; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Using magnetization, transport and single-crystal specific heat measurements we have determined the superconducting phase diagram of MgB(sub 2). A zero-temperature in-pane coherence length of 9.4 nm is found. The superconducting anisotropy changes monotonously from a value around 2 near T(sub c) to above 4.5 near 22 K. We present strong evidence for a surface superconducting state for H(parallel)c which might account for the wide spread in reported values of the superconducting anisotropy.
NTIS
Magnesium Compounds; Phase Diagrams; Superconductivity; Boron Compounds

20030013641 NASA Langley Research Center, Hampton, VA USA
Active Piezoelectric Diaphragms
Bryant, Robert G., NASA Langley Research Center, USA; Effinger, Robert T., IV, Texas A&M Univ., USA; Aranda, Isaiah, Jr., Texas A&M Univ., USA; Copeland, Ben M., NASA Langley Research Center, USA; Covington, Ed W., III, NASA Langley Research Center, USA; [2002]; 12p; In English; SPIE's 9th Annual International Symposium on Smart Structures and Materials, 17-21 Mar. 2002, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; Original contains color illustrations
Report No.(s): SPIE Paper 4699-40; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Several active piezoelectric diaphragms were fabricated by placing unelectroded piezoelectric disks between copper clad films patterned with Inter-Circulating Electrodes "ICE". When a voltage potential is applied to the electrodes, the result is radially distributed electric field that mechanically strains the piezo-ceramic along the Z-axis (perpendicular to the applied electric field), rather than the expected in-plane (XY-axis) direction. Unlike other out of plane piezoelectric actuators, which are benders, these Radial Field Diaphragms (RFDs) strain concentrically yet afford high displacements while maintaining a constant circumference. This paper covers the fabrication and characterization of these diaphragms as a function of poling field strength, ceramic diameter and line spacing, as well as the surface topography, the resulting strain field and displacement as a function of applied voltage ranging from DC to 10 Hz.
Author
Electrodes; Fabrication; Piezoelectric Actuators; Electric Field Strength; Topography

20030013736 Ames Lab., IA USA
Effect of Varying the Crystal Structure on the Magnetism, Electronic, Structure and Thermodynamics in the Gd(5)(Si(x)Ge(1-x))(4) System near x=0.5
Pecharsky, V. K.; Samolyuk, G. D.; Antropov, V. P.; Pecharsky, A. O.; Gschneidner, K. A.; 2002; 42p; In English
Report No.(s): DE2002-802142; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The crystal structure, magnetic and other physical properties of the intermetallic Gd5(SixGe1-x)4 phases are strongly dependent on the Si:Ge ratio (x). Especially intriguing behavior is observed when the chemical composition in this system is near x . 0.5, where small changes in the stoichiometry result in drastic variations in the chemical bonding, electronic structure, crystal structure, and magnetism. Furthermore, the fully reversible magnetic/crystallographic (TC . 270 K) and the irreversible thermoelastic crystallographic (between 500 and 750 K) transformations exist near this critical chemical composition. Both of these transformations involve the same two crystallographic modifications: the monoclinic Gd5(Si2Ge2)-type (Ya') and the orthorhombic Gd5Si4-type structures (YA and Ya). First principle calculations of the electronic structure and exchange coupling of these materials are in nearly quantitative agreement with the experiment. It appears that the unusual behavior observed in the near critical Gd5(SixGe1-x)4 phases is closely related to the stability of the well-defined sub-nanometer thick atomic slabs coupled with the flexibility of their arrangements.
NTIS
Crystal Structure; Intermetallics; Magnetic Properties; Silicides

20030013957 Lawrence Livermore National Lab., Livermore, CA USA

Studies of Dynamic Properties of Shock Compressed fcc Crystals by In Situ Dynamic X-Ray Diffraction

Baldis, H.; Kalantar, D. H.; Remington, B. A.; Belak, J.; Colvin, J.; Aug. 14, 2001; 10p; In English

Report No.(s): DE2002-802095; UCRL-ID-145209; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

There were 5 laser experiments conducted to date in FY-01 under the ongoing project to study the response of single crystal fcc materials under shock compression. An additional 10 laser shots are planned for August, 2001. This work has focused on developing capability to record diffraction from multiple lattice planes during the passage of a shock through a thin foil of single crystal copper, while simultaneously performing separate shock sample recovery experiments to study the residual deformation structure in the recovered samples.

NTIS

Shock Waves; Crystal Lattices; Copper; Foils (Materials)

20030014135 NASA Langley Research Center, Hampton, VA USA

Reliability Testing of NASA Piezocomposite Actuators

Wilkie, W., NASA Langley Research Center, USA; High, J., NASA Langley Research Center, USA; Bockman, J., NASA Langley Research Center, USA; [2002]; 4p; In English; 8th International Conference on New Actuators, 10-12 Jun. 2002, Bremen, Germany; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

NASA Langley Research Center has developed a low-cost piezocomposite actuator which has application for controlling vibrations in large inflatable smart space structures, space telescopes, and high performance aircraft. Tests show the NASA piezocomposite device is capable of producing large, directional, in-plane strains on the order of 2000 parts-per-million peak-to-peak, with no reduction in free-strain performance to 100 million electrical cycles. This paper describes methods, measurements, and preliminary results from our reliability evaluation of the device under externally applied mechanical loads and at various operational temperatures. Tests performed to date show no net reductions in actuation amplitude while the device was moderately loaded through 10 million electrical cycles. Tests were performed at both room temperature and at the maximum operational temperature of the epoxy resin system used in manufacture of the device. Initial indications are that actuator reliability is excellent, with no actuator failures or large net reduction in actuator performance.

Author

Piezoelectric Actuators; Fiber Composites; Reliability; Tests

20030014336 Helsinki Univ. of Technology, Electromagnetics Lab., Espoo, Finland

How Strict Are Theoretical Bounds for Dielectric Properties of Mixtures

Sihvola, A.; Jul. 2001; 26p; In English

Report No.(s): PB2003-101227; Rept-382; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This report discusses bounds for mixing rules. Several theoretical bounds and limits for the effective permittivity of heterogeneous media have been derived. However, it may happen that the bounds are trespassed in the real-life applications. Examples of such behavior are given for snow, random media simulations, lossy heterogeneous materials, and magnetic and magnetoelectric materials. Reasons for the bound-violation phenomena are discussed and correct ways of interpreting the bounds are suggested.

NTIS

Dielectric Properties; Mixtures

20030014499 Computer Sciences Corp., USA

Modeling of Carbon Nanotube Schottky Barrier Modulation Due to Oxidation

Yamada, Toshishige, NASA Ames Research Center, USA; [2002]; 1p; In English; American Physical Society March Meeting, 3-7 Mar. 2003, Austin, TX, USA; Sponsored by American Physical Society, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; No Copyright; Avail: Issuing Activity; Abstract Only

A model is proposed for the experimentally observed lower Schottky barrier for holes in air than in vacuum at a metallic electrode - semiconducting carbon nanotube (CNT) junction. In oxidation occurring in air, the negatively charged oxygen molecules on a material usually enhance the surface dipole and provide stronger electron confinement within the bulk. Thus the CNT electron affinity will increase in air. Then the Schottky barrier for holes will have to increase according to the standard band-alignment theory, but this is against the experiment. In order to overcome this difficulty, we propose a new Schottky barrier model, assuming there is a transition region between the electrode and the CNT and an appreciable potential can drop there. The role of the oxidation is to increase this potential drop with negatively charged oxygen molecules, leading to a lower Schottky

barrier for holes. This mechanism prevails for both p- and n-CNTs. The model consistently explains all the reported CNT device experiments.
Author
Carbon Nanotubes; Models; Modulation; Oxidation; Electrodes; Semiconductors (Materials)

20030014584 NASA Glenn Research Center, Cleveland, OH USA
Method for Growing Low-Defect Single Crystal Heteroepitaxial Films
Powell, J. Anthony, Inventor, NASA Glenn Research Center, USA; Neudeck, Philip G., Inventor, NASA Glenn Research Center, USA; Dec. 03, 2002; 56p; In English
Patent Info.: Filed 25 Sep. 2001; NASA-Case-LEW-17186-1; US-Patent-6,488,771; US-Patent-Appl-SN-965250; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A method is disclosed for growing high-quality low-defect crystal films heteroepitaxially on substrates that are different than the crystal films. The growth of the first two heteroepitaxial bilayers is performed on a first two-dimensional nucleate island before a second growth of two-dimensional nucleation is allowed to start. The method is particularly suited for the growth of 3C-SiC, 2H-AlN, or 2H-GaN on 6H-SiC, 4H-SiC, or silicon substrates.
Official Gazette of the U.S. Patent and Trademark Office
Crystal Growth; Thin Films; Silicon Carbides; Aluminum Nitrides; Gallium Nitrides

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.

20030012888 Eidgenoessische Technische Hochschule, Swiss Federal Inst. of Technology, Zurich, Switzerland
Future Development for Laser-Induced Thermal Acoustics
Schlamp, Stefan; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409140; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The development of novel flow diagnostic techniques typically proceeds in certain stages from a proof of principle in a laboratory to a commercial product either for use in industry or as turn-key research tool. While the first usable versions are brought to market, further progress is made in the laboratory by improvements, refinements, and extensions of the technique. Consider Particle Image Velocimetry (PIV), which started by double-exposing a photographic film with the image of an illuminated particle-laden flow and where today turn-key, off-the-shelf CCD systems are available for purchase, which include the necessary data analysis software. At the same time, 3d PIV, dual-plane PIV, Doppler Global Velocimetry (DGV), etc. are being used in laboratories and will doubtless be available as integrated systems in the near future. In this paper, the origin, an overview over the current status and an outlook on the future potential of Laser-Induced Thermal Acoustics (LITA) will be given, where the focus will be on the possible technique extensions to other than the current applications. As such, it represents a collection of ideas and avenues for future research, which have not been applied as of yet, but are conceptually feasible.
DTIC
Acoustics; Laser Applications; Thermal Diffusion; Flow Visualization

20030012890 Academy of Sciences (USSR), Inst. of Theoretical and Applied Mechanics, Novosibirsk, USSR
Comparison of Fuels Used for Chemical Heating of the Working Medium in Gasdynamic High-Enthalpy Facilities
Shumskii, V. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409135; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In the present study we compare hydrogen, acetylene, propane and their mixtures with nitrogenous oxide from the viewpoint of the amount of fuel required for reproducing full-scale enthalpy and pressures, with due regard made for their ignition conditions.
DTIC
Enthalpy; Fuels; Heating; Gas Dynamics

20030012897 California Univ., Dept. of Physics, Berkeley, CA USA

Seiberg-Witten Map for Noncommutative Gauge Theories

Cerchiai, B. L.; Pasqua, A. F.; Zumino, B.; 2002; 18p; In English

Report No.(s): DE2002-801972; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Seiberg-Witten map for noncommutative Yang-Mills theories is studied and methods for its explicit construction are discussed which are valid for any gauge group. In particular the use of the evolution equation is described in some detail and its relation to the cohomological approach is elucidated. Cohomological methods which are applicable to gauge theories requiring the Batalin-Vilkoviskii antifield formalism are briefly mentioned. Also, the analogy of the Weyl-Moyal star product with the star product of opestring field theory and possible ramifications of this analogy are briefly mentioned.

NTIS

Quantum Chromodynamics; Yang-Mills Theory; Gauge Theory

20030012995 Max-Planck-Inst. fuer Stroemungsforschung, Goettingen Germany

Stimulated Heterogeneous Nucleation of Supercooled Liquid H2 Droplets

Knuth, E. L.; Schaper, S.; Toennies, J. P.; Jul. 09, 2000; 9p; In English; Papers from Rarefied Gas Dynamics (RGD) 22nd International Symposium held in Sydney, Australia on 9-14 July 2000. See also ADM001341 for whole conference on cd-rom

Report No.(s): AD-A409083; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The properties of H(2) droplets formed by condensation in a supersonic freejet were probed by the capture and coagulation of CO molecules for the purpose of determining whether the droplets are liquid or solid. The CO was introduced into the H(2) droplets by passing the droplet beam through a scattering chamber containing CO at room temperature and various pressures. Reduction of droplet size as a result of droplet collisions with CO molecules was determined by measuring the droplet size downstream from the scattering region for several different values of the CO pressure. The size of the embedded clusters formed by coagulation of the captured CO molecules was determined from the mass spectra measured for several values of CO pressure in the scattering chamber. A comparison of (a) the observed dramatic loss of about 7% of the H(2) molecules from a droplet after between 2 and 8 collisions with (b) the loss predicted due to evaporation/sublimation in the event of solidification is taken to be compelling evidence that the H(2) droplets were liquid prior to their collisions with the CO scattering gas. The observed dependence of the maximum CO cluster size on the collision frequency appears to indicate that a sufficiently high collision frequency will liquify a droplet which otherwise would be solid. This observation supports the conclusion that the H(2) droplets are solidified as a consequence of heterogeneous nucleation induced by the captured CO molecules. The evidence in favor of a liquid state. coupled with the estimated 4K droplet temperature, suggest strongly that the supercooled H(2) droplets are superfluid.

DTIC

Water; Heterogeneity; Supercooling; Superfluidity; Nucleation; Drops (Liquids)

20030013645 Air Force Rocket Propulsion Lab., Edwards AFB, CA USA

AFRPL Solar-Thermal Rocket Activities

Selph, C. C.; Naujokas, G. J.; Mar. 1984; 11p; In English

Report No.(s): AD-A409326; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Earth orbital maneuvers, particularly orbit raising, provide the most important and extensive propulsion tasks in space and are not ideally served by either chemical rockets with their comparatively low Isp or electric rockets with their low thrust. For several years the Air Force Rocket Propulsion Laboratory (AFRPL) has investigated solar thermal propulsion as a potential way of filling this gap in propulsion capability. The concept makes use of concentrated sunlight to heat hydrogen to temperatures approaching 5000 deg R for expansion through a converging-diverging nozzle. The payload advantages which accrue from the high Isp (over 800 seconds) in various mission scenarios were determined analytically and a combined in-house and contractual investigation was launched to provide a demonstration and evaluation of the concept within the limits of a ground test facility. The design and fabrication of a nominal one pound thrust solar rocket was contracted out, and an in-house project was initiated to design and build a facility for testing the solar engine. In addition the analysis of alternative thruster concepts has been accomplished.

DTIC

Solar Thermal Propulsion; Solar Energy; Spacecraft Propulsion; Fabrication; Orbital Maneuvers

20030014170 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Modelling of Heat and Mass Transfer Around Single Hot Particle Surrounded by a Vapor Layer and Liquid
Gubaidullin, A. A.; Sannikov, I. N.; Kosheleva, E. A.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002
Report No.(s): AD-A409116; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The investigation of heat and mass transfer process around a single hot particle surrounded by vapor layer and liquid is actual due to a study of vapor explosion in the time of hard accidents on the nuclear reactors and metallurgy industry. The process of heat and mass transfer of vapor bubble at surrounding liquid was investigated well. However, insufficient attention was devoted a similarly process in the case of presence of a hot particle in the bubble. The models describing this process were proposed in the works. Unfortunately the questionable assumptions were used in the papers that can restricted the field of applications proposed ones. The model from the work was developed just for the some cases. The aim of this work is to fill up the mentioned gaps.
DTIC
Phase Transformations; Particles

20030014244 Stanford Linear Accelerator Center, Stanford, CA USA
de Sitter Space in Non-Critical String Theory
Maloney, A.; Silverstein, E.; Strominger, A.; Jun. 20, 2002; 28p; In English
Report No.(s): DE2002-799932; SLAC/PUB-9228; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Supercritical string theories in D greater than 10 dimensions with no moduli are described, generalizing the asymmetric orientifold construction of one of the authors. by taking the number of dimensions to be large and turning on fluxes, dilation potentials are generated with nontrivial minima at arbitrarily small cosmological constant and D-dimensional string coupling, separated by a barrier from a flat-space linear dilaton region, but possibly suffering from strong coupling problems. The general issue of the decay of a de Sitter vacuum to flat space is discussed. For relatively small barriers, such decays are described by gravitational instantons.
NTIS
String Theory; Models

20030014245 Stanford Linear Accelerator Center, Stanford, CA USA
Constraints on Light Bottom Squarks from Radiative B-Meson Decays
Becher, T.; Braig, S.; Kagan, A. L.; Newbert, M.; May 24, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799933; SLAC/PUB-9230; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Mesons; Particle Decay

20030014246 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the B(sup o) Yields D*-a(sup +)(sub 1) Branching Fraction with Partially Reconstructed D*: The BABAR Collaboration
Jul. 25, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799965; SLAC-PUB-9315; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Particle Decay; Mesons

20030014286 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Upgrading CEBAF to 12 GeV
Harwood, L.; 2002; 8p; In English
Report No.(s): DE2002-799888; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Electron Beams; Linear Accelerators

20030014310 Argonne National Lab., IL USA
Spin-Echo Resolved Grazing Incidence Scattering (SERGIS) of Cold Neutrons
Felcher, G. P.; te Velthuis, S. G. E.; Major, J.; Dosch, H.; Anderson, C.; 2002; 16p; In English
Report No.(s): DE2002-799807; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The conceptual design of a new instrument is presented, which makes use of the spin echo technique to analyze the scattering angle of neutrons impinging upon a rough or corrugated surface at grazing incidence. In a grazing incidence geometry the roughness of the surface and of submersed interfaces give rise to a neutron scattering pattern at angles well resolved from that of specular reflection for corrugation lengths up to several microns, but only in the plane of specular reflection. In contrast, scattering caused by corrugations of comparable length perpendicular to the reflection plane is limited to angles that can be separated only with an extreme tightening of the instrumental resolution. However this scattering can be well resolved by spin-echo methods for polarized neutrons. Results from scattering in and out of the reflection plane provide complementary information on the structure of the roughness and its location in a system with complex layering. This spin-echo technique may also distinguish static from time-dependent roughness.
NTIS
Cold Neutrons; Scattering

20030014585 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA
Towards Precision Experiments with Bose-Einstein Condensates ***Final Report, 1 Feb. 1998 - 31 Jan. 2003***
Ketterle, Wolfgang, Massachusetts Inst. of Tech., USA; [2003]; 34p; In English
Contract(s)/Grant(s): NAG8-1435; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Dilute quantum gases are new quantum fluids providing new phenomena and experimental possibilities. Quantum degeneracy is reached in the nanokelvin temperature range. At such low temperatures, gravitational forces become relevant and are major limitations to precision measurements. Such limitations are absent in the microgravity environment of the space station. In our current work we are developing the technology and scientific agenda for studies of Bose-Einstein condensates in microgravity. During the reporting period, the field of Bose-Einstein condensation developed dramatically. This happened both in experimental techniques and scientific explorations. On the more technical side, we developed optical trapping and tweezers for condensates, a continuous BEC source, atomic waveguides, and atom chips, and a new way to perform precision atom interferometry. Scientific studies include spinor condensates, light scattering experiments on BECs (which led to coherent matter wave amplification), studies of superfluidity and vortex lattices. Studies were extended to condensates in lower dimensions and to degenerate fermions.
Author
Bose-Einstein Condensates; Microgravity; Low Temperature; Spaceborne Experiments

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

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

20030012804 Old Dominion Univ., Norfolk, VA USA
2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program
Tiwari, Surendra N., Compiler, Old Dominion Univ., USA; Murray, Deborah B., Compiler, Old Dominion Univ., USA; December 2002; 114p; In English, 4 Jun. - 10 Aug. 2001, Hampton, VA, USA; Also announced as 20030012805 through 20030012840
Contract(s)/Grant(s): NCC1-01043
Report No.(s): NASA/CR-2002-211234; NAS 1.26:211234; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Since 1964, the National Aeronautics and Space Administration (NASA) has supported a program of summer faculty fellowships for engineering and science educators. In a series of collaborations between NASA research and development centers and nearby universities, engineering faculty members spend 10 weeks working with professional peers on research. The Summer Faculty Program Committee of the American Society for Engineering Education supervises these programs. Objectives: (1) to further the professional knowledge of qualified engineering and science faculty members; (2) to stimulate and exchange ideas between participants and NASA; (3) to enrich and refresh the research and teaching activities of participants' institutions; (4 to contribute to the research objectives of the NASA center. Program Description: College or university faculty members will be appointed as Research Fellows to spend 10 weeks in cooperative research and study at the NASA Langley Research Center. The Fellow will devote approximately 90 percent of the time to a research problem and the remaining time to a study program. The

study program will consist of lectures and seminars on topics of interest or that are directly relevant to the Fellow's research topics. The lecture and seminar leaders wil be distinguished scientists and engineers from NASA, education and industry.
Author
Education; NASA Programs; Scientists; Engineers; Research

20030012807 Hampton Univ., Office of Education, VA USA
In Support of Pre-Service Teacher Training
Barry, Effi, Hampton Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 47; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

There has been a growing concern that a number of the nation's teachers are under qualified to teach our children, especially math and science. This concern has lead to many reforms in our educational systems. Good teachers are at the center of a successful education. Each child has a right to receive an excellent education from a highly qualified teacher. Education is the single most important way to allow millions of Americans to improve their status and quality in life, to increase their occupational opportunities, enhance their income, provide security, foster financial independence, and enable them to become good productive citizens. The spotlight has also shone brightly on the quality of pre-service training and especially on the institutions that prepare them. If, in fact, we are determined to leave no child behind, it is vitally important to focus our energy and resources on the sound preparation of teachers. Teachers who enter the classrooms of our schools must be adequately prepared to provide our children with the knowledge and skills they will kind to survive and thrive in the highly technical 21st century. Each and every child despite his or her race, ethnicity, or gender has the right to the best education t h s country can provide. In order for us to provide the best for our children, as a nation, we must assure that each pre-service teacher being educated to teach our children, has had the best opportunity not only to learn about technology, but also has mastered the skills needed to appropriately infuse its use in their daily teaching; especially in math and the sciences. The teachers# technology skills will adequately provide our children with the knowledge and skills they deserve, need, and will be required to possess, if they are to master the challenges and requirements for success in the highly technical 21st century. In 1999, at an education conference, the Director of the National Science Foundation, Rita Colwell commented on the dilemma facing Minority-Serving Institutions. "It is critical that Minority-Serving Institutions be at the cutting edge of information technology. This is particularly important because minorities are under-represented in the information technology industry; an industry with wages that are 80% above the private sector average. What does it say about the future when the transformation in communications and computing-the cutting edge of science-has not yet swept major sectors of ow population into the excitement?"
Author
Education; Instructors; Information Systems

20030012812 James Madison Univ., School of Media Arts and Design, Harrisonburg, VA USA
Research and write an episode of The NASA "Why?" Files Television Series "The Case of the Wright Invention"
Greene, Rustin P., James Madison Univ., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 52; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The NASA "Why?" Files is a standards-based, technology focused, distance learning initiative designed to integrate and enhance the teaching of math, science, and technology in grades 3-5. This series of instructional programs includes broadcast, print, and on-line elements. It emphasizes standards-based instruction, Problem-Based Learning, and science as inquiry, including the scientific method and science process skills, to introduce students in grades 3 - 5 to the excitement and exploration of real-world mathematics, science, and technology. The NASA "Why?"Files seeks to motivate students to become critical thinkers and active problem solvers. Each program supports the national mathematics, science, and technology standards and includes: (1) A 60-minute video broadcast; (2) A companion educator's guide; (3) Web-based activities and materials; and (4) Information about NASA programs, projects, facilities, and researchers. "The Case of The Wright Invention" introduces students to the process of discovery and invention, and also celebrates the Wright Brothers' invention of the airplane. The program is divided into four parts, basically corresponding with the four parts of the invention process:. Identify the problem, evaluate and select ideas, design and create a model, test and revise. I helped define the scope of the project and developed the program's content outline, conducted program content research and negotiated with potential participants, and wrote the script for the program. This episode will be produced this fall, and will be broadcast to over three million students on PBS in December, 2001.
Author
Inventions; NASA Programs; Broadcasting; Research and Development; Television Systems; Technologies

20030012821 Blackfeet Community Coll., Div. of Math-Science-Computers, Browning, MT USA

GIFTS-IOMI: Education and Public Outreach

Nichols, William, Blackfeet Community Coll., USA; 2001 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; December 2002, pp. 61; In English; Also announced as 20030012804; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

GIFTS is an innovative blend of technologies that will provide continuous observation of the Earth's air and surface from geosynchronous orbit. It uses several innovative technologies to gather data on atmospheric temperature, distribution of trace gases, water vapor, clouds, and other items. The heart of GIFTS is a Fourier Transform Spectrometer that converts infrared images into accurate measurements of water vapor distribution and transport. The data will yield better weather forecasts. GIFTS will be launched in the Fall of 2004. It will occupy an orbital slot above the Western Hemisphere for the first twelve months of its mission. During that time, its technologies will be thoroughly tested. Its final orbit will be over the Indian Ocean where it can monitor developing weather patterns for NOAA and the U.S. Navy. The scientists and technicians who are working with the GIFTS project want people to know about the science and technology that will make GIFTS work. NASA and the GIFTS project staff are very interested in public education, and helping everyone understand what remote sensing and space exploration are all about. This project and the EPO pages that were generated during it are the results of their enthusiastic interests in educating people about NASA's missions. The purpose of this study is to research and screen all of the key technologies that will be resident on the GIFTS system for their suitability as features in the Education and Public Outreach component of the project. The goal of this study is to enlighten the world public about the technologies and monitoring capabilities of the GIFTS remote sensing satellite package. Specific objectives include: a) research the key technologies of the Sensor Module and the Control Module, b) simplify the terminology and descriptions to promote layperson understanding of the targeted technologies, c) coordinate references and links to supplement the descriptions, d) create low-tech curriculum units and lessons that illustrate the technologies, e) develop a series of web pages to post the descriptions and curriculum units along with supporting graphics and links, and f) pilot an evaluation component that can be linked to all of the EPO web pages from LaRC, SDL, and SSEC. Specific activities include reading the technical manuals, interviewing the key technology developers, conducting web searches to look for supporting links, creating a flexible web page format, coordinating with the LaRC Atmospheric Sciences -SDL - SSEC EPO personnel, among others. The initial outcome of this project is to identify three key technologies and develop web-based EPO units around them. The result of the project will be nine technology pages, an EPO home page, and a functional evaluation page. There are plans to host a workshop for educators to pilot the EPO pages and activities later this fall. The units are user friendly so the lessons and activities can be experienced by anyone. Each unit presents a series of lessons with each lesson keyed to primary, middle school, secondary, or undergraduate education levels. The appropriate NCTM and the NSES standards regarding computation and inquiry serve as the background for all of the lessons and activities. The pages are set up to provide the public with information, links to activities, other web-sites, curriculum units, and lessons that will facilitate an understanding of NASA, GIFTS, and remote sensing satellite technologies.

