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Space Administration
Langley Research Center

Scientific and Technical
Information Program Office

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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.

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- 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.
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- Telephone the NASA STI Help Desk at (301) 621-0390
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  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.

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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/.

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Subject Term Index

Personal Author Index

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20030000684 Boeing Co., Seattle, WA USA
First Order Ozone Impact of a Fleet of Supersonic Business Jets (SSBJs) ***Final Report***
Baughcum, Steven L., Boeing Co., USA; September 2002; 40p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS3-01140; RTOP 714-01-20; DA Proj. 1L1-62211-A-47-A
Report No.(s): NASA/CR-2002-211898; NAS 1.26:211898; E-13585; ARL-CR-0507; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The NASA High Speed Research Program conducted an extensive evaluation of the effects of emissions from a supersonic high speed civil transport (HSCT) on the stratospheric ozone layer. That study evaluated the effect of fleet size, cruise altitude, NOx emission levels, water vapor emissions and sulfate emissions on ozone. Supersonic business jets (SSBJs) would be much smaller and would burn much less fuel than the HSCT. In addition, the SSBJ concepts that have been discussed are for aircraft that would fly slower than Mach 2.4 and at lower altitudes. The daily utilization of private supersonic business jets is expected to be smaller than for scheduled airliners. So, the SSBJ fleet fuel use at cruise altitudes is expected to be much lower than for the HSCT scenarios used previously. Because of the limited market for such aircraft, SSBJs might use conventional combustors with higher NOx emissions levels than the advanced technology combustors that were being developed as part of the HSR program. In this report, a two-dimensional model is used to evaluate parametrically the ozone impact of supersonic business jets as a function of fleet fuel use at cruise altitudes, NOx emission index (grams of NOx/kilogram of fuel used), and cruise altitude.
Author
Civil Aviation; Ozonosphere; Supersonic Speed; Supersonic Transports; Contaminants; Exhaust Emission

20030001006 NASA Langley Research Center, Hampton, VA USA
Some Aviation Growth Events
Spearman, M. Leroy, NASA Langley Research Center, USA; [2002]; 9p; 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 2002-0172; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

The growth of aviation since the first flight of a heavier-than-air powered manned vehicle in 1903 has been somewhat remarkable. Some of the events that have influenced this growth are reviewed in this paper. This review will include some events prior to World War I; the influence of the war itself; the events during the post-war years including the establishment of aeronautical research laboratories; and the influence of World War II which, among other things, introduced new technologies that included rocket and jet propulsion and supersonic aerodynamics. The subsequent era of aeronautical research and the attendant growth in aviation over the past half century will be reviewed from the view point of the author who, since 1944, has been involved in the NACA/NASA aeronautical research effort at what is now the Langley Research Center in Hampton, Virginia. The review will discuss some of the research programs related to the development of some experimental aircraft, the Century

series of fighter aircraft, multi-mission aircraft, advanced military aircraft and missiles, advanced civil aircraft, supersonic transports, spacecraft and others.
Author
Aeronautics; Military Aircraft; Research Projects; Civil Aviation; Research Aircraft

20030001036 NASA Glenn Research Center, Cleveland, OH USA
Ice Accretion Formations on a NACA 0012 Swept Wing Tip in Natural Icing Conditions
Vargas, Mario, NASA Glenn Research Center, USA; Giriunas, Julius A., NASA Glenn Research Center, USA; Ratvasky, Thomas P., NASA Glenn Research Center, USA; January 2002; 28p; In English; 40th Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 711-20-23
Report No.(s): NASA/TM-2002-211357; E-13175; NAS 1.15:211357; AIAA Paper 2002-0244; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
An experiment was conducted in the DeHavilland DHC-6 Twin Otter Icing Research Aircraft at NASA Glenn Research Center to study the formation of ice accretions on swept wings in natural icing conditions. The experiment was designed to obtain ice accretion data to help determine if the mechanisms of ice accretion formation observed in the Icing Research Tunnel are present in natural icing conditions. The experiment in the Twin Otter was conducted using a NACA 0012 swept wing tip. The model enabled data acquisition at 0 deg, 15 deg, 25 deg, 30 deg, and 45 deg sweep angles. Casting data, ice shape tracings, and close-up photographic data were obtained. The results showed that the mechanisms of ice accretion formation observed in-flight agree well with the ones observed in the Icing Research Tunnel. Observations on the end cap of the airfoil showed the same strong effect of the local sweep angle on the formation of scallops as observed in the tunnel.
Author
Swept Wings; Sweep Angle; Aircraft Icing

20030001844 NASA Glenn Research Center, Cleveland, OH USA
Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines
Briscoe, Victoria, Compiler, NASA Glenn Research Center, USA; October 2002; 835p; In English, 11-13 Jun. 2001, Westlake, OH, USA; Sponsored by Federal Aviation Administration, USA; Also announced as 20030001845 through 20030001883; Original contains color illustrations
Contract(s)/Grant(s): RTOP 323-71-00
Report No.(s): NASA/CP-2002-211682; E-13410; NAS 1.55:211682; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche
These are the proceedings of the 5th Annual FAA/Air Force/NASA/Navy Workshop on the Probabilistic Methods for Gas Turbine Engines hosted by NASA Glenn Research Center and held at the Holiday Inn Cleveland West. The history of this series of workshops stems from the recognition that both military and commercial aircraft engines are inevitably subjected to similar design and manufacturing principles. As such, it was eminently logical to combine knowledge bases on how some of these overlapping principles and methodologies are being applied. We have started the process by creating synergy and cooperation between the FAA, Air Force, Navy, and NASA in these workshops. The recent 3-day workshop was specifically designed to benefit the development of probabilistic methods for gas turbine engines by addressing recent technical accomplishments and forging new ideas. We accomplished our goals of minimizing duplication, maximizing the dissemination of information, and improving program planning to all concerned. This proceeding includes the final agenda, abstracts, presentations, and panel notes, plus the valuable contact information from our presenters and attendees. We hope that this proceeding will be a tool to enhance understanding of the developers and users of probabilistic methods. The fifth workshop doubled its attendance and had the success of collaboration with the many diverse groups represented including government, industry, academia, and our international partners. So, ”Start your engines!” and utilize these proceedings towards creating safer and more reliable gas turbine engines for our commercial and military partners.
Author
Probability Theory; Engine Design; Gas Turbine Engines; Design Analysis

20030001845 NASA Glenn Research Center, Cleveland, OH USA
NASA Glenn Research Center Overview
Sehra, Arun K., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 1-7; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

This viewgraph presentation provides information on the NASA Glenn Research Center. The presentation is a broad overview, including the chain of command at the center, its aeronautics facilities, and the factors which shape aerospace product line integration at the center. Special attention is given to the future development of high fidelity probabilistic methods, and NPSS (Numerical Propulsion System Simulation).
CASI
Research Facilities; Test Facilities; Management; Product Development

20030001848 NASA Glenn Research Center, Cleveland, OH USA
NASA Overview
Rusick, Jeff, NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 25-39; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This viewgraph presentation provides information on computer programs for the application of probabilistics in aerospace design. The presentation defines risk, and lists probabilistic tools which can take risk into account. It then lists current and future examples of NASA aerospace technology program support which utilize probabilistic methods. Current examples include turbofan engines, combustor liners, life estimation, the analysis of rotors and blades, and shuttle ground operations. The 2nd Generation Reusable Launch Vehicle is one of the future areas of support. The presentation also suggests other future uses of probabilistic tools in aerospace design, and optimal methods for their implementation.
CASI
Computer Programs; Probability Theory; Risk; Aircraft Design; Spacecraft Design; Engine Design

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.

20030000729 NASA Marshall Space Flight Center, Huntsville, AL USA
Launch Vehicle Ascent Stage Separation Wind Tunnel Test
Bordelon, Wayne, NASA Marshall Space Flight Center, USA; Frost, Alonzo, NASA Marshall Space Flight Center, USA; Pritchett, Victor, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 26p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The Aerodynamic Research Facility (ARF) LGBB (Liquid Glide-back Booster) Stage Separation Test is part of the Multi-Center Second Generation In-House Tool Development Task. The ARF LGBB Stage Separation Test has been completed at MSFC (Marshall Space Flight Center). It includes the following: PSP (Project Study Plan) Feasibility Test; Isolated Force/Moment Data; Bimese Configuration Force/Moment Data; Schlieren Video. The LGBB Bimese Reference Configuration Analyses and Test Results In-Work to Develop Tools and Database. Preliminary results showed qualitative agreement with CFD (computational fluid dynamics) aerodynamic predictions. The preliminary results exhibit the complex nature of the stage separation aerothermal problem.
Author
Wind Tunnel Tests; Launch Vehicles; Stage Separation; Computational Fluid Dynamics

20030000739 NASA Marshall Space Flight Center, Huntsville, AL USA
Status of Nozzle Aerodynamic Technology at MSFC
Ruf, Joseph H., NASA Marshall Space Flight Center, USA; McDaniels, David M., NASA Marshall Space Flight Center, USA; Smith, Bud, Plumetech, USA; Owens, Zachary, Virginia Univ., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 23p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation provides information on the status of nozzle aerodynamic technology at MSFC (Marshall Space Flight Center). The objectives of this presentation were to provide insight into MSFC in-house nozzle aerodynamic technology, design, analysis, and testing. Under CDDF (Center Director's Discretionary Fund), 'Altitude Compensating Nozzle Technology', are the following tasks: Development of in-house ACN (Altitude Compensating Nozzle) aerodynamic design capability; Building in-house experience for all aspects of ACN via End-to-End Nozzle Test Program; Obtaining Experimental Data for Annular

Aerospike: Thrust eta, TVC (thrust vector control) capability and surface pressures. to support selection/optimization of future Launch Vehicle propulsion we needed a parametric design and performance tool for ACN. We chose to start with the ACN Aerospike Nozzles.
Derived from text
Nozzle Design; Aerospike Engines; Spike Nozzles; Aerodynamics; Launch Vehicles

20030000740 ORVA Corp., Toronto, Ontario Canada
Aero-Heating Analysis for DaVinci Space Project Rocket Ballute
Feeney, Brian, ORVA Corp., Canada; Kudriavtsev, Vladimir, CFD Canada, Canada; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 34p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation provides information on an aero-heating analysis conducted for a ballute to return a rocket. The objective of the X-Project is to fly a spacecraft with the three astronauts, to an elevation greater than 100 km and to do it twice during the two week period. No government funding is allowed. The award is 10 million dollars; 20 teams are now registered. The DaVinci Project intends to meet this objective using off-the-shelf commercial technologies. It will utilize helium balloon for delivery to 80,000 ft, rocket on the tether, commercial multi-use engines. The rocket is returned using pressurized ballute to be deployed during the re-entry. We utilized CFD (Computational Fluid Dynamics) ACE+ to analyze several consecutive iterations for the design of daVinci rocket ballute; Using CFD we were able to zero-in on a conceptual configuration, flight scenario and trajectory requirements that will meet X-prize objectives and also minimize thermal loads; Estimated thermal loads (Tmax less than 500 C) can be met with commercially available materials used by ballute manufacturers.
Derived from text
Ballutes; Aerodynamic Heating; Computational Fluid Dynamics; Spacecraft Reentry

20030000831 NASA Langley Research Center, Hampton, VA USA
Discrete Roughness Effects on Shuttle Orbiter at Mach 6
Berry, Scott A., NASA Langley Research Center, USA; Hamilton, H. Harris, II, NASA Langley Research Center, USA; [2002]; 16p; In English; 32nd AIAA Fluid Dynamics 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 2002-2744; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Discrete roughness boundary layer transition results on a Shuttle Orbiter model in the NASA Langley Research Center 20-Inch Mach 6 Air Tunnel have been reanalyzed with new boundary layer calculations to provide consistency for comparison to other published results. The experimental results were previously obtained utilizing the phosphor thermography system to monitor the status of the boundary layer via global heat transfer images of the Orbiter windward surface. The size and location of discrete roughness elements were systematically varied along the centerline of the 0.0075-scale model at an angle of attack of 40 deg and the boundary layer response recorded. Various correlative approaches were attempted, with the roughness transition correlations based on edge properties providing the most reliable results. When a consistent computational method is used to compute edge conditions, transition datasets for different configurations at several angles of attack have been shown to collapse to a well-behaved correlation.
Author
Hypersonic Speed; Scale Models; Space Shuttle Orbiters; Reusable Launch Vehicles; Wind Tunnel Tests

20030000845 NASA Langley Research Center, Hampton, VA USA
Uncertainty of Videogrammetric Techniques used for Aerodynamic Testing
Burner, A. W., NASA Langley Research Center, USA; Liu, Tianshu, NASA Langley Research Center, USA; DeLoach, Richard, NASA Langley Research Center, USA; [2002]; 12p; In English; 22nd AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-2794; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

The uncertainty of videogrammetric techniques used for the measurement of static aeroelastic wind tunnel model deformation and wind tunnel model pitch angle is discussed. Sensitivity analyses and geometrical considerations of uncertainty are augmented by analyses of experimental data in which videogrammetric angle measurements were taken simultaneously with precision servo accelerometers corrected for dynamics. An analysis of variance (ANOVA) to examine error dependence on angle of attack, sensor used (inertial or optical). and on tunnel state variables such as Mach number is presented. Experimental

comparisons with a high-accuracy indexing table are presented. Small roll angles are found to introduce a zero-shift in the measured angles. It is shown experimentally that. provided the proper constraints necessary for a solution are met, a single- camera solution can he comparable to a 2-camera intersection result. The relative immunity of optical techniques to dynamics is illustrated.
Author
Wind Tunnel Tests; Cameras; Aeroelasticity; Sensitivity Analysis; Analysis of Variance; Static Models

20030000865 Naval Postgraduate School, Monterey, CA USA
A 3D Theodorsen-Based Rotor Blade Flutter Model Using Normal Modes
Rauchenstein, Werner J., Jr; Sep. 2002; 75p; In English; Original contains color images
Report No.(s): AD-A407180; No Copyright; Avail: CASI; A04, Hardcopy
This thesis presents a fully coupled, quasi-3D analysis of rotor blade flutter that can accommodate forward flight conditions. The rotor blade is modeled as a uniform beam, taking the average characteristics of a real blade between 20% and 90% of its length. Applying Rayleigh's method, the first few bending and torsion normal mode shapes and natural frequencies are determined, and then adjusted for the rotating case. With this data, force and moment equations of motion are developed using Lagrange's equation along with a normal mode analysis. Theodorsen coefficients are calculated over a range of forward velocities (input as reduced frequencies) for a specified number of elements along the blade model. Incorporating these coefficients into the equations of motion, a square matrix is generated from which complex eigenvalues can be derived. These eigenvalues provide the aeroelastic natural frequencies and damping coefficients for each coupled mode. The forward velocity at which one of the modes produces a positive damping coefficient gives the value of reduced frequency for the flutter point. The resulting forward speed and blade tip speed can then be determined.
DTIC
Vibration Mode; Three Dimensional Models; Aeroelasticity; Flutter; Rotor Blades (Turbomachinery); Aeronautical Engineering

20030001764 Academy of Sciences (USSR), Inst. of High Temperatures, Moscow, USSR
Workshop on Magneto-Plasma-Aerodynamics in Aerospace Applications (3rd) Held in Moscow on 24 April - 26 April 2001
Bityurin, V.; Jun. 27, 2002; 434p; In English
Contract(s)/Grant(s): F61775-01-W-F033
Report No.(s): AD-A407842; EOARD-CSP 01-5033; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche
The Final Proceedings for The Third Workshop on Magneto- and Plasma Aerodynamics For AeroSpace Applications, 24 April 2001 - 26 April 2001 This is an interdisciplinary conference. Topics include 1) MHD and Plasma Aerodynamics flow/flight control; 2) MHD on-board electrical power generation, 3) MHD assisted hypervelocity testing, 4) Plasma Aerodynamics, drag/heat flux/boundary layer control, 5) Shock wave propagation in gas-plasma systems, 6) On-board plasma generators, and related problems.
DTIC
Magnetic Fields; Aerodynamic Characteristics; Plasma Generators; Boundary Layer Control; Magnetohydrodynamic Flow; Shock Wave Propagation

20030001794 RAND Corp., Santa Monica, CA USA
Developing Aerospace Leaders for the Twenty-First Century
Weaver, Nancy E.; Apr. 2001; 80p; In English; Original contains color images
Report No.(s): AD-A407846; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Sound leadership within a dynamic, ever-changing environment is at the heart of the Air Force's institutional character. It is key to bonding airmen and is the foundation for successful Air Force achievements in peace and in war. Of the many skills and abilities used in the profession of arms, none is prized more highly. As we transform to meet the challenges of the twenty-first century, leadership can strengthen the foundation of mutual trust and respect among the ranks and the organization as a whole. Most people who equate leadership with good management model their leadership practices based on readings and research published in the industrial era of the twentieth century. This understanding of leadership has dominated military organizations in the past but will not serve the mature Expeditionary Aerospace Force of tomorrow. This paper explores the advantages to adapting emerging leadership philosophies into the Air Force culture to meet the growing challenges of the twenty-first century work force. Leadership doctrine, leadership development programs, and the human resource management system should be aligned to support these changes in leadership philosophy and practice. This is critical in order to build Air Force leaders with

a clearly recognizable set of competencies and attitudes that thrive regardless of a particular career-path or assigned location throughout an entire career.
DTIC
Aerospace Systems; Leadership

20030001948 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Analysis of the Impacts of Wake Vortex Restrictions at LGA
Allan, S. S.; Dasey, T. J.; Sep. 16, 2002; 50p; In English
Report No.(s): PB2003-100542; ATC-305; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Wake vortex restrictions at New York's LaGuardia airport cause a significant reduction in capacity when aircraft land on runway 22 and depart on runway 31. This report presents an analysis of the annual delay cost a LGA associated with the wake vortex restrictions. We find that the delay due to these restrictions exceeds 4000 hours annually, and that these restrictions cause a significant workload increase at both LaGuardia and the New York TRACON. If traffic levels were to increase 10% from their February 2001 levels, the corresponding increase in delay due to the wake vortex restrictions would rise from 30 hours a day to over 400 hours a day in this runway configuration. It is also found that for a meaningful increase in passenger capacity in this runway configuration to be achieved as demand grows, restrictions must be reduced from their current levels. If the percentage of heavy/757s doubled at LGA, there would be no increase in passenger capacity while daily delays in this runway configuration due to current wake vortex separation standards would increase by 250 hours.
NTIS
Aircraft Wakes; Vortex Alleviation

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.

20030000437 NASA Langley Research Center, Hampton, VA USA
Vertical Field of View Reference Point Study for Flight Path Control and Hazard Avoidance
Comstock, J. Raymond, Jr., NASA Langley Research Center, USA; Rudisill, Marianne, NASA Langley Research Center, USA; Kramer, Lynda J., NASA Langley Research Center, USA; Busquets, Anthony M., NASA Langley Research Center, USA; November 2002; 69p; In English
Contract(s)/Grant(s): RTOP 728-60-10-01
Report No.(s): NASA/TP-2002-211954; NAS 1.60:211954; L-18241; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Researchers within the eXternal Visibility System (XVS) element of the High-Speed Research (HSR) program developed and evaluated display concepts that will provide the flight crew of the proposed High-Speed Civil Transport (HSCT) with integrated imagery and symbology to permit path control and hazard avoidance functions while maintaining required situation awareness. The challenge of the XVS program is to develop concepts that would permit a no-nose-droop configuration of an HSCT and expanded low visibility HSCT operational capabilities. This study was one of a series of experiments exploring the 'design space' restrictions for physical placement of an XVS display. The primary experimental issues here was 'conformality' of the forward display vertical position with respect to the side window in simulated flight. 'Conformality' refers to the case such that the horizon and objects appear in the same relative positions when viewed through the forward windows or display and the side windows. This study quantified the effects of visual conformality on pilot flight path control and hazard avoidance performance. Here, conformality related to the positioning and relationship of the artificial horizon line and associated symbology presented on the forward display and the horizon and associated ground, horizon, and sky textures as they would appear in the real view through a window presented in the side window display. No significant performance consequences were found for the non-conformal conditions.
Author
Flight Control; Flight Simulation; Flight Paths; Field of View; Pilot Performance; Design Analysis; Visual Signals; Display Devices

20030000452 Animal and Plant Health Inspection Service, Amherst, MA USA
Environmental Assessment for the Statewide Wildlife Damage Management at Airports in Massachusetts
May 2002; 80p; In English
Report No.(s): PB2003-101142; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Wildlife Service's mission is to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety. This is accomplished through: (1) training of wildlife damage management professionals; (2) development and improvement of strategies to reduce economic losses and threats to humans from wildlife; (3) collection, evaluation, and dissemination of management information; (4) cooperative wildlife damage management programs; (5) informing and educating the public on how to reduce wildlife damage and; (6) providing data and a source for limited-use management materials and equipment, including pesticides. This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts associated with wildlife at airports in the State of Massachusetts. This analysis covers WS's plans for current and future WDM actions wherever they might be requested on civil and military airports within the State.
NTIS
Airports; Management Information Systems; Earth Resources; Wildlife; Damage

20030000453 Animal and Plant Health Inspection Service, Amherst, MA USA
State Wide Wildlife Damage Management at Airports in Connecticut
Apr. 2002; 80p; In English
Report No.(s): PB2003-101132; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Wildlife Service's mission is to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety. This is accomplished through: (1) training of wildlife damage management professionals; (2) development and improvement of strategies to reduce economic losses and threats to humans from wildlife; (3) collection, evaluation, and dissemination of management information; (4) cooperative wildlife damage management programs; (5) informing and educating the public on how to reduce wildlife damage and; (6) providing data and a source for limited-use management materials and equipment, including pesticides. This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts associated with wildlife at airports in the State of Connecticut. This analysis covers WS's plans for current and future WDM actions wherever they might be requested on civil and military airports within the State.
NTIS
Airports; Information Management; Management Information Systems; Wildlife

20030000646 Department of Agriculture, Animal and Plant Health Inspection Service, Hyattsville, MD USA
Environmental Assessment for the Wildlife Damage Management at Airports in Indiana
Apr. 2002; 80p; In English
Report No.(s): PB2003-101136; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Wildlife Service's mission is to provide leadership in wildlife damage management in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety. This is accomplished through: (1) training of wildlife damage management professionals; (2) development and improvement of strategies to reduce economic losses and threats to humans from wildlife; (3) collection, evaluation, and dissemination of management information; (4) cooperative wildlife damage management programs; (5) informing and educating the public on how to reduce wildlife damage and; (6) providing data and a source for limited-use management materials and equipment, including pesticides. This Environmental Assessment (EA) evaluates ways by which this responsibility can be carried out to resolve conflicts with wildlife at airports in Indiana.
NTIS
Airports; Wildlife; Management Information Systems; Information Management; Information Dissemination; Earth Resources

20030000680 NASA Langley Research Center, Hampton, VA USA
Runway Incursion Prevention System Simulation Evaluation
Jones, Denise R., NASA Langley Research Center, USA; [2002]; 12p; In English; 21st Digital Avionics Systems Conference, 27-31 Oct. 2002, Irvine, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A Runway Incursion Prevention System (RIPS) was evaluated in a full mission simulation study at the NASA Langley Research center in March 2002. RIPS integrates airborne and ground-based technologies to provide (1) enhanced surface

situational awareness to avoid blunders and (2) alerts of runway conflicts in order to prevent runway incidents while also improving operational capability. A series of test runs was conducted in a high fidelity simulator. The purpose of the study was to evaluate the RIPS airborne incursion detection algorithms and associated alerting and airport surface display concepts. Eight commercial airline crews participated as test subjects completing 467 test runs. This paper gives an overview of the RIPS, simulation study, and test results.
Author
Runways; Accident Prevention; Situational Awareness; Airfield Surface Movements; Air Traffic Control; Flight Simulators; Flight Simulation

20030000682 NASA Langley Research Center, Hampton, VA USA
Occupant Responses in a Full-Scale Crash Test of the Sikorsky ACAP Helicopter
Jackson, Karen E., NASA Langley Research Center, USA; Fasanella, Edwin L., NASA Langley Research Center, USA; Boitnott, Richard, NASA Langley Research Center, USA; McEntire, Joseph, Army Aeromedical Research Lab., USA; Lewis, Alan, Army Aeromedical Research Lab., USA; [2002]; 18p; In English; American Helicopter Society 58th Annaul Forum, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

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

20030000797 NASA Langley Research Center, Hampton, VA USA
Overview of the NASA Systems Approach to Crashworthiness Program
Jones, Lisa E., NASA Langley Research Center, USA; [2002]; 9p; In English; American Helicopter Society 58th Annual Forum, 11-13 Jun. 2002, Montreal, Canada; Sponsored by American Helicopter Society, Inc., USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The NASA Aviation Safety Program was developed in response to the federal government's goal to reduce the fatal accident rate for aviation by 80% within 10 years. Accident Mitigation is a primary element of the Aviation Safety Program. The overall Accident Mitigation goal is to provide technology to the air transport industry to enable a decrease in the rate of fatalities and injury from crash loads and from in-flight and post-crash explosion and/or fire. Accident Mitigation is divided into two main elements - Fire Prevention and Systems Approach to Crashworthiness. The Systems Approach to Crashworthiness goal is to develop and promote technology that will increase the human survival rate or reduce the fatality rate in survivable accidents. The technical background and planning, selected technical activities, and summary of future efforts will be presented in this paper.
Author
Air Transportation; Aircraft Safety; Crashworthiness; NASA Programs; General Overviews

20030000826 NASA Langley Research Center, Hampton, VA USA
Evaluation of a Pair-Wise Conflict Detection and Resolution Algorithm in a Multiple Aircraft Scenario
Carreno, Victor A., NASA Langley Research Center, USA; December 2002; 16p; In English
Contract(s)/Grant(s): RTOP 727-01-26-01
Report No.(s): NASA/TM-2002-211963; NAS 1.15:211963; L-18252; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The KB3D algorithm is a pairwise conflict detection and resolution (CD&R) algorithm. It detects and generates trajectory vectoring for an aircraft which has been predicted to be in an airspace minima violation within a given look-ahead time. It has been proven, using mechanized theorem proving techniques, that for a pair of aircraft, KB3D produces at least one vectoring solution and that all solutions produced are correct. Although solutions produced by the algorithm are mathematically correct, they might not be physically executable by an aircraft or might not solve multiple aircraft conflicts. This paper describes a simple

solution selection method which assesses all solutions generated by KB3D and determines the solution to be executed. The solution selection method and KB3D are evaluated using a simulation in which N aircraft fly in a free-flight environment and each aircraft in the simulation uses KB3D to maintain separation. Specifically, the solution selection method filters KB3D solutions which are procedurally undesirable or physically not executable and uses a predetermined criteria for selection.
Author
Algorithms; Computerized Simulation; Trajectory Analysis; Flight Management Systems; Collision Avoidance; Performance Prediction; Decision Making

20030001684 Army Safety Center, Fort Rucker, AL USA
FLIGHTFAX: Army Aviation Risk-Management Information. Volume 30, Number 5
May 2002; 16p; In English; Original contains color images
Report No.(s): AD-A407939; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report is a Military Publication concerning Army Aviation Safety.
DTIC
Aircraft Safety; Life Support Systems; Military Aviation; Risk; Flight Safety

20030001833 Texas Univ., Center for Transportation Research, Austin, TX USA
Assessment of Intermodal Strategies for Airport Access ***Final Report, Sep. 1999 - Apr. 02***
Mahmassani, H. S.; Chebli, H.; Slaughter, K.; Ludders, F. J.; Apr. 2002; 152p; In English
Report No.(s): PB2003-100544; RR-1849-3; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Air transportation plays a vital role in the Texas economy. Air passenger and air cargo traffic is projected to continue to increase considerably at many of the state's large airports. Ground access to airports is an important function that must be provide at the regional level as well as in the immediate vicinity of the facility itself. Congestion problems affecting airport access are, in some instances, reaching unacceptable proportions, with negative impacts on air quality and other environmental considerations. Accordingly, these issues require concerted action to meet project needs. to address these challenges and current gaps, this project adopts a comprehensive look at the landslide access issues associated with the major airports in the state. It seeks to improve on existing planning procedures and processes to meet the unique need of airport traffic demand for both people and goods. to be effective, planning for airport ground access must be multimodal and intermodal; consider operational, regulatory, and capital-intensive infrastructure provision issues; consider multiple levels of scale/resolution, and recognize the unique, dynamic aspects of air traffic demand, i.e., its temporal patterns. It must also consider carefully the potential of emerging Intelligent Transportation System (ITS) technologies in the airport environment.
NTIS
Texas; Airport Planning; Airports; Transportation

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.

20030000582 NASA Langley Research Center, Hampton, VA USA
The Aeronautical Data Link: Taxonomy, Architectural Analysis, and Optimization
Morris, A. Terry, NASA Langley Research Center, USA; Goode, Plesent W., NASA Langley Research Center, USA; [2002]; 12p; In English; 21st Digital Avionics Systems Conference, 27-31 Oct. 2002, Irvine, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The future Communication, Navigation, and Surveillance/Air Traffic Management (CNS/ATM) System will rely on global satellite navigation, and ground-based and satellite based communications via Multi-Protocol Networks (e.g. combined Aeronautical Telecommunications Network (ATN)/Internet Protocol (IP)) to bring about needed improvements in efficiency and safety of operations to meet increasing levels of air traffic. This paper will discuss the development of an approach that completely describes optimal data link architecture configuration and behavior to meet the multiple conflicting objectives of concurrent and different operations functions. The practical application of the approach enables the design and assessment of configurations relative to airspace operations phases. The approach includes a formal taxonomic classification, an architectural analysis methodology, and optimization techniques. The formal taxonomic classification provides a multidimensional correlation of data

link performance with data link service, information protocol, spectrum, and technology mode; and to flight operations phase and environment. The architectural analysis methodology assesses the impact of a specific architecture configuration and behavior on the local ATM system performance. Deterministic and stochastic optimization techniques maximize architectural design effectiveness while addressing operational, technology, and policy constraints.
Author
Air Traffic Control; Data Links; Architecture (Computers); Optimization; Communication Networks

20030000656 General Accounting Office, Washington, DC USA
Air Traffic Control: Impact of Revised Personnel Relocation Policies Is Uncertain
Oct. 2002; 22p; In English
Report No.(s): PB2003-100958; GAO-03-141; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In fiscal year 2001, the Federal Aviation Administration (FAA) spent more than $15 million to move air traffic controllers (who are responsible for controlling the takeoff, landing, and ground movement of planes) and their managers (who oversee and administer the air traffic control program) to new permanent duty locations. FAA classifies the funds that it spends for these moves as permanent change of station (PCS) benefits. In 1998, as part of a broader effort to reform its personnel policies, FAA changed its policies on PCS benefits. Instead of fully reimbursing the costs of all PCS moves and prohibiting unfunded PCS moves, as it once did, FAA now determines the amount of PCS benefits to be offered on a position-by-position basis. Under its new policies, FAA can fully reimburse the costs of a move if it determines that the move is in the interest of the government, or it can offer partial (fixed) relocation benefits if it determines that the agency will derive some benefit from the move. Under the new policy, employees and managers can now also move at their own expense. We examined the impact of these changes in PCS policies on FAA's Air Traffic Services organization.
NTIS
Personnel Management; Relocation; Air Traffic Controllers (Personnel)

20030001040 North Carolina Agricultural and Technical State Univ., Dept. of Industrial and Systems Engineering, Greensboro, NC USA
Examining the Pilot and Controller Performance Data When in a Free Flight with Weather Phenomenon ***Final Report, Dec. 2001 - Dec. 2002***
Nituen, Celestine A., North Carolina Agricultural and Technical State Univ., USA; Dec. 06, 2002; 58p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG2-1469
Report No.(s): Rept-4-42110; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The present study investigated effects of weather related factors on the performance of pilots under free flight. A weather scenario was defined by a combination of precipitation factors (light rain, moderate rain, and heavy rain or snow), visibility (1,4,8 miles), wind conditions (light, medium, or heavy), cloud ceiling (800ft. below, 1800ft above, and 4000ft horizontal). The performance of the aircraft self-separation was evaluated in terms of detection accuracy and detection times for student- and commercial (expert) pilots. Overall, the results obtained from a behavioral analysis showed that in general, the ability to recognize intruder aircraft conflict incidents, followed by the ability to acquire the spatial location of the intruder aircraft relative to ownership aircraft were judged to be the major cognitive tasks as perceived by the participants during self-separation. Further, the participants rarely used cockpit display of traffic information (CDTI) during conflict management related to aircraft separation, but used CDTI highly during decision-making tasks. In all weather scenarios, there were remarkable differences between expert and student pilots in detection times. In summary, weather scenarios were observed to affect intruder aircraft detection performance accuracies. There was interaction effects between weather Scenario-1 and Scenario-2 for climbing task data generated by both expert- and student- pilots at high traffic density. Scenario-3 weather condition provided an opportunity for poor detection accuracy as well as detection time increase. This may be attributed to low visibility. The intruder aircraft detection times were not affected by the weather conditions during climbing and descending tasks. The decision of pilots to fly into certain weather condition was dependent in part on the warning distance to the location of the weather. When pilots were warned of the weather conditions, they were more likely to fly their aircraft into it, but mostly when the warning was not close to the weather location.
Author
Free Flight; Cockpits; Weather; Pilot Performance; Air Traffic Control

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

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

20030000441 NASA Langley Research Center, Hampton, VA USA
A Novel Approach to Rotorcraft Damage Tolerance
Forth, Scott C., NASA Langley Research Center, USA; Everett, Richard A., Army Research Lab., USA; Newman, John A., Army Research Lab., USA; [2002]; 18p; In English; 6th Joint FAA/DOD/NASA, 16-19 Sep. 2002, San Francisco, CA, USA; Sponsored by Federal Aviation Administration, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Damage-tolerance methodology is positioned to replace safe-life methodologies for designing rotorcraft structures. The argument for implementing a damage-tolerance method comes from the fundamental fact that rotorcraft structures typically fail by fatigue cracking. Therefore, if technology permits prediction of fatigue-crack growth in structures, a damage-tolerance method should deliver the most accurate prediction of component life. Implementing damage-tolerance (DT) into high-cycle-fatigue (HCF) components will require a shift from traditional DT methods that rely on detecting an initial flaw with nondestructive inspection (NDI) methods. The rapid accumulation of cycles in a HCF component will result in a design based on a traditional DT method that is either impractical because of frequent inspections, or because the design will be too heavy to operate efficiently. Furthermore, once a HCF component develops a detectable propagating crack, the remaining fatigue life is short, sometimes less than one flight hour, which does not leave sufficient time for inspection. Therefore, designing a HCF component will require basing the life analysis on an initial flaw that is undetectable with current NDI technology.
Author
Aircraft Structures; Rotary Wing Aircraft; Fatigue (Materials); Crack Propagation; Cracking (Fracturing); Tolerances (Mechanics); Service Life; Failure Analysis

20030000557 Army Training and Doctrine Command, Dismounted Battlespace Battle Lab., Fort Monroe, VA USA
Aviation Urban Operations Multiservice Procedures for Aviation Urban Operations FM 3-06/1, MCRP 3-35/3A, NTTP 3-01.04, and AFTP(l)3-2.29
Apr. 2001; 126p; In English; Original contains color images
Report No.(s): AD-A407365; PCN-14400008800; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Provides MTTP for tactical level planning and execution of fixed- and rotary-wing aviation urban operations. * Provides reference material to assist aircrew and ground personnel in planning and coordinating tactical urban operations. * Applies to all elements of a force planning and conducting aviation urban operations, including commanders, planners, aircrew, and ground personnel requiring aviation support. * This publication does not address all functions of airpower employment that may be used in urban operations (e.g. counterair, strategic attack, air interdiction, etc.), as these topics are addressed in other appropriate joint and Service publications.
DTIC
Military Operations; Aeronautics

20030000569 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA
Methodology for the Assessment of the Capability of Inspection Systems for Detection of Subsurface Flaws in Aircraft Turbine Engine Components *Final Report*
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): PB2003-100820; DOT/FAA/AR-01/96; No Copyright; Avail: National Technical Information Service (NTIS)

A new methodology for determining probability of detection is described. Physical models are used heavily during the inspection process to minimize the amount of empirical data that must be gathered. This report includes a general review of various methodologies for determining probability of detection as well as a detailed discussion of the new approach that is being applied to the ultrasonic detection of internal inclusions in the rotating components of aircraft engines. Results of its application to the ultrasonic detection of flat-bottom holes and synthetic hard-alpha inclusions in laboratory measurements on flat plate samples are presented as well as a comparison to results obtained by other methodologies. This report summarizes the ongoing experiments and analysis aimed at validating the methodology of full geometry components in an industrial setting and extending its

predictions to the detection of naturally occurring flaws. New tools will further reduce the need for empirical experiments through the use of physical models of microstructural effects on the ultrasonic response are included.
NTIS
Detection; Defects; Engine Parts; Gas Turbine Engines; Inspection

20030000640 Army Vehicle Technology Center, Hampton, VA USA
Crash Simulation of Vertical Drop Tests of Two Boeing 737 Fuselage Sections ***Final Report***
Jackson, Karen E.; Fasanella, Edwin L.; Aug. 2002; 96p; In English
Report No.(s): AD-A407558; DOT/FAA/AR-02/62; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
A 30-ft/s vertical drop test of a 10-ft-long fuselage section of a Boeing 737 (B737) aircraft was conducted in October of 1999 at the Federal Aviation Administration (FAA) William J. Hughes Technical Center, Atlantic City International Airport, NJ. This test was performed to evaluate the structural integrity of a conformable auxiliary fuel tank mounted beneath the fuselage floor and to determine its effect on the structural response of the airframe. A second drop test of a similar B737 fuselage section was conducted in November of 2000 in which two different overhead stowage bins were evaluated. These tests present an invaluable opportunity to evaluate the capabilities of computational tools for crash simulation through analytical and experimental correlation. To perform this evaluation, a full-scale three-dimensional finite element model of the fuselage section was developed. A crash simulation was conducted using the explicit, nonlinear transient dynamic code, MSC.DytranTM. For the initial simulation, structural deformation and floor-level acceleration responses were generated and correlated with experimental data obtained during the drop test of the B737 fuselage section with the auxiliary fuel tank. The focus of the follow-on simulation was to develop pretest predictions of the fuselage and overhead bin responses for correlation with data from the vertical drop test of the second B737 fuselage section. An assessment of the accuracy of the pretest predictions was made and model improvements were suggested. Several of the model improvements were implemented and the effects of the changes on model accuracy were evaluated.
DTIC
Drop Tests; Fuel Tanks; Transport Aircraft

20030000663 Air Command and Staff Coll., Maxwell AFB, AL USA
The B-2A and 500 Pound JDAM: A New Concept of Mass
Basham, Steven L.; Apr. 2001; 41p; In English
Report No.(s): AD-A407464; AU/ACSC/022/2001-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
As a key tenant of Joint Vision 2020 and one of the core competencies of the USA Air Force, precision strike is a key component to fast and decisive victory in war and some operations other than war. Precision strike is now more than ever the norm for employment of military forces and especially the air arm. The capability of a single or multiple B-2s, carrying 80, 500-pound near-precision weapons each, to strike a large number of targets with precision, while evading enemy radar, minimizes the number of aircrews in danger and maximizes the effects across the strategic, operational, and tactical levels of the campaign. With limited assets, the USA military must maximize the effectiveness of each weapon system. This paper gives a closer look into the concept of operations for employing the B-2 and JDAM 82. The B-2's long-range, stealth, and heavy-payload capabilities coupled with the JDAM 82's near-precision accuracy make an extremely viable weapon system across a range of operational scenarios. When considering the appropriate use of the B-2 carrying the JDAM 82, there are a number of influences that should be considered such as collateral damage, weather, enemy air defenses, intelligence, mission planning, and aircrew workload. Considering these influences provides the foundation for understanding how to employ the B-2 with the JDAM 82 to achieve a desired outcome in differing scenarios.
DTIC
Aircraft; Weapon Systems; Military Operations

20030000809 Marine Corps Development and Education Command, Quantico, VA USA
The Expanding Mission of the CH-53E Heavy Lift Helicopter
Payne, Brian J.; Apr. 11, 2002; 48p; In English
Report No.(s): AD-A407595; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper will attempt to answer the question as to whether the Marine Corps heavy lift helicopter mission has changed and expanded beyond the capabilities, design, and acceptable risk for the CH-53E to support the Marine Air Ground Task Force (MAGTF) and joint missions with continued success. This paper will also analyze the Marine Corps doctrine for employment

of the CH-53E in comparison to the actual employment of the aircraft on actual missions and identify if a mismatch exists and what needs to be done to ensure mission success in the future.
DTIC
Helicopters; Transport Aircraft; Heavy Lift Helicopters

20030001584 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
F/A-18A/B/C/D F404-GE-400/402 Engine Slotted Spraybar Inlet Flameholder Follow-On Flight Test Evaluation
Pleard, Mary; Whitley, Scott; Sep. 23, 2002; 70p; In English; Original contains color images
Contract(s)/Grant(s): NAWCADPAX/RTR-2001/1
Report No.(s): AD-A407860; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The current production F404-GE-400/402 flameholder (P/N 6056T68G07) experiences a high rate of replacement in the F/A-18A-D fleet, The replacement of the F404-GE400 (-400) and F404-GE-402 (-402) flameholder requires the removal of the spraybars and support links, which can only be accomplished with the removal of the engine from the aircraft, For the -402 engine, flameholder replacement is the number one reason for unscheduled engine removals. The flameholder is exchangeable between the 402 and -400 engine, although the flameholder installed in the 402 engine has a lower life than the -400 engine flameholder because of the increased temperature severity to which the flameholder is exposed. A slotted flameholder designed to allow flameholder replacement with the engine installed in the aircraft was determined to be the best design solution. It would not require any modification to other afterburner (A/B) hardware, and after the initial installation the flameholder could be removed with the engine installed. Previous flight tests were conducted with the first version of the slotted flameholder (P/N 6056T68G10GK). Improvements to durability and operability were incorporated into the second flight test version of the slotted flameholder (P/N 6056T68G10G1) in an attempt to produce a slotted flameholder with similar durability and operability as the current production flameholder. The purpose of this flight test was to evaluate the A/B light-off performance of the slotted flameholder (P/N 6056T68G10G1) for the F/A-18A-D aircraft with F404-GE-400/402 engines. These tests were conducted from 20-28 September 2000. While evaluating the slotted flameholder, some degradation in light-off performance was observed in the upper left-hand corner of the F/A-18A-D flight envelope.
DTIC
Engine Inlets; Flame Holders; Flight Tests; F-18 Aircraft; Aircraft Engines

20030001683 Alabama Univ., Huntsville, AL USA
Unmanned Hybrid Vehicle. Volume 2 ***Final Report***
Flynt, Jamie L.; Quick, Dana M.; Morris, Geof F.; Pierce, Jennifer C.; Frederick, Robert A., Jr; Sep. 27, 2002; 113p; In English
Contract(s)/Grant(s): DAAH01-01-C-R160
Report No.(s): AD-A407940; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Aviation and ground systems must increase use of emerging and advanced technologies to remain viable in complex, future battlefield environments. Unmanned vehicles will become part of future military operations due to: the demand for immediate intelligence on the battlefield, decreasing defense budgets, increasing operational tempos, and the low tolerance for casualties by the public. This work develops and evaluates system level concepts that fulfill these overall requirements using an unmanned hybrid vehicle. The unmanned hybrid vehicle combines the attributes of an autonomous vertical takeoff and landing air vehicle and an autonomous ground vehicle. This allows fast, flexible deployment and quiet, longer duration ground missions. The assumed time of deployment is the year 2012. The study included requirements definition, concept synthesis, and down selection to three final configurations. Engineering students from the University of Alabama in Huntsville and Ecole Superneure des Techniques Aeronautiques et de Construction Automobile participated on three competing design teams. Team I developed a basic system with coaxial rotors and a fuel cell drive system. The system is one unit that can both fly and operate on the ground. Team 2 developed a separate air and ground vehicle with intermeshing rotors. The integrated ground unit is deployed and retrieved by the air system. Team 3 also developed a separate air and ground vehicle but with a single rotor system that also requires a tail rotor.
DTIC
Pilotless Aircraft; Unmanned Ground Vehicles; Vertical Takeoff Aircraft; Rotary Wing Aircraft; Autonomy

20030001963 CC Technologies Labs., Inc., Dublin, OH USA
Corrosion Morphology in Lap Joints ***Final Report, 1 Apr. 1999-31 May 2000***
Koch, Gerhardus H.; Styborski, Steve E.; Jun. 2000; 40p; In English; Original contains color images
Contract(s)/Grant(s): F33601-96-D-J017
Report No.(s): AD-A407945; AFRL-VA-WP-TR-2002-3032; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes a metallographic evaluation of lap joint corrosion as a function of location on a KC-135 aircraft. Sites for examination were selected on the fuselage and wings of the aircraft. Both two- and three-dimensional metallographic montages were prepared to characterize the corrosion damages and to determine the extent of the corrosion penetrations. Depending on the location on the airplane, different forms of corrosion were detected, which were dependent on the alloy microstructure. Examination of the microstructure and electrochemical tests provided insight into the distribution and type of corrosion observed in the lap joints.
DTIC
Aging (Materials); Corrosion; Aircraft Maintenance; C-135 Aircraft

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.

20030000444 NASA Langley Research Center, Hampton, VA USA
Technology Roadmap for Dual-Mode Scramjet Propulsion to Support Space-Access Vision Vehicle Development
Cockrell, Charles E., Jr., NASA Langley Research Center, USA; Auslender, Aaron H., NASA Langley Research Center, USA; Guy, R. Wayne, NASA Langley Research Center, USA; McClinton, Charles R., NASA Langley Research Center, USA; Welch, Sharon S., NASA Langley Research Center, USA; [2002]; 14p; In English; 11th AIAA/AAAF International Space Planes and Hypersonic Systems, 24 Sep. - 4 Oct. 2002, Orleans, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-5188; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Third-generation reusable launch vehicle (RLV) systems are envisioned that utilize airbreathing and combined-cycle propulsion to take advantage of potential performance benefits over conventional rocket propulsion and address goals of reducing the cost and enhancing the safety of systems to reach earth orbit. The dual-mode scramjet (DMSJ) forms the core of combined-cycle or combination-cycle propulsion systems for single-stage-to-orbit (SSTO) vehicles and provides most of the orbital ascent energy. These concepts are also relevant to two-stage-to-orbit (TSTO) systems with an airbreathing first or second stage. Foundation technology investments in scramjet propulsion are driven by the goal to develop efficient Mach 3-15 concepts with sufficient performance and operability to meet operational system goals. A brief historical review of NASA scramjet development is presented along with a summary of current technology efforts and a proposed roadmap. The technology addresses hydrogen-fueled combustor development, hypervelocity scramjets, multi-speed flowpath performance and operability, propulsion-airframe integration, and analysis and diagnostic tools.
Author
Reusable Launch Vehicles; Supersonic Combustion Ramjet Engines; Ascent Propulsion Systems; Systems Analysis; Propulsive Efficiency; Research and Development; Propulsion System Performance

20030001697 Universitaet der Bundeswehr, Fachbereich Maschinenbau, Hamburg Germany
Thermodynamic State Diagnosis of a Gas Turbine System with Recuperative Heat Recovery ***Thermodynamische Zustandsdiagnose einer Gasturbinenanlage mit rekuperativer Warmerueckgewinnung***
Hoeben-Stoermer, Ruediger; Dec. 2000; 103p; In German
Report No.(s): AD-A407930; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The goal of this dissertation is to pursue the requests of manufactures and distributors to develop further the existing paradigms of diagnosis for gas turbine systems in order to widen the additional components and thereby to achieve a contribution to the condition-oriented maintenance of gas turbine systems. The author gives an overview of the processes that enable him to judge the condition of gas turbine systems. In terms of financability, the author then mentions how the whole project potentially could save manufactures and distributors alike a great deal of investment. The last chapter concerns itself with the diagnosis of the suction filter and compressor.
DTIC
Gas Turbines; Thermodynamics; Diagnosis

20030001760 Lawrence Livermore National Lab., Livermore, CA USA

Advancement and Refinement of HyperSoar Modeling

Carter, P. H.; Pines, D. J.; vonEggers Rudd, L.; Feb. 25, 2000; 32p; In English

Report No.(s): DE2002-793451; UCRL-ID-137756; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report discusses the topic of periodic cruise trajectories for hypersonic flight. An extensive review of previous work associated with periodic cruise trajectories for subsonic, supersonic and hypersonic flight is presented to provide the background for this investigation. The primary objective of this report is to discuss why periodic cruise trajectories lead to near fuel-optimal trajectories from a heuristic, mathematical and computational perspective with air breathing propulsion. Results to date indicate that periodic achieves greater fuel savings by exchanging kinetic and potential energy more efficiently. The vehicle attempts to chatter back and forth between where the vehicle wants to fly for optimum aerodynamic and propulsive performance. Results from computational simulations are inconclusive and require further work to define appropriate interfaces for aerodynamic and propulsion data decks for input into the POST software. The notional design of a vehicle to fly periodic hypersonic cruise trajectories was improved by including concepts for engine installation, flight controls and by including considerations for off-design performance. This notional design provides a better starting point for more serious and complete vehicle design studies.

NTIS

Cruising Flight; Hypersonic Flight; Trajectory Optimization; Air Breathing Engines

20030001846 Air Force Research Lab., Propulsion Directorate, USA

Probabilistic Research at the AFRL Turbine Engine Division

Brown, Jeffrey M., Air Force Research Lab., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 9-16; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

This viewgraph presentation provides information on probabilistic analysis research at the AFRL (Air Force Research Laboratory). The vision of the AFRL is to use probabilistic analysis pragmatically to reduce weight and improve durability of turbine engine components. The AFRL is engaged in the following activities: Evolving industry standard work towards probabilistics; Demonstrating probabilistics on fielded components; Demonstrating probabilistics design on new designs; Incorporating probabilistic design into ENSIP.

Derived from text

Armed Forces (USA); Probability Theory; Turbine Engines

20030001847 Naval Air Systems Command, USA

Naval Air Systems Command Propulsion and Power Systems Probabilistics Overview

Zimmerman, Paul, Naval Air Systems Command, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 17-24; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

This viewgraph presentation provides information on research the United States Navy is conducting into probabilistic design methods for naval aircraft engines. Engine rotors and blades receive special attention, as well as aircraft safety, and reduction of total ownership cost.

Derived from text

Navy; Military Aircraft; Aircraft Engines; Engine Design; Probability Theory

20030001849 Federal Aviation Administration, Engine and Propeller Directorate, USA

FAA/USAF/NASA/Navy Workshop on the Application of Probabilistic Methods to Gas Turbine Engines

Fernandez, Jorge, Federal Aviation Administration, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 41-48; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

This viewgraph presentation provides information on the risk of accidents on commerical aircraft flights due to engine failure. The FAA is interested in working with the aviation industry to develop a DT (Damage Tolerance) philosophy, and increasing the durability of rotating engine components.

CASI

Civil Aviation; Gas Turbine Engines; Engine Failure; Aircraft Safety

20030001851 Massachusetts Inst. of Tech., Cambridge, MA USA

An Overview of the MIT Gas Turbine Laboratory Robust Jet Engines Project

Darmofal, D., Massachusetts Inst. of Tech., USA; Garzon, V., Massachusetts Inst. of Tech., USA; Sidwell, V., Massachusetts Inst. of Tech., USA; Engelhardt, F., Massachusetts Inst. of Tech., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 97-119; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

In this presentation, we will overview the M.I.T. Gas Turbine Laboratory Robust Aerothermal Design effort. Initiated in the fall of 1999, the five-year goals of this program are: 1) Identification and quantification of key drivers for engine-to-engine variability in aerothermal quality including validation against data. 2) Definition of criteria for the design of engines with a commercially significant reduction in sensitivity to variability including analysis of cost trade-offs. 3) Development of improved processes for monitoring and controlling the effects of variability on aerothermal quality. 4) Implementation of one or more of the above elements in an industrial setting. The effort currently involves four faculty members, four graduate research students, interactions with engine manufacturers including Pratt & Whitney and SNECMA, and support from NASA Glenn Research Center. On-going projects within the group are: Quantification and modeling of geometric variations for compressor blades due to manufacturing; Probabilistic, robust design of compressor blades with geometric variability; Impact of secondary flow system variability and modeling uncertainty on bearing load and turbine durability; Identification of key drivers for variability in combustor stability. Our talk will include both an overview of the program goals and a status report of the on-going research projects.

Author

Gas Turbine Engines; Laboratories; Engine Design; Aerothermodynamics

20030001853 NASA Glenn Research Center, Cleveland, OH USA

Risk-Based Probabilistic Approach to Aeropropulsion System Assessment

Tong, Michael T., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 139-164; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

In an era of shrinking development budgets and resources, where there is also an emphasis on reducing the product development cycle, the role of system assessment, performed in the early stages of an engine development program, becomes very critical to the successful development of new aeropropulsion systems. A reliable system assessment not only helps to identify the best propulsion system concept among several candidates, it can also identify which technologies are worth pursuing. This is particularly important for advanced aeropropulsion technology development programs, which require an enormous amount of resources. In the current practice of deterministic, or point-design, approaches, the uncertainties of design variables are either unaccounted for or accounted for by safety factors. This could often result in an assessment with unknown and unquantifiable reliability. Consequently, it would fail to provide additional insight into the risks associated with the new technologies, which are often needed by decision makers to determine the feasibility and return-on-investment of a new aircraft engine. In this work, an alternative approach based on the probabilistic method was described for a comprehensive assessment of an aeropropulsion system. The statistical approach quantifies the design uncertainties inherent in a new aeropropulsion system and their influences on engine performance. Because of this, it enhances the reliability of a system assessment. A technical assessment of a wave-rotor-enhanced gas turbine engine was performed to demonstrate the methodology. The assessment used probability distributions to account for the uncertainties that occur in component efficiencies and flows and in mechanical design variables. The approach taken in this effort was to integrate the thermodynamic cycle analysis embedded in the computer code NEPP (NASA Engine Performance Program) and the engine weight analysis embedded in the computer code WATE (Weight Analysis of Turbine Engines) with the fast probability integration technique (FPI). FPI was developed by Southwest Research Institute under contract with the NASA Glenn Research Center. The results were plotted in the form of cumulative distribution functions and sensitivity analyses and were compared with results from the traditional deterministic approach. The comparison showed that the probabilistic approach provides a more realistic and systematic way to assess an aeropropulsion system. The current work addressed the application of the probabilistic approach to assess specific fuel consumption, engine thrust, and weight. Similarly, the approach can be used to assess other aspects of aeropropulsion system performance, such as cost, acoustic noise, and emissions. Additional information is included in the original extended abstract.

Author

Aircraft Engines; Design Analysis; Engine Design; Fuel Consumption; Thrust; Weight Analysis; Gas Turbine Engines; Technology Assessment; Risk; Probability Distribution Functions; Probability Theory

20030001860 European Association of Aerospace Industries, Rotor Integrity Sub-Committee, Derby, UK

A Probabilistic Approach to Anomalies in High Energy Turbine Discs

Corran, Richard S. J., European Association of Aerospace Industries, UK; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 263-278; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

During the last decade the work of the Rotor Integrity Sub-Committee of the Aerospace Industries Association has been directed to reducing the probability of burst of high energy rotors whose failure may hazard the airframe. AC 33.14.1, recently issued, represents the first fruits of this work and addresses the potential failure of titanium rotor hubs through the presence of hard alpha particles introduced in the melt process. Current work is directed at the possibility of failure of a hub due to an anomaly introduced during the manufacturing processes. Both of these potential failures have occurred previously in well publicised events. This paper gives a review of the RISC work in the light of the AC and reports on the current state of material cleanliness as evidenced by recent reports of finds in billet material. This is followed by an account of the current work on surface damage tolerance. As a first consideration, work is aimed at anomalies arising in holemaking in turbine discs. The strategy is to derive an underlying rate and size distribution captured in an exceedance curve which will allow individual Original Equipment Manufacturers (OEMs) to determine whether special measures for achieving increased quality of manufacture are required. In this development key decisions must be made about how the probability of burst should be estimated and how experience in the past can be used to determine the underlying exceedance curve. Finally thought must be given to the incorporation of improved controls and how the benefit of these can be captured in the method.

Author

Anomalies; Probability Theory; Turbines; Rotor Dynamics; Tolerances (Mechanics)

20030001861 Southwest Research Inst., San Antonio, TX USA

Turbine Rotor Material Design

Leverant, Gerald R., Southwest Research Inst., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 279-288; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

Premium grade titanium alloys are used for fan and compressor rotors and disks in aircraft turbine engines. Occasional upsets during processing can result in the formation of metallurgical anomalies referred to as hard alpha (HA). Although rare, low cycle fatigue cracks initiated by HA have led to uncontained engine failures that resulted in fatal accidents such as the incident at Sioux City, Iowa in 1989. In a report issued by the Federal Aviation Administration (FAA) after the accident at Sioux City, it was recommended that a damage tolerance approach be implemented to explicitly address HA anomalies, with the objective of enhancing conventional rotor life management methodology. The probabilistic, damage tolerance code developed in this program for low-cycle fatigue of titanium rotors/disks is intended to supplement, not replace, the current safe-life design. The code is called Design Assessment for Reliability with Inspection (DARWIN) and was developed in collaboration with General Electric, Honeywell, Pratt & Whitney, and Rolls-Royce. DARWIN integrates finite element stress analysis, fracture mechanics analysis, non-destructive inspection simulation, and probabilistic analysis to assess the risk of rotor fracture. The code has been readied for industrial use and has been licensed to several OEM's. Supplementary tasks being performed in this program in support of code implementation include the generation of fatigue crack growth data for Ti-64, Ti-6242, and Ti-17 in high vacuum; determination of the crack initiation behavior of artificial and natural HA defects embedded in plates and disks of Ti-64; and development of a forging microcode to predict the movement, shape and orientation of HA anomalies during processing from ingot to billet and from billet to a disk forging.

Author

Rotors; Turbine Engines; Mechanical Properties; Probability Theory; Fracture Mechanics; Systems Engineering

20030001865 Rolls-Royce Ltd., Derby, UK

Integrating the Probability of Burst Over Volume

Corran, Richard S. J., Rolls-Royce Ltd., UK; Pacey, K., Rolls-Royce Ltd., UK; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 391-408; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

AC 33.14.1 introduces the concept of a probabilistic assessment of the risk of burst of a high energy rotor in a gas turbine engine from a hard alpha type particle in a titanium rotor disc. The method uses an exceedance curve which gives the probability per unit mass of an anomaly, in this case hard alpha being larger than the given size. Fracture mechanics is used to calculate the size of initial crack which will just fail (or survive) the required life of the part. The probability of burst of the rotor is then simply the integral of: Pr(Burst)=integral/volume pr(Exceeding a(sub crit))density.dv where a(sub crit) is the critical crack size for the

small volume element dv and the exceedance curve give the Pr(exceeding a(sub crit)). In the method described in the AC the component is divided into zones in each of which a(sub crit) is assumed constant. In practice it varies continuously across the part. This paper examines different strategies of using Gaussian integration as used in the formulation of the stiffness matrices in finite elements to identify an optimum combination of convergence and minimisation of the number of points at which fracture mechanics need be performed. This recognizes that performing the fracture mechanics calculations in such assessments is often the most time consuming aspect of the work.
Author
Alpha Particles; Probability Theory; Risk; Gas Turbine Engines; Fracture Mechanics; Crack Initiation; Failure Analysis; Rotor Blades (Turbomachinery)

20030001867 ANSYS, Inc., Canonsburg, PA USA
Probabilistic Analysis of Gas Turbine Components Using the New ANSYS Probabilistic Design System
Reh, Stefan, ANSYS, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 441-453; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The paper illustrates the capabilities of the new probabilistic design system (PDS) implemented and available in ANSYS 5.7. The individual probabilistic methods are illustrated and their use in the context of gas turbine engine design is illustrated. The post-processing capabilities of the ANSYS-PDS allow the engine designer and/or analyst to address the reliability and quality of the design.
Author
Gas Turbine Engines; Engine Design; Engine Parts; Reliability Analysis; Structural Analysis; Design Optimization; Probability Theory; Turbine Blades

20030001868 Applied Research Associates, Inc., Raleigh, NC USA
Probabilistic Analysis of a Stator Ladder Using ProFES
Cesare, Mark A., Applied Research Associates, Inc., USA; Pentz, Alan C., Naval Air Systems Command, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 455-466; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The purpose of this investigation was to apply probabilistic methods to determine the probability of failure associated with torque loads and sensitivity to model variable/inputs on the stage 3 compressor stator vane ladder configuration used in the F405-RR-401 Adour engine. The analysis was performed using ProFES. ProFES is a probabilistic finite element analysis system that allows engineers to perform probabilistic finite element analysis in a 3D environment that is completely familiar and similar to modern deterministic FEA. A deterministic approach was used previously using a commercial FEA package called ANSYS. An underlying purpose of this investigation was to gauge the accuracy and timesaving that a probabilistic approach could provide to this problem versus a deterministic approach.
Author
Probability Theory; Aircraft Engines; Loads (Forces); Turbine Blades; Reliability Analysis; Finite Element Method; Failure Analysis; Fatigue Life

20030001869 Air Force Research Lab., Propulsion Directorate, Wright-Patterson AFB, OH USA
Workshop on Probabilistic Design Validation
Brown, Jeffrey M., Air Force Research Lab., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 467-473; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

This viewgraph presentation provides a general consideration of validation issues concerning probability theory design models. These paradigms seek to predict the design life cycle or failure rate for material components. Military planners and industrial engineers have been very interested in applying these techniques to the design and production of aircraft gas turbine engine parts such as turbine blades and rotor disks. Key issues covered include: validation design, data acquisition, data collection, data analysis and validation tests.
Author
Gas Turbine Engines; Engine Parts; Probability Theory; Reliability Analysis; Life (Durability); Failure Analysis; Evaluation

20030001874 NASA Glenn Research Center, Cleveland, OH USA

Transient Reliability of Ceramic Structures For Heat Engine Applications

Nemeth, Noel N., NASA Glenn Research Center, USA; Jadaan, Osama M., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 555-586; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The objectives of this report was to develop a methodology to predict the time-dependent reliability (probability of failure) of brittle material components subjected to transient thermomechanical loading, taking into account the change in material response with time. This methodology for computing the transient reliability in ceramic components subjected to fluctuation thermomechanical loading was developed, assuming SCG (Slow Crack Growth) as the delayed mode of failure. It takes into account the effect of varying Weibull modulus and materials with time. It was also coded into a beta version of NASA's CARES/Life code, and an example demonstrating its viability was presented.

Derived from text

Reliability Analysis; Ceramics; Life (Durability); Applications Programs (Computers); Engine Parts; Heat Engines; Brittle Materials

20030001876 NASA Glenn Research Center, Cleveland, OH USA

Probabilistic Life and Reliability Analysis of Model Gas Turbine Disk

Holland, Frederic A., NASA Glenn Research Center, USA; Melis, Matthew E., NASA Glenn Research Center, USA; Zaretsky, Erwin V., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 603-625; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

In 1939, W. Weibull developed what is now commonly known as the "Weibull Distribution Function" primarily to determine the cumulative strength distribution of small sample sizes of elemental fracture specimens. In 1947, G. Lundberg and A. Palmgren, using the Weibull Distribution Function developed a probabilistic lifing protocol for ball and roller bearings. In 1987, E. V. Zaretsky using the Weibull Distribution Function modified the Lundberg and Palmgren approach to life prediction. His method incorporates the results of coupon fatigue testing to compute the life of elemental stress volumes of a complex machine element to predict system life and reliability. This paper examines the Zaretsky method to determine the probabilistic life and reliability of a model gas turbine disk using experimental data from coupon specimens. The predicted results are compared to experimental disk endurance data.

Author

Gas Turbines; Life (Durability); Reliability Analysis; Weibull Density Functions; Probability Theory

20030001881 STI Technologies, Inc., Rochester, NY USA

Generalized Response Surface Modeling for Stochastic Mechanics Problems

Ghiocel, Dan M., STI Technologies, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 747-755; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

The paper describes stochastic models for idealizing complex random variations for gas turbine engine applications. Typically, these random variations are stochastic functions of space and/or time or different physical input random parameters. A key requirement for a good stochastic modeling is to be intimately related to the physics of the problem. The paper suggests different stochastic series models for approximation of stochastic surfaces that represent either input random surfaces or stochastic nonlinear response surfaces.

Author

Approximation; Gas Turbine Engines; Stochastic Processes; Reliability; Series Expansion

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.

20030001765 Defence Science and Technology Organisation, Information Technology Div., Canberra Australia

Mathematical Models for a Missile Autopilot Design

Faruqi, Farhan A.; Vu, Thanh L.; Aug. 2002; 46p; In English

Report No.(s): AD-A407845; DSTO-TN-0449; DODA-AR-012-430; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report considers the derivation of the mathematical model for a missile autopilot in state space form. The basic equations defining the airframe dynamics are non-linear, however, since the non-linearities are ”structured” (in the sense that the states are of quadratic form) a novel approach of expressing this non-linear dynamics in state space form is given. This should provide a useful way to implement the equations in a computer simulation program and possibly for future application of non-linear analysis and synthesis techniques, particularly for autopilot design of missiles executing high g-manoeuvres. This report also considers a locally linearised state space model that lends itself to better known linear techniques of the modem control theory. A coupled multi-input multi-output (MIMO) model is derived suitable for both the application of the modern control techniques as well as the classical time-domain and frequency domain techniques. This is validated by comparing the model with the other published results, and through both open and closed- loop systems simulations. The models developed are useful for further research on precision optimum guidance and control. It is hoped that the model will provide more accurate presentations of missile autopilot dynamics and will be used for adaptive and integrated guidance & control of agile missiles.

DTIC

Automatic Pilots; Mathematical Models; Control Systems Design; Missile Design; Time Domain Analysis

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).

20030000476 Department of Defense, Office of the Inspector General, Arlington, VA USA

Acquisition: Procedures for Selecting Contractor Personnel to Perform Maintenance on Army Aircraft in Bosnia

Sep. 18, 2002; 21p; In English

Report No.(s): AD-A407438; IG/DOD-D-2002-150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

No abstract available.

CASI

Aircraft Maintenance; Contractors; Personnel Selection; Military Aircraft; Government Procurement

20030000827 NASA Langley Research Center, Hampton, VA USA

The Efficacy of Using Synthetic Vision Terrain-Textured Images to Improve Pilot Situation Awareness

Uenking, Michael D., NASA Langley Research Center, USA; Hughes, Monica F., NASA Langley Research Center, USA; [2002]; 12p; In English; 2002 SAE World Aviation Congress and Display, 5-7 Nov. 2002, Phoenix, AZ, USA

Report No.(s): Rept-2001-01-2970; 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 is being 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 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. In this part of the 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. This paper focuses on the experimental set-up and final physiological results of the TP-HDD simulation experiment. The physiological measures of skin temperature, heart rate, and muscle response, show a

decreased engagement (while using the synthetic vision displays as compared to the baseline conventional display) of the sympathetic and somatic nervous system responses which, in turn, indicates a reduced level of mental workload. This decreased level of workload is expected to enable improvement in the pilot's situation and terrain awareness.
Author
Display Devices; Computerized Simulation; Situational Awareness; Pilot Performance; Physiological Responses; Terrain; Flight Simulators

20030000847 NASA Langley Research Center, Hampton, VA USA
Uncertainty Analysis of the Single-Vector Force Balance Calibration System
Parker, Peter A., NASA Langley Research Center, USA; Liu, Tianshu, NASA Langley Research Center, USA; [2002]; 7p; In English; 22nd AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 24-27 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-2792; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

This paper presents an uncertainty analysis of the Single-Vector Force Balance Calibration System (SVS). This study is focused on the uncertainty involved in setting the independent variables during the calibration experiment. By knowing the uncertainty in the calibration system, the fundamental limits of the calibration accuracy of a particular balance can be determined. A brief description of the SVS mechanical system is provided. A mathematical model is developed to describe the mechanical system elements. A sensitivity analysis of these parameters is carried out through numerical simulations to assess the sensitivity of the total uncertainty to the elemental error sources. These sensitivity coefficients provide valuable information regarding the relative significance of the elemental sources of error. An example calculation of the total uncertainty for a specific balance is provided. Results from this uncertainty analysis are specific to the Single-Vector System, but the approach is broad in nature and therefore applicable to other measurement and calibration systems.
Author
Force Distribution; Calibrating; Independent Variables; Vectors (Mathematics)

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.

20030000982 NASA Marshall Space Flight Center, Huntsville, AL USA
A New Direction for the NASA Materials Science Research Using the International Space Station
Schlagheck, Ronald A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; World Space Congress and ISS Utilization Conference, 9-17 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In 2001 NASA created a fifth Strategic Enterprise, the Office of Biological and Physical Research (OBPR), to bring together physics, chemistry, biology, and engineering to foster interdisciplinary research. The Materials Science Program is one of five Microgravity Research disciplines within this new Enterprise's Division of Physical Sciences Research. The Materials Science Program will participate within this new enterprise structure in order to facilitate effective use of ISS facilities, target scientific and technology questions and transfer results for Earth benefits. The Materials Science research will use a low gravity environment for flight and ground-based research in crystallization, fundamental processing, properties characterization, and biomaterials in order to obtain fundamental understanding of various phenomena effects and relationships to the structures, processing, and properties of materials. Completion of the International Space Station's (ISS) first major assembly, during the past year, provides new opportunities for on-orbit research and scientific utilization. The Enterprise has recently completed an assessment of the science prioritization from which the future materials science ISS type payloads will be implemented. Science accommodations will support a variety of Materials Science payload hardware both in the US and international partner modules with emphasis on early use of Express Rack and Glovebox facilities. This paper addresses the current scope of the flight and ground investigator program. These investigators will use the various capabilities of the ISS lab facilities to achieve their research objectives. The type of research and classification of materials being studied will be addressed. This includes the recent emphasis being placed on radiation shielding, nanomaterials, propulsion materials, and biomaterials type research. The Materials Science Program will pursue a new, interdisciplinary approach, which contributes, to Human Space Flight Exploration research. The Materials Science

Research Facility (MSRF) and other related American and International experiment modules will serve as the foundation for the flight research environment. A summary will explain the concept for materials science research processing capabilities aboard the ISS along with the various ground facilities necessary to support the program.
Author
International Space Station; Materials Science; Spaceborne Experiments

20030001127 NASA Marshall Space Flight Center, Huntsville, AL USA
An Automated Optical Fiber Puller for Use in Low-Earth Orbit
Tucker, Dennis S., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; XIIIth International Symposium on Non-Oxide Glasses and Advanced Materials, 9-13 Sep. 2002, Pardubice, Czech Republic, Czechoslovakia; No Copyright; Avail: Issuing Activity; Abstract Only

With the slowdown in space station construction, limiting astronaut time for scientific experiments, an effort is being made to automate certain experiments. One such experiment is production of heavy metal fluoride fibers in the microgravity environment. Previous work by this author and others have shown that microgravity inhibits crystallization of ZBLAN glass. Thus an automated experiment has been designed. This experiment will consist of several elements, one which includes the use of an autonomous robot to initiate fiber pulling. The first element will be to melt the preform to eliminate crystals. The preform tip will then be heated to the viscosity necessary for fiber drawing. The robot will initiate the draw and attach the fiber end to the take-up reel. Once fiber pulling has commenced, sensors will be used to detect a fiber break, whereupon the robot can re-initiate the pulling process. The fiber will be coated with a polymer and the polymer cured with ultraviolet light. A laser micrometer will be used to monitor fiber diameter. The experiment is designed so that up to 10 preforms can be pulled into fiber during one flight. The apparatus will be mounted on a free-flying carrier which will be placed into low-earth orbit from the cargo bay of the space shuttle by the shuttle robot arm. The experiment can be started by a signal from the shuttle or from the ground via telescience. The experiment will proceed automatically using specially designed algorithms and will be monitored from the ground. The carrier will be picked up by the shuttle before return to earth.
Author
Metal Fluorides; Optical Fibers; Ultraviolet Radiation; Low Earth Orbits; Heavy Metals

20030001131 Air Univ., School of Advanced Airpower Studies, Maxwell AFB, AL USA
Ten Propositions Regarding Spacepower
Smith, M. V.; Jun. 2001; 156p; In English
Report No.(s): AD-A407810; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This study rides the coattails of Colonel Phillip S. Meilinger's book, Ten Propositions Regarding Air Power. As the USA ponders its future regarding space operations, the time has come to flame similar propositions regarding spacepower. Specifically, this study seeks to answer the question, "What is the nature of spacepower?" It also tests the aerospace integration school's hypothesis that spacepower is simply a continuation or extension of airpower. Two points come immediately to the forefront of this work. First, spacepower is different from airpower even though both share the vertical dimension of warfare. Second, space operations have matured to a point wherein valid and unique propositions regarding spacepower are identifiable. The ten propositions presented here do not represent a complete list. The method used to derive these propositions involved literary research that resulted in a long list. The list evolved over three years during numerous brainstorming sessions with several space experts most of them space weapons officers with theater and often combat experience until the list was carefully refined into the ten most salient propositions. There were many ways to present the Ten Propositions Regarding Spacepower, but the author deferred to Meilinger's approach of citing each proposition as a thesis statement with supporting material immediately following. The objective of this work is to stimulate discussions and help those who do not yet understand or appreciate the nature of spacepower in modern warfare.
DTIC
Space Missions; Combat; Aerospace Systems

20030001132 Air Univ., School of Advanced Airpower Studies, Maxwell AFB, AL USA
Space-Derived Transparency: Players, Policies, Implications, and Synergies
Kinnan, C. J.; Jun. 2001; 138p; In English
Report No.(s): AD-A407812; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Space-derived transparency will become a common means of monitoring, preventing, and mitigating crises, verifying compliance with treaties and law, and enabling confidence and security building measures. Democratization and globalization, the proliferation of information technologies, the availability of commercial space high-resolution imagery, and the growing

influence of NGOs invite this question: What is (space-derived) transparency and what effect does it have on US security policy? Three camps have emerged in the debate -Horaeists who seek to build a transnational society through complete transparency; Preservationists, mostly military, who fear the threat to national security, want to deny most space-derived information to non-traditional/non-state actors; and Synergists who seek to capitalize on the best of both camps. There is evidence suggesting that space-derived transparency is an inevitable trend and will resist even the best means of preservationist control. Space-derived transparency may change the dynamic of the security environment by introducing new players into the policy fomentation and implementation process. These players, if not properly schooled in imagery analysis or the potential effects of their use of misinterpreted space-derived imagery, could force policy makers to make fast, ill-considered decisions in order to respond to incidents. In some cases this fast response will defuse potential crises and in other situations these rushed decisions might result in policies without considering the potential consequences, which could turn incidents into crises. Space-derived transparency is a step forward into the future for each camp . . . the challenge for the USA lies in forging synergies in an increasingly transparent world while maintaining the balance between openness and security.
DTIC
Astronautics; Satellite Imagery; Spaceborne Photography; Transparence

20030001576 NASA Marshall Space Flight Center, Huntsville, AL USA
Lessons Learned In Developing Multiple Distributed Planning Systems for the International Space Station
Maxwell, Theresa G., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; SpaceOps 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The planning processes for the International Space Station (ISS) Program are quite complex. Detailed mission planning for ISS on-orbit operations is a distributed function. Pieces of the on-orbit plan are developed by multiple planning organizations, located around the world, based on their respective expertise and responsibilities. The ”pieces” are then integrated to yield the final detailed plan that will be executed onboard the ISS. Previous space programs have not distributed the planning and scheduling functions to this extent. Major ISS planning organizations are currently located in the United States (at both the NASA Johnson Space Center (JSC) and NASA Marshall Space Flight Center (MSFC)), in Russia, in Europe, and in Japan. Software systems have been developed by each of these planning organizations to support their assigned planning and scheduling functions. Although there is some cooperative development and sharing of key software components, each planning system has been tailored to meet the unique requirements and operational environment of the facility in which it operates. However, all the systems must operate in a coordinated fashion in order to effectively and efficiently produce a single integrated plan of ISS operations, in accordance with the established planning processes. This paper addresses lessons learned during the development of these multiple distributed planning systems, from the perspective of the developer of one of the software systems. The lessons focus on the coordination required to allow the multiple systems to operate together, rather than on the problems associated with the development of any particular system. Included in the paper is a discussion of typical problems faced during the development and coordination process, such as incompatible development schedules, difficulties in defining system interfaces, technical coordination and funding for shared tools, continually evolving planning concepts/requirements, programmatic and budget issues, and external influences. Techniques that mitigated some of these problems will also be addressed, along with recommendations for any future programs involving the development of multiple planning and scheduling systems. Many of these lessons learned are not unique to the area of planning and scheduling systems, so may be applied to other distributed ground systems that must operate in concert to successfully support space mission operations.
Author
International Space Station; Mission Planning; Software Engineering; Distributed Processing

20030001709 Old Dominion Univ., Norfolk, VA USA
Young PHD’s in Human Space Flight, *1 Sep. 2001 - 1 Aug. 2002*
Wilson, Eleanor, Old Dominion Univ., USA; [2002]; 5p; In English
Contract(s)/Grant(s): NAG1-01121; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME) in cooperation with the NASA Office of Space Flight, Human Exploration and Development of Space Enterprise sponsored a summer institute, Young PHD#s (Persons Having Dreams) in Human Space Flight. This 3-day institute used the curriculum of a workshop designed for space professionals, ’Human Space Flight-Analysis and Design: An Integrated, Systematic Approach.’ The content was tailored to a high school audience. This institute seeks to stimulate the interest of pre-college students in space flight and motivate them to

pursue further experiences in this field. Additionally, this institute will serve as a pilot model for a pre- collegiate training program that can be replicated throughout the country. The institute was complemented with a trip to the Goddard Space Flight Center.
Author
Education; Minorities; Space Exploration; Organizations

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).

20030000579 NASA Marshall Space Flight Center, Huntsville, AL USA
Relocation of the Cryo-Test Facility to NASA-MSFC
Sisco, Jimmy D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Institute of Environment Sciences and Technology (IEST) 22nd Space Simulation Conference, 21-24 Oct. 2002, Ellicott City, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Environmental Test Facility (ETF), located at NASA-Marshall Space Flight Center, Huntsville, Alabama, has provided thermal vacuum testing for several major programs since the 1960's. The ETF consists of over 13 thermal vacuum chambers sized and configured to handle the majority of test payloads. Testing is performed around the clock with multiple tests being conducted simultaneously. Chamber selection to achieve the best match with test articles and juggling program schedules, at times, can be a challenge. The ETF's Sunspot chamber has had tests scheduled and operated back-to-back for several years and provides the majority of schedule conflicts. Future test programs have been identified which surpass the current Sunspot availability. This paper describes a very low cost alternate to reduce schedule conflicts by utilizing government excess equipment
Author
Environmental Tests; Test Facilities; Vacuum Chambers; Cryogenics

20030001135 National Air Intelligence Center, Wright-Patterson AFB, OH USA
Selected Articles
Nov. 04, 2002; 31p; Transl. into ENGLISH of Zhonggyo Hangtian (Aerospace China) (China) n175, p3-6, 13-15, 19, Nov 199; In English
Contract(s)/Grant(s): F33657-88-D-2188
Report No.(s): AD-A407821; NAIC-ID(RS)T-0258-96; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract.
Author
Resources Management; Aerospace Environments

20030001554 NASA Marshall Space Flight Center, Huntsville, AL USA
First Materials Science Research Facility Rack Capabilities and Design Features
Cobb, S., NASA Marshall Space Flight Center, USA; Higgins, D., NASA Marshall Space Flight Center, USA; Kitchens, L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; World Space Conference, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The first Materials Science Research Rack (MSRR-1) is the primary facility for U.S. sponsored materials science research on the International Space Station. MSRR-1 is contained in an International Standard Payload Rack (ISPR) equipped with the Active Rack Isolation System (ARIS) for the best possible microgravity environment. MSRR-1 will accommodate dual Experiment Modules and provide simultaneous on-orbit processing operations capability. The first Experiment Module for the MSRR-1, the Materials Science Laboratory (MSL), is an international cooperative activity between NASA's Marshall Space Flight Center (MSFC) and the European Space Agency's (ESA) European Space Research and Technology Center (ESTEC). The MSL Experiment Module will accommodate several on-orbit exchangeable experiment-specific Module Inserts which provide distinct thermal processing capabilities. Module Inserts currently planned for the MSL are a Quench Module Insert, Low Gradient Furnace, and a Solidification with Quench Furnace. The second Experiment Module for the MSRR-1 configuration is a commercial device supplied by MSFC's Space Products Development (SPD) Group. Transparent furnace assemblies include

capabilities for vapor transport processes and annealing of glass fiber preforms. This Experiment Module is replaceable on-orbit. This paper will describe facility capabilities, schedule to flight and research opportunities.
Author
Furnaces; Research Facilities; Test Facilities; Vapors; Microgravity; Glass Fibers

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.

20030000638 Iowa State Univ. of Science and Technology, Dept. of Aerospace Engineering and Engineering Mechanics, Ames, IA USA
Closed-Loop Endoatmospheric Ascent Guidance
Lu, Ping, Iowa State Univ. of Science and Technology, USA; Sun, Hongsheng, Iowa State Univ. of Science and Technology, USA; [2002]; 10p; In English; 2002 AIAA GN and C Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-01105; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This paper will present a complete formulation of the optimal control problem for atmospheric ascent of rocket powered launch vehicles subject to usual load constraints and final condition constraints. We shall demonstrate that the classical finite difference method for two-point-boundary-value-problems (TPBVP) is suited for solving the ascent trajectory optimization problem in real time, therefore closed-loop optimal endoatmospheric ascent guidance becomes feasible. Numerical simulations with a the vehicle data of a reusable launch vehicle will be provided.
Author
Ascent; Feedback Control; Optimal Control; Guidance (Motion); Optimization; Rocket Flight

20030000768 NASA Marshall Space Flight Center, Huntsville, AL USA
X-38 De-orbit Propulsion Stage MLI Performance Test
Kittredge, Ken, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 21p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
This paper presents a performance test of the X-38 Deorbit Propulsion Stage (DPS) Multi-Layer Insulation (MLI) system. The purpose of this test is to determine if MLI performance meets or exceeds thermal analyses requirements and if there is performance degradation due to seams.
CASI
Multilayer Insulation; Performance Tests; X-38 Crew Return Vehicle; Spacecraft Propulsion

20030000844 NASA Marshall Space Flight Center, Huntsville, AL USA
Atmospheric Ascent Guidance for Rocket-Powered Launch Vehicles
Dukeman, Greg A., NASA Marshall Space Flight Center, USA; [2002]; 17p; In English; AIAA Guidance, Navigation and Control Conference, 5-8 Aug. 2002, Monterey, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-4559; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

An advanced ascent guidance algorithm for rocket- powered launch vehicles is developed. This algorithm cyclically solves the calculus-of-variations two-point boundary-value problem starting at vertical rise completion through main engine cutoff. This is different from traditional ascent guidance algorithms which operate in a simple open-loop mode until high dynamic pressure (including the critical max-Q) portion of the trajectory is over, at which time guidance operates under the assumption of negligible aerodynamic acceleration (i.e., vacuum dynamics). The initial costate guess is corrected based on errors in the terminal state constraints and the transversality conditions. Judicious approximations are made to reduce the order and complexity of the state/costate system. Results comparing guided launch vehicle trajectories with POST open-loop trajectories are given verifying the basic formulation of the algorithm. Multiple shooting is shown to be a very effective numerical technique for this application. In particular, just one intermediate shooting point, in addition to the initial shooting point, is sufficient to significantly reduce sensitivity to the guessed initial costates. Simulation results from a high-fidelity trajectory simulation are given for the case of launch to sub-orbital cutoff conditions as well as launch to orbit conditions. An abort to downrange landing site formulation of the algorithm is presented.
Author
Ascent; Guidance (Motion); Launch Vehicles; Rocket Vehicles

20030000980 NASA Marshall Space Flight Center, Huntsville, AL USA
Manufacturing Process Simulation of Large-Scale Cryotanks
Babai, Majid, NASA Marshall Space Flight Center, USA; Phillips, Steven, NASA Marshall Space Flight Center, USA; Griffin, Brian, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA's Space Launch Initiative (SLI) is an effort to research and develop the technologies needed to build a second-generation reusable launch vehicle. It is required that this new launch vehicle be 100 times safer and 10 times cheaper to operate than current launch vehicles. Part of the SLI includes the development of reusable composite and metallic cryotanks. The size of these reusable tanks is far greater than anything ever developed and exceeds the design limits of current manufacturing tools. Several design and manufacturing approaches have been formulated, but many factors must be weighed during the selection process. Among these factors are tooling reachability, cycle times, feasibility, and facility impacts. The manufacturing process simulation capabilities available at NASA's Marshall Space Flight Center have played a key role in down selecting between the various manufacturing approaches. by creating 3-D manufacturing process simulations, the varying approaches can be analyzed in a virtual world before any hardware or infrastructure is built. This analysis can detect and eliminate costly flaws in the various manufacturing approaches. The simulations check for collisions between devices, verify that design limits on joints are not exceeded, and provide cycle times which aid in the development of an optimized process flow. In addition, new ideas and concerns are often raised after seeing the visual representation of a manufacturing process flow. The output of the manufacturing process simulations allows for cost and safety comparisons to be performed between the various manufacturing approaches. This output helps determine which manufacturing process options reach the safety and cost goals of the SLI.
Author
Reusable Launch Vehicles; Manufacturing; Feasibility; Cryogenic Fluid Storage; Fuel Tanks; Simulation

20030001001 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of Segmented Composite Toroidal Tanks
DeLay, Thomas K., NASA Marshall Space Flight Center, USA; Roberts, J. Keith, Thiokol Propulsion, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The conservation of weight and space are major challenges for launch vehicles, especially upper stages. Upper-stage launch vehicles are confined by the space of the payload fairing of the first stage and it is difficult to stack fuel and oxidizer tanks end-to-end. Toroidal tanks have been studied as a way to help solve this problem. A toroidal tank concept would allow a portion of another tank, or part of an engine, to pass through its center opening. A toroidal tank assembly would be especially beneficial if it could somehow handle structural loads of the vehicle. Marshall Space Flight Center, along with ATK Thiokol Propulsion, is designing and fabricating a toroidal tank composed of individual conformal segments. Each conformal segment will be a metal-lined composite over-wrapped vessel. This paper will demonstrate unique materials and processing approaches that are overcoming hurdles for the fabrication of this vessel.
Author
Toruses; Fuel Tanks; Development

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.

20030000434 Pace Univ., New York, NY USA
The Interstellar Probe (ISP): Pre-Perihelion Trajectories and Application of Holography ***Final Report***
Matloff, G. L., Pace Univ., USA; Vulpetti, G., Telespazio S.p.A., Italy; Bangs, C., Art Resource Transfer, Inc., USA; Haggerty, R., Pace Univ., USA; June 2002; 1p; In English
Contract(s)/Grant(s): NASA Order H-29712-D
Report No.(s): NASA/CR-2002-211730; NAS 1.26:211730; M-1046; No Copyright; Avail: Issuing Activity; Abstract Only

Between February and September 2001, a number of aspects of the solar-sail-launched Interstellar probe (ISP), which is under consideration by NASA for launch in the 2010-2015 timeframe, were researched. The effort was conducted in New York City (NYC) February-May, at Marshall Space Flight Center (MSFC) May-July (when the PI served as a NASA Summer 2001 Faculty Fellow), and in NYC August-September. In addition to the people listed on the title sheet, many people in NYC and at MSFC participated in this research.
Author
Space Probes; Solar Sails; Holography; Perihelions; Trajectories; Trajectory Planning

20030000622 Gray Research, Inc., Huntsville, AL USA
Integrated In-Space Transportation Plan ***Final Report***
Farris, B., Gray Research, Inc., USA; Eberle, B., Gray Research, Inc., USA; Woodcock, G., Gray Research, Inc., USA; Negast, B., Gray Research, Inc., USA; October 2002; 277p; In English
Contract(s)/Grant(s): NASA Order H-32738-D
Report No.(s): NASA/CR-2002-212050; M-1060; NAS 1.26:212050; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

The purpose of this report is to provide the reader with a readily accessible reference volume and history for the Integrated In-Space Transportation Plan (IISTP) phase I effort. This report was prepared by Gray Research, Inc. as a partial fulfillment of the Integrated Technology Assessment Center subcontract No. 4400037135 in support of the IISTP phase I effort within the In-Space Investment Area of the Advanced Space Transportation Program managed at Marshall Space Flight Center, Huntsville, Alabama. Much of the data used in the preparation of this report was taken from analyses, briefings, and reports prepared by the vast number of dedicated engineers and scientists who participated in the IISTP phase I effort. The opinions and ideas expressed in this report are solely those of the authors and do not necessarily reflect those of NASA in whole or in part. Reaching the outer solar system is a struggle against time and distance. The most distant planets are 4.5 to 6 billion kilometers from the Sun and to reach them in any reasonable time requires much higher values of specific impulse than can be achieved with conventional chemical rockets. In addition, the few spacecraft that have reached beyond Jupiter have used gravity assist, mainly by Jupiter, that is only available for a few months' period every 13 or so years. This permits only very infrequent missions and mission planners are very reluctant to accept travel times greater than about ten years since this is about the maximum for which one can have a realistic program plan. Advanced In-Space Propulsion (ISP) technologies will enable much more effective exploration of our Solar System and will permit mission designers to plan missions to "fly anytime, anywhere and complete a host of science objectives at the destinations' with greater reliability and safety. With a wide range of possible missions and candidate propulsion technologies with very diverse characteristics, the question of which technologies are "best" for future missions is a difficult one. The primary focus of the IISTP Phase I efforts were to: Develop, iterate and baseline future NASA requirements for In-Space Transportation; Define preliminary integrated architectures utilizing advanced ISP technologies; Identify and prioritize ISP technologies. The primary efforts of the IISTP Phase I process was to: Address Customer defined missions, mission priorities, mission requirements and technology preferences. Provide a forum for Technologists to advocate and have sufficiently considered any ISP technology for any mission of interest defined by the customer. Perform Systems analyses of the customer defined prioritized mission set to the degree necessary to support evaluation and prioritization of each technology advocated by the technologists. Perform Cost analyses on each of the technologies that were determined by systems analyses to be viable candidates for the customer defined mission set. Integrate all customers, technologists, systems, cost, program and project inputs into the final IISTP Prioritized set of technologies. The primary products of the IISTP Phase I effort were: Prioritized set of advanced ISP

technologies that meet customer-provided requirements for customer prioritized mission sets; Recommendations of relative technology payoffs to guide augmentation investments.
Author
Mission Planning; Outer Planets Explorers; Technology Assessment; Spacecraft Propulsion

20030001014 NASA Johnson Space Center, Houston, TX USA
STS-113 Flight Day 11 Highlights Replay
Dec. 04, 2002; In English; 19 min. playing time, in color, with sound
Report No.(s): BRF-1436K; NONP-NASA-VT-2002153514; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS
The STS-113 eleventh flight day begins with Flight Engineer John Herrington and ISS Science Officer Peggy Whitson answering questions from the media. Earth Views from the Space Shuttle Endeavor payload bay, as the Space Shuttle Endeavor Expedition Five Crew travel over the Baja Peninsula are also presented.
CASI
Space Transportation System; Endeavour (Orbiter); International Space Station; Space Shuttle Orbiters

20030001038 NASA Johnson Space Center, Houston, TX USA
STS-113 Flight Day 10 Highlights Replay
Dec. 03, 2002; In English; 23 min. playing time, in color, with sound
Report No.(s): BRF-1436J; NONP-NASA-VT-2002153319; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS
The activities of the STS-113 (Jim Wetherbee, Commander; Paul Lockhart, Pilot; Michael Lopez-Alegria, John Herrington, Mission Specialists) crew during flight day 10 are shown. Also seen are the outgoing Expedition 5 (Valeri Korzun, Commander; Peggy Whitsun, ISS Science Officer/Flight Engineer; Sergei Treschev, Flight Engineer) and incoming Expedition 6 (Kenneth Bowersox, Commander; Donald Pettit, Nikolai Budarin, Flight Engineers) crews of the International Space Station (ISS). A panoramic view of the undocking of the Space Shuttle Endeavor from the International Space Station is also presented.
CASI
Expeditions; International Space Station; Space Transportation System; Spacecraft Docking

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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.

20030001567 NASA Marshall Space Flight Center, Huntsville, AL USA
High-Rate Communications Outage Recorder Operations for Optimal Payload and Science Telemetry Management Onboard the International Space Station
Shell, Michael T., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
All International Space Station (ISS) Ku-band telemetry transmits through the High-Rate Communications Outage Recorder (HCOR). The HCOR provides the recording and playback capability for all payload, science, and International Partner data streams transmitting through NASA's Ku-band antenna system. The HCOR is a solid-state memory recorder that provides recording capability to record all eight ISS high-rate data during ISS Loss-of-Signal periods. NASA payloads in the Destiny module are prime users of the HCOR; however, NASDA and ESA will also utilize the HCOR for data capture and playback of their high data rate links from the Kibo and Columbus modules. Marshall Space Flight Center's Payload Operations Integration Center manages the HCOR for nominal functions, including system configurations and playback operations. The purpose of this paper is to present the nominal operations plan for the HCOR and the plans for handling contingency operations affecting payload operations. In addition, the paper will address HCOR operation limitations and the expected effects on payload operations. The HCOR is manifested for ISS delivery on flight 9A with the HCOR backup manifested on flight 11A. The HCOR replaces the Medium-Rate Communications Outage Recorder (MCOR), which has supported payloads since flight 5A.1.
Author
Flight Operations; International Space Station; Payload Integration; Systems Engineering; Recording Instruments; Radio Telemetry

20030001575 AZ Technology, Inc., Huntsville, AL USA

EZStream: Distributing Live ISS Experiment Telemetry via Internet

Myers, Gerry, AZ Technology, Inc., USA; [2002]; 1p; In English; ISS Utilization Conference, 10-12 Oct. 2002, Houston, TX, USA

Contract(s)/Grant(s): NAS8-01163; No Copyright; Avail: Issuing Activity; Abstract Only

This paper will present the high-level architecture and components of the current version of EZStream as well as the product direction & enhancements to be incorporated through a Phase II grant. Security will be addressed such as data encryption and user login. Remote user devices will be discussed including web browsers on PC's and displays on PDA's and smart cell phones. The interaction between EZStream and TReK will be covered as well as the eventuality of EZStream to receive and parse binary data streams directly. This makes EZStream beneficial to both the International Partners and non-NASA applications. The options of developing client-side display web pages will be addressed and the development of new tools to allow creation of display web pages by non-programmers.

Author

Internets; Telemetry; International Space Station; Architecture (Computers); Technology Utilization

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.

20030000446 NASA Marshall Space Flight Center, Huntsville, AL USA

Design, Development, and Integration of A Space Shuttle Orbiter Bay 13 Payload Carrier

Spencer, Susan H., NASA Marshall Space Flight Center, USA; Phillips, Michael W., Boeing Co., USA; [2002]; 1p; In English; 53rd International Astronautical (IAF) Congress Space Station Utilization Conference, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Bay 13 of the Space Shuttle Orbiter has been limited to small sidewall mounted payloads and ballast. In order to efficiently utilize this space, a concept was developed for a cross-bay cargo carrier to mount Orbital Replacement Units (ORU's) for delivery to the International Space Station and provide additional opportunities for science payloads, while meeting the Orbiter ballast requirements. The Lightweight Multi-Purpose Experiment Support Structure (MPESS) Carrie (LMC) was developed and tested by NASA's Marshall Space Flight Center and the Boeing Company. The Multi-Purpose Experiment Support Structure (MPESS), which was developed for the Spacelab program was modified, removing the keel structure and relocating the sill trunnions to fit in Bay 13. Without the keel fitting, the LMC required a new and innovative concept for transferring Y loads into the Orbiter structure. Since there is no keel fitting available in the Bay 13 location, the design had to utilize the longeron bridge T-rail to distribute the Y loads. This concept has not previously been used in designing Shuttle payloads. A concept was developed to protect for Launch-On-Need ORU's, while providing opportunities for science payloads. Categories of potential ORU's were defined, and Get-Away Special (GAS) payloads of similar mass properties were provided by NASA's Goddard Space Flight Center. Four GAS payloads were manifest as the baseline configuration, preserving the capability to swap up to two ORU's for the corresponding science payloads, after installation into the Orbiter cargo bay at the pad, prior to closeout. Multiple configurations were considered for the analytical integration, to protect for all defined combinations of ORU's and GAS payloads. The first physical integration of the LMC war performed by Goddard Space Flight Center and Kennedy Space Center at an off-line facility at Kennedy Space Center. This paper will discuss the design challenges, structural testing, analytical and physical integration for the LMC's successful maiden flight on STS-108/ISS UF-1 mission in December 2001.