Author

Atmospheric Composition; Geosynchronous Orbits; Satellite Observation; Weather Forecasting; Infrared Imagery; Atmospheric Temperature

20030014608 NASA Glenn Research Center, Cleveland, OH USA

NASA Microgravity Science Competition for High-School-Aged Student Teams

DeLombard, Richard, NASA Glenn Research Center, USA; Stocker, Dennis, NASA Glenn Research Center, USA; Hodanbosi, Carol, National Center for Microgravity Research on Fluids and Combusiton, USA; Baumann, Eric, NASA Glenn Research Center, USA; December 2002; 14p; In English; 41st Aerospace Sciences Meeting and Exhibit, 6-9 Jan. 2003, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 101-58-13

Report No.(s): NASA/TM-2002-212007; E-13694; NAS 1.15:212007; AIAA Paper 2003-0944; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright

NASA participates in a wide variety of educational activities including competitive events. There are competitive events sponsored by NASA and student teams which are mentored by NASA centers. This participation by NASA in public forums serves to bring the excitement of aerospace science to students and educators. A new competition for highschool-aged student teams involving projects in microgravity has completed two pilot years and will have national eligibility for teams during the 2002-2003 school year. A team participating in the Dropping In a Microgravity Environment will research the field of microgravity, develop a hypothesis, and prepare a proposal for an experiment to be conducted in a microgravity drop tower facility. A team of NASA scientists and engineers will select the top proposals and those teams will then design and build their experiment apparatus. When the experiment apparatus are completed, team representatives will visit NASA Glenn in Cleveland, Ohio for operation of their

facility and participate in workshops and center tours. Presented in this paper will be a description of DIME, an overview of the planning and execution of such a program, results from the first two pilot years, and a status of the first national competition.
Author
Research and Development; Education; Competition; Microgravity; Drop Towers

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030012588 Swedish Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
Principles for Successful Research, Analysis and Consultancy ***Kriterier foer Framgangsrik Forsknings, Utrednings och Konsultverksamhet Fem-Exempel***
Hedvall, M.; Dec. 2001; 66p; In Swedish
Report No.(s): PB2003-101221; FOI-R-0242-SE; No Copyright; Avail: National Technical Information Service (NTIS)
The aim of this project is to identify principles/instruments used by five organizations in their research, analysis and consultancy. The results indicate the importance of having clear objectives; That the organization's vision should be reflected when doing research and analysis. to document and to minute can improve the research processes and results.
NTIS
Research; Management; Analyzing

20030012629 General Accounting Office, Washington, DC USA
GAO's Agency Protocols
Dec. 2002; 40p
Report No.(s): PB2003-100660; GAO-03-232SP; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This document contains GAO's (General Accounting Office) Agency Protocols that we are launching in a pilot phase starting in December 2002. These protocols are intended to govern the U.S. General Accounting Office's (GAO) work with executive branch agencies and to provide clearly defined and transparent policies and practices on how GAO will interact with agencies in the performance of its work. GAO supports the Congress in meeting its constitutional responsibilities and strives to help improve the performance and accountability of the federal government for the benefit of the American people. While GAO's primary client is the Congress, we seek to maintain constructive working relationships with the executive branch; conduct our work in a professional, objective, and nonpartisan manner; and help improve government. The vast majority of GAO's recommendations are addressed to executive branch officials for action. These protocols will help to ensure the consistency, fairness, and effectiveness of GAO's interactions with the agencies and thereby enable GAO to better serve the Congress and the American people.
NTIS
USA; Governments; Procedures; Accounting; Management

20030012630 Federal Emergency Management Agency, Decision and Information Sciences Div., Washington, DC USA
Decision Making and Problem Solving: Student Manual
Aug. 2002; 110p
Report No.(s): PB2003-101056; G-241; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Decision making and problem solving are critically important skill areas for Emergency Managers, planners, first responders, voluntary agency coordinators, and other professional in emergency management. As emergency management professionals your ability to identify current and potential problems and to make sound, timely decisions before and during an emergency can literally affect the lives and well-being of the local citizenry. Your decisions can impact the ability of response agencies to do their jobs and can make the difference in how quickly the community is able to recover from an event.
NTIS
Decision Making; Problem Solving; Emergencies

20030012749 Technical Research Centre of Finland, Information Technology, Espoo, Finland
Integrated News Publishing-Technology and User Experiences. Report of the IMU2 Project
Soedergaerd, C.; 2001; In English
Report No.(s): PB2003-101897; VTT-PUB-441; No Copyright; Avail: National Technical Information Service (NTIS)

Fast networks and multipurpose terminals enable the integrated delivery and use of media content originally targeted at different media. The emerging multiple media portals accessed by a variety of terminals require semi- and fully automatic procedures for managing the content. News services benefit from an integration of news sources that goes deeper than mere listings of links provided by many current Internet portals. This deep integration groups news articles from different sources and media into common and personal categories as well as interlinks the articles.
NTIS
Networks; News; Media; Delivery; Terminals

20030012751 General Accounting Office, Washington, DC USA
Defense Management: New Management Reform Program Still Evolving
Dec. 2002; 78p; In English
Report No.(s): PB2003-101828; GAO-03-58; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The Secretary of Defense announced a new business transformation program in 2001 with the intent of improving the effectiveness and efficiency of Department of Defense business operations. Concerned that the previous administration's Defense Reform Initiatives (DRI) could not be successful without many years of sustained effort, the Senate Committee on Armed Services issued a September 2001 report directing GAO to assess which DRI initiatives have been carried forward. In completing this assessment, GAO also examined the management structure and types of initiatives contained in the new business transformation program. Also at the request of the Committee, more detailed information on the status of the logistics reform and electronic business/electronic commerce initiatives is provided in the GAO report.
NTIS
Defense Program; Government/Industry Relations

20030012752 General Accounting Office, Washington, DC USA
Information Technology Services: Agencies Complying with Revision to Federal Acquisition Regulation
Dec. 2002; 26p; In English
Report No.(s): PB2003-101825; GAO-03-32; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Concerned that minimum personnel experience or education requirements in agency solicitations for information technology (IT) services were contributing to worker shortages, Congress included a provision in the fiscal year 2001 Defense authorization act requiring that the Federal Acquisition Regulation (FAR) be amended to limit the use of such requirements. Specifically, agencies are not to include these requirements in solicitations for IT services that result in performancebased contracts-those with performance work statements that set forth contract requirements in clear, specific, and objective terms with measurable outcomes-unless the contracting officer determines that agency needs cannot be met without them.
NTIS
Contract Management; Contractors; Contract Negotiation

20030012841 NASA, Washington, DC USA
ASK Magazine, Volume 10
Hoffman, Edward, Editor, NASA, USA; Laufer, Alexander, Editor, Maryland Univ., USA; Post, Todd, Editor, EduTech Ltd., USA; Brady, Jody Lannen, Editor, EduTech Ltd., USA; January 2003; 39p; In English; Also announced as 20030012842 through 20030012850; Original contains color illustrations
Report No.(s): NASA/NP-2003-1-295-HQ; NAS 1.83:1-295-HQ; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Academy of Program and Project Leadership (APPL) and ASK Magazine is presented. APPL is a research-based organization that serves NASA program and project managers, as well as project teams, at every level of development. In 1997, APPL was created from an earlier program to underscore the importance that NASA places on project management and project teams through a wide variety of products and services, including knowledge sharing, classroom and online courses, career development guidance, performance support, university partnerships, and advanced technology tools. ASK Magazine grew out of our Knowledge Sharing Initiative. The stories that appear in ASK are written by the 'best of the best' project managers, primarily from NASA, but also from other government agencies and industry. These stories contain genuine nuggets of knowledge and wisdom that are transferable across projects. Who better than a project manager to help another project manager address a critical issue on a project? Big projects, small projects-they're all here in ASK. APPL is one of our most exciting publications about project management.
Derived from text
Leadership; NASA Programs; Project Management; Documents

20030012842 NASA Glenn Research Center, Cleveland, OH USA

So This is Knowledge Sharing

Motil, Susan, NASA Glenn Research Center, USA; ASK Magazine; January 2003; Volume 10, pp. 6-9; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

People within large organizations have probably already dealt with problems similar to the problems that you face; you can save time and money by taking advantage of that experience and knowledge. Knowledge sharing by mentors can empower less experienced managers who would otherwise not challenge the status quo. Reviews should encourage joint problem solving rather than just reporting. to accomplish this, ensure that the review process is viewed as feedback from independent and supportive experts.

Derived from text

Project Management; Organizations; Knowledge; NASA Space Programs

20030012843 NASA Glenn Research Center, Cleveland, OH USA

Dressing Down

Schabes, Harvey, NASA Glenn Research Center, USA; ASK Magazine; January 2003; Volume 10, pp. 10-11; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Smiles and laughter reduce stress. They also renew energy and trust in ourselves and others. A characteristic of any good project manager is his or her willingness to challenge the conventional way of doing things. Use whatever tools you have available, including a sense of humor. Do you have examples of how you learned from experience, especially examples that challenged the status quo?

Derived from text

Project Management; Organizations; NASA Space Programs; Sociology

20030012844 Frandsen (Allan), USA

Learning the ABCs (of Project Management)

Frandsen, Allan, Frandsen (Allan), USA; ASK Magazine; January 2003; Volume 10, pp. 12-14; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To lead a project effectively, one has to establish and maintain the flexibility to take appropriate actions when needed. Overconstrained situations should be avoided. to get on top of matters and stay there, a manager needs to anticipate what it will take to successfully complete the job. Physical and financial resources, personnel, and management structure are all important considerations. Carving out the necessary turf up front can make a world of difference to the project's outcome. After the "what," "where," and "when" of a project are nailed down, the next question is "how" to do the job. When I first interviewed for the job of Science Payload Manager on the Advanced Composition (ACE) Explorer mission, Dr. Edward Stone (ACE Principal Investigator) asked, "Al, give me an idea of your management style." It was a question I had not considered before. I thought about it for a few seconds and then answered, "Well, the first descriptive term that comes to mind is the word "tranquility". That seemed to startle him. So I added, "I guess what I mean is, that if the situation is tranquil and the project is running smoothly, then I've anticipated all the problems and taken necessary actions to head them off." He then asked: "Have you ever reached this state?" "No," I admitted, "but I strive for it." That seemed to satisfy him because I got the job.

Derived from text

Project Management; Leadership; NASA Space Programs; Learning

20030012845 NASA Kennedy Space Center, Cocoa Beach, FL USA

A Little GOES a Long Way

Jenkins, Kimberly R., NASA Kennedy Space Center, USA; ASK Magazine; January 2003; Volume 10, pp. 15-16; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We were a team of five engineers responsible for the command and data systems used during experiment integration and testing of Spacelab payloads. For the most part, we performed component level testing for the experiments, the first phase of testing for Spacelab Program payloads. In the beginning, the members of my team didn't know what to think of me, but as time went by they realized that I was sincere. A relationship of trust developed. Since then, we've all moved on to other projects, but every now and then we run into each other and the bond that we have is still strong. Every good manager wants to do well by the people working on a project. One way to achieve this is simple: Pay attention to the environment in which your employees work.

People warn you not to get mired in the details; they say you might miss the big picture. But sometimes it's the details that give you a better view of what the big picture is all about.
Derived from text
Project Management; Engineers; NASA Space Programs; Spacelab Payloads

20030012846 HITT Corporate Interiors, USA
Thanksgiving Hocus Pocus
Zazzali, Christian, HITT Corporate Interiors, USA; ASK Magazine; January 2003; Volume 10, pp. 17-20; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

I was managing the construction project, and I thought my biggest challenge was simply finishing the work in time for start of the holiday shopping season. The store opened three weeks before Thanksgiving. Everything looked great. Business picked up steadily as the serious spending season approached. Then, two days before Thanksgiving, disaster struck. The fire protection system was designed to prevent smoke and fire from reaching the merchandise. If a fire alarm went off anywhere in the building, the system went into a massive pressurization mode. Dampers would open and the system would pump in hundreds of cubic feet of air from outside into the store, pressurizing every square foot, preventing fire or smoke from spreading into the store. That night an unknown event tripped the alarm-and it sounded for six hours. The air conditioning system was still operational as the outside air temperatures had been warm all month. That night, however, temperatures plummeted to 20 degrees. With an alarm sounding in a building complex that covers many millions of square feet, no one paid attention to the cold air flowing into the space. Pipes froze and burst. Hundreds of gallons of water came down through the drywall, soaking merchandise, the carpet and the hardwood racks. This state of the art system, which had been designed to protect, was now responsible for unthinkable damage. You could be the among greatest project managers in world, but if you have an attitude and you give the client heartburn, unnecessary heartburn, you're not going to do more work with him. If you have a disaster like this one, and you manage to make everybody feel good and believe that you are going to take care of them, then everybody looks back on it and says, "You know what, this is a good project team; we work well together, so let's do another one."
Derived from text
Project Management; Leadership; Industrial Management; Human Behavior

20030012847 Proctor and Gamble Co., Food and Beverage Global Business Unit, Cincinnati, OH USA
The Project Manager's Tool Kit
Cameron, W. Scott, Proctor and Gamble Co., USA; ASK Magazine; January 2003; Volume 10, pp. 21-23; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Project managers are rarely described as being funny. Moreover, a good sense of humor rarely seems to be one of the deciding factors in choosing someone to be a project manager, or something that pops up as a major discussion point at an annual performance review. Perhaps this is because people think you aren't serious about your work if you laugh. I disagree with this assessment, but that's not really my point. As I talk to people either pursuing a career in project management, or broadening their assignment to include project management, I encourage them to consider what tools they need to be successful. I suggest that they consider any strength they have to be part of their Project Management (PM) Tool Kit, and being funny could be one of the tools they need.
Derived from text
Project Management; Human Relations; Leadership

20030012848 Missile Defense Agency, Kinetic Energy Boost Office, Washington, DC USA
I Hate Reviews!
Little, Terry, Missile Defense Agency, USA; ASK Magazine; January 2003; Volume 10, pp. 24-25; In English; Also announced as 20030012841; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In our business we have all kinds of reviews: financial reviews, strategy reviews, technical reviews, test reviews, design reviews, baseline reviews, etc., etc. Some ways to avoid the most common pitfalls that I find specifically in these kinds of reviews are given.
Derived from text
Project Management; Training Evaluation; Verbal Communication

20030012849 NASA Marshall Space Flight Center, Huntsville, AL USA

ASK Talks with Alex McCool

ASK Magazine; January 2003; Volume 10, pp. 26-29; In English; Also announced as 20030012841; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

As a charter member at Marshall, McCool was instrumental in the design of the propulsion systems for the Saturn launch vehicles that propelled Apollo to the Moon and directed project engineering for Skylab, the first space science laboratory. Alex McCool's 48-year career includes exceptional contributions to the vehicles that launched America into orbit and carried human beings to the moon. Presently, he is the manager of the Space Shuttle Projects Office at Marshall. Among his many honors he recently received the National Space Club's 2002 Astronautics Engineer Award. The award recognizes those who have made outstanding contributions in engineering management to the national space program.

Derived from text

Space Shuttle Missions; NASA Space Programs; Engineering Management; Propulsion System Configurations

20030012850 Teany (Douglas R.), Indianapolis, IN USA

Pragmatic Leadership Advice from Donald Rumsfeld

Teany, Douglas R., Teany (Douglas R.), USA; ASK Magazine; January 2003; Volume 10, pp. 30-32; In English; Also announced as 20030012841; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

When President Gerald Ford appointed Donald Rumsfeld as his Secretary of Defense in 1975, Rumsfeld became the youngest defense secretary in US. history. Today, as defense secretary for President George W. Bush, Rumsfeld is the most senior appointee to hold that post. Between political assignments, he became an expert at turning around troubled corporations. His work at G.D. Searle-now a subsidiary of Pharmacia-earned him awards as an outstanding chief executive officer in the pharmaceutical industry. Rumsfeld's management philosophy is unique and direct, and the best part is he's written it down. While serving in the Ford administration, Rumsfeld wrote a white paper titled Rumsfeld's Rules. These rules were written as guiding principles for White House staff. First published in 1980, the rules were revised and expanded in 2001 to include broader insights on management, work and leadership. They reflect more than 40 years of Rumsfeld's wisdom and experience.

Derived from text

Leadership; Project Management; Industrial Management

20030012875 General Accounting Office, Washington, DC USA

Defense Commissaries: Additional Small Business Opportunities Should Be Explored

Dec. 2002; 34p; In English

Report No.(s): PB2003-102425; GAO-03-160; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document discusses how the Defense Commissary Agency (DeCA) is managing its product purchases. Specifically, you asked us to determine the extent to which: (1) DeCA requires grocery suppliers to pay for shelf space in commissaries, (2) DeCA's large suppliers select the products that are sold by commissaries, (3) products sold by commissaries are produced by small businesses and foreign businesses, and (4) small businesses face barriers to selling their products in commissaries as well as whether opportunities for small businesses could be improved.

NTIS

Procurement; Commerce; Military Technology; Armed Forces

20030012876 General Accounting Office, Washington, DC USA

Federal-Aid Highways: States Need Guidance on Sales or Leases of Real Property Purchased with Federal Funds

Dec. 2002; 46p; In English

Report No.(s): PB2003-102428; GAO-03-207; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1998, the Transportation Equity Act for the 21st Century (TEA-21), authorized the states to retain the federal share of proceeds from the sale or lease of real property that had been purchased with federal aid funds. It also required the states to use the federal share on other highway projects eligible for funding under the federal-aid highway program. GAO determined (1) the extent to which states are selling, leasing, or disposing of real property purchased with federal-aid funds and (2) how the proceeds generated from the sale or lease of real property are being used, including whether they are being used in accordance with TEA-21. GAO issued a related legal opinion in September 2002.

NTIS

Highways; Federal Budgets; Structural Properties (Geology)

20030012877 General Accounting Office, Washington, DC USA
Homeland Security: Information Technology Funding and Associated Management Issues
Dec. 2002; 42p; In English
Report No.(s): PB2003-102431; GAO-03-250; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Information technology (IT) will play a critical role in strengthening our nation's homeland security against potential future attacks. Specifically, IT will help enable the nation to identify potential threats, share information more readily, provide mechanisms to protect our homeland, and develop response capabilities. The Permanent Subcommittee on Investigations of the Senate Committee on Governmental Affairs requested that we identify, for fiscal years 2002 and 2003, IT funding targeted for purposes related to homeland security in those departments and agencies that play a key role in this mission area and, using our prior work, report on the IT management issues facing these organizations.
NTIS
Management Information Systems; Security; Financial Management

20030012894 Environmental Protection Agency, Office of Water, Washington, DC USA
Nomination Guidance. 2002 Biosolids Exemplary Management Awards Program: For Operating Projects, Technology Development, Research, and Public Acceptance
Jan. 2002; 22p; In English
Report No.(s): PB2003-101933; EPA/832/B-02/002; No Copyright; Avail: National Technical Information Service (NTIS)
The report material describes the awards program in detail and provides guidance for preparing and submitting nominations. The purpose of the awards program is to recognize significant contributions in the development and implementation of cost-effective, environmentally safe and publicly acceptable biosolids beneficial use practices which recycle nutrients, improve soil conditions, or otherwise conserve valuable natural resources. This excellence awards program helps EPA achieve its goal of promoting, collecting and disseminating information pertaining to the beneficial use of biosolids as authorized and encouraged under section 501(e) of the Clean Water Act.
NTIS
Waste Utilization; Criteria; Sewage Treatment

20030012917 Institute for Employment Studies, Brighton, England UK
Resourcing the Training and Development Function
Carter, A.; Hirsh, W.; Aston, J.; 2002; 108p
Report No.(s): PB2003-101470; IES-390; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The research for this report included survey responses from over a hundred major private and public sector employers and detailed case studies of the training and development functions in six organisations. These were chosen for their adoption of varied strategies, structures and delivery methods for training. The study explored the concept of aligning training with business strategy.
NTIS
Education; Personnel Development

20030014084 Lawrence Livermore National Lab., Livermore, CA USA
Meeting National Needs: Earth & Environmental Sciences 1999 Annual Report
2002; In English
Report No.(s): DE2002-791660; UCRL-LR-126434-99; No Copyright; Avail: National Technical Information Service (NTIS)
Contents include the following: Overview; Research Highlights (Nuclear Materials, Climate, Carbon, Energy, Environmental Risk Reduction, National Security, Cross-Cutting Technologies/Capabilities); Collaborations; Resources; Publications; Awards; Patents.
NTIS
Earth Sciences; Environment Pollution; Conferences

20030014126 NASA Langley Research Center, Hampton, VA USA
Revolutionary Aerospace Systems Concepts - Planning for the Future of Technology Investments
Ferebee, Melvin J., Jr., NASA Langley Research Center, USA; Breckenridge, Roger A., NASA Langley Research Center, USA; Hall, John B., Jr., NASA Langley Research Center, USA; [2002]; 12p; In English; 53rd International Astronautical Congress, 10-19 Oct. 2002, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In January, 2000, the NASA Administrator gave the following directions to Langley: ”We will create a new role for Langley as a leader for the assessment of revolutionary aerospace system concepts and architectures, and provide resources needed to assure technology breakthroughs will be there to support these advanced concepts. This is critical in determining how NASA can best invest its resources to enable future missions.” The key objective of the RASC team is to look beyond current research and technology (R&T) programs and missions and evolutionary technology development approaches with a ”top-down” perspective to explore possible new mission capabilities. The accomplishment of this objective will allow NASA to provide the ability to go anywhere, anytime - safely, and affordably- to meet its strategic goals for exploration, science, and commercialization. The RASC Team will seek to maximize the cross-Enterprise benefits of these revolutionary capabilities as it defines the revolutionary enabling technology areas and performance levels needed. The product of the RASC Team studies will be revolutionary systems concepts along with enabling technologies and payoffs in new mission capabilities, which these concepts can provide. These results will be delivered to the NASA Enterprises and the NASA Chief Technologist for use in planning revolutionary future NASA R&T program investments.
Author
Aerospace Systems; Technology Assessment; Management Planning; NASA Space Programs; Astronautics

20030014495 National Inst. of Standards and Technology, Gaithersburg, MD USA
Communicating the Future: Best Practices for Communication of Science and Technology to the Public. Conference Proceedings held in Gaithersburg, MD., on March 6-8, 2002
Sep. 2002; 168p; In English
Report No.(s): PB2003-101638; NIST/SP-991; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Communicating science and technology to the public has become an essential enterprise for research universities, government agencies, science museums, foundations and granting agencies, other non-profit scientific organizations, and corporations. to advance the state of the art, a conference on Best Practices for Communicating Science and Technology to the Public was held March 6-8, 2002, at the National Institute of Standards and Technology in Gaithersburg, Md., with major funding provided by the U.S. Department of Energy Office of Science. This report of the conference proceedings includes a summary statement by the conference steering committee, transcripts or other text summarizing the remarks of conference speakers, and abstracts for 48 ’best practice’ communications programs selected by the steering committee through an open competition and a formal peer review process.
NTIS
Communicating; Conferences; Procedures; Research and Development

20030014645 NASA Langley Research Center, Hampton, VA USA
NASA Langley/CNU Distance Learning Programs
Caton, Randall, Christopher Newport Univ., USA; Pinelli, Thomas E., NASA Langley Research Center, USA; [2002]; 7p; In English; ED-MEDIA 2002, 24-29 Jun. 2002, Denver, CO, USA
Contract(s)/Grant(s): NAG1-2219; NCC1-435; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
NASA Langley Research Center and Christopher Newport University (CNU) provide, free to the public, distance learning programs that focus on math, science, and/or technology over a spectrum of education levels from K-adult. The effort started in 1997, and we currently have a suite of five distance-learning programs. We have around 450,000 registered educators and 12.5 million registered students in 60 countries. Partners and affiliates include the American Institute of Aeronautics and Astronautics (AIAA), the Aerospace Education Coordinating Committee (AECC), the Alliance for Community Media, the National Educational Telecommunications Association, Public Broadcasting System (PBS) affiliates, the NASA Learning Technologies Channel, the National Council of Teachers of Mathematics (NCTM), the Council of the Great City Schools, Hampton City Public Schools, Sea World Adventure Parks, Busch Gardens, ePALS.com, and Riverdeep. Our mission is based on the ”Horizon of Learning,” a vision for inspiring learning across a continuum of educational experiences. The programs form a continuum of educational experiences for elementary youth through adult learners. The strategic plan for the programs will evolve to reflect evolving national educational needs, changes within NASA, and emerging system initiatives. Plans for each program component include goals, objectives, learning outcomes, and rely on sound business models. It is well documented that if technology is used properly it can be a powerful partner in education. Our programs employ both advances in information technology and in effective pedagogy to produce a broad range of materials to complement and enhance other educational efforts. Collectively, the goals of the five programs are to increase educational excellence; enhance and enrich the teaching of mathematics, science, and technology; increase scientific and technological literacy; and communicate the results of NASA discovery, exploration, innovation and research. All pre-college distance learning programs support the national mathematics, science, and technology standards; support K-12 systemic change; involve educators in their development, implementation, and evaluation; and are based

on alliances and partnerships. In addition the programs seek to invoke a sense of geographic, ethnic and cultural diversity by featuring schools from all over the U.S.; schools from urban, suburban, and rural areas; public, private, and religious schools; and schools with large populations of African-American, Asian and Hispanic students.
Derived from text
Education; NASA Programs; Technologies; Information Systems; Culture (Social Sciences); Research and Development

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.

20030012736 Lawrence Livermore National Lab., Livermore, CA USA
Parametric Grid Information in the DOE Knowledge Base: Data Preparation, Storage, and Access
Hipp, J. R.; Young, C. J.; Moore, S. G.; Shepherd, E. R.; Schultz, C. A.; Oct. 01, 1999; 138p; In English
Report No.(s): DE2002-792256; UCRL-ID-136921; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The parametric grid capability of the Knowledge Base provides an efficient, robust way to store and access interpolatable information which is needed to monitor the Comprehensive Nuclear Test Ban Treaty. to meet both the accuracy and performance requirements of operational monitoring systems, we use a new approach which combines the error estimation of kriging with the speed and robustness of Natural Neighbor Interpolation (NNI). The method involves three basic steps: data preparation (DP), data storage (DS), and data access (DA). The goal of data preparation is to process a set of raw data points to produce a sufficient basis for accurate NNI of value and error estimates in the Data Access step. This basis includes a set of nodes and their connectedness, collectively known as a tessellation, and the corresponding values and errors that map to each node, which we call surfaces.
NTIS
Nuclear Explosions; Knowledge Bases (Artificial Intelligence)

20030012785 Army Safety Center, Fort Rucker, AL USA
FLIGHTFAX: Army Aviation Risk-Management Information. Volume 30, Number 10 ***Monthly Report***
Simmons, James E.; Oct. 2002; 20p; In English; Original contains color images
Report No.(s): AD-A408973; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract.
DTIC
Information Management; Risk; Armed Forces (USA)

20030012882 Cornell Univ., Dept. of Computer Science, Ithaca, NY USA
AFRL/Cornell Information Assurance Institute ***Final Report, 15 Mar. 2000-31 Aug. 2002***
Schneider, Fred B.; Aug. 2002; 25p; In English
Contract(s)/Grant(s): F49620-00-1-0209
Report No.(s): AD-A408987; Rept-38094; AFRL-SR-AR-TR-02-0421; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The AFRL/Cornell Information Assurance Institute supports a broad spectrum of research aimed at developing a science and technology base to enhance information assurance and networked information systems trustworthiness--system and network security, reliability, and assurance. The institute also fosters closer collaborations between Cornell and AFRL researchers, as well as facilitating technology transfer and exposing Cornell researchers to problems facing the Air Force.
DTIC
Information Systems; Computer Networks; Computer Information Security; Technology Transfer; Reliability Engineering

20030012969 Naval Postgraduate School, Monterey, CA USA
Summary of Research 2000, Department of Physics
Maier, William B.; Baker, Steven; Dec. 2001; 57p; In English
Report No.(s): AD-A409022; NPS-09-02-005; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report contains project summaries of the research projects in the Department of Physics. A list of recent publications is also included, which consists of conference presentations and publications, books, contributions to books, published journal papers, and technical reports. Thesis abstracts of students advised by faculty in the Department are also included.
DTIC
Physics; Documents; Military Operations

20030013747 National Cheng Kung Univ., Inst. of Manufacturing Engineering, Tainan, Taiwan, Province of China
Development of an Educational Supply Chain Information System using Object Web Technology
Cheng, Fan-Tien, National Cheng Kung Univ., Taiwan, Province of China; Yang, Haw-Ching, National Cheng Kung Univ., Taiwan, Province of China; Huang, Eric, National Cheng Kung Univ., Taiwan, Province of China; Journal of the Chinese Institute of Engineers; November 2002; ISSN 0253-3839; Volume 25, No. 6, pp. 735-752; In English
Contract(s)/Grant(s): NSC-90-2212-E-006-074; Copyright; Avail: Issuing Activity
With the explosive growth of the Web. it becomes essential for developing a program to educate students to comprehend how to develop large-scale software systems for Internet applications. One of the major enabling technologies for constructing e-Commerce applications is the Object Web. Supply chains are typical large-scale applications of e-Commerce. Therefore, this work presents a collaborative and event-driven educational Supply Chain Information System (SCIS) by using Object Web technology. Unified Modeling Language (UML) is applied to analyze and design the SCIS framework that contains two major components: the Information Coordinator Component and the Agent Component. Demonstration results indicate that this SCIS frame-work provides a collaborative, event-driven, object-oriented, and agent-based infrastructure for the supply chain members to mutually exchange information efficiently. Educational aspects concerning development procedures. development tools. software reuse, and a system interface for distributed object-oriented software engineering courses are also emphasized in this paper.
Author
Computer Systems Programs; Object-Oriented Programming; Software Engineering; Information Systems

20030014078 Shanghai Astronomical Observatory, China
Citation Statistic Analysis of 353 Articles During 1995 - 2000 in Acta Astrophysica Sinica
Wang, Xiu-Mei, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 144-150; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
The citation statistic analysis 353 articles, which were published in Acta Astrophysica Sinica during 1995 - 2000, was discussed. It included the quantities, types, published year, semiattenuation period, attenuation coefficient and so on for cited articles. It was compared that the analysis result of citation statistics were obtained by us with one of some other periodicals of internal and external. It was expounded the current state, law and character of citing scientific literature was used by astronomers. At last, It was made that some suggestions of improving and raising the server of scientific literature were in the astronomical field.
Author
Statistical Analysis; Periodicals

20030014174 Army Research Inst. for the Behavioral and Social Sciences, Research and Advanced Concepts Office, Alexandria, VA USA
U.S. Army Research Institute Program in Basic Research, 2002-2003
Simutis, Zita M.; Oct. 2002; 53p; In English
Report No.(s): AD-A409096; ARI/RACO-SR-55; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of this document is to communicate the annual progress for each individual research project in the Research and Advanced Concepts Office (RACO) basic research program at the USA Army Research Institute for the Behavioral and Social Sciences (ARI). The summaries contained herein are written by the scientists who are performing the work and provide a snapshot of their continuing efforts. In addition, RACO conducts a more detailed in-progress review of each project each year. If successful, the projects within RACO's basic research program will lay the foundations for many of ARI's future applied behavioral research efforts. These summaries serve as guideposts for ensuring that our basic research results transition to ARI' 5 applied research programs.
DTIC
Abstracts; Military Technology; Research and Development

20030014175 Shanghai Astronomical Observatory, China

Statistical Analysis and Discussions on Scientific Paper Output by the Staffs of Astrophysics Research Department of SHAO in Recent 10 Years

Jiang, Pei-Fang, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 151-157; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

The scientific papers published by the staffs of Astrophysics Research Department of SHAO during 1992 - 2001 are statistically analysed and quantitatively discussed, including the total number of papers, the numbers of SCI papers and non - SCI ones, and the citation of the papers. Special attention is paid to the papers published by the people with ages younger than 40. It shown from the analyses that the number and the academic level of the papers published by staffs of the department have increased steadily, and young astronomers have become a major force in astrophysics researches in SHAO.