Author

Bays (Structural Units); Space Shuttle Orbiters; Space Shuttle Payloads; Structural Design; Space Transportation System

20030000606 NASA Glenn Research Center, Cleveland, OH USA

Charging of the International Space Station Due to Its High Voltage Solar Arrays

Ferguson, Dale C., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 154-159; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The International Space Station (ISS) has the highest voltage solar arrays ever flown in Low Earth Orbit (LEO). The ISS power system (and structure) ground is at the negative end of the 160 V solar arrays. Due to plasma current collection balance that must be maintained in LEO, it is possible for a spacecraft to charge negative of the ambient plasma by up to its entire solar array voltage (-160 V for ISS).
Derived from text
High Voltages; International Space Station; Solar Arrays; Electric Current; Spacecraft Charging

20030000686 NASA Langley Research Center, Hampton, VA USA
Heat Shield Cavity Parametric Experimental Aeroheating for a Proposed Mars Smart Lander Aeroshell
Liechty, Derek S., NASA Langley Research Center, USA; Hollis, Brian R., NASA Langley Research Center, USA; [2002]; 12p; In English; 32nd AIAA Fluid Dynamics Conference and Exhibit, 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 2002-2746; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The proposed Mars Smart Lander is to be attached through its aeroshell to the main spacecraft bus, thereby producing cavities in the heat shield. to study the effects these cavities will have on the heating levels experienced by the heat shield, an experimental aeroheating investigation was performed at the NASA Langley Research Center in the 20-Inch Mach 6 Air Tunnel. The effects of Reynolds number, angle-of-attack, and cavity size and location on aero-heating levels and distributions were determined and are presented. to aid the discussion on the effects of the cavities, laminar, thin-layer Navier-Stokes flow field solutions were post-processed to calculate relevant boundary layer properties such as boundary layer height and momentum thickness, edge Mach number, and streamwise pressure gradient. It was found that the effect of the cavities varies with angle-of-attack, freestream Reynolds number, and cavity size and location. The presence of a cavity raised the downstream heating rates by as much as 325% as a result of boundary layer transition.
Author
Aerodynamic Heating; Aeroshells; Cavities; Heat Shielding; Wind Tunnel Tests; Mars Surface; Mars Landing

20030000742 NASA Ames Research Center, Moffett Field, CA USA
Thermal Response Modeling System for a Mars Sample Return Vehicle
Chen, Y.-K., NASA Ames Research Center, USA; Milos, F. S., NASA Ames Research Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 12p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
A multi-dimensional, coupled thermal response modeling system for analysis of hypersonic entry vehicles is presented. The system consists of a high fidelity Navier-Stokes equation solver (GIANTS), a two-dimensional implicit thermal response, pyrolysis and ablation program (TITAN), and a commercial finite element thermal and mechanical analysis code (MARC). The simulations performed by this integrated system include hypersonic flowfield, fluid and solid interaction, ablation, shape change, pyrolysis gas generation and flow, and thermal response of heatshield and structure. The thermal response of the heatshield is simulated using TITAN, and that of the underlying structural is simulated using MARC. The ablating heatshield is treated as an outer boundary condition of the structure, and continuity conditions of temperature and heat flux are imposed at the interface between TITAN and MARC. Aerothermal environments with fluid and solid interaction are predicted by coupling TITAN and GIANTS through surface energy balance equations. With this integrated system, the aerothermal environments for an entry vehicle and the thermal response of the entire vehicle can be obtained simultaneously. Representative computations for a flat-faced arc-jet test model and a proposed Mars sample return capsule are presented and discussed.
Author
Temperature Effects; Thermal Analysis; Mars Sample Return Missions; Heat Shielding

20030000764 NASA Marshall Space Flight Center, Huntsville, AL USA
Assessment and Accommodation of Thermal Expansion of the Internal Active Thermal Control System Coolant During Launch to On-Orbit Activation of International Space Station Elements
Edwards, Darryl, Qualis Corp., USA; Ungar, Eugene K., NASA Johnson Space Center, USA; Holt, James M., NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 22p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
The International Space Station (ISS) employs an Internal Active Thermal Control System (IATCS) comprised of several single-phase water coolant loops. These coolant loops are distributed throughout the ISS pressurized elements. The primary element coolant loops (i.e. U.S. Laboratory module) contain a fluid accumulator to accomodate thermal expansion of the system. Other element coolant loops are parasitic (i.e. Airlock), have no accumulator, and require an alternative approach to insure that

the system maximum design pressure (MDP) is not exceeded during the Launch to Activation (LTA) phase. During this time the element loops is a stand alone closed system. The solution approach for accomodating thermal expansion was affected by interactions of system components and their particular limitations. The mathematical solution approach was challenged by the presence of certain unknown or not readily obtainable physical and thermodynamic characteristics of some system components and processes. The purpose of this paper is to provide a brief description of a few of the solutions that evolved over time, a novel mathematical solution to eliminate some of the unknowns or derive the unknowns experimentally, and the testing and methods undertaken.
Author
Spacecraft Equipment; Heating Equipment; Loops; Thermal Expansion; Design Analysis; Systems Engineering; Temperature Control

20030000995 NASA Langley Research Center, Hampton, VA USA
Deployment Simulation of Ultra-Lightweight Inflatable Structures
Wang, John T., NASA Langley Research Center, USA; Johnson, Arthur R., Army Research Lab., USA; [2002]; 18p; 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 2002-1261; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Dynamic deployment analyses of folded inflatable tubes are conducted to investigate modeling issues related to the deployment of solar sail booms. The analyses are necessary because ground tests include gravity effects and may poorly represent deployment in space. A control volume approach, available in the LS-DYNA nonlinear dynamic finite element code, and the ideal gas law are used to simulate the dynamic inflation deployment process. Three deployment issues are investigated for a tube packaged in a Z-fold configuration. The issues are the effect of the rate of inflation, the effect of residual air, and the effect of gravity. The results of the deployment analyses reveal that the time and amount of inflation gas required to achieve a full deployment are related to these issues.
Author
Deployment; Simulation; Inflatable Structures; Low Weight

20030001121 NASA Marshall Space Flight Center, Huntsville, AL USA
Replacement of Ablators with Phase-Change Material for Thermal Protection of STS Elements
Kaul, Raj K., NASA Marshall Space Flight Center, USA; Stuckey, Irvin, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; The Aerospace Materials, Processes, and Environmental Technology Conference (AMPET), 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

As part of the research and development program to develop new Thermal Protection System (TPS) materials for aerospace applications at NASA's Marshall Space Flight Center (MSFC), an experimental study was conducted on a new concept for a non-ablative TPS material. Potential loss of TPS material and ablation by-products from the External Tank (ET) or Solid Rocket Booster (SRB) during Shuttle flight with the related Orbiter tile damage necessitates development of a non-ablative thermal protection system. The new Thermal Management Coating (TMC) consists of phase-change material encapsulated in micro spheres and a two-part resin system to adhere the coating to the structure material. The TMC uses a phase-change material to dissipate the heat produced during supersonic flight rather than an ablative material. This new material absorbs energy as it goes through a phase change during the heating portion of the flight profile and then the energy is slowly released as the phase-change material cools and returns to its solid state inside the micro spheres. The coating was subjected to different test conditions simulating design flight environments at the NASA/MSFC Improved Hot Gas Facility (IHGF) to study its performance.
Author
Space Transportation System; Ablative Materials; Thermal Protection; External Tanks; Space Shuttle Boosters; Temperature Control; Ablation

20030001139 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Launch Initiative: New Capabilities ... New Horizons
Dumbacher, Daniel L., NASA Marshall Space Flight Center, USA; Nov. 15, 2002; 14p; In English; 4th European Conference on Hot Structures and Thermal Protection Systems for Space Vehicles, 25-29 Nov. 2002, Palermo, Italy; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents NASA's Space Launch Initiative (SLI) with new capabilities and new horizons. The topics include: 1) Integrated Space Transportation Plan; 2) SLI: The Work of an Nation; 3) SLI Goals and Status; 4) Composites and Materials; and 5) SLI & DoD/USAF Collaboration. This paper is presented in viewgraph form.
CASI
Spacecraft Launching; NASA Space Programs; Space Transportation System; Aerospace Engineering; Reusable Launch Vehicles

20030001141 NASA Ames Research Center, Moffett Field, CA USA
A Scalable, Out-of-Band Diagnostics Architecture for International Space Station Systems Support
Fletcher, Daryl P., Science Applications International Corp., USA; Alena, Rick, NASA Ames Research Center, USA; [2002]; 12p; In English; IEEE Aerospace Conference, 8-15 Mar. 2003, Big Sky, MT, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The computational infrastructure of the International Space Station (ISS) is a dynamic system that supports multiple vehicle subsystems such as Caution and Warning, Electrical Power Systems and Command and Data Handling (C&DH), as well as scientific payloads of varying size and complexity. The dynamic nature of the ISS configuration coupled with the increased demand for payload support places a significant burden on the inherently resource constrained computational infrastructure of the ISS. Onboard system diagnostics applications are hosted on computers that are elements of the avionics network while ground-based diagnostic applications receive only a subset of available telemetry, down-linked via S-band communications. In this paper we propose a scalable, out-of-band diagnostics architecture for ISS systems support that uses a read-only connection for C&DH data acquisition, which provides a lower cost of deployment and maintenance (versus a higher criticality readwrite connection). The diagnostics processing burden is off-loaded from the avionics network to elements of the on-board LAN that have a lower overall cost of operation and increased computational capacity. A superset of diagnostic data, richer in content than the configured telemetry, is made available to Advanced Diagnostic System (ADS) clients running on wireless handheld devices, affording the crew greater mobility for troubleshooting and providing improved insight into vehicle state. The superset of diagnostic data is made available to the ground in near real-time via an out-of band downlink, providing a high level of fidelity between vehicle state and test, training and operational facilities on the ground.
Author
International Space Station; Avionics; Systems Engineering; Architecture (Computers); Radio Communication

20030001574 Virginia Polytechnic Inst. and State Univ., Center for Intelligent Material Systems and Structures, Blacksburg, VA USA
Dynamics and Control of Inflated Satellite Components ***Final Report, 20 Feb. 2001-31 Mar. 2002***
Inman, Daniel J.; Oct. 15, 2002; 4p; In English
Contract(s)/Grant(s): F49620-01-1-0213
Report No.(s): AD-A407918; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The instrumentation purchased under this DURIP (Defense University Research Instrumentation Program) was in support of an ongoing effort to understand the dynamics of inflated satellite components and then to provide both shape and vibration control based on the discovered dynamics. Inflatable space-based devices have become popular over the past decade due to their minimal launch-mass and launch-volume. Once inflated, these space structures are subject to vibrations induced mechanically by guidance systems and space debris, as well as thermally-induced vibrations from variable amounts of direct sunlight during orbit around the Earth. Understanding the dynamics of inflated components and controlling the shape and vibrations of spaced-based structures is critical to ensuring optimal performance.
DTIC
Inflatable Structures; Large Space Structures; Vibration Damping; Spacecraft Structures

20030001956 Air Force Research Lab., Space Vehicles Directorate, Kirkland AFB, NM USA
A Backroom Mission Operations Center for TechSat 21
Zetocha, Paul; Jan. 2002; 6p; In English
Contract(s)/Grant(s): Proj-8809
Report No.(s): AD-A407954; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The TechSat 21 satellite program is an Air Force Research Laboratory (AFRL) technology initiative which has an objective to demonstrate and validate microsatellite cluster system concepts and enabling technologies. The primary experimental objectives are to demonstrate formation flying algorithms and technologies for clustered satellites, and to demonstrate autonomous cluster and spacecraft operations. TechSat 21 consists of three satellites which will fly in various configurations with variable separation distances. Command and control of a cluster of satellites with multiple heterogeneous experimental objectives

poses several challenges from a ground perspective. to assist in operating TechSat 21, AFRL is developing a backroom Mission Operations Center (MOC) which will be capable of performing, among other tasks: planning and scheduling; command generation; state-of-health (SOH) monitoring; telemetry playbacks; fault detection, isolation, and resolution (FDIR); data storage; and payload data analysis. The objective of this paper is to describe the MOC architecture, highlight the key components, and outline its planned operational use.
DTIC
Command and Control; Satellite Constellations; Microsatellites

20030001957 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Powersail High Power Propulsion System Design Study
Gulczinski, Frank S., III; Nov. 2000; 3p; In English; Presented at AIAA/ASME/SAE/ASEE Joint Propulsion Conf. (37th). Held in Salt Lake City, UT, 8-11 Jul. 2001. Abstract only
Contract(s)/Grant(s): Proj-6340
Report No.(s): AD-A407953; AFRL-PR-ED-AB-2000-219; AFRL-PR-ED-AB-2000-219; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A desire by the USA Air Force to exploit the space environment has led to a need for increased on-orbit electrical power availability. To enable this, the Air Force Research Laboratory Space Vehicles Directorate (AFRL/ VS) is developing Powersail: a two-phased program to demonstrate high power (100 kW to 1 MW) capability in space using a deployable, flexible solar array connected to the host spacecraft using a slack umbilical. The first phase will be a proof-of-concept demonstration at 50 kW, followed by the second phase, an operational system at full power. In support of this program, the AFRL propulsion Directorate's Spacecraft Propulsion Branch (AFRL/PRS) at Edwards AFB has commissioned a design study of the Powersail High Power Propulsion System. The purpose of this study, the results of which are summarized in this paper, is to perform mission and design trades to identify potential full-power applications (both near-Earth and interplanetary) and the corresponding propulsion system requirements and design. The design study shall farther identify a suitable low power demonstration flight that maximizes risk reduction for the fully operational system. This propulsion system is expected to be threefold: (1) primary propulsion for moving the entire vehicle, (2) a propulsion unit that maintains the solar array position relative to the host spacecraft, and (3) control propulsion for maintaining proper orientation for the flexible solar array.
DTIC
Solar Arrays; Solar Propulsion; Spacecraft Propulsion

20030001964 Air Force Research Lab., Space Vehicles Directorate, Kirkland AFB, NM USA
Development of a Testbed for Distributed Satellite Command and Control
Zetocha, Paul; Brito, Margarita; Jan. 2002; 7p; In English
Contract(s)/Grant(s): Proj-8809
Report No.(s): AD-A407955; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

At the Air Force Research Laboratory's Space Vehicles Directorate we are investigating and developing architectures for commanding and controlling a cluster of cooperating satellites through prototype development for the TechSat-21 program. The objective of this paper is to describe a distributed satellite testbed that is currently under development and to summarize near term prototypes being implemented for cluster command and control. to design, develop, and test our architecture we are using eight PowerPC 750 VME-based single board computers, representing eight satellites. Each of these computers is hosting the OSE(TM) real-time operating system from Enea Systems. At the core of our on-board cluster manager is ObjectAgent. ObjectAgent is an agent-based object-oriented framework for flight systems, which is particularly suitable for distributed applications. In order to handle communication with the ground as well as to assist with the cluster management we are using the Spacecraft Command Language (SCL). SCL is also at the centerpiece of our ground control station and handles cluster commanding, telemetry decommutation, state-of-health monitoring, and Fault Detection, Isolation, and Resolution (FDIR). For planning and scheduling activities we are currently using ASPEN from NASA/JPL. This paper will describe each of the above components in detail and then present the prototypes being implemented.
DTIC
Command and Control; Satellite Networks; Microsatellites

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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.

20030001695 NASA Marshall Space Flight Center, Huntsville, AL USA
Raytracing for Multi-Spacecraft Missions
Coffey, Victoria, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; International Space Science Institute Workshop on Calibration Techniques for In-Situ Plasma Instrumentation, 30 Sep. - 4 Oct. 2002, Bern, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

The numerical simulation of in-situ instruments allows the instrument design to be optimized for particle throughput and allows for the iteration of the design parameters before fabrication. This effort leads to greater efficiency since the hardware itself does not have to be machined and fabricated to test each design change. More importantly for multi-spacecraft missions, the numerical raytracing allows the assessment of manufacturing tolerances so that a low relative accuracy can be obtained between the instruments. We will discuss our experience in optimizing and raytracing our charged particle instruments, obtaining the geometry factor from these simulations, and the comparison with the results of laboratory testing. This discussion with others will support the ISSI Scientific Report on Calibration Techniques for In-Situ Plasma Instrumentation.
Author
Spacecraft Instruments; Design Optimization; Computer Aided Design; Fabrication; Computerized Simulation

20030001707 NASA Marshall Space Flight Center, Huntsville, AL USA
Low Energy Calibration for Multi-Spacecraft Missions
Coffey, Victoria, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; International Space Science Institute Workshop on Calibration Techniques for In-Situ Plasma Instrumentation, 30 Sep. - 4 Oct. 2002, Bern, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

Instruments designed for low-energy measurements have their own specific challenges in design and calibration. They may have a non-uniform response at lower energies and may encounter sources of error due to stray fields in the lab and in flight. In addition, the particle source beams for testing and calibration have to be spatially broad, monoenergetic, and monodirectional at the lower energies. Again, the same challenges for the uniform response and removal of stray fields comes into play for these sources. We will discuss our experiences in the low energy calibration of recent flight in-situ instruments and conclude with ideas for multi-spacecraft instruments calibrations. This discussion with others will support the ISSI Scientific Report on Calibration Techniques for In-Situ Plasma Instrumentation.
Author
Spacecraft Instruments; Flight Instruments; Calibrating

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SPACECRAFT PROPULSION AND POWER

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

20030000457 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
Performance Testing of a Resistojet Thruster for Small Satellite Applications
Lawrence, Timothy J.; Sweeting, Martin; Paul, Malcolm; Sellers, J. J.; LeDuc, J. R.; Jul. 13, 1998; 16p; In English
Report No.(s): AD-A407349; AFRL-PR-ED-TP-1998-143; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Resistojets operating at low power (less than lOO W) and using liquid propellants have re-emerged as attractive propulsion options for orbit-raising small satellites deployed at Space Shuttle altitudes (approx. 2OO km). Compared to low power pulsed plasma thrusters (PPT), the resistojet produces two orders of magnitude more thrust (approximately 1.4 mN compared to 140 mN) which is required to overcome drag at solar maximum. The wet mass of both systems is approximately equal although the propellant volume for the PPT is significantly lower since it is stored in solid form. The major disadvantage of the resistojet

propulsion system compared to the PPT, is in the complexity added from the propellant tanks. Shuttle integration concerns for the solid Teflon (trademark) propellant of the PPT are minimal or non-existent. Although non-toxic, the water or nitrous oxide propellant of the resistojet requires pressurized tanks and valves which increase safety requirements. to investigate the usefulness of the resistojet for small satellite applications, a series of performance tests have been completed at the AFRL Electric Propulsion Laboratory using the JPL inverted pendulum thrust stand. The tests were conducted for two types of resistojet thrusters developed at the University of Surrey which utilize a packed bed of SiC particles for the heat exchanger. Performance testing eas accomplished at power levels from 0-600 W for five propellants: water, nitrous oxide, water/ methanol, nitrogen, and helium. Two endurance tests were conducted to determine possible failure modes. Performance characterization and thermal models were developed for future design applications of these thrusters. Future USAF and Surrey Satellite Technology, Ltd. (SSTL) missions using these resistojets are also discussed.
DTIC
Liquid Propellant Rocket Engines; Thrustors; Spacecraft Propulsion; Resistojet Engines; Performance Tests

20030000462 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Preliminary Plume Characterization of a Low-Power Hall Thruster Cluster
Beal, Brian E.; Gallimore, Alec D.; Hargus, William A., Jr; Jun. 13, 2002; 18p; In English
Report No.(s): AD-A407338; AFRL-PR-ED-TP-2002-142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In an effort to understand the technical issues related to running multiple Hall effect thrusters in close proximity to each other, testing of a cluster of four Busek BHT-200-X3 devices has begun in Chamber 6 at the Air Force Research Laboratory. Preliminary measurements have shown that the variations in the discharge currents of the four thrusters are synchronized, possibly due to cross talk through the thruster plumes. Measurements of plasma density, electron temperature, and plasma potential in the thruster plumes obtained using a triple Langmuir probe are presented. Anomalously high electron temperatures were recorded along the centerline of each thruster. Collisionless, magnetosonic shock waves induced by the ion-ion two-stream instability are proposed as a possible cause of the high temperatures. The unperturbed ion velocity distribution along the centerline of a Hall thruster is shown to be unstable and a simple geometric model is presented to illustrate the qualitative changes in plasma properties expected across the proposed shock. Estimates using this model show that relatively large changes in electron temperature are consistent with small changes in electron number density across a shock. Qualitative arguments are presented indicating that collisionless shocks are unlikely to form as a result of clustering multiple thrusters. In an effort to understand the technical issues related to running multiple Hall effect thrusters in close proximity to each other, testing of a cluster of four Busek BHT-200-X3 devices has begun in Chamber 6 at the Air Force Research Laboratory. Preliminary measurements have shown that the variations in the discharge currents of the four thrusters are synchronized, possibly due to cross talk through the thruster plumes. Measurements of plasma density, electron temperature, and plasma potential in the thruster plumes obtained using a triple Langmuir probe are presented.
DTIC
Hall Thrusters; Plumes; Electric Propulsion; Electrostatic Probes

20030000562 Air Force Research Lab., Propulsion Directorate West, Edwards AFB, CA USA
Current Efforts to Develop Alternate ”TB 700-2” Test Protocols for the Hazard Classification of Large Rocket Motors
Schwartz, Daniel F.; Bennett, Robert R.; Graham, Kenneth J.; Boggs, Thomas L.; Atwood, Alice I.; Jan. 1998; 25p; In English
Contract(s)/Grant(s): AF Proj. 4373
Report No.(s): AD-A407332; AFRL-PR-ED-TP-2002-005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
When the Department of Defense (DoD) revised Technical Bulletin (TB) 700-2, NAVSEAINST 8020.8B, TO 11A-1-47, DLAR 8220.12 hazard classification guidelines in January 1998 1, it significantly changed the procedures used to determine the explosive classification of rocket motors, to be shipped or placed in DoD storage facilities. The revised test protocols outlined in this document, (hereafter referred to as TB 700-2) are far more conservative and costly to implement than the previous ones. These changes could have a profound impact on the solid rocket community and in particular those involved with the research and development and manufacture of large (greater than or equal 304.8-millimeter (greater than or equal l2-inch)) diameter solid rocket motors (SRMs). The ramifications may include higher development costs and limitations on performance improvements. This paper outlines current efforts of the solid rocket community to develop acceptable alternate test protocols for large rocket motors that could fulfill the intent of TB 700-2 and be considered by the Department of Defense Explosive Safety Board (DDESB) for incorporation into a future revision to TB 700-2.
DTIC
Hazards; Protocol (Computers); Explosives; Solid Propellant Rocket Engines

20030000584 NASA Glenn Research Center, Cleveland, OH USA

17th Space Photovoltaic Research and Technology Conference

Jenkins, Phillip, Compiler, NASA Glenn Research Center, USA; October 2002; 222p; In English, 11-13 Sep. 2001, Cleveland, OH, USA; Sponsored by NASA Glenn Research Center, USA; Also announced as 20030000585 through 20030000611; Original contains color illustrations

Contract(s)/Grant(s): RTOP 344-96-5B

Report No.(s): NASA/CP-2002-211831; E-13525; NAS 1.55:211831; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The 17th Space Photovoltaic Research and Technology (SPRAT XVII) Conference was held September 11-13, 2001, at the Ohio Aerospace Institute (OAI) in Cleveland, Ohio. The SPRAT conference, hosted by the Photovoltaic and Space Environments Branch of the NASA Glenn Research Center, brought together representatives of the space photovoltaic community from around the world to share the latest advances in space solar technology. This year's conference continued to build on many of the trends shown in SPRAT XVI; the use of new high-efficiency cells for commercial use and the development of novel array concepts such as Boeing's Solar Tile concept. In addition, new information was presented on space environmental interactions with solar arrays. Author

Conferences; Technology Utilization; Aerospace Engineering; Photovoltaic Cells; Semiconductors (Materials)

20030000585 Emcore Corp., Photovoltaics Div., Albuquerque, NM USA

High Efficiency Triple Junction Manufacturing and Development at Emcore Photovoltaics

Aiken, Daniel J., Emcore Corp., USA; Fatemi, Navid S., Emcore Corp., USA; Murray, Chris S., Emcore Corp., USA; Sharps, Paul R., Emcore Corp., USA; Spadafora, Frank, Emcore Corp., USA; Stan, Mark A., Emcore Corp., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 1-7; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This paper describes recent progress in the development of extremely radiation hard, high efficiency triple junction InGaP/GaAs/Ge space solar cells at Emcore Photovoltaics. to address the increasing demand for space satellite power, Emcore Photovoltaics has an on going development program to increase the triple junction 1 sun AM0 BOL efficiency while maintaining the exceptional radiation hardness. This program is partially funded by the Air Force under its Broad Agency Announcement program. Efforts to date have resulted in a 27.5 square centimeters triple junction cell with a 1 sun AM0 BOL efficiency of 27.9% for solar cells designed for maximum EOL performance. This is a 2% absolute efficiency gain over the current production average. Development efforts have included the use of an InGaAs middle cell lattice-matched to Ge and better matched to the AM0 spectrum, as well as an improved MOCVD growth process resulting in a significant boost in the Ge subcell performance. Author

Manufacturing; Photovoltaic Conversion; Semiconductor Junctions; Quantum Efficiency

20030000586 Essential Research, Inc., Cleveland, OH USA

Progress in the Development of Metamorphic Multi-Junction III-V Space-Solar Cells at Essential Research Incorporated

Sinharoy, Samar, Essential Research, Inc., USA; Patton, Martin O., Essential Research, Inc., USA; Valko, Thomas M., Sr., Essential Research, Inc., USA; Weizer, Victor G., Essential Research, Inc., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 8-13; In English; Also announced as 20030000584; Original contains color illustrations

Contract(s)/Grant(s): NAS3-99174; F29601-99-C-0135; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Theoretical calculations have shown that highest efficiency III-V multi-junction solar cells require alloy structures that cannot be grown on a lattice-matched substrate. Ever since the first demonstration of high efficiency metamorphic single junction 1.1 eV and 1.2 eV InGaAs solar cells by Essential Research Incorporated (ERI), interest has grown in the development of multi-junction cells of this type using graded buffer layer technology. ERI is currently developing a dual-junction 1.6 eV InGaP/1.1 eV InGaAs tandem cell (projected practical air-mass zero (AM0), one-sun efficiency of 28%, and 100-sun efficiency of 37.5%) under a Ballistic Missile Defense Command (BMDO) SBIR Phase II program. A second ongoing research effort at ERI involves the development of a 2.1 eV AlGaInP/1.6 eV InGaAsP/1.2 eV InGaAs triple-junction concentrator tandem cell (projected practical AM0 efficiency of 36.5% under 100 suns) under a SBIR Phase II program funded by the Air Force. We are in the process of optimizing the dual-junction cell performance. In case of the triple-junction cell, we have developed the bottom and the middle cell, and are in the process of developing the layer structures needed for the top cell. A progress report is presented in this paper.

Author

Solar Cells; Quantum Efficiency; Fabrication; Aerospace Engineering; Semiconductors (Materials)

20030000587 NASA Glenn Research Center, Cleveland, OH USA

The Stretched Lens Array (SLA): An Ultra-Light Photovoltaic Concentrator

ONeill, Mark J., Entech, Inc., USA; Pisczor, Michael F., NASA Glenn Research Center, USA; Eskenazi, Michael I., Able Engineering Co., Inc., USA; McDanal, A. J., Entech, Inc., USA; George, Patrick J., NASA Glenn Research Center, USA; Botke, Matthew M., Able Engineering Co., Inc., USA; Brandhorst, Henry W., Auburn Univ., USA; Edwards, David L., NASA Marshall Space Flight Center, USA; Jaster, Paul A., Minnesota Mining and Mfg. Co., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 14-23; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

A high-performance, ultralight, photovoltaic concentrator array is being developed for space power. The stretched lens array (SLA) uses stretched-membrane, silicone Fresnel lenses to concentrate sunlight onto triple-junction photovoltaic cells. The cells are mounted to a composite radiator structure. The entire solar array wing, including lenses, photovoltaic cell flex circuits, composite panels, hinges, yoke, wiring harness, and deployment mechanisms, has a mass density of 1.6 kg/sq.m. NASA Glenn has measured 27.4% net SLA panel efficiency, or 375 W/sq.m. power density, at room temperature. At GEO operating cell temperature (80 C), this power density will be 300 W/sq.m., resulting in more than 180 W/kg specific power at the full wing level. SLA is a direct ultralight descendent of the successful SCARLET array on NASA's Deep Space 1 spacecraft. This paper describes the evolution from SCARLET to SLA, summarizes the SLA's key features, and provides performance and mass data for this new concentrator array.

Author

Concentrators; Photovoltaic Cells; Aerospace Engineering; Solar Arrays; Fresnel Lenses; Spacecraft Performance

20030000588 NASA Glenn Research Center, Cleveland, OH USA

34% Efficient InGaP/GaAs/GaSb Cell-Interconnected-Circuits for Line-Focus Concentrator Arrays

Fraas, L. M., JX Crystals, Inc., USA; Daniels, W. E., JX Crystals, Inc., USA; Huang, H. X., JX Crystals, Inc., USA; Minkin, L. E., JX Crystals, Inc., USA; Avery, J. E., JX Crystals, Inc., USA; Chu, C., TECSTAR, Inc., USA; Iles, P., TECSTAR, Inc., USA; ONeill, M. J., Entech, Inc., USA; McDanal, A. J., Entech, Inc., USA; Piszczor, Mike, NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 24-31; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

While monolithic multi-junction cells are preferred for flat plate arrays, mechanically stacked multi-junction cells are superior for solar concentrator applications. Reasons for this are that the mechanical stacked configuration with high efficiency Gallium Antimonide cells allows utilization of a much wider range of the solar energy spectrum, and the ability to use voltage matched interconnects results in full use of low bandgap cell currents. Herein, data are presented for simple two terminal voltage-matched circuits using InGaP/GaAs/GaSb stacked cells showing 34% average circuit efficiency for a lot of 12 circuits given prismatic covers. These circuits have been designed to fit into the ultralight Stretched Lens Array being developed by NASA. With these new cell-interconnected-circuits, we project that the power density at GEO operating temperature can be increased from 296 W/m2 to 350 W/m2 while maintaining the specific power at 190 W/kg at the full wing level.

Author

Circuits; Concentrators; Gallium Antimonides; Gallium Phosphides; Indium Phosphides; Solar Cells; Quantum Efficiency

20030000589 Houston Univ., Space Vacuum Epitaxy Center, TX USA

Carrier Recombination and Escape in P-I-N Multiquantum Well Space Solar Cells

Alemu, A., Houston Univ., USA; Monier, C., Houston Univ., USA; Williams, L., Houston Univ., USA; Freundlich, A., Houston Univ., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 32-37; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The addition of quantum wells (QWs) in the intrinsic region of a p-i-n solar cell can boost the current output of a cell. The absorption region of the cell is extended towards the infrared by the incorporation of wells that have, by definition, a band gap lower than the host material. In order to have as much current improvement as possible, one will try to collect as much carriers as possible from the wells and minimize the loss of carriers. Both recombination and escape of photogenerated carriers occur in the iregion. Understanding recombination and escape mechanisms will help the optimization of the QW region for better performances. Recent studies showed the dependence of the carriers collection efficiency from the wells on the built-in electric field. A critical electric field was identified as necessary for the achievement of high collection efficiencies. Photocurrent and photoluminescence studies were carried out at different temperatures and bias in order to identify the main mechanisms involving carriers from the QW region. Samples included in this study are a large variety of InP-InAsP MQW solar cells which differ from one another by their arsenic composition and their QW region geometry. A qualitative analysis of the results is included in this

work which identifies radiative recombination as the main carrier loss channel for non-collected carriers in a device with a relatively weak electric field.
Author
P-I-N Junctions; Quantum Wells; Radiative Recombination; Solar Cells; Electric Current; Photoluminescence

20030000590 National Renewable Energy Lab., Golden, CO USA
Procedures at NREL for Evaluating Multi-junction One Sun and Concentrator Cells
Moriarty, Tom, National Renewable Energy Lab., USA; Emery, Keith, National Renewable Energy Lab., USA; Dunlavy, Don, National Renewable Energy Lab., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 38-44; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The procedures for evaluating the performance of multi-junction one sun and concentrator cells at NREL are described. The accurate measurement of the performance of multi-junction cells requires relative quantum efficiency measurements for each junction, reference cells for each junction, and a spectrally adjustable solar simulator. The quantum efficiency for each junction is measured by light biasing the other junctions to insure that the junction of interest is current limiting. The quantum efficiencies are used to calculate the spectral mismatch for each junction under the simulator and the simulator spectrum is adjusted until each is operating at its correct photocurrent.
Author
Quantum Efficiency; Solar Cells; Semiconductor Devices; Solar Simulators; Concentrators; Light Sources

20030000591 Sachs/Freeman Associates, Inc., Largo, MD USA
Update on the Displacement Damage Dose Model for Proton Damage in Gallium Arsenide Solar Cells
Messenger, S. R., Sachs/Freeman Associates, Inc., USA; Burke, E. A., Sachs/Freeman Associates, Inc., USA; Summers, G. P., Naval Research Lab., USA; Walters, R. J., Naval Research Lab., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 45-48; In English; Also announced as 20030000584; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

An update is given of some details of the displacement damage dose (D(sub d)) approach for predicting solar cell degradation in space, with the emphasis being on proton damage effects in GaAs solar cells, especially at very high and very low energies. High energy protons with E greater than 15 MeV and low energy protons with E less than 0.1 MeV are found to give relatively small contributions to the overall device degradation.
Author
Degradation; Gallium Arsenides; Proton Damage; Solar Cells; Dosage

20030000592 NASA Glenn Research Center, Cleveland, OH USA
Boeing's High Voltage Solar Tile Test Results
Reed, Brian J., Boeing Phantom Works, USA; Harden, David E., Boeing Phantom Works, USA; Ferguson, Dale C., NASA Glenn Research Center, USA; Snyder, David B., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 49-54; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Real concerns of spacecraft charging and experience with solar array augmented electrostatic discharge arcs on spacecraft have minimized the use of high voltages on large solar arrays despite numerous vehicle system mass and efficiency advantages. Boeing's solar tile (patent pending) allows high voltage to be generated at the array without the mass and efficiency losses of electronic conversion. Direct drive electric propulsion and higher power payloads (lower spacecraft weight) will benefit from this design. As future power demand grows, spacecraft designers must use higher voltage to minimize transmission loss and power cable mass for very large area arrays. This paper will describe the design and discuss the successful test of Boeing's 500-Volt Solar Tile in NASA Glenn's Tenney chamber in the Space Plasma Interaction Facility. The work was sponsored by NASA's Space Solar Power Exploratory Research and Technology (SERT) Program and will result in updated high voltage solar array design guidelines being published.
Author
Electrostatics; High Voltages; Solar Arrays; Spacecraft Charging

20030000593 Emcore Corp., Photovoltaics Div., Albuquerque, NM USA
Proton and Electron Radiation Data and Analysis of GaInP2/GaAs/Ge Solar Cells
Sharps, P. R., Emcore Corp., USA; Aiken, D. J., Emcore Corp., USA; Stan, M. A., Emcore Corp., USA; Thang, C. H., Emcore

Corp., USA; Fatemi, Navid, Emcore Corp., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 55-64; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We present electron and proton radiation data for our GaInP2/GaAs/Ge triple junction solar cell. An analysis of the data is also done with both the ”relative damage coefficients” (RDC) method developed at NASA-JPL, as well as the ”displacement damage dose” (D3) method developed by the Naval Research Lab. We also discuss radiation tolerance of cells in the light of our development of an advanced triple junction cell.

Author

Electron Radiation; Gallium Arsenides; Solar Cells; Indium Phosphides; Germanium; Gallium Phosphides; Proton Energy

20030000594 Aerospace Corp., Los Angeles, CA USA

Comparison of the Electrical Performance of Various Amorphous Silicon Thin Film Solar Cells Produced for the PowerSphere Concept

Simburger, Edward J., Aerospace Corp., USA; Ross, Jasen, Aerospace Corp., USA; Matsumoto, James, Aerospace Corp., USA; Baer, Jean, Aerospace Corp., USA; Presser, Nathan, Aerospace Corp., USA; Jeffery, Frank R., Iowa Thin Film Technologies, Inc., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 65-73; In English; Also announced as 20030000584; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Aerospace Corporation has independently developed conceptual designs for microsatellites and nanosatellites. This development of microsatellites and nanosatellites for low earth orbits requires the collection of sufficient power for onboard instruments with a low weight, low volume spacecraft. Because the overall surface area of a microsatellite or nanosatellite is small, body-mounted solar cells are incapable of providing enough power. Deployment of traditional, rigid, solar arrays necessitates larger satellite volumes and weights, and also requires extra apparatus needed for pointing. One potential solution to this ”power choke” problem is the deployment of a large, spherical, inflatable power system. This power system, termed the ”PowerSphere”, would offer a high collection area, low weight, and low stowage volume, and eliminate the need for a pointing mechanism. A laboratory model of a PowerSphere populated with Iowa Thin Film Technologies (ITFT) Amorphous Silicon Solar Cells is presented. Development of a thin film amorphous silicon solar cell for the PowerSphere concept has focused on the impact that the size of an individual cell and top contact design has on the electrical performance of these cells. PowerSpheres ranging in size from approximately 7 inches in diameter to 2 feet in diameter are under investigation. Aerospace Corporation contracted with ITFT to produce amorphous silicon solar cells in hexagonal and pentagonal shapes with the sides of individual pentagons and hexagons ranging from 1 inch to 5 inches. These cells were fabricated with three different grid patterns using the standard printed silver ink used for ITFT’s standard terrestrial product. In addition a number of cells were produced on which Aerospace vapor deposited silver metal contacts.

Author (revised)

Amorphous Silicon; Microsatellites; Nanosatellites; Fabrication; Solar Cells; Thin Films; Electrical Properties; Performance Tests

20030000595 NASA Glenn Research Center, Cleveland, OH USA

Thin-Film Solar Array Earth Orbit Mission Applicability Assessment

Hoffman, David J., NASA Glenn Research Center, USA; Kerslake, Thomas W., NASA Glenn Research Center, USA; Hepp, Aloysius F., NASA Glenn Research Center, USA; Raffaelle, Ryne P., Rochester Inst. of Tech., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 74-83; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This is a preliminary assessment of the applicability and spacecraft-level impact of using very lightweight thin-film solar arrays with relatively large deployed areas for representative Earth orbiting missions. The most and least attractive features of thin-film solar arrays are briefly discussed. A simple calculation is then presented illustrating that from a solar array alone mass perspective, larger arrays with less efficient but lighter thin-film solar cells can weigh less than smaller arrays with more efficient but heavier crystalline cells. However, a proper spacecraft-level systems assessment must take into account the additional mass associated with solar array deployed area: the propellant needed to desaturate the momentum accumulated from area-related disturbance torques and to perform aerodynamic drag makeup reboost. The results for such an assessment are presented for a representative low Earth orbit (LEO) mission, as a function of altitude and mission life, and a geostationary Earth orbit (GEO) mission. Discussion of the results includes a list of specific mission types most likely to benefit from using thin-film arrays. NASA Glenn’s low-temperature approach to depositing thin-film cells on lightweight, flexible plastic substrates is also briefly discussed to provide a perspective on one approach to achieving this enabling technology. The paper concludes with a list of issues to be addressed prior to use of thin-film solar arrays in space and the observation that with their unique characteristics, very lightweight

arrays using efficient, thin-film cells on flexible substrates may become the best array option for a subset of Earth orbiting missions.
Author
Solar Arrays; Thin Films; Geosynchronous Orbits; Technology Assessment; NASA Space Programs; Space Missions

20030000596 NASA Glenn Research Center, Cleveland, OH USA
Atmospheric Pressure Spray Chemical Vapor Deposited CuInS2 Thin Films for Photovoltaic Applications
Harris, J. D., Cleveland State Univ., USA; Raffaelle, R. P., Rochester Inst. of Tech., USA; Banger, K. K., Ohio Aerospace Inst., USA; Smith, M. A., Ohio Aerospace Inst., USA; Scheiman, D. A., Ohio Aerospace Inst., USA; Hepp, A. F., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 84-90; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Solar cells have been prepared using atmospheric pressure spray chemical vapor deposited CuInS2 absorbers. The CuInS2 films were deposited at 390 C using the single source precursor (PPh3)2CuIn(SEt)4 in an argon atmosphere. The absorber ranges in thickness from 0.75 - 1.0 micrometers, and exhibits a crystallographic gradient, with the leading edge having a (220) preferred orientation and the trailing edge having a (112) orientation. Schottky diodes prepared by thermal evaporation of aluminum contacts on to the CuInS2 yielded diodes for films that were annealed at 600 C. Solar cells were prepared using annealed films and had the (top down) composition of Al/ZnO/CdS/CuInS2/Mo/Glass. The Jsc, Voc, FF and (eta) were 6.46 mA per square centimeter, 307 mV, 24% and 0.35%, respectively for the best small area cells under simulated AM0 illumination.
Author
Atmospheric Pressure; Vapor Deposition; Copper Sulfides; Thin Films; Indium Sulfides; Sprayers; Photovoltaic Cells; Disulfides

20030000597 Florida Solar Energy Center, Cocoa, FL USA
CIGS2 Thin-Film Solar Cells on Flexible Foils for Space Power
Dhere, Neelkanth G., Florida Solar Energy Center, USA; Ghongadi, Shantinath R., Florida Solar Energy Center, USA; Pandit, Mandar B., Florida Solar Energy Center, USA; Jahagirdar, Anant H., Florida Solar Energy Center, USA; Scheiman, David, Ohio Aerospace Inst., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 91-100; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

CuIn(1-x)Ga(x)S2 (CIGS2) thin-film solar cells are of interest for space power applications because of the near optimum bandgap for AM0 solar radiation in space. CIGS2 thin film solar cells on flexible stainless steel (SS) may be able to increase the specific power by an order of magnitude from the current level of 65 Wkg(sup -1). CIGS solar cells are superior to the conventional silicon and gallium arsenide solar cells in the space radiation environment. This paper presents research efforts for the development of CIGS2 thin-film solar cells on 127 micrometers and 20 micrometers thick, bright-annealed flexible SS foil for space power. A large-area, dual-chamber, inline thin film deposition system has been fabricated. The system is expected to provide thickness uniformity of plus or minus 2% over the central 5” width and plus or minus 3% over the central 6” width. During the next phase, facilities for processing larger cells will be acquired for selenization and sulfurization of metallic precursors and for heterojunction CdS layer deposition both on large area. Small area CIGS2 thin film solar cells are being prepared routinely. Cu-rich Cu-Ga/In layers were sputter-deposited on unheated Mo-coated SS foils from CuGa (22%) and In targets. Well-adherent, large-grain Cu-rich CIGS2 films were obtained by sulfurization in a Ar: H2S 1:0.04 mixture and argon flow rate of 650 sccm, at the maximum temperature of 475 C for 60 minutes with intermediate 30 minutes annealing step at 120 C. Samples were annealed at 500 C for 10 minutes without H2S gas flow. The intermediate 30 minutes annealing step at 120 C was changed to 135 C. p-type CIGS2 thin films were obtained by etching the Cu-rich layer segregated at the surface using dilute KCN solution. Solar cells were completed by deposition of CdS heterojunction partner layer by chemical bath deposition, transparent-conducting ZnO/ZnO: Al window bilayer by RF sputtering, and vacuum deposition of Ni/Al contact fingers through metal mask. PV parameters of a CIGS2 solar cell on 127 micrometers thick SS flexible foil measured under AM 0 conditions at NASA GRC were: V(sub oc) = 802.9 mV, J(sub sc) = 25.07 mA per square centimeters, FF = 60.06%, and efficiency 0 = 8.84%. For this cell, AM 1.5 PV parameters measured at NREL were: V(sub oc) = 788 mV, J(sub sc) = 19.78 mA per square centimeter, FF = 59.44%, efficiency 0 = 9.26%. Quantum efficiency curve showed a sharp QE cutoff equivalent to CIGS2 bandgap of approximately 1.50 eV, fairly close to the optimum value for efficient AM0 PV conversion in the space.
Author
Fabrication; Solar Cells; Thin Films; Aerospace Engineering; Metal Foils; Gallium; Indium Sulfides; Copper Sulfides

20030000598 NASA Glenn Research Center, Cleveland, OH USA

Overview of Photovoltaic Calibration and Measurement Standards at GRC

Baraona, Cosmo, NASA Glenn Research Center, USA; Snyder, David, NASA Glenn Research Center, USA; Brinker, David, NASA Glenn Research Center, USA; Bailey, Sheila, NASA Glenn Research Center, USA; Curtis, Henry, NASA Glenn Research Center, USA; Scheiman, David, Ohio Aerospace Inst., USA; Jenkins, Phillip, Ohio Aerospace Inst., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 101-104; In English; Also announced as 20030000584; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Photovoltaic (PV) systems (cells and arrays) for spacecraft power have become an international market. This market demands accurate prediction of the solar array power output in space throughout the mission life of the spacecraft. Since the beginning of space flight, space-faring nations have independently developed methods to calibrate solar cells for power output in low Earth orbit (LEO). These methods rely on terrestrial, laboratory, or extraterrestrial light sources to simulate or approximate the air mass zero (AM0) solar intensity and spectrum.

Author

Calibrating; Photovoltaic Cells; Power Efficiency; Aerospace Engineering; Space Flight

20030000599 Air Force Research Lab., Advanced Space Power Generation, Kirkland AFB, NM USA

Radiation Hardness Tests of Flexible, Thin-Film Photovoltaics for Space Applications

Tlomak, Pawel, Air Force Research Lab., USA; Reinhardt, Kitt C., Air Force Research Lab., USA; Walters, Robert J., Naval Research Lab., USA; Messenger, Scott R., Sachs/Freeman Associates, Inc., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 105-114; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

An overview of flexible thin-film photovoltaics (TFPV) radiation-testing program undertaken at the AFRL is presented. This effort has been initiated and supported by the AFRL to develop a space radiation qualification program for the state-of-the-art TFPV. Preliminary radiation studies concentrated on two state-of-the-art technologies, namely amorphous silicon (a-Si) and copper-indium-diselenide (CIS) TFPV. Proton and electron irradiation tests were carried out and the response of the a-Si cells has been characterized via illuminated I-V, dark I-V, and QE measurements. The cells demonstrated relatively high radiation resistance up to high Displacement Damage Dose (D(sub d)) levels. The degradation of the FF, observed at high radiation doses was effectively removed by annealing.

Author

Hardness Tests; Photovoltaic Cells; Technology Utilization; Thin Films; Solar Cells; Radiation Measurement

20030000602 Wayne State Univ., Detroit, MI USA

Measured and Simulated Dark J-V Characteristics of a-Si:H Single Junction p-i-n Solar Cells Irradiated with 40 keV Electrons

Lord, Kenneth, Wayne State Univ., USA; Woodyard, James R., Wayne State Univ., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 128-136; In English; Also announced as 20030000584; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2180; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The effect of 40 keV electron irradiation on a-Si:H p-i-n single-junction solar cells was investigated using measured and simulated dark J-V characteristics. EPRI-AMPS and PC-1D simulators were explored for use in the studies. The EPRI-AMPS simulator was employed and simulator parameters selected to produce agreement with measured J-V characteristics. Three current mechanisms were evident in the measured dark J-V characteristics after electron irradiation, namely, injection, shunting and a term of the form CV(sup m). Using a single discrete defect state level at the center of the band gap, good agreement was achieved between measured and simulated J-V characteristics in the forward-bias voltage region where the dark current density was dominated by injection. The current mechanism of the form CV(sup m) was removed by annealing for two hours at 140 C. Subsequent irradiation restored the CV(sup m) current mechanism and it was removed by a second anneal. Some evidence of the CV(sup m) term is present in device simulations with a higher level of discrete density of states located at the center of the bandgap.