Author

Statistical Analysis; Documents

20030014193 NASA Langley Research Center, Hampton, VA USA

Tactical Versus Strategic Behavior: General Aviation Piloting in Convective Weather Scenarios

Latorella, Kara A., NASA Langley Research Center, USA; Chamberlain, James P., NASA Langley Research Center, USA; [2002]; 5p; In English; 46th Human Factors and Ergonomics Annual Meeting, 30 Sep. - 4 Oct. 2002, Baltimore, MD, USA; Sponsored by Human Factors and Ergonomic Society, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We commonly describe environments and behavioral responses to environmental conditions as 'tactical' and 'strategic.' However theoretical research defining relevant environmental characteristics is rare, as are empirical investigations that would inform such theory. This paper discusses General Aviation (GA) pilots' descriptions of tactical/strategic conditions with respect to weather flying, and evaluates their ratings along a tactical/strategic scale in response to real convective weather scenarios experienced during a flight experiment with different weather information cues. Perceived risk was significantly associated with ratings for all experimental conditions. In addition, environmental characteristics were found to be predictive of ratings for Traditional IMC (instrument meteorological conditions), i.e., aural weather information only, and Traditional VMC (visual meteorological conditions), i.e., aural information and an external view. The paper also presents subjects' comments regarding use of Graphical Weather Information Systems (GWISs) to support tactical and strategic weather flying decisions and concludes with implications for the design and use of GWISs.

Author

General Aviation Aircraft; Pilot Performance; Convection; Weather; Flight Conditions; Pilot Ratings

20030014494 General Accounting Office, Washington, DC USA

Electronic Government: Selection and Implementation of the Office of Management and Budget's 24 Initiatives

Nov. 2002; 74p; In English

Report No.(s): PB2003-101832; GAO-03-229; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In the President's Management Agenda, a key element for reforming the federal government is the expansion of electronic government (e-government)-that is, the use of technology, particularly the Internet, to enhance access to government information and services. Accordingly, the Office of Management and Budget (OMB) established a task force to select and manage strategic e-government initiatives. GAO was asked to review the completeness of information used for choosing and overseeing these initiatives.

NTIS

Technology Transfer; Information Transfer; Governments

89
ASTRONOMY

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

20030012579 Smithsonian Astrophysical Observatory, Cambridge, MA USA

ASCA and Bepposax Observations of the Newly Discovered SNR RX J0852-4622 ***Annual Report, 1 Mar. 2002 - 28 Feb. 2003***

Slane, Patrick, Smithsonian Astrophysical Observatory, USA; January 2003; 2p; In English

Contract(s)/Grant(s): NAG5-9106; No Copyright; Avail: Issuing Activity; Abstract Only

This grant supports an investigation of the supernova remnant RX J0852-4622 (G266.1-1.2), a large-diameter, nearby SNR for which the X-ray emission is dominated by nonthermal processes. As only the third such SNR discovered, for which there is direct evidence of cosmic-ray acceleration dominating the SNR dynamics, this is an exceptionally important object. Our progress on this study to date has been good. We have published the results of a spectral mapping of the XNR as well as the identification of a compact X-ray source which may be the associated neutron star. Our final work involves modeling of the emission using limits from the radio flux in order to estimate the inverse-Compton flux that might be observable in the TeV gamma-ray regime. We have just completed similar modeling of the emission from G347.3-0.5 (Lazendic et al. - submitted to ApJ), and the results have drawn considerable interest in the gamma-ray community (Slane 2002; astro-ph/0212353). Extensive observations of G266.1--1.2 with the CANGAROO TeV gamma-ray telescope have been carried out, and our modeling of the broad-band emission characteristic are of importance for such studies.
Author
Gamma Ray Telescopes; Supernova Remnants; Astrophysics; Cosmic Rays; X Ray Astronomy

20030012610 Hawaii Univ., Inst. for Astronomy, Honolulu, HI USA
Thermal Studies of Near Earth Objects ***Annual Report, 1 Mar. 2002 - 28 Feb. 2003***
Jewitt, David, Hawaii Univ., USA; [2003]; 6p; In English
Contract(s)/Grant(s): NAG5-11445; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In this proposal, we seek to apply the optical/thermal method to the measurement of the diameters and albedos of a large sample of Near Earth Objects (NEOs). Whereas main-belt asteroids have been studied in large numbers, principally using thermal detections from the IRAS satellite, relatively few thermal observations of NEOs have been secured. This program capitalizes on our access to large telescopes and imaging thermal IR detectors in pursuit of the definitive set of albedo data on the NEOs.
Author
Near Earth Objects; Thermodynamic Properties; Optical Properties; Albedo; Surface Properties; Comet Nuclei

20030012772 National Center for Atmospheric Research, High Altitide Observatory, Boulder, CO USA
Equilibria, Stability and Nonlinear Dynamics of Magenetically-Sheared Atmospheres with Applications to the Solar Environment
Manchester, W. B.; May 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101235; NCAR/CT-169; No Copyright; Avail: National Technical Information Service (NTIS)
The subject of this thesis is the equilibria, stability and nonlinear dynamics of magnetically-sheared atmospheres as they relate to magnetic flux emergence and the structure and disruption of magnetic arcades of the sun. To begin this study, two families of analytical solutions describing isothermic magnetostatic atmospheres in uniform gravity are presented that are characterized by magnetic shear.
NTIS
Theses; Solar Radiation; Solar Physics

20030014080 Shanghai Astronomical Observatory, China
A New Observation of OH1612 MHz Maser in the West Position of ON2
Yu, Zhi-Yao, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 102-106; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Using the Nancay radio telescope of Paris Observatory, France, OH 1612MHz maser in the west position of ON2 has been first observed. The observational results indicate that the emission spectrum of the OH 1612MHz in the west position shows a typical structure of single peak. With a model of thin - disk the emission spectrum has been analysed and studied. This paper has obtained the position of maser spot, corresponding to the single peak, at r = 112.5AU, Y = 7.6AU. Its Keplerian velocity V(sub r) = 10. 6km/s, V(sub t) = - 9.4km/s.
Author
Observatories; Interstellar Masers; Emission Spectra; Star Formation

20030014081 Shanghai Astronomical Observatory, China
The Photometry of Narrow - Line Seyfert 1 Galaxy Arakelian 564
Tao, Jun, Shanghai Astronomical Observatory, China; Qian, Bochen, Shanghai Astronomical Observatory, China; Yu, Jian, Shanghai Astronomical Observatory, China; Pan, Hong-Jian, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 83-89; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity

A 3 - week - monitoring for the Narrow - line Seyfert 1 galaxy Ark 564 was carried out by the 1.56m telescope of Shanghai Astronomical Observatory. The light curves of V, R and I bands are presented. No time lags between these bands were detected by the cross - correlation function.
Author
Photometry; Cross Correlation; Time Lag

20030014149 Shanghai Astronomical Observatory, China
Satellite Laser Ranging Observation at Shanghai Astronomical Observatory in 2000
Yang, Fumin, Shanghai Astronomical Observatory, China; Zhang, Zhong-Ping, Shanghai Astronomical Observatory, China; Chen, Wan-Zhen, Shanghai Astronomical Observatory, China; Chen, Ju-Ping, Shanghai Astronomical Observatory, China; Xu, Yong-Ping, Shanghai Astronomical Observatory, China; Li, Xin, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 94-96; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
This is a report on satellite laser ranging observation at Shanghai Astronomical Observatory in 2000. The total 1462 passes, and 1121960 observations for 28 satellites we obtained in 174 night/day and given in Table 1.
Author
Satellite Laser Ranging; Observation

20030014150 Shanghai Astronomical Observatory, China
VLA Observations and Observe Program
Wang, Wei-Hua, Shanghai Astronomical Observatory, China; An, Tao, National Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 115-124; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Observe is a program for preparing VIA observing files. As the Knowledge Innovation project deeply proceeding, more and more chinese astronomer observe and study with the Very Large Array (VLA), Observe is widely used in China. So we briefly introduce the function and usage of Observe in this paper. Moreover, based on an example of preparing experiments AH721 in December 2000, some attention was also listed that is helpful to those VLA observers. The paper focuses on ways to prepare experiments of interferometric continuum observation.
Author
Very Large Array (VLA); Interferometry; Radio Telescopes

20030014158 Shanghai Astronomical Observatory, China
The Report on Scientific Research and Technical Work of Shanghai Astronomical Observatory in 2001
Zhao, Jun-Liang, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 1-4; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
A brief summary is given on scientific research work of Shanghai Astronomical Observatory in 2001, including achievements obtained in knowledge innovation and basic research, observations and technical development, personal training and introducing, scientific management and service, international corporation and academic exchange, and so on. The main shortage on the work is also pointed out.
Author
Research Facilities; Knowledge Representation; Astronomical Observatories

20030014300 National Optical Astronomy Observatories, Tucson, AZ USA
NOAO Newsletter, No. 72
Isbell, Doug, Editor, National Optical Astronomy Observatories, USA; Lauer, Todd R., Editor, National Optical Astronomy Observatories, USA; Bell, Dave, Editor, National Optical Astronomy Observatories, USA; vanderBliek, Nicole, Editor, Cerro Tololo Inter-American Observatory, Chile; Green, Richard, Editor, Kitt Peak National Observatory, USA; Hinkle, Ken, Editor, National Optical Astronomy Observatories, USA; Adams, Sally, Editor, National Optical Astronomy Observatories, USA; Leibacher, John, Editor, National Solar Observatory, USA; Piano, Priscilla, Editor, National Solar Observatory, USA; December 2002; 44p; In English; No Copyright; Avail: Issuing Activity
The National Optical Astronomy Observatory (NOAO) seventy second newsletter for December 2002 is presented. The topics include: 1) Science Highlights; 2) Director's Office; 3) U.S. Gemini Program; 4) Observational Programs; 5) Cerro Tololo

Inter-American Observatory; 6) Kitt Peak National Observatory; 7) National Solar Observatory/GONG; and 8) Public Affairs & Education Outreach.
CASI
Astronomical Observatories; Solar Observatories; Telescopes; Astrophysics; Optical Measuring Instruments

20030014319 Lawrence Livermore National Lab., Livermore, CA USA
X-Ray Spectroscopy of Astrophysically-Relevant Photoionized Iron Plasmas at Z
Heeter, R. F.; Bailey, J. E.; Cuneo, M. E.; Emig, J.; Jun. 12, 2000; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM.
Report No.(s): DE2002-792756; UCRL-JC-137660; No Copyright; Avail: National Technical Information Service (NTIS)
In order to provide benchmark data for models used to interpret X-ray astronomy data from newly-launched orbital telescopes such as Chandra, we have used 120 TW, 180 eV pinch plasmas on the Sandia Z facility to drive iron foils into X-ray photoionized equilibrium. The experiment was designed to achieve photoionization parameters characteristic of accretion-powered objects such as X-ray binaries (neutron stars) and active galactic nuclei (black holes). These objects comprise roughly half of observed X-ray sources, but the interpretation of their spectra is difficult: state-of-the-art models for photoionized iron plasmas do not yet agree on the expected ionization balance.
NTIS
Photoionization; X Ray Astronomy

20030014615 Extrasolar Research Corp., Pasadena, CA USA
The High-Resolution IRAS Galaxy Atlas
Cao, Yu, California Inst. of Tech., USA; Terebey, Susan, Extrasolar Research Corp., USA; Prince, Thomas A., California Inst. of Tech., USA; Beichman, Charles A., California Inst. of Tech., USA; The Astrophysical Journal Supplement Series; August 1997; Volume 111, pp. 387-408; In English
Contract(s)/Grant(s): NAS5-32642; NAS5-97066; Copyright; Avail: Issuing Activity
An atlas of the Galactic plane (-4.7 deg is less than b is less than 4.7 deg), along with the molecular clouds in Orion, rho Oph, and Taurus-Auriga, has been produced at 60 and 100 microns from IRAS data. The atlas consists of resolution-enhanced co-added images with 1 min - 2 min resolution and co-added images at the native IRAS resolution. The IRAS Galaxy Atlas, together with the Dominion Radio Astrophysical Observatory H(sub I) line/21 cm continuum and FCRAO CO (1-0) Galactic plane surveys, which both have similar (approx. 1 min) resolution to the IRAS atlas, provides a powerful tool for studying the interstellar medium, star formation, and large-scale structure in our Galaxy. This paper documents the production and characteristics of the atlas.
Author
Infrared Astronomy Satellite; Sky Surveys (Astronomy); Astronomical Maps; Milky Way Galaxy; Infrared Astronomy

20030014633 Extrasolar Research Corp., Pasadena, CA USA
Cross Burg Entropy Maximization and Its Application to Ringing Suppression in Image Reconstruction
Cao, Yu, KLA-Tencor Corp., USA; Eggermont, Paul P. B., Delaware Univ., USA; Terebey, Susan, Extrasolar Research Corp., USA; IEEE Transactions on Image Processing; February 1999; ISSN 1057-7149; Volume 8, No. 2, pp. 286-292; In English
Contract(s)/Grant(s): NAS5-32642; NAS5-97066; Copyright; Avail: Issuing Activity
We present a multiplicative algorithm for image reconstruction, together with a partial convergence proof. The iterative scheme aims to maximize cross Burg entropy between modeled and measured data. Its application to infrared astronomical satellite (IRAS) data shows reduced ringing around point sources, compared to the EM (Richardson-Lucy) algorithm.
Author
Entropy; Image Reconstruction; Algorithms; Infrared Astronomy Satellite

90
ASTROPHYSICS

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

20030012581 Stanford Univ., Dept. of Chemistry, Stanford, CA USA
Understanding Organics in Meteorites and the Pre-Biotic Environment ***Final Report, 1 Aug. 2001 - 31 Jul. 2002***
Zare, Richard N., Stanford Univ., USA; [2003]; 13p; In English
Contract(s)/Grant(s): NAG5-10544; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

(1) Refinement of the analytic capabilities of our experiment via characterization of molecule-specific response and the effects upon analysis of the type of sample under investigation; (2) Measurement of polycyclic aromatic hydrocarbons (PAHs) with high sensitivity and spatial resolution within extraterrestrial samples; (3) Investigation of the interstellar reactions of PAHs via the analysis of species formed in systems modeling dust grains and ices; (4) Investigations into the potential role of PAHs in prebiotic and early biotic chemistry via photoreactions of PAHs under simulated prebiotic Earth conditions. to meet these objectives, we use microprobe laser-desorption, laser-ionization mass spectrometry (MuL(exp 2)MS), which is a sensitive, selective, and spatially resolved technique for detection of aromatic compounds. Appendix A presents a description of the MuL(exp 2)MS technique. The initial grant proposal was for a three-year funding period, while the award was given for a one-year interim period. Because of this change in time period, emphasis was shifted from the first research goal, which was more development-oriented, in order to focus more on the other analysis-oriented goals. The progress made on each of the four research areas is given below.
Author
Polycyclic Aromatic Hydrocarbons; Primitive Earth Atmosphere; Meteoritic Composition; Cosmochemistry; Extraterrestrial Matter; Interstellar Chemistry; Chemical Reactions

20030012953 Phillips Lab., Edwards AFB, CA USA
Studies of Hafnium-Carbide Wafers Using a Thermogravimetric Analyzer
Castillo, Domingo G.; Jones, Paul F.; Jan. 1993; 12p; In English
Report No.(s): AD-A409008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Solar thermal propulsion can improve orbital transfer and maneuvering of space payloads due to double the performance of specific impulse (lsp) over chemical propulsion systems. Solar thermal can accomplish this increased performance by absorbing concentrated solar energy with very high temperature materials which through conduction heat hydrogen (H2). Hafnium carbide (HfC) is an excellent candidate material as a solar absorber and conductor because of its high melting temperature of 395000 (71420F)1. Several reticulated vitreous hafnium carbide wafers with varying porosities were made by a commercial vendor. Samples of these wafers were placed in a Thermogravimetric Analyzer (TGA) and heated from room temperature to 100000 (1832F). This would determine any weight gains or losses of the wafers during testing. Results of this analysis show that the hafnium carbide increased in weight approximately 2.5 percent.
DTIC
Hafnium Compounds; Solar Energy; Carbides; Solar Thermal Propulsion; Chemical Analysis; Thermogravimetry; Potable Water; Aerospace Environments

20030014151 Shanghai Astronomical Observatory, China
The Cross of Contours of the Equipotential in the Minisuperspace for Superpotential of Complex phi(sup 6) Field at Finite Temperature
Chen, Chi-Yi, Shanghai Astronomical Observatory, China; Shen, You-Gen, Shanghai Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 97-101; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Some conclusions are drew strictly as following: for the complex phi(sup 6) field, the contours of the equipotential in the minisuperspace for superpotential at different temperatures can show following probable results: intersection (4 points or 2 points) and separation.
Author
Contours; Equipotentials; Quantum Theory; Cosmology

20030014176 Shanghai Astronomical Observatory, China
Absolute Proper Motions of 534 Stars in the Region of Globular Cluster M3
Wu, Zhen-Yu, Shanghai Astronomical Observatory, China; Wang, Jia-Ji, National Astronomical Observatory, China; Li, Chen, National Astronomical Observatory, China; Annals of Shanghai Observatory, Academia Sinica; 2002, No. 23, pp. 61-82; In Chinese; ISBN 7-5323-6796-7; Copyright; Avail: Issuing Activity
Based on ACRS represented by the Hipparcos Catalogue, the positions and absolute proper motions of 534 stars in a 100 ft x 100 ft region around the globular cluster M3(NGC 5272) are reduced by plates taken with the 40 cm refractor at Sheshan station of Shanghai Astronomical Observatory, referred to the positions and absolute proper motions in the Hipparcos (for 8 stars) and Tycho - 2 (for 49 stars) Catalogues. The membership probabilities of these stars are estimated.
Author
Estimating; Globular Clusters; Star Trackers

20030014277 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Spectroscopy and Photometry of the Earth Grazer 2002 NY40

Rivkin, A. S., Massachusetts Inst. of Tech., USA; Howell, E. S., Arecibo Ionospheric Observatory, Puerto Rico; Bus, S. J., Massachusetts Inst. of Tech., USA; Hicks, M., Jet Propulsion Lab., California Inst. of Tech., USA; Reach, W. T., California Inst. of Tech., USA; Jarrett, T. H., California Inst. of Tech., USA; Binzel, R. P., Massachusetts Inst. of Tech., USA; [2003]; 2p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG5-10604; Copyright; Avail: Issuing Activity

The near-Earth asteroid 2002 NY40 was discovered on July 14, 2002 by the LINEAR survey. The object was predicted to make a close pass by the Earth on August 18, which led to observations at a large range of wavelengths, including radar. The combination of visible and near-infrared spectroscopy/spectrophotometry gives some indication of the composition. Thermal emission in the 3-4m spectral region gives constraints on the albedo, which is consistent with the spectral type and with the available size from the radar measurements. The lightcurve was well measured by a large number of observers, which helps to determine the rotation phase of the observations at the various wavelengths. The favorable observing conditions and rapid dissemination of the astrometry have led to a good physical characterization of this object which is relatively rare for a newly discovered near-Earth asteroid.

Author

Asteroids; Spectrophotometry; Photometry; Thermal Emission; Spectroscopy

20030014278 NASA Johnson Space Center, Houston, TX USA

Hydrated Minerals on Asteroids: The Astronomical Record

Rivkin, A. S., Massachusetts Inst. of Tech., USA; Howell, E. S., Arecibo Ionospheric Observatory, Puerto Rico; Vilas, F., NASA Johnson Space Center, USA; Lebofsky, L. A., Arizona Univ., USA; [2003]; 1p; In English

Contract(s)/Grant(s): NAG5-10604; No Copyright; Avail: Issuing Activity; Abstract Only

Knowledge of the hydrated mineral inventory on the asteroids is important for deducing the origin of Earth's water, interpreting the meteorite record, and unraveling the processes occurring during the earliest times in solar system history. Reflectance spectroscopy shows absorption features in both the 0.6-0.8 and 2.5-3.5-micron regions, which are diagnostic of or associated with hydrated minerals. Observations in those regions show that hydrated minerals are common in the mid-asteroid belt, and can be found in unexpected spectral groupings as well. Asteroid groups formerly associated with mineralogies assumed to have high-temperature formation, such as M- and E-class steroids, have been observed to have hydration features in their reflectance spectra. Some asteroids have apparently been heated to several hundred degrees Celsius, enough to destroy some fraction of their phyllosilicates. Others have rotational variation suggesting that heating was uneven. We summarize this work, and present the astronomical evidence for water- and Hydroxl-bearing minerals on asteroids.

Author

Asteroids; Hydration; Minerals; Reflectance; Spectroscopy; Meteorites

20030014284 Stanford Linear Accelerator Center, Stanford, CA USA

Unitary Evolution of a Massless Scalar Field in a Schwarzschild Background: Hawking Radiation and the Information Paradox

Melnikov, K.; Weinstein, M.; May 21, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-799931; SLAC/PUB-9224; No Copyright; Avail: National Technical Information Service (NTIS)

We develop a Hamiltonian formalism which can be used to discuss the physics of a massless scalar field in a gravitational background of a Schwarzschild black hole. Using this formalism we show that the time evolution of the system is unitary and yet all known results such as the existence of Hawking radiation can be readily understood. We then point out that the Hamiltonian formalism leads to interesting observations about black hole entropy and the information paradox.

NTIS

Black Holes (Astronomy); Scalars; Gravitational Fields; Schwarzschild Metric

91
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.

20030012595 Lunar and Planetary Inst., Houston, TX USA
Morphology and Scaling of Ejecta Deposits on Icy Satellites
Schenk, Paul M., Lunar and Planetary Inst., USA; Ridolfi, Francis J., Lunar and Planetary Inst., USA; Geophysical Research Letters; 2002; ISSN 0094-8276; Volume 29, No. 12, pp. 31-1 - 31-4; In English
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1113; Copyright; Avail: Issuing Activity

Continuous ejecta deposits on Ganymede consist of two major units, or facies: a thick inner hummocky pedestal facies, and a relatively thin outer radially scoured facies defined also by the inner limit of the secondary crater field. Both ejecta facies have a well-defined power-law relationship to crater diameter for craters ranging from 15 to approx. 600 km across. This relationship can be used to estimate the nominal crater diameter for impact features on icy satellites (such as palimpsests and multiring basins) for which the crater rim is no longer recognizable. Ejecta deposits have also been mapped on 4 other icy satellites. Although morphologically similar to eject deposits on the Moon, ejecta deposits for smaller craters are generally significantly broader in extent on the icy satellites, in apparent defiance of predictions of self-similarity. A greater degree of rim collapse and enlargement on the Moon may explain the observed difference.
Author
Icy Satellites; Ejecta; Morphology; Deposits

20030012597 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Evolution of the Martian Hydrosphere: Implications for the Fate of a Primordial Ocean and the Current State of the Northern Plains
Clifford, Stephen M., Lunar and Planetary Inst., USA; Parker, Timothy J., Jet Propulsion Lab., California Inst. of Tech., USA; Icarus; [2001]; ISSN 0019-1035; Volume 154, pp. 40-79; In English; Original contains color illustrations
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-992; Copyright; Avail: Issuing Activity

In this paper we consider the hydraulic and thermal conditions that gave rise to the elevated source regions of the Late Hesperian outflow channels and explore their implications for the evolution of the Martian hydrosphere. We find that if the outflow channel floodwaters were derived from a subpermafrost aquifer, then it implies that, throughout the planet's first billion years of evolution, as much as one third of its surface was covered by standing bodies of water and ice. Following the development of the global dichotomy, the bulk of this water would have existed as an ice-covered ocean in the northern plains. We demonstrate that the progressive crustal assimilation of this early surface reservoir of H2O (punctuated by possible episodes of less extensive flooding) was a natural consequence of the planet's subsequent climatic and geothermal evolution-potentially cycling the equivalent of a km-deep global ocean of water through the atmosphere and subsurface every approx. 10(exp 9) years. In response to the long-term decline in planetary heat flow, the progressive coldtrapping of H2O into the growing cryosphere is expected to have significantly depleted the original inventory of groundwater-a development that could well explain the apparent decline in outflow channel activity observed during the Amazonian. Although primarily a theoretical analysis, our findings appear remarkably consistent with the geomorphic and topographic evidence that Mars once possessed a primordial ocean and that a substantial relic of that body continues to survive as massive ice deposits within the northern plains. Confirmation of the presence of such deposits, combined with the potential detection of a global-scale groundwater system, would provide persuasive support for the validity of this analysis.
Author
Mars (Planet); Mars Surface; Mars Atmosphere; Ice Environments; Earth Hydrosphere

20030012598 Lunar and Planetary Inst., Houston, TX USA
The Mountains of Io: Global and Geological Perspectives from Voyager and Galileo
Schenk, Paul, Lunar and Planetary Inst., USA; Hargitai, Henrik, Eoetvoes LORANd Univ., Hungary; Wilson, Ronda, Lunar and Planetary Inst., USA; McEwen, Alfred, Arizona Univ., USA; Thomas, Peter, Cornell Univ., USA; Journal of Geophysical Research; Dec. 25, 2001; ISSN 0148-0227; Volume 106, No. E12, pp. 33,201-33,222; In English; Original contains color illustrations

Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1085; Paper-2002JE001408; Copyright; Avail: Issuing Activity

To search for local and global scale geologic associations that may be related to the internal dynamics of Io, we have completed a global catalog of all mountains and volcanic centers. We have identified 115 mountain structures (covering approx. 3% of the surface) and 541 volcanic centers, including paterae (calderas and dark spots) and shield volcanoes. The average length of an Ionian mountain is 157 km, with the longest being 570 km. The mean height of Ionian mountains is 6.3 km, and the highest known mountain is Boosaule Montes (17.5 +/- 3 km). Five basic morphologic types of mountains have been identified; mesa, plateau peak, ridge, and massif. Very few mountains bear any physical similarity. to classic volcanic landforms, but many resemble flatiron mountains on Earth and are interpreted as tilted crustal blocks. This would be consistent with the hypothesis that most mountains are thrust blocks formed as a result of compressive stresses built up in the lower crust due to the global subsidence of volcanic layers as they are buried over time. More than one mechanism may be responsible for all Ionian mountains, however. The proximity of some mountains to paterae may indicate a direct link between some mountains and volcanism, although it is not always clear which came first. In contrast to earlier studies, a pronounced bimodal pattern is observed in the global distribution of both mountains and volcanic centers. The regions of highest areal densities of volcanic centers are near the sub- and anti-Jovian regions, but are offset roughly 90deg in longitude from the two, regions of greatest concentration of mountains. This anticorrelation may indicate the overprinting of a second stress field on the global compressive stresses due to subsidence. The bimodal distribution of volcanic centers and mountains is consistent with models of asthenospheric tidal heating and internal convection developed by Tackley et al.Over regions of mantle upwelling, compressive stresses in the lower crust induced by global subsidence might be reduced, encouraging volcanism and discouraging mountain building. In regions of mantle downwelling, these compressive stresses in the lower crust might be increased, discouraging volcanism and encouraging mountain building. Alternatively, the global pattern may be related to possible (but undocumented) nonsynchronous rotation of lo, which would produce two regions each of compression and extension in the crust. Evidence of layering and of mass wasting, including landslides, block sliding, debris aprons and downslope creep, on Ionian mountains suggests that the crust of Io is essentially a layered stack of partially consolidated volcanic lavas and plume deposits, becoming more consolidated with depth. The lower crust especially may also be ductily deformed, punctuated by volcanic intrusions and faulting at paterae, and broken into blocks, some of which have been uplifted to form mountains.
Author
Io; Mountains; Volcanology; Geology; Volcanoes

20030012636 Lunar and Planetary Inst., Houston, TX USA
Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations
Kirkland, Laurel, Editor, Lunar and Planetary Inst., USA; Mustard, John, Editor, Lunar and Planetary Inst., USA; McAfee, John, Editor, Lunar and Planetary Inst., USA; Hapke, Bruce, Editor, Lunar and Planetary Inst., USA; Ramsey, Michael, Editor, Lunar and Planetary Inst., USA; 2002; 36p; In English, 4-6 Jun. 2002, Houston, TX, USA; Also announced as 20030012637 through 20030012646
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1148; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The continuity and timely implementation of the Mars exploration strategy relies heavily on the ability of the planetary community to interpret infrared spectral data. However, the increasing mission rate, data volume, and data variety, combined with the small number of spectroscopists within the planetary community, will require a coordinated community effort for effective and timely interpretation of the newly acquired and planned data sets. Relevant spectroscopic instruments include the 1996 TES, 2001 THEMIS, 2003 Pancam, 2003 Mini-TES, 2003 Mars Express OMEGA, 2003 Mars Express PFS, and 2005 CFUSM. In light of that, leaders of the Mars spectral community met June 4-6 to address the question: What terrestrial theoretical, laboratory, and field studies are most needed to best support timely interpretations of current and planned visible infrared spectrometer data sets, in light of the Mars Program goals? A primary goal of the spectral community is to provide a reservoir of information to enhance and expand the exploration of Mars. Spectroscopy has a long history of providing the fundamental compositional discoveries in the solar system, from atmospheric constituents to surface mineralogy, from earth-based to spacecraft-based observations. However, such spectroscopic compositional discoveries, especially surface mineralogies, have usually come after long periods of detailed integration of remote observations, laboratory analyses, and field measurements. Spectroscopic information of surfaces is particularly complex and often is confounded by interference of broad, overlapping absorption features as well as confusing issues of mixtures, coatings, and grain size effects. Thus some spectroscopic compositional discoveries have come only after many years of research. However, we are entering an era of Mars exploration with missions carrying sophisticated spectrometers launching about every 2 years. It is critical that each mission provide answers to relevant questions to optimize the success of the next mission. That will not occur effectively unless the spectroscopic remote sensing data can be processed and

understood on an approximate 2-year rate. Our current knowledge of spectral properties of materials and confounding effects of the natural environment are note well enough understood for the accurate interpretations needed for such ambitious and time critical exploration objectives. This workshop focused on identify ing critical gaps in moving the field towards the goal of rapid and accurate analysis and interpretation.
Author
Mars Surface; Mars Exploration; Infrared Spectroscopy; Mineralogy; Mars Missions; Data Acquisition; Spectrum Analysis; Planetary Geology

20030012637 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA
Mars Exploration and Importance of Spectroscopic Observations
Arvidson, R. E., Washington Univ., USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002, pp. 20; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

An update will be given based on the work by the Pathways Science Steering Subgroup of the Mars Exploration Payload Analysis Group (MEPAG), focusing on planned and needed spectroscopic investigations from orbit and from the surface that would pursue science objectives associated with climate, life, resources, and the role of water. This Subgroup is chartered to examine the mission set and expected results through the 2009 Mars Smart Lander (MSL) Mission and to postulate alternate discovery-driven investigation pathways that NASA might take in exploring Mars during the next decade. An emphasis will be on global understanding of the tectonic and climatic cycles and whether or not they conspired to produce suitable habitats for life of Mars. Summaries will be provided for observation capabilities associated with existing and planned spectroscopic systems through MSL and requirements derived and presented for several investigation-driven pathways for the next decade.
Author
Mars Exploration; Mars Missions; Spectroscopy; Exobiology; Extraterrestrial Life; Mars Environment

20030012638 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA USA
The Power of Combining Multiple Spectroscopic Techniques for Mineral Identification on Mars and the Necessity of Lab and Field Study of Analog Materials
Bishop, J. L., Search for Extraterrestrial Intelligence Inst., USA; Lane, M. D., Planetary Science Inst., USA; Murad, E., Bavarian Geological Survey, Germany; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Martian surface composition analysis should include multiple types of spectral measurements in order to maximize the information to be gained. Mars research is utilizing this concept in combining thermal IR (TES and THEMIS) with visible/NIR (Omega and CRISM) global spectral measurements in current and upcoming missions, as well as a combination of multispectral visible/NIR and hyperspectral thermal IR on the 2003 MERs. What we need urgently to support these missions are studies of analog materials, both in the lab and in situ. These studies should include hyperspectral visible/NIR, mid-IR and Raman data in order to be applicable to future missions where these data will hopefully be collected on Mars.
Author
Mars Surface; Planetary Geology; Spectrum Analysis; Spectroscopy; Spectral Emission; Spectroscopic Analysis; Mars Missions

20030012639 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Visible to Short Wavelength Infrared Spectroscopy on Rovers: Why We Need it on Mars and What We Need to do on Earth
Blaney, D. L., Jet Propulsion Lab., California Inst. of Tech., USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The next stage of Mars exploration will include the use of rovers to seek out specific mineralogies. Understanding the mineralogical diversity of the locale will be used to determining which targets should be investigated with the full suite of in situ capability on the rover. Visible to Short Wavelength Infrared (VSWIR) spectroscopy is critical in evaluating the mineralogical diversity and to validate the global remote sensing data sets to be collected by Mars Express and the Mars Reconnaissance Orbiter. However, spectroscopy on mobile platforms present challenges in both the design of instruments and in the efficient operation of the instrument and mission. Field-testing and validation on Earth can be used to develop instrument requirements analysis tools needed for used on Mars.
Author
Infrared Spectroscopy; Roving Vehicles; Mars Surface; Mars Exploration; Design Analysis; Mars Landing Sites; Data Processing

20030012640 Geological Survey, Denver, CO USA

Spectral Feature Mapping and Analysis of Mars Global Surveyor Thermal Emission Spectrometer Data

Clark, Roger N., Geological Survey, USA; Hoefen, Todd, Geological Survey, USA; Smith, Michael D., Geological Survey, USA; Pearl, John C., Geological Survey, USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 1p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Mars Global Surveyor (MGS) spacecraft began orbiting Mars on September 11, 1997. After aerobraking and science phasing periods where the orbit shape and equator timing were adjusted, mapping by science instruments began on March 9, 1999. The Thermal Emission Spectrometer (TES) has obtained 6-50 micron spectra of Mars since the mapping period began and continues to do so to the present. The TES obtains nadir pointed spectra of nominal 5 and 10 cm(exp -1) spectral sampling (143 or 286 spectral channels) from 6.25 to 50 micron (1600 to 200(exp -1)) in 2 to 4 seconds. The TES also obtains limb pointed spectra and selected angles in between nadir and limb, as well as space pointed and internal black body pointed (for calibration) spectra. The TES obtains both day and night side data in a 3-pixel cross track and 2-pixel down track array. The pixel size is 3 km across track and 6 km down track. Six-km downtrack smear is caused by orbital motion due to the spacecraft flying backwards from its intended direction and in an orientation where the TES image motion compensation does not work.

Author

Mars Global Surveyor; Spectrometers; Infrared Spectroscopy; Planetary Mapping; Thermal Mapping; Data Processing; Planetary Geology

20030012641 Lecce Univ., Dept. di Fisica, Italy

A Coordinated Laboratory Program in Support of the Spectroscopic Experiments on Board Martian Missions

Fonti, S., Lecce Univ., Italy; Arnold, G., Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; Blanco, A., Lecce Univ., Italy; Bonello, G., Paris-Sud Univ., France; Colangeli, L., Osservatorio Astronomico, Capodimonte, Italy; Delia, M., Lecce Univ., Italy; DeCarlo, F., Lecce Univ., Italy; Erard, S., Paris-Sud Univ., France; Esposito, F., Osservatorio Astronomico, Capodimonte, Italy; Formisano, V., Consiglio Nazionale delle Ricerche, Italy; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

In recent years the scientific interest for Mars has grown considerably, spurred mainly by the renewed attention of Space Agencies. In particular the successful NASA missions Mars Pathfinder and Mars Global Surveyor (MGS) have supplied a wealth of new data, but at the same time have opened a large number of new questions concerning both the present and the past of the planet. It is worthwhile to note that some of the pending issues are considerably appealing also for the general public. As an example we can consider the consequences that the assessment of past existence of liquid water on the surface of the planet can have for the possibility that life has developed on Mars in the past. It is probable that no definite results can be obtained without a direct analysis of samples retrieved from a carefully chosen landing site, but such an occurrence is not scheduled in the near future. Therefore, for the time being, the information obtained with the observation of the planet by means of orbiting instruments, can play an important role in addressing many important questions concerning the climatic evolution of Mars.

Author

Spacecraft Equipment; Optical Emission Spectroscopy; Infrared Spectroscopy; Mars Missions; Spectrum Analysis; Data Bases; Data Processing

20030012642 NASA Johnson Space Center, Houston, TX USA

Mapping Lithologic Units Exposed on the Summit of Mauna Kea Using AVIRIS Hyperspectral Reflectance Data

Guinness, E. A., Washington Univ., USA; Arvidson, R. E., Washington Univ., USA; Jolliff, B. L., Washington Univ., USA; Morris, R. V., NASA Johnson Space Center, USA; Ming, D. W., NASA Johnson Space Center, USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Mauna Kea summit region is largely comprised of cinder cones and lava flows that form the cap of the Mauna Kea Volcano. The cones and flows at the summit are part of the Laupahoehoe Volcanic series. The Laupa hoehoe volcanism occurred both during and after the late Pleistocene Makanaka glacial episode at the summit. In addition, a few Laupahoehoe cones have been glacially eroded as evidenced by oversteepened slopes, which suggests that they predate the Makanaka glacial period. Two notable examples of possible preglacial cones are Puu Waiau and Puu Poliahu. These two cones are also significantly altered, most likely by hydrothermal activity that has weakly cemented the materials on the cones. Well-crystalline sulfates (alunite and jarosite), phyllosilicates, and zeolites, have been found in samples collected from altered cones at the summit. In addition, palagonitic tephra, which have nanophase ferric oxide, allophane, and other poorly crystalline forms of weakly altered basaltic

glass (i.e., no phyllosilicates), have been described at several locations on Mauna Kea. While several studies have discussed the occurrence of alteration products on Mauna Kea, the distribution of these materials exposed at the summit has not been extensively mapped. Hyperspectral imaging can provide information for identifying and mapping lithologic units containing alteration minerals, such as are found on Mauna Kea. The Airborne Visible Infrared Imaging Spectrometer (AVIRIS) is a hyperspectral imaging instrument that covers the wavelength range from about 0.4 to 2.5 micron in 224 bands, with a band spacing of 10 nm and average band width of 10 nm
Author
Thematic Mapping; Cones (Volcanoes); Airborne Equipment; Infrared Spectroscopy; Mineralogy; Volcanoes; Spectral Reflectance

20030012643 Pittsburgh Univ., Dept. of Geology and Planetary Science, Pittsburgh, PA USA
Status of Reflectance and Emissivity Models Relevant to Mars Studies
Hapke, Bruce, Pittsburgh Univ., USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 1p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The status of theoretical models of the interaction of electromagnetic radiation with planetary regoliths relevant to the interpretation of Martian spectroscopic observations is discussed. Most of the problems have to do with particle size effects, because the physics of light scattering is different, depending on whether the particles making up a medium are larger or smaller than the wavelength. The spectral emissivities of media of large and small particles will, in general, be quite different in ways that often are not predictable.
Author
Mathematical Models; Electromagnetic Radiation; Planetary Geology; Light Scattering; Reflectance; Mars Surface; Particle Size Distribution

20030012644 Lunar and Planetary Inst., Houston, TX USA
Thermal Infrared Field Spectroscopy
Kirkland, L. E., Lunar and Planetary Inst., USA; Herr, K. C., Aerospace Corp., USA; McAfee, J. M., Los Alamos National Lab., USA; Adams, P. M., Aerospace Corp., USA; Salisbury, J. W., Johns Hopkins Univ., USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The 2003 Mars Exploration Rover science strategy calls on Pancam and Mini-TES to identify promising targets for the rover, which will then traverse to those targets for examination. Team members will select sites using target morphology and color (Pancam), and interpretations of the mineralogy using Mini-TES. This strategy requires high quality, near real-time interpretations of Mini-TES data. The planetary community has essentially no experience with rapid identification using field images measured similarly to Mini-TES. Department of Defense researchers have instrumentation, data sets, and experience in this area. Here we discuss lessons learned in interpreting field spectra and measurement protocols that improve interpretations. We solicit input for what targets and sites to measure using our hyperspectral field scanners for release to the community.
Author
Infrared Spectroscopy; Thermal Emission; Mineralogy; Mars Exploration; Roving Vehicles; Mars Surface; Spectrum Analysis

20030012645 NASA Johnson Space Center, Houston, TX USA
Martian Analogue Sample Characterization and Spectral Library Development at the Johnson Space Center
Morris, Richard V., NASA Johnson Space Center, USA; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 1p; In English; Also announced as 20030012636; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

An extensive collection of Martian analogue samples housed at the Johnson Space Center is the focus of ongoing research by the JSC Mars soil genesis group and their collaborators. Because the major element composition of Martian meteorites and in situ analyses of Martian soils and rocks indicate that Mars is predominantly an iron-rich basaltic world, the focus of active sample collection and analysis is basaltic materials and their hydrolytic (both aqueous and hydrothermal) and sulfatetic alteration products. Described below are the scope of the JSC Mars analogue sample collection, the characterization process, and plans to incorporate the data into spectral libraries for the Mars 2003 Mars Exploration Rover (MER) and Mars 2005 Mars Reconnaissance Orbiter (MRO) CRISM missions.
Author
Mars Surface Samples; Mars Exploration; Analogs; Mars Surface; Infrared Spectroscopy; Spectrum Analysis; Mars Missions

20030012646 NASA Ames Research Center, Moffett Field, CA USA

CRISM: Compact Reconnaissance Imaging Spectrometer for Mars on the Mars Reconnaissance Orbiter

Murchie, S., Johns Hopkins Univ., USA; Arvidson, R., Washington Univ., USA; Barnouin-Jha, O., Centre National de la Recherche Scientifique, France; Beisser, K., Johns Hopkins Univ., USA; Bibring, J.-P., Centre National de la Recherche Scientifique, France; Bishop, J., NASA Ames Research Center, USA; Boldt, J., Johns Hopkins Univ., USA; Choo, T., Centre National de la Recherche Scientifique, France; Clancy, R. T., Space Science Inst., USA; Darlington, E. H., Centre National de la Recherche Scientifique, France; Mars Infrared Spectroscopy: From Theory and the Laboratory to Field Observations; 2002; 2p; In English; Also announced as 20030012636; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) on the Mars Reconnaissance Orbiter (MRO) will conduct a comprehensive series of investigations of the Martian surface and atmosphere. The investigations will be accomplished using an instrument design that provides high spatial and spectral resolutions, extended wave- length range, and ability to gimbal through a range of orientations. Baseline investigations include a near-global survey to find high science priority sites, full-resolution measurement of thousands of such sites, and tracking of seasonal variations in atmospheric and surface properties.
Author

Imaging Spectrometers; Infrared Spectroscopy; Mars Surface; Mars Missions; Design Analysis; Planetary Mapping; Mars Exploration

20030012803 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA

Participation in the Mars Orbiting Laser Altimeter Experiment ***Final Report, 31 Dec. 1997 - 31 Dec. 2002***

Pettengill, Gordon H., Massachusetts Inst. of Tech., USA; [2002]; 10p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-4434; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This NASA Grant, 5-4434, has covered the active participation of the Principal Investigator, Prof. Gordon Pettengill, and his Co-Investigator, Peter Ford, in the Mars Orbiting Laser Altimeter (MOLA) Experiment, over a period of five years. This participation has included attending team meetings, planning observing operations, developing data-reduction software algorithms, and processing data, as well as presenting a number of oral reports at scientific meetings and published papers in refereed journals. This research has concentrated on the various types of Martian clouds that were detected by the laser altimeter.
Author

Mars Atmosphere; Laser Altimeters; Cloud Cover; Infrared Radiation; Applications Programs (Computers); Planetary Mapping; Position (Location)

20030014276 Proxemy Research, Inc., Laytonsville, MD USA

Volcanic Plume Heights on Mars: Limits of Validity for Convective Models

Glaze, Lori S., Proxemy Research, Inc., USA; Baloga, Stephen M., Proxemy Research, Inc., USA; Journal of Geophysical Research; 2002; ISSN 0148-0227; Volume 107, No. E10, pp. 16-1 - 16-11; In English
Contract(s)/Grant(s): NASW-00013; NAS5-01009; NAG5-10530; NAG5-7251; Copyright; Avail: Issuing Activity

Previous studies have overestimated volcanic plume heights on Mars. In this work, we demonstrate that volcanic plume rise models, as currently formulated, have only limited validity in any environment. These limits are easily violated in the current Mars environment and may also be violated for terrestrial and early Mars conditions. We indicate some of the shortcomings of the model with emphasis on the limited applicability to current Mars conditions. Specifically, basic model assumptions are violated when (1) vertical velocities exceed the speed of sound, (2) radial expansion rates exceed the speed of sound, (3) radial expansion rates approach or exceed the vertical velocity, or (4) plume radius grossly exceeds plume height. All of these criteria are violated for the typical Mars example given here. Solutions imply that the convective rise, model is only valid to a height of approximately 10 kilometers. The reason for the model breakdown is hat the current Mars atmosphere is not of sufficient density to satisfy the conservation equations. It is likely that diffusion and other effects governed by higher-order differential equations are important within the first few kilometers of rise. When the same criteria are applied to eruptions into a higher-density early Mars atmosphere, we find that eruption rates higher than 1.4 x 10(exp 9) kilograms per second also violate model assumptions. This implies a maximum extent of approximately 65 kilometers for convective plumes on early Mars. The estimated plume heights for both current and early Mars are significantly lower than those previously predicted in the literature. Therefore, global-scale distribution of ash seems implausible.
Author

Mars Surface; Plumes; Planetary Geology; Mars Volcanoes; Volcanic Eruptions; Mathematical Models

92
SOLAR PHYSICS

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

20030014067 Krasnoyarsk Inst. of Non-Ferrous Metals, Krasnoyarsk, Russia
Computational Simulation of the Low Chromosphere Heating by the Shock Waves Series
Alekseenko, S. V.; Dudnikova, G. I.; Romanov, V. A.; Romanov, D. V.; Romanov, K. V.; Jul. 2002; 6p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with Russian Academy of Sciences
Report No.(s): AD-A409238; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The low chromosphere heating by the series of shock waves is investigated. Waves are initially generated in the solar photosphere. Due to propagation in the strong stratified solar atmosphere the waves are overturning to the shock waves. The goal of present paper is to investigate it using 2D approximation. to describe the solar atmosphere one-fluid hydrodynamics with taken into consideration radiative heat transfer and absence of the thermodynamic equilibrium is used. Computer modeling is performed for one-and two-dimensional formulation of problem. The results obtained are important for understanding the physics of star atmospheres reaction on the dynamical disturbances like flares mass surges and heating by penetrating convection.
DTIC
Heating; Chromosphere; Shock Waves; Computerized Simulation

20030014164 Krasnoyarsk Inst. of Non-Ferrous Metals, Krasnoyarsk, Russia
Hypersonic Pulsing Regimes of Magnetic Field Emerge From Lower Layers of the Convective Zone Up to the Photosphere of the Sun
Alekseenko, S. V.; Romanov, V. A.; Romanov, K. V.; Semeonov, I. V.; Jul. 2002; 7p; In English; See also ADM001433. International Conference on Methods of Aerophysical Research (11th). Held in Novosibirsk, Russia on 1-7 Jul 2002. Prepared in cooperation with Russian Academy of Sciences Inst. of Thermophysics, Novosibirsk, Russia
Report No.(s): AD-A409239; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Oscillations of an isolated thin magnetic tube at various depths of the convective zone and in the atmosphere of the Sun are investigated in the present work in the approximation of ideal magnetic gas-dynamics. These oscillations are the source of generation of acoustic waves whose transition in weak shock waves provides anomalous heating of the solar atmosphere. The modes of small-amplitude linear oscillations at various depths of the convective zone are investigated. The loss of stability of equilibrium of the magnetic tube which is initially at rest in the convective zone as well as the nonlinear large-scale oscillations of the tube and tube emergence into the solar atmosphere are independently investigated. The results obtained are fundamental for research of sunspot generation and physics of solar activity, they are important for analysis of generation and tine evolution of global magnetic structures, solar wind, and some other astrophysical phenomena.
DTIC
Heating; Photosphere; Solar Magnetic Field

20030014334 Mullard Space Science Lab., Dorking, UK
Trajectories of Microwave Prominence Eruptions
Hori, K., Mullard Space Science Lab., UK; Culhane, J. L., Mullard Space Science Lab., UK; Astronomy and Astrophysics; 2002; ISSN 0004-6361; Volume 382, pp. 666-677; In English; Copyright; Avail: Issuing Activity

On the basis of 17 GHz microwave images from the Nobeyama Radioheliograph near solar maximum (1999-2000), we examined trajectories of 50 prominence eruptions in order to address how prominence motions affect or reflect the surrounding coronal structures. We marked the heliocentric latitude of the top of the moving prominences on the white-light synoptic maps, which were constructed at 2.5-4.5 solar radii from the LASCO (Large Angle and Spectrometric Coronagraph Experiment) C2 coronagraph on the SOHO (Solar and Heliospheric Observatory) spacecraft. We found that i) 92% of the prominence eruptions were associated with coronal mass ejections (CMEs) and that the remaining 8%, show weak mass motions confined to nearby streamers, and ii) coronal mass motions involving prominence eruptions and CMEs are not random but are organized by bundles of streamers. Our findings support the idea of multiple plasma sheets emanating from active regions, arcades, trans-equatorial interconnecting loops, and polar crown filaments, through which coronal mass is transported toward interplanetary space. This study suggests that microwave observations can provide useful information on the activity at the base of such ’coronal mass corridors’.
Author
Trajectories; Microwaves; Solar Prominences; Solar Corona; Solar Physics

Subject Term Index

Numbers

2001 MARS ODYSSEY, 105

A

ABLATION, 214
ABNORMALITIES, 165
ABSTRACTS, 233
ACCELEROMETERS, 36, 131
ACCESS CONTROL, 185
ACCIDENT PREVENTION, 11
ACCOUNTING, 225
ACETIC ACID, 52
ACETYL COMPOUNDS, 165
ACID RAIN, 133
ACOUSTIC EMISSION, 206
ACOUSTIC FATIGUE, 20
ACOUSTIC MEASUREMENT, 111, 202, 203, 205
ACOUSTIC PROPERTIES, 205
ACOUSTIC VELOCITY, 148
ACOUSTICS, 122, 148, 203, 219
ACTIVATED CARBON, 60
ACTIVE CONTROL, 17, 84, 201, 202
ACTUATORS, 80
ADAPTIVE FILTERS, 36
ADDITIVES, 52
ADENOSINE TRIPHOSPHATE, 166
ADHESION, 210
ADHESIVE BONDING, 18, 59
ADHESIVES, 59
AERIAL PHOTOGRAPHY, 200
AEROACOUSTICS, 1, 21, 111, 200, 201, 203, 204, 205
AEROBRAKING, 105
AERODYNAMIC CHARACTERISTICS, 4, 5, 17, 19, 100
AERODYNAMIC DRAG, 16
AERODYNAMIC FORCES, 104
AERODYNAMIC HEAT TRANSFER, 93
AERODYNAMIC HEATING, 34
AERODYNAMIC LOADS, 3
AERODYNAMIC NOISE, 200, 204
AERODYNAMIC STALLING, 2, 14, 15, 17, 19, 205
AERODYNAMICS, 6, 7, 8, 25, 27
AEROELASTICITY, 87
AERONAUTICAL ENGINEERING, 29
AERONAUTICS, 11
AEROSHELLS, 34
AEROSOLS, 66, 116, 153
AEROSPACE ENGINEERING, 42
AEROSPACE ENVIRONMENTS, 172, 179, 238
AEROSPACE MEDICINE, 167
AEROSPACE SYSTEMS, 231
AEROSPACE VEHICLES, 22, 31
AEROTHERMODYNAMICS, 16, 65
AIR, 97
AIR BREATHING ENGINES, 16
AIR DEFENSE, 175
AIR POLLUTION, 68, 69, 140, 141, 142, 143, 146, 147, 148
AIR QUALITY, 141, 143, 144
AIR SAMPLING, 146
AIR TRAFFIC CONTROL, 9, 11, 13, 154, 155
AIR TRANSPORTATION, 9, 154
AIRBORNE EQUIPMENT, 13, 244
AIRCRAFT, 10, 19
AIRCRAFT ACCIDENTS, 11, 154
AIRCRAFT CONFIGURATIONS, 15, 19
AIRCRAFT CONTROL, 27
AIRCRAFT DESIGN, 19
AIRCRAFT ENGINES, 1, 15
AIRCRAFT FUELS, 207
AIRCRAFT INDUSTRY, 30
AIRCRAFT LANDING, 171
AIRCRAFT MAINTENANCE, 20, 23
AIRCRAFT MANEUVERS, 20
AIRCRAFT MODELS, 24, 84
AIRCRAFT NOISE, 20, 203, 205
AIRCRAFT PILOTS, 15, 22, 65, 154
AIRCRAFT SAFETY, 11
AIRCRAFT STRUCTURES, 216
AIRFOILS, 4, 6, 21, 43, 190, 203
AIRFRAMES, 16, 203, 204
AIRPORTS, 11, 12, 15
AIRSHIPS, 5
ALASKA, 128
ALBEDO, 235
ALGORITHMS, 6, 14, 64, 74, 85, 98, 111, 175, 177, 178, 180, 187, 206, 210, 237
ALKALI METALS, 47
ALKANES, 141
ALKYLATION, 207
ALLOYS, 215
ALUMINIDES, 56
ALUMINUM, 54, 55, 78
ALUMINUM NITRIDES, 219
ALUMINUM OXIDES, 46
AMINES, 57
AMMONIUM COMPOUNDS, 48
AMORPHOUS MATERIALS, 109, 215
AMPLIFICATION, 75
AMPLIFIERS, 211
ANALOG TO DIGITAL CONVERTERS, 202
ANALOGS, 244
ANALYZING, 132, 185, 225
ANATOMY, 177
ANEMOMETERS, 113
ANGLE OF ATTACK, 89, 91
ANGULAR MOMENTUM, 150
ANGULAR VELOCITY, 163
ANHYDRIDES, 57, 60
ANISOTROPY, 77
ANNUAL VARIATIONS, 155
ANNULAR PLATES, 123
ANTENNA RADIATION PATTERNS, 188
ANTHROPOMETRY, 15
ANTIBODIES, 171
ANTIFERROMAGNETISM, 217
APPLICATIONS PROGRAMS (COMPUTERS), 124, 176, 181, 182, 245
AQUATIC PLANTS, 200
AQUIFERS, 127, 129, 136, 137
ARC HEATING, 6
ARC JET ENGINES, 65
ARCHIPELAGOES, 200
ARCHITECTURE (COMPUTERS), 175, 176
ARCTIC OCEAN, 99
ARID LANDS, 131
ARMED FORCES, 11, 229
ARMED FORCES (UNITED STATES), 232
ARMOR, 52, 62
ARRAYS, 198
ARSENIC, 130, 132
ARTERIES, 166
ARTERIOSCLEROSIS, 164
ARTIFICIAL INTELLIGENCE, 23, 155, 183
ARTIFICIAL SATELLITES, 37
ASIA, 133
ASTEROIDS, 239
ASTRONAUT PERFORMANCE, 172
ASTRONAUTICS, 231
ASTRONOMICAL MAPS, 237

ASTRONOMICAL OBSERVATORIES, 236, 237
ASTROPHYSICS, 49, 235, 237
ASYMPTOTIC SERIES, 88
ATLANTIS (ORBITER), 32, 33
ATMOSPHERIC CHEMISTRY, 31, 66, 109
ATMOSPHERIC COMPOSITION, 224
ATMOSPHERIC EFFECTS, 151
ATMOSPHERIC ENTRY, 34
ATMOSPHERIC GENERAL CIRCULATION MODELS, 126, 156
ATMOSPHERIC MODELS, 116, 145, 153, 169
ATMOSPHERIC MOISTURE, 152
ATMOSPHERIC PRESSURE, 97
ATMOSPHERIC TEMPERATURE, 154, 224
ATOMIC CLOCKS, 209
ATOMIC INTERACTIONS, 207
ATOMIC LAYER EPITAXY, 109
ATOMIC STRUCTURE, 215
ATOMS, 208
ATTITUDE (INCLINATION), 31
ATTITUDE CONTROL, 29, 31
AUDITORY SIGNALS, 111
AUSTENITIC STAINLESS STEELS, 54
AUTOMATIC CONTROL, 20, 71
AUTOMATION, 183
AXIAL FLOW TURBINES, 2
AXISYMMETRIC FLOW, 94

B

BACKGROUND NOISE, 202
BALLISTIC MISSILES, 191
BALLOONS, 62
BANDWIDTH, 202
BARIUM COMPOUNDS, 53
BAYES THEOREM, 192
BEACONS, 9
BEAMFORMING, 198
BEAMS (RADIATION), 179
BEAMS (SUPPORTS), 10
BEARINGS, 117
BERYLLIUM, 53, 197
BGK MODEL, 194
BIAS, 75
BINARY MIXTURES, 49
BINARY PHASE SHIFT KEYING, 211
BIOCHEMISTRY, 157, 163
BIODYNAMICS, 162
BIOFILMS, 169
BIOGEOCHEMISTRY, 169
BIOGRAPHY, 3
BIOLOGICAL EVOLUTION, 173
BIOLOGICAL WEAPONS, 107
BIOMARKERS, 111
BIOSPHERE, 169
BIOSYNTHESIS, 58
BIRD-AIRCRAFT COLLISIONS, 9
BIRDS, 161
BLACK HILLS (SD-WY), 137
BLACK HOLES (ASTRONOMY), 239
BLADE TIPS, 2
BLASIUS FLOW, 93
BLOOD CIRCULATION, 166
BLOOD PLASMA, 165
BLOWDOWN WIND TUNNELS, 6
BLOWING, 96
BLUNT BODIES, 8
BLUNT LEADING EDGES, 5
BO-105 HELICOPTER, 2
BODY CENTERED CUBIC LATTICES, 53
BOLTZMANN TRANSPORT EQUATION, 194
BOMB CALORIMETERS, 112
BONDED JOINTS, 123
BONES, 170
BOREHOLES, 131
BORIDES, 41, 45
BORON COMPOUNDS, 217
BOSE-EINSTEIN CONDENSATES, 222
BOUNDARY CONDITIONS, 2, 49, 79
BOUNDARY LAYER CONTROL, 103
BOUNDARY LAYER FLOW, 21, 92, 99
BOUNDARY LAYER SEPARATION, 87, 89, 93, 94
BOUNDARY LAYER THICKNESS, 91
BOUNDARY LAYER TRANSITION, 8, 89, 92, 93, 94, 99, 104
BOUNDARY LAYERS, 86, 96, 102, 205
BRAGG GRATINGS, 210
BRAIN, 171
BRAIN DAMAGE, 165
BRANCHING (MATHEMATICS), 198
BRAZING, 55
BREADBOARD MODELS, 212
BREATHING APPARATUS, 172
BRIDGES (STRUCTURES), 131
BROADBAND, 201, 203
BROADCASTING, 73, 223
BUBBLE CHAMBERS, 97
BUCKLING, 43
BUILDINGS, 143
BUOYANCY, 5
BURNERS, 24, 26
BYPASSES, 89