Author

Electron Irradiation; Electrons; P-I-N Junctions; Solar Cells; Simulation; Amorphous Silicon; Dark Current

20030000609 NASA Glenn Research Center, Cleveland, OH USA

Mission Applicability Assessment of Integrated Power Components and Systems

Raffaelle, R. P., Rochester Inst. of Tech., USA; Hepp, A. F., NASA Glenn Research Center, USA; Landis, G. A., NASA Glenn Research Center, USA; Hoffman, D. J., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology

Conference; October 2002, pp. 187-194; In English; Also announced as 20030000584; Original contains color illustrations
Contract(s)/Grant(s): NCC3-710; NCC3-563; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The need for smaller lightweight autonomous power systems has recently increased with the increasing focus on micro- and nanosatellites. Small area high-efficiency thin film batteries and solar cells are an attractive choice for such applications. The NASA Glenn Research Center, Johns Hopkins Applied Physics Laboratory, Lithium Power Technologies, MicroSat Systems, and others, have been working on the development of autonomous monolithic packages combining these elements or what are called integrated power supplies (IPS). These supplies can be combined with individual satellite components and are capable of providing continuous power even under intermittent illumination associated with a spinning or Earth orbiting satellite. This paper discusses the space mission applicability, benefits, and current development efforts associated with integrated power supply components and systems. The characteristics and several mission concepts for an IPS that combines thin-film photovoltaic power generation with thin-film lithium ion energy storage are described. Based on this preliminary assessment, it is concluded that the most likely and beneficial application of an IPS will be for small ”nanosatellites” or in specialized applications serving as a decentralized or as a distributed power source or uninterruptible power supply.
Author
Autonomy; Systems Integration; Space Missions; Spacecraft Power Supplies; Small Satellite Technology

20030000611 NASA Glenn Research Center, Cleveland, OH USA
Space and Terrestrial Photovoltaics: Synergy and Diversity
Bailey, Sheila, NASA Glenn Research Center, USA; Raffaelle, Ryne, Rochester Inst. of Tech., USA; Emery, Keith, National Renewable Energy Lab., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 202-210; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

A historical view of the research and development in photovoltaics from the perspective of both the terrestrial and the space communities is presented from the early days through the ’70s and ’80s and the ’90s and beyond. The synergy of both communities in the beginning and once again in the present and hopefully future are highlighted, with examples of the important features in each program. The space community which was impressed by the light-weight and reliability of photovoltaics drove much of the early development. Even up to today, nearly every satellites and other scientific space probe that has been launched has included some solar power. However, since the cost of these power systems were only a small fraction of the satellite and launch cost, the use of much of this technology for the terrestrial marketplace was not feasible. It was clear that the focus of the terrestrial community would be best served by reducing costs. This would include addressing a variety of manufacturing issues and raising the rate of production. Success in these programs and a resulting globalization of effort resulted in major strides in the reduction of PV module costs and increased production. Although, the space community derived benefit from some of these advancements, its focus was on pushing the envelope with regard to cell efficiency. The gap between theoretical efficiencies and experimental efficiencies for silicon, gallium arsenide and indium phosphide became almost non-existent. Recent work by both communities have focused on the development thin film cells of amorphous silicon, CuInSe2 and CdTe. These cells hold the promise of lower costs for the terrestrial community as well as possible flexible substrates, better radiation resistance, and higher specific power for the space community. It is predicted that future trends in both communities will be directed toward advances through the application of nanotechnology. A picture is emerging in which the space and terrestrial solar cell communities shall once again share many common goals and, in fact, companies may manufacture both space and terrestrial solar cells in III-V materials and thin film materials. Basic photovoltaics research including these current trends in nanotechnology provides a valuable service for both worlds in that fundamental understanding of cell processes is still vitally important, particularly with new materials or new cell structures. It is entirely possible that one day we might have one solar array design that will meet the criteria for success in both space and on the Earth or perhaps the Moon or Mars.
Author
Nanotechnology; Photovoltaic Conversion; Research and Development; Solar Cells; Space Probes

20030000804 Air Force Research Lab., Propulsion Directorate, Wright-Patterson AFB, OH USA
The Place of Solar Thermal Rockets in Space
Selph, C. C.; May 1981; 25p; In English
Report No.(s): AD-A407602; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The harnessing of sunlight for propulsive energy is a recurring theme in space propulsion, particularly for applications requiring large velocity increments, such as planetary exploration or comet rendezvous. Characteristically, it is viewed in terms of the solar sail and the solar cell; but for operations in earth orbit these approaches are less desirable because the very low thrust leads to undesirably long maneuver times. Thrust levels several orders of magnitude higher are available with solar-thermal

rockets, while preserving a specific impulse advantage over chemical systems. The performance advantages, penalties, technological problems, and approaches are examined for solar thermal rockets. Its suitability in several earth orbit missions is assessed. The peculiarities of vehicle design, the nature of the thruster and the solar concentrator are presented, and AF plans to implement the development of solar rockets are outlined.
DTIC
Solar Thermal Propulsion; Spacecraft Propulsion

20030000808 Air Force Research Lab., Propulsion Directorate, Wright-Patterson AFB, OH USA
Scaling Characteristics of Inflatable Paraboloid Concentrators
Thomas, Mitchell; Veal, Gordon; Jan. 1991; 7p; In English
Report No.(s): AD-A407596; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Under a series of contracted analytic and experimental studies, we have been increasing the size of inflated parabolic structures for use in space and determining surface accuracy. The primary user for this technology is the Solar-Powered Rocket, where hydrogen gas is heated to a high temperature by solar energy, rather than chemical or electrical means. to make the solar rocket work, very large (typically 150-ft. diameter), highly-accurate (typically surface accuracy better than 1 mrad slope error), lightweight paraboloids are needed. Based on subscale surface accuracy tests, there is a concern if a full size system can be constructed that meets the accuracy requirements. An analysis was performed that indicates when absolute error is held nearly constant, the slope error will be greatly reduced as size increases. A major source of error is the elastic modulus of the plastic film used for the reflector. Modulus data published by the film manufacturers are average values and cannot be used in determining the gore dimensions required to obtain the desired reflector shape. Modulus data as a function of stress is presented. Tests have been performed on 1 and 3 meter on-axis and 3 meter off-axis parabolas. The results to date indicate that surface shape errors do not increase directly with size. Further work in progress is needed to properly evaluate the scaling of surface error with size.
DTIC
Solar Thermal Propulsion; Parabolic Reflectors; Inflatable Space Structures; Modulus of Elasticity; Scale (Ratio)

20030000897 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
Current Efforts to Develop Alternate 'TB 700-2' Protocol. Appendix
Schwartz, Dan; Jan. 28, 2002; 8p; In English
Report No.(s): AD-A407569; AFRL-PR-ED-AP-2002-017; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
No abstract available
Author
Solid Propellant Rocket Engines; Research Management; Aerospace Safety

20030000909 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
AFRL POSS Applications Research
Phillips, Shawn; Sep. 03, 2002; 24p; In English; Presented at POSS Nanotechnology Conference held in Huntington Beach, CA on 25-27 Sep. 2002. Viewgraphs only
Report No.(s): AD-A407573; AFRL-PR-ED-VG-2002-213; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Air Force is heavily invested in POSS Applications Research and Development. Currently one application is being 'flight-tested' for a technology transition. New applications are being investigated (e.g. batteries, capacitors, radomes). The technology transfer to Hybrid Plastics is a success story with significant volume increase and price reduction. POSS Nanotechnology Offers Versatility.
DTIC
Propulsion; Oligomers; Nanotechnology; Rocket Thrust; Capacitors; Radomes; Electric Batteries

20030001004 NASA Marshall Space Flight Center, Huntsville, AL USA
Evaluation of New Repair Methods for Seal Surface Defects on Reusable Solid Rocket Motor (RSRM) Hardware
Stanley, Stephanie D., ATK-Thiokol Propulsion, USA; Selvidge, Shawn A., NASA Marshall Space Flight Center, USA; [2002]; 10p; In English; 5th AMPET Conference, 16-18 Sep. 2002, Huntsville, AL, USA
Contract(s)/Grant(s): NAS8-38100; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
The focus of the evaluation was to develop a back-up method to cell plating for the improvement or repair of seal surface defects within D6-AC steel and 7075-T73 aluminum used in the RSRM program. Several techniques were investigated including thermal and non-thermal based techniques. Ideally the repair would maintain the inherent properties of the substrate without losing

integrity at the repair site. The repaired sites were tested for adhesion, corrosion, hardness, microhardness, surface toughness, thermal stability, ability to withstand bending of the repair site, and the ability to endure a high-pressure water blast without compromising the repaired site. The repaired material could not change the inherent properties of the substrate throughout each of the test in order to remain a possible technique to repair the RSRM substrate materials. One repair method, Electro-Spark Alloying, passed all the testing and is considered a candidate for further evaluation.
Author
Maintenance; Seals (Stoppers); Solid Propellant Rocket Engines; Reusable Rocket Engines; Surface Defects

20030001133 Air Force Research Lab., Edwards AFB, CA USA
Engine Optimization for a Solar Thermal Powered Orbit Transfer Vehicle
Jun. 11, 1998; 10p; In English
Report No.(s): AD-A407819; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Recent technological advancements in solar thermal rocket propulsion and solar orbit transfer vehicles make it critical to perform additional engine performance analyses. Several system level flight demonstrations are imminent. Space flight hardware component testing is being conducted at the Air Force Research Laboratory, Edwards AFB, California. The focus of current research is engine and nozzle configurations for a solar orbit transfer vehicle. The optimal design must produce 1-10 pounds thrust, perform at high lsp and be compatible in a hybrid of spiral, perigee, and apogee (multi-burn) configurations. The nozzle material must not ablate when subjected to extreme thermal loading, yet be durable enough to withstand widely varying temperature differentials during frequent thermal cycling. This paper addresses propulsive needs in the orbit transfer arena and defines governing upper stage vehicle engine equations. These equations are modified versions of rocket engine equations used for chemical systems. The correction factors and modifications are for Solar Thermal Propulsion specific hardware.
DTIC
Rocket Engines; Solar Orbits; Solar Thermal Propulsion

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.

20030000488 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Evaluation of Coatings for Icing Control at Hydraulic Structures. Ice Engineering. Number 33, January 2002
Haehnel, Robert B.; Jan. 2002; 5p; In English; Original contains color images
Report No.(s): AD-A407393; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The Ice Engineering Information Exchange Bulletin is published in accordance with AR 25-30 as one of the information exchange functions of the Corps of Engineers. It is primarily intended to be a forum thereby information on ice engineering work done or managed by Corps held offices can be disseminated to other Corps offices, of the U.S. Government agencies, and the engineering community in general. The topic of this issue concerns evaluation of coatings for icing control at hydraulic structure. Adhesion of ice to surfaces creates problems for many industries, including hydropower and navigation. At present, ice removal techniques are costly, hazardous, and time-consuming. Andersson and Andersson (1992) reported that one hydropower station in Sweden had ice-related costs averaging $0.2 million per year over a 10-year period. Annual maintenance costs incurred at Corps of Engineer projects as a result of ice problems were estimated to be $33 million in 1992. Numerous commercially available materials, coatings, and paints are advertised to have low friction or non-stick properties. Some of these coatings are also marketed as icephobic (i.e., significantly lowering the adhesion strength of ice). We have measured the ice adhesion strength for many of these coatings and materials in the laboratory to rank their relative performance. Our most recent study focused on the suitability of these materials and coatings for controlling icing at hydraulic structures.
DTIC
Ice Formation; Coatings; Ice Prevention; Evaluation; Hydraulic Equipment; Control Systems Design

20030000600 NASA Glenn Research Center, Cleveland, OH USA
A Review of Single Source Precursors for the Deposition of Ternary Chalcopyrite Materials
Banger, K. K., Ohio Aerospace Inst., USA; Cowen, J., Cleveland State Univ., USA; Harris, J., Cleveland State Univ., USA; McClarnon, R., Cleveland State Univ., USA; Hehemann, D. G., Cleveland State Univ., USA; Duraj, S. A., Cleveland State Univ.,

USA; Scheiman, D., QSS Group, Inc., USA; Hepp, A. F., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 115-125; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The development of thin-film solar cells on flexible, lightweight, space-qualified durable substrates (i.e. Kapton) provides an attractive solution to fabricating solar arrays with high specific power, (W/kg). The syntheses and thermal modulation of ternary single source precursors, based on the [{LR}2Cu(SR')2In(SR')2] architecture in good yields are described. Thermogravimetric analyses (TGA) and Low temperature Differential Scanning Caloriometry, (DSC) demonstrate that controlled manipulation of the steric and electronic properties of either the group five-donor and/or chalcogenide moiety permits directed adjustment of the thermal stability and physical properties of the precursors. TGA-Evolved Gas Analysis, confirms that single precursors decompose by the initial extrusion of the sulphide moiety, followed by the loss of the neutral donor group, (L) to release the ternary chalcopyrite matrix. X-ray diffraction studies, EDS and SEM on the non-volatile pyrolized material demonstrate that these derivatives afford single-phase CuInS2/CuInSe2 materials at low temperature. Thin-film fabrication studies demonstrate that these single source precursors can be used in a spray chemical vapor deposition process, for depositing CuInS2 onto flexible polymer substrates at temperatures less than 400 C.

Author

Deposition; Fabrication; Substrates; Thin Films; Minerals; Photovoltaic Cells; Chalcogenides

20030001107 NASA Ames Research Center, Moffett Field, CA USA

Biogeochemical Cycles of Carbon and Sulfur

DesMarais, David J., NASA Ames Research Center, USA; Jun. 19, 2002; 1p; In English; GeoBiology Summer 2002 Field Course, 19-27 Jul. 2002, Catalina Island, CA, USA

Contract(s)/Grant(s): RTOP 344-50-92-02; Copyright; Avail: Issuing Activity; Abstract Only

The elements carbon (C) and sulfur (S) interact with each other across a network of elemental reservoirs that are interconnected by an array of physical, chemical and biological processes. These networks are termed the biogeochemical C and S cycles. The compounds of C are highly important, not only as organic matter, but also as atmospheric greenhouse gases, pH buffers in seawater, oxidation-reduction buffers virtually everywhere, and key magmatic constituents affecting plutonism and volcanism. The element S assumes important roles as an oxidation-reduction partner with C and Fe in biological systems, as a key constituent in magmas and volcanic gases, and as a major influence upon pH in certain environments. This presentation describes the modern biogeochemical C and S cycles. Measurements are described whereby stable isotopes can help to infer the nature and quantitative significance of biological and geological processes involved in the C and S cycles. This lecture also summarizes the geological and climatologic aspects of the ancient C and S cycles, as well as the planetary and extraterrestrial processes that influenced their evolution over millions to billions of years.

Author

Atmospheric Composition; Carbon; Sulfur; Chemical Reactions; Biogeochemistry; Activity (Biology)

20030001810 Lawrence Livermore National Lab., Livermore, CA USA

Impurity Role in Mechanically Induced Defects

Howell, R. H.; Asoka-Kumar, P.; Hartley, J.; Sterne, P.; Feb. 25, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-793454; UCRL-ID-137732; No Copyright; Avail: National Technical Information Service (NTIS)

An improved understanding of dislocation dynamics and interactions is an outstanding problem in the multi scale modeling of materials properties, and is the current focus of major theoretical efforts world wide. We have developed experimental and theoretical tools that will enable us to measure and calculate quantities defined by the defect structure. Unique to the measurements is a new spectroscopy that determines the detailed elemental composition at the defect site. The measurements are based on positron annihilation spectroscopy performed with a 3 MeV positron beam. Positron annihilation spectroscopy is highly sensitive to dislocations and associated defects and can provide unique elements of the defect size and structure. Performing this spectroscopy with a highly penetrating positron beam enables flexibility in sample handling. Experiments on fatigued and stressed samples have been done and insitu measurement capabilities have been developed. We have recently performed significant upgrades to the accelerator operation and novel new experiments have been performed.

NTIS

Defects; Impurities; Chemical Composition; Flexibility; Positron Annihilation

20030001949 North Dakota Dept. of Transportation, Materials and Research Div., Bismark, ND USA
3M Stamark (Trade Mark) Liquid Pavement Markings ***Final Report***
Sprynczynatyk, D. A.; Horner, R.; Aug. 2002; 36p; In English
Report No.(s): PB2003-100534; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Water based paint pavement markings deteriorate quickly and are commonly remarked annually. The North Dakota Department of Transportation needs a cost effective long-term pavement marking system that lasts longer than the available water based paints. The objective of this study was to determine if 3M Stamark Liquid Pavement Marking Series 1200 is a cost effective and more durable alternative than presently used water based paint.
NTIS
Paints; Durability; Cost Effectiveness; Pavements; Marking

24
COMPOSITE MATERIALS

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

20030000479 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Launch Initiative: New Capabilities - New Horizons
Dumbacher, Daniel, NASA Marshall Space Flight Center, USA; Sep. 10, 2002; 18p; In English; 10th Japan-US Conference on Composites Materials, 16-18 Sep. 2002, Stanford, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents NASA's Space Launch Initiative (SLI) with new capabilities and new horizons. The topics include: 1) Integrated Space Transportation Plan; 2) SLI: The Work of a Nation; 3) SLI Goals and Status; 4) Composites and Materials; and 5) SLI and DOD/USAF Collaboration. This paper is in viewgraph form.
CASI
Spacecraft Launching; Space Transportation System; NASA Programs; Reusable Launch Vehicles; Technology Utilization

20030000653 NASA Langley Research Center, Hampton, VA USA
Carbon Nanotube/Space Durable Polymer Nanocomposite Films for Electrostatic Charge Dissipation
Smith, J. G., Jr., NASA Langley Research Center, USA; Watson, K. A., Institute for Computer Applications in Science and Engineering, USA; Thompson, C. M., National Academy of Sciences - National Research Council, USA; Connell, J. W., NASA Langley Research Center, USA; [2002]; 12p; In English; 34th International SAMPE Technical Conference, 4-7 Nov. 2002, Baltimore, MD, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Low solar absorptivity, space environmentally stable polymeric materials possessing sufficient electrical conductivity for electrostatic charge dissipation (ESD) are of interest for potential applications on spacecraft as thin film membranes on antennas, solar sails, large lightweight space optics, and second surface mirrors. One method of imparting electrical conductivity while maintaining low solar absorptivity is through the use of single wall carbon nanotubes (SWNTs). However, SWNTs are difficult to disperse. Several preparative methods were employed to disperse SWNTs into the polymer matrix. Several examples possessed electrical conductivity sufficient for ESD. The chemistry, physical, and mechanical properties of the nanocomposite films will be presented.
Author
Thin Films; Carbon Nanotubes; Electrostatic Charge; Energy Dissipation; Polyimides; Nanocomposites; Spacecraft Construction Materials; Electrical Resistivity

20030000695 Pulse Power Physics, Inc., Albuquerque, NM USA
Measurement and Evaluation of Artificial Dielectric Material ***Final Report, Sep. 2000-Oct. 2001***
Frost, C. A.; Feb. 2002; 74p; In English; Original contains color images
Contract(s)/Grant(s): F29601-00-D-0074; AF Proj. 2304
Report No.(s): AD-A407530; AFRL-DE-TR-2002-1055; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report describes measurements of dielectric parameters for artificial dielectric materials using picosecond time domain instrumentation. The time domain data is transformed to yield frequency dependent permittivity and loss factor. Artificial

dielectric materials are of interest for lightweight dielectric lenses for ultra-wideband and wideband sources and antennas. Such lightweight antennas are useful for airborne and space applications.
DTIC
Dielectric Properties; Airborne Equipment; Dielectrics; Technology Utilization

20030000726 Virginia Univ., Charlottesville, VA USA
Efficient Reformulation of the Thermoelastic Higher-Order Theory for FGMs ***Final Report***
Bansal, Yogesh, Virginia Univ., USA; Pindera, Marek-Jerzy, Virginia Univ., USA; November 2002; 82p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2524; RTOP 708-73-35
Report No.(s): NASA/CR-2002-211909; NAS 1.26:211909; E-13599; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Functionally graded materials (FGMs) are characterized by spatially variable microstructures which are introduced to satisfy given performance requirements. The microstructural gradation gives rise to continuously or discretely changing material properties which complicate FGM analysis. Various techniques have been developed during the past several decades for analyzing traditional composites and many of these have been adapted for the analysis of FGMs. Most of the available techniques use the so-called uncoupled approach in order to analyze graded structures. These techniques ignore the effect of microstructural gradation by employing specific spatial material property variations that are either assumed or obtained by local homogenization. The higher-order theory for functionally graded materials (HOTFGM) is a coupled approach developed by Aboudi et al. (1999) which takes the effect of microstructural gradation into consideration and does not ignore the local-global interaction of the spatially variable inclusion phase(s). Despite its demonstrated utility, however, the original formulation of the higher-order theory is computationally intensive. Herein, an efficient reformulation of the original higher-order theory for two-dimensional elastic problems is developed and validated. The use of the local-global conductivity and local-global stiffness matrix approach is made in order to reduce the number of equations involved. In this approach, surface-averaged quantities are the primary variables which replace volume-averaged quantities employed in the original formulation. The reformulation decreases the size of the global conductivity and stiffness matrices by approximately sixty percent. Various thermal, mechanical, and combined thermomechanical problems are analyzed in order to validate the accuracy of the reformulated theory through comparison with analytical and finite-element solutions. The presented results illustrate the efficiency of the reformulation and its advantages in analyzing functionally graded materials.
Author
Functionally Gradient Materials; Microstructure; Thermoelasticity; Matrices (Mathematics); Mechanical Properties; Structural Analysis

20030000912 NASA Langley Research Center, Hampton, VA USA
The Effects of Reinforced Cutouts on the Buckling of Composite Shells
Starnes, James H., Jr., NASA Langley Research Center, USA; Hilburger, Mark W., NASA Langley Research Center, USA; [2002]; 16p; In English; Fifth World Congress on Computational Mechanics, 7-12 Jul. 2002, Vienna, Austria; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results from an analytical study of the response of thin-wall compression-loaded quasi-isotropic composite cylindrical shells with reinforced and unreinforced square cutouts are presented. The effects of cutout reinforcement orthotropy, area and thickness on the buckling and nonlinear responses of the shells are described. A high-fidelity nonlinear analysis procedure has been used to predict the buckling and nonlinear responses of the shells. The analysis procedure includes a nonlinear static analysis that predicts stable response characteristics of the shells and a nonlinear transient analysis that predicts unstable dynamic buckling response characteristics. The results illustrate the complex nonlinear response of a compression-loaded shell with a cutout. In particular, a local buckling response occurs in the shell near the cutout that is caused by the nonlinear coupling of the local shell-wall deformations and the in-plane destabilizing compression stresses near the cutout. In general, the addition of reinforcement around a cutout in a compression-loaded shell can retard or eliminate the local buckling response near the cutout and can increase the buckling load of the shell. The results also show how certain reinforcement configurations can cause an increase in the magnitude of local deformations and stresses in the shell, and can cause a reduction in the buckling load. Results for specific cases can be presented that suggest that the orthotropy, thickness, and area of the cutout reinforcement can be tailored to achieve improved buckling response characteristics.
Author
Shells (Structural Forms); Buckling; Structural Failure; Loads (Forces); Reinforcement (Structures); Nonlinearity; Structural Analysis; Design Optimization

20030000999 NASA Marshall Space Flight Center, Huntsville, AL USA

Characterization of Carbon Nanotube Reinforced Nickel

Gill, Hansel, NASA Marshall Space Flight Center, USA; Hudson, Steve, NASA Marshall Space Flight Center, USA; Bhat, Biliyar, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Carbon nanotubes are cylindrical molecules composed of carbon atoms in a regular hexagonal arrangement. If nanotubes can be uniformly dispersed in a supporting matrix to form structural materials, the resulting structures could be significantly lighter and stronger than current aerospace materials. Work is currently being done to develop an electrolyte-based self-assembly process that produces a Carbon Nanotube/Nickel composite material with high specific strength. This process is expected to produce a lightweight metal matrix composite material, which maintains it's thermal and electrical conductivities, and is potentially suitable for applications such as advanced structures, space based optics, and cryogenic tanks.

Author

Carbon Nanotubes; Nickel; Electrolytes; Self Assembly; Metal Matrix Composites

20030001002 NASA Marshall Space Flight Center, Huntsville, AL USA

Metal Matrix Composite LOX Turbopump Housing Via Novel Tool-less Net-Shape Pressure Infiltration Casting Technology

Shah, Sandeep, NASA Marshall Space Flight Center, USA; Lee, Jonathan, NASA Marshall Space Flight Center, USA; Bhat, Biliyar, NASA Marshall Space Flight Center, USA; Wells, Doug, NASA Marshall Space Flight Center, USA; Gregg, Wayne, NASA Marshall Space Flight Center, USA; Marsh, Matthew, NASA Marshall Space Flight Center, USA; Genge, Gary, NASA Marshall Space Flight Center, USA; Forbes, John, NASA Marshall Space Flight Center, USA; Salvi, Alex, Metal Matrix Cast Composites, Inc., USA; Cornie, James A., Metal Matrix Cast Composites, Inc., USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Metal matrix composites (MMC) offer relatively higher specific strength, specific stiffness, lower coefficient of thermal expansion (CTE) and lower density as compared with conventional alloys. These unique properties make them very attractive for aerospace turbomachinery applications where there is ever increasing emphasis to reduce weight and cost, and to increase engine performance. Through a joint effort between NASA and Metal Matrix Cast Composites, Inc., a complex liquid oxygen (LOX) compatible turbopump housing is being redesigned and manufactured from hybrid (particulate and fibers) Aluminum MMC. to this end, a revolutionary toolless pressure infiltration casting technology is being perfected. Ceramic preforms for the composite are 3-dimensionally printed using a stereolithography file, acquired from a CAD model. The preforms are then invested into a refractory material and pressure infiltrated with liquid metal. After casting, the refractory material is washed away leaving behind a near net-shape composite part. Benefits of this process include increased composite uniformity, no mold machining, short time from design to part, properties matching traditional methods, ability to make previously impossible to manufacture parts and no size limitations with a newly developed joining technology. The results of materials, manufacturing and design optimizations, preform joining, and sub-element tests will be presented.

Author

Metal Matrix Composites; Liquid Oxygen; Turbine Pumps; Casting; Aluminum

20030001007 NASA Marshall Space Flight Center, Huntsville, AL USA

Carbon Nanomaterials as Reinforcements for Composites

Zhu, Shen, Universities Space Research Association, USA; Su, Ching-Hua, NASA Marshall Space Flight Center, USA; Lehoczky, S. L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English, 22 Aug. 2002, Tallahassee, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Carbon nanomaterials including fellerenes, nanotubes (CNT) and nanofibers have been proposed for many applications. One of applications is to use the carbon nanomaterials as reinforcements for composites, especially for polymer matrices. Carbon nanotubes is a good reinforcement for lightweight composite applications due to its low mass density and high Young's modulus. Two obscures need to overcome for carbon nanotubes as reinforcements in composites, which are large quantity production and functioning the nanotubes. This presentation will discuss the carbon nanotube growth by chemical vapor deposition. In order to reduce the cost of producing carbon nanotubes as well as preventing the sliding problems, carbon nanotubes were also synthesized on carbon fibers. The synthesis process and characterization results of nanotubes and nanotubes/fibers will be discussed in the presentation.

Author

Carbon Nanotubes; Nanocomposites; Nanostructure Growth; Vapor Deposition

20030001646 Southern Research Inst., Birmingham, AL USA

Center for Composite Manufacturing Final Report ***Final Report, 15 Mar. 01 - 31 May 02***

Gleich, K. F.; Jackson, T. E.; Jun. 06, 2002; 100p; In English

Report No.(s): PB2003-100533; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This annual report describes an investigation of the use of long-fiber thermoplastic composites in transit bus applications for the Department of Transportation and the Federal Transit Administration. The goals of improved safety, reduced weight, and lower cost are very important to the transportation industry. Investigations into several candidate transit bus components were made to replace heavier conventional components with long-fiber thermoplastic components while simultaneously maintaining safety and reducing fabrication costs. A two-person bus seat was selected as the composite candidate and then was designed and compression-molded as a demonstration of the technology. The weight of the composite seat was 50 percent less than the conventional component and could be manufactured in commercial quantities with a 40 percent reduction in cost.

NTIS

Composite Materials; Manufacturing; Fabrication; Transportation

20030001647 Southern Research Inst., Birmingham, AL USA

Center for Composite Manufacturing Fabrication Guide ***Final Report, 15 Mar. 01 - 31 May 02***

Gleich, K. L.; Jackson, T. E.; Jun. 06, 2002; 36p; In English

Report No.(s): PB2003-100532; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes thermoplastic composite materials and processes and demonstrates fabrication methods for molding these materials into passenger seating components or other large components for use in buses and other mass transit applications. The primary goal of this work was to demonstrate that these technologies could provide lower cost, lighter weight, improved performance structures for mass transit applications. This fabrication guide was written to outline the basic requirements involved in design and fabrication of large long-fiber thermoplastic composite parts by compression molding.

NTIS

Manufacturing; Fabrication; Composite Materials; Transportation

20030001921 NASA Marshall Space Flight Center, Huntsville, AL USA

Fatigue Crack and Porosity Measurement in Composite Materials by Thermographic and Ultrasonic Methods

Walker, James L., NASA Marshall Space Flight Center, USA; Russell, Samuel S., NASA Marshall Space Flight Center, USA; Suits, Michael W., NASA Marshall Space Flight Center, USA; Workman, Gary L., Alabama Univ., USA; Watson, Jason M., Alabama Univ., USA; [2002]; 1p; In English; Aerospace Materials, Processes, and Enviornmental Technology (AMPET), 16-18 Sep. 2002, Huntsville, AL, USA

Contract(s)/Grant(s): NAG8-1548; No Copyright; Avail: Issuing Activity; Abstract Only

Many nondestructive methods exist for the detection of localized material anomalies in an otherwise good composite structure. The problem arises when the material system as a whole has degraded during service or was improperly manufactured. Porosity and intra-ply microcracking are two such conditions that in unlined composite pressure vessels can be very troublesome to detect and when linked through the thickness can be critical to mission success. These leak paths may lead to loss of pressure/propellant, increased risk of explosion and possible cryo-pumping. Research sought nondestructive methods for quantifying porosity and microcracking in composite tankage. Both thermographic and resonance ultrasound methods have been utilized with artificial neural network and statistical approaches to analyze the data. Resonant ultrasound spectroscopy provides measurements, which are sensitive to fine details in the materials character, such as micro-cracking and porosity. Here, the higher frequency (shorter wavelength) components of the signal train provide more significant interaction with the defects causing the spectral characteristics to shift toward lower amplitudes at the higher frequencies. As the density of the defects increases more interactions occur and more drastic amplitude changes are observed. From a thermal perspective, the higher the defect density the lower the through thickness thermal diffusivity will be. Utilizing a point heat source, and thermographically recording the heat profile with time, diffusivity calculations can be made which in turn can be related to the relative quality of the material. Preliminary experiments to verify the measurable effect on the resonance spectrum of the ultrasonic data to detect microcracking and for porosity detection thermographically are presented. Methods involving supervised and unsupervised artificial neural networks as well as other clustering algorithms are developed for signal identification.

Author

Fatigue (Materials); Microcracks; Porosity; Composite Structures; Thermography; Ultrasonics; Pressure Vessels

20030001934 Lawrence Livermore National Lab., Livermore, CA USA
Elasto-Plastic Response of a Large-Tow Triaxial Braided Composite
Zywicz, E.; O'Brien, M. J.; Nguyen, T.; Jun. 14, 2000; 16p; In English
Report No.(s): DE2002-793612; UCRL-JC-137881; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Due to fiber undulations present in woven and braided composites, the effective lamina flexural and extensional properties are distinct quantities not derivable from one another. Marrey and Sankar calculated the extensional, bending, and coupling matrices for a plain weave and a five-harness satin weave textile composite plate using representative volume elements (RVEs) and periodic boundary conditions, and showed that the extensional matrix could not be used to construct either the bending or coupling matrices. Whitcomb used finite elements (FE) to examine a plain weave composite subjected to flexure and explored how free surfaces influence the effective stiffness.
NTIS
Braided Composites; Elastoplasticity; Fiber Composites; Woven Composites

20030001936 Lawrence Livermore National Lab., Livermore, CA USA
Tow-Level Progressive Damage Model for Simulating Carbon-Fiber Textile Composites: Interim Report
Zywicz, E.; Jul. 01, 2000; 46p; In English
Report No.(s): DE2002-793579; UCRL-ID-139828; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A numerical approach to model the elasto-plastic and tensile damage response of tri-axially braided carbon-fiber polymeric-matrix composites is developed. It is micromechanically based and consists of a simplified unit cell geometry, a planestress tow-level constitutive relationship, a one-dimensional undulation constitutive law, and a non-traditional shell element integration rule. The braided composite lamina is idealized as periodic in the plane, and a simplified three-layer representative volume (RV) is assembled from axial and braider tows and pure resin regions. The constituents in each layer are homogenized with an iso-strain assumption in the fiber-direction and an iso-stress condition in the other directions. In the upper and lower layers, the fiber-direction strain is additively decomposed into an undulation and a tow portion. A finite-deformation tow model predicts the planestress tow response and is coupled to the undulation constitutive relationship. The overall braid model is implemented in DYNA3D and works with traditional shell elements.
NTIS
Carbon Fibers; Damage; Mathematical Models; Polymer Matrix Composites; Textiles; Simulation

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.

20030000440 NASA Langley Research Center, Hampton, VA USA
Detection of Intergranular Corrosion in Cold Plate Face Sheets
Winfree, William P., NASA Langley Research Center, USA; Smith, Stephen W., NASA Langley Research Center, USA; Piascik, Robert S., NASA Langley Research Center, USA; Howell, Patricia A., NASA Langley Research Center, 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

Cold plates are critical for cooling electronic systems in the shuttle. As a result of the environmental conditions in which they operate, water can condense between them and a support shelf. In some cases, this water results in intergranular corrosion in the face sheet. If the intergranular corrosion sufficiently penetrates the face sheet, a coolant leak could occur and jeopardize cold plate operation. This paper examines techniques for detecting and characterizing the intergranular corrosion, to enable recertification of cold plates that have been in operation for 15 plus years. Intergranular corrosion was artificially induced in the face sheets of a series of cold plate specimens using an electrochemical process. Some of the cold plate specimens were separated for destructive characterization of the extent of corrosion produced by the electrochemical process and to insure the induced corrosion was intergranular. The rest of the specimens were characterized nondestructively using several techniques. X-ray tomography and ultrasonic techniques provided the best indication of corrosion in these specimens and will be the focus of this paper. An x-ray tomography technique was shown to be the most effective technique for characterizing depth of the intergranular corrosion. From these measurements, corrosion profile maps were developed that were consistent with subsequent destructive evaluations of the

specimens. This enabled the assessment of NDE (ondestructive evaluation) standards to evaluate the viability of other NDE techniques. Due to system constraints, a different technique must be used to inspect an entire cold plate. An ultrasonic technique was shown to be very reliable for detection of corrosion in the unbacked regions of the face sheet. The ultrasonic technique was performed in an alcohol bath to avoid additional corrosion during the NDE evaluation. A pulse echo technique that focuses on the RMS value of the signal is shown to be very sensitive to the presence of intergranular corrosion.
Author
Intergranular Corrosion; Nondestructive Tests; Metal Plates; Spacecraft Equipment; Cooling Systems; Destructive Tests; Detection

20030000628 Naval Submarine Medical Research Lab., Groton, CT USA
Estimated Carbon Dioxide Production and Physiological Adaptation of Survivors in a Simulated Disabled Submarine
Francis, T. J.; Young, A. J.; Stulz, D. A.; Muza, S. R.; Castellani, J. W.; Jun. 24, 2002; 48p; In English
Contract(s)/Grant(s): N0463A00WR00021
Report No.(s): AD-A407483; NSMRL-1224; No Copyright; Avail: Defense Technical Information Center (DTIC)
Seven volunteer US Navy personnel were exposed for one week to conditions simulating those expected to develop within a disabled submarine (DISSUB) in the hypobaric facility at the USA Army Research Institute of Environmental Medicine (USAKIEM) The primary purpose of the study was to obtain a more reliable estimate of the rate at which DISSUB survivors consume oxygen (V02) and generate carbon dioxide (VC02) This information will be used to provide improved estimates of the amount of lithium hydroxide (LiOH) required aboard submarines for emergency C02 scrubbing, and to calculate likely survival times based on the quantity of LiOH available and the number of surviving crew.
DTIC
Carbon Dioxide; Physiology; Adaptation; Disabilities; Physiological Responses; Submarines; Personnel

20030000697 Colorado State Univ., Dept. of Chemistry, Fort Collins, CO USA
Initial Steps in the Decomposition of Energetic Materials: Pathways Involving Their Excited Electronic States ***Final Report, 28 Sep. 1998-27 Mar. 2002***
Bernstein, Elliot R.; Jun. 01, 2002; 5p; In English
Contract(s)/Grant(s): DAAG55-98-1-0528
Report No.(s): AD-A407527; ARO-37691.6-CH; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The study of dissociation pathways, mechanism, and products for the energetic materials RDX C3H6N3(NO2)3 and ADN NH4N(NO2)2 in excited electronic valence and Rydberg states is undertaken. These spectroscopic and dissociation studies will be carried out on gas phase species that have been cooled and isolated in a supersonic expansion. A number of recent advances in experimental and theoretical techniques and capabilities have been incorporated into our laboratory so that these studies become feasible. The experiments are carried out on laser ablated materials that are cooled in a supersonic expansion and accessed with tunable photolysis lasers. Time-of-flight mass spectroscopy and fluorescence spectroscopy are employed to analyze the fragments. Covariance mapping of spectral data will aid in identifying the fragmentation pathways. Experiments will be supported by a theoretical effort of ab initio quantum chemistry calculations. These studies are important to the functioning of energetic materials in real applications because the ignition process can create excited electronic states of RDX and ADN and each state can have a different decomposition mechanism and set of products (e.g., CH2NNO2, CO2, NO, NO2, OH, etc.). System and material performance, as fuels and explosives, can be adjusted and tuned to maximize overall effectiveness and efficiency if RDX and ADN decomposition chemistry can be elucidated and understood as a function of electronic state.
DTIC
Carbon Dioxide; Emission Spectra; Time of Flight Spectrometers; Photolysis; Explosives

20030001049 NASA Marshall Space Flight Center, Huntsville, AL USA
The Connection Between Local Icosahedral Order in Metallic Liquids and the Nucleation of Ordered Phases
Kelton, K. F., NASA Marshall Space Flight Center, USA; Gangopadhyay, A. K., NASA Marshall Space Flight Center, USA; Lee, G. W., NASA Marshall Space Flight Center, USA; Hyers, R. W., NASA Marshall Space Flight Center, USA; Rathz, T. J., NASA Marshall Space Flight Center, USA; Rogers, J. R., NASA Marshall Space Flight Center, USA; Robinson, M. B., NASA Marshall Space Flight Center, USA; Schenk, T., NASA Marshall Space Flight Center, USA; Simonet, V., NASA Marshall Space Flight Center, USA; Holland-Moritz, D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only
Over fifty years ago, David Turnbull showed that the temperature of many metallic liquids could be decreased far below their equilibrium melting temperature before crystallization occurred. to explain those surprising results, Charles Frank hypothesized

that the local structures of undercooled metallic liquids are different from those of crystal phases, containing a significant degree of icosahedral order that is incompatible with extended periodicity. Such structural differences must create a barrier to the formation crystal phases, explaining the observed undercooling behavior. If true, the nucleation from the liquid of phases with extended icosahedral order should be easier. Icosahedral order is often favored in small clusters, as observed recently in liquid-like clusters of pure Pb on the (111) surface of Si(3), for example. However, it has never been shown that an increasing preference for icosahedral phase formation can be directly linked with the development of icosahedral order in the undercooled liquid. Owing to the combination of very recent advances in levitation techniques and the availability of synchrotron X-ray and high flux neutron facilities.
Author
Crystallization; Liquid Phases; Periodic Variations; Supercooling; X Rays

20030001136 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Azure Dyes as Redox Mediators for Electrochemical Biosensing
Lim, Lucy; Jan. 2002; 80p; In English
Report No.(s): AD-A407822; AFIT-CI02-521; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The research presented in this thesis was composed of three parts. In the first part, the kinetics of the redox mediation between the azure dyes and the enzyme glucose oxidase was investigated. Electrochemical studies showed that azure dyes were fast mediators when dissolved in aqueous solutions. In the second part, the covalent immobilization of azure dyes in the biopolymeric matrix of chitosan was explored in order to design a reagentless glucose biosensor. These investigations indicated that the length of the tethering molecule was a crucial parameter, which controlled the mediation efficiency in the biosensor. The third part of this work was devoted to the preparation and characterization of a carbon paste-based electrochemical biosensor for glucose. The paste was modified with an azure eosinate mediator and glucose oxidase, and its analytical performance was tested under the conditions of diffusional and convective mass transport.
DTIC
Electrochemistry; Aqueous Solutions; Bioinstrumentation; Enzymes

20030001560 Navy Experimental Diving Unit, Panama City, FL USA
Measurement of Diffusing Capacity for Carbon Monoxide (D sub LCO)
Shykoff, B.; May 2002; 16p; In English
Report No.(s): AD-A407909; NEDU-TR-02-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Single breath calculations of diffusing capacity for carbon monoxide (D sub LCO) rely on the concentrations of carbon monoxide measured in the expired gas. Automated equipment generally collects data after the subject exhales a preset washout somewhat larger than the expected dead space. However, subjects with very high peak expiratory flows may exhale the washout volume before the gas analyzer step response has stabilized. A small sample volume recorded during rapid flow at that time may yield incorrectly low carbon monoxide concentrations, leading to falsely high D (sub LCO) values. This report proposes that investigators inspect gas concentration vs. time graphs and choose the sample starting time to exclude the analyzer instability. This choice will result in a variety of washout volumes that are dependent on the peak expiratory flow generated by the subjects. Sample volumes of 1 L are recommended, to help to average out some of the experimental noise. The increased sample size adds less than 1 second to the 10-second breath-hold time.
DTIC
Diffusion; Carbon Monoxide; Respiration; Breathing

20030001653 Sandia National Labs., Albuquerque, NM USA
Forms of Approximate Radiation Transport
Brunner, T. A.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800993; SAND2002-1778; No Copyright; Avail: National Technical Information Service (NTIS)
Photon radiation transport is described by the Boltzmann equation. Because this equation is difficult to solve, many different approximate forms have been implemented in computer codes. Several of the most common approximations are reviewed, and test problems illustrate the characteristics of each of the approximations. This document is designed as a tutorial so that code users can make an educated choice about which form of approximate radiation transport to use for their particular simulation.
NTIS
Radiation Transport; Approximation; Photons; Computer Programs

20030001675 Sandia National Labs., Albuquerque, NM USA

Batch Microreactor Studies of Lignin Depolymerization by Bases. 2. Aqueous Solvents

Miller, J. E.; Evans, L. R.; Mudd, J. E.; Brown, K. A.; May 2002; In English

Report No.(s): DE2002-800964; SAND2002-1318; No Copyright; Avail: CASI; C01, CD-ROM

Biomass feedstocks contain roughly 15-30% lignin, a substance that can not be converted to fermentable sugars. Hence, most schemes for producing biofuels assume that the lignin coproduct will be utilized as boiler fuel. Yet, the chemical structure of lignin suggests that it will make an excellent high value fuel additive, if it can be broken down into smaller compounds. From Fiscal year 1997 through Fiscal year 2001, Sandia National Laboratories (SNL) participated in a cooperative effort with the National Renewable Energy Laboratory and the University of Utah to develop and scale a base catalyzed depolymerization (BCD) process for lignin conversion. SNL's primary role in the effort was to perform kinetic studies, examine the reaction chemistry, and to develop alternate BCD catalyst systems. This report summarizes the work performed at Sandia during Fiscal Year 1999 through Fiscal Year 2001 with aqueous systems. Work with alcohol based systems is summarized in part 1 of this report.

NTIS

Aqueous Solutions; Lignin; Depolymerization; Catalysts

20030001700 University of Southern California, Dept. of Chemistry, Los Angeles, CA USA

Tritylsulfinylamine: A New Member in the Family of Sulfinylamines

Christe, Karl O.; Gerken, Michael; Haiges, Ralf; Schneider, Stefan; Schroer, Thorsten; Sep. 25, 2002; 23p; In English; Prepared in cooperation with Loker Hydrocarbon Research Institute and the University of California at Riverside

Contract(s)/Grant(s): F04611-99-C-0025; Proj-DARP

Report No.(s): AD-A407891; AFRL-PR-ED-TP-2002-224; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Triphenylmethyl N-sulfinylamine (trityl-NSO) was prepared from the reaction of trityl amine and SOCl2. Trityl-NSO was characterized by 1H, 13C, and 14N NMR spectroscopy in CH2C12 solution and by Raman and infrared spectroscopy in the solid state. Crystals of trityl NSO were grown from n-heptane and characterized by single crystal X-ray diffraction (P1-bar, alpha = 8.9642(9) A, b = 9.2135(9) A, c = 11.0645(11) A, alpha = 93.578(2)0, Beta = 101.098(2)0, gamma = 118.1420, Z = 2, and R(sub int) = 0.0332 at 223 K). Trityl-NSO represents the first alkyl N-sulfinylamine that has been fully structurally characterized.

DTIC

Triphenyls; Organic Sulfur Compounds; Amines; Crystal Structure; Vibrational Spectra

20030001932 Argonne National Lab., IL USA

Nanomaterials Research in Chicago-The Center for Nanoscale Materials at Argonne National Laboratory

Gibson, J. M.; Coble, J.; 2002; 10p; In English

Report No.(s): DE2002-799781; ANL/MSD/CP-105824; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The report discusses the following topics: Regional center planned for nanofabrication and nanocharacterization; Capabilities of the unique x-ray nanoprobe facility at the Advanced Photon Source; Overview of research programs in nanomagnetism, ferroelectrics, nanocrystalline diamond, photochemistry and others; Opportunities for collaborative research.

NTIS

Nanofabrication; Photochemical Reactions; Electric Batteries; Ferroelectricity

20030001974 NASA Marshall Space Flight Center, Huntsville, AL USA

Infrared Spectroscopy as a Chemical Fingerprinting Tool

Huff, Tim, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Aerospace, Materials, Processes, adn Enviornmental Technology (AMPET), 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Infrared (IR) spectroscopy is a powerful analytical tool in the chemical fingerprinting of materials. The technique is rapid, reproducible and usually non-invasive. With the appropriate accessories, the technique can be used to examine samples in either a solid, liquid or gas phase. Solid samples of varying sizes and shapes may be used, and with the addition of microscopic IR (microspectroscopy) capabilities, minute materials such as single fibers and threads may be examined. With the addition of appropriate software, microspectroscopy can be used for automated discrete point or compositional surface area mapping, with the latter providing a means to record changes in the chemical composition of a material surface over a defined area. Both aqueous and non-aqueous free-flowing solutions can be analyzed using appropriate IR techniques, as can viscous liquids such as heavy oils and greases. Due to the ability to characterize gaseous samples, IR spectroscopy can also be coupled with thermal processes such as thermogravimetric (TG) analyses to provide both thermal and chemical data in a single run. In this configuration, solids

(or liquids) heated in a TG analyzer undergo decomposition, with the evolving gases directed into the IR spectrometer. Thus, information is provided on the thermal properties of a material and the order in which its chemical constituents are broken down during incremental heating. Specific examples of these varied applications will be cited, with data interpretation and method limitations further discussed.
Author
Infrared Spectroscopy; Microanalysis; Thermogravimetry

26
METALS AND METALLIC MATERIALS

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

20030000899 Sheffield Univ., UK
Investigating Strain Path Changes on Flow Stress and Microstructural Evolution in TiAl-4V Alloy During Hot Deformation ***Final Report, 20 Sep. 2000-31 Aug. 2002***
Beynon, John; Sep. 26, 2002; 7p; In English
Contract(s)/Grant(s): F61775-00-W-E063
Report No.(s): AD-A407561; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Using the purpose built arbitrary strain path rig, hot deformation testing has been carried out on a commercial Ti-6A1-4V alloy. Initially, simple reverse torsion tests were performed, followed by tests combining torsion and uniaxial deformation. Optical and scanning electron microscopy have been used to assess the initial, heat treated and deformed structures. Bulk texture analysis has been carried out on the initial material, Electron Beam Backscattering Diffraction (EBSD) was used to assess micro-texture changes in heat-treated and deformed material.
DTIC
Deformation; Titanium Alloys

20030001009 NASA Marshall Space Flight Center, Huntsville, AL USA
High Strength and Wear Resistant Aluminum Alloy for High Temperature Applications
Lee, Jonathan A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
In this paper, a new high strength and wear resistant aluminum cast alloy invented by NASA-MSFC for high temperature applications will be presented. Developed to meet U.S. automotive legislation requiring low-exhaust emission, the novel NASA 398 aluminum-silicon alloy offers dramatic improvement in tensile and fatigue strengths at elevated temperatures (500 F-800 F), enabling new pistons to utilize less material, which can lead to reducing part weight and cost as well as improving performance. NASA 398 alloy also offers greater wear resistance, surface hardness, dimensional stability, and lower thermal expansion compared to conventional aluminum alloys for several commercial and automotive applications. The new alloy can be produced economically using permanent steel molds from conventional gravity casting or sand casting. The technology was developed to stimulate the development of commercial aluminum casting products from NASA-developed technology by offering companies the opportunity to license this technology.
Author
High Strength; Wear Resistance; Aluminum Alloys; High Temperature

20030001044 NASA Marshall Space Flight Center, Huntsville, AL USA
Effects of Thermal Exposure on Properties of Al-Li Alloys
Shah, Sandeep, NASA Marshall Space Flight Center, USA; Wells, Douglas, NASA Marshall Space Flight Center, USA; Stanton, William, NASA Marshall Space Flight Center, USA; Lawless, Kirby, NASA Marshall Space Flight Center, USA; Russell, Carolyn, NASA Marshall Space Flight Center, USA; Wagner, John, NASA Langley Research Center, USA; Domack, Marcia, NASA Langley Research Center, USA; Babel, Henry, Boeing Co., USA; Farahmand, Bahram, Boeing Co., USA; Schwab, David, Boeing Co., USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Aluminum-Lithium (Al-Li) alloys offer significant performance benefits for aerospace structural applications due to their higher specific properties compared with conventional Al alloys. For example, the application of Al-Li alloy 2195 to the space shuffle external cryogenic fuel tank resulted in weight savings of over 7,000 lb, enabling successful deployment of International Space Station components. The composition and heat treatment of 2195 were optimized specifically for strength-toughness

considerations for an expendable cryogenic tank. Time-dependent properties related to reliability, such as thermal stability, fatigue, and corrosion, will be of significant interest when materials are evaluated for a reusable cryotank structure. Literature surveys have indicated that there is limited thermal exposure data on Al-Li alloys. The effort reported here was designed to establish the effects of thermal exposure on the mechanical properties and microstructure of Al-Li alloys C458, L277, and 2195 in plate gages. Tensile, fracture toughness, and corrosion resistance were evaluated for both parent metal and friction stir welds (FSW) after exposure to temperatures as high as 300 F for up to 1000 hrs. Microstructural changes were evaluated with thermal exposure in order to correlate with the observed data trends. The ambient temperature parent metal data showed an increase in strength and reduction in elongation after exposure at lower temperatures. Strength reached a peak with intermediate temperature exposure followed by a decrease at highest exposure temperature. Friction stir welds of all alloys showed a drop in elongation with increased length of exposure. Understanding the effect of thermal exposure on the properties and microstructure of Al-Li alloys must be considered in defining service limiting temperatures and exposure times for a reusable cryotank structure.
Author
Aluminum-Lithium Alloys; Temperature Effects; Exposure; Mechanical Properties; Microstructure

20030001119 NASA Marshall Space Flight Center, Huntsville, AL USA
Use of FT-IR Analysis to Support Contamination Studies for Bonding Surfaces
Boothe, Richard, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; The Aerospace Materials, Processes, and Environmental Technology Conference (AMPET), 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The FT-IR analysis technique has become increasingly important for measuring and verifying coating levels on calibration standards and bonding specimens used to evaluate the effects of contamination on rocket motor bondlines. Use of this technique for evaluating solvent effectiveness for contamination removal is also increasing. Typical testing scenarios, analysis techniques and instrumentation used at MSFC will be described.
Author
Fourier Transformation; Infrared Spectroscopy; Contamination; Coating; Calibrating; Rocket Engines; Bonding

20030001572 Universitaet der Bundeswehr Muenchen, Fakultaet fuer Luft- UND Raumfahrttechnik, Neubiberg Germany
Working Life Predictions for Particle-Strengthened Aluminum Alloy with Regard to Microstructural Aspects of Deterioration ***Lebensdauervorhersage fur partikelverstaerkte Aluminiumlegierungen unter Beruecksichtigung der mikrostrukturellen Aspekte der Schaedigung***
Berger, Wolfgang; Nov. 2000; 178p; In German
Report No.(s): AD-A407921; X5-X5; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The goal of the study is to produce a reliable working life assessment for construction components made out of metal-matrix compounds with complex micro structures. In addition, the results should come from texture analysis, continuum-mechanical observations and., therefore, influence deterioration testing in preserved working life prediction concepts, thereby creating the basis for an improved application of these concepts for materials with heterogenous micro structures. The method employed is the Finite Element Method (FEM), which is outlined in detail in the second chapter. The qualification of the compound 6061/Al 203 also is discussed as the beginning of chapter five, which concludes with working life predictions for oscillating strain.
DTIC
Service Life; Aluminum Alloys; Microstructure; Deterioration

20030001761 California State Univ., Los Angeles, CA USA
Structure and Kinetics of Sn Whisker Growth on Pb-free Solder Finish
Choi, W. J.; Lee, T. Y.; Tu, K. N.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799652; No Copyright; Avail: National Technical Information Service (NTIS)