C

C++ (PROGRAMMING LANGUAGE), 181
CALCIUM ISOTOPES, 168
CALIBRATING, 133, 140, 213
CALIFORNIA, 132, 140, 145, 146
CANCER, 157, 158, 159, 160, 161, 163, 164
CAPACITANCE, 203
CARBIDES, 238
CARBON, 146
CARBON DIOXIDE, 49, 144
CARBON FIBERS, 44
CARBON MONOXIDE, 51
CARBON NANOTUBES, 57, 59, 61, 215, 216, 219
CARBON-CARBON COMPOSITES, 44
CARBONATES, 69
CARBONYL COMPOUNDS, 146
CARDIOVASCULAR SYSTEM, 164, 166, 167
CATALOGS (PUBLICATIONS), 3
CAVITY FLOW, 86
CELL DIVISION, 158
CELLS (BIOLOGY), 158, 159, 167, 169
CENTRAL NERVOUS SYSTEM, 172
CENTRAL PROCESSING UNITS, 182
CENTRIFUGAL COMPRESSORS, 24, 108
CENTRIFUGAL FORCE, 116
CERAMIC COATINGS, 44, 119
CERAMICS, 44, 45, 64, 66, 67
CHANDLER WOBBLE, 151
CHANNEL FLOW, 108, 116
CHARACTERIZATION, 131
CHEMICAL ANALYSIS, 133, 145, 238
CHEMICAL BONDS, 59
CHEMICAL COMPOSITION, 141
CHEMICAL EVOLUTION, 169, 174
CHEMICAL PROPERTIES, 124
CHEMICAL REACTIONS, 47, 48, 49, 68, 88, 238
CHEMISORPTION, 48
CHEMOTHERAPY, 159, 170
CHIPS, 170
CHIPS (ELECTRONICS), 77
CHLORINE, 146
CHOLESTEROL, 58
CHOLINESTERASE, 165
CHROMOSPHERE, 246
CIRCUIT BOARDS, 82
CIRCUITS, 83, 113
CIRCULAR TUBES, 86
CIVIL AVIATION, 9, 11, 15, 20, 30
CLAMPS, 120

CLASSIFICATIONS, 191
CLAYS, 132
CLEAN FUELS, 69
CLIMATE CHANGE, 137
CLIMATE MODELS, 154, 155
CLIMATOLOGY, 155, 156
CLINICAL MEDICINE, 143
CLOCKS, 151
CLOTHING, 178
CLOUD COVER, 245
CLOUDS (METEOROLOGY), 107
CLUSTER ANALYSIS, 177
CMOS, 81
COAGULATION, 165
COAL, 67
COAL DERIVED GASES, 69
COAL GASIFICATION, 69
COASTAL WATER, 156
COASTS, 146
COATINGS, 40
COCKPIT WEATHER INFORMATION SYSTEMS, 152
COCKPITS, 22
CODE DIVISION MULTIPLEXING, 72
COHERENCE, 207, 210
COHERENT RADAR, 28, 107, 213
COLD NEUTRONS, 222
COLLISIONS, 50
COLLOIDS, 106
COLOR, 110, 187
COLORADO, 138
COLUMBIA (ORBITER), 33, 34, 35
COMBAT, 73
COMBINATORIAL ANALYSIS, 187
COMBUSTION, 46, 48, 50, 90, 96
COMBUSTION CHAMBERS, 24, 26, 69, 98, 101
COMBUSTION PHYSICS, 26
COMET NUCLEI, 235
COMMERCE, 229
COMMERCIAL AIRCRAFT, 11, 13, 30
COMMUNICATING, 231
COMMUNICATION, 157, 186
COMMUNICATION NETWORKS, 73, 76, 111
COMPARATORS, 187
COMPATIBILITY, 81, 151
COMPETITION, 225
COMPONENT RELIABILITY, 11
COMPOSITE MATERIALS, 44, 82
COMPOSITE STRUCTURES, 41, 42, 43, 57, 60, 79, 80, 122, 210
COMPOSITION (PROPERTY), 85
COMPRESSIBLE FLOW, 91
COMPRESSION WAVES, 92
COMPRESSIVE STRENGTH, 62, 69
COMPRESSORS, 27
COMPUTATION, 30, 190, 206
COMPUTATIONAL ELECTROMAGNETICS, 74
COMPUTATIONAL FLUID DYNAMICS, 1, 3, 4, 17, 20, 27, 34, 65, 84, 87, 88, 89, 98, 101, 103, 105, 116, 192, 194
COMPUTATIONAL GRIDS, 74
COMPUTER AIDED DESIGN, 27, 179
COMPUTER AIDED TOMOGRAPHY, 121, 162
COMPUTER GRAPHICS, 176, 177, 192
COMPUTER INFORMATION SECURITY, 180, 232
COMPUTER NETWORKS, 72, 74, 178, 185, 186, 232
COMPUTER PROGRAM INTEGRITY, 179
COMPUTER PROGRAMMING, 176, 178, 181, 182, 189
COMPUTER PROGRAMS, 18, 46, 72, 76, 88, 106, 131, 132, 178, 181, 184, 192, 193
COMPUTER SYSTEMS DESIGN, 175
COMPUTER SYSTEMS PROGRAMS, 233
COMPUTERIZED SIMULATION, 17, 18, 42, 72, 96, 105, 128, 129, 138, 154, 155, 175, 193, 208, 246
COMPUTERS, 83, 174
CONCAVITY, 5
CONCENTRATORS, 81, 113
CONDUCTIVITY, 79, 136
CONES (VOLCANOES), 244
CONFERENCES, 54, 128, 185, 230, 231
CONGRESSIONAL REPORTS, 141
CONICAL BODIES, 92
CONIFERS, 136, 145
CONNECTICUT, 131
CONSTRICTIONS, 15
CONSTRUCTION, 12
CONTAMINANTS, 24, 40, 127
CONTAMINATION, 120, 143, 149, 216
CONTINUUM MECHANICS, 61
CONTOURS, 238
CONTRACT MANAGEMENT, 226
CONTRACT NEGOTIATION, 226
CONTRACTORS, 226
CONTROL EQUIPMENT, 27
CONTROL SURFACES, 19, 27
CONTROL SYSTEMS DESIGN, 186
CONTROL THEORY, 20, 186
CONTROLLABILITY, 7, 27
CONVECTION, 152, 234
CONVERGENCE, 5
CONVERSION, 69
CONVEXITY, 186
COOLING, 197
COPOLYMERS, 62, 64
COPPER, 55, 218
CORE SAMPLING, 171
CORNER FLOW, 88
CORRELATORS, 151
CORROSION, 53, 56
CORROSION RESISTANCE, 46
COSMIC RAYS, 235
COSMOCHEMISTRY, 238
COSMOLOGY, 238
COST REDUCTION, 25
COUNTERMEASURES, 172
CRACK INITIATION, 43
CRACK PROPAGATION, 44, 118
CRACK TIPS, 123
CRACKS, 216
CREEP PROPERTIES, 25
CRITERIA, 230
CROSS CORRELATION, 236
CROSS SECTIONS, 195, 199
CRUSTAL FRACTURES, 149
CRYOGENIC COOLING, 212
CRYOGENIC FLUID STORAGE, 42
CRYOGENIC TEMPERATURE, 43
CRYOGENICS, 31, 197
CRYPTOGRAPHY, 76
CRYSTAL GROWTH, 58, 219
CRYSTAL LATTICES, 218
CRYSTAL STRUCTURE, 217
CRYSTALLINITY, 42, 54
CUBES (MATHEMATICS), 30
CULTURE (SOCIAL SCIENCES), 232
CULTURE TECHNIQUES, 167
CURING, 57
CYCLONES, 154
CYLINDERS, 64
CYLINDRICAL BODIES, 196
CYTOPLASM, 162

D

DAMAGE, 79, 119
DAMPING, 37, 123
DATA ACQUISITION, 83, 100, 106, 108, 134, 135, 136, 137, 155, 181, 195, 242
DATA BASES, 8, 74, 84, 138, 145, 185, 243
DATA FLOW ANALYSIS, 135
DATA MANAGEMENT, 72, 174, 185
DATA MINING, 192
DATA PROCESSING, 111, 211, 242, 243
DATA REDUCTION, 10

DATA RETRIEVAL, 14
DATA SYSTEMS, 76, 181
DECISION MAKING, 13, 71, 185, 225
DECISION THEORY, 29
DEEP SPACE, 173
DEFENSE PROGRAM, 226
DEFORMATION, 22, 149
DEGRADATION, 37, 124
DEGREES OF FREEDOM, 18
DELIVERY, 226
DELTA WINGS, 5
DENSITY MEASUREMENT, 103
DEOXYRIBONUCLEIC ACID, 160, 163, 170
DEPLOYMENT, 36
DEPOSITS, 240
DESCENT, 7
DESIGN, 197
DESIGN ANALYSIS, 56, 120, 121, 242, 245
DESORPTION, 45
DESTINY LABORATORY MODULE, 33
DETECTION, 61, 107, 149, 203
DETECTORS, 81, 108, 149
DETERIORATION, 167
DETONATION, 112
DETONATION WAVES, 88
DEXTRANS, 166
DIAGNOSIS, 121, 158, 164, 170, 213
DIAMINES, 49, 207
DIAMONDS, 114
DIAPHRAGMS (MECHANICS), 112
DICTIONARIES, 138
DIELECTRIC PROPERTIES, 218
DIELECTRICS, 72, 81
DIFFRACTION, 123, 211
DIFFRACTIVE OPTICS, 207
DIFFUSERS, 7
DIFFUSION, 84, 90, 212
DIFFUSION COEFFICIENT, 208
DIFFUSION FLAMES, 47
DIGESTIVE SYSTEM, 157
DIGITAL SYSTEMS, 73, 78, 185, 201
DIGITAL TECHNIQUES, 108, 200
DIGITAL TELEVISION, 84
DIMENSIONAL MEASUREMENT, 30
DIMENSIONAL STABILITY, 20
DIPOLE ANTENNAS, 188
DIRECT NUMERICAL SIMULATION, 129, 205
DIRECTION FINDING, 112
DISARMAMENT, 193
DISCONTINUITY, 3
DISCRETE COSINE TRANSFORM, 84
DISCRETIZATION (MATHEMATICS), 187
DISCRIMINANT ANALYSIS (STATISTICS), 191
DISKS (SHAPES), 108
DISPERSING, 82
DISPLACEMENT, 149
DISPLAY DEVICES, 22, 63, 65, 78, 110, 157, 178
DISPOSAL, 71
DISSIPATION, 49, 96, 214
DISSOLVING, 63
DISTANCE MEASURING EQUIPMENT, 9
DIURNAL VARIATIONS, 116
DOCUMENTS, 120, 154, 226, 233, 234
DOLOMITE (MINERAL), 136
DOPED CRYSTALS, 40
DOPPLER RADAR, 28
DOSAGE, 165
DRAG, 197
DRAG REDUCTION, 21
DRAINAGE, 155
DROP TESTS, 118
DROP TOWERS, 225
DROPS (LIQUIDS), 220
DUCTS, 88
DUMMIES, 118
DUST, 103
DYNAMIC CHARACTERISTICS, 173
DYNAMIC LOADS, 64
DYNAMIC MODELS, 157, 173
DYNAMIC PRESSURE, 24
DYNAMIC RESPONSE, 21, 38, 122
DYNAMIC STRUCTURAL ANALYSIS, 71

E

EARTH GRAVITATION, 30
EARTH HYDROSPHERE, 240
EARTH OBSERVING SYSTEM (EOS), 153
EARTH RADIATION BUDGET EXPERIMENT, 137
EARTH ROTATION, 150, 163
EARTH SCIENCES, 230
EARTHQUAKES, 132, 133
ECHO SOUNDING, 200
ECHOES, 195
ECOLOGY, 40
ECONOMIC ANALYSIS, 142
ECONOMIC IMPACT, 142
ECONOMICS, 193
ECOSYSTEMS, 143
EDDY CURRENTS, 83
EDUCATION, 124, 174, 185, 223, 225, 230, 232
EFFECTIVENESS, 75
EFFECTORS, 19
EFFLUENTS, 71, 142
EIGENVALUES, 187, 198
EJECTA, 240
ELASTIC MEDIA, 122
ELASTIC PROPERTIES, 67, 190
ELECTRIC CONDUCTORS, 80
ELECTRIC FIELD STRENGTH, 217
ELECTRIC POTENTIAL, 58, 81, 202, 208
ELECTRIC POWER PLANTS, 53
ELECTRIC SWITCHES, 82
ELECTRIC WIRE, 65, 78
ELECTRICAL INSULATION, 65
ELECTRICAL MEASUREMENT, 36
ELECTRICAL PROPERTIES, 79
ELECTRICAL RESISTIVITY, 36
ELECTRO-OPTICS, 81, 213
ELECTROCATALYSTS, 139
ELECTROCHEMISTRY, 51, 53
ELECTRODES, 217, 219
ELECTROLUMINESCENCE, 40
ELECTROMAGNETIC FIELDS, 74, 171
ELECTROMAGNETIC INTERFERENCE, 13
ELECTROMAGNETIC RADIATION, 244
ELECTROMAGNETISM, 176
ELECTROMYOGRAPHY, 162
ELECTRON BEAM WELDING, 119
ELECTRON BEAMS, 78, 116, 213, 216, 221
ELECTRON DIFFUSION, 208
ELECTRON TRANSITIONS, 195
ELECTRON TUNNELING, 110
ELECTRONIC EQUIPMENT, 13, 173
ELECTRONIC PACKAGING, 74
ELECTRONS, 197
EMERGENCIES, 225
EMISSION, 147
EMISSION SPECTRA, 235
ENERGY, 162
ENERGY CONVERSION EFFICIENCY, 67
ENERGY REQUIREMENTS, 174
ENERGY STORAGE, 29, 139
ENERGY TECHNOLOGY, 139
ENERGY TRANSFER, 102
ENGINE DESIGN, 106
ENGINE PARTS, 27
ENGINE TESTS, 23
ENGINEERING, 131
ENGINEERING MANAGEMENT, 229

ENGINEERS, 223, 228
ENHANCED VISION, 22
ENTHALPY, 219
ENTROPY, 217, 237
ENVIRONMENT EFFECTS, 131, 141
ENVIRONMENT POLLUTION, 230
ENVIRONMENT PROTECTION, 71
ENVIRONMENTAL MONITORING, 12, 143, 146, 147
ENVIRONMENTAL QUALITY, 143
ENVIRONMENTAL SURVEYS, 143
ENZYME ACTIVITY, 168
EOSINOPHILS, 161
EPOXY COMPOUNDS, 18
EPOXY RESINS, 57
EQUATIONS OF MOTION, 94, 123
EQUIPMENT, 115
EQUIPOTENTIALS, 238
ERROR ANALYSIS, 9
ERRORS, 214
ERYTHROCYTES, 166
ESTIMATES, 151
ESTIMATING, 238
ESTROGENS, 158
ETCHING, 13
ETHYL ALCOHOL, 90
EULER-BERNOULLI BEAMS, 188
EUROPE, 133
EVALUATION, 11, 143, 148, 172
EVAPORATION, 90
EXCITATION, 195
EXHALATION, 173
EXHAUST EMISSION, 11, 24, 142, 145, 147
EXHAUST GASES, 39
EXOBIOLOGY, 174, 242
EXPERIMENT DESIGN, 8, 13, 25
EXPERIMENTATION, 19, 106, 108
EXPLOSIVES, 51, 68, 69, 112, 182
EXPOSURE, 140, 161, 166, 171
EXTRACTION, 115
EXTRATERRESTRIAL LIFE, 168, 174, 242
EXTRATERRESTRIAL MATTER, 238
EXTRAVEHICULAR ACTIVITY, 32
EYE (ANATOMY), 210
EYE MOVEMENTS, 171

F

F-16 AIRCRAFT, 17
F-18 AIRCRAFT, 14, 17
FABRICATION, 40, 52, 60, 61, 78, 81, 107, 110, 122, 210, 217, 220
FABRICS, 62
FAILURE ANALYSIS, 27, 43, 208
FAILURE MODES, 43
FAN BLADES, 1
FAR INFRARED RADIATION, 35
FATIGUE (MATERIALS), 18, 56, 118
FATTY ACIDS, 164
FAULT DETECTION, 20
FAULT TOLERANCE, 186
FEDERAL BUDGETS, 74, 229
FEEDBACK, 153
FEEDBACK CONTROL, 202
FEMALES, 160, 178
FERROELECTRIC MATERIALS, 57, 58
FERROELECTRICITY, 13, 36
FIBER COMPOSITES, 218
FIBER OPTICS, 114
FIELD EFFECT TRANSISTORS, 36, 202
FIGHTER AIRCRAFT, 18, 205
FIGURE OF MERIT, 19
FILLERS, 119
FILTRATION, 92
FINANCIAL MANAGEMENT, 230
FINITE ELEMENT METHOD, 43, 59, 83, 176, 187
FINS, 5, 95
FIRE EXTINGUISHERS, 33, 34
FIRE FIGHTING, 10
FISHES, 40, 156
FIXED WINGS, 15
FLAMES, 26
FLAT PANEL DISPLAYS, 63
FLAT PLATES, 8, 89
FLEXIBILITY, 63
FLEXIBLE BODIES, 21
FLIGHT CHARACTERISTICS, 13
FLIGHT CONDITIONS, 27, 205, 234
FLIGHT CONTROL, 3, 152
FLIGHT CREWS, 171
FLIGHT INSTRUMENTS, 65
FLIGHT SIMULATION, 18, 65, 182
FLIGHT TESTS, 15, 182
FLOOD CONTROL, 128
FLOOD PLAINS, 128
FLOW CHARACTERISTICS, 101
FLOW DISTRIBUTION, 4, 84, 89, 94, 95, 101, 105, 106, 192, 204
FLOW MEASUREMENT, 101, 130
FLOW NOISE, 20
FLOW VELOCITY, 92
FLOW VISUALIZATION, 8, 90, 94, 95, 98, 219
FLUID DYNAMICS, 25
FLUID FLOW, 126, 129, 130, 149
FLUORESCENCE, 162
FLUTTER ANALYSIS, 87
FLUXES, 70
FOAMS, 60, 62, 67
FOILS (MATERIALS), 218
FOOTPRINTS, 153
FOREST MANAGEMENT, 128, 130
FORMALISM, 72
FORMING TECHNIQUES, 81
FORMULATIONS, 201
FORTRAN, 176
FOSSIL FUELS, 69
FOURIER ANALYSIS, 195
FOURIER TRANSFORMATION, 35, 109
FRACTIONS, 198
FRACTURE MECHANICS, 54, 55
FRACTURE STRENGTH, 123, 124
FREE FLIGHT, 8
FREE FLOW, 102
FREE MOLECULAR FLOW, 85
FREQUENCIES, 123, 171
FREQUENCY DISTRIBUTION, 94
FREQUENCY DIVISION MULTIPLEXING, 72
FREQUENCY DOMAIN ANALYSIS, 204
FREQUENCY RESPONSE, 61, 203
FRICTION STIR WELDING, 117
FUEL CELLS, 139
FUEL COMBUSTION, 142
FUEL SPRAYS, 26
FUELS, 219
FUNCTIONS (MATHEMATICS), 188, 201
FUNGI, 136
FUSELAGES, 10, 118, 216
FUZZY SETS, 175
FUZZY SYSTEMS, 175

G

GALERKIN METHOD, 188
GALLIUM ARSENIDES, 80
GALLIUM NITRIDES, 219
GAME THEORY, 193
GAMMA RAY TELESCOPES, 235
GAS CHROMATOGRAPHY, 146
GAS COMPOSITION, 66
GAS DETECTORS, 140
GAS DYNAMICS, 7, 46, 90, 101, 219
GAS FLOW, 85, 93, 94, 97, 102, 103, 115
GAS MIXTURES, 88
GAS PIPES, 101
GAS TURBINES, 23, 24, 26
GAS-SOLID INTERACTIONS, 47
GASES, 31, 49

GAUGE THEORY, 220
GENE EXPRESSION, 158, 166, 167
GENERAL AVIATION AIRCRAFT, 22, 65, 152, 154, 234
GENETIC ALGORITHMS, 176, 190, 200
GENOME, 163
GEOBOTANY, 132
GEOCENTRIC COORDINATES, 30
GEOCHEMISTRY, 131
GEOIDS, 30
GEOLOGICAL FAULTS, 131
GEOLOGY, 132, 136, 144, 241
GEOPHYSICS, 126, 133, 149
GEOSYNCHRONOUS ORBITS, 224
GIMBALS, 38
GLASS, 63
GLASS TRANSITION TEMPERATURE, 52
GLOBAL POSITIONING SYSTEM, 14
GLOBULAR CLUSTERS, 238
GOVERNMENT/INDUSTRY RELATIONS, 226
GOVERNMENTS, 225, 234
GRADIENTS, 126
GRADIOMETERS, 113
GRAIN BOUNDARIES, 56
GRAPHICAL USER INTERFACE, 152
GRAPHITE-EPOXY COMPOSITES, 122
GRATINGS (SPECTRA), 58, 208
GRAVITATIONAL CONSTANT, 163
GRAVITATIONAL EFFECTS, 70
GRAVITATIONAL FIELDS, 239
GROUND PENETRATING RADAR, 72
GROUND WATER, 51, 125, 129, 131, 133, 135, 136, 137, 216

H

HABITATS, 138, 161
HADRONS, 195, 196
HAFNIUM, 45, 119
HAFNIUM COMPOUNDS, 41, 238
HALIDES, 47
HALL THRUSTERS, 97
HARMONICS, 196
HAWAII, 135
HAZARDOUS MATERIALS, 9
HAZARDOUS WASTES, 212
HAZARDS, 11, 12, 143
HEALTH, 11, 143, 161, 172
HEART, 168
HEART DISEASES, 164
HEAT BUDGET, 125
HEAT EXCHANGERS, 106
HEAT RESISTANT ALLOYS, 25
HEAT TRANSFER, 3, 48, 101, 107
HEAT TRANSMISSION, 60
HEAT TREATMENT, 25
HEATING, 219, 246
HEATING EQUIPMENT, 107
HELMET MOUNTED DISPLAYS, 110
HETEROGENEITY, 220
HEURISTIC METHODS, 193
HIGH ENERGY ELECTRONS, 216
HIGH POLYMERS, 58
HIGH POWER LASERS, 196
HIGH PRESSURE, 53, 199
HIGH REYNOLDS NUMBER, 88
HIGH SPEED, 108
HIGH TEMPERATURE, 60, 119
HIGH TEMPERATURE PLASMAS, 213
HIGH THRUST, 29
HIGHWAYS, 229
HILBERT SPACE, 191
HISTORIES, 17
HODOGRAPHS, 189
HOMING DEVICES, 109
HONEYCOMB STRUCTURES, 215
HORMONES, 159, 160
HOT PRESSING, 66
HOT-WIRE ANEMOMETERS, 113
HUBS, 2
HUMAN BEHAVIOR, 228
HUMAN BODY, 157, 170
HUMAN FACTORS ENGINEERING, 157
HUMAN PERFORMANCE, 171
HUMAN RELATIONS, 228
HUMIDITY, 120
HYBRID COMPOSITES, 122
HYBRID PROPULSION, 109
HYBRID ROCKET ENGINES, 50
HYDRATES, 48
HYDRATION, 239
HYDRAULIC EQUIPMENT, 19
HYDRAULIC FLUIDS, 136
HYDROCARBON FUELS, 69
HYDROCARBONS, 145, 146
HYDRODYNAMIC EQUATIONS, 214
HYDROGEN, 26, 45, 50, 58, 67, 85, 90, 96, 174, 208
HYDROGEN PEROXIDE, 69
HYDROGEN PRODUCTION, 169
HYDROGEOLOGY, 129, 135, 137
HYDROLOGY, 128, 131, 135, 136, 138
HYDROLOGY MODELS, 129
HYDROMECHANICS, 70, 71
HYDROSTATIC PRESSURE, 92
HYDROXIDES, 49, 207
HYGROMETERS, 120
HYPERSONIC FLOW, 5, 86, 88, 92
HYPERSONIC FORCES, 8
HYPERSONIC INLETS, 1
HYPERSONIC VEHICLES, 3, 16
HYPERSONIC WIND TUNNELS, 6
HYPOXIA, 168

I

ICE ENVIRONMENTS, 240
ICE FORMATION, 132
ICY SATELLITES, 240
IGNITION, 24, 39, 101, 213
IMAGE PROCESSING, 76, 121, 164, 169, 185, 186, 187, 214
IMAGE RECONSTRUCTION, 237
IMAGING SPECTROMETERS, 109, 245
IMAGING TECHNIQUES, 84, 111, 162, 195
IMIDES, 59, 60
IMPACT DAMAGE, 41
IMPACT TESTS, 10, 41, 118, 182
IMPROVEMENT, 143
IN SITU RESOURCE UTILIZATION, 29
IN VITRO METHODS AND TESTS, 163
INDEPENDENT VARIABLES, 86
INDUSTRIAL MANAGEMENT, 228, 229
INDUSTRIAL WASTES, 68
INDUSTRIES, 101
INELASTIC COLLISIONS, 194
INELASTIC SCATTERING, 196
INERTIA, 54
INFERENCE, 182, 183
INFLATING, 62
INFORMATION MANAGEMENT, 108, 232
INFORMATION SYSTEMS, 154, 174, 178, 185, 223, 232, 233
INFORMATION TRANSFER, 234
INFRARED ASTRONOMY, 237
INFRARED ASTRONOMY SATELLITE, 237
INFRARED IMAGERY, 111, 224
INFRARED RADIATION, 245
INFRARED SPECTRA, 49
INFRARED SPECTROSCOPY, 242, 243, 244, 245
INJECTION, 216
INJURIES, 165
INORGANIC MATERIALS, 62
INPUT, 75
INSECTS, 150
INSERTION LOSS, 13

INSPECTION, 172
INSTALLING, 15
INSTRUCTORS, 223
INSTRUMENT ERRORS, 211
INSULATION, 60
INSULIN, 158
INTEGRATED CIRCUITS, 77
INTERFACES, 185
INTERFEROMETRY, 72, 212, 236
INTERMETALLICS, 54, 217
INTERMOLECULAR FORCES, 50
INTERNAL COMBUSTION ENGINES, 147
INTERNAL FLOW, 88, 89, 93
INTERNATIONAL SPACE STATION, 32, 38
INTERNATIONAL SYSTEM OF UNITS, 188
INTERNETS, 177
INTERSTELLAR CHEMISTRY, 238
INTERSTELLAR MASERS, 235
INVENTIONS, 223
INVERTEBRATES, 138
INVESTIGATION, 40
IO, 241
ION ACCELERATORS, 208
ION ENGINES, 82, 208
IONIZATION, 82
IONIZATION GAGES, 97
IRON ORES, 142
IRRADIATION, 53, 54
ISCHEMIA, 165
ISOTHERMAL PROCESSES, 43
ISOTOPE SEPARATION, 55
ISRAELI SPACE PROGRAM, 33

J

JAVA (PROGRAMMING LANGUAGE), 184
JET AIRCRAFT NOISE, 1, 20
JET ENGINE FUELS, 11, 24
JET ENGINES, 5, 200
JET FLOW, 5, 7, 65
JET MIXING FLOW, 24
JOINTS (JUNCTIONS), 70
JUNCTION DIODES, 82

K

K-EPSILON TURBULENCE MODEL, 98
KARST, 138
KERNEL FUNCTIONS, 191
KEROSENE, 24
KEVLAR (TRADEMARK), 62
KINETIC ENERGY, 102, 112
KINETIC THEORY, 85, 194
KINETICS, 45
KLYSTRONS, 197
KNOWLEDGE, 183, 227
KNOWLEDGE BASES (ARTIFICIAL INTELLIGENCE), 232
KNOWLEDGE REPRESENTATION, 236
KNUDSEN FLOW, 49, 85, 94, 108

L

LAKES, 40, 133
LAMINAR FLOW, 8, 96, 103
LAMINATES, 39, 59
LAND MANAGEMENT, 129, 131
LAND USE, 126
LANDING GEAR, 19
LAP JOINTS, 123
LAPLACE TRANSFORMATION, 123
LARGE SCALE INTEGRATION, 185
LARGE SPACE STRUCTURES, 79, 80, 179
LASER ALTIMETERS, 245
LASER APPLICATIONS, 115, 179, 209, 210, 211, 219
LASER BEAMS, 31, 213
LASER CAVITIES, 114
LASER INDUCED FLUORESCENCE, 26, 31
LASER OUTPUTS, 113
LASER PUMPING, 113
LASER TARGETS, 213
LASER WELDING, 117
LASERS, 115, 116, 214
LATERAL STABILITY, 15
LATTICES (MATHEMATICS), 198
LAUNCH VEHICLES, 5
LAW (JURISPRUDENCE), 9, 142
LEADERSHIP, 226, 227, 228, 229
LEADING EDGES, 16, 17, 205
LEARNING, 227
LEAST SQUARES METHOD, 74
LENSES, 38, 208
LIBRARIES, 174, 188
LIFE CYCLE COSTS, 25
LIFT, 5
LIFT AUGMENTATION, 84
LIFT DEVICES, 100
LIFTOFF (LAUNCHING), 35
LIGHT SCATTERING, 207, 211, 244
LIGHT WATER REACTORS, 56
LIMNOLOGY, 134
LINEAR ACCELERATORS, 197, 221
LINEAR INTEGRATED CIRCUITS, 202
LINEAR PROGRAMMING, 191, 211
LINEARITY, 29
LIPID METABOLISM, 164
LIPOPROTEINS, 164
LIQUID COOLING, 69
LIQUID CRYSTALS, 58
LIQUID FLOW, 93
LIQUID FUELS, 26
LIQUID METALS, 82
LIQUID PHASES, 149
LIQUIDS, 100
LITHIUM COMPOUNDS, 53
LITHOGRAPHY, 39, 109
LOADS (FORCES), 21, 43, 118
LOGISTICS, 33
LOW CONCENTRATIONS, 140
LOW GRAVITY MANUFACTURING, 179
LOW PRESSURE, 132
LOW TEMPERATURE, 222
LOW VOLTAGE, 78
LUMINANCE, 110
LUMINESCENCE, 90, 210

M

MACH NUMBER, 23
MACHINE LEARNING, 182
MACROPHAGES, 162
MAGNESIUM COMPOUNDS, 217
MAGNESIUM ISOTOPES, 168
MAGNETIC BEARINGS, 118
MAGNETIC FIELDS, 110, 112, 162, 208
MAGNETIC MATERIALS, 55
MAGNETIC MEASUREMENT, 111, 112, 198
MAGNETIC PROPERTIES, 217
MAGNETIC RESONANCE, 159, 195
MAGNETIC SIGNATURES, 149
MAGNETIZATION, 199
MAGNETO-OPTICS, 198
MAGNETOHYDRODYNAMIC FLOW, 96
MAGNETOHYDRODYNAMICS, 214
MAGNETOMETERS, 113, 162
MAGNETORESISTIVITY, 199, 216
MAMMARY GLANDS, 157, 158, 159, 160, 163, 164
MAN MACHINE SYSTEMS, 157
MANAGEMENT, 225
MANAGEMENT INFORMATION SYSTEMS, 230
MANAGEMENT PLANNING, 143, 231
MANEUVERABILITY, 27
MANNED SPACE FLIGHT, 34
MANUFACTURING, 20, 40, 42
MAPPING, 139

MARS (PLANET), 240
MARS ATMOSPHERE, 240, 245
MARS ENVIRONMENT, 242
MARS EXPLORATION, 242, 244, 245
MARS GLOBAL SURVEYOR, 243
MARS LANDING SITES, 242
MARS MISSIONS, 29, 242, 243, 244, 245
MARS PROBES, 34
MARS SURFACE, 240, 242, 244, 245
MARS SURFACE SAMPLES, 244
MARS VOLCANOES, 245
MARSHLANDS, 161
MASS TRANSFER, 48, 90
MATERIALS SCIENCE, 54
MATHEMATICAL MODELS, 6, 8, 23, 43, 47, 51, 52, 60, 61, 81, 84, 86, 99, 105, 107, 135, 138, 140, 175, 181, 188, 191, 192, 193, 194, 200, 244, 245
MATHEMATICS, 188
MEAN SQUARE VALUES, 14, 151
MEASURE AND INTEGRATION, 86
MEASUREMENT, 48, 94, 104
MEASURING INSTRUMENTS, 125, 146, 211
MECHANICAL DRIVES, 118
MECHANICAL ENGINEERING, 176
MECHANICAL PROPERTIES, 20, 43, 44, 52, 59, 61, 62, 64, 66, 67, 123, 196
MEDIA, 226
MEDICAL SCIENCE, 67
MEDICAL SERVICES, 143, 158
MEMBRANE STRUCTURES, 80
MEMBRANES, 38, 58, 139
MENSTRUATION, 164
MENTAL PERFORMANCE, 172
MERCURY (METAL), 115, 141
MERRITT ISLAND (FL), 161
MESON-MESON INTERACTIONS, 198
MESONS, 221
METABOLISM, 157
METAL FOAMS, 55
METAL PLATES, 10
METALLIZING, 81
METALS, 55, 127
METASTASIS, 157
METEORITES, 239
METEORITIC COMPOSITION, 238
METEOROLOGICAL INSTRUMENTS, 155
METEOROLOGICAL PARAMETERS, 126, 155
METEOROLOGICAL SATELLITES, 154
METEOROLOGY, 155, 156
METHANE, 48, 49
METHODOLOGY, 44, 100, 191
METHYL ALCOHOL, 26
METHYL COMPOUNDS, 52
METHYLATION, 160
MICHELSON INTERFEROMETERS, 109
MICROELECTROMECHANICAL SYSTEMS, 113, 202
MICROGRAVITY, 70, 106, 107, 164, 172, 222, 225
MICROMACHINING, 81, 203
MICROMECHANICS, 61, 190
MICROORGANISMS, 168, 169, 174
MICROPARTICLES, 60
MICROPHONES, 112, 202
MICROSCOPY, 111, 159
MICROSTRIP TRANSMISSION LINES, 13
MICROSTRUCTURE, 36, 45, 54, 56
MICROWAVES, 13, 36, 246
MIDCOURSE GUIDANCE, 81
MILITARY OPERATIONS, 157, 193, 233
MILITARY TECHNOLOGY, 23, 40, 83, 229, 233
MILITARY VEHICLES, 111, 149
MILKY WAY GALAXY, 237
MILLIMETER WAVES, 74
MINE DETECTORS, 72
MINERALOGY, 242, 244
MINERALS, 239
MINES (ORDNANCE), 72, 172
MINIATURE ELECTRONIC EQUIPMENT, 79
MINING, 172
MINNESOTA, 129
MIRRORS, 41, 209, 212
MISSILE CONTROL, 81
MISSILE DEFENSE, 51, 109, 191
MISSISSIPPI RIVER (US), 134
MISSOURI, 136
MIXTURES, 218
MOBILITY, 76, 173
MODELS, 30, 148, 150, 183, 188, 219, 221
MODES (STANDING WAVES), 212
MODULATION, 113, 219
MOIRE INTERFEROMETRY, 22
MOLECULAR BIOLOGY, 170
MOLECULAR CHAINS, 59
MOLECULAR DYNAMICS, 49, 208
MOLECULAR GASES, 102
MOLECULAR STRUCTURE, 61
MOLECULAR WEIGHT, 58, 166
MOLECULES, 62, 173
MONITORS, 47
MONOMERS, 215
MONTE CARLO METHOD, 18, 85, 192
MORPHOLOGY, 67, 109, 175, 240
MOTION, 150
MOUNTAINS, 145, 241
MULTIBLOCK GRIDS, 96
MULTIPHASE FLOW, 98
MULTISCALE MODELS, 96
MULTISENSOR FUSION, 108
MULTIVARIATE STATISTICAL ANALYSIS, 8
MUSCLES, 165, 166, 167, 168

N

NANOCOMPOSITES, 215
NANOSTRUCTURE (CHARACTERISTICS), 44
NANOSTRUCTURE GROWTH, 215
NANOTECHNOLOGY, 54, 77
NASA PROGRAMS, 15, 28, 84, 182, 223, 226, 232
NASA SPACE PROGRAMS, 32, 227, 228, 229, 231
NATIONAL AIRSPACE SYSTEM, 154
NATIONAL PARKS, 128, 141
NAVIER-STOKES EQUATION, 17, 85, 88, 98, 194
NAVY, 15, 180
NEAR EARTH OBJECTS, 235
NEODYMIUM LASERS, 55
NETWORKS, 226
NEURAL NETS, 155, 186, 187
NEUROMUSCULAR TRANSMISSION, 165
NEURONS, 165
NEUROPHYSIOLOGY, 171
NEW JERSEY, 126, 137
NEWS, 226
NICKEL ALLOYS, 56
NIOBIUM, 119
NITROGEN, 26, 50, 134
NITROGEN OXIDES, 24
NITROUS OXIDES, 46
NOAA SATELLITES, 28
NODES (STANDING WAVES), 209
NOISE (SOUND), 115, 148
NOISE INTENSITY, 148
NOISE MEASUREMENT, 202
NOISE PREDICTION, 203
NOISE PREDICTION (AIRCRAFT), 15, 201, 203, 205
NOISE REDUCTION, 20, 75, 201, 202
NOISE SPECTRA, 205

NONDESTRUCTIVE TESTS, 65, 120, 216
NONEQUILIBRIUM FLOW, 97
NONLINEAR EQUATIONS, 189
NONLINEAR OPTICS, 211
NONLINEAR SYSTEMS, 189, 194
NONLINEARITY, 18, 99, 190, 191, 204, 209
NOZZLE FLOW, 89
NOZZLES, 194
NUCLEAR EXPLOSIONS, 232
NUCLEAR PROPULSION, 29, 157
NUCLEATE BOILING, 107
NUCLEATION, 220
NUCLEONS, 195
NUCLEOSIDES, 166
NUMERICAL ANALYSIS, 16, 26, 85, 87, 88, 94, 96, 108, 123, 133, 189, 190, 194
NUMERICAL DIFFERENTIATION, 67
NUMERICAL FLOW VISUALIZATION, 85
NUMERICAL INTEGRATION, 67
NUTATION DAMPERS, 37
NUTRITION, 157

O

OBJECT-ORIENTED PROGRAMMING, 183, 233
OBLIQUE SHOCK WAVES, 88
OBSERVATION, 66, 236
OBSERVATORIES, 235
OCEAN CURRENTS, 99
OCEANOGRAPHY, 156
OIL FIELDS, 131
OILS, 47, 164
OLIGOMERS, 59, 62, 64
ON-LINE SYSTEMS, 47, 185
ONCOGENES, 160
OPERATING SYSTEMS (COMPUTERS), 180
OPERATIONS, 197
OPERATORS (PERSONNEL), 75
OPTICAL EMISSION SPECTROSCOPY, 243
OPTICAL FIBERS, 72, 209, 210
OPTICAL HETERODYNING, 213
OPTICAL MATERIALS, 114
OPTICAL MEASUREMENT, 212
OPTICAL MEASURING INSTRUMENTS, 237
OPTICAL PROPERTIES, 97, 197, 207, 210, 235
OPTICAL RADAR, 28, 107, 109, 116, 146, 213
OPTICS, 211
OPTIMIZATION, 14, 181, 187, 213, 214
OPTOELECTRONIC DEVICES, 79
ORBITAL MANEUVERS, 220
OREGON, 131
ORGANIC COMPOUNDS, 64, 129, 146, 149, 173
ORGANIC MATERIALS, 62, 153
ORGANIZATIONS, 70, 71, 227
ORTHOGONAL FUNCTIONS, 8
OSCILLATING FLOW, 4
OSCILLATIONS, 7
OXIDATION, 41, 161, 219
OXYGEN, 207
OXYGEN MASKS, 173
OXYGEN PRODUCTION, 47
OZONE, 116, 145, 146
OZONOMETRY, 140

P

PACKAGING, 79
PAIN, 170
PAIN SENSITIVITY, 157
PAINTS, 31
PANELS, 20, 41, 122
PARALLEL FLOW, 192
PARALLEL PROCESSING (COMPUTERS), 98, 186
PARALLEL PROGRAMMING, 182
PARAMETER IDENTIFICATION, 124
PARTICLE ACCELERATORS, 195
PARTICLE DECAY, 221
PARTICLE IMAGE VELOCIMETRY, 24, 108
PARTICLE SIZE DISTRIBUTION, 244
PARTICLES, 6, 221
PARTICULATES, 44, 140, 141, 144
PATENT APPLICATIONS, 76
PATIENTS, 157
PATTERN RECOGNITION, 98, 110
PATTERN REGISTRATION, 169
PENETRATION, 52
PEPTIDES, 168
PERFORMANCE PREDICTION, 34, 40
PERFORMANCE TESTS, 95
PERIODICALS, 233
PERSONNEL, 180
PERSONNEL DEVELOPMENT, 230
PERSONNEL SELECTION, 191
PESTICIDES, 40
PHARMACOLOGY, 164
PHASE DIAGRAMS, 217
PHASE TRANSFORMATIONS, 221
PHASE VELOCITY, 65
PHENOLS, 60
PHENYLS, 59
PHOSPHORS, 40, 90
PHOSPHORUS ISOTOPES, 159
PHOTOABSORPTION, 197
PHOTOCATHODES, 116
PHOTOCHEMICAL REACTIONS, 68, 114, 141, 146
PHOTOCONDUCTIVITY, 80
PHOTOCONDUCTORS, 83
PHOTOIONIZATION, 97, 237
PHOTOMETRY, 236, 239
PHOTOMICROGRAPHY, 59
PHOTOSPHERE, 246
PHOTOVOLTAIC CELLS, 38
PHYSICAL CHEMISTRY, 59
PHYSICAL PROPERTIES, 60, 64
PHYSICS, 233
PHYSIOLOGICAL FACTORS, 172
PIEZOELECTRIC ACTUATORS, 217, 218
PIEZOELECTRICITY, 202
PILOT PERFORMANCE, 13, 22, 65, 152, 234
PILOT RATINGS, 234
PILOTLESS AIRCRAFT, 19
PIPELINES, 101
PIPES (TUBES), 55, 86, 121
PLANETARY ATMOSPHERES, 7
PLANETARY GEOLOGY, 242, 243, 244, 245
PLANETARY MAPPING, 243, 245
PLANKTON, 169
PLANT ROOTS, 136
PLANTS (BOTANY), 147, 163
PLASMA CHEMISTRY, 168
PLASMA DIAGNOSTICS, 213, 214
PLASMA PHYSICS, 83
PLASMAS (PHYSICS), 213
PLASTIC ANISOTROPY, 122
PLASTIC PROPERTIES, 190
PLASTICS, 62, 69
PLATES, 204
PLUMES, 71, 85, 89, 194, 245
PLUTONIUM, 64
PLUTONIUM 239, 199
POISONS, 169
POLAR WANDERING (GEOLOGY), 151
POLARIZATION, 114
POLLUTION, 141
POLLUTION CONTROL, 68, 69, 142, 147, 216
POLYACETYLENE, 58
POLYCYCLIC AROMATIC HYDROCARBONS, 238
POLYETHYLENES, 36
POLYIMIDES, 42, 59, 60, 62, 119

POLYMER BLENDS, 63, 64
POLYMER MATRIX COMPOSITES, 43, 59
POLYMERIZATION, 215
POLYMERS, 54, 63, 67, 124
POLYMORPHISM, 160
POLYPEPTIDES, 58
POLYSTYRENE, 62
POSITION (LOCATION), 12, 245
POTABLE WATER, 130, 238
POTENTIAL ENERGY, 50
POWDER METALLURGY, 56
POWER SUPPLIES, 110
PRECIPITATION, 155
PRECIPITATION (METEOROLOGY), 141, 155
PRECISION, 139
PREDICTION ANALYSIS TECHNIQUES, 11, 87
PREDICTIONS, 148
PREMIXED FLAMES, 47
PRESSURE, 88
PRESSURE DISTRIBUTION, 4, 16
PRESSURE EFFECTS, 92
PRESSURE GRADIENTS, 86, 91, 99
PRESSURE MEASUREMENT, 4, 14, 24, 48, 98
PRESSURE OSCILLATIONS, 97
PRESSURE RATIO, 88
PRESSURE REDUCTION, 7
PRESSURE SENSITIVE PAINTS, 90
PRESSURIZING, 196
PRIMITIVE EARTH ATMOSPHERE, 238
PROBABILITY DENSITY FUNCTIONS, 124
PROBABILITY THEORY, 123, 124
PROBLEM SOLVING, 72, 225
PROCEDURES, 225, 231
PROCUREMENT, 229
PROGRAM VERIFICATION (COMPUTERS), 175, 180, 183, 184
PROGRAMMING LANGUAGES, 177, 180, 183
PROJECT MANAGEMENT, 226, 227, 228, 229
PROJECTILES, 52, 199
PROPELLANT COMBUSTION, 47
PROPELLANT EXPLOSIONS, 68
PROPULSION, 23, 25
PROPULSION SYSTEM CONFIGURATIONS, 31, 229
PROPULSION SYSTEM PERFORMANCE, 31
PROTECTIVE CLOTHING, 172
PROTECTIVE COATINGS, 41, 204
PROTEIN SYNTHESIS, 58
PROTEINS, 159, 167
PROTONS, 139, 197
PROVING, 88, 120, 131
PSYCHOLOGICAL FACTORS, 172
PUBLIC HEALTH, 12, 140
PUBLIC LAW, 125
PULSE COMMUNICATION, 73
PULSE DURATION, 24
PULSE GENERATORS, 54
PULSED LASER DEPOSITION, 114
PULSED LASERS, 114, 196
PUMPS, 31, 108

Q

Q FACTORS, 151
QUALITY CONTROL, 120, 121
QUANTUM CHROMODYNAMICS, 220
QUANTUM THEORY, 210, 238
QUENCHING, 51

R

RADAR ANTENNAS, 72
RADIANCE, 153
RADIATION DETECTORS, 144
RADIATION EFFECTS, 77
RADIATION HARDENING, 80
RADICALS, 208
RADIO COMMUNICATION, 73, 76
RADIO FREQUENCIES, 199, 203
RADIO TELESCOPES, 118, 236
RADIOACTIVE ISOTOPES, 131
RADIOACTIVE WASTES, 64, 120
RADIOIMMUNOASSAY, 168
RAMAN SPECTRA, 26, 105, 116
RAMJET ENGINES, 23, 50
RAREFIED GASES, 86, 91, 94
RAYLEIGH SCATTERING, 26, 77
REACTING FLOW, 105
REACTION KINETICS, 49, 63, 207
REACTIVITY, 145
REACTOR CORES, 54
REAL TIME OPERATION, 47, 76
RECEIVERS, 213
RECEPTORS (PHYSIOLOGY), 158, 159
RECTANGULAR WAVEGUIDES, 187
RECYCLING, 40
REENTRY SHIELDING, 41
REENTRY VEHICLES, 45
REFLECTANCE, 39, 239, 244
REFLECTION, 103
REFRACTIVITY, 38
REFRACTORIES, 46
REFRACTORY COATINGS, 66
REGENERATION (PHYSIOLOGY), 163
REGENERATORS, 209
REGRESSION ANALYSIS, 191
REGULATIONS, 13, 172
RELAXATION, 105
RELIABILITY, 199, 218
RELIABILITY ANALYSIS, 124
RELIABILITY ENGINEERING, 232
REMOTE CONTROL, 183
REMOTE SENSING, 109, 137
REMOTE SENSORS, 51
REPETITION, 195
REPORTS, 143
RESCUE OPERATIONS, 10
RESEARCH, 223, 225
RESEARCH AIRCRAFT, 3
RESEARCH AND DEVELOPMENT, 74, 83, 84, 174, 177, 223, 225, 231, 232, 233
RESEARCH FACILITIES, 24, 30, 33, 178, 213, 236
RESEARCH MANAGEMENT, 180
RESERVOIRS, 131
RESIDUES, 40
RESIN TRANSFER MOLDING, 20, 42, 57, 60
RESONANCE, 94
RESONANT FREQUENCIES, 7, 99, 209
RESPONSE BIAS, 110
REUSABLE HEAT SHIELDING, 66
REUSABLE LAUNCH VEHICLES, 32, 43
REVISIONS, 118
REYNOLDS NUMBER, 5, 19, 89
RISK, 232
RIVER BASINS, 128, 130, 137
RIVERS, 125, 128
ROCKET ENGINES, 31, 51
ROCKET EXHAUST, 39, 105, 192
ROCKET PROPELLANTS, 49
ROTARY WING AIRCRAFT, 22
ROTARY WINGS, 2
ROTATING ELECTRICAL MACHINES, 83
ROTATING STALLS, 24
ROTATION, 25
ROTOR AERODYNAMICS, 2, 22
ROTOR DYNAMICS, 117
ROTORS, 22, 85
ROVING VEHICLES, 242, 244
RUBBER, 64
RUN TIME (COMPUTERS), 183

S

SAFETY, 40, 179

SAFETY DEVICES, 172
SAFETY MANAGEMENT, 180, 205, 210
SAMPLING, 40, 134, 141
SAN FRANCISCO BAY (CA), 131
SANDS, 132
SANDWICH STRUCTURES, 41
SATELLITE IMAGERY, 200
SATELLITE LASER RANGING, 115, 236
SATELLITE OBSERVATION, 66, 224
SATELLITE-BORNE INSTRUMENTS, 153
SCALARS, 239
SCANNING, 121
SCATTERING, 196, 222
SCHOOLS, 173
SCHWARZSCHILD METRIC, 239
SCIENTIFIC VISUALIZATION, 182
SCIENTISTS, 223
SEA ICE, 48
SEATS, 118
SECULAR VARIATIONS, 163
SECURITY, 186, 230
SEDIMENTS, 129, 134
SEEPAGE, 144
SEISMIC WAVES, 148, 150
SEISMOLOGY, 131, 133, 149
SELECTION, 151
SEMICONDUCTOR DEVICES, 210
SEMICONDUCTOR LASERS, 115
SEMICONDUCTORS (MATERIALS), 81, 219
SEMISPAN MODELS, 4
SENSORS, 9, 22, 72, 111, 155, 187
SEPARATED FLOW, 96, 188
SEPARATION, 58
SEQUENCING, 84
SEWAGE TREATMENT, 230
SHAPE CONTROL, 17
SHAPE MEMORY ALLOYS, 122
SHAPE OPTIMIZATION, 21
SHAPES, 20, 110
SHARP LEADING EDGES, 45
SHEAR FLOW, 104
SHIPS, 71
SHOCK TESTS, 36
SHOCK WAVE INTERACTION, 95, 103
SHOCK WAVES, 87, 103, 182, 218, 246
SHOT PEENING, 55
SIERRA NEVADA MOUNTAINS (CA), 133
SIGNAL DETECTORS, 205
SIGNAL PROCESSING, 35, 76, 200, 201, 211
SIGNAL TO NOISE RATIOS, 206
SIGNATURES, 148
SILICIDES, 217
SILICON, 77, 195
SILICON CARBIDES, 45, 82, 219
SILICON DIOXIDE, 45
SILVER, 41
SIMULATION, 5, 6, 24, 86, 99, 106, 116, 118, 137, 214
SITUATIONAL AWARENESS, 22, 65
SIZE (DIMENSIONS), 41
SKIN FRICTION, 104
SKY SURVEYS (ASTRONOMY), 237
SLURRIES, 67
SOCIOLOGY, 227
SOFT LANDING SPACECRAFT, 7
SOFTWARE DEVELOPMENT TOOLS, 175, 177
SOFTWARE ENGINEERING, 100, 175, 176, 178, 179, 180, 182, 183, 185, 192, 193, 233
SOFTWARE RELIABILITY, 179
SOI (SEMICONDUCTORS), 109
SOILS, 121, 126, 136
SOL-GEL PROCESSES, 119, 215
SOLAR ARRAYS, 38
SOLAR CELLS, 52
SOLAR COLLECTORS, 140
SOLAR CORONA, 246
SOLAR ENERGY, 220, 238
SOLAR MAGNETIC FIELD, 246
SOLAR OBSERVATORIES, 237
SOLAR PHYSICS, 235, 246
SOLAR PROMINENCES, 246
SOLAR RADIATION, 235
SOLAR SAILS, 37
SOLAR SYSTEM, 173
SOLAR THERMAL PROPULSION, 81, 220, 238
SOLDERING, 70
SOLID NITROGEN, 49
SOLID PROPELLANT ROCKET ENGINES, 47
SOLID STATE, 81
SOLUBILITY, 62
SOLVENT EXTRACTION, 46
SOLVENTS, 62
SONAR, 206
SONIC BOOMS, 17
SOUND DETECTING AND RANGING, 112
SOUND GENERATORS, 204
SOUND INTENSITY, 20
SOUND WAVES, 93
SPACE BASED RADAR, 28
SPACE MAINTENANCE, 33
SPACE MANUFACTURING, 179
SPACE MISSIONS, 157
SPACE SHUTTLE MISSIONS, 229
SPACE STATION POWER SUPPLIES, 38
SPACE TRANSPORTATION, 43
SPACE TRANSPORTATION SYSTEM, 32, 33
SPACEBORNE EXPERIMENTS, 33, 34, 35, 222
SPACECRAFT, 157
SPACECRAFT CONTROL, 29
SPACECRAFT DESIGN, 32
SPACECRAFT EQUIPMENT, 243
SPACECRAFT LAUNCHING, 32
SPACECRAFT MAINTENANCE, 32
SPACECRAFT PROPULSION, 29, 97, 220
SPACECREWS, 33, 34, 35
SPACELAB PAYLOADS, 228
SPATIAL DEPENDENCIES, 207
SPECTRAL EMISSION, 242
SPECTRAL REFLECTANCE, 244
SPECTROMETERS, 35, 243
SPECTROPHOTOMETRY, 239
SPECTROSCOPIC ANALYSIS, 242
SPECTROSCOPY, 97, 159, 207, 239, 242
SPECTRUM ANALYSIS, 242, 243, 244
SPHERES, 194
SPIN, 195
SPUTTERING, 55
STABILITY, 45, 54, 99, 118
STABILITY TESTS, 77
STAGNATION POINT, 8, 16
STAINLESS STEELS, 53, 55, 56
STANDING WAVES, 109
STAR FORMATION, 235
STAR TRACKERS, 238
STATISTICAL ANALYSIS, 127, 177, 233, 234
STATORS, 2
STEADY FLOW, 15, 88
STEADY STATE, 5
STEELS, 52
STIMULATION, 165
STIRLING CYCLE, 106
STOCHASTIC PROCESSES, 188
STOICHIOMETRY, 47
STRAIN DISTRIBUTION, 210
STRAIN RATE, 57
STRATIGRAPHY, 136
STREAMS, 126, 129, 131
STREETS, 75
STRESS (BIOLOGY), 166
STRESS (PHYSIOLOGY), 160, 170, 172
STRESS INTENSITY FACTORS, 44

STRING THEORY, 221
STRUCTURAL ANALYSIS, 37, 43, 121
STRUCTURAL BASINS, 146
STRUCTURAL DESIGN, 43
STRUCTURAL ENGINEERING, 79
STRUCTURAL FAILURE, 122
STRUCTURAL PROPERTIES (GEOLOGY), 229
STRUCTURAL RELIABILITY, 121
STUDENTS, 124, 180
SUBSONIC FLOW, 7, 91
SUBSTRATES, 52
SULFATES, 144
SUPERCONDUCTIVITY, 217
SUPERCOOLING, 220
SUPERFLUIDITY, 220
SUPERNOVA REMNANTS, 235
SUPERSONIC AIRCRAFT, 18
SUPERSONIC BOUNDARY LAYERS, 99, 102
SUPERSONIC COMBUSTION, 90
SUPERSONIC COMBUSTION RAMJET ENGINES, 24, 98
SUPERSONIC FLIGHT, 17
SUPERSONIC FLOW, 88, 92, 101, 105
SUPERSONIC JET FLOW, 18, 87, 90
SUPERSONIC TRANSPORTS, 4
SURFACE CRACKS, 123
SURFACE ENERGY, 77
SURFACE LAYERS, 85
SURFACE PROPERTIES, 3, 212, 235
SURFACE ROUGHNESS, 210
SURFACE TEMPERATURE, 61
SURFACE WATER, 125, 131, 135, 136, 137
SURFACE WAVES, 150
SURGES, 108
SURGICAL INSTRUMENTS, 209
SWEPT WINGS, 8
SYMMETRY, 180
SYNTHESIS (CHEMISTRY), 57, 60, 63, 64
SYNTHESIS GAS, 69
SYNTHETIC FUELS, 69
SYSTEMS HEALTH MONITORING, 22
SYSTEMS INTEGRATION, 30, 176, 182, 183

T

TANKS (CONTAINERS), 120
TANTALUM, 53
TARGET ACQUISITION, 81
TARGET RECOGNITION, 76
TAYLOR INSTABILITY, 85
TECHNOLOGIES, 96, 223, 232
TECHNOLOGY ASSESSMENT, 191, 231
TECHNOLOGY TRANSFER, 75, 232, 234
TECHNOLOGY UTILIZATION, 30, 32, 138
TECTONICS, 150
TELECOMMUNICATION, 73, 100, 121
TELEMEDICINE, 67, 158
TELEPHONES, 75
TELESCOPES, 41, 237
TELEVISION EQUIPMENT, 73
TELEVISION SYSTEMS, 223
TEMPERATURE EFFECTS, 65, 113
TEMPERATURE GRADIENTS, 86, 94
TEMPERATURE MEASUREMENT, 48, 61
TEMPERATURE SENSORS, 61
TENSILE CREEP, 25
TENSILE PROPERTIES, 54
TENSILE STRENGTH, 215
TENSILE STRESS, 62
TENSILE TESTS, 69, 119
TERMINALS, 226
TERMINOLOGY, 138
TERRAIN, 65, 138, 185
TEST CHAMBERS, 97
TEST FACILITIES, 20, 39
TEST RANGES, 149
TEST STANDS, 39
TESTS, 218
THEMATIC MAPPING, 244
THERMAL CONDUCTIVITY, 3, 60
THERMAL DIFFUSION, 219
THERMAL EMISSION, 239, 244
THERMAL INSULATION, 66, 119
THERMAL MAPPING, 243
THERMAL PROTECTION, 65, 66, 67
THERMAL RESISTANCE, 82
THERMAL STABILITY, 215
THERMODYNAMIC EQUILIBRIUM, 153
THERMODYNAMIC PROPERTIES, 42, 60, 67, 86, 90, 91, 235
THERMODYNAMICS, 44, 64, 84, 112, 145
THERMOELASTICITY, 53
THERMOGRAVIMETRY, 238
THERMONUCLEAR POWER GENERATION, 115
THERMOPHORESIS, 94
THERMOPLASTICITY, 121
THESES, 235
THICK PLATES, 117
THIN FILMS, 36, 40, 52, 81, 107, 114, 219
THIN WALLS, 196
THREE DIMENSIONAL FLOW, 96, 116
THREE DIMENSIONAL MODELS, 42, 126, 135, 149
THRESHOLDS, 118
THRUST AUGMENTATION, 37
THRUST CONTROL, 89
THRUSTORS, 31, 89
TILES, 66
TIMBER INVENTORY, 130
TIME DIVISION MULTIPLEXING, 209
TIME DOMAIN ANALYSIS, 201, 204
TIME LAG, 211, 236
TISSUES (BIOLOGY), 40
TITANIUM, 57
TITANIUM ALLOYS, 18
TITANIUM CHLORIDES, 53
TOLLMIEN-SCHLICHTING WAVES, 92
TOPOGRAPHY, 217
TOPOLOGY, 73, 155, 198
TORUSES, 30
TOTAL OZONE MAPPING SPECTROMETER, 66
TOXICITY, 141, 161
TOXICOLOGY, 144
TRACE ELEMENTS, 129
TRACKING (POSITION), 76, 111, 177
TRAINING DEVICES, 15
TRAINING EVALUATION, 228
TRAJECTORIES, 246
TRANSCRIPTION (GENETICS), 158
TRANSFERRING, 77
TRANSFORMATIONS (MATHEMATICS), 149, 189
TRANSMISSION LOSS, 20
TRANSONIC SPEED, 5
TRANSONIC WIND TUNNELS, 4, 14, 95
TRANSPORT AIRCRAFT, 15
TRANSPORTATION, 11, 186
TROPICAL STORMS, 154
TROPOSPHERE, 66, 152, 155
TUBES, 54
TUMORS, 158
TUNABLE FILTERS, 13
TUNNEL JUNCTIONS, 216
TURBINE BLADES, 196
TURBOGENERATORS, 89
TURBOMACHINERY, 196
TURBULENCE, 6, 91, 98, 101, 102
TURBULENCE EFFECTS, 34
TURBULENCE MODELS, 34, 85, 93
TURBULENT BOUNDARY LAYER, 21, 90, 93, 94, 104, 105
TURBULENT FLAMES, 26