Standard leadframes used in surface mount technology are finished with a layer of eutectic SnPb for passivation and for enhancing solder wetting during reflow. When eutectic SnPb is replaced by Pb-free solder, especially the eutectic SnCu, a large number of Sn whiskers are found on the Pb-free finish. Some of the whiskers are long enough to become shorts between the neighboring legs of the leadframe. How to suppress their growth and how to perform accelerated test of Sn whisker growth are crucial reliability issues in the electronic packaging industry. In this paper, we report the study of spontaneous Sn whisker growth at room temperature on eutectic SnCu and pure Sn finishes. Both compressive stress and surface oxide on Sn are necessary

conditions for whisker growth. Structure and stress analyses by using the micro-diffraction in synchrotron radiation are reported. Cross-sectional electron microscopy, with samples prepared by focused ion beam, are included.
NTIS
Soldering; Synchrotron Radiation; Stress Analysis; Solders; Diffraction Radiation; Compression Loads; Accelerated Life Tests

20030001772 Department of Energy, Richland, WA USA
Evaluation of Cracking in the 241-AZ Tank Farm Ventilation Line at the Hanford Site
Anantatmula, R. P.; Blackburn, L. D.; Mar. 26, 2000; 26p; In English
Report No.(s): DE2002-798126; HNF-5264-FP; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In the period from April to October of 1988, a series of welding operations on the outside of the A2 Tank Farm ventilation line piping at the Hanford Site produced unexpected and repeated cracking of the austenitic stainless steel base metal and of a seam weld in the pipe. The ventilation line is fabricated from type 304L stainless steel pipe of 24 inches diameter and 0.25 inches wall thickness. The pipe was wrapped in polyethylene bubble wrap and buried approximately 12 feet below grade. Except for the time period between 1980 and 1987, impressed current cathodic protection has been applied to the pipe since its installation in 1974. The paper describes the history of the cracking of the pipe, the probable cracking mechanisms, and the recommended future action for repair/replacement of the pipe.
NTIS
Cracking (Fracturing); Pipes (Tubes); Ventilation; Welding; Austenitic Stainless Steels

20030001801 Lawrence Livermore National Lab., Livermore, CA USA
Biochemical Contributions to Corrosion of Carbon Steel and Alloy 22 in a Continual Flow System
Horn, J.; Martin, S.; Masterson, B.; Lian, T.; Dec. 03, 1999; 26p; In English
Report No.(s): DE2002-792713; UCRL-JC-136521; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Microbiologically influenced corrosion (MIC) may decrease the functional lifetime of nuclear waste packaging materials in the potential geologic repository at Yucca Mountain (YM), Nevada. Biochemical contributions to corrosion of package materials are being determined in reactors containing crushed repository site rock with the endogenous microbial community, and candidate waste package materials. These systems are being continually supplied with simulated ground water. Periodically, bulk chemistries are analyzed on the system outflow, and surfacial chemistries are assessed on withdrawn material coupons. Both Fe and Mn dissolved from C1020 coupons under conditions that included the presence of YM microorganisms. Insoluble corrosion products remained in a reduced state at the coupon surface, indicating at least a localized anoxic condition; soluble reduced Mn and Fe were also detected in solution, while precipitated and spalled products were oxidized. Alloy 22 surfaces showed a layer of chrome oxide, almost certainly in the Cr(III) oxidation state, on microcosm-exposed coupons, while no soluble chrome was detected in solution. The results of these studies will be compared to identical testing on systems containing sterilized rock to generate, and ultimately predict, microbial contributions to waste package corrosion chemistries.
NTIS
Biochemistry; Carbon Steels; Corrosion; Metal Surfaces; Continuum Flow; Alloys

20030001820 Lawrence Livermore National Lab., Livermore, CA USA
Experimental Investigation of a Prescription for Identifying Plastic Strain
Brown, A. A.; Casey, J.; Nikkel, D. J.; Feb. 29, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-793614; UCRL-JC-137887; No Copyright; Avail: National Technical Information Service (NTIS)
A series of experiments is described in which a novel prescription for the identification of plastic strain is tested to determine its validity in the context of the strain-space formulation of rate-independent plasticity. Biaxial experiments were performed on several thin-walled aluminum 1100-O cylindrical specimens.
NTIS
Aluminum; Plastic Properties; Deformation

20030001864 NASA Glenn Research Center, Cleveland, OH USA
Ceramic Inclusions In Powder Metallurgy Disk Alloys: Characterization and Modeling
Bonacuse, Pete, Army Research Lab., USA; Kantzos, Pete, Ohio Aerospace Inst., USA; Telesman, Jack, NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 359-389; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Powder metallurgy alloys are increasingly used in gas turbine engines, especially as the material chosen for turbine disks. Although powder metallurgy materials have many advantages over conventionally cast and wrought alloys (higher strength, higher temperature capability, etc.), they suffer from the rare occurrence of ceramic defects (inclusions) that arise from the powder atomization process. These inclusions can have potentially large detrimental effect on the durability of individual components. An inclusion in a high stress location can act as a site for premature crack initiation and thereby considerably reduce the fatigue life. Because these inclusions are exceedingly rare, they usually don't reveal themselves in the process of characterizing the material for a particular application (the cumulative volume of the test bars in a fatigue life characterization is typically on the order of a single actual component). Ceramic inclusions have, however, been found to be the root cause of a number of catastrophic engine failures. to investigate the effect of these inclusions in detail, we have undertaken a study where a known population of ceramic particles, whose composition and morphology are designed to mimic the 'natural' inclusions, are added to the precursor powder. Surface connected inclusions have been found to have a particularly large detrimental effect on fatigue life, therefore the volume of ceramic 'seeds' added is calculated to ensure that a minimum number will occur on the surface of the fatigue test bars. Because the ceramic inclusions are irregularly shaped and have a tendency to break up in the process of extrusion and forging, a method of calculating the probability of occurrence and expected intercepted surface and embedded cross-sectional areas were needed. We have developed a Monte Carlo simulation to determine the distributions of these parameters and have verified the simulated results with observations of ceramic inclusions found in macro slices from extrusions and forgings. The ultimate goal of this study will be to use probabilistic methods to determine the reliability detriment that can be attributed to these ceramic inclusions.
Author
Inclusions; Powder Metallurgy; Alloys; Ceramics; Gas Turbine Engines; Life (Durability); Crack Initiation; Fatigue Tests

20030001914 Argonne National Lab., IL USA
Low-Energy Undulator Test Line: A SASE FEL Operating from 660 to 130 nm
Biedron, S. G.; Borland, M.; Hartog, P. D.; Dejus, R.; Erdmann, M.; 2002; 12p; In English
Report No.(s): DE2002-799794; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
There is a strong desire for short wavelength (down to 1 A), short pulsewidth (less than 100 fs), high-brightness, transverse, and longitudinally coherent light pulses for use by the synchrotron radiation community. Much effort is ongoing worldwide to advance this desire both experimentally, in theory and design, and politically. One of the ongoing experimental efforts is the low-energy undulator test line (LEUTL) at the Advanced Photon Source (APS) at Argonne National Laboratory (ANL). This experiment is based upon the self-amplified spontaneous emission (SASE) process, a method to attain a next-generation light source. This presentation gives an overview concerning the history and results of next-generation light sources, the results of the LEUTL SASE FEL, and the description of the upcoming first user experiment on LEUTL. We will also briefly review exotic schemes for future, next-generation light sources based upon FELs including biharmonic undulators and the possibility of interfacing of traditional x-ray lasers with FELs.
NTIS
Free Electron Lasers; Photons; Spontaneous Emission; Synchrotron Radiation; Particle Beams

20030001942 Lawrence Livermore National Lab., Livermore, CA USA
Nova Experiments Examining Rayleigh-Taylor Instability in Materials with Strength
Weber, S. V.; Kalantar, D. H.; Colvin, J. D.; Gold, D. M.; Mikaelian, K. O.; Oct. 06, 1999; 20p; In English
Report No.(s): DE2002-792361; UCRL-JC-132739; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Material strength can affect the growth of the Rayleigh-Taylor instability in solid materials where growth occurs through plastic flow. In order to study this effect at megabar pressures, we have shocked metal foils using hohlraum x-ray drive on Nova, and observed the growth of pre-imposed modulations with x-ray radiography. Previous experiments employing, Cu foils did not conclusively show strength effects for resolvable wavelengths. Therefore, we have redesigned the experiment to use aluminum foils. As aluminum has higher specific strength at pressures approximately equal to 1 Mbar, the new design is predicted to show growth reduction due to strength of at least a factor of two for some wavelengths in the observable range of 10 - 50 micrometers. We have also modified the drive history to extend the interval of uniform acceleration and to reduce the risk of melting the foils with coalesced shocks. The design changes, as well as Nova operational constraints, limit peak pressures to l-l.5 Mbar. Foil surface motion has been measured with high sensitivity by laser interferometry to look for thermal expansion due to preheat. We have continued to pursue dynamic x-ray diffraction as the most definitive measurement of crystal state.
NTIS
Mechanical Properties; Taylor Instability; Metal Foils; Laser Interferometry

20030001943 Eastern Research Group, Inc., Lexington, MA USA
Summary Report of the Meeting on Development of a Metals Assessment Framework ***Final Report***
Apr. 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): PB2003-101338; No Copyright; Avail: National Technical Information Service (NTIS)

EPA convened a one-day meeting on February 20, 2002 to gather stakeholder input for an Action Plan for the development of a Metals Assessment Framework. The meeting was held at the Holiday Inn Washington Capitol Hotel in Washington, D.C. Approximately 40 stakeholders representing industry and regulatory agencies attended the meeting. Five stakeholders presented comments. The stakeholders agreed that the Metals Assessment Framework should be based on sound science, and that it should provide a basis for appropriately identifying the risks of metals to human health and the environment. The Framework should support EPA's principles and should be structured to mesh with similar EPA and international programs. The stakeholders believed that the method of determining the hazard of a metal should be modified from the Persistence, Bioaccumulation, and Toxicity (PBT) approach developed for evaluating organics. Suggested alternative methods for evaluating metals toxicity included redefining persistence in metals to consider bioavailability, consideration of the nonintrinsic bioaccumulation property of metals, and consideration of speciation and bioavailability.
NTIS
Metals; Conferences; Risk

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.

20030000537 NASA Marshall Space Flight Center, Huntsville, AL USA
Micro-Raman Analysis of Irradiated Diamond Films
Newton, R. L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Owing to its unique and robust physical properties, diamond is a much sought after material for use in advanced technologies such as Microelectromechanical Systems (MEMS). The volume and weight savings promised by MEMS-based devices are of particular interest to spaceflight applications. However, much basic materials science research remains to be completed in this field. Results of micro-Raman analysis of proton (1015 - 1017 H+/cm2 doses) irradiated chemical vapor deposited (CVD) diamond reveals that the microstructure is retained even after high radiation exposure.
Author
Diamond Films; Microstructure; Radiation Dosage

20030000565 Engineering Research and Consulting, Inc., San Diego, CA USA
POSS Polystyrene Copolymers, Reactivity and Control
Moore, Brian; Haddad, Tim; Gonzalez, Rene; Sep. 03, 2002; 25p; In English
Report No.(s): AD-A407321; AFRL-PR-ED-VG-2002-211; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Presentation of findings in POSS-styrene copolymer research.
DTIC
Copolymers; Polystyrene; Reactivity; Synthesis (Chemistry); Control Theory

20030000631 Stanford Linear Accelerator Center, Stanford, CA USA
Morphology of Thermoplastic Elastomers: Stereoblock Polypropylene
Schoenherr, H.; Wiyatno, W.; Frank, C. W.; Fuller, G. G.; Gast, A. P.; 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): DE2002-799985; SLAC-PUB-9341; No Copyright; Avail: National Technical Information Service (NTIS)

Many recent developments in polymer materials science have been triggered by the development of improved synthetic methods, including the development of single site catalysts for controlled polymerizations, novel polymerization techniques, and highly specific polymerizations using cloning strategies. As a consequence, a wide variety of polymers with unusual properties can be designed and synthesized. New synthetic techniques are providing higher levels of control over composition, molecular mass distributions, branching, and stereoregularity. For instance, thermoplastic elastomers based on polypropylene have been known since the 50's. New catalysts and synthetic strategies have led to new classes of these materials and fresh insights into the

origin of their elastomeric properties. The structure and properties of elastomeric polypropylenes derived from bis(2-arylindene) metallocenes have been the subject of study by a variety of techniques. These materials exhibit properties that are both similar to and in some cases distinct from those prepared by other synthetic methods.
NTIS
Elastomers; Polypropylene; Polymerization; Thermoplastic Resins; Morphology; Stereochemistry

20030000681 NASA Marshall Space Flight Center, Huntsville, AL USA
Selection of a Non-ODC Solvent for Rubber Processing Equipment Cleaning
Morgan, R. E., ATK-Thiokol Propulsion, USA; Thornton, T. N., ATK-Thiokol Propulsion, USA; Semmel, L., NASA Marshall Space Flight Center, USA; Selvidge, S. A., NASA Marshall Space Flight Center, USA; [2002]; 7p; In English; 5th AMPET Conference, 16-18 Sep. 2002, Huntsville, AL, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS8-97238; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
NASA/MSFC has recently acquired new equipment for the manufacture and processing of rubber and rubber containing items that are used in the RSRM (Reusable Solid Rocket Motor) system. Work with a previous generation of rubber equipment at MSFC (Marshall Space Flight Center) in the 1970's had involved the use of ODC's such as 1,1,1-Trichloroethane or VOC's such as Toluene as the solvents of choice in cleaning the equipment. Neither of these options is practical today. This paper addresses the selection and screening of candidate cleaning solvents that are not only effective, but also meet the new environmental standards.
Author
Manufacturing; Rubber; Solvents; Cleaning; Toluene; Environmental Quality

20030000893 Carnegie-Mellon Univ., Dept. of Chemical Engineering, Pittsburgh, PA USA
High Resolution Vibrational Spectroscopy of Vapor Phase Lubrication on Ceramics ***Final Report, 1 Mar. 2001-28 Feb. 2002***
Gellman, Andrew J.; Aug. 01, 2002; 7p; In English
Contract(s)/Grant(s): F49620-01-1-0232; AF Proj. 3484
Report No.(s): AD-A407585; AFRL-SR-AR-TR-02-0339; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A High Resolution Electron Energy Loss Spectrometer (HREELS) has been purchased to allow detailed study of the surface chemistry of vapor phase lubricants on both metal and ceramic surfaces. The most commonly used types of vapor phase lubricants are the aryl-phosphates such as tricresylphosphate (TCP). These react with metal surfaces at high temperatures to form solid films that are capable of lubricating at temperatures as high as 500- 600 deg C. The mechanisms by which vapor phase lubricants react to form these lubricious films are key to their success as high temperature lubricants but are not well understood. One of the reasons is that they are more complex than most of the types of compounds typically used in studies of surface chemistry. As a result there are many possible pathways by which they can react and many possible intermediates that might be formed in those reaction mechanisms. Unraveling this complex chemistry requires high resolution spectroscopy that can be used to resolve spectral features and distinguish between species on the surface during TCP reaction. The HREELS spectrometer purchased with the funding that has been provided by this DURIP grant has state-of-the-art resolution for performing vibrational spectroscopy of species on surfaces.
DTIC
Chemical Reactions; Surface Reactions; Vapor Phase Lubrication; Metal Surfaces; High Temperature Lubricants; Ceramics

20030000895 Air Force Research Lab., Space and Missile Propulsion Div., Edwards AFB, CA USA
The Synthesis and Characterization of Lubricants Based on POSS Technology
Blanski, Rusty; Viers, Brent; Gonzalez, Rene; Lee, Andre; Phillips, Shawn H.; Sep. 27, 2002; 33p; In English; Presented at POSS Nanotechnology Conference, Huntington Beach, CA, 25-27 Sep. 2002. Viewgraphs only
Report No.(s): AD-A407571; AFRL-PR-ED-VG-2002-210; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract available
Author
Lubricants; Synthesis (Chemistry)

20030000916 NASA Langley Research Center, Hampton, VA USA
Polyimides Containing Pendent Phosphine Oxide Groups for Space Applications
Thompson, C. M., National Academy of Sciences - National Research Council, USA; Smith, J. G., Jr., Institute for Computer

Applications in Science and Engineering, USA; Watson, K. A., Institute for Computer Applications in Science and Engineering, USA; Connell, J. W., NASA Langley Research Center, USA; [2002]; 12p; In English; 34th International SAMPE Technical Conference, 4-7 Nov. 2002, Baltimore, MD, USA
Contract(s)/Grant(s): NAS1-97046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of an ongoing materials development activity to produce high performance polymers that are durable to the space environment, phosphine oxide containing polyimides have been under investigation. A novel dianhydride was prepared from 2,5-dihydroxyphenyldiphenylphosphine oxide in good yield. The dianhydride was reacted with commercially available diamines, and a previously reported diamine was reacted with commercially available dianhydrides to prepare isomeric polyimides. The physical and mechanical properties, particularly thermal and optical properties, of the polymers were determined. One material exhibited a high glass transition temperature, high tensile properties, and low solar absorptivity. The chemistry, physical, and mechanical properties of these resins will be discussed.
Author
Spacecraft Construction Materials; Materials Selection; Anhydrides; High Polymers; Organic Materials; Chemical Bonds

20030000994 NASA Langley Research Center, Hampton, VA USA
Thermal/Mechanical Response and Damage Growth in Polymeric Composites at Cryogenic Temperatures
Whitley, Karen S., NASA Langley Research Center, USA; Gates, Thomas S., 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 2002-1416; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

In order to increase the reliability of the next generation of space transportation systems, the mechanical behavior of polymeric matrix composite (PMC) materials at cryogenic temperatures must be investigated. This paper presents experimental data on the residual mechanical properties of a carbon fiber polymeric composite, IM7/PETI-5 both before and after aging at cryogenic temperatures. Tension modulus and strength were measured at room temperature, -196 C, and -269 C on five different specimen ply lay-ups, [0](sub 12), [90](sub 12), [+/-45](sub 3S), [+/-25](sub 3s) and [45,90(sub 3),-45,0(sub 3),-45,90(sub 3),45]. Specimens were preconditioned with one set of coupons being isothermally aged for 555 hours at -184 C in an unloaded state. Another set of corresponding coupons were mounted in constant displacement fixtures such that a constant uniaxial strain was applied to the specimens for 555 hours at -184 C. The measured lamina level properties indicated that cryogenic temperatures have an appreciable influence on behavior, and residual stress calculations based on lamination theory showed that the transverse tensile ply stresses could be quite high for cryogenic test temperatures. Microscopic examination of the surface morphology showed evidence of degradation along the exposed edges of the material due to aging at cryogenic temperatures.
Author
Polymer Matrix Composites; Cryogenic Temperature; Carbon Fibers; Modulus of Elasticity

20030001587 NASA Marshall Space Flight Center, Huntsville, AL USA
Macromolecular Crystal Growth by Means of Microfluidics
vanderWoerd, Mark, Universities Space Research Association, USA; Ferree, Darren, Universities Space Research Association, USA; Spearing, Scott, Morgan Research Corp., USA; Monaco, Lisa, Morgan Research Corp., USA; Molho, Josh, Caliper Technologies Corp., USA; Spaid, Michael, Caliper Technologies Corp., USA; Brasseur, Mike, Caliper Technologies Corp., USA; [2002]; 1p; In English; International Union for Crystallography (IUC), 8 Aug. 2002, Geneva, Switzerland; Sponsored by International Union of Crystallography, UK
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

We have performed a feasibility study in which we show that chip-based, microfluidic (LabChip(TM)) technology is suitable for protein crystal growth. This technology allows for accurate and reliable dispensing and mixing of very small volumes while minimizing bubble formation in the crystallization mixture. The amount of (protein) solution remaining after completion of an experiment is minimal, which makes this technique efficient and attractive for use with proteins, which are difficult or expensive to obtain. The nature of LabChip(TM) technology renders it highly amenable to automation. Protein crystals obtained in our initial feasibility studies were of excellent quality as determined by X-ray diffraction. Subsequent to the feasibility study, we designed and produced the first LabChip(TM) device specifically for protein crystallization in batch mode. It can reliably dispense and mix from a range of solution constituents into two independent growth wells. We are currently testing this design to prove its efficacy for protein crystallization optimization experiments. In the near future we will expand our design to incorporate up to 10 growth wells per LabChip(TM) device. Upon completion, additional crystallization techniques such as vapor diffusion and liquid-liquid diffusion will be accommodated. Macromolecular crystallization using microfluidic technology is envisioned as a fully automated

system, which will use the 'tele-science' concept of remote operation and will be developed into a research facility for the International Space Station as well as on the ground.
Author
Crystallization; Diffusion; Dispensers; Protein Crystal Growth; Vapors; Technology Utilization

20030001962 McDermott Technology, Inc., Alliance, OH USA
Robust Fiber Coatings ***Final Report, 1 Oct. 1998-31 May 2002***
Goettler, Richard W.; Aug. 2002; 97p; In English; Original contains color images
Contract(s)/Grant(s): F33615-98-C-5219; Proj-4347
Report No.(s): AD-A407946; RDD98:43702-400-100-01R; AFRL-ML-WP-TR-2002-4167; No Copyright; Avail: Defense Technical Information Center (DTIC)

The highly desired ceramic matrix composite is the one in which the high strength and strain-to-failure is achieved through judicious selection of a fiber coating that can survive the high-temperature oxidizing use environment that is envisioned for these engineered structural materials. Scheelite (CaWO4) had been identified as a promising oxidation-resistant fiber coating, but its functionality within a CMC having a dense matrix had remained to be proven. The objective of this program was to verify that scheelite coatings provide for high strains-to- failure, nonlinearity in the stress-strain curves and the corresponding fiber pullout expected in CMC fracture. It was important under this program to evaluate CMCs with as high of a matrix density as possible to insure that the fiber coating was duly tested rather than having the fracture behavior being influenced by damage of a weak matrix phase, typical for the porous matrix class of CMCs. Nextel 610 alumina fibers were chosen as the reinforcement because of its higher strength compared to the Nextel 720 mullite-alumina fiber that is also a candidate for scheelite coatings. Unidirectional CMC were fabricated and tested throughout the program to examine the functionality of the scheelite coatings.
DTIC
Fibers; Ceramic Matrix Composites; Ceramic Coatings; Scheelite

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.

20030000672 Advanced Power Technologies, Inc., Alexandria, VA USA
Reduced Energy Consumption Through Projectile Based Excavation ***Progress Report***
Jul. 12, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800754; No Copyright; Avail: National Technical Information Service (NTIS)

During the sixth quarter of performance field/quarry testing of the 60 mm system began. Design of the electric launch system also proceeded in a satisfactory manner. Two mufflers were designed and fabricated during the report period. Although this design proved effective in reducing the acoustic signature of the launcher, it failed to hold the overpressure occurring during launch and therefore, was replaced with a steel drum design.
NTIS
Energy Consumption; Excavation; Projectiles; Fabrication

20030000767 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Examination of an Orbiting Cryogenic Fuel Depot
Hull, Patrick V., Tennessee Technological Univ., USA; Canfield, Steven L., Tennessee Technological Univ., USA; Carrington, Connie, NASA Marshall Space Flight Center, USA; Fikes, John, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 10p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

For many years NASA has been interested in the storage and transfer of cryogenic fuels in space. Lunar, L2 and other chemical propulsive space vehicle missions now have staged refueling needs that a fuel depot would satisfy. The depot considered is located in lower earth orbit. Many considerations must go into designing and building such a station. Multi-layer insulation systems, thermal shielding and low conductive structural supports are the principal means of protecting the system from excessive heat loss due to boiloff. This study focuses on the thermal losses associated with storing LH2 in a passively cooled fuel depot in a lower earth equatorial orbit. The corresponding examination looks at several configurations of the fuel depot. An analytical model has

been developed to determine the thermal advantages and disadvantages of three different fuel depot configurations. Each of the systems consists of three Boeing rocket bodies arranged in various configurations. The first two configurations are gravity gradient stabilized while the third one is a spin-stabilized concept. Each concept was chosen for self-righting capabilities as well as the fuel settling capabilities, however the purpose of this paper is to prove which of the three concepts is the most efficient passively cooled system. The specific areas to be discussed are the heating time from the fusion temperature to the vaporization temperature and the amount of boiloff for a specific number of orbits. Each of the previous points is compared using various sun exposed surface areas of the tanks.
Author
Cryogenics; Mathematical Models; Cryogenic Fluid Storage; Equatorial Orbits; Heat of Vaporization; Thermodynamics

20030000979 NASA Marshall Space Flight Center, Huntsville, AL USA
Reproducibility and Repeatability of Tensile and Low-Cycle Fatigue Properties in Propulsion Grade Hydrogen
Vesely, E. J., NASA Marshall Space Flight Center, USA; Bhat, B. N., NASA Marshall Space Flight Center, USA; McPherson, W. B., Morgan Research Corp., USA; Grethlein, C. E., IIT Research Inst., USA; [2002]; 1p; In English; International Conference for Hydrogen Effects on Material Behavior and Corrosion Deformation Interaction, 22-26 Sep. 2002, Morgan, WY, USA
Contract(s)/Grant(s): NAS8-38258; No Copyright; Avail: Issuing Activity; Abstract Only
Hydrogen has the potential of increased use in the future as an environmentally friendly fuel. It has, however, shown a tendency to embrittle some materials. to be used in a safe manner and to exploit its full potential, it will be necessary to develop a database of material properties in hydrogen environment. The tests needed to produce this data are costly to perform (tensile test cost 25 times more and low cycle fatigue test are 55 times as expensive). Moreover, there is presently a lack of universal test methods to ensure standardized data within the hydrogen community. Each of the industries that work with hydrogen (aerospace, petroleum, fuel cells, etc.) performs tests by their own laboratory-developed methods, thus rendering cross- comparisons of material property data highly questionable. It is extremely important that data generated in a hydrogen environment be done to a standard that reduces variance to a minimum and allows direct comparison of test results from different laboratories. Doing so will assure that all data generated can be used to further our understanding of the hydrogen effects and to make sure components/products designed for hydrogen are the safest and most reliable possible. This paper reviews the results of two 'round-robin' programs conducted by NASA-MSFC. These two programs examined the reproducibility and repeatability of tensile and low-cycle fatigue test results in high-pressure hydrogen environments. The studies indicated that even with the tightest controls available from current commercial standards, the reproducibility (between different laboratories) and repeatability (within a laboratory) results of the tensile tests exhibited five times the variance as in standard ambient air tests. The variance with the LCF tests were on the same order as with air tests, but that was due to the large variation present in the last Interlaboratory air program. The paper concludes with a recommendation for a program that would allow the development of improved test methods, leading to lower variance in the generation of mechanical property data in the future.
Author
Hydrogen; Hydrogen Fuels; Data Bases; Brittleness; Tensile Tests; Fatigue Tests

20030001652 Sandia National Labs., Albuquerque, NM USA
Viability of Applying Curie Point Pyrolysis/Gas Chromatography Techniques for Characterization of Ammonium Perchlorate Based Propellants
Barnett, J.; Montoya, B. M.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-801003; SAND2002-1992; No Copyright; Avail: National Technical Information Service (NTIS)
Curie Point pyrolysis-gas chromatography was investigated for use a tool for characterization of aged ammonium perchlorate based composite propellants.
NTIS
Ammonium Perchlorates; Composite Propellants; Gas Chromatography; Pyrolysis; Curie Temperature

20030001947 Lawrence Livermore National Lab., Livermore, CA USA
Improving Gas Storage Development Planning through Simulation-Optimization
Johnson, V. M.; Ammer, J.; Trick, M. D.; Jul. 25, 2000; 26p; In English
Report No.(s): DE2002-792731; UCRL-JC-139801; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is the first of two papers describing the application of simulator-optimization methods to a natural gas storage field development planning problem. The results presented here illustrate the large gains in cost-effectiveness that can be made by employing the reservoir simulator as the foundation for a wide-ranging search for solutions to management problems. The current

paper illustrates the application of these techniques given a deterministic view of the reservoir. A companion paper will illustrate adaptations needed to accommodate uncertainties regarding reservoir properties.
NTIS
Optimization; Computerized Simulation; Natural Gas; Crude Oil; Management Planning

20030001960 Thiokol Corp., Brigham City, UT USA
Development of New Energetic Materials for Advanced Solid Rocket Propellants
Cannizzo, Lou F.; Jan. 1997; 7p; In English
Contract(s)/Grant(s): F04611-96-C-0005; Proj-1011
Report No.(s): AD-A407949; AFRL-PR-ED-TP-1998-081; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Integrated High Performance Rocket Propulsion Technology (IHPRPT) program has set ambitious goals of significant increases in rocket propulsion performance while maintaining acceptable cost and hazards criteria. As part of this effort, Thiokol Corporation has been actively investigating the synthesis, development, and formulation of new energetic ingredients for application in solid rocket propellants. Several new materials under investigation include CL-20 (a new high density nitramine), ADN (a high energy non-chlorine oxidizer), and heterocycle-based high nitrogen compounds. Recent propellant results indicate that attractive hazards properties and ballistic characteristics can be obtained with CL-20 and ADN.
DTIC
Solid Rocket Propellants; Nitrogen Compounds

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.

20030001000 NASA Marshall Space Flight Center, Huntsville, AL USA
Microgravity Manufacturing
Cooper, Ken, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Manufacturing capability in outer space remains one of the critical milestones to surpass to allow humans to conduct long-duration manned space exploration. The high cost-to-orbit for leaving the Earth's gravitational field continues to be the limiting factor in carrying sufficient hardware to maintain extended life support in microgravity or on other planets. Additive manufacturing techniques, or 'chipless' fabrication, like RP are being considered as the most promising technologies for achieving in situ or remote processing of hardware components, as well as for the repair of existing hardware. At least three RP technologies are currently being explored for use in microgravity and extraterrestrial fabrication.
Author
Microgravity; Space Manufacturing; Fabrication; Technology Assessment

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.

20030000454 Ship Structure Committee, Washington, DC USA
Failure Definition for Structural Reliability Assessment
Sep. 2002; 92p; In English
Report No.(s): PB2003-101115; SSC-420; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This study provides methodologies for defining failure for reliability-based, marine structural design and analysis. Structural reliability methods allow the prediction of an occurrence likelihood for a particular event of interest (for example, structural failure), allowing the designer to limit the probability of undesirable events. Changes to the traditional serviceability failure definitions are not possible without addressing the costs associated with the failures, either subjectively or objectively. A framework is provided by which this may be accomplished in the future. This study begins with a review and description of

structural reliability methodologies as they have been applied to ship structure. Uncertainty types are then explored for information and tools used in a reliability prediction. Types of failure modes are described as reported in literature. These types are then expanded upon to establish classes of failure modes, leading to a methodology for formulating the range of failure definitions. Failure definition examples are provided for the hull girder and structural components at both the ultimate and serviceability types of failure. Finally, recommendations are made to provide guidance on applications and future research in this topic area.
NTIS
Hulls (Structures); Structural Design; Structural Reliability; Reliability Analysis; Performance Prediction

20030000746 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
How to Quickly Import CAD Geometry into Thermal Desktop
Wright, Shonte, Jet Propulsion Lab., California Inst. of Tech., USA; Beltran, Emilio, Microsoft Corp., USA; July 2002; 12p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

There are several groups at JPL (Jet Propulsion Laboratory) that are committed to concurrent design efforts, two are featured here. Center for Space Mission Architecture and Design (CSMAD) enables the practical application of advanced process technologies in JPL's mission architecture process. Team I functions as an incubator for projects that are in the Discovery, and even pre-Discovery proposal stages. JPL's concurrent design environment is to a large extent centered on the CAD (Computer Aided Design) file. During concurrent design sessions CAD geometry is ported to other more specialized engineering design packages.
Derived from text
Computer Aided Design; Design Analysis; Systems Engineering

20030000758 CFD Research Corp., Huntsville, AL USA
MDICE: An Integrated Framework for Multidisciplinary Engineering Simulations
Sarathy, V., CFD Research Corp., USA; Underwood, M., CFD Research Corp., USA; Harrand, V., CFD Research Corp., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 26p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

MDICE provides middleware technology for integrating applications at the source level; Legacy applications are integrated using wrapper approach. MDICE also provides an environment that enables workflow management of a simulation including parallelization, optimization and multi-disciplinary analysis. Coupling between applications is controlled using dynamic data exchange i.e., user may control the level of coupling (Fine vs. Coarse, One-way vs.Two-way). Turnkey solutions are available in Conjunction with CFDRC's software for specific engineering disciplines
Derived from text
Computer Programming; Software Engineering; Fluid Dynamics; Thermodynamic Properties

20030000759 NASA Glenn Research Center, Cleveland, OH USA
NPSS Overview to TAFW Multidisciplinary Simulation Capabilities
Owen, Karl, NASA Glenn Research Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 46p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The Numerical Propulsion System Simulation (NPSS) is a concerted effort by NASA Glenn Research Center, the aerospace industry, and academia to develop an advanced engineering environment or integrated collection of software programs for the analysis and design of aircraft engines and, eventually, space transportation components. NPSS is now being applied by GE ground power to ground power generation with the view of expanding the capability to nontraditional power plant applications (example: fuel cells) and NPSS has an interest in in-space power and will be developing those simulation capabilities.
Derived from text
Space Transportation; Computer Programs; Aircraft Engines; Simulation; Propulsion System Configurations

20030000760 International Space Systems, Inc., Huntsville, AL USA
RECIPE: Collaborative Engineering Environment
Twelfth Thermal and Fluids Analysis Workshop; July 2002; 28p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The top five reasons to use RECIPE are: 1) Engineers get to work with their models in a familiar atmosphere and can easily receive data from other models as soon as it is ready; 2) Engineers and managers can trace problems and know that finished data is secure from tampering and easily retrieved; 3) Engineers and managers can easily view results and easily export those results

to other presentations; 4) Engineers can easily retrieve important data from other models and insert that data into their models; and 5) ISSI will provide support and do everything possible to satisfy you, the customer!
Derived from text
International Trade; Engineers; Systems Analysis; Inserts

20030000761 Engineous Software, Inc., Cary, NC USA
Rethinking the Design Process iSIGHT Framework
Prow, Mark, Engineous Software, Inc., USA; Rhodes, Therese, Engineous Software, Inc., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 46p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This presentation provides an overview of the iSight software developed by Engineious Software which is designed to be an automated intelligent agent that aids and assists engineers in all aspects of product design and analysis. Topics covered include: design cycle issues, quality engineering, optimization, design analysis, graphic user interface and connectivity. Case histories of iSight software use in the design of multi-stage power generation steam turbines, airframe structures, propellers, nozzles and hulls.
CASI
Design Analysis; Computer Aided Design; Structural Design; Computer Aided Manufacturing; Software Engineering; Case Histories; Applications Programs (Computers); Design Optimization; Structural Analysis

20030000762 USA Gypsum Co., Sweetwater, TX USA
iMAN
Bailey, Mitchell, USA Gypsum Co., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 46p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This presentation provides an overview of the iMan software application which is designed to assist production managers and engineers in all aspects of computer aided manufacturing and product lifecycle management. Topics covered include: product development, product tracking, interoperability, web collaboration, data management, business drivers, computer architecture, data analysis, change management, configuration management and systems integration.
CASI
Computer Aided Manufacturing; Software Engineering; Production Management; Product Development; Structural Analysis; Structural Design; Tracking (Position)

20030000763 Boeing Co., USA
Robust Design Computational System (RDCS)
Rajagopal, Kadambi, Boeing Co., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 13p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This presentation provides an overview of the Robust Design Computational System, a comprehensive software application, designed to assist engineers in all aspects of design analysis. Topics covered include: parallel computing applications, computer networks, design process selection, design visualization and assessment, global variables, parameter identification and computer architecture.
CASI
Design Analysis; Computer Aided Design; Software Engineering; Applications Programs (Computers); Structural Analysis; Structural Design

20030001651 Case Western Reserve Univ., Cleveland, OH USA
Optimization of the Squeeze Casting Process for Aluminum Alloy Parts ***Final Report***
Schwam, D.; Wallace, J. F.; Chang, Q.; Zhu, Y.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-801193; No Copyright; Avail: National Technical Information Service (NTIS)

This study was initiated with the installation of a new production size Ube 350 Ton VSC Squeeze Casting Laboratory at Case Western Reserve University. A Lindberg 75kW electrical melting furnace was installed alongside. The challenge of installation and operation of such industrial-size equipment in an academic environment was met successfully. This investigation has studied the influence of the various casting variables on the quality of indirect squeeze castings primarily of aluminum alloys. The variables studied include gating design, fill time and fill pattern, metal pressure and die temperature variations. The quality of the

die casting was assessed an analysis of both their surface condition and internal soundness. The primary metal tested was an aluminum 356 alloy.
NTIS
Aluminum Alloys; Optimization; Squeeze Casting; Cast Alloys

20030001706 NASA Marshall Space Flight Center, Huntsville, AL USA
Advancements in Binder Systems for Solid Freeform Fabrication
Cooper, Ken, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Paper will present recent developments in advanced material binder systems for solid freeform fabrication (SFF) technologies. The advantage of SFF is the capability to custom fabricate complex geometries directly from computer aided design data in layer- by-layer fashion, eliminated the need for traditional fixturing and tooling. Binders allow for the low temperature processing of 'green' structural materials, either metal, ceramic or composite, in traditional rapid prototyping machines. The greatest obstacle comes when green parts must then go through a sintering or burnout process to remove the binders and fully densify the parent material, without damaging or distorting the original part geometry. Critical issues and up-to-date assessments will be delivered on various material systems.
Author
Computer Aided Design; Computational Geometry; Fabrication; Computer Aided Manufacturing; Binders (Materials)

20030001831 National Inst. of Standards and Technology, Gaithersburg, MD USA
Nanomanufacturing of Atom-Based Dimensional Standards: A Final Project Report of the National Advanced Manufacturing Testbed (NAMT)
Vorburger, T. V.; Allen, R. H.; Damazo, B.; Fu, J.; Monk, D.; Jan. 2002; In English
Report No.(s): PB2002-101311; NISTIR-6850; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the accomplishments of the Nanomanufacturing of Atom-based Dimensional Standards Project, which operated as part of the National Advanced Manufacturing Testbed (NAMT), a program to research a wide range of leading edge technologies for manufacturing. As part of the NAMT vision, the Nanomanufacturing of Atom-based Dimensional Standards Project researched the techniques to manufacture and use dimensional standards at subnanometer levels of uncertainty. Its main area of application is the microelectronics and data storage industries where in the future, the critical dimensions of manufactured devices will grow continually smaller and where we anticipate that environments in which certain components are manufactured and used will become more specialized and exotic. This report discusses developments in atom-based step height standards, atom-based linewidth standards, a vacuum-based artifact transport system, a portable data logger, design and communication processes, and telerobotics.
NTIS
Standardization; Robotics; Nanotechnology; Manufacturing

20030001835 National Inst. for Occupational Safety and Health, Rockville, MD USA
Drill Monitor with Strata Strength Classification in Near-Real Time
2002; 24p; In English
Report No.(s): PB2003-100941; NIOSH/RI-9658; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The process of drilling and bolting the roof is currently one of the most dangerous jobs in underground mining, resulting in about 1,000 accidents with injuries each year in the USA. Researchers from the Spokane Research Laboratory of the National Institute for Occupational Safety and Health are studying the use of a drill monitoring system to estimate the strength of successive layers of rock and assess the integrity of a mine roof so that roof drill operators can be warned when a weak layer is being drilled. Measurements taken during drilling can be converted to suitably scaled features so that a neural network can classify mine roof strata in terms of relative strength. The feasibility of this concept has been demonstrated in the laboratory. The research project was undertaken in order to increase the safety of underground miners, especially those involved in roof bolting. The system should be applicable to the mobile drills used in underground mining and would likely find wider application as well.
NTIS
Drills; Rocks; Mining

20030001946 Northwestern Univ., Dept. of Mechanical Engineering, Evanston, IL USA
Spray Characteristics of Fire Sprinklers
Sheppard, D. T.; Jun. 2002; 212p; In English
Report No.(s): PB2003-100879; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
Although fire sprinklers have been in use for over 100 years there has been little progress toward developing analytical methods of calculating their effectiveness. This lack of progress is primarily due to absence of information about initial spray characteristics near sprinklers. In this study, experiments were conducted near a variety of sprinkler designs utilizing (1) a pulsed laser sheet and CCD camera and (2) phase Doppler interferometry.
NTIS
Design Analysis; Sprayers; Sprinkling; Components

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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.

20030000822 Naval Postgraduate School, Monterey, CA USA
Detection and Classification of Low Probability of Intercept Radar Signals Using Parallel Filter Arrays and Higher Order Statistics
Taboada, Fernando L.; Sep. 2002; 297p; In English; Original contains color images
Report No.(s): AD-A407164; No Copyright; Avail: CASI; A13, Hardcopy
Low probability of intercept (LPI) is that property of an emitter that because of its low power, wide bandwidth, frequency variability, or other design attributes, makes it difficult to be detected or identified by means of passive intercept devices such as radar warning, electronic support and electronic intelligence receivers. In order to detect LPI radar waveforms new signal processing techniques are required. This thesis first develops a MATLAB toolbox to generate important types of LPI waveforms based on frequency and phase modulation. The power spectral density and the periodic ambiguity function are examined for each waveforms. These signals are then used to test a novel signal processing technique that detects the waveforms parameters and classifies the intercepted signal in various degrees of noise. The technique is based on the use of parallel filter (sub-band) arrays and higher order statistics (third-order cumulant estimator). Each sub-band signal is treated individually and is followed by the third-order estimator in order to suppress any symmetrical noise that might be present. The significance of this technique is that it separates the LPI waveforms in small frequency bands, providing a detailed time-frequency description of the unknown signal. Finally, the resulting output matrix is processed by a feature extraction routine to detect the waveforms parameters. Identification of the signal is based on the modulation parameters detected.
DTIC
Detection; Emitters; Low Frequencies; Probability Theory; Signal Processing; Statistical Analysis; Radar Transmission

20030000823 Naval Postgraduate School, Monterey, CA USA
Analysis of Low Probability of Intercept (LPI) Radar Signals Using Cyclostationary Processing
Lime, Antonio F., Jr.; Sep. 2002; 186p; In English; Original contains color images
Report No.(s): AD-A407011; No Copyright; Avail: CASI; A09, Hardcopy
LPI (Low Probability of Intercept) radar is a class of radar systems that possess certain performance characteristics that make them nearly undetectable by today's digital intercept receivers. This presents a significant tactical problem in the battle space. to detect these types of radar, new digital receivers that use sophisticated signal processing techniques are required This thesis investigates the use of cyclostationary processing to extract the modulation parameters from a variety of continuous-wave (CW) low-probability-of-intercept (LPI) radar waveforms. The cyclostationary detection techniques described exploit the fact that digital signals vary in time with single or multiple periodicities, because they have spectral correlation, namely, non-zero correlation between certain frequency components, at certain frequency shifts. The use of cyclostationary signal processing in a non-cooperative intercept receiver can help identify the particular emitter and can help develop electronic attacks. LPI CW waveforms examined include Frank codes, polyphase codes (Pt through P4), Frequency Modulated CW (FMCW), Costas frequencies as well as several frequency-shift-keying/phase-shift-keying (FSK/PSK) waveforms. It is shown that for

signal-to-noise ratios of OdB and -6 dB, the cyclostationary signal processing can extract the modulation parameters necessary in order to distinguish among the various types of LPI modulations.
DTIC
Signal Processing; Radar; Interception

20030000824 Air Command and Staff Coll., Maxwell AFB, AL USA
DOD Use of Commercial Wideband Satellite Communications Systems: How Much is Needed, and How Do We Get It?
Hutchens, Robert E., III; Apr. 01, 2001; 44p; In English; Original contains color images
Report No.(s): AD-A407005; AU/ACSC/060/2001-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Joint force commanders must have the right information at the right time in order to make the best decisions to conduct successful contingency operations in defense of U.S. national security interests. A key enabler to this end is sufficient wideband satellite communications connectivity DoD's (Department of Defense) organic wideband satellite communications capabilities are inadequate, so commercial services must be used to overcome the shortfall. The problem is to dedicate enough resources in the most efficient manner to meet this growing need, and time is of the essence, This paper capitalizes on the vast work already accomplished concerning what DoD needs to do to obtain the commercial wideband satellite communications it needs. DoD is procuring advanced satellite ground terminals capable of using commercial wideband satellites and is contracting to launch more of its own capabilities, but the gap is continuing to widen. This paper offers a solution of procuring 140 percent of DoD's projected wideband satellite communications from commercial sources, to ensure sufficient capacity is available to support contingency operations.
DTIC
Defense Program; Broadband; Satellite Communication; Communication Networks

20030000856 National Inst. of Standards and Technology, Gaithersburg, MD USA
Security for Telecommuting and Broadband Communications: Recommendations of the National Institute of Standards and Technology
Kuhn, D. R.; Tracy, Miles C.; Frankel, Sheila E.; Aug. 2002; 114p; In English; Original contains color images
Report No.(s): AD-A407184; NIST-800-46; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This document is intended to assist those responsible - users, system administrators, and management - for telecommuting security, by providing introductory information about broadband communication security and policy, security of home office systems, and considerations for system administrators in the central office. It addresses concepts relating to the selection, deployment, and management of broadband communications for a telecommuting user. This document is not intended to provide a mandatory framework for telecommuting or home office broadband communication environments, but rather to present suggested approaches to the topic.
DTIC
Broadband; Computer Information Security; Wide Area Networks

20030000869 Naval Postgraduate School, Monterey, CA USA
Communicating Reengineering at Naval Facilities Engineering Command, Southwest Division
Welch, David T.; Sep. 2002; 63p; In English
Report No.(s): AD-A407171; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This research evaluates how effectively the reengineering process concept has been communicated within the Southwest Division in San Diego, California. It clearly defines reengineering, why reengineering has been embraced by Southwest Division, and what senior leadership's communication objectives and strategies have been since its inception. The research analyzes senior leadership's communication of organizational reengineering and some of the obstacles they have encountered. The research provides action recommendations, where warranted, for greater success in communicating the reengineering process transformation.
DTIC
Communication; Command and Control; Navy; Engineering

20030000894 Defence Science and Technology Organisation, Information Sciences Lab., Salisbury, Australia
Loop Group Parakeet Virtual Cable Concept Demonstrator
Dowsett, T.; McNeill, T. C.; Reynolds, A. B.; Blair, W. D.; Jul. 2002; 29p; In English
Report No.(s): AD-A407572; DSTO-TN-0446; DODA-AR-012-449; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Parakeet Virtual Cable (PVC) concept demonstrator uses the Ethernet Local Area Network (LAN) laid for the Battle Command Support System (BCSS) to connect the Parakeet DVT(DA) (voice terminal) to the Parakeet multiplexer. This currently requires pairs of PVC interface units to be installed for each DVT(DA) . to reduce the cost of a PVC installation, the concept of a Loop Group Parakeet Virtual Cable (LGPVC) was proposed. This device was designed to replace the up to 30 PVC boxes and the multiplexer at the multiplexer side of a PVC installation. While the demonstrator is largely complete, testing has revealed an incomplete understanding of how to emulate the proprietary handshaking occurring between the circuit switch and the multiplexer. The LGPVC concept cannot yet be demonstrated.
DTIC
Communication Networks; Computer Networks

20030000991 Naval Postgraduate School, Monterey, CA USA
Analysis of Low Probability of Intercept (LPI) Radar Signals Using the Wigner Distribution
Gau, Jen-Yu; Sep. 2002; 166p; In English; Original contains color images
Report No.(s): AD-A407020; No Copyright; Avail: CASI; A08, Hardcopy
The parameters of Low Probability of Intercept (LPI) radar signals are hard to identity by using traditional periodogram signal processing techniques. Using the Wigner Distribution (WD), this thesis examines eight types of LPI radar signals. Signal to noise ratios of 0 dB and -6 dB are also investigated. The eight types LPI radar signals examined include Frequency Modulation Continuous Wave (FMCW), Frank code, Pt code, P2 code, P3 code, P4 code, COSTAS frequency hopping and Phase Shift Keying/Frequency Shift Keying (PSK/FSK) signals. Binary Phase Shift Keying (BPSK) signals although not used in modern LPI radars are also examined to further illustrate the principal characteristics of the WD.
DTIC
Signal Processing; Radar; Distribution Functions

20030000992 Naval Postgraduate School, Monterey, CA USA
Analysis of Jammer Resistant, Spread Spectrum, VSAT Communication Scheme for Maritime Platform Using DS-CDMA
Aras, Ersin; Sep. 2002; 94p; In English
Report No.(s): AD-A407018; No Copyright; Avail: CASI; A05, Hardcopy
In this thesis, a new VSAT (Very Small Aperture Terminal) Communication system is developed using Direct Sequence Code Division Multiple Access (DS-CDMA) for multiple maritime mobile users in the footprints of national communication satellites. The Forward Error Correction (FEC) is implemented by applying convolution encoding with soft decision decoding. The worst case scenario is always considered by placing VSAT system and different types of jammers on the footprint where the minimum signal- to-noise ratio is possible. Using this assumption, the performance of the system is analyzed for different convolution code rates, for a different number of users and for the different jammer powers. The Walsh codes are used to establish an orthogonal cover between CDMA channels in a VSAT. Additionally, spread spectrum is included by PN sequences to ensure as much orthogonal coverage as possible between the VSATs. Also, that spreading is the key to minimizing these hostile jammers effects. After analyzing VSAT system for possible scenario elements, optimum system parameters are introduced for military and civilian applications.
DTIC
Jamming; Radio Communication; Communication Satellites

20030001581 Naval Postgraduate School, Monterey, CA USA
Direct-Sequence Spread-Spectrum Modulation for Utility Packet Transmission in Underwater Acoustic Communication Networks
Duke, Peter S.; Sep. 2002; 151p; In English
Report No.(s): AD-A407872; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
This thesis investigates the feasibility and performance of using Direct-Sequence Spread-Spectrum (DSSS) modulation for utility-packet transmission in Seaweb underwater wireless acoustic communications networks, Seaweb networks require robust channel-tolerant utility packets having a low probability of detection (LPD) and allowing for multi-user access, MATLAB code simulated the DSSS transmitter and receiver structures and a modeled channel impulse response represented the underwater environment, The specific modulation scheme implemented is direct-sequence, differentially encoded binary phase-shift keying (DS-DBPSK) with quadrature spreading, Performance is examined using Monte Carlo simulation Bit error rates and packet error

rates for various signal-to-noise ratios and channel conditions are presented and the use of a RAKE receiver, forward error-correction coding and symbol interleaving are examined for improving system performance.
DTIC
Communication Networks; Packet Transmission; Packets (Communication); Probability Theory; Spread Spectrum Transmission; Underwater Acoustics; Wireless Communication

20030001642 Coast Guard, Washington, DC USA
Advanced Communications Technology: Technology Assessment of Mobile Satellite System Alternatives
Johnson, G. W.; Turban, J.; Erickson, R.; Apr. 1998; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101441; No Copyright; Avail: National Technical Information Service (NTIS)
This report describes the results of extensive research into the commercial mobile satellite (MSAT) communications market. All current and emerging MSAT communications systems are identified and described in the sections below. We have chosen to categorize the systems based upon when they will be available: Now, Soon (1998-1999), Turn-of-the-Century (2000-2001), and On-the-Horizon (2002+). Within each year-group, all types of systems (data-only, voice/data, and broadband) are considered. The most promising mobile satellite systems (the ones that appear to meet the documented requirements) will be tested at the R&D Center to establish an independent, impartial evaluation of each system. A preliminary test outline and list of systems to be evaluated is included in this report. At the completion of each system test, results will be reported separately. Due to the rapid developments in this field, a second MSAT Evaluation report will be completed in the first quarter of FY99 as an update to this work.
NTIS
Communication Satellites; Technology Assessment; Mobile Communication Systems

20030001838 Coast Guard, Office of Research and Development, Washington, DC USA
Advanced Communications Technology: Eighth District BOATRACS Test and Evaluation *Final Report*
Jul. 1998; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101433; No Copyright; Avail: National Technical Information Service (NTIS)
One of the objectives of the Mobile Communications Infrastructure project is to conduct in-depth evaluations of mobile satellite systems that appear to meet Coast Guard communications requirements. The goal in testing these systems is to quantify how well they work and to provide some metrics to see how each of these systems could fit the needs of the Coast Guard. There are a variety of parameters that will be measured for each system. Most of the measurements are of the overall system, not the individual pieces. These parameters include coverage, availability, reliability, accuracy, interoperability, bandwidth, latency, ease of use, and cost. Some testing will be performed in the Advanced Communications Lab at the R&D Center, and some will be performed by placing systems on operational units for field testing. The Eight Coast Guard District has an extremely large AOR encompassing 26 States. The District is responsible for 1,200 miles of coastline and 10,300 miles of inland waterways. The major missions are Law Enforcement, Search and Rescue, and Pollution Response.
NTIS
Mobile Communication Systems; Computer Networks; Military Operations

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ELECTRONICS AND ELECTRICAL ENGINEERING

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

20030000439 bd Systems, Inc., Control Dynamics Div., Huntsville, AL USA
SRB Altitude Switch Assembly Wire Harness Failure *Final Report*
Blanche, Jim, bd Systems, Inc., USA; [2002]; 3p; In English
Contract(s)/Grant(s): NAS8-02045; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper presents an assessment of two wire harness failures that had occurred in Solid Rocket Booster Altitude Switch Assemblies S/N 200001 and S/N 20002. A list of modifications to EDU #4 and modification of qualification units 2000001 and 2000002 are also presented.
CASI
Harnesses; Space Shuttle Boosters; Failure Analysis; Switches; Electric Wire; Altitude

20030000604 NASA Glenn Research Center, Cleveland, OH USA
Advance Power Technology Demonstration on Starshine 3
Jenkins, Phillip, Ohio Aerospace Inst., USA; Scheiman, David, Ohio Aerospace Inst., USA; Wilt, David, NASA Glenn Research Center, USA; Raffaelle, Ryne, Rochester Inst. of Tech., USA; Button, Robert, NASA Glenn Research Center, USA; Smith, Mark, Ohio Aerospace Inst., USA; Kerslake, Thomas, NASA Glenn Research Center, USA; Miller, Thomas, NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 145-150; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche
The Starshine 3 satellite will carry several power technology demonstrations. Since Starshine 3 is primarily a passive experiment and does not need electrical power to successfully complete its mission, the requirement for a highly reliable power system is greatly reduced. This creates an excellent opportunity to test new power technologies. Several government and commercial interests have teamed up to provide Starshine 3 with a small power system using state-of-the-art components. Starshine 3 will also fly novel integrated microelectronic power supplies (IMPS) for evaluation.
Author
Microelectronics; Technology Utilization; Space Missions; Satellite Power Transmission

20030000605 NASA Glenn Research Center, Cleveland, OH USA
Solar Array Arcing Failure Mode and High Voltage Array Testing
Ferguson, Dale C., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 151-153; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche
In 1998, a new failure mode for space solar arrays was discovered. A flowchart for this failure mode is presented. Since the discovery of this arc failure mode, many tactics have been used to defeat it. The arc thresholds and arc mitigation strategies must be determined in vacuum-plasma tank testing on Earth. Results from these tests must then be extrapolated to the space plasma environment. Thus, the test conditions on Earth must be adequate to reproduce the important aspects of the phenomenon in space. At Glenn Research Center, we have been testing solar arrays for their arc thresholds and sustained arcing thresholds. In this paper, we detail the test conditions for a specific set of tests-those aimed at qualifying the Boeing Solar Tile solar arrays to operate in space at very high voltages (300 V or more).
Derived from text
Failure Modes; High Voltages; Solar Arrays; Solar Generators; Performance Tests

20030000875 Universitaet der Bundeswehr, Fachbereich Elektrotechnik, Hamburg, Germany
Direct Calculation of Short Circuit Reactance, Winding Strength, and Inherent Forms of Output Transformers *Direkte Berechung der Kurzschlussreaktanzen, Wicklungskraefte und Eigenformen von Leistungstransformatoren*
Bollman, Christian; Jan. 2001; 164p; In German
Report No.(s): AD-A407661; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The dissertation seeks to employ boundary-element methods (regarding finite elements and differences) in determining how detailed the modeling of an output transformer must be in order to deliver sufficiently precise results. A two-dimensional transformer model, from which the unwinding of the transformer shall take place, is suitable for the calculation of magnetic fields, and yields valuable clarifications. The mathematical components to the study are described in terms of boundary- value tasks as stipulated within the boundary-element method, thereby making discrete the vector potential on the boundaries. The final chapter concerns the frequency and inherent forms of output transformers with and without the interpolation of inductive coupling.
DTIC
Short Circuits; Transformers; Boundary Element Method; Finite Element Method

20030000989 Naval Postgraduate School, Monterey, CA USA
VHDL Modeling and Simulation for a Digital Target Imaging Architecture for Multiple Large Targets Generation
Bergoen, Halkan; Sep. 2002; 194p; In English; Original contains color images
Report No.(s): AD-A407024; No Copyright; Avail: CASI; A09, Hardcopy

The subject of this thesis is to model and verify the correctness of the architecture of the Digital Image Synthesizer (DIS). The DIS, a system-on-a-chip, is especially useful as a counter-targeting repeater. It synthesizes the characteristic echo signature of a pre-selected target. The VHDL (VHSIC (Very High Speed Integrated Circuit) Hardware Description Language) description of the DIS architecture was exported from Tanner S-Edit, modified, and simulated. Different software oriented verification approaches were researched and a White-box approach to functional verification was adopted. An algorithm based on the hardware functionality was developed to compare expected and simulated results. Initially, the architecture of one Range Bin Modulator was exported. Modifications to the VHDL source code included modeling of the behavior of the N-FET and P-FET (Positive Channel Field Effect Transistor) transistors as well as Ground and Vdd (the voltages connected to the drains of the FETs). It also included renaming of entities to comply with VHDL naming conventions. Simulation results were compared to manual calculations and Matlab programs to verify the architecture. The procedure was repeated for the architecture of an Eight-Range Bin Modulator with equally successful results. VHDL was then used to create a super class of a 32-Range Bin Modulator. Test vectors developed in Matlab were used to yet again verify correct functionality.
DTIC
Digital Systems; Computer Programming; Architecture (Computers); Integrated Circuits; Targets; Signal Generators; Field Effect Transistors; Systems-On-A-Chip

20030000993 Naval Postgraduate School, Monterey, CA USA
Design Implementation and Testing of a VLSI High Performance ASIC for Extracting the Phase of a Complex Signal
Altmeyer, Ronald C.; Sep. 2002; 130p; In English; Original contains color images
Report No.(s): AD-A407014; No Copyright; Avail: CASI; A07, Hardcopy
This thesis documents the research, circuit design, and simulation testing of a VLSI (Very Large Scale Integration) ASIC which extracts phase angle information from a complex sampled signal using the arctangent relationship: (phi=tan/-1 (Q/1). Specifically, the circuit will convert the In-Phase and Quadrature terms into their corresponding phase angle. The design specifications were to implement the design in CMOS (Complementary Metal Oxide Semiconductors) technology with a minimum transistor count and ability to operate at a clock frequency of 700 MHz. Research on the arctangent function was performed to determine mathematical calculation methods and the CORDIC method was chosen to achieve the stated design specifications. MATLAB simulations were used to calculate and verify accuracy and to implement Quine-McClusky logic minimization. T-SPICE netlists were generated and simulations were run to determine transistor and circuit electrical operation and timing. Finally, overall circuit logic functionality of all possible input combinations was completed using a VHDL (VHSIC(Very High Speed Integrated Circuit) Hardware Description Language) simulation program.
DTIC
Logic Circuits; Digital Computers; Very Large Scale Integration; Application Specific Integrated Circuits; Design Analysis

20030001019 Naval Postgraduate School, Monterey, CA USA
Comparison of Analytic and Numerical Models With Commercially Available Simulation Tools for the Prediction of Semiconductor Freeze-Out and Exhaustion
Reeves, Derek E.; Sep. 2002; 84p; In English; Original contains color images
Report No.(s): AD-A407191; No Copyright; Avail: CASI; A05, Hardcopy
This thesis reports on three procedures and the associated numerical results for obtaining semiconductor majority carrier concentrations when subjected to a temperature sweep. The capability of predicting the exhaustion regime boundaries of a semiconductor is critical in understanding and exploiting the full potential of the modern integrated circuit. An efficient and reliable method is needed to accomplish this task. Silvaco International's semiconductor simulation software was used to predict temperature dependent majority carrier concentration for a semiconductor cell. Comparisons with analytical and numerical MATLAB-based schemes were made. This was done for both Silicon and GaAs materials. Conditions of the simulations demonstrated effect known as Bandgap Narrowing.
DTIC
Semiconductors (Materials); Numerical Analysis; Computerized Simulation

20030001033 Academy of Sciences (Russia), IOFFE Physical-Technical Inst., Saint Petersburg, Russia
Nanostructures: Physics and Technology
Esaki, Alferov L.; Jun. 18, 1999; 580p; In English; 7th International Symposium, 14-18 Jun. 1999, Saint Petersburg, Russia; For individual articles, see ADP012853 thru ADP013001
Report No.(s): AD-A407055; No Copyright; Avail: CASI; A25, Hardcopy

The International Symposium ”Nanostructures: Physics and Technology” is held annually since 1993.
DTIC
Conferences; Nanotechnology; Nanostructure (Characteristics)

20030001556 Honeywell, Inc., Minneapolis, MN USA
MEMS - Frequency Agile High Precision Ranging under the Dual Use Applications Program (DUAP) ***Final Report***
Bauhahn, Paul; Dec. 04, 2001; 20p; In English
Contract(s)/Grant(s): N00014-98-3-0020; Proj-98PR07011-00
Report No.(s): AD-A407917; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this program was laboratory demonstration of a low cost, jamming resistant, precision ranging system (radar) for proximity fuze and short-range measurement systems. Two approaches were envisioned: (1) The baseline-a baseband system directly radiating and detecting a random sequence of short pulses and (2) A higher risk design based on a transmitter using high-speed modulation of a micro-electromechanical (MEM) oscillator to avoid low frequency antenna radiation requirements. Size constraints drive the design toward small, single-chip monocycle pulse radar implemented in CMOS (Complementary Metal Oxide Semiconductors). This device with two external capacitors, a battery and a miniature antenna for the baseline approach is described in Figure 1-1. Triggering ranges from several inches to more than 6feet were demonstrated. Fabrication of MEM components on gallium arsenide for the second approach will require additional work. While CMOS technology is almost ideal for the long time-constant, multiple pulse integration circuits in the precision ranging receiver and most of the transmitter circuits, it is insufficient for submunition sensor final output amplifiers. The issue is the small size of the submunition antenna. Either step recovery diode circuit or higher performance output transistors are needed to generate the high frequency spectrum required for efficient radiation from these antennas. Using a 0.5-micron BiCMOS/Si(3e process, recently available for prototyping at MOSIS,’ all of the required CMOS and faster output devices could be implemented with trivial modifications of the existing circuits.
DTIC
Frequency Hopping; Microelectromechanical Systems; Radar; Jamming; CMOS

20030001673 Sandia National Labs., Albuquerque, NM USA
Electro-Microfluidic Packaging
Benavides, G. L.; Galambos, P. C.; Jun. 2002; In English
Report No.(s): DE2002-801005; SAND2002-1941; No Copyright; Avail: CASI; C01, CD-ROM
There are many examples of electro-microfluidic products that require cost effective packaging solutions. Industry has responded to a demand for products such as drop ejectors, chemical sensors, and biological sensors. Drop ejectors have consumer applications such as ink jet printing and scientific applications such as patterning self-assembled monolayers or ejecting picoliters of expensive analytes/reagents for chemical analysis. Drop ejectors can be used to perform chemical analysis, combinatorial chemistry, drug manufacture, drug discovery, drug delivery, and DNA sequencing. Chemical and biological micro-sensors can sniff the ambient environment for traces of dangerous materials such as explosives, toxins, or pathogens. Other biological sensors can be used to improve world health by providing timely diagnostics and applying corrective measures to the human body. Electro-microfluidic packaging can easily represent over fifty percent of the product cost and, as with Integrated Circuits (IC), the industry should evolve to standard packaging solutions. Standard packaging schemes will minimize cost and bring products to market sooner.
NTIS
Printed Circuits; Microelectronics; Fluidic Circuits

20030001676 Sandia National Labs., Albuquerque, NM USA
Quadrature Mixer LO Leakage Suppression Through Quadrature DC Bias
Baldwin, J. G.; Dubbert, D. F.; May 2002; In English
Report No.(s): DE2002-800958; SAND2002-1316; No Copyright; Avail: CASI; C01, CD-ROM
A new concept has been developed which allows direct-to-RF (radio frequency) conversion of digitally synthesized waveforms. The concept named Quadrature Error Corrected Digital Waveform Synthesis (QECDWS) employs quadrature amplitude and phase predistortion to the complex waveform to reduce the undesirable quadrature image. Another undesirable product of QECDWS-based RF conversion is the Local Oscillator (LO) leakage through the quadrature upconverter (mixer). A common technique for reducing this LO leakage is to apply a quadrature bias to the mixer I and Q inputs. This report analyzes

this technique through theory, lab measurement, and data analysis for a candidate quadrature mixer for Synthetic Aperture Radar (SAR) applications.
NTIS
Waveforms; Quadratures; Synthetic Aperture Radar

20030001681 Washington State Univ., Dept. of Physics, Pullman, WA USA
Characterization of Photorefractive and Photonic Bandgap Composite Fibers ***Final Report, 15 Mar. 2001-14 Mar 2002***
Kuzyk, Mark G.; Sep. 25, 2002; 7p; In English
Contract(s)/Grant(s): F49620-01-1-0267; Proj-3484
Report No.(s): AD-A407943; AFRL-SR-AR-TR-02-0334; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This grant was used to buy a tunable continuous wave laser source and beam diagnostic package that is now being used to characterize the spectral response of photorefractive materials and photonic bandgap structures. Devices made of such structures that are incorporated into our unique fibers (made in our laboratory) are also now being characterized. Our laboratory is active in DOD and private-sector-sponsored interdisciplinary research that spans materials processing, characterization, and device demonstration with particular emphasis on all-optical devices such as optical limiters, which are based on photonic fibers and photorefractive fibers. The experiments will aid in understanding the physical properties of matrials, how they are affected by processing, and how the operation of devices is influenced by processing and material composition. Furthermore, this equipment is being used to enhance the learning experience of the half dozen undergraduate students from physics, engineering and materials science along with several graduate students and post docs who routinely use this equipment in their research.
DTIC
Electro-Optics; Fiber Composites; Refractory Materials; Energy Gaps (Solid State)

20030001685 Microelectronics Center of North Carolina, Materials and Electronics Tech Div., Research Triangle Park, NC USA
Tunable HTS Filters ***Final Report, 10 Sep. 1998-31 Dec. 2001***
Mancusi, Joseph E.; Roberson, Mark; Jun. 17, 2002; 11p; In English; Prepared in cooperation with Superconductor Technologies, Inc. Santa Barbara, CA and Cronos Integrated Microsystems, Inc., Research Triangle Park, NC
Contract(s)/Grant(s): DAAG55-98-K-0005
Report No.(s): AD-A407938; ARO-39169.1-EL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The tunable HTS program goals are to develop a process, method, or device to tune high-temperature superconductor (HTS) resonant circuits. The process for tuning should preserve the low-loss nature of the s preconducting resonant circuits and be compatible with the operating environment of packaged HTS RF circuitry. Although we were originally developing three technologies to perform this tuning, we have down selected to the two that offer the greatest potential for high 0 operation, the half-HTS MEMS variable capacitor and the continuously variable inductor. The target application is for this technology is SIGINT applications in the 400 MHz to 3000 MHz frequency band, with potential applications in areas from 20 MHz to 20 GHz. We reached a significant milestone with the demonstration of the continuously variable inductors. In this demonstration we achieved a 23% tuning range, with better than 1 pan in 10,000 resettability, and a 0 of over 1.0,000. These are significant achievements in the area of tunable filters.
DTIC
Superconducting Devices; High Temperature Superconductors; Tunable Filters; Electric Filters

20030001686 Universitaet der Bundeswehr Muenchen, Fakultaet Fuer Elektrotechnik, Neubiberg, Germany
Experiments on Switched-On Reluctance Mechanisms for Electric Vehicles ***Untersuchungen an Geschalteten Reluktanzantrieben fuer Elecktrofahrzeuge***
Greif, Andreas; May 2000; 232p; In German
Report No.(s): AD-A407933; X5-X5; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The study's reluctance mechanism, henceforth GRM, is described in functional terms, and then delimited through two calculation models, the first of which enables the computation of torque and electric current, the second of a much more analytical nature. The models are then compared insofar as a GRM can be considered a source of torque. Based on the results of these two processes, a torque steering for the GRM is produced. Particularly emphasized are the implementation and application thereof in modem micro-controllers in the instructions for vehicle operation. As a check of the torque steering, two GRMs (in test machines #1 and #2) with performance electronics and steering were constructed and measured.
DTIC
Regulators; Electric Automobiles; Reluctance

20030001701 Pittsburgh Univ., Dept. of Computer Science, Pittsburgh, PA USA
Low Level Signal Processing for the Optoelectronic Memory System Interface ***Final Report, Aug. 1999-Dec. 2001***
Chiarulli, Donald M.; Levitan, Steven P.; Sep. 2002; 24p; In English; Original contains color images
Contract(s)/Grant(s): F30602-99-1-0550; Proj-PMEM
Report No.(s): AD-A407888; AFRL-IF-RS-TR-2002-251; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes the development and implementation of channel coding and error detection firmware and software for a prototype optical memory system. Specific accomplishments include the development and implementation of a novel 2D coding system for managing inter-symbol interference in page oriented memory as well as clock extraction, noise filters, 5-7 coder firmware for the memory prototype. Software and firmware implementation of spectral Reed- Solomon error correcting codes were also developed and incorporated into a demonstration system. Additionally, we have identified transaction-level processing primitives that might be implemented at the storage interface to improve utilization of the high transfer rate data for image storage applications.
DTIC
Detection; Optical Memory (Data Storage); Optoelectronic Devices; Signal Processing; Coding

20030001909 Sandia National Labs., Albuquerque, NM USA
Fisher Information: Its Flow, Fusion, and Coordination
Berg, T.; Jun. 2002; 22p; In English
Report No.(s): DE2002-801006; SAND2002-1969; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper considers the problem of optimal, decentralized estimation- where there are no central facilities. Global sensor fusion centers or other central functions represent single points of catastrophic failure or compromise for a system. The ability to remove centralized communications, computation, and memory functions increases fault tolerance, data throughput, and system security. Central facilities continue to be used, however, for several reasons: centralized command structures are simple to understand and explain to customers, system designers are accustomed to centralized systems, and many software tools or algorithms for implementing decentralized systems do not yet exist. This paper addresses problems of the third type, specifically how system tradeoffs can be made in implementing decentralized estimation systems for a wide range of applications. The Kalman filter is used as a vehicle for assessing computation, communication and memory tradeoffs for decentralized estimation. This paper combines three extensions of the Kalman filter to produce a distributed implementation.
NTIS
Sonar; Tracking (Position); Target Recognition; Kalman Filters

20030001945 National Inst. of Standards and Technology, Electricity Div., Gaithersburg, MD USA
Surge Protection in Low-Voltage AC Power Circuits: An Anthology, Part 4, Propagation of Coupling of Surges
Martzloff, F. D.; Oct. 2002; 244p; In English
Report No.(s): PB2003-100880; NISTIR-6714-4; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The papers included in this part of the Anthology provide basic information on the propagation of surges in low-voltage AC power circuits. The subject was approached by a combination of experiments and theoretical considerations. One important distinction is made between voltage surges and current surges. Historically, voltage surges were the initial concern. After the introduction and widespread use of current-diverting surge-protective devices at the point-of-use, the propagation of current surges became a significant factor. The papers included in this part reflect this dual dichotomy of voltage versus current and impedance mismatch effects versus simple circuit theory.
NTIS
Power Supply Circuits; Surges; Low Voltage

20030001986 Sandia National Labs., Albuquerque, NM USA
Regularization Analysis of SAR Superresolution
DeLaurentis, J. M.; Dickey, F. M.; Apr. 2002; 22p; In English
Report No.(s): DE2002-800817; SAND2002-1020; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Superresolution concepts offer the potential of resolution beyond the classical limit. This great promise has not generally been realized. In this study we investigate the potential application of superresolution concepts to synthetic aperture radar. The analytical basis for superresolution theory is discussed. In a previous report the application of the concept to synthetic aperture radar was investigated as an operator inversion problem. Generally, the operator inversion problem is ill posed. This work treats

the problem from the standpoint of regularization. Both the operator inversion approach and the regularization approach show that the ability to superresolve SAR imagery is severely limited by system noise.
NTIS
Synthetic Aperture Radar; Image Analysis

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FLUID MECHANICS AND THERMODYNAMICS

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

20030000727 NASA Marshall Space Flight Center, Huntsville, AL USA
Twelfth Thermal and Fluids Analysis Workshop
Majumdar, Alok, Compiler, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 1047p; In English; Twelfth Thermal and Fluids Analysis Workshop, 10-14 Sep. 2001, Huntsville, AL, USA; Sponsored by NASA Marshall Space Flight Center, USA; Also announced as 20030000728 through 20030000774; CD-ROM contains the entire Conference Proceedings presented in PDF format.
Report No.(s): NASA/CP-2002-211783; M-1049; NAS 1.55:211783; No Copyright; Avail: CASI; C01, CD-ROM
The Twelfth Thermal and Fluids Analysis Workshop (TFAWS 01) was held at the Bevill Center, The University of Alabama in Huntsville, Huntsville, Alabama, September 10-14, 2001. The theme for the hands-on training workshop and conference was ”Engineering Excellence and Advances in the New Millenium.” Forty-five technical papers were presented in four sessions: (1) Thermal Spacecraft/Payloads, (2) Thermal Propulsion/Vehicles, (3) Interdisciplinary Papers, and (4) Fluids Papers. Thirty-nine papers were published in these proceedings. The remaining six papers were not available in electronic format at the time of publication. In addition to the technical papers, there were (a) nine hands-on classes on thermal and flow analyses software, (b) thirteen short courses and product overview lectures, (c) five keynote lectures and, (d) panel discussions consisting of eight presentations. The workshop resulted in participation of 195 persons representing NASA Centers, Government agencies, aerospace industries, academia, software providers, and private corporations.
Author
Thermal Analysis; Computational Fluid Dynamics; Heat Transfer; Thermal Protection; Multidisciplinary Research

20030000728 AEA Technology Engineering Software, Waterloo, Ontario Canada
Determining Dynamic Stiffness of a Pressurized Bearing Using 3D CFD Code with Experimental Verification
Blumenthal, Robert F., AEA Technology Engineering Software, Canada; Franklin, Wes, Bently Rotor Dynamics Research Corp., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 20p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
There is a new method of simulating pressurized bearing operation using computational fluid dynamics. The ’moving boundary’ feature allows time-accurate modeling of journal motion within a bearing. The predicted dynamic stiffness compares well with the measured dynamic stiffness. This new approach is applicable to any bearing/seal geometry.
Derived from text
Bearings; Computational Fluid Dynamics; Stiffness

20030000730 Combustion Research and Flow Technology, Inc., Dublin, PA USA
Advances in Turbulence and Plume Thermo-Chemistry on the Prediction of Missile Plume Structure
Calhoon, W. H., Combustion Research and Flow Technology, Inc., USA; Papp, J. L., Combustion Research and Flow Technology, Inc., USA; Dash, S. M., Combustion Research and Flow Technology, Inc., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 27p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
Missile exhaust plume flowfield and signature prediction is a very complex problem. An advanced turbulence and combustion modeling framework is required to make accurate predictions. Ongoing research at CRAFT Tech (Combustion Research and Flow Technology) focused on improving predictive capabilities for: high speed turbulent transition, rotating turbulence and anisotropy, scalar fluctuations, turbulent flame extinction, and turbulent particulate dispersion.
Derived from text
Exhaust Gases; Turbulence Models; Thermochemistry; Missile Signatures; Combustion; Rocket Exhaust; Predictions

20030000731 NASA Marshall Space Flight Center, Huntsville, AL USA

Comparison of Full and Partial Admission Flow Fields in the Simplex Turbine

Dorney, Daniel J., NASA Marshall Space Flight Center, USA; Griffin, Lisa W., NASA Marshall Space Flight Center, USA; Sondak, Douglas L., NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 34p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation provides information on computerized simulations of flow fields in a Simplex turbine. The motivations for the simulation were: Determining the effects of partial admission flow on rotor performance as a function of circumferential location and on unsteady rotor loading; Providing an efficient technique for determining turbine performance. The simulation used the flow code CORSAIR.

CASI

Turbines; Computerized Simulation; Computational Fluid Dynamics; Time Dependence; Boundary Conditions; Baldwin-Lomax Turbulence Model; Turbine Pumps; Unsteady State; Flow Distribution

20030000732 NASA Marshall Space Flight Center, Huntsville, AL USA

Pre- and Post-Processing Tools to Streamline the CFD Process

Dorney, Suzanne Miller, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 24p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation provides information on software development tools to facilitate the use of CFD (Computational Fluid Dynamics) codes. The specific CFD codes FDNS and CORSAIR are profiled, and uses for software development tools with these codes during pre-processing, interim-processing, and post-processing are explained.

CASI

Computational Fluid Dynamics; Computerized Simulation; Applications Programs (Computers); Computer Animation

20030000733 NASA Marshall Space Flight Center, Huntsville, AL USA

Stage Separation CFD Tool Development and Evaluation

Droege, Alan, NASA Marshall Space Flight Center, USA; Gomez, Reynaldo, NASA Johnson Space Center, USA; Wang, Ten-See, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 16p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation evaluates CFD (Computational Fluid Dynamics) tools for solving stage separation problems. The demonstration and validation of the tools is for a second generation RLV (Reusable Launch Vehicle) stage separation. The flow solvers are: Cart3D; Overflow/Overflow-D; Unic.

CASI

Computational Fluid Dynamics; Stage Separation; Computer Programs

20030000734 NASA Ames Research Center, Moffett Field, CA USA

Time-Dependent Simulations of Turbopump Flows

Kiris, Cetin, NASA Ames Research Center, USA; Kwak, Dochan, NASA Ames Research Center, USA; Chan, William, NASA Ames Research Center, USA; Williams, Robert, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 32p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Unsteady flow simulations for RLV (Reusable Launch Vehicles) 2nd Generation baseline turbopump for one and half impeller rotations have been completed by using a 34.3 Million grid points model. MLP (Multi-Level Parallelism) shared memory parallelism has been implemented in INS3D, and benchmarked. Code optimization for cash based platforms will be completed by the end of September 2001. Moving boundary capability is obtained by using DCF module. Scripting capability from CAD (computer aided design) geometry to solution has been developed. Data compression is applied to reduce data size in post processing. Fluid/Structure coupling has been initiated.

Author

Turbine Pumps; Unsteady Flow; Computerized Simulation; Computational Grids; Computational Fluid Dynamics

20030000735 CFD Research Corp., Huntsville, AL USA

CFD Prediction of the BEAGLE 2 Mars Probe Aerodynamic Database

Liever, Peter A., CFD Research Corp., USA; Habchi, Sami D., CFD Research Corp., USA; Burnell, Simon I., Baker (Martin) Aircraft Ltd., UK; Lingard, Steve J., Baker (Martin) Aircraft Ltd., UK; Twelfth Thermal and Fluids Analysis Workshop; July

2002; 27p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

CFD (Computational Fluid Dynamics) has matured to provide reliable planetary entry vehicle aerodynamic predictions. CFD provides substantial time and cost savings. CFD-FASTRAN was applied over the entire trajectory (Entry to Chute Deployment). It provided valuable insight into vehicle flow characteristics (Examples: Wake and Base Flow Structure, Transonic Wake Unsteadiness). A blended aerodynamic database was generated by combining CFD data, scaled existing data, and wind tunnel test data. CFD based pitch damping analysis provides insight into dynamic stability characteristics not easily obtained from wind tunnel tests.

Derived from text

Computational Fluid Dynamics; Wind Tunnel Tests; Atmospheric Entry; Predictions; Data Bases

20030000736 NASA Marshall Space Flight Center, Huntsville, AL USA

Extension of a System Level Tool for Component Level Analysis

Majumdar, Alok, NASA Marshall Space Flight Center, USA; Schallhorn, Paul, Sverdrup Technology, Inc., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 16p; In English; Also announced as 20030000727; Original contains color illustrations

Contract(s)/Grant(s): NAS8-40386; RTOP 022-00-00; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents an extension of a numerical algorithm for network flow analysis code to perform multi-dimensional flow calculation. The one dimensional momentum equation in network flow analysis code has been extended to include momentum transport due to shear stress and transverse component of velocity. Both laminar and turbulent flows are considered. Turbulence is represented by Prandtl's mixing length hypothesis. Three classical examples (Poiseuille flow, Couette flow and shear driven flow in a rectangular cavity) are presented as benchmark for the verification of the numerical scheme.

Author

Algorithms; Laminar Flow; Turbulent Flow; Momentum Transfer; Network Analysis; Systems Analysis; Numerical Analysis

20030000737 NASA Marshall Space Flight Center, Huntsville, AL USA

Approximating Fluid Flow from Ambient to Very Low Pressures: Modeling ISS Experiments that Vent to Vacuum

Minor, Robert, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 18p; In English; Also announced as 20030000727; No Copyright; Avail: CASI; A03, Hardcopy

Two ISS (International Space Station) experiment payloads will vent a volume of gas overboard via either the ISS Vacuum Exhaust System or the Vacuum Resource System. A system of ducts, valves and sensors, under design, will connect the experiments to the ISS systems. The following tasks are required: Create an analysis tool that will verify the rack vacuum system design with respect to design requirements, more specifically approximate pressure at given locations within the vacuum systems; Determine the vent duration required to achieve desired pressure within the experiment modules; Update the analysis as systems and operations definitions mature.

Derived from text

Fluid Flow; Spaceborne Experiments; Low Pressure; Vacuum Systems; Predictions

20030000738 NASA Marshall Space Flight Center, Huntsville, AL USA

Incorporation of Condensation Heat Transfer in a Flow Network Code

Anthony, Miranda, NASA Marshall Space Flight Center, USA; Majumdar, Alok, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 22p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Pure water is distilled from waste water in the International Space Station. The distillation assembly consists of an evaporator, a compressor and a condenser. Vapor is periodically purged from the condenser to avoid vapor accumulation. Purged vapor is condensed in a tube by coolant water prior to entering the purge pump. The paper presents a condensation model of purged vapor in a tube. This model is based on the Finite Volume Method. In the Finite Volume Method, the flow domain is discretized into multiple control volumes and a simultaneous analysis is performed.

Derived from text

Condensation; Heat Transfer; Water Vapor; Finite Volume Method; Water Treatment; International Space Station

20030000743 European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands

Advances in Thermal Model Data Exchange Using Open Standards

DeKoning, Hans Peter, European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands;

Twelfth Thermal and Fluids Analysis Workshop; July 2002; 38p; In English; Also announced as 20030000727; Sponsored in part by Simulog, Fokker Space, Association GOSET, Epsilon Ingenierie and Alstom Power; No Copyright; Avail: CASI; A03, Hardcopy

STEP, STandard for the Exchange of Product model data, is the casual name for ISO 10303. ISO 10303 is an International Standard for the computer-interpretable representation and exchange of product data. The objective is to provide a mechanism that is capable of describing product data throughout the life cycle of a product, independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving.

Derived from text

Thermal Analysis; Standards; Life (Durability); Products; Data Bases; Information Transfer

20030000744 Swales Aerospace, Beltsville, MD USA

Use of Thermplot Software for Quick Evaluation of Thermal Model Results

Peabody, Hume, Swales Aerospace, USA; July 2002; 10p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

Recently, advances have been made in graphical displays of thermal modelers, allowing color contour temperature plots and animations. While these are useful for presentations, they do little to help debug or identify areas of a model that may be out of design limits. Often, a thermal engineer needs hard data for analysis or debugging. Swales Aerospace has developed a tool called ThermPlot that runs in the familiar Windows environment. ThermPlot reads output files from many of the popular thermal analysis packages (SindaFluint, Sinda/G(trademark), ESATAN, TMG) and stores the data in a Microsoft Excel(trademark) workbook. This allows the user access to all time dependent thermal data for post processing, rather than a simple plot or image. Features included in ThermPlot are: inclusion of node descriptions from thermal model file, multiple file capabilities for trend studies and comparisons, creation of tables and plots of selected data, grouping of nodes, and generation of post run-time calculated heatmaps. Once the desired options have been selected, the data is read from the thermal model output files and written directly into an Excel(trademark) workbook. Tables and plots are also created in the workbook as defined by the user. The user is also free to perform any additional analysis using the wide range of functions offered in Microsoft Excel(trademark). This paper describes the features of ThermPlot in greater detail. It also provides some examples of real-world applications where use of ThermPlot resulted in quicker data reduction and analysis of model conversions, parametric studies, and heat flow analysis.

Author

Thermal Analysis; Applications Programs (Computers); Computerized Simulation

20030000747 NASA Johnson Space Center, Houston, TX USA

Steady State Transportation Cooling in Porous Media Under Local, Non-Thermal Equilibrium Fluid Flow

Rodriquez, Alvaro Che, NASA Johnson Space Center, USA; July 2002; 11p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

An analytical solution to the steady-state fluid temperature for 1-D (one dimensional) transpiration cooling has been derived. Transpiration cooling has potential use in the aerospace industry for protection against high heating environments for re-entry vehicles. Literature for analytical treatments of transpiration cooling has been largely confined to the assumption of thermal equilibrium between the porous matrix and fluid. In the present analysis, the fundamental fluid and matrix equations are coupled through a volumetric heat transfer coefficient and investigated in non-thermal equilibrium. The effects of varying the thermal conductivity of the solid matrix and the heat transfer coefficient are investigated. The results are also compared to existing experimental data.

Author

Steady State; Sweat Cooling; Porous Materials; Equilibrium Flow; Fluid Flow

20030000749 NASA Marshall Space Flight Center, Huntsville, AL USA

Thermal/Fluid Analysis of a Composite Heat Exchanger for Use on the RLV Rocket Engine

Nguyen, Dalton, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 7p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

As part of efforts to design a regeneratively cooled composite nozzle ramp for use on the reusable vehicle (RLV) rocket engine, an C-SiC composites heat exchanger concept was proposed for thermal performance evaluation. to test the feasibility of the concept, sample heat exchanger panels were made to fit the Glenn Research Center's cell 22 for testing. Operation of the heat exchanger was demonstrated in a combustion environment with high heat fluxes similar to the RLV Aerospike Ramp. Test measurements were reviewed and found to be valuable for the on going fluid and thermal analysis of the actual RLV composite

ramp. Since the cooling fluid for the heat exchanger is water while the RLV Ramp cooling fluid is LH2, fluid and thermal models were constructed to correlate to the specific test set-up. The knowledge gained from this work will be helpful for analyzing the thermal response of the actual RLV Composite Ramp. The coolant thermal properties for the models are taken from test data. The heat exchanger's cooling performance was analyzed using the Generalized Fluid System Simulation Program (GFSSP). Temperatures of the heat exchanger's structure were predicted in finite element models using Patran and Sinda. Results from the analytical models and the tests show that RSC's heat exchanger satisfied the combustion environments in a series of 16 tests.
Author
Thermal Analysis; Heat Exchangers; Reusable Launch Vehicles; Rocket Engines

20030000750 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Analysis in Support of the Booster Separation Motor Crack Investigation
Davis, Darrell, NASA Marshall Space Flight Center, USA; Prickett, Terry, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 13p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

During a post-test inspection of a Booster Separation Motor (BSM) from a Lot Acceptance Test (LAT), a crack was noticed in the graphite throat. Since this was an out-of-family occurrence, an investigation team was formed to determine the cause of the crack. This paper will describe thermal analysis techniques used in support of this investigation. Models were generated to predict gradients in nominal motor conditions, as well as potentially anomalous conditions. Analysis was also performed on throats that were tested in the Laser Hardened Material Evaluation Laboratory (LHMEL). Some of these throats were pre-cracked, while others represented configurations designed to amplify effects of thermal stresses. Results from these analyses will be presented in this paper.
Author
Stage Separation; Thermal Analysis; Booster Rocket Engines; Cracks

20030000751 NASA Marshall Space Flight Center, Huntsville, AL USA
Fundamental Boiling and RP-1 Freezing Experiments
Goode, Brian, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 9p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The prestart thermal conditioning of the hardware in LOX (liquid oxygen) systems involve heat transfer between LOX and metal where boiling plays a large role. Information is easily found on nucleate boiling, maximum heat flux, minimum heat flux and film boiling for common fluids like water. After looking at these standard correlations it was felt more data was needed for the cool down side transition boiling for the LN2 and LOX. In particular interest is the film boiling values, the temperature at which transition begins and the slope as peak heat flux is approached. The ultimate goal is an array of boiling heat transfer coefficient as a function of surface temperature which can be used in the chilldown model of the feed system, engine and bleed system for X-34. The first experiment consisted of an actual MC-1 LOX Impeller which had been machined backwards, that was instrumented with 17 surface thermocouples and submerged in liquid nitrogen. The thermocouples were installed on metal thicknesses varying from the thin inducer to the thick hub.
Author
Boiling; Freezing; Heat Transfer; Liquid Oxygen; RP-1 Rocket Propellants

20030000752 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal and Chemical Characterization of Non-Metallic Materials Using Coupled Thermogravimetric Analysis and Infrared Spectroscopy
Huff, Timothy L., NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 8p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

Thermogravimetric analysis (TGA) is widely employed in the thermal characterization of non-metallic materials, yielding valuable information on decomposition characteristics of a sample over a wide temperature range. However, a potential wealth of chemical information is lost during the process, with the evolving gases generated during thermal decomposition escaping through the exhaust line. Fourier Transform-Infrared spectroscopy (FT-IR) is a powerful analytical technique for determining many chemical constituents while in any material state, in this application, the gas phase. by linking these two techniques, evolving gases generated during the TGA process are directed into an appropriately equipped infrared spectrometer for chemical speciation. Consequently, both thermal decomposition and chemical characterization of a material may be obtained in a single sample run. In practice, a heated transfer line is employed to connect the two instruments while a purge gas stream directs the evolving gases into the FT-IR. The purge gas can be either high purity air or an inert gas such as nitrogen to allow oxidative and pyrolytic processes

to be examined, respectively. The FT-IR data is collected realtime, allowing continuous monitoring of chemical compositional changes over the course of thermal decomposition. Using this coupled technique, an array of diverse materials has been examined, including composites, plastics, rubber, fiberglass epoxy resins, polycarbonates, silicones, lubricants and fluorocarbon materials. The benefit of combining these two methodologies is of particular importance in the aerospace community, where newly developing materials have little available data with which to refer. by providing both thermal and chemical data simultaneously, a more definitive and comprehensive characterization of the material is possible. Additionally, this procedure has been found to be a viable screening technique for certain materials, with the generated data useful in the selection of other appropriate analytical procedures for further material characterization.
Author
Thermogravimetry; Infrared Spectroscopy; Chemical Composition

20030000753 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Analysis of the MCI Engine Turbopump
Roman, Jose, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 5p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The MCI Engine turbopump supplied the propellants to the main injector. The turbopump consisted of four parts; lox pump, interpropellant seal package (IPS), RP pump and turbine. The thermal analysis was divided into two 2D finite element models; Housing or stationary parts and rotor or rotating parts. Both models were analyzed at the same boundary conditions using SINDA. The housing model consisted of; lox pump housing, ips housing, RP housing, turbine inlet housing, turbine housing, exit guide vane, heat shield and both bearing outer races. The rotor model consisted of the lox impeller; lox end bearing and id race, RP impeller, and RP bearing and id race, shaft and turbine disk. The objectives of the analysis were to (1) verified the original design and recommend modifications to it, (2) submitted a thermal environment to support the structural analysis, (3) support the component and engine test program and (4) to support the X34 vehicle program.
Author
Thermal Analysis; Turbine Pumps; Liquid Oxygen; Liquid Propellant Rocket Engines; Cryogenic Rocket Propellants; Fuel Pumps; Design Analysis

20030000754 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Analysis of a Carbon Fiber Rope Barrier for Use in the Reusable Solid Rocket Motor Nozzle Joint-2
Clayton, J. Louie, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 9p; In English; Also announced as 20030000727; No Copyright; Avail: CASI; A02, Hardcopy

This study provides development and verification of analysis methods used to assess performance of a carbon fiber rope (CFR) thermal barrier system that is currently being qualified for use in Reusable Solid Rocket Motor (RSRM) nozzle joint-2. Modeled geometry for flow calculations considers the joint to be vented with the porous CFR barriers placed in the 'open' assembly gap. Model development is based on a 1-D volume filling approach where flow resistances (assembly gap and CFRs) are defined by serially connected internal flow and the porous media 'Darcy' relationships. Combustion gas flow rates are computed using the volume filling code by assuming a lumped distribution total joint fill volume on a per linear circumferential inch basis. Gas compressibility, friction and heat transfer are included in the modeling. Gas-to-wall heat transfer is simulated by concurrent solution of the compressible flow equations and a large thermal 2-D finite element (FE) conduction grid. The derived numerical technique loosely couples the FE conduction matrix with the compressible gas flow equations. Free constants that appear in the governing equations are calibrated by parametric model comparison to hot fire subscale test results. The calibrated model is then used to make full-scale motor predictions using RSRM aft dome environments. Model results indicate that CFR thermal barrier systems will provide a thermally benign and controlled pressurization environment for the RSRM nozzle joint-2 primary seal activation.
Author
Thermal Analysis; Carbon Fibers; Reusable Rocket Engines; Solid Propellant Rocket Engines; Rocket Nozzles

20030000755 NASA Kennedy Space Center, Cocoa Beach, FL USA
Corrections of Heat Flux Measurements on Launch Vehicles
Reinarts, Thomas R., NASA Kennedy Space Center, USA; Matson, Monique L., NASA Kennedy Space Center, USA; Walls, Laurie K., NASA Kennedy Space Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 9p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

Knowledge of aerothermally induced convective heat transfer is important in the design of thermal protection systems for launch vehicles. Aerothermal models are typically calibrated via the data from circular, in-flight, flush-mounted surface heat flux

gauges exposed to the thermal and velocity boundary layers of the external flow. Typically, copper or aluminum Schmidt- Boelter gauges, which take advantage of the one-dimensional Fourier's law of heat conduction, are used to measure the incident heat flux. This instrumentation, when surrounded by low-conductivity insulation, has a wall temperature significantly lower than the insulation. As a result of this substantial disturbance to the thermal boundary layer, the heat flux incident on the gauge tends to be considerably higher than it would have been on the insulation had the calorimeter not been there. In addition, radial conductive heat transfer from the hotter insulation can cause the calorimeter to indicate heat fluxes higher than actual. An overview of an effort to develop and calibrate gauge correction techniques for both of these effects will be presented.
Author
Heat Flux; Launch Vehicles; Convective Heat Transfer; Thermal Protection

20030000756 NASA Marshall Space Flight Center, Huntsville, AL USA
Panel Discussion on Multi-Disciplinary Analysis
Garcia, Robert, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 2p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy

The Marshall Space Flight Center (MSFC) is hosting the Thermal and Fluids Analysis Workshop (TFAWS) during the week of September 10, 2001. Included in this year's TFAWS is a panel session on Multidisciplinary Analysis techniques. The intent is to provide an opportunity for the users to gain information as to what product may be best suited for their applications environment and to provide feedback to you, the developers, on future desired developments. Potential users of multidisciplinary analysis (MDA) techniques are often overwhelmed by the number of choices available to them via commercial products and by the pace of new developments in this area. The purpose of this panel session is to provide a forum wherein MDA tools available and under development can be discussed, compared, and contrasted. The intent of this panel is to provide the end-user with the information necessary to make educated decisions on how to proceed with selecting their MDA tool. It is anticipated that the discussions this year will focus on MDA techniques that couple discipline codes or algorithms (as opposed to monolithic, unified MDA approaches). The MDA developers will be asked to prepare a product overview presentation addressing specific questions provided by the panel organizers. The purpose of these questions will be to establish the method employed by the particular MDA technique for communication between the discipline codes, to establish the similarities and differences amongst the various approaches, and to establish the range of experience and applications for each particular MDA approach.
Derived from text
Thermal Analysis; Algorithms; Multidisciplinary Research

20030000757 Mississippi State Univ., MS USA
Loci: Logic Programming for Computational Field Simulations
Luke, Edward, Mississippi State Univ., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 17p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Computations are performed with respect to numerical discretizations called meshes. Meshes can be represented as a collection of entities combined with a set of binary relations called maps. Computations are performed by binding values to entities. Many computations are based on values assigned to neighboring entities. The binary relations used to represent the mesh are involved in the access of these neighboring entities.
Derived from text
Logic Programming; Simulation; Computation; Grid Generation (Mathematics)

20030000765 NASA Goddard Space Flight Center, Greenbelt, MD USA
Thermal Technology Development Activities at the Goddard Space Flight Center - 2001
Butler, Dan, NASA Goddard Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 81p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A05, Hardcopy

This presentation provides an overview of thermal technology development activities carried out at NASA's Goddard Space Flight Center during 2001. Specific topics covered include: two-phase systems (heat pipes, capillary pumped loops, vapor compression systems and phase change materials), variable emittance systems, advanced coatings, high conductivity materials and electrohydrodynamic (EHD) thermal coatings. The application of these activities to specific space missions is also discussed.
CASI
Research and Development; NASA Programs; Technology Utilization; Temperature Effects; Product Development

20030000766 Tec-Masters, Inc., Huntsville, AL USA

Analysis of Pool Boiling in Microgravity During Loss of Cooling for the Quench Module Insert (QMI)

Horton, Richard D., Tec-Masters, Inc., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 14p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

In support of the thermal design of the quench module insert (QMI) microgravity experiment, a thermal/fluid math model was created with SINDA/FLUINT in order to simulate a loss of cooling scenario and the resultant pool boiling in the cooling lines. The objectives of the analysis were to determine whether critical components would surpass maximum temperature, what affect would phase change have on the component temperatures, and how much liquid volume would be expelled during the phase change. While developing the model, concerns were raised about the validity of phase change correlations used in SINDA/FLUINT when applied in the microgravity environment. This paper discusses the results of the thermal/fluid math model and the impact of microgravity on the pool boiling heat transfer coefficient.

Author

Cooling; Mathematical Models; Microgravity; Nucleate Boiling; Thermal Analysis; Vacuum Furnaces; Space Station Modules

20030000771 NASA Marshall Space Flight Center, Huntsville, AL USA

Comparison of Analytical and Numerical Performance Predictions for an International Space Station Node 3 Internal Active Thermal Control System Regenerative Heat Exchanger

Wise, Stephen A., Qualis Corp., USA; Holt, James M., NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 11p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

The complexity of International Space Station (ISS) systems modeling often necessitates the concurrence of various dissimilar, parallel analysis techniques to validate modeling. This was the case with a feasibility and performance study of the ISS Node 3 Regenerative Heat Exchanger (RHX). A thermo-hydraulic network model was created and analyzed in SINDA/FLUINT. A less complex, closed form solution of the systems dynamics was created using an Excel Spreadsheet. The purpose of this paper is to provide a brief description of the modeling processes utilized, the results and benefits of each to the ISS Node 3 RHX study.

Author

Heat Exchangers; Active Control; Thermal Analysis; Prediction Analysis Techniques; Numerical Analysis

20030000772 NASA Marshall Space Flight Center, Huntsville, AL USA

Thermal Design, Analysis, and Testing of the Quench Module Insert Bread Board

Breeding, Shawn, NASA Marshall Space Flight Center, USA; Khodabandeh, Julia, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 28p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Quench Module Insert (QMI) science requirements. QMI interfaces. QMI design layout. QMI thermal analysis and design methodology. QMI bread board testing and instrumentation approach. QMI thermal probe design parameters. Design features for gradient measurement. Design features for heated zone measurements. Thermal gradient analysis results. Heated zone analysis results. Bread board thermal probe layout. QMI bread board correlation and performance. Summary and conclusions.

CASI

Breadboard Models; Design Analysis; Thermal Analysis

20030000773 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Thermal Design Overview of the Mars Exploration Rover Project

Tsuyuki, Glenn, Jet Propulsion Lab., California Inst. of Tech., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 47p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Contents include the following: Mission Overview. Thermal Environments. Driving Thermal Requirements. Thermal Design Approach. Thermal Control Block Diagram. Thermal Design Description. Thermal Analysis Results Summary. Testing Plans. Issues & Concerns.

CASI

Mars Exploration; Temperature Control; Thermal Environments

20030000802 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Navier-Stokes Computations for a Spinning Projectile From Subsonic to Supersonic Speeds ***Final Report, Dec. 2001-May 2002***
Silton, Sidra I.; Sep. 2002; 38p; In English; Original contains color images
Contract(s)/Grant(s): Proj-AH80
Report No.(s): AD-A407616; ARL-TR-2850; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational study has been undertaken to predict the aerodynamic coefficients of a standard spinning projectile using a modem unstructured Navier-Stokes flow solver. Numerical and semi-empirical results have been obtained for a wide range of Mach numbers to include subsonic, transonic, and supersonic flight regimes. Effects of 00, 20, and 50 angles of attack have been investigated. Comparison of computational fluid dynamics results to both experimental range data and semi-empirical aeroprediction code results shows remarkably good agreement. Flow field characteristics of each flight regime are explored.
DTIC
Computational Fluid Dynamics; Projectiles; Spin; Subsonic Speed; Transonic Flight; Supersonic Flight

20030000830 NASA Langley Research Center, Hampton, VA USA
Snapshot of Active Flow Control Research at NASA Langley
Washburn, A. E., NASA Langley Research Center, USA; Gorton, S. Althoff, NASA Langley Research Center, USA; Anders, S. G., NASA Langley Research Center, USA; [2002]; 20p; In English; 1st Flow Control Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-3155; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

NASA Langley is aggressively investigating the potential advantages of active flow control as opposed to more traditional aerodynamic techniques. Many of these techniques will be blended with advanced materials and structures to further enhance payoff. Therefore a multi-disciplinary approach to technology development is being attempted that includes researchers from the more historical disciplines of fluid mechanics. acoustics, material science, structural mechanics, and control theory. The overall goals of the topics presented are focused on advancing the state of knowledge and understanding of controllable fundamental mechanisms in fluids rather than on specific engineering problems. An organizational view of current research activities at NASA Langley in active flow control as supported by several programs such as the Morphing Project under Breakthrough Vehicle Technologies Program (BVT). the Ultra-Efficient Engine Technology Program (UEET), and the 21st Century Aircraft Technology Program (TCAT) is presented. On-center research as well as NASA Langley funded contracts and grants are discussed at a relatively high level. The products of this research, as part of the fundamental NASA R and D (research and development) program. will be demonstrated as either bench-top experiments, wind-tunnel investigations, or in flight tests. Later they will be transferred to more applied research programs within NASA, DOD (Department of Defense), and U.S. industry.
Author
Multidisciplinary Design Optimization; Fluid Mechanics; Active Control; Flow Distribution; Design Analysis; Aircraft Design; Structural Analysis

20030000846 NASA Langley Research Center, Hampton, VA USA
Boundary Layer Transition on Slender Cones in Conventional and Low Disturbance Mach 6 Wind Tunnels
Horvath, Thomas J., NASA Langley Research Center, USA; Berry, Scott A., NASA Langley Research Center, USA; Hollis, Brian R., NASA Langley Research Center, USA; Chang, Chau-Lyan, NASA Langley Research Center, USA; Singer, Bart A., NASA Langley Research Center, USA; [2002]; 14p; In English; 32nd AIAA Fluid Dynamics Conference and Exhibit, 24-27 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2002-2743; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

An experimental investigation was conducted on a 5-degree half-angle cone and a 5-degree half-angle flared cone in a conventional Mach 6 wind tunnel to examine the effects of facility noise on boundary layer transition. The influence of tunnel noise was inferred by comparing transition onset locations determined from the present test to that previously obtained in a Mach 6 low disturbance quiet tunnel. Together, the two sets of experiments are believed to represent the first direct comparison of transition onset between a conventional and a low disturbance wind tunnel using a common test model and transition detection technique. In the present conventional hypersonic tunnel experiment, separate measurements of heat transfer and adiabatic wall temperatures were obtained on the conical models at small angles of attack over a range of Reynolds numbers, which resulted in laminar, transitional, and turbulent flow. Smooth model turbulent heating distributions are compared to that obtained with transition forced via discrete surface roughness. The model nosetip radius was varied to examine the effects of bluntness on

transition onset. Despite wall to total temperature differences between the transient heating measurements and the adiabatic wall temperature measurement, the two methods for determining sharp cone transition onset generally yielded equivalent locations. In the 'noisy' mode of the hypersonic low disturbance tunnel, transition onset occurred earlier than that measured in the conventional hypersonic tunnel, suggesting higher levels of freestream acoustic radiation relative to the conventional tunnel. At comparable freestream conditions, the transition onset Reynolds number under low disturbance conditions was a factor of 1.3 greater than that measured on flared cone in the LaRC conventional hypersonic tunnel and a factor of 1.6 greater that the flared cone run in the low disturbance tunnel run 'noisy'. Navier-Stokes mean flow computations and linear stability analysis were conducted to assess the experimental results and have indicated N factors associated with sharp flared cone transition onset to be approximately a factor of 2 lower than that inferred from the corresponding low disturbance tunnel measurements.
Author
Boundary Layer Transition; Slender Cones; Wind Tunnel Tests; Hypersonic Wind Tunnels; Aeroacoustics

20030000915 NASA Langley Research Center, Hampton, VA USA
Time-Accurate Simulations and Acoustic Analysis of Slat Free-Shear-Layer, Part 2
Khorrami, Mehdi R., NASA Langley Research Center, USA; Singer, Bart A., NASA Langley Research Center, USA; Lockard, David P., NASA Langley Research Center, USA; [2002]; 14p; In English; 8th AIAA/CEAS Aeroacoustics Conference and Exhibit, 17-19 Jun. 2002, Breckenridge, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-2579-Pt-2; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
Unsteady computational simulations of a multi-element, high-lift configuration are performed. Emphasis is placed on accurate spatiotemporal resolution of the free shear layer in the slat-cove region. The excessive dissipative effects of the turbulence model, so prevalent in previous simulations, are circumvented by switching off the turbulence-production term in the slat cove region. The justifications and physical arguments for taking such a step are explained in detail. The removal of this excess damping allows the shear layer to amplify large-scale structures, to achieve a proper non-linear saturation state, and to permit vortex merging. The large-scale disturbances are self-excited, and unlike our prior fully turbulent simulations, no external forcing of the shear layer is required. to obtain the farfield acoustics, the Ffowcs Williams and Hawkings equation is evaluated numerically using the simulated time-accurate flow data. The present comparison between the computed and measured farfield acoustic spectra shows much better agreement for the amplitude and frequency content than past calculations. The effect of the angle-of-attack on the slat's flow features radiated acoustic field are also simulated presented.
Author
Acoustic Measurement; Shear Layers; Computerized Simulation; Unsteady Aerodynamics; Flow Distribution; Aeroacoustics

20030000983 NASA Langley Research Center, Hampton, VA USA
Review of Research on Low-Profile Vortex Generators to Control Boundary-Layer Separation
Lin, John C., NASA Langley Research Center, USA; Progress in Aerospace Sciences; 2002; ISSN 0376-0421; Volume 38, pp. 389-420; In English; Copyright; Avail: Issuing Activity
An in-depth review of boundary-layer flow-separation control by a passive method using low-profile vortex generators is presented. The generators are defined as those with a device height between 10% and 50% of the boundary layer thickness. Key results are presented for several research efforts, all of which were performed within the past decade and a half where the majority of these works emphasize experimentation with some recent efforts on numerical simulations. Topics of discussion consist of both basic fluid dynamics and applied aerodynamics research. The fluid dynamics research includes comparative studies on separation control effectiveness as well as device-induced vortex characterization and correlation. The comparative studies cover the controlling of low-speed separated flows in adverse pressure gradient and supersonic shock-induced separation. The aerodynamics research includes several applications for aircraft performance enhancement and covers a wide range of speeds. Significant performance improvements are achieved through increased lift and/or reduced drag for various airfoils-low-Reynolds number, high-lift, and transonic-as well as highly swept wings. Performance enhancements for non-airfoil applications include aircraft interior noise reduction, inlet flow distortion alleviation inside compact ducts, and a more efficient overwing fairing. The low-profile vortex generators are best for being applied to applications where flow-separation locations are relatively fixed and the generators can be placed reasonably close upstream of the separation. Using the approach of minimal near-wall proturbances through substantially reduced device height, these devices can produce streamwise vortices just strong enough to overcome the separation without unnecessarily persisting within the boundary layer once the flow-control objective is achieved. Practical

advantages of low-profile vortex generators, such as their inherent simplicity and low device drag, are demonstrated to be critically important for many applications as well.
Author
Boundary Layer Separation; Vortex Generators; Controllability; Separated Flow; Aerodynamic Configurations; Computational Fluid Dynamics; Aerodynamic Drag; Boundary Layer Flow

20030001035 NASA Langley Research Center, Hampton, VA USA
Statistical Analysis of CFD Solutions from the Drag Prediction Workshop
Hemsch, Michael J., NASA Langley Research Center, USA; [2002]; 29p; 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 2002-0842; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A simple, graphical framework is presented for robust statistical evaluation of results obtained from N-Version testing of a series of RANS CFD codes. The solutions were obtained by a variety of code developers and users for the June 2001 Drag Prediction Workshop sponsored by the AIAA Applied Aerodynamics Technical Committee. The aerodynamic configuration used for the computational tests is the DLR-F4 wing-body combination previously tested in several European wind tunnels and for which a previous N-Version test had been conducted. The statistical framework is used to evaluate code results for (1) a single cruise design point, (2) drag polars and (3) drag rise. The paper concludes with a discussion of the meaning of the results, especially with respect to predictability, Validation, and reporting of solutions.
Author
Statistical Analysis; Computational Fluid Dynamics; Drag; Computer Programs

20030001043 NASA Marshall Space Flight Center, Huntsville, AL USA
Numerical Modeling of Cavitating Venturi: A Flow Control Element of Propulsion System
Majumdar, Alok, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Thermal and Fluids Analysis Workshop, 11-16 Aug. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In a propulsion system, the propellant flow and mixture ratio could be controlled either by variable area flow control valves or by passive flow control elements such as cavitating venturies. Cavitating venturies maintain constant propellant flowrate for fixed inlet conditions (pressure and temperature) and wide range of outlet pressures, thereby maintain constant, engine thrust and mixture ratio. The flowrate through the venturi reaches a constant value and becomes independent of outlet pressure when the pressure at throat becomes equal to vapor pressure. In order to develop a numerical model of propulsion system, it is necessary to model cavitating venturies in propellant feed systems. This paper presents a finite volume model of flow network of a cavitating venturi. The venturi was discretized into a number of control volumes and mass, momentum and energy conservation equations in each control volume are simultaneously solved to calculate one-dimensional pressure, density, and flowrate and temperature distribution. The numerical model predicts cavitations at the throat when outlet pressure was gradually reduced. Once cavitation starts, with further reduction of downstream pressure, no change in flowrate is found. The numerical predictions have been compared with test data and empirical equation based on Bernoulli's equation.
Author
Finite Volume Method; Mathematical Models; Cavitation Flow; Feed Systems

20030001116 NASA Ames Research Center, Moffett Field, CA USA
Unsteady Computations of a Jet in a Crossflow with Ground Effect
Pandya, Shishir, NASA Ames Research Center, USA; Murman, Scott, Eloret Corp., USA; Venkateswaran, Sankaran, Tennessee Univ., USA; [2002]; 7p; In English; 33rd AIAA Fluid Dynamics Conference, 23-26 Jun. 2003, Orlando, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A numerical study of a jet in crossflow with ground effect is conducted using OVERFLOW with dual time-stepping and low Mach number preconditioning. The results of the numerical study are compared to an experiment to show that the numerical methods are capable of capturing the dominant features of the flow field as well as the unsteadiness associated with the ground vortex.
Author
Cross Flow; Ground Effect (Aerodynamics); Jet Impingement; Unsteady Flow; Computerized Simulation; Numerical Analysis

20030001134 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Observations of Velocities and Orientations of Cylindrical Bodies at Terminal Condition in Water
Valent, Phillip J.; Holland, K. T.; Green, Albert W.; Theophanis, Stephen; King, C.; May 01, 2002; 10p; In English; Original contains color images
Report No.(s): AD-A407820; NRL/PP/7400-02-1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Trajectories of 1/3rd-scale and full-scale cylindrical bottom mine models falling in the water column are found to be much more complex than predicted by a present impact burial prediction model. For cylinders released in air, air bubbles trapped when the cylinder enters the water appear to dampen turbulent boundary effects resulting in stable trajectories while the bubbles remain attached. With loss of trapped air bubbles during descent through the water, turbulent wake and boundary layer effects generate a wide range of motion and lateral excursion. This paper offers some preliminary projections for the extent of cylinder excursion and for orientations and velocities to be expected at the bottom.
DTIC
Cylindrical Bodies; Turbulent Wakes; Hydrodynamics

20030001138 Universitaet der Bundeswehr Muenchen, Fakultaet fuer Luft- UND Raumfahrttechnik, Neubiberg Germany
Untersuchungen zur Optimiening der Kueh11uft-Ausblasekonfiguration fortschrittlicher Turbinenbeschaufelungen (Experiments on the Optimization of Cool Air Blow-Off Configurations of Advanced Turbine Blades)
Ganzert, Wolfgang; Jan. 2000; 285p; In German
Report No.(s): AD-A407829; X5-X5; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Deftly building upon a strong literature on film cooling in aerodynamics, the author observes various film cooling configurations in experiments designed to provide a better understanding of the TRACE-S and FINE/Turbo instruments. The goal is then to put forward the optimal blow-off configurations for the turbine blades under scrutiny. It is claimed that this study differs from its numerous forerunners in that it takes into account not only the standard aerodynamic measurements, but also information on the distribution of heat transfer coefficients on the sucking side of a film-cooled, evenly-keeled turbo grate within the maintenance of the most important similarity parameters.
DTIC
Turbine Blades; Aerothermodynamics; Aerodynamics

20030001557 Universitaet der Bundeswehr Muenchen, Fakultaet fuer Luft- UND Raumfahrttechnik, Neubiberg Germany
The Influence of Periodically Non-Stationary Afflux on Transition Behavior of Compressor Grids ***Der Einfluss peridisch instationaerer Zustroemung auf das Transitionsverhalten von Verdichtergittern***
Teusch, Reinhold; Jan. 2001; 188p; In German
Report No.(s): AD-A407914; X5-X5; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The primary goal of this study is to obtain a deeper look into the physical occurrences within the shovel border layer. The author accomplishes this effort through a detailed examination of non-stationary flow behavior of compressor shovels with Controlled Diffusion Airfoil (CDA)-profiling under the influence of after-running depressions of current salient shovel rows. In addition to the checking of the precision of stationary and non-stationary calculatory processes, criteria are defined for the layout of modern compression shovels under the rubrick of rotor/stator interaction. An overview of the literature is then given regarding both the basic principles of non-stationary transition behavior under the influence of after-running depressions as well as the most up-to-date scholarship on the problematics of the field discussed.
DTIC
Fluid Flow; Compressors; Airfoils

20030001558 Alabama Univ., Dept. of Aerospace Engineering and Mechanics, Tuscaloosa, AL USA
Influence of Surface Roughness and Freestream Turbulence on the Second Order Transport of Turbulence in Non-Equilibrium Boundary Layers ***Final Report, 1 Jan. 2001-30 Jun. 2002***
Bowersox, Rodney D.; Sep. 2002; 36p; In English
Contract(s)/Grant(s): F49620-01-1-0115
Report No.(s): AD-A407911; TAMU-HAL-2002-001; AFRL-SR-AR-TR-02-0346; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This document describes the results of AFOSR (Air Force Office of Scientific Research) Grant F49620-01-1-0115, which was a one year project to bridge the gap between AFOSR Grants F49620-98-1-0038 and F49620-02-1-0365. The objectives of the grant F49620-01-1-0115 were to design and construct Mach 3.0 rough-wall, favorable pressure-gradient test sections and perform wind tunnel tests. Ten favorable pressure gradient models were designed and constructed. However, testing was not

accomplished. Instead, to continue progress, numerical simulations were performed. First, algebraic roughness models, which were previously validated by the PI (principle investigator) for flat-plate flows, were incorporated into a parabolized Navier-Stokes solver, and simulations of the smooth and rough wall supersonic favorable pressure gradient flows were accomplished. Second, additional simulations were performed with the Wilcox k-w model using the Aerosoft, Inc. CFD (computational fluid dynamics) code GASP.
DTIC
Free Flow; Boundary Layers; Surface Roughness; Wall Pressure; Wind Tunnel Tests; Computational Fluid Dynamics

20030001561 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Fishermans Bend, Australia
A Parametric Study of Jet/Vortex Interactions in the AMRL Water Tunnel
Erm, Lincoln P.; Sep. 2001; 71p; In English
Report No.(s): AD-A407908; DSTO-TR-1209; DODA-AR-012-017; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

In this report, details are given of a parametric study undertaken in the AMRL (Aeronautical and Maritime Research Laboratory, Australia) flow visualization water tunnel to determine how vortices are affected when they interact with different types of jet flows. The effects on vortices of jets having different shapes, velocities, locations and pitch angles were investigated. The flow was visualized using dye and vortex behaviour was examined for 42 different jets. It was found that jet shape, jet velocity and jet location all had a significant effect on vortex behavior, whereas jet pitch angle generally had a minimal effect. Possible physical explanations for vortex behavior have been proposed. The parametric study is the first stage of a longer investigation aimed at determining the best jet configurations to use to control vortical flow over modern high-performance aircraft to improve aircraft control at extreme flight attitudes. The findings of the initial parametric study will be used in any ongoing work on the investigation.
DTIC
Vortices; Flow Visualization; Jet Flow

20030001677 Sandia National Labs., Albuquerque, NM USA
Evaluation Techniques and Properties of an Exact Solution to a Subsonic Free Surface Jet Flow
Robinson, A. C.; Apr. 2002; In English
Report No.(s): DE2002-800816; SAND2002-1015; No Copyright; Avail: CASI; C01, CD-ROM

Computational techniques for the evaluation of steady plane subsonic flows represented by Chaplygin series in the hodograph plane are presented. These techniques are utilized to examine the properties of the free surface wall jet solution. This solution is a prototype for the shaped charge jet, a problem which is particularly difficult to computer properly using general purpose finite element or finite difference continuum mechanics codes. The shaped charge jet is a classic validation problem for models involving high explosives and material strength. Therefore, the problem studied in this report represents a useful verification problem associated with shaped charge jet modeling.
NTIS
Jet Flow; Subsonic Flow; Computational Fluid Dynamics

20030001682 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA
Research on Instabilities and Transition in Three-Dimensional Boundary Layers, with Emphasis on Gas-Turbine-Blade Flows
Ryzhov, Olef S.; Jan. 2000; 18p; In English
Contract(s)/Grant(s): F49620-00-1-0066
Report No.(s): AD-A407942; AFRL-SR-AR-TR-02-0405; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Absolute instability of (Gortler vortices on the severely curved concave pressure side of a gas-turbine blade is the main thrust of the third-year work under this grant. For the most part, the Gortler vortices have been investigated in an incompressible boundary layer over thin-wing sections or artificial inserts on an otherwise flat plate. The cascade of modern aircraft engines operate in the high subsonic Mach number regime with velocity fields strongly affected by centrifugal forces maintained by the large curvature of profiles. Unsteady spiral-type vortices developing in these environments provoke the absolute instability in the streamwise direction of the boundary layer leading to earlier transition. An effort undertaken after the meeting in Shalimar (May

29-31, 2002) show that the heat transfer coefficient is even more susceptible to enhancing oscillations in the upstream moving wave packets than the pressure.
DTIC
Three Dimensional Boundary Layer; Stability; Turbine Blades; Gas Turbines

20030001852 NASA Glenn Research Center, Cleveland, OH USA
Probabilistic Study of Fluid Structure Interaction
Gorla, Rama S. R., N and R Engineering and Management Services, USA; Pai, Shantaram S., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 121-138; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Probabilistic CFD design is needed because we are asked to do more with less. to cost effectively accomplish the design task, we need to formally quantify the effect of uncertainties (variables) in the design. Probabilistic design is one effective method to formally quantify the effect of uncertainties. Our objective is to establish a revolutionary new early design process, by developing non-deterministic physics-based probabilistic design tools, which will include all the life cycle processes. Breakthroughs will be sought in speed, accuracy, intelligence, and usability of the system. This paper is concerned with the usefulness of parametric optimization method coupled with a Navier-Stokes analysis code for the aero-thermodynamic design of turbomachinery combustor liner. The interconnection between the CFD code and NESSUS codes facilitated the coupling between the thermal profiles and structural design. We have developed new concepts for reducing the computational cost of unsteady, three-dimensional, compressible aerodynamic analyses for multistage turbomachinery flows. The flow was modeled by the three-dimensional Favre-Reynolds-averaged Navier-Stokes equations using the k-epsilon turbulence closure, which was integrated using an implicit third-order upwind solver. The methodology developed in this paper is expected to lead to the design optimization of turbomachinery blades.
Author
Probability Theory; Computational Fluid Dynamics; Design Optimization; Aerothermodynamics; Linings

20030001941 Lawrence Livermore National Lab., Livermore, CA USA
Test Problems for Reactive Flow HE Model in the ALE3D Code and Limited Sensitivity Study
Gerassimenko, M.; Mar. 01, 2000; 64p; In English
Report No.(s): DE2002-792686; UCRL-ID-138456; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We document quick running test problems for a reactive flow model of HE initiation incorporated into ALE3D. A quarter percent change in projectile velocity changes the outcome from detonation to HE burn that dies down. We study the sensitivity of calculated HE behavior to several parameters of practical interest where modeling HE initiation with ALE3D.
NTIS
Helium; Mathematical Models; Finite Element Method; Performance Tests; Sensitivity Analysis

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INSTRUMENTATION AND PHOTOGRAPHY

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

20030000436 NASA Marshall Space Flight Center, Huntsville, AL USA
Daytime Aspect Camera for Balloon Altitudes
Dietz, Kurt L., NASA Marshall Space Flight Center, USA; Ramsey, Brian D., NASA Marshall Space Flight Center, USA; Alexander, Cheryl D., NASA Marshall Space Flight Center, USA; Apple, Jeff A., NASA Marshall Space Flight Center, USA; Ghosh, Kajal K., Universities Space Research Association, USA; Swift, Wesley R., Raytheon Information Technology and Scientific Services, USA; Optical Engineering; October 2002; ISSN 0091-3286; Volume 41, No. 10, pp. 2641-2651; In English; Copyright; Avail: Issuing Activity

We have designed, built, and flight-tested a new star camera for daytime guiding of pointed balloon-borne experiments at altitudes around 40 km. The camera and lens are commercially available, off-the-shelf components, but require a custom-built baffle to reduce stray light, especially near the sunlit limb of the balloon. This new camera, which operates in the 600- to 1000-nm region of the spectrum, successfully provides daytime aspect information of approx. 10 arcsec resolution for two distinct star fields

near the galactic plane. The detected scattered-light backgrounds show good agreement with the Air Force MODTRAN models used to design the camera, but the daytime stellar magnitude limit was lower than expected due to longitudinal chromatic aberration in the lens. Replacing the commercial lens with a custom-built lens should allow the system to track stars in any arbitrary area of the sky during the daytime.
Author
Cameras; Lenses; Star Trackers; Guidance Sensors

20030000535 State Univ. of New York, Albany, NY USA
Monochromatic Mammographic Imaging Using X-Ray Polycapillary Optics ***Annual Report, 1 Jun. 1999-31 May 2002***
Sugiro, Francisca; Jun. 2002; 14p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9316
Report No.(s): AD-A407379; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Monochromatic imaging is typically done with synchrotron sources. These sources are expensive and not practical for clinical settings. However, conventional laboratory sources normally have insufficient intensity. Polycapillary x-ray optics can be used to efficiently produce an intense parallel beam, which can be diffracted from a crystal to create monochromatic radiation. Monochromatic parallel beam imaging produces high subject contrast, high resolution, and low patient dose. Contrast, resolution, and intensity measurements were performed with both high and low angular acceptance crystals. Testing was first done at 8 keV with an intense copper rotating anode source. Preliminary l7.5 kev measurements were then made with a molybdenum source. At 8 keV, contrast enhancement was a factor of five relative to the polychromatic case, in good agreement with theoretical values. At l7.5 kev, monochromatic subject contrast was a factor of two times greater than the conventional polychromatic contrast. The measured angular resolution with a silicon crystal is 0.6 mrad at 8 keV, and 0.2 - 0.3 mrad at 17.5 keV. For a 50-mm thick patient, this angle corresponds to 50 lp/mm with an ideal detector. The use of polychromatic collimating optics allow monochromatic mammographic imaging measurements with a conventional x-ray source in a practical clinical setting.
DTIC
X Ray Optics; Cancer; Mammary Glands

20030000748 NASA Marshall Space Flight Center, Huntsville, AL USA
Heat Flux Sensor Testing
Clark, D. W., NASA Marshall Space Flight Center, USA; July 2002; 21p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
This viewgraph presentation provides information on the following objectives: Developing secondary calibration capabilities for MSFC's (Marshall Space Flight Center) Hot Gas Facility (HGF), a Mach 4 Aerothermal Wind Tunnel; Evaluating ASTM (American Society for Testing and Materials) slug/ thinskin calorimeters against current HGF heat flux sensors; Providing verification of baselined AEDC (Arnold Engineering Development Center) / Medtherm gage calibrations; Addressing future calibration issues involving NIST (National Institute of Standards and Technology) certified radiant gages.
Derived from text
Calibrating; Calorimeters; Heat Flux; Wind Tunnels; Aerothermodynamics

20030000774 Brigham Young Univ., Dept. of Mechanical Engineering, Provo, UT USA
Use of Blackbody Optical Fiber Thermometers in High-Temperature Environments
Jones, Matthew R., Brigham Young Univ., USA; Barker, David G., Brigham Young Univ., USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 16p; In English; Also announced as 20030000727; No Copyright; Avail: CASI; A03, Hardcopy
A blackbody optical fiber thermometer consists of an optical fiber whose sensing tip is given a metallic coating. The sensing tip of the fiber forms an isothermal cavity, and the emission from this cavity is approximately equal to the emission from a blackbody. Temperature readings are obtained by measuring the spectral intensity at the end of the fiber at two wavelengths. The ratio of these measurements is used to infer the temperature at the sensing tip. However, readings from blackbody optical fiber thermometers are corrupted by self-emission when extended portions of the probe are exposed to elevated temperatures. This paper describes two possible methods for correcting the problem due to self-emission by the fiber. The first method is two-fiber optical fiber thermometry. In this method, a second fiber is positioned parallel to the original fiber. The fibers are identical except that the second fiber has a reflecting coating instead of a blackbody cavity at its tip. Since both the emitting and reflecting fibers are exposed to the same thermal environment, measurements of the intensity at the end of the reflecting fiber can be used to eliminate error due to emission by the fiber. The second approach is spectral remote sensing. In this method, the intensity exiting the fiber is measured in portions of the visible and infrared spectrum. The measured spectral intensities are used to reconstruct

the temperature profile along the fiber. Application of these techniques to the thermal control system of a microgravity furnace is discussed.
Author
Errors; High Temperature Environments; Infrared Spectra; Optical Fibers; Remote Sensing; Temperature Measurement; Temperature Sensors

20030000796 NASA Langley Research Center, Hampton, VA USA
Close-Range Photogrammetry & Next Generation Spacecraft
Pappa, Richard S., NASA Langley Research Center, USA; Professional Surveyor; June 2002; 4p; In English; Original contains color illustrations; Copyright; Avail: Issuing Activity
NASA is focusing renewed attention on the topic of large, ultra-lightweight space structures, also known as 'gossamer' spacecraft. Nearly all of the details of the giant spacecraft are still to be worked out. But it's already clear that one of the most challenging aspects will be developing techniques to align and control these systems after they are deployed in space. A critical part of this process is creating new ground test methods to measure gossamer structures under stationary, deploying and vibrating conditions for validation of corresponding analytical predictions. In addressing this problem, I considered, first of all, the possibility of simply using conventional displacement or vibration sensor that could provide spatial measurements. Next, I turned my attention to photogrammetry, a method of determining the spatial coordinates of objects using photographs. The success of this research and development has convinced me that photogrammetry is the most suitable method to solve the gossamer measurement problem.
Derived from text
Large Space Structures; Photogrammetry; Ground Tests; Inflatable Space Structures; Dimensional Measurement; Coordinates

20030000818 Birmingham Univ., School of Physics and Space Research, UK
Solar Mass Ejection Imager ***Final Report, 31 Jul. 1999-20 Feb. 2002***
Simnett, George M.; Feb. 20, 2002; 11p; In English
Contract(s)/Grant(s): F19628-96-K-0005; AF Proj. 7601
Report No.(s): AD-A407169; AFRL-VS-TR-2002-1612; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The University of Birmingham has designed, fabricated, qualified and calibrated the Solar Mass Ejection Imager to be flown on the Coriolis spacecraft. The hardware consists of three flight camera systems, plus a flight spare, and a complex data handling unit. The CCD camera was developed under subcontract by the Rutherford Appleton Laboratory, Chilton, UK. The SMEI has been thoroughly qualified to the requirements of the Coriolis mission. Each camera system has been optically calibrated to verify its performance.
DTIC
Fabrication; Cameras; Image Processing; Stellar Mass

20030000821 Naval Postgraduate School, Monterey, CA USA
Digital Video (DV): A Primer for Developing an Enterprise Video Strategy
Talovich, Thomas L.; Sep. 2002; 91p; In English; Original contains color images
Report No.(s): AD-A407165; No Copyright; Avail: CASI; A05, Hardcopy
The purpose of this thesis is to provide an overview of digital video production and delivery. The thesis presents independent research demonstrating the educational value of incorporating video and multimedia content in training and education programs. The thesis explains the fundamental concepts associated with the process of planning, preparing, and publishing video content and assists in the development of follow-on strategies for incorporation of video content into distance training and education programs. The thesis provides an overview of the following technologies: Digital Video, Digital Video Editors, Video Compression, Streaming Video, and Optical Storage Media.
DTIC
Digital Television; Multimedia; Video Compression; Optical Memory (Data Storage); Video Communication

20030000905 CSC Professional Services Group, Falls Church, VA USA
Bistatic Radar System Graphical User Interface Calibration and Measurement Data Analysis and Display Components ***Final Report, Jun. 1995-Sep. 1991***
Bright, Gerald; Jun. 2002; 9p; In English; Original contains color images
Contract(s)/Grant(s): F30602-95-C-0060; AF Proj. 4072
Report No.(s): AD-A407577; AFRL-SN-RS-TR-2002-145; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report describes the Bistatic Radar System Graphical User Interface design and development.
DTIC
Calibrating; Graphical User Interface; Multistatic Radar; Systems Engineering

20030000985 NASA Marshall Space Flight Center, Huntsville, AL USA
Energy Dispersive Spectrometry and Quantitative Analysis Short Course. Introduction to X-ray Energy Dispersive Spectrometry and Quantitative Analysis
Carpenter, Paul, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Introduction to X-ray Energy Dispersive Spectrometry and Quantitative Analysis, 4 Aug. 2002, Quebec, Canada
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only
This course will cover practical applications of the energy-dispersive spectrometer (EDS) to x-ray microanalysis. Topics covered will include detector technology, advances in pulse processing, resolution and performance monitoring, detector modeling, peak deconvolution and fitting, qualitative and quantitative analysis, compositional mapping, and standards. An emphasis will be placed on use of the EDS for quantitative analysis, with discussion of typical problems encountered in the analysis of a wide range of materials and sample geometries.
Author
X Rays; Dispersing; Spectrometers; Quantitative Analysis

20030001045 NASA Marshall Space Flight Center, Huntsville, AL USA
Uses of Computed Tomography in the NASA Materials Science Program
Engel, H. Peter, Wyle Labs., Inc., USA; Gillies, Donald C., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; World Space Conference, 10-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Computed Tomography (CT) has proved to be of inestimable use in providing a rapid evaluation of a variety of samples from Mechanics of Granular Materials (MGM) to electronic materials (Ge-Si alloys) to space grown materials such as meteorites. The system at Kennedy Space Center (KSC), because of its convenient geographical location, is ideal for examining samples immediately after returning to Earth. It also has the advantage of the choice of fluxes, and in particular the use of a radioactive cobalt source, which is basically monochromatic. This permits a reasonable measurement of density to be made from which chemical composition can be determined. Due to the current dearth of long duration space grown materials, the CT instrument has been used to characterize materials in preparation for flight, to determine thermal expansion values, and to examine long duration space grown materials, i.e. meteorites. The work will first describe the establishment of the protocol for obtaining the optimum density readings for any material. This will include both the effects of the hardware or instrumental parameters that can be controlled, and the techniques used to process the CT data. Examples will be given of the compositional variation along single crystals of germanium-silicon alloys. Density variation with temperature has been measured in preparation for future materials science experiments; this involved the fabrication and installation of a single zone furnace incorporating a heat pipe to ensure of high temperature uniformity. At the time of writing the thermal expansion of lead has been measured from room temperature to 900 C. Three methods are available. Digital radiography enable length changes to be determined. Prior to melting the sample is small than the container and the diameter change can be measured. Most critical, however, is the density change in solid, through the melting region, and in the liquid state. These data are needed for engineering purposes to aid in the design of containment cartridges, and for enabling fluid flow calculations. A second sample, with the lead alloyed with antimony is ready for scanning. This corresponds to the planned composition of Dr. Poirier's flight experiment. Finally, three-dimensional results will be shown of the structure of a two-phase metallic meteorite of metal and sulfide, in which the iron-nickel phase has coarsened during slow cooling over hundreds of millions of years.
Author
Tomography; Meteorites; Granular Materials; Chemical Composition

20030001781 Stanford Linear Accelerator Center, Stanford, CA USA
Optimizing the Linear Collider Detector for the Measurement of the Higgs to Charm Branching Ratio
Abe, T.; Chou, A. S.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently available only on CD-ROM
Report No.(s): DE2002-799936; SLAC-PUB-9250; No Copyright; Avail: National Technical Information Service (NTIS)
Several different vertex detector designs for the Linear Collider Detector (LCD) are evaluated in the context of measurements of the branching ratio of the standard model Higgs particle decaying into charm/anti-charm final states. Fast Monte Carlo simulations are used to model the detector and neural network-optimized flavor tagging is used to perform the measurements.

These tools are used to study the effects of pixel resolution, material thickness, and inner layer radius on the flavor tagging efficiency-purity curve and ultimately on the branching ratio measurement error.
NTIS
Detectors; Thickness; Monte Carlo Method; Purity

20030001808 Lawrence Livermore National Lab., Livermore, CA USA
SSPX Bolometer Systems
Thomassen, K. I.; Feb. 2000; 20p; In English
Report No.(s): DE2002-793449; UCRL-ID-137802; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
There are two bolometry systems on SSPX, one that measures the total radiated power and a 16-channel array to measure the radiation profile. The first collimates the radiation through two slits in the horizontal plane spaced a distance s = 1.2 cm apart. The slit heights are h = l/100 th of an inch, and the detector material is behind the second one. The number of electrons generated per photon is proportional to the photon energy (except for a factor of 3-4 enhancement in efficiency in the visible) so that the current of electrons is proportional to the power received. The power is in turn the product of the flux hitting the detector material and the projected perpendicular area of the slab material to the line of sight (which is often at an angle to the slab).
NTIS
Bolometers; Infrared Detectors; Laser Power Beaming; Photons

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LASERS AND MASERS

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

20030000502 Stanford Linear Accelerator Center, Stanford, CA USA
Initial Gain Measurements of a 800nmm SASE FEL, VISA
Tremaine, A.; Frigola, P.; Murokh, A.; Musumeci, P.; Pellegrini, C.; Aug. 2002; In English; This document is color dependent and/or landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800022; SLAC-PUB-9392; No Copyright; Avail: National Technical Information Service (NTIS)
The VISA (Visible to Infrared SASE Amplifier) FEL is designed to obtain high gain at a radiation wavelength of 800nm. The FEL uses the high brightness electron beam of the Accelerator Test Facility (ATF), with energy of 72MeV. VISA uses a novel, 4 m long, strong focussing undulator with a gap of 6mm and a period of 1.8cm. to obtain large gain the beam and undulator axis have to be aligned to better than 50mm. Results from initial measurements on the alignment, gain, and spectrum will be presented and compared to theoretical calculations and simulations.
NTIS
Free Electron Lasers; High Gain

20030001120 NASA Marshall Space Flight Center, Huntsville, AL USA
Advanced Material Developments with Laser Engineered Net Shaping
Williams, Glenn A., NASA Marshall Space Flight Center, USA; Cooper, Ken, NASA Marshall Space Flight Center, USA; McGill, Preston, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; The Aerospace Materials, Processes, and Environmental Technology Conference (AMPET), 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Laser Engineered Net Shaping (LENS(Trademark)) process is a new technology to fabricate three-dimensional metallic components directly from CAD solid models. It directly fabricates metal hardware by injecting the metal powder of choice into the focal point of a 700W Nd:YAG laser as it traces the perimeter and fills of a part. The Rapid Prototype Laboratory at Marshall Space Flight Center is currently operating a OPTOMEC 750 LENS machine in evaluation experiments involving integration of this technology into various manufacturing processes associated with aerospace applications. This paper will cover our research finding about properties of samples created from Inconel 718 & SS316 using this process versus the same materials in cast & wrought conditions.
Author
Computer Aided Design; YAG Lasers; Wrought Alloys; Fabrication; Aerospace Engineering

20030001703 Duke Univ., Dept. of Mechanical Engineering and Materials Science, Durham, NC USA
Acquisition of a Point-to-Point Laser Doppler Vibrometer Measurement System ***Final Report, 4 Jan.-30 Dec. 2001***
Virgin, L. W.; Feb. 10, 2002; 3p; In English
Contract(s)/Grant(s): F49620-01-1-0252
Report No.(s): AD-A407884; AFRL-SR-AR-TR-02-0403; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Measurements in dynamical systems provide the important data which is used to assess the accuracy of theoretical models and their improvement if necessary, provide monitoring information for damage detection including system aging, etc. Acquiring data from structural systems has traditionally been accomplished using strain gages or conventional accelerometers. However, with the rapidly improving processing capabilities of digital systems, (non-contacting) optically-based transducers are becoming an increasingly popular means of extracting data from experimental systems. The funded grant was used to acquire a state-of-the-art Laser Doppler Vibrometer system to measure the dynamic response of structural and aeroelastic systems of interest to the Air Force. The research program has successfully assessed the robustness of the measurement system in a variety of situations, and provides a strong resource for education of PhD candidates in sophisticated experimental measurements. A further use of this system has been directed toward lightweight inflatable structures, again an area of strong relevance to the research mission of the Air Force for space applications.
DTIC
Detection; Mathematical Models; Vibration Meters; Technology Utilization; Accelerometers; Lasers

20030001786 Lawrence Livermore National Lab., Livermore, CA USA
Laser Programs Highlights 1998
Dec. 1999; In English; This document is color dependent and/or in landscape layout. It is currently available only on CD-ROM
Report No.(s): DE2002-793681; UCRL-ID-109089-98; No Copyright; Avail: National Technical Information Service (NTIS)
This report covers the following topics: Commentary; Laser Programs; Inertial Confinement Fusion/National Ignition Facility (ICF/NIF); Atomic Vapor Laser Isotope Separation (AVLIS); Laser Science and Technology (LS&T); Information Science and Technology Program (IS&T); Strategic Materials Applications Program (SMAP); Medical Technology Program (MTP) and Awards.
NTIS
Inertial Confinement Fusion; Laser Applications; Lasers; Isotope Separation

20030001829 Naval Surface Warfare Center, Silver Spring, MD USA
Evidence for Transverse Dependencies in COTR and Microbunching in a SASE FEL
Sep. 26, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-801626; No Copyright; Avail: National Technical Information Service (NTIS)
Using coherent optical transition radiation (COTR) techniques, we have observed transverse dependencies, which in some aspects relate to the electron beam microbunching in a visible wavelength (540 nm) self-amplified spontaneous emission (SASE) free-electron laser (FEL). The experimental COTR observations include the z-dependent e-beam sizes, the z-dependent angular distributions, and the z-dependent spectra (which show an x-dependence). A 30-40% narrowing of the observed beam size using COTR is explainable by the mechanisms dependence on the square of the number of microbunched particles. However, additional effects are needed to explain beam size reductions by factors of 2-3 at different z locations. Localized e-beam structure in the gun or induced in the bunch compression process may result in microbunching transverse dependence, and hence the observed COTR effects.
NTIS
Electron Beams; Electron Bunching

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.

20030000472 NASA Marshall Space Flight Center, Huntsville, AL USA
Synthesis and Characterization of Carbon Nanotubes for Reinforced and Functional Applications
Zhu, Shen, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 5th Conference on Aerospace Materials, Processes, and Environmental Technology, 16-18 Sep. 2002, Hunstville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Many efforts have been engaged recently in synthesizing single-walled and multi-walled carbon nanotubes due to their superior mechanical, electrical and thermal properties, which could be used to enhance numerous applications such as electronics, sensors and composite strength. This presentation will show the synthesizing process of carbon nanotubes by thermal chemical vapor deposition and the characterization results by using electron microscopy and optical spectroscopy. Carbon nanotubes were synthesized on various substances. The conditions of fabricating single-walled or multi-walled carbon nanotubes depend strongly on temperatures and hydrocarbon concentrations but weakly on pressures. The size, growth modes and orientations of carbon nanotube will be illustrated. The advantages and limitations of several potential applications including sensor, heat pipe, field emission, radiation shielding, and reinforcements for composites by using carbon nanotubes will be discussed.
Author
Carbon Nanotubes; Mechanical Properties; Synthesis (Chemistry); Thermodynamic Properties; Fabrication; Reinforcing Materials

20030000481 TRW, Inc., Space and Technology Div., Redondo Beach, CA USA
Compositionally-Graded Shape Memory Film for Self-Deployment of Membrane Reflectors and Optics
Hill, Lisa, TRW, Inc., USA; Carman, Greg, California Univ., USA; [2002]; 1p; In English; 2002 ASME International Mechanical Engineering Congress and Exposition, 17-22 Nov. 2002, New Orleans, LA, USA; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): NAS8-01127; No Copyright; Avail: Issuing Activity; Abstract Only

The next generation of space systems will require large apertures in order to image faint targets or cover large areas of Earth. These large apertures must be able to fit inside a launch vehicle fairing, be light enough for launch into orbit, and deploy on orbit with repeatability and reliability. The current state-of-the-art in flight optics is represented by the 4 meter LAMP telescope, with an areal density of 10 km sq m. Development of a Beryllium mirror demonstration article for NGST (Next Generation Space Telescope) at the University of Arizona indicate areal densities of 0.5 kg sq m with flight hardware in the 12 meter range. With progressive improvements in existing deployment, packaging, and structural technologies, the size of optics and reflectors will continue to increase, while mass is reduced. However, without a breakthrough in materials, packaging and/or deployment technologies, the goal for Gossamer structures of 0.1 kg sq m is unachievable for the near and mid-term NASA missions. Membrane technology provides the best hope of achieving such low areal densities. In combination with advances in membrane materials and structures, development of revolutionary techniques for deployment systems can provide significant improvements in large aperture technology. In this paper, the results of a six-month Phase I research effort to demonstrate the application of thin film NiTi to aerospace-qualified membrane and mesh materials are presented. Deposition of shape memory thin film was achieved Astromesh (trademark) metal mesh and CP-1, and optical-quality polymer membrane. Not only was full-coating deposition demonstrated, but also small segment deposition which holds potential for local surface control. Deployment of these materials was also demonstrated, setting the stage for the development of a larger test article.
Author
Apertures; Spaceborne Telescopes; Research and Development; Thin Films; Materials Selection; Membrane Structures; Deposition

20030000741 NASA Marshall Space Flight Center, Huntsville, AL USA
Experimental Study of Unshrouded Impeller Pump Stage Sensitivity to Tip Clearance
Williams, Robert W., NASA Marshall Space Flight Center, USA; Zoladz, Thomas, NASA Marshall Space Flight Center, USA; Storey, Anne K., NASA Marshall Space Flight Center, USA; Skelley, Stephen E., NASA Marshall Space Flight Center, USA; July 2002; 30p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This viewgraph presentation provides information on an experiment. Its objective is to experimentally determine unshrouded impeller performance sensitivity to tip clearance. The experiment included: Determining impeller efficiency at scaled operating conditions in water at MSFC's Pump Test Equipment (PTE) Facility; Testing unshrouded impeller at three different tip clearances; Testing each tip clearance configuration at on- and off-design conditions, and collecting unsteady- and steady-state data in each configuration; Determining impeller efficiency directly using drive line torquemeter and pump inlet and exit total pressure measurements.
Derived from text
Blade Tips; Efficiency; Clearances; Pump Impellers

20030000745 Concepts NREC, White River Jct., VT USA
Integrated Turbopump Thermo-Mechanical Design and Analysis Tools
Platt, Mike, Concepts NREC, USA; July 2002; 20p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy
This viewgraph presentation provides information on the thermo-mechanical design and analysis tools used to control the steady and transient thermo-mechanical effects which drive life, reliability, and cost. The thermo-mechanical analysis tools provide upfront design capability by effectively leveraging existing component design tools to analyze and control: fits, clearance, preload; cooling requirements; stress levels, LCF (low cycle fatigue) limits, and HCF (high cycle fatigue) margin.
Derived from text
Design Analysis; Thermodynamics; Turbine Pumps; Applications Programs (Computers); Design Optimization; Computer Aided Design

20030001562 Universitaet der Bundeswehr Muenchen, Fakultaet Fuer Elektrotechnik, Neubiberg, Germany
Experimental Examinations and Numerical Simulation of the Geometry of Technical Flow Throttles for "Common Rail" Direct Injection Engine Systems ***Experimentelle Untersuchungen und Numerische Simulation der Geometrie technischer Stroemungsdrosseln fur "Common Rail"-Direkteinspritzsysteme***
Unger, Martin; Mar. 2001; 158p; In German; Original contains color images
Report No.(s): AD-A407906; X5-X5; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy
This dissertation concerns itself with direct injection engine systems and, more specifically, with the examination of technical flow throttles, which are set into an injector in order to control the switch procedure. An optimization with regard to the switch process and efficiency is targeted, so that a particular profile of the throttles might be attained. As far as the throttle profile is concerned, modifications included relate to the diameter and length, a possible conical form of the throttle canal as well as a touching, to some degree, a rounding of the inlet and outlet edges of the throttle. The parameters employed subsequently succeed in simulations with various models, such as with oil, and then with water.
DTIC
Throttling; Engine Parts; Engine Design

20030001644 Michigan Univ., School of Natural Resources and Environment, Ann Arbor, MI USA
Life Cycle Design of Air Intake Manifolds. Phase 1: 2.0 L Ford Contour Air Intake Manifold
Keoleian, G. A.; Kar, K.; Feb. 1999; 90p; In English
Report No.(s): PB2003-101104; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This life cycle design project was a collaborative effort between the Center for Sustainable Systems (formerly National Pollution Prevention Center) at the University of Michigan, a cross functional team at Ford, and the National Risk Management Research Laboratory of the U.S. Environmental Protection Agency. The project team applied the life cycle design methodology to the design analysis of three alternative air intake manifolds: a sand cast aluminum, brazed aluminum tubular, and nylon composite. The design analysis included a life cycle inventory analysis, environmental regulatory/policy analysis, life cycle cost analysis and a product/process performance analysis. These analyses highlighted significant tradeoffs among alternatives.
NTIS
Air Intakes; Design Analysis; Life Cycle Costs; Intake Systems; Manifolds

20030001655 Sandia National Labs., Albuquerque, NM USA
Assembly of LIGA Using Electric Fields
Feddema, J. T.; Warne, L. K.; Johnson, W. A.; Ogden, A. J.; Armour, D. L.; Apr. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800946; SAND2002-1084; No Copyright; Avail: National Technical Information Service (NTIS)

The goal of this project was to develop a device that uses electric fields to grasp and possibly levitate LlGA parts. This non-contact form of grasping would solve many of the problems associated with grasping parts that are only a few microns in dimensions. Scaling laws show that for parts this size, electrostatic and electromagnetic forces are dominant over gravitational forces. This is why micro-parts often stick to mechanical tweezers. If these forces can be controlled under feedback control, the parts could be levitated, possibly even rotated in air. In this project, we designed, fabricated, and tested several grippers that use electrostatic and electromagnetic fields to grasp and release metal LlGA parts. The eventual use of this tool will be to assemble metal and non-metal LlGA parts into small electromechanical systems.
NTIS
Lithography; Manufacturing; Actuators; Assembling; Electric Fields; Electromechanical Devices