TURBULENT FLOW, 85, 95, 203
TURBULENT JETS, 26
TWO DIMENSIONAL BODIES, 8
TWO DIMENSIONAL MODELS, 217
TWO PHASE FLOW, 6

U

ULTRASONIC FLAW DETECTION, 65
ULTRASONIC TESTS, 120
ULTRASONICS, 119, 121, 132, 158, 162, 169
ULTRAVIOLET EMISSION, 192
ULTRAVIOLET RADIATION, 212
UNDERGROUND STORAGE, 144
UNDERWATER ACOUSTICS, 200
UNDERWATER VEHICLES, 86
UNITED STATES, 225
UNSTEADY AERODYNAMICS, 14, 95, 201
UNSTEADY FLOW, 15, 98
UPPER ATMOSPHERE, 192
URANIUM, 161
URANIUM 235, 199
URANIUM 238, 199
URANIUM ALLOYS, 119
USER MANUALS (COMPUTER PROGRAMS), 190

V

VACUUM, 20, 57, 100
VACUUM CHAMBERS, 31, 97
VACUUM PUMPS, 116
VACUUM SYSTEMS, 42
VADOSE WATER, 126, 131
VAPOR DEPOSITION, 52, 114
VAPOR PHASES, 49
VARIATIONS, 97
VEGETATION, 131, 147, 200
VELOCITY, 94, 132
VELOCITY DISTRIBUTION, 150
VERBAL COMMUNICATION, 228
VERY LARGE ARRAY (VLA), 236
VERY LARGE SCALE INTEGRATION, 74
VERY LONG BASE INTERFEROMETRY, 151, 181
VIBRATION, 102, 123, 150, 196, 205
VIBRATION ISOLATORS, 123
VIBRATION MODE, 196
VIDEO COMPRESSION, 84
VIRTUAL REALITY, 137, 177, 178, 182, 183, 189
VISCOELASTIC DAMPING, 7
VISCOELASTICITY, 64, 67
VISCOSITY, 165, 190
VISCOUS FLOW, 2, 92, 96
VISUAL DISCRIMINATION, 84
VOID RATIO, 42
VOLATILE ORGANIC COMPOUNDS, 66, 127, 145
VOLCANIC ERUPTIONS, 245
VOLCANOES, 241, 244
VOLCANOLOGY, 241
VOLTAGE AMPLIFIERS, 202
VORTEX BREAKDOWN, 203
VORTEX GENERATORS, 89
VORTICES, 2, 6, 89, 90, 96, 99, 102

W

WAKES, 2
WALL PRESSURE, 188
WALLS, 57, 148, 215
WASTE DISPOSAL, 64, 69, 120
WASTE UTILIZATION, 230
WATER, 125, 220
WATER FLOW, 129, 135, 137
WATER INJECTION, 8
WATER POLLUTION, 40, 71, 126, 127, 142, 216
WATER QUALITY, 125, 126, 127, 128, 129, 134
WATER RESOURCES, 131, 135
WATER SAMPLING, 132
WATER VAPOR, 120, 152
WATERSHEDS, 125
WAVE EXCITATION, 93
WAVE FRONTS, 211
WAVE INTERACTION, 95
WAVE PROPAGATION, 65, 99, 181, 193, 200, 204
WAVELET ANALYSIS, 30
WEAPON SYSTEMS, 109
WEAPONS, 149
WEATHER, 152, 154, 234
WEATHER FORECASTING, 109, 154, 155, 224
WEBSITES, 185
WEDGES, 91, 103
WEIGHT REDUCTION, 43
WEIGHTLESSNESS, 166
WEIGHTLESSNESS SIMULATION, 165, 167
WELDED JOINTS, 117
WELDED STRUCTURES, 117
WELLS, 130
WILDLIFE, 161
WIND (METEOROLOGY), 28
WIND PROFILES, 28
WIND TUNNEL APPARATUS, 95, 205
WIND TUNNEL MODELS, 4, 14, 95, 205
WIND TUNNEL TESTS, 1, 2, 3, 4, 6, 8, 14, 15, 22, 24, 95, 99, 103, 205
WIND TUNNELS, 46, 98
WINDSHIELDS, 205
WING FLAPS, 204
WING OSCILLATIONS, 95
WING PANELS, 43
WING PROFILES, 91
WING ROCK, 205
WINGS, 2, 4, 5, 14, 15, 19, 91, 92, 122
WIRE, 78, 119
WIRELESS COMMUNICATION, 75
WORLD WIDE WEB, 185
WRINKLING, 37

X

X RAY ASTRONOMY, 235, 237
X RAY DIFFRACTION, 42, 212
X RAY FLUORESCENCE, 47
X RAY IMAGERY, 121
X RAY SCATTERING, 212
X RAYS, 109

Y

YANG-MILLS THEORY, 220
YIELD STRENGTH, 122

Z

ZIRCONIUM, 57

Personal Author Index

A

Abbott, M. M., 127
Abdel-Fattah, Tarek, 215
Abdrakhmanov, R. Kh., 101
Ablaev, A. R., 91
Abrahamsen, T. A., 126
Abrahamsson, L., 199
Ackerman, Jerome L., 159
Adams, P. M., 244
Adams, Richard J., 12
Adams, Sally, 236
Agrell, Johan, 25
Akasaka, N., 54
Akhmetov, A. T., 92
Alameda, J., 39
Albert, Daniel B., 174
Alekseenko, S. V., 246
Alfano, Angelo J., 46
Algorri, M. E., 177
Alidaee, Bahram, 193
Aljunid, Syed A., 173
Allamandola, Louis J., 173
Allan, Brian G., 89
Allan, Mark, 182
Allard, Richard, 181, 193
Allen, T., 53
Allen, T. R., 54
Alonso, R., 145
Alperin, Marc J., 174
Alter, Stephen J., 34
Alterovitz, Samuel A., 35
Alvani, C., 53
Amzajerdian, Farzin, 28, 213
An, S. K., 80
An, Tao, 236
Anastasi, Robert F., 65, 119
Anderson, Bernhard H., 25
Anderson, C., 222
Anderson, John, 110
Anderson, M., 199
Anderson, Thomas S., 148
Anderson, Todd A., 78
Andersson, B. L., 199
Andreev, V. N., 92
Andrews, W. J., 127
Antropov, V. P., 217
Aoki, K., 86
Aoki, Yoshinori, 97
Aquino, Z., 135
Aracne Ruddle, C. M., 126
Aracne-Ruddle, C. M., 132
Aranda, Isaiah, Jr., 217
Arbaugh, M. J., 145
Arch, D., 16
Archer, Myla, 179
Arey, J., 141
Arkadov, Y. K., 7
Arkkio, A., 83
Arnold, G., 243
Arnold, Steven M., 190
Artho, Cyrille, 183
Arvidson, R., 245
Arvidson, R. E., 242, 243
Aschmann, S. M., 141
Askovic, R., 92
Aston, J., 230
Atkinson, R., 141
Auer, Robert, 138
Aulchenko, S. M., 91
Avalle, C. A., 36
Avenhaus, Rudolf, 193
Ayers, M. A., 125

B

Babbitt, W. R., 211
Bachin, A. A., 6
Bachmanova, N. S., 92
Baden, S., 175
Bai, Gui-e, 165, 166
Bai, H. C., 24
Bai, Shu-min, 164
Bailey, Arthur, 105
Bailey, J. E., 237
Bajt, S., 39, 197
Bake, S., 93
Baker, Steven, 232
Baldis, H., 218
Baldis, H. A., 213
Balog, J. N., 186
Baloga, Stephen M., 245
Balooch, M., 45
Banger, K. K., 52
Banks, P. S., 114
Barbgee, T., 39
Bardsley, J. N., 78
Bark, Lindley W., 10
Barkstrom, Bruce R., 174
Barlow, R. S., 25, 26
Barmore, Bryan E., 12
Barnouin-Jha, O., 245
Barrick, J., 152
Barry, Effi, 223
Batenko, S. R., 93
Baumann, Eric, 224
Baust, Henry D., 25
Bearat, H., 69
Bearman, Gregory H., 111
Beaumier, Philippe, 2
Bebout, Brad M., 169
Becher, T., 221
Becker, J. A., 195
Beckman, Sarah, 41, 45, 66
Bednarcyk, Brett A., 190
Bedner, A. J., 132
Bedrossian, P. J., 56
Beecken, Brian P., 109
Beichman, Charles A., 237
Beineke, Dieter, 139
Beisser, K., 245
Belak, J., 218
Belcher, W. R., 135
Belkin, Michael, 210
Bell, Dave, 236
Bennet, Edward M., 2
Bennett, D. H., 147
Benson, S., 197
Benson, S. M., 144
Berge, P. A., 126, 132
Berger, R., 213
Bergmann, D., 126
Bernstein Max P., 173
Bernstein, Max P., 49
Beylkin, G., 30
Bhalla, D. K., 141
Bhattacharyya, J., 132
Bibring, J.-P., 245
Bice, Terry, 172
Bifano, Tom, 111
Binzel, R. P., 239
Bird, G. A., 86
Bishop, J., 245
Bishop, J. L., 242
Blackwell, D. D., 82
Blair, W. D., 72
Blanco, A., 243
Blaney, D. L., 242
Blanksi, Rusty L., 62
Blanski, Rusty L., 63
Blum, Yigal, 119
Bo, Zhang, 151

Bockman, J., 218
Boettinger, W. J., 84
Bohannan, E. W., 52
Boiko, V. M., 6, 93
Boldt, J., 245
Boldyrev, S., 6
Bonello, G., 243
Bonner, B. P., 126, 132
Borg, Karl I., 94
Borisov, G. B., 64
Borisov, Sergei F., 85
Born, G., 30
Bornhop, Darryl J., 111
Bornhorst, T. J., 131
Borodulin, V. I., 93, 94, 99
Borowski, Stanley K., 28
Boura, Jihad, 111
Bourne, Lyle E., Jr., 172
Boyarshinov, B. F., 48, 90
Boyd, Iain D., 96
Boyle, J. S., 154
Brabets, T. P., 128
Brackett, V. G., 152
Bradley, D. K., 214
Brady, Jody Lannen, 226
Braig, S., 221
Brasseur, L. H., 152
Brattin, Lori, 15
Brazhko, V., 6
Breckenridge, Roger A., 230
Breininger, David R., 161
Bridges, F., 199
Brigham, M. E., 127
Bright, Michelle M., 23, 108
Brooks, Thomas F., 2
Browell, E. V., 152
Brown, A. A., 122
Brown, C. J., 130
Brown, S. A., 20
Brown, T. L., 22
Brown-VanHoozer, S. Alenka, 156
Browning, L., 142
Bruce, J. F., 138
Bryant, Robert G., 217
Brylyakov, A. P., 90
Buckmaster, John, 47
Buhro, W. E., 52
Bullock, A. B., 214
Bunde, K., 53
Burczynski, Janusz, 200
Burk, K. W., 155
Burkhardt, M. R., 132
Burley, Casey L., 2
Bus, S. J., 239
Busciolano, R., 135
Bush, Harold G., 122
Bush, Linda C., 140
Bytnerowicz, A., 145

C

Cabra, R., 25, 26
Cai, Chunpei, 96
Cairelli, James E., 106
Cameron, W. Scott, 228
Campisi, I. E., 197
Cano, Roberto J., 20, 42, 57
Cao, D., 199
Cao, Yu, 237
Capone, F. J., 18, 205
Carlsson, T., 68, 107
Carpenter, R. W., 69
Carroll, Suzanne N., 181, 193
Carter, A., 230
Carter, J. M., 137
Carter, W. P. L., 144
Casey, J., 122
Casper, J., 200, 203
Castillo, Domingo G., 238
Caton, Randall, 231
Caturla, M. J., 45, 208
Cederwall, R. T., 156
Cerchiai, B. L., 220
Cerjan, C., 55, 77
Chaffee, Kevin, 62, 63
Chamberlain, James P., 152, 154, 234
Chambers, D. M., 68
Chambers, Lin H., 153
Chance, Kelly, 66
Chandler, E. A., 54, 55
Chaudhury, S. Raj, 137
Chavis, Zachary Q., 105
Chen, Chi-Yi, 238
Chen, David J., 162
Chen, Fangyi, 111
Chen, J. Y., 25, 26
Chen, Ju-Ping, 115, 236
Chen, Ping-Hei, 97
Chen, Shi-lun, 170
Chen, Tzi-Kang, 64
Chen, Wan-Zhen, 236
Cheng, Fan-Tien, 233
Cheng, Wen-Feng, 97
Chernorai, V. G., 104
Cherry, Andrew, 111
Chichenin, A. G., 103
Chidester, S. K., 181
Chien, L. C., 58
Chin, M., 116
Chirkashenko, V. F., 100
Chizmeshya, A. V. G., 69
Cho, Kyeongjae, 56
Choi, B. W., 215
Choi, Sang H., 79
Choi, Wook-Jin, 108
Choo, T., 245
Chopra, O. K., 56
Choudhari, M. M., 204
Choudhari, Meelan, 204
Choudhari, Meelan M., 19
Christe, Karl O., 46
Christensen, R., 72
Christianson, Rebecca, 105
Chu, Sang-Hyon, 79
Chu, Y., 212
Chung, James, 17
Chung, M., 146
Chute, S. K., 130
Ciovati, G., 197
Clancy, R. T., 245
Clanton, Sam, 182
Clark, Roger N., 243
Clauson, T. L., 117
Clayton, M., 116, 152
Cleckner, Craig S., 95
Clemment, T. L., 134
Clifford, Stephen M., 240
Clift, M., 39
Clifton, C., 130
Cloutman, L. D., 85
Cocroft, R. B., 150
Coffin, Richard B., 48
Cohen, B., 213
Cohn, Richard, 69
Colangeli, L., 243
Cole, J., 53
Cole, J. I., 54
Colvin, J., 218
Connell, J. W., 59, 60
Connell, John W., 51, 215
Connell, P. S., 126
Cooper, E. G., 22
Copeland, Ben M., 217
COrdero, Patricio, 48
Covington, Ed W., III, 217
Cowan, T., 115
Cox, David E., 186
Crabtree, G. W., 217
Cramer, R., 30
Cravey, Robin L., 188
Creutz, M., 198
Criss, J. M., 60
Critchlow, T., 181
Croizet, Cedric, 194

Crooks, Roy E., 215
Crowe, E., 130
Culhane, J. L., 246
Cullings, Kenneth W., 136
Cuneo, M. E., 237
Cunningham, B., 69
Curry, Charles, 182
Czipott, Peter V., 111

D

D, 135
Dabdub, D., 145, 146, 153
Dalichaouch, Yacine, 111
Daly, E., 197
Daly, J., 54
Dane, C. B., 54
Dang, Thong Q., 26
Daniels, Taumi S., 155
Darden, Christine M., 17
Darlington, E. H., 245
Davis, G. K., 197
Davis, John C., 148
Davis, K., 181
Davletkildeev, R., 6
De Heer, P. W., 70
de Supinski, B., 175
Debnath, Niranjan, 173
DeCarlo, F., 243
DeFlumere, Michael E., 108
Deforge, Philippe, 162
Delayen, J. R., 197
Delia, M., 243
Delleur, Ann M., 37
DeLoach, Richard, 8
DeLombard, Richard, 224
Delory, G. D., 81
Delrieux, Yves, 2
Deng, T. Q., 174
Denley, Tristan, 187
Deptula, A., 53
Derunov, E. K., 95
Deshpande, Manohar D., 187, 188
DesMarais, David J., 169
Dettleff, Georg, 89
Devenport, W. J., 203
Devost, M. G., 186
Devries, K. L., 124
Dhir, Vijay K., 106
Diaz de la Rubia, T., 45, 208
Diaz, P. L., 135
Dibble, R. W., 25, 26
Dicus, Dennis L., 179
Diethelm, Kai, 67
Dinh, L., 114
Dinh, L. N., 45
Ditmire, T., 115
Dobrica, L., 175
Dobyns, Alan, 41
Doherty, Michael, 105
Doherty, Tammy J., 157
Dolbeer, Richard A., 9
Dosch, H., 222
Dougherty, Michele K., 157
Douglas, Robert B., 136
Driscoll, D. G., 137
Drusinsky, Doron, 183
Drzal, Lawrence T., 211
Duan, Yuan-ru, 165
Duck, Peter, 86
Dudnikova, G. I., 246
Dudzinski, Leonard A., 28
Duhamel, Katherine N., 157
Dula, Jose H., 191
Dumbacher, Dan L., 31
Duncan, Donald D., 114
Duraj, S. A., 52
Durbin, T., 147

E

Ebert, W. L., 63
Eccles, Brian, 30
Edelstein, Alan S., 112
Edmonson, William W., 201
Edquist, Karl T., 34
Effinger, Robert T., IV, 217
Efraimsson, G., 1
Efroymson, A., 147
Egan, P. O., 54, 55
Eggermont, Paul P. B., 237
Eidel, Werner, 37
Ellerby, Don, 41, 45, 66, 119
Elmaghraby, Adel S., 169
Elmer, J. W., 118
Ely, Jay J., 13
Emig, J., 237
Emmitt, G. David, 28
Engel, Greg T., 154
Englund, E., 73
Epik, E. Ya., 88
Erard, S., 243
Eremin, V. V., 92
Ergun, A. S., 203
Erickson, R., 72
Erofeev, Alexander I., 192
Ershov, I. V., 102
Esposito, F., 243
Evans, D., 130

F

Falco, Charles M., 109
Fan, Quan-chun, 165, 166
Fan, Xiao-li, 165, 166
Fang, Xian-de, 173
Farassat, F., 200, 203
Fasanella, Edwin L., 118
Faunt, C. C., 135
Fedorchenko, I. A., 102
Fedorov, A. V., 102
Fedorov, S. Yu., 48
Fedorova, N. N., 102
Feit, M. D., 114
Felcher, G. P., 222
Feldman, D. M., 143
Feldman, Jay D., 119
Feng, Chu-Gang, 30
Ferebee, Melvin J., Jr., 230
Ferebee, Michelle, 174
Fernsler, R. F., 82
Ferrare, R. A., 116, 152
Figueroa-Alamo, C., 135
Filman, Robert, 183
Finch, Melinda, 174
Finfrock, S. H., 131
Fischer, Gregory A., 112
Fischer, J. R., 134
Flanagan, M. P., 132
Fleming, G. A., 22
Fleming, Gary A., 21
Fleming, Gregg G., 15
Florance, James R., 4
Flores, F., 177
Fluss, M. J., 45
Folta, J. A., 39
Fomin, V. M., 114
Fong, Michael W., 108
Fonti, S., 243
Forbes, J. W., 181
Forman, Royce G., 118
Formisano, V., 243
Forth, Scott C., 118
Foster, John E., 207
Fraczek, W., 145
Frandsen, Allan, 227
Freed, Alan, 67
Frehlich, Rod G., 28
Fried, L., 68
Friedlander, Oscar G., 192
Friedman, D., 75
Friedman, J. R., 53

Friend, Richard, 23
Frisell, J., 76
Fu, Pin-Yi, 115
Fujimoto, Tetsuo, 31
Fukuda, T., 91
Fulton, R. D., 54, 55

G

Gabb, Timothy P., 25
Gabrielson, Thomas B., 206
Gallimore, Alec D., 96
Gally, Thomas A., 16
Ganimedov, V. L., 88
Gao, Hui, 206
Gao, Nan-nan, 166
Gapanov, S. A., 99
Gaponov, S. A., 102
Garbarino, J. R., 132
Garcia, F., 181
Garcia, R., 135
Garkusha, V. V., 100
Garrett, H. E., 79
Garza, Frederico R., 18
Gasch, Matthew, 41, 45, 66
Gates, T. S., 61
Gatignol, Renee, 194
Gayda, John, 25
Geary, Joe, 212
Gedeon, David, 106
Gent, R. D., 134
Gentile, N. A., 208
Genzel, Noah N., 8
Georgievskii, Y., 208
Ghent, J., 148
Gierow, Paul A., 81
Gilyov, V .M., 100
Glaze, Lori S., 245
Gleason, James F., 66
Glover, Fred, 193
Gnoffo, Peter A., 5
Godines, Cody R., 124
Goldberg, Allen, 183
Goldfeld, M. A., 24
Golembiewski, Walter T., 79
Gonsoulin, B., 60
Goonko, Y. P., 103
Gorchakova, N. G., 103
Gordon, A. D., 137
Gorobchuk, A. G., 48
Gould, D. E., 134
Grabner, F., 55
Grandau, Frank J., 154
Grantz, D. A., 147
Gray, Mark S., 58
Grechanova, A. P., 93
Green, P., 75
Green, Richard, 236
Greene, Rustin P., 223
Greenhill, S., 183
Greenwood, D. W., 181
Grek, G. R., 91, 104
Grekhov, Igor V., 81
Griffin, F. J., 153
Griffin, Lanny V., 172
Griffin, R. J., 145
Grigoryev, Yu N., 48
Grigoryev, Yu. N., 102
Grimsley, Brian W., 20, 42, 57, 61
Gritters, S. A., 134
Groenkvist, J., 73
Groves, S., 69
Gschneidner, K. A., 217
Gubaidullin, A. A., 92, 221
Guinness, E. A., 243
Gullikson, E. M., 197
Gunnarsson, R., 72
Guo, Tang-Yong, 30
Gurski, J. F., 77
Gusman, Michael, 41, 45, 66
Gwin, K. K., 143

H

Hackel, L. A., 54
Haddad, Tim, 62
Hadjadj, A., 86, 101
Hafley, R. A., 78
Hafley, Robert A., 77, 179
Haight, Jeffrey, 191
Hailani, Zul A., 173
Hall, John B., Jr., 230
Hall, John M., 187
Hall, R. M., 18, 205
Hall, Robert M., 14
Halpin, J., 54
Hamano, Y., 26
Hamilton, Ann S., 159
Hanafee, J. E., 53
Hannemann, Klaus, 84
Hansen, Sean T., 203
Hansson, A., 73
Hansson, H., 52
Hansson, M. B., 175
Hao, Wei-wei, 167
Hapke, Bruce, 241, 244
Hardesty, R. M., 146
Harding, L. B., 208
Hardy, E. D., 132
Hargitai, Henrik, 240
Harris, J. D., 52
Harris, Robert M., 172
Harrison, Joycelyn S., 215
Harrison, W. B., 131
Harrisson, J., 54
Harvey, F. E., 125
Harwood, L., 221
Hasan, M., 106
Hathaway, Michael D., 26
Hausler, Bernd, 37
Havelund, Klaus, 183
Having, Paul R., 110
Hawkins, J., 180
Hayda, Roman A., 172
Hayden, Linda, 180
Hayes, Monson H., 35
Haylett, Daniel R., 70
Haynes, R. W., 127
Hazen, Stanley L., 160
He, Anzhi, 192
He, Cheng, 170
He, Wei, 24
Heck, E. L., 50
Hedvall, M., 225
Heeter, R. F., 237
Heft, Eric L., 110
Heijmans, H. J. A. M., 174
Hemstrom, M. A., 130
Heo, Joong-Sik, 94, 108
Hepple, R. P., 144
Hergenrother, P. M., 59, 60
Hergenrother, Paul M., 51
Herman, Benjamin M., 13
Herman, L., 148
Herr, K. C., 244
Herr, S., 5, 205
Hess, J. E., 11
Hibbs, A. D., 81
Hicks, M., 239
High, J., 218
Hill, R. L., 144
Hinkle, Ken, 236
Hipp, J. R., 232
Hirsh, W., 230
Ho, D. D. M., 212
Ho, H., 44
Hodanbosi, Carol, 224
Hoddfelder, J., 131
Hodge-Richardson, L. A., 134
Hoefen, Todd, 243
Hoehler, Tori M., 169, 174
Hoffman, Edward, 226
Hoffman, Joel, 200

Hoitink, D. J., 155
Hokazono, T., 91
Hollingsworth, J. A., 52
Hollis, Brian R., 34
Holloway, C. Michael, 179
Holmes, Michael R., 139
Holst, T., 190
Honjo, Susumu, 98
Hori, K., 246
Hou, Chien-Yuan, 71
Hougli, Ni, 15
Howard, R. B., 180
Howard, S. R., 55
Howell, E. S., 239
Hsiao, Kang-Wei, 149
Hsiung, L. M., 56, 215
Hsu, Deh-Shiu, 71
Hsu, Rong-Shin, 149
Hu, Shang-feng, 171
Hua, Ying-Min, 76
Huang, Eric, 233
Huang, Ji-ming, 164
Huang, Shyh-Chin, 123
Huang, Sun, 168
Hubbard, Allyn, 111
Hubert, P., 60
Hubert, Pascal, 20, 42, 57
Hudy, L., 188
Huegel, Thomas, 155
Huff, Edward M., 20
Hughes, Monica F., 64
Hull, Andrew J., 204
Humphreys, W. M., Jr., 188
Hurley, J. P., 46
Hutchings, L., 131
Hwang, Young-Kyu, 94, 108
Hyakutake, Toru, 193

I

Ibrahim, Mounir B., 106
Igarashi, Saburo, 116
Ikonen, E., 209
Illias, S., 139
Ing, Yi-Shyong, 123
Inger, George R., 2
Inoue, Tomoyuki, 31
Irby, Edward, 41, 45
Ironson, Gail, 160
Isaev, S. A., 96
Isbell, Doug, 236
Ishida, Toshihiko, 97
Islam, Mohammed N., 209
Ismail, S., 152
Ivanov, A. V., 205
Ivanov, M. S., 88

J

Jackson, H. E., 195
Jackson, Karen E., 118
Jackson, Wade, 41
Jacob, Daniel J., 66
Jacques, Steven L., 114
Jamaludin, Sakinah, 173
Jameson, L., 189
Jamison, Andrew, 30
Jankovsky, Amy, 105
Jardine, L. J., 64
Jarrett, T. H., 239
Jegley, Dawn C., 43, 122
Jenkins, Kimberly R., 227
Jensen, C. E., 120
Jensen, K., 1
Jensen, R., 53
Jeong, S. -Y., 63
Jewitt, David, 235
Jialing, Le, 15
Jiang, Pei-Fang, 234
Jiao, Xue-jun, 83
Jin, M. H.-C., 52
Jin, Shuang-Gen, 150
Joensson, C., 73
Johnson, A. C., 127
Johnson, Arthur R., 64
Johnson, Curtis, 69
Johnson, Peter C., 114
Johnson, Sylvia M., 41, 45, 66, 119
Johnson, W. L., 176
Jokinen, T., 83
Jolliff, B. L., 243
Jones, Gregory S., 84
Jones, Kenneth M., 8
Jones, L. M., 79
Jones, Paul F., 238
Joslin, Ronald D., 19
Journey, C. A., 126
Junttila, T., 180
Jussila, T., 180