20030001665 Sandia National Labs., Albuquerque, NM USA
Ceramic-Metal Brazing, from Fundamentals to Applications: A Review of Sandia National Laboratories Brazing Capabilities, Needs, and Opportunities
Hosking, F. M.; Stephens, J. J.; Glass, S. J.; Johannes, J. E.; Kotula, P.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800814; SAND2002-0978; No Copyright; Avail: National Technical Information Service (NTIS)
The purpose of the report is to summarize discussions from a Ceramic/Metal Brazing: From Fundamentals to Applications Workshop that was held at Sandia National Laboratories in Albuquerque, NM on April 4, 2001. Brazing experts and users who bridge common areas of research, design, and manufacturing participated in the exercise. External perspectives on the general state of the science and technology for ceramics and metal brazing were given. Other discussions highlighted and critiqued Sandia's brazing research and engineering programs, including the latest advances in braze modeling and materials characterization. The workshop concluded with a facilitated dialogue that identified critical brazing research needs and opportunities.
NTIS
Brazing; Ceramics; Manufacturing; Materials Science

20030001773 Numatec Hanford Corp., Richland, WA USA
Evaluation of Cold Vacuun Drying Facility Seal Ring Loading and Stress
Irwin, J. J.; Sep. 22, 1999; 20p; In English
Report No.(s): DE2002-798070; SNF-4772; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The loads and resulting stresses in the seal ring are calculated and compared to the allowables for the service from ASME Boiler and Pressure Vessel Code.
NTIS
Seals (Stoppers); Barrels (Containers); Vacuum; Drying

20030001882 Tennessee State Univ., Dept. of Mechanical Engineering, Nashville, TN USA
Probabilistic Design Methodology and its Application to the Design of an Umbilical Retract Mechanism
Onyebueke, Landon, Tennessee State Univ., USA; Ameye, Olusesan, Tennessee State Univ., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 757-788; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche
A lot has been learned from past experience with structural and machine element failures. The understanding of failure modes and the application of an appropriate design analysis method can lead to improved structural and machine element safety as well as serviceability. to apply Probabilistic Design Methodology (PDM), all uncertainties are modeled as random variables with selected distribution types, means, and standard deviations. It is quite difficult to achieve a robust design without considering the randomness of the design parameters which is the case in the use of the Deterministic Design Approach. The US Navy has a fleet of submarine-launched ballistic missiles. An umbilical plug joins the missile to the submarine in order to provide electrical and cooling water connections. As the missile leaves the submarine, an umbilical retract mechanism retracts the umbilical plug clear of the advancing missile after disengagement during launch and retrains the plug in the retracted position. The design of the current retract mechanism in use was based on the deterministic approach which puts emphasis on factor of safety. A new umbilical retract mechanism that is simpler in design, lighter in weight, more reliable, easier to adjust, and more cost effective has become desirable since this will increase the performance and efficiency of the system. This paper reports on a recent project performed at Tennessee State University for the US Navy that involved the application of PDM to the design of an umbilical retract mechanism. This paper

demonstrates how the use of PDM lead to the minimization of weight and cost, and the maximization of reliability and performance.
Author
Ballistic Missiles; Design Analysis; Probability Theory; Umbilical Connectors

20030001931 Argonne National Lab., IL USA
Variation of Nominal Contact Pressure with Time during Sliding Wear
Ajayi, O. O.; Erek, R. A.; Jan. 2001; 22p; In English
Report No.(s): DE2002-799783; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A variation of nominal contact pressure with sliding distance/time during sliding wear contact was analyzed from experimental data available in the open literature and data from tests the authors conducted with five materials under unlubricated, solid-lubricated, and oil-lubricated conditions.
NTIS
Wear; Pressure; Tribology; Sliding Friction; Time

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QUALITY ASSURANCE AND RELIABILITY

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

20030000449 MesoSystems Technology, Inc., Richland, WA USA
Mesochannel Gas Sampler for Rapid Sample Collection and Concentration
Hong, S.; Birmingham, J.; Fountain, M.; Mar. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-797808; No Copyright; Avail: National Technical Information Service (NTIS)
Under DOE Grant No. DE-FG03-00ER83048, MesoSystems Technology, Inc., (Mesosystems) completed a Phase I SBIR effort for the Department of Energy. The goal of this project was to demonstrate the feasibility of a compact, lightweight, gas-sampling device with rapid-cycle-time characteristics. The highlights of our Phase I work include: Demonstration of a compact gas sampler with integrated heater. This device has an order of magnitude greater adsorption capacity and much faster heating/cooling times than commercial sorbent tubes. Completion of computational fluid dynamics modeling of the gas sampler to determine airflow characteristics for various design options. These modeling efforts guided the development and testing of the Mesochannel Gas Sampler prototype. Testing of the Mesochannel Gas Sampler in parallel with tests of two packed-bed samplers. These tests showed the Mesochannel Gas Sampler represents a substantial improvement compared with the packed-bed approach.
NTIS
Contaminants; Mesometeorology; Air Flow; Samplers

20030000484 NASA Marshall Space Flight Center, Huntsville, AL USA
Structural Health Monitoring of Composite Materials Using Distributed Fiber Bragg Sensors
Grant, Joseph, NASA Marshall Space Flight Center, USA; Kual, Raj, NASA Marshall Space Flight Center, USA; Taylor, Scott, NASA Marshall Space Flight Center, USA; Jackson, Kurt V., NASA Marshall Space Flight Center, USA; Myers, George, NASA Marshall Space Flight Center, USA; Wang, Y., Alabama Agricultural and Mechanical Univ., USA; Sharma, A., Alabama Agricultural and Mechanical Univ., USA; [2002]; 1p; In English; 2002 OSA Annual Meeting and Exhibit/LS-XVIII, 29 Sep. - 3 Oct. 2002, Orlando, FL, USA; Sponsored by Optical Society of America, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Health monitoring of polymer matrix composite materials using fiber optic Bragg grating (FBG) sensors is accomplished using a tunable IR (infrared) laser via transmission mode. Results are presented from experiments of composite structures with FBG's embedded at various orientations, and surface measurements of various cryogenic composite vessels.
Author
Polymer Matrix Composites; Smart Materials; Bragg Gratings; Systems Health Monitoring

20030001654 Sandia National Labs., Albuquerque, NM USA
Development of Magnetically Excited Flexural Plate Wave Devices for Implementation as Physical, Chemical, and Acoustic Sensors, and as Integrated Micro-Pumps for Sensored Systems
Schubert, W. K.; Mitchell, M. A.; Graf, D. C.; Shul, R. J.; May 2002; In English; This document is color dependent and/or in

landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800963; SAND2002-1406; No Copyright; Avail: National Technical Information Service (NTIS)

The magnetically excited flexural plate wave (mag-FPW) device has great promise as a versatile sensor platform. FPW's can have better sensitivity at lower operating frequencies than surface acoustic wave (SAW) devices. Lower operating frequency simplifies the control electronics and makes integration of sensor with electronics easier. Magnetic rather than piezoelectric excitation of the FPW greatly simplifies the device structure and processing by eliminating the need for piezoelectric thin films, also simplifying integration issues. The versatile mag-FPW resonator structure can potentially be configured to fulfill a number of critical functions in an autonomous sensored system. As a physical sensor, the device can be extremely sensitive to temperature, fluid flow, strain, acceleration and vibration. by coating the membrane with self-assembled monolayers (SAMs), or polymer films with selective absorption properties (originally developed for SAW sensors), the mass sensitivity of the FPW allows it to be used as biological or chemical sensors. Yet another critical need in autonomous sensor systems is the ability to pump fluid. FPW structures can be configured as micro-pumps. This report describes work done to develop mag-FPW devices as physical, chemical, and acoustic sensors, and as micro-pumps for both liquid and gas-phase analytes to enable new integrated sensing platform.
NTIS
Detection; Excitation; Piezoelectricity; Sensitivity; Signal Detectors; Surface Acoustic Wave Devices; Fluid Flow

20030001834 Transportation Research Board, IDEA Programs, Washington, DC USA
Development of a Portable Pavement Thickness/Density Meter (PTDM) ***Final Report***
Maser, K. R.; Aug. 2002; 50p; In English
Report No.(s): PB2003-100548; NCHRP/IDEA-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Pavement Thickness/Density Meter (PTDM) concept developed in this research represents a new and innovative method for automatically determining pavement thickness and density. Pavement thickness and pavement density are two key variables that determine the future life and performance of asphalt pavement. In many cases, due to variations in placement conditions, the actual in-place thickness and density can vary considerably from specifications. Current testing methods based on coring are time consuming and do not provide adequate coverage. The PTDM system provides a means for quickly obtaining complete thickness/density coverage assessment of the pavement. The device is transportable and easily operated with limited training. It provides continuous data, in the form of profiles of the pavement thickness and density as a function of distance along the pavement. The method is safe, since it is based on low-powered pulsed electromagnetic waves. The key technological innovations required for the development of the PTDM are (1) the implementation of small and more portable components, particularly the transmitting antenna; (2) the implementation of software which automatically produces the readings that will be directly displayed for the operator; and (3) the packaging of all of these components in a small portable device that can be easily used and handled as a routine piece of field test equipment. The work carried out under this program has successfully achieved objectives (1) and (2).
NTIS
Measuring Instruments; Pavements

20030001855 NASA Glenn Research Center, Cleveland, OH USA
NESTEM-QRAS: A Tool for Estimating Probability of Failure
Patel, Bhogilal M., N and R Engineering and Management Services, USA; Nagpal, Vinod K., N and R Engineering and Management Services, USA; Lalli, Vincent A., NASA Glenn Research Center, USA; Pai, Shantaram, NASA Glenn Research Center, USA; Rusick, Jeffrey J., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 197-220; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

An interface between two NASA GRC specialty codes, NESTEM and QRAS has been developed. This interface enables users to estimate, in advance, the risk of failure of a component, a subsystem, and/or a system under given operating conditions. This capability would be able to provide a needed input for estimating the success rate for any mission. NESTEM code, under development for the last 15 years at NASA Glenn Research Center, has the capability of estimating probability of failure of components under varying loading and environmental conditions. This code performs sensitivity analysis of all the input variables and provides their influence on the response variables in the form of cumulative distribution functions. QRAS, also developed by NASA, assesses risk of failure of a system or a mission based on the quantitative information provided by NESTEM or other

similar codes, and user provided fault tree and modes of failure. This paper will describe briefly, the capabilities of the NESTEM, QRAS and the interface. Also, in this presentation we will describe stepwise process the interface uses using an example.
Author
Probability Theory; Failure Analysis; Systems Engineering; Applications Programs (Computers); Computer Systems Programs

20030001856 Cruse (Thomas A.), Pagosa Springs, CO USA
Issues in Modeling System Reliability
Cruse, Thomas A., Cruse (Thomas A.), USA; Annis, Chuck, Pratt and Whitney Aircraft, USA; Booker, Jane, Los Alamos National Lab., USA; Robinson, David, Sandia National Labs., USA; Sues, Rob, ARA, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 221-224; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A10, Microfiche

This paper discusses various issues in modeling system reliability. The topics include: 1) Statistical formalisms versus pragmatic numerics; 2) Language; 3) Statistical methods versus reliability-based design methods; 4) Professional bias; and 5) Real issues that need to be identified and resolved prior to certifying designs. This paper is in viewgraph form.
CASI
Reliability Analysis; Systems Engineering; Models; Formalism

20030001857 Los Alamos National Lab., Engineering Analysis Group, NM USA
Issues in Modeling System Reliability Panel Discussion
Booker, Jane M., Los Alamos National Lab., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 225-229; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A10, Microfiche

This paper presents a panel discussion on issues in modeling system reliability. The topics include: 1) Lack of Test Data-Limits Conventional Reliability; 2) Must Certify Weapons-Mission Impossible; 3) A New Approach to Performance-Predict; and 4) Some Issues. This paper is in viewgraph form.
CASI
Reliability Analysis; Systems Engineering; Models; Performance Tests

20030001858 Sandia National Labs., Risk and Reliability Dept., USA
Issues with Modeling System Reliability Using Probabilistic Methods
Robinson, David G., Sandia National Labs., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 231-253; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

This paper presents an application of probabilistic methods to model system reliability issues. Some of the topics include: 1) Why use probabilistic methods? 2) PM allow for an integrated assessment of the impact of uncertainty at all levels of the system; 3) Levels of Analysis; 4) Sample Applications; 5) Family Tree; 6) Isssues: Tradiational: Analytical; 7) Issues Traditional: Simulation; 8) Issues: Bayes: Classical; 9) Issues: Bayes: Emperical; 10) Issues: Bayes: Hierarchial; and 11) Comparison. This paper is in viewgraph form.
CASI
Probability Theory; Reliability Analysis; Systems Engineering; Mathematical Models

20030001859 Pratt and Whitney Aircraft, USA
Issues and Strategies for Reliability-Based Certification Methodologies
Annis, Chuck, Pratt and Whitney Aircraft, USA; Booker, Jane, Los Alamos National Lab., USA; Robinson, David, Sandia National Labs., USA; Sues, Rob, ARA, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 255-261; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

A means to reduce the amount of testing while achieving a given confidence level and rely to a greater extent on modeling techniques for structure certification are presented.
Derived from text
Certification; Confidence Limits; Reliability Analysis; Methodology

20030001866 Los Alamos National Lab., Engineering Analysis Group, NM USA

A Perspective on Reliability: Probability Theory and Beyond

Booker, Jane M., Los Alamos National Lab., USA; Singpurwalla, Nozer D., George Washington Univ., USA; Bement, Thomas R., Los Alamos National Lab., USA; Keller-McNulty, Sallie, Los Alamos National Lab., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 409-440; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

To discuss the applicability of traditional reliability philosophy and analysis, the foundations and fundamentals of probability theory are considered. The discussion will also include alternatives to probability theory and to test data-based reliability growth analysis. The latter is especially important when required test data are absent or difficult/expensive to obtain. Probability approaches include Bayesian methods that can be broadened to include mathematical integration of all available sources of information, including formal use of expert knowledge. In integrating such diverse sources of information, uncertainties must be characterized, quantified and propagated. Methods for these uncertainty issues include probability theory and alternative paradigms of logic such as fuzzy logic. Such methods have been successfully demonstrated in reliability applications in the automotive industry and national defense.

Author

Reliability Analysis; Performance Prediction; Probability Theory; Bayes Theorem; Mathematical Models; Information Systems; Functional Integration

20030001875 NASA Glenn Research Center, Cleveland, OH USA

Structural Life and Reliability Metrics: Benchmarking and Verification of Probabilistic Life Prediction Codes

Litt, Jonathan S., Army Research Lab., USA; Soditus, Sherry, San Francisco International Airport, USA; Hendricks, Robert C., NASA Glenn Research Center, USA; Zaretsky, Erwin V., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 587-601; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Over the past two decades there has been considerable effort by NASA Glenn and others to develop probabilistic codes to predict with reasonable engineering certainty the life and reliability of critical components in rotating machinery and, more specifically, in the rotating sections of airbreathing and rocket engines. These codes have, to a very limited extent, been verified with relatively small bench rig type specimens under uniaxial loading. Because of the small and very narrow database the acceptance of these codes within the aerospace community has been limited. An alternate approach to generating statistically significant data under complex loading and environments simulating aircraft and rocket engine conditions is to obtain, catalog and statistically analyze actual field data. End users of the engines, such as commercial airlines and the military, record and store operational and maintenance information. This presentation describes a cooperative program between the NASA GRC, United Airlines, USAF Wright Laboratory, U.S. Army Research Laboratory and Australian Aeronautical & Maritime Research Laboratory to obtain and analyze these airline data for selected components such as blades, disks and combustors. These airline data will be used to benchmark and compare existing life prediction codes.

Author

Aircraft Engines; Life (Durability); Reliability Analysis; Structural Reliability; Probability Theory; Applications Programs (Computers)

20030001883 Honeywell, Inc., Aerospace Engines and Systems, Phoenix, AZ USA

Probabilistic Reliability Validation of an Impeller Using DARWIN(tm)

Muju, Sandeep, Honeywell, Inc., USA; Nelson, Rick, Honeywell, Inc., USA; Lentz, Jeff, Honeywell, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 789-806; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

DARWIN (Design Assessment of Reliability With INspection) is a computer program for the prediction of the probability of fracture in aircraft engine rotor disks. Its risk prediction process includes finite element analysis based stress distribution, fracture mechanics based crack growth calculations, material defect distributions and nondestructive inspection simulation. Southwest Research Institute is developing this program as part of the Turbine Rotor Material Design (TRMD) contract under FAA (Federal Aviation Administration) sponsorship. As part of the TRMD program, Honeywell is conducting failure risk prediction validation of DARWIN for hard alpha analysis using actual component experience. Specifically, the case considered herein involves a fielded impeller that has accumulated significant service cycles but has not experienced any hard alpha issues in the field. However, during routine production overspeed an impeller of this type did experience a spin-pit event due to a hard alpha inclusion. This case challenges the two extremes of risk prediction process. First, the overspeed spin-pit case will be analyzed for DARWIN validation from the standpoint of high failures per cycle (single cycle failure). Second, the same impeller

will be analyzed using field conditions for DARWIN validation from the ”null hypothesis” (extremely low failures per cycle) probability standpoint. Figure 1 shows the stress results for the spin-pit overspeed condition. This work presents the results of the DARWIN predicted failure risk probability and shows calibration results with both field and spin-pit experience.
Author
Failure; Impellers; Probability Theory; Reliability; Applications Programs (Computers); Performance Prediction; Computerized Simulation

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STRUCTURAL MECHANICS

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

20030000863 Naval Postgraduate School, Monterey, CA USA
An Approach for Impression Creep of Lead Free Microelectronic Solders
Anastasio, Onofrio A.; Jun. 2002; 57p; In English; Original contains color images
Report No.(s): AD-A407182; No Copyright; Avail: CASI; A04, Hardcopy
Currently, the microelectronics industry is transitioning from lead-containing to lead-free solders in response to legislation in the EU and Japan. Before an alternative alloy can be designated as a replacement for current Pb-Sn extensive testing must be accomplished. One major characteristic of the alloy that must be considered is creep. Traditionally, creep testing requires numerous samples and a long tin, which thwarts the generation of comprehensive creep databases for difficult to prepare samples such as microelectronic solder joints. However, a relatively new technique, impression creep enables us to rapidly generate creep data. This test uses a cylindrical punch with a flat end to make an impression on the surface of a specimen under constant load. The steady state velocity of the indenter is found to have the same stress and temperature dependence as the conventional unidirectional creep test using bulk specimens. This thesis examines impression creep tests of eutectic Sn-Ag. A testing program and apparatus was developed constructed based on a servo hydraulic test frame. The apparatus is capable of a load resolution of 0.01N with a stability of plus/minus 0.1N, and a displacement resolution of 0.05 microns with a stability of plus/minus 0.1 microns. Samples of eutectic Sn-Ag solder were reflowed to develop the microstructure used in microelectronic packaging. Creep tests were conducted at various stresses and temperatures and showed that coarse microstructures creep more rapidly than the microstructures in the tested regime.
DTIC
Creep Tests; Solders

20030000896 Army Construction Engineering Research Lab., Champaign, IL USA
Alternative Shear Panel Configurations for Light Wood Construction. Development, Seismic Performance, and Design Guidance *Final Report*
Wilcoski, James; Fischer, Chad; Allison, Tim; Malach, Kelly Jo; Apr. 2002; 136p; In English; Original contains color images
Report No.(s): AD-A407570; ERDC/CERL-TR-02-12; No Copyright; Avail: Defense Technical Information Center (DTIC)
Shear panels are used in light wood construction to resist lateral loads resulting from earthquakes or strong winds. These panels are typically made of wooden sheathing nailed to building frame members, but this standard panel design interferes with the installation of sheet insulation. A non-insulated shear panel conducts heat between the building interior and exterior wasting considerable amounts of energy. Several alternative shear panel designs were developed to avoid this insulation-mounting problem and sample panels were tested according to standard cyclic test protocols. One of the alternative designs consisted of diagonal steel straps nailed directly to the structural framing. Several others consisted of sheathing nailed to 2 x 4 framing then set into a larger 2 x 6 structural frame in such a way that no sheathing protruded beyond the edge of the 2 x 6 members. Also samples of industry-standard shear panels were constructed and tested in order to establish a performance baseline. Analytical models were developed to size test panels and predict panel behavior. A procedure was developed for establishing design capacities based on both test data and established baseline panel design capacity. The behavior of each panel configuration is documented and recommended design capacities are presented.
DTIC
Shear Properties; Construction; Wood

20030000913 NASA Langley Research Center, Hampton, VA USA

Buckling Behavior of Compression-Loaded Composite Cylindrical Shells with Reinforced Cutouts

Hilburger, Mark W., NASA Langley Research Center, USA; Starnes, James H., Jr., NASA Langley Research Center, USA; [2002]; 28p; In English; 43rd AIAA/ASME/ASCE/AHS/ASC Structures and Structural Dynamics and Materials, 22-25 Apr. 2002, Denver, CO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-1516; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Results from a numerical study of the response of thin-wall compression-loaded quasi-isotropic laminated composite cylindrical shells with reinforced and unreinforced square cutouts are presented. The effects of cutout reinforcement orthotropy, size, and thickness on the nonlinear response of the shells are described. A high-fidelity nonlinear analysis procedure has been used to predict the nonlinear response of the shells. The analysis procedure includes a nonlinear static analysis that predicts stable response characteristics of the shells and a nonlinear transient analysis that predicts unstable dynamic buckling response characteristics. The results illustrate how a compression-loaded shell with an unreinforced cutout can exhibit a complex nonlinear response. In particular, a local buckling response occurs in the shell near the cutout and is caused by a complex nonlinear coupling between local shell-wall deformations and in-plane destabilizing compression stresses near the cutout. In general, the addition of reinforcement around a cutout in a compression-loaded shell can retard or eliminate the local buckling response near the cutout and increase the buckling load of the shell, as expected. However, results are presented that show how certain reinforcement configurations can actually cause an unexpected increase in the magnitude of local deformations and stresses in the shell and cause a reduction in the buckling load. Specific cases are presented that suggest that the orthotropy, thickness, and size of a cutout reinforcement in a shell can be tailored to achieve improved response characteristics.

Author

Laminates; Composite Structures; Cylindrical Shells; Buckling; Shells (Structural Forms)

20030001028 Army Construction Engineering Research Lab., Champaign, IL USA

Predictive Service Life Tests for Roofing Membranes, Phase II, Investigation of Accelerated Aging Tests for Tracking Degradation of Roofing Membrane Materials *Final Report*

Bailey, David M.; Cash, Carl G.; Davies, Arthur G.; Sep. 2002; 55p; In English; Original contains color images

Report No.(s): AD-A407075; ERDC/CERL-TR-02-22; No Copyright; Avail: CASI; A04, Hardcopy

The average service life of roofing membranes used in low-slope applications on U.S. Army buildings is estimated to be considerably shorter than the industry-presumed 20-year design life, even when installers carefully adhere to the latest guide specifications. This problem is due in large part to market-driven product development cycles, which do not include time for long-term field testing. to reduce delivery costs, contractors may provide untested, interior membranes in place of ones proven satisfactory in long-term service. Federal procurement regulations require that roofing systems and components be selected according to desired properties and generic type, not brand name. The problem is that a material certified to have satisfactory properties at installation time will not necessarily retain those properties in service. The overall objective of this research is to develop a testing program that can be executed in a matter of weeks to adequately predict a membrane's long-term performance in service. This report details accelerated aging tests of 12 popular membrane materials in the laboratory, and describes outdoor experiment stations set up for long-term exposure tests of those same membranes. The laboratory results will later be correlated with the outdoor test results to develop performance models and predictive service life tests.

DTIC

Aging (Materials); Service Life; Degradation; Roofs; Performance Prediction; Maintenance

20030001031 Naval Postgraduate School, Monterey, CA USA

Experimental Studies of Welding Effects on Damping for Undersea Warfare Applications

Carey, Agustin E.; Sep. 2002; 72p; In English; Original contains color images

Report No.(s): AD-A407070; No Copyright; Avail: CASI; A04, Hardcopy

Damping in structures has historically been of great importance in nearly all branches of engineering endeavors, and it also happens to be one of the most difficult parameters to predict. The purpose of this research is to study the effects that welding has on damping. Measurements and comparisons of the damping ratios of two welded stiffened plates, two flat plates and one machined stiffened plate are undertaken. The frequency response and natural frequencies of five steel structures are determined experimentally. A finite element model is created for three of the structures to determine the natural frequencies and associated mode shapes. The damping ratios are then determined using the half-power point method. The results show that at frequencies less than 500 Hz, welding tends to cause the damping ratio to increase. The experimental and numerical results show that the mode shapes that experience the highest degree of stress at a weld are associated with the natural frequencies with the highest damping

ratio. These results may lend to better understanding of the effects of welding on damping and assist in obtaining better empirical approximations of damping for use in ship shock computer simulations.
DTIC
Structural Vibration; Steel Structures; Vibration Damping; Welded Joints

20030001113 Queensland Univ., Mechanical Engineering Dept., Brisbane, Australia
Numerical Simulation of Diaphragm Rupture
Petrie-Repar, Paul, Queensland Univ., Australia; Dec. 23, 1997; 253p; In English; CD-ROM contains full text document in PDF format
Contract(s)/Grant(s): NAG1-1846
Report No.(s): Rept-6; NONP-NASA-CD-2002154962; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
The results from computer simulations of the gas-dynamic processes that occur during and after the rupture of diaphragms within shock tubes and expansion tubes are presented. A two-dimensional and axisymmetric finite-volume code that solves the unsteady Euler equations for inviscid compressible flow, was used to perform the simulations. The flow domains were represented as unstructured meshes of triangular cells and solution-adaptive remeshing was used to focus computational effort in regions where the flow-field gradients were high. The ability of the code to produce accurate solutions to the Euler equations was verified by examining the following test cases: supersonic vortex flow between two arcs, an ideal shock tube, and supersonic flow over a cone. The ideal shock tube problem was studied in detail, in particular the shock speed. The computed shock speed was accurate when the initial pressure ratio was low. When the initial pressure ratio was high the flow was difficult to resolve because of the large density ratio at the contact surface where significant numerical diffusion occurred. However, solution-adaptive remeshing was used to control the error and reasonable estimates for the shock speed were obtained. The code was used to perform multi-dimensional simulations of the gradual opening of a primary diaphragm within a shock tube. The development of the flow, in particular the contact surface was examined and found to be strongly dependent on the initial pressure ratio across the diaphragm. For high initial pressure ratios across the diaphragm, previous experiments have shown that the measured shock speed can exceed the shock speed predicted by one-dimensional models. The shock speeds computed via the present multi-dimensional simulation were higher than those estimated by previous one-dimensional models and were closer to the experimental measurements. This indicates that multi-dimensional flow effects were partly responsible for the relatively high shock speeds measured in the experiments.
Author
Computerized Simulation; Gas Dynamics; Diaphragms (Mechanics); Shock Waves; Rupturing; Computational Grids; Numerical Analysis; Unsteady Flow

20030001805 Lawrence Livermore National Lab., Livermore, CA USA
FETI Level 1 Method: Theory and Implementation
Kamath, C.; Mar. 01, 2000; 38p; In English
Report No.(s): DE2002-792775; UCRL-ID-138075; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report summarizes our experiences in developing a prototype serial code for the implementation of the Level 1 Finite Element Tearing and Interconnecting (FETI) method. This method is a non-overlapping domain-decomposition scheme for the parallel solution of ill-conditioned systems of linear equations arising in structural mechanics problems. The FETI method has been shown to be numerically scalable for second order elasticity and fourth order plate and shell problems. In this report, we first outline the theory underlying the FETI method and discuss the approaches taken to improve the robustness and convergence of the method. We next provide implementation details, focusing on our serial prototype code. Finally, we present experimental results, followed by a summary of our observations.
NTIS
Finite Element Method; Prototypes; Ill-Conditioned Problems (Mathematics); Linear Equations

20030001862 Southwest Research Inst., USA
Crack Nucleation and Growth Data and Modeling
McClung, Craig, Southwest Research Inst., USA; McKeighan, Peter, Southwest Research Inst., USA; Laz, Peter, Southwest Research Inst., USA; Perocchi, Lee, General Electric Co., USA; Gill, Yancey, Honeywell, Inc., USA; Lehmann, Darryl, Pratt and Whitney Aircraft, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 289-322; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

The contents include: 1) Crack nucleation in hard alpha defects; 2) Thermal residual stresses in and near HA; 3) Vacuum FCG behavior for titanium rotor alloys; and 4) Spin pit tests on rotors with HA defects. This paper is in viewgraph form.
CASI
Crack Propagation; Mathematical Models; Nucleation; Rotors; Cracking (Fracturing)

20030001871 NASA Glenn Research Center, Cleveland, OH USA
Probabilistic Fatigue: Computational Simulation
Chamis, Christos C., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 481-510; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Fatigue is a primary consideration in the design of aerospace structures for long term durability and reliability. There are several types of fatigue that must be considered in the design. These include low cycle, high cycle, combined for different cyclic loading conditions - for example, mechanical, thermal, erosion, etc. The traditional approach to evaluate fatigue has been to conduct many tests in the various service-environment conditions that the component will be subjected to in a specific design. This approach is reasonable and robust for that specific design. However, it is time consuming, costly and needs to be repeated for designs in different operating conditions in general. Recent research has demonstrated that fatigue of structural components/structures can be evaluated by computational simulation based on a novel paradigm. Main features in this novel paradigm are progressive telescoping scale mechanics, progressive scale substructuring and progressive structural fracture, encompassed with probabilistic simulation. These generic features of this approach are to probabilistically telescope scale local material point damage all the way up to the structural component and to probabilistically scale decompose structural loads and boundary conditions all the way down to material point. Additional features include a multifactor interaction model that probabilistically describes material properties evolution, any changes due to various cyclic load and other mutually interacting effects. The objective of the proposed paper is to describe this novel paradigm of computational simulation and present typical fatigue results for structural components. Additionally, advantages, versatility and inclusiveness of computational simulation versus testing are discussed. Guidelines for complementing simulated results with strategic testing are outlined. Typical results are shown for computational simulation of fatigue in metallic composite structures to demonstrate the versatility of this novel paradigm in predicting a priori fatigue life.
Author
Aerospace Engineering; Reliability Analysis; Computerized Simulation; Fatigue Life; Design Analysis; Loads (Forces); Probability Theory; Structural Design; Component Reliability

20030001872 Defence Evaluation Research Agency, Farnborough, UK
The Prediction of Fatigue Life for Arbitrary Geometries From the Statistical Analysis of Plain Specimen Data
Shepherd, Duncan P., Defence Evaluation Research Agency, UK; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 511-538; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Engine manufacturers are under constant commercial pressure to produce engines with improved performance, with increased reliability and at lower cost. As a result, the materials from which fracture critical components are made are increasingly being pushed to the limit of their capability. to ensure that uncontained failures of these components are reduced below current levels, it is critically important to understand the behaviour of these materials under the extremes of stress and temperature they are now expected to endure in service. However, since practical understanding of materials derives largely from laboratory specimen studies, it is necessary to know how the observed properties are reflected in full scale components. The current paper introduces a statistical model for the size effect in fatigue, which, when combined with fully non-linear stress analysis, advanced materials models and fracture mechanics calculations, provides a means of predicting fatigue life distributions for arbitrary geometries and loadings. The model is applied to an extensive fatigue database for a modern engine alloy, which contains both notched specimen and full scale component results. It is demonstrated that the model can predict both types of results accurately, which is important because they represent the relative extremes in terms of both stress and volume.
Author
Gas Turbine Engines; Component Reliability; Performance Prediction; Statistical Analysis; Mathematical Models; Failure Analysis; Fatigue Life; Scale Effect

20030001877 NASA Glenn Research Center, Cleveland, OH USA
NASA GRC Fatigue Crack Initiation Life Prediction Models
Arya, Vinod K., Akron Univ., USA; Halford, Gary R., NASA Glenn Research Center, USA; Fifth Annual Workshop on the

Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 627-651; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Metal fatigue has plagued structural components for centuries, and it remains a critical durability issue in today's aerospace hardware. This is true despite vastly improved and advanced materials, increased mechanistic understanding, and development of accurate structural analysis and advanced fatigue life prediction tools. Each advance is quickly taken advantage of to produce safer, more reliable, more cost effective, and better performing products. In other words, as the envelope is expanded, components are then designed to operate just as close to the newly expanded envelope as they were to the initial one. The problem is perennial. The economic importance of addressing structural durability issues early in the design process is emphasized. Tradeoffs with performance, cost, and legislated restrictions are pointed out. Several aspects of structural durability of advanced systems, advanced materials and advanced fatigue life prediction methods are presented. Specific items include the basic elements of durability analysis, conventional designs, barriers to be overcome for advanced systems, high-temperature life prediction for both creep-fatigue and thermomechanical fatigue, mean stress effects, multiaxial stress-strain states, and cumulative fatigue damage accumulation assessment.

Author

Crack Initiation; Prediction Analysis Techniques; Structural Analysis; Metal Fatigue; Life (Durability)

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GEOSCIENCES (GENERAL)

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

20030000466 Geological Survey, Water Resources Div., Reston, VA USA

Results of Streamflow Gain-Loss Studies in Texas, with Emphasis on Gains from and Losses to Major and Minor Aquifers

Slade, R. M.; Taylor Bentley, J.; Michaud, D.; 2002; 140p; In English

Report No.(s): PB2003-101125; USGS-OFR-02-068; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Data for all 366 known streamflow gain-loss studies conducted by the U.S. Geological Survey in Texas were aggregated. A water-budget equation that includes discharges for main channels, tributaries, return flows, and withdrawals was used to document the channel gain or loss for each of 2,872 subreaches for the studies. The channel gain or loss represents discharge from or recharge to aquifers crossed by the streams. Where applicable, the major or minor aquifer outcrop traversed by each subreach was identified, as was the length and location for each subreach. These data will be used to estimate recharge or discharge for major and minor aquifers in Texas, as needed by the Ground-Water Availability Modeling Program being conducted by the Texas Water Development Board. The data also can be used, along with current flow rates for streamflow-gaging stations, to estimate streamflow at sites remote from gaging stations, including sites where streamflow availability is needed for permitted withdrawals.

NTIS

Aquifers; Streams; Flow Velocity; Geological Surveys

20030000678 Schreuder and Davis, Inc., Tampa, FL USA

Potential Use of Phosphate Mining Tailing Sand for Water Filtration: Leaching Tests. Final Report

Schreuder, P. J.; Dumeyer, J.; Sep. 2001; 98p; In English

Report No.(s): PB2003-101191; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Demand for water in central Florida is increasing while the availability of groundwater is dwindling. Because of extensive pumping of fresh water from the Floridian Aquifer, saltwater intrusion is threatening the aquifer in coastal areas, while lowered aquifer levels may affect lake levels and spring flows in more inland areas. The Southwest Florida Water Management District (SWFWMD) has proposed cutting back on the permitted quantities of water pumped from the Floridian Aquifer in the Southern Water Use Caution Area (SWUCA) so as to be closer to sustainable yield levels. This will have a significant impact on current, and especially future, water users. to meet the growing demands of development, alternative sources of water must be sought. Possible sources are reclaimed wastewater, the capture of storm water, the capture of 'excess' surface water, development of the surficial aquifer, and desalinization of seawater. This project is part of an effort to examine the feasibility of storing waste water or excess surface water in reservoirs on mined lands, purifying the water with wetland treatment and sand tailing filtration, and

then injecting the treated water into the Floridian Aquifer. This report specifically addresses the leaching of sand tailings in barrels as a first step to be sure that water quality would not be degraded by sand tailing filtration.
NTIS
Ground Water; Leaching; Water Management; Water Quality; Aquifers

20030000679 Geological Survey, Water Resources Div., Reston, VA USA
Reclaimed Phosphate Clay Settling Area Investigation: Hydrologic Model Calibration and Ultimate Clay Elevation Prediction. Final Report
Reigner, W. R.; Winkler, C.; Aug. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available in CD-ROM
Report No.(s): PB2003-101148; No Copyright; Avail: National Technical Information Service (NTIS)
This report presents the research objectives, work plan and study results of an intensive three-year research project designed to monitor and evaluate the hydrology and clay consolidation behavior of phosphate clay settling areas (CSAs). The primary objective of the study is to develop a procedure for predicting the hydrology of above ground clay settling areas that directly considers the short and long term effect of clay consolidation. Problems associated with CSA behavior include: Difficulties in predicting hydrologic functionality; Lack of confidence regarding the selection of model parameters; Inability to accurately predict long-term topographic changes; Uncertainty with regard to groundwater interaction; Concern regarding optimal regulatory practices; and Concern associated with the time necessary to achieve CSA equilibrium.
NTIS
Hydrology Models; Calibrating; Hydrology; Phosphates

20030001106 NASA Ames Research Center, Moffett Field, CA USA
Astrobiology: A Roadmap for Charting Life in the Universe
DesMarais, David J., NASA Ames Research Center, USA; Jun. 19, 2002; 1p; In English; GeoBiology Summer 2002 Field Course, 19-27 Jul. 2002, Catalina Island, CA, USA
Contract(s)/Grant(s): RTOP 344-50-92-02; Copyright; Avail: Issuing Activity; Abstract Only
Astrobiology is the study of the origin, evolution and distribution of life in the universe. It provides a biological perspective to many areas of NASA research. It links such endeavors as the search for habitable planets, exploration missions to Mars and the outer Solar System, efforts to understand the origins and early evolution of life, and charting the potential of life to adapt to future challenges, both on Earth and in space. Astrobiology addresses the following three basic questions, which have been asked in some form for generations. How does life begin and evolve? Does life exist elsewhere in the universe? What is future of life on Earth and beyond? The NASA Astrobiology Roadmap provides guidance for research and technology development across several NASA Enterprises: Space Science, Earth Science, and the Human Exploration and Development of Space. The Roadmap is formulated in terms of eight Science Goals that outline key domains of investigation that might require perhaps decades of effort to consolidate. For each of these goals, Science Objectives outline more specific high priority near-term efforts for the next three to five years. These twenty objectives will be integrated with NASA strategic planning.
Author
Exobiology; Earth Sciences; Space Exploration; Management Planning; Life Sciences; Biological Evolution

20030001111 NASA Ames Research Center, Moffett Field, CA USA
Ultramafic Terranes and Associated Springs as Analogs for Mars and Early Earth
Blake, David, NASA Ames Research Center, USA; Schulte, Mitch, NASA Ames Research Center, USA; Cullings, Ken, NASA Ames Research Center, USA; Feb. 01, 2002; 1p; In English; Exploring Mars Surface and its Earth Analogues, 23-25 Sep. 2002, Cannizzaro, Sicily, Italy
Contract(s)/Grant(s): RTOP 344-38-00-02; No Copyright; Avail: Issuing Activity; Abstract Only
Putative extinct or extant Martian organisms, like their terrestrial counterparts, must adopt metabolic strategies based on the environments in which they live. In order for organisms to derive metabolic energy from the natural environment (Martian or terrestrial), a state of thermodynamic disequilibrium must exist. The most widespread environment of chemical disequilibrium on present-day Earth results from the interaction of mafic rocks of the ocean crust with liquid water. Such environments were even more pervasive and important on the Archean Earth due to increased geothermal heat flow and the absence of widespread continental crust formation. The composition of the lower crust and upper mantle of the Earth is essentially the-same as that of Mars, and the early histories of these two planets are similar. It follows that a knowledge of the mineralogy, water-rock chemistry and microbial ecology of Earth's oceanic crust could be of great value in devising a search strategy for evidence of past or present life on Mars. In some tectonic regimes, cross-sections of lower oceanic crust and upper mantle are exposed on land as so-called

”ophiolite suites.” Such is the case in the state of California (USA) as a result of its location adjacent to active plate margins. These mafic and ultramafic rocks contain numerous springs that offer an easily accessible field laboratory for studying water/rock interactions and the microbial communities that are supported by the resulting geochemical energy. A preliminary screen of Archaean biodiversity was conducted in a cold spring located in a presently serpentinizing ultramafic terrane. PCR and phylogenetic analysis of partial 16s rRNA, sequences were performed on water and sediment samples. Archaea of recent phylogenetic origin were detected with sequences nearly identical to those of organisms living in ultra-high pH lakes of Africa. Author

Metabolism; Organisms; Thermodynamics; Geochemistry; Rocks

20030001669 Lawrence Livermore National Lab., Livermore, CA USA

Mechanical and Acoustic Properties of Weakly Cemented Granular Rocks

Nakagawa, S.; Myer, L. R.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-799643; No Copyright; Avail: National Technical Information Service (NTIS)

This paper presents the results of laboratory measurements on the mechanical and acoustic properties of weakly cemented granular rock. Artificial rock samples were fabricated by cementing sand and glass beads with sodium silicate binder. During uniaxial compression tests, the rock samples showed stress strain behavior which was more similar to that of soils than competent rocks, exhibiting large permanent deformations with frictional slip. The mechanical behavior of the samples approached that of competent rocks as the amount of binder was increased. For very weak samples, acoustic waves propagating in these rocks showed very low velocities of less than 1000 m/sec for compressional waves. A borehole made within this weakly cemented rock exhibited a unique mode of failure that is called ’anti-KI mode fracture’ in this paper. The effect of cementation, grain type, and boundary conditions on this mode of failure was also examined experimentally.

NTIS

Acoustic Properties; Cements; Mechanical Properties; Rocks; Granular Materials

20030001832 Bureau of Reclamation, Washington, DC USA

Engineering Geology Field Manual. Second Edition, Volume 2

2001; 572p; In English

Report No.(s): PB2003-100460; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

The manual presents the practices for the collection of geologic data obtained by the Bureau of Reclamation. The manual establishes common guidelines, procedures, and concepts for the collection, evaluation, and presentation of geologic information. The analysis of geologic conditions, the preparation of designs and specifications, and effective monitoring of construction require consistent, comprehensive, and timely geologic information. The use of these guidelines by all Reclamation engineering geological and geotechnical data promotes integration and coordination of geological and engineering activities.

NTIS

Manuals; Geology; Engineering

20030001837 Geological Survey, Columbia, SC USA

Effects of Fire-Retardant Chemical Products of Fathead Minnows in Experimental Streams *Final Report*

Little, E. E.; Calfee, R.; 2002; 32p; In English

Report No.(s): PB2003-101325; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Each year large amounts of fire-retardant chemicals are applied to wildfires across the nation. The assessment of risk posed by the use of these chemicals includes understanding the toxicity of these materials relative to exposure concentrations that are likely to result from applications, the environmental persistence of the material, and surface runoff from treated watersheds. Recent laboratory studies with long-term fire retardant chemicals indicate a significant photo-enhanced toxicity of products containing sodium ferrocyanide corrosion inhibitors, with up to a 100-fold increase in toxicity to rainbow trout and a 10-fold increase in toxicity to southern leopard frogs in the presence of ultraviolet (UV) light. In contrast, compounds without this corrosion inhibitor were either unaffected in the presence of UV or exhibited a lesser additive toxicity than those containing the corrosion inhibitor. Toxicity data determined in laboratory studies of fireretardant chemicals may not accurately reflect toxicity in natural habitats because a variety of environmental variables can influence persistence as well as toxicity. Without information on toxicity in natural settings it is difficult to determine the ecological hazards and probability of injury resulting from exposure following field application of the fire-retardant chemicals. Aside from unintentional spills and overspray, stormwater runoff is a likely pathway of contamination to aquatic systems by fire-retardant chemicals. One might expect such exposures to be transient and of limited duration as the contaminated runoff is diluted and carried downstream by the water flow. In order to assess

fire-chemical toxicity resulting from runoff, the fate and effects of two fire-retardant chemicals, Fire-Trol GTS-R (GTS-R) and Phos-Chek D75-R (D75-R) were tested over a 24-hour period in field tests using experimental streams.
NTIS
Toxicity; Protective Coatings; Forests

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20030000566 Naval Research Lab., Bay Saint Louis, MS USA
Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) Spatial and Temporal Reference Systems and the 4D3 Concept
Mesick, Hillary; Carter, Susan; Harris, Michael; Sep. 20, 2002; 11p; In English
Report No.(s): AD-A407319; NRL/MR/7440-02-8282; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A technical review of the Spatial and Temporal Reference Systems and the 4D3 Concept was performed by the Digital Mapping, Charting, and Geodesy Analysis Program (DMAP). Background, discussion points, and conclusions are presented.
DTIC
Mathematical Models; Spatial Distribution; Celestial Geodesy; Computer Aided Mapping; Temporal Distribution

20030000624 Geological Survey, Urbana, IL USA
Geology, Hydrology, and Water Quality in the Vicinity of a Brownfield Redevelopment Site in Canton, Illinois
Kay, R. T.; Cornue, D. B.; Ursic, J. R.; 2002; 42p; In English
Report No.(s): PB2003-100986; USGS/OFR-01-307; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes the results of an investigation of the hydrogeology and water quality in the vicinity of the Canton Brownfield site. The results of geophysical logging, two series of water-level measurements, slug testing, and water-quality sampling from 11 monitoring wells installed in the study area for this investigation are presented. In addition, this report presents the results of geotechnical, mineralogic, and stratigraphic analysis of lithologic sampling from soil borings in the study area. The report describes the geology, stratigraphy, and hydrology in the study area, identifies the directions and estimates the rate of ground-water flow, describes ground-water quality, and identifies potential factors that affect hydrology and water quality in the unconsolidated deposits underlying the study area.
NTIS
Geology; Hydrology; Water Quality; Geotechnical Engineering

20030000654 Geological Survey, Water Resources Div., Sacramento, CA USA
Preliminary Estimates of Spatially Distributed Net Infiltration and Recharge for the Death Valley Region, Nevada-California
Hevesi, J. A.; Flint, A. L.; Flint, L. E.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101123; USGS/WRI-02-4010; No Copyright; Avail: National Technical Information Service (NTIS)
A three-dimensional ground-water flow model has been developed to evaluate the Death Valley regional flow system, which includes ground water beneath the Nevada Test Site. Estimates of spatially distributed net infiltration and recharge are needed to define upper boundary conditions. This study presents a preliminary application of a conceptual and numerical model of net infiltration. The model was developed in studies at Yucca Mountain, Nevada, which is located in the approximate center of the Death Valley ground-water flow system. The conceptual model describes the effects of precipitation, runoff, evapotranspiration, and redistribution of water in the shallow unsaturated zone on predicted rates of net infiltration; precipitation and soil depth are the two most significant variables. The conceptual model was tested using a preliminary numerical model based on energy- and water-balance calculations. Daily precipitation for 1980 through 1995, averaging 202 millimeters per year over the 39,556 square kilometers area of the ground-water flow model, was input to the numerical model to simulate net infiltration ranging from zero for a soil thickness greater than 6 meters to over 350 millimeters per year for thin soils at high elevations in the Spring Mountains overlying permeable bedrock. Estimated average net infiltration over the entire ground-water flow model domain is 7.8 millimeters per year. to evaluate the application of the net-infiltration model developed on a local scale at Yucca Mountain, to

net-infiltration estimates representing the magnitude and distribution of recharge on a regional scale, the net-infiltration results were compared with recharge estimates obtained using empirical methods. Comparison of model results with previous estimates of basinwide recharge suggests that the net-infiltration estimates obtained using this model may overestimate recharge because of uncertainty in modeled precipitation, bedrock permeability, and soil properties for locations such as the Spring Mountains. Although this model is preliminary and uncalibrated, it provides a first approximation of the spatial distribution of net infiltration for the Death Valley region under current climatic conditions.
NTIS
Boundary Conditions; Three Dimensional Flow; Climatology; Hydrology Models

20030000657 Geological Survey, Water Resources Div., Denver, CO USA
Bed-Material Entrainment Potential, Roaring Fork River at Basalt, Colorado
Elliott, J. G.; 2002; In English; This document is color dependent and/or in landscape format. It is currently only available on CD-ROM
Report No.(s): PB2003-100953; USGS-WRI02-4223; No Copyright; Avail: National Technical Information Service (NTIS)
The Town of Basalt is considering several strategies to mitigate or accommodate high water and sediment discharges, including continued dredging, revised flood-plain zoning, and reconfiguring the channel cross section and sinuosity. Previous studies have identified flood-prone areas and hazards related to inundation and high streamflow velocity, but the studies have not evaluated response of the channel and the streambed to discharges that entrain, or result in movement of, coarse streambed sediment. This report quantifies the potential for sediment scour or deposition at specific locations in the Roaring Fork River and will enable the Town of Basalt to better assess hazards related to changes in floodflow conveyance and allocate resources in response to immediate or long-term channel degradation or aggradation. This report also addresses potential flood-conveyance problems and hazards to life and property associated with bed-material movement.
NTIS
Hydrology; Entrainment; Rivers

20030001046 Oklahoma Univ., Norman, OK USA
Oklahoma NASA EPSCoR
Snowden, Victoria Duca, Oklahoma Univ., USA; [2002]; 5p; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC5-171
Report No.(s): Rept-125-4489; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The mission of Oklahoma EPSCoR is to make Oklahoma researchers more successful in competing for research funding. Specific goals, objectives, and strategies were developed for each federal EPSCoR program, based on federal and state needs. A theme of stimulating collaboration among campuses and building on common research strengths is a strong component of the Oklahoma EPSCoR strategic plan. It extends also to our relationships with the federal agencies, and wherever possible, Oklahoma EPSCoR projects are developed collaboratively with federal research laboratories and program offices. Overall, Oklahoma EPSCoR seeks to capitalize on unique research capabilities and opportunities. The NASA EPSCoR Program in Oklahoma was developed through this grant as a joint effort between Oklahoma EPSCoR and the NASA Oklahoma Space Grant Consortium (OSGC). The major goal of the Oklahoma NASA EPSCoR Plan established in 1996 is to develop