K

Kachanov, Y. S., 5, 93, 94, 99, 205
Kagan, A. L., 221
Kalantar, D. H., 208, 218
Kalinin, E. M., 6
Kalinina, A. P., 23
Kamimori, Gary H., 164
Kantzos, Peter T., 25
Karabadzhak, George F., 192
Karande, Kiran W., 153
Karapetrov, G., 217
Karpetis, A. N., 25, 26
Karpov, V. A., 91
Kasameyer, P., 131
Kasmarek, M. C., 129
Kassoy, E., 142
Kattner, U. R., 84
Kavaya, Michael J., 28
Kay, J. P., 57
Keahava, N., 188
Kearns, Kimberly A., 39
Keller, Donald F., 4
Kennen, J. G., 125
Kerans, B., 134
Ketsdever, Andrew D., 30, 82
Ketterle, Wolfgang, 222
Khachaturyan, V. M., 90
Khorrami, M. R., 204
Khorrami, Mehdi R., 204
Khramov, N. E., 6
Khuri-Yakub, Butrus T., 203
Kim, B. M., 208
Kim, Jesung, 163
Kim, S. J., 80
King, B., 11
King, Glen C., 79
King, W. E., 56
Kingsbury, J. A., 127
Kinnison, D. E., 126
Kirkland, L. E., 244
Kirkland, Laurel, 241
Kiselev, N. P., 90
Kiselev, S. P., 97
Kiselev, V. Ja., 3
Kiselev, V. P., 97
Kleb, William L., 177
Kleeschulte, M. J., 136
Kleinman, M. T., 141
Kleven, P. L., 46
Klinkov, K. V., 6
Klippenstein, S. J., 208
Klos, J., 20
Knauss, H., 113
Knipping, E. M., 146
Knorr, Jeffrey B., 83
Knuth, E. L., 220
Kochenberger, Gary, 193
Koenig, David W., 168
Konkel, William A., 25
Kooi, S., 152
Koptsev, D. B., 94, 99
Korinko, P. S., 55

Kornilov, V. I., 91, 93, 104
Kosheleva, E. A., 221
Kosinov, A. D., 7
Kottke, Nelson F., 206
Koudriavtsev, V. V., 5
Kovalev, O. B., 114
Kozick, Richard J., 110
Kozlov, V. V., 91, 104
Kozlovskii, V. A., 92
Krischke, U., 146
Krishfield, Richard A., 98
Krishnamurthy, T., 123
Krueger, S. K., 156
Kruger, Charles H., 213
Krupka, M. A., 81
Kruse, William, 69
Kudryavtsev, A. N., 86, 88, 101, 103
Kuhlman, G., 113
Kullander, F., 71, 107
Kumar, M., 56
Kuo, Kuang-Te, 60
Kuroda, T., 158
Kurosu, Thomas P., 66
Kwok, E. S., 141
Kwok, W. K., 217
Kyriazi, N., 172

L

Labaune, C., 213
LaCreta, John M., 110
Lada, W., 53
Lagutin, V. I., 91, 104
Laine, A. F., 194
Lamar, J. E., 18
Lamar, John E., 14
Lammert, A., 152
Landen, O. L., 214
Lane, M. D., 242
Lapygin, V. I., 5, 6, 104
Larosiliere, Louis M., 26
Larson, M. C., 79
Latorella, Kara A., 152, 154, 234
Latypov, A. F., 23, 98
Lau, Kai-Hung, 66
Lauchle, Gerald C., 206
Lauer, Todd R., 236
Laufer, Alexander, 226
Law, B., 55
Le Sage, G., 115
Le, J. L., 24
Le, Jia-Ling, 24, 98
Le, Jialing, 192
Lebedev, V. P., 101
Lebofsky, L. A., 239
Lee, Andre, 62, 63
Lee, Gwo-Bin, 60
Lee, T. M., 133
Lee, Tsong-Sheng, 49
Lehmann, Fritz, 193
Lei, Hin-Chi, 188
Leibacher, John, 236
Leiser, Daniel B., 66
LeMay, J. D., 45
Leng, Yun, 170
Leonard, Elizabeth, 179
Leonhardt, D., 82
Letalick, D., 107
Leuliette, E. W., 30
Levchenko, V. Ya., 7
Levenson, Richard M., 111
Levine, Jay, 51
Leydecker, A., 133
Li, Chen, 238
Li, Chou H., 44, 82
Li, De-yu, 121
Li, Jin-Ling, 151, 181
Li, Jin-sheng, 164
Li, Lin-Sen, 163
Li, Qi-jie, 83
Li, Shu-guang, 170
Li, Wen-bin, 167
Li, Wu, 21
Li, Xin, 236
Li, Yi, 170
Li, Yong-zhi, 165, 166
Liang, Hong, 170
Liao, De-Chun, 151
Liao, Xin-Hao, 151
Lichtenhan, Joseph, 62, 63
Liechty, Derek S., 34
Lim, Carol S., 159
Lim, Joon W., 2
Lin, Bing, 153
Lin, J., 176
Lin, John C., 89
Lin, Jui-Ting, 123
Lin, K., 148
Lindgren, M., 107
Lindvall, T., 209
Linne, H., 152
Lipnitskii, Yu. M., 92
Lipnitsky, Yu. M., 5
Little, Terry, 228
Litvinenko, M. V., 104
Litvinenko, Yu. A., 104
Liu, C., 212
Liu, C. T., 44
Liu, Feng, 87
Liu, Hui-ling, 164
Liu, Rong-tao, 168
Liu, Wei, 171
Liu, Wei-Xiong, 24
Liu, Xing-hua, 166
Liu, Yu, 167
Liu, Zhong-qi, 171
Lockard, D. P., 204
Lockard, David P., 203, 204
Loennblad, L., 196
Lofdal, L. L., 104
Lokotko, A. V., 86
London, R. A., 208
Long, L., 131
Loomis, Mark P., 34
Loos, Alfred C., 42, 57
Lopatkina, A. A., 90
Lorik, Tibor, 105
Lotts, C. G., 43
Lou, Shu-jie, 170
Louie, Richard Nam, 216
Lovejoy, Andrew E., 122
Lowry, Mike, 183
Lowther, Sharon E., 215
Lu, Chang-lin, 170
Lu, Sheng-qiang, 166
Luchko, Yury, 67
Luckring, J. M., 5
Lukashov, V. V., 101
Lumetta, G. J., 46
Lurmann, F., 140
Lvov, Nikolay, 182
Ly, T. C., 183
Lyle, Karen H., 10
Lyon, B. F., 147
Lyubar, A., 101

M

Ma, Gui-xi, 167
Ma, Jin, 165
Mackey, Calvin, 174
Macrander, A. T., 212
Madaras, Eric I., 65, 119
Maddalena, R., 147
Maestrello, Lucio, 21
Maghami, Peiman G., 186
Maier, William B., 232
Mailloux, Robert J., 197
Major, J., 222
Makarewicz, A. M., 208
Maksimov, A. I., 95
Maletic, Jonathan I., 178
Malkina, I., 144

Maloney, A., 221
Malov, A. N., 90
Manaa, M. R., 68
Manchester, W. B., 235
Mancini, D., 212
Maniet, Edward R., Jr, 205
Manley, Suliana, 105
Manning, J., 113
Manteufel, Randall D., 124
Mantooth, D. S., 144
Mao, M., 55
Marche, Pierre, 162
Maris, C., 146
Martens, Christopher S., 174
Martin, J. W., 131
Martini, B. A., 132
Martinsen, Gary L., 110
Masutani, Stephen M., 48
Matinlassi, M., 175
Matsuzaki, T., 162
Matthews, R., 81
Maurer, D. K., 128
Mautz, W. J., 141
May, J., 175
Mazhul, I. I., 100
McAfee, J. M., 244
McAfee, John, 241
McCarthy, A., 77
McCollor, D. P., 57
McConnell, James A., 206
McDonanld, William C., 191
McDowall, R., 132
McEwen, Alfred, 240
McFadden, G. B., 77
McGuire, Melissa L., 28
McKelvy, M. J., 69
McKone, T. E., 147
McMillin, S. N., 18
McMillin, S. Naomi, 14
McNabb, D. P., 199
McNulty, I., 121
McPherson, A. K., 126
Medd, Adam J., 26
Medved, V., 162
Mekle, R., 194
Melack, J., 133
Melnikov, K., 239
Meng, Qing-jun, 165
Menzel, D. B., 141
Merimaa, M., 209
Miau, Jiun-Jih, 61
Migeon, Bruno, 162
Mihuc, T., 134
Mikel, D., 143
Mikulas, Martin M., 37
Miles, R. N., 111, 150
Miller, J. S., 195
Miller, Richard D., 148
Ming, D. W., 243
Miranda, Felix A., 13, 35, 36
Miranda, R. M., 128
Mirels, Harold, 195
Mirkin, Chad A., 44
Mironov, S. G., 50
Mish, P. F., 203
Mishra, Saroj K., 168
Mockensturm, Eric M., 38
Moerder, Daniel D., 27
Monserud, R. A., 127, 129
Moore, Mark D., 84
Moore, S. G., 232
Moran, Mark L., 148
Morelli, Eugene A., 8, 18
Morgan, D. V., 54, 55
Morgan, Harry L., Jr., 4
Mori, Hideo, 97
Moriarity, J. A., 52
Morral, J. E., 84
Morris, R. V., 243
Morris, Richard V., 244
Morrison, J., 131
Morse, T. F., 114
Moses, Donald, 12
Moskvichev, D. Yu., 50
Motil, Susan, 227
Mueller, Carl H., 13, 35, 36
Mulkern, Thomas J., 62
Munson-McGee, Stuart H., 42
Muntz, E. P., 30, 31, 82
Murad, E., 242
Murchie, S., 245
Murdoch, Fern E., 158
Murphy, Catherine J., 210
Murphy, D. P., 82
Murphy, Laura L., 163
Murray, Deborah B., 222
Murrill, Steven R., 169
Murzinov, I. N., 91
Musick, R., 181
Muss, Jeff, 69
Mustard, John, 241
Myhrvold, T., 25

N

Nadella, S., 148
Naguib, A., 188
Nakashima, Kouji, 31
Nalivajchenko, D. G., 3
Nambu, M., 158
Naniwa, Shuji, 31
Nath, D. S., 122
Naujokas, G. J., 220
Navratil, P., 199
Nazarov, A. D., 100
Nellis, W. J., 199
Nemec, M., 190
Nemoto, I., 162
Nerem, R. Steven, 30
Nestoulia, R. V., 24
Neudeck, Philip G., 219
Newbert, M., 221
Newman, James C., J., 118
Ng, K. Y., 196
Nguyen, Duc T., 176
Nguyen, H. V., 180
Nguyen, Linh V. T., 115
Nguyen, SonBinh T., 44
Nguyen, Truong X., 13
Nichols, William, 224
Nieh, T. G., 56, 215
Niemelae, E., 175
Niimi, Tornohide, 97
Nikkel, D. J., 122
Nishide, Michio, 193
Nishimoto, D. C., 135
Niu, Cong-min, 206
Nordman, Cathy, 110
Norris, J. R., 131
Nowakowski, C., 75

O

O, 132, 135
Odegard, G. M., 61
Oh, S. J., 80
Olapinski, M., 199
Olczar, T., 53
Olsen, Khris B., 51
Orishich, A. M., 114
Orlikowski, D., 52
Ornellas, D. L., 112
Orsagh, R. F., 196
Orsagh, Rolf F., 23
Oshiro, O., 158
Oten, T. C., 120
Ounaies, Zoubeida, 215
Overturf, G., 68
Owens, D. B., 18, 205
Oza, Nikunj, 20

P

Padula, Sharon L., 21
Pak, A. Yu., 113
Palgon, Michael S., 76
Pan, Hong-Jian, 235
Papkov, A. N., 101
Parikh, Paresh, 17
Park, Cheol, 215
Park, S., 198
Parker, Timothy J., 240
Parker, V. Thomas, 136
Pasareanu, Corina, 183
Pasini, Jose M., 48
Pasqua, A. F., 220
Pasquale, Joseph, 178
Pasyanos, M. E., 132
Patel, R. R., 79
Patterson, Michael J., 207
Paulson, S., 146
Pavlish, J. H., 140
Pavljuchenko, A. M., 101
Pavlov, A. A., 50, 104
Payne, G. A., 127
Pearce. A., 183
Pearl, John C., 243
Pecharsky, A. O., 217
Pecharsky, V. K., 217
Pena-Cruz, G., 135
Perry, Alexander R., 111
Peters, Kara, 209
Petersen, D. D., 78
Peterson, C. E., 129
Peterson, Christopher O., 24
Petrov, A. P., 93
Pettegrew, Richard D., 70
Pettengill, Gordon H., 245
Phalen, R. F., 141
Pham, A. Q., 67
Phillip, B., 181
Phillips, D. R., 187
Phillips, Shawn, 62, 63
Phillips, Shawn H., 62, 63
Piano, Priscilla, 236
Piatak, David J., 95
Picard, Mary, 19
Pickalov, V. V., 89
Pickett, M. H., 156
Pickles, W. L., 132
Pierce, R., 72
Pierson, Duane L., 168
Pilewskie, Peter, 182
Pinder, Howard G., 76
Pinelli, Thomas E., 231
Pinkerton, K. E., 144
Pinto, Nicholas J., 36
Pipes, R. B., 60
Pipes, R. Bryon, 61
Pipes, R. Byron, 20, 57
Pishchik, B. N., 100
Plaehn, Klaus, 89
Plahn, Klaus, 84
Plastinin, Yurii A., 192
Plevako, N. B., 91
Plueddemann, Albert J., 98
Pocha, M. D., 79
Pollock, Ronald J., 47
Poplavski, S. V., 6
Post, David L., 110
Post, R. F., 117
Post, Todd, 226
Postnov, A. V., 89
Potapkin, A., 49
Potapkin, A. V., 50
Potts, D. C., 132
Powell, J. Anthony, 219
Pradella, Matteo, 179
Prasad, Vikram, 105
Preisler, H., 145
Prestero, Timothy, 85
Prikhodko, V. G., 100, 103
Prince, Thomas A., 237
Propp, Timothy W., 37
Prosser, W. H., 22
Provencher, P. L., 131
Pudliner, B., 175
Pulliam, T. H., 190
Pun, B. K., 145, 153
Putnam, L. D., 137

Q

Qian, Bochen, 235
Qian, Zhenghong, 110
Qin, Shi-zhen, 167
Quesenberry, C. P., 140
Quinian, D., 181
Quinlan, W., 131

R

Rabbette, Maura, 182
Raboin, P., 176
Raffel, Markus, 2
Raftenberg, Martin N., 62
Raines, T. H., 128
Raju, I. S., 187
Rakhimov, R. D., 100, 103
Ralston, S., 156
Ramirez, A. P., 199
Ramirez, Rosa, 48
Ramsdell, J. V., 155
Ramsey, Michael, 241
Rao, Zhi-ren, 164
Ratcliff, E., 134
Reach, W. T., 239
Reason, William, 15
Reid, Talmage J., 187
Remington, B. A., 218
Respond, J., 196
Retzlaff-Roberts, Donna, 191
Reynolds, A. B., 72
Richard, Hughes, 2
Ridder, Andrew, 18
Ridolfi, Francis J., 240
Riley, J., 132
Rimbey, Scott E., 87
Ring, Carol, 178
Rivkin, A. S., 239
Roberts, D., 156
Roberts, J. J., 126
Robinson, Daryl C., 36
Rodriguez, Waldo J., 137
Roemer, M. J., 196
Roemer, Michael J., 23
Rogers, Erick, 181, 193
Rogers, Ted, 212
Rogowski, Robert S., 210
Romanofsky, Robert R., 35
Romanov, D. V., 246
Romanov, K. V., 246
Romanov, V. A., 246
Roschektayev, A. P., 93, 99
Rose, Ollie J., 88
Rosenhauer, Mathis, 84
Rosenzweig, J., 115
Rosipal, Roman, 191
Rosu, Grigore, 183
Rothschild, Lynn, 168
Rotman, D. A., 126
Rountree, Mark S., 172
Rozmus, W., 213
Rubenchik, A. M., 114
Ruhl, J. F., 129
Rui, Jia-bai, 167
Rushing, Kate V., 193
Rydh, A., 217

S

Sabol, Bruce M., 200
Sacks, Michael, 119
Sadler, Brian M., 110

Sakuma, K. M., 156
Salenko, S. D., 7
Salisbury, J. W., 244
Samolyuk, G. D., 217
Samuelsen, G. S., 24
San Juan, C., 135
Sanchez, A. V., 135
Sanchez-del-Valle, Carmina, 16
Sander, T., 105
Sandford, Scott A., 49, 173
Sanjurjo, Angel, 66
Sankaran, Subramanian, 105
Sannikov, I. N., 221
Sargand, S., 121
Sartowska, B., 53
Sato, Kimihiko, 31
Sattelmayer, T., 101, 105
Say, C., 81
Sazhin, Oleg V., 85
Sboev, D. S., 90
Scanlon, Michael V., 169
Schabes, Harvey, 227
Schaper, S., 220
Scheid, James, 23
Scheiman, D., 52
Schenk, Paul, 240
Schenk, Paul M., 240
Schiehlen, Werner, 189
Schlamp, Stefan, 219
Schleper, Roger, 138
Schmidt, R., 68
Schneider, Fred B., 232
Schoeller, Michael, 23
Schubert, Ulrich, 57
Schultz, C. A., 232
Schwartz, A. J., 56
Schwing, F. B., 156
Scott, Robert C., 4
Seeger, C. M., 136
Seigneur, C., 145, 153
Seinfeld, J. H., 145, 153
Sellers, William L., III, 84
Selph, C. C., 220
Semeonov, I. V., 246
Semionov, N. V., 7
Sennerbrant, A., 76
Senzig, David A., 15
Serbyn, M. Roman, 201
Serov, A. F., 100
Shahmatova, N. V., 3
Shan, J., 140
Sharma, R., 69
Shaw, W. J., 155
Shelley, J. S., 124
Shelton, J. M., 127
Shen, Xing-yun, 171
Shen, You-Gen, 238
Shepherd, E. R., 232
Shepherd, Kevin P., 15
Sherlock, Barry G., 75
Shi, Hong-zhi, 165, 166, 170
Shi, Jie-ping, 164
Shiley, William, 105
Shirvani, Mir S., 202
Shnaider, A. V., 92
Short, Paul, 138
Shu, Feng-Chun, 151
Shubilla, J. P., 172
Shulyatev, V. B., 114
Shumskii, V. V., 219
Shyu, Jin-Cherng, 97
Sickman, J. O., 133
Sigmon, T. W., 77
Sihvola, A., 218
Silva, Walter A., 4
Silver, E. A., 132
Silverstein, E., 221
Simmons, James E., 232
Simoes, Conan R., 66
Simon, Terrence W., 106
Simutis, Zita M., 233
Singer, B. A., 204
Singer, Bart A., 204
Singh, Upendra N., 28
Siochi, Emilie J., 215
Sjoegreen, Bjoern, 95, 214
Skoch, Gary J., 23, 108
Skoglund, P., 52
Skorokhod, Valery V., 54
Skovorodko, Petr A., 85
Skrobialowski, S. C., 129
Slane, Patrick, 234
Sledge, John, 148
Sleight, D. W., 43
Slezak, T., 181
Slocum, R., 113
Smart, Michael K., 1
Smith, J. G., Jr., 60
Smith, Joseph G., Jr., 51
Smith, Joseph, Jr., 215
Smith, M., 52
Smith, Michael D., 243
Smith, Rebecca B., 161
Smith, Steven A., 123
Smith, T., 130
Smogolev, A. A., 89
Smolfkova, Renata, 169
Soballe, D. M., 133, 134
Socolovsky, Eduardo A., 177
Soedergaerd, C., 225
Soederholm, Lars H., 94
Soederlind, P., 52
Solcum, Kevin R., 185
Solotchin, A. V., 86, 90, 93
Sone, Y., 86, 91
Song, Kyo D., 79
Song, Sang Sub, 58
Song, Xiao-Lan, 42
Song, Xiaolan, 57
Soto, Hector L., 21
Soufli, R., 197
South, Bruce W., 21
Sowa, William A., 24
Sparks, Dean W., 27
Spearman, M. Leroy, 4
Spinello, A. G., 135
Sprunt, Samuel N., 58
Spurr, Robert J. D., 66
Srivastava, Deepak, 56
St.Clair, Terry L., 215
Stackpoole, Mairead, 66, 119
Stahl, Phil, 212
Steele, G. V., 125
Steeples, Don W., 148
Stekenius, K. A., 5
Stenzel, S. W., 133
Steuck, M. J., 134
Stewart, David A., 65, 66
Stewart, Hamilton M., 108
Stocker, Dennis, 224
Stoddard, J. L., 133
Stodilka, Robert Z., 161
Stokes, J., 54, 55
Stolen, Eric D., 161
Strakey, P. A., 210
Streett, C. L., 103, 204
Streett, Craig L., 204
Strom, E. W., 129
Strominger, A., 221
Stroud, W. Jefferson, 123
Struk, Peter M., 70
Stuart, B. C., 114
Stuck, Bruce E., 210
Subramanyam, Guru, 13
Suenaga, T., 158
Sugimoto, H., 91
Sullivan, J. P., 186
Sun, Ai-min, 168
Sun, Sey-Shing, 40
Sun, We, 80
Sun, Xi-qing, 164
Sundermurthy, Sanjaykumar, 111
Suprun, T. T., 88
Svensson, P., 107
Switzer, J. A., 52

Szuecs, A., 83

T

Taft, Jim, 182
Takahashi, K., 86
Takahashi, T., 162
Takallu, M. A., 22, 64
Takata, S., 86
Tam, Christopher, 200
Taminger, K. M., 78
Taminger, Karen M. B., 77, 179
Tamura, T., 158
Tan, Lin, 111
Tan, Ying-jun, 167
Tan, Yu, 24
Tang, Bin, 165, 166
Tannahill, J. R., 126
Tao, Jun, 235
Taogoshi, R. I., 135
Tapley, B. D., 30
Tarver, C. M., 181
Taylor, S., 175
te Velthuis, S. G. E., 222
Teany, Douglas R., 229
Tedjojuwono, Ken K., 210
Teeters, P. C., 135
Telesman, Jack, 25
Terebey, Susan, 237
Terekhov, B. I., 96
Terekhov, V. I., 93
Terekhov, V. V., 96
Terekhova, N. M., 99
Terrill, P. E., 118
Teruya, A. T., 118
Teshima, Koji, 17
Tew, Roy C., 106
Theofylaktos, Noulie, 36
Thomas, N., 41
Thomas, Peter, 240
Thomas, Russell H., 19
Thompson, C. M., 59
Thompson, H. E., 81
Thompson, S. D., 9
Timucin, Dogan, 182
Tise, Larry E., 3
Titkov, V. I., 90
Tittonen, I., 209
Tiwari, Surendra N., 222
Toennies, J. P., 220
Tondra, Mark, 110
Trexler, Carl A., 1
Trombino, C. N., 132
Trotsyuk, A. V., 88
Trujillo, Anna C., 156
Tsai, H., 53, 54
Tseng, Chung-Jen, 60
Tsiotras, Panagiotis, 29
Tucker, Dave, 138
Tucker, George F., 119
Tucker, Heather, 15
Tucker, Jerry, 201
Tucker, Jerry H., 202
Tumer, Irem Y., 20
Tumer, Kagan, 20
Tummals, Murali, 83
Tung, Chee, 2
Turner, D., 116
Turner, Travis L., 122
Turpin, C., 131
Tzeng, Jerome T., 80

U

Uenking, M. D., 22
Unnasch, S., 142
Usami, Masaru, 17

V

Vaganov, A., 6
Vaghjiani, Ghanshyam L., 49, 207
Vaidya, S., 55
Valasek, Michael, 189
Van Scotter, James, 191
Van Tol, David J., 206
VanDenEeden, S. K., 140
vanderBliek, Nicole, 236
VanDerVliet, Scott D., 149
vanderWall, Berend, 2
VanKeuls, Fred W., 13
VanKeuls, Frederick W., 35
Varpaaniemi, K., 174
Vasenev, L. G., 3
Vaughn, D. L., 147
Veenhuis, J. E., 130
Venkatesh, S., 183
Venosa, A. D., 216
Vetlutsky, V. N., 88
Vignesparamoorthy, Sivaruban, 13
Vilas, F., 239
Villasenor, M. A., 177
Visser, Willem, 183
Voegele, Donald H., 184
Volchkov, E. P., 90, 96
Voran, S. D., 74
Voronin, V. V., 5
Vorontsov, S. S., 89
Vorozhtsov, E. V., 97
Voskoboinikov, Yu. E., 6

W

Wachowiak, Mark P., 169
Wagner, S., 5, 113, 205
Walker, Mitchell ., 96
Walsh, David O., 111
Waltemeyer, S. D., 125
Walter, W. R., 132
Walton, S. G., 82
Wan, Chao-min, 168
Wang, Dexin, 110
Wang, Guan-Gli, 151
Wang, Guang-Li, 181
Wang, Hu-Sheng, 118
Wang, Jia-Ji, 238
Wang, Joseph, 31, 51
Wang, Lei, 164
Wang, Long, 121
Wang, Rui, 171
Wang, Tian-fu, 121
Wang, Wei-Hua, 236
Wang, Xiu-Mei, 233
Wang, Youqi, 59
Wang, Zheng-rong, 168
Watkins, B., 68
Watson, Andrew B., 83
Watson, J. K., 78
Watson, John K., 70
Watson, Kent A., 215
Weber, Thorsten, 43
Wei, Chenyu, 56
Weinstein, M., 239
Weiser, E. S., 60
Weiser, Erik S., 61
Weiss, J., 113
Weitz, David, 105
Welp, U., 217
Wernet, Mark P., 23, 108
Wheeler, Kevin, 182
Whitaker, John F., 80
White, Robert C., 198
Whitecotton, Brian R., 111
Wildenschild, D., 126
Wilkie, W., 218
Wilkins, Gregory M., 73
Williams, Martha K., 61
Williams, W., 147
Williamson, J. E., 137
Williamson, Keith M., 117
Wills, C. E., 120
Wilmoth, Richard G., 105

Wilson, Ronda, 240
Winer, A. M., 145
Wing, David J., 12
Winowitch, R. B., 135
Wirth, B. D., 208
Wise, K. E., 61
Wolf, Emil, 206
Wolfe, J., 41
Wolling, Andreas, 193
Womer, Keith, 193
Wong, D. T., 22
Wong, M. F., 135
Wood, J. R., 131
Wood, Jerry R., 26
Wood, Richard M., 19
Wood, William A., 177
Woodall, Roger L., 186
Woodard, S. E., 22
Woods, William C., 8
Woodson, Shawn H., 14
Woronowicz, Michael, 38
Wright, R. H., 133
Wu, Bin, 166
Wu, E. X., 194
Wu, Haidong, 187
Wu, Ji-How, 60
Wu, Meng-Chou, 210
Wu, N. Eva, 10
Wu, Su-di, 165, 166
Wu, Wei, 206
Wu, Xing-yu, 164
Wu, Yingchuan, 192
Wu, Zhen-Yu, 238
Wuerz, W., 5, 205
Wusk, Michael S., 29
Wyntjes, Geert, 112
Wysong, Ingrid, 51
Wysong, Ingrid J., 50, 51

X

Xie, Jun-shui, 165
Xie, S. C., 156
Xie, Xiao-ping, 164
Xie, Yin-zhi, 167
Xing, Xuan, 170
Xiong, N., 107
Xu, Ji-Hong, 29
Xu, Yong-Ping, 236
Xue, Yue-ying, 166

Y

Yamada, Toshishige, 218
Yamamoto, Fumiichiro, 160
Yan, Hong, 83
Yang, Fu-Min, 30
Yang, Fumin, 115, 236
Yang, Haw-Ching, 233
Yang, T. Y. B., 208
Yang, Xi-ming, 167
Yao, Chung-Sheng, 89
Yaroush, Rita A., 172
Yarozlavtsev, M. I., 46
Yarygin, I. V., 100
Yarygin, V. N., 103
Yee, H. C., 189, 214
Yee, Helen C., 95
Yeh, Chiu-Shang, 71
Yeh, Ming-Chang, 71
Yin, Li-xue, 121
Yin, Zhao-yun, 167
Yio, J. J., 156
Yokota, R., 60
Yoshitake, T., 54
You, Guang-xing, 166
Young, C. J., 232
Young, David F., 153
Young, Marc, 82
Young, Marcus, 31
Young, Marcus P., 30
Yu, Jian, 235
Yu, Jian-ru, 167
Yu, Jing-guang, 166
Yu, Qi-fu, 167
Yu, Shann-Chewn, 123
Yu, Yung H., 2
Yu, Zhi-Yao, 235
Yuan, Xiu-gan, 167, 171
Yuanyan, He, 15
Yudin, A. V., 102

Z

Zabaikin, V. A., 89
Zadonsky, S., 6
Zamuraev, V. P., 23, 98
Zanin, B. Y., 2
Zanin, B. Yu., 90
Zaprjagaev, V. I., 91
Zapryagaev, V. I., 86, 90, 93, 100
Zare, Richard N., 237
Zazzali, Christian, 228
Zhang, Bo, 181
Zhang, Da-lin, 173
Zhang, Le-ning, 165
Zhang, Li-fan, 165
Zhang, Xiao, 173
Zhang, Xiuz-Hong, 151
Zhang, Yan-ping, 171
Zhang, Z. C., 24
Zhang, Zhong-Ping, 115, 236
Zhao, Jun-Liang, 236
Zhao, Lun, 170
Zhao, Shu-kui, 121
Zhao, Y., 146
Zharkova, G. M., 90
Zheltovodov, A. A., 95
Zhen, Chang-qiong, 121
Zheng, Wei-Min, 151
Zheng, Z. Charlie, 202
Zheung, Zhong-Hua, 98
Zhou, Feng-shu, 171
Zhou, Yong-Hong, 151
Zhou, Zhi, 167
Zhu, Bin, 168
Zhu, Han, 42
Zhu, Qiuming, 192
Zhu, Wen-Yao, 150
Zhu, Yuan-Lan, 30
Zielinski, M., 196
Zingg, D. W., 190
Zolotarev, S. L., 91
Zondervan, Kevin L., 195
Zumino, B., 220
Zvegintsev, V. I., 3, 100
Zverkov, I. D., 2
Zywicz, E., 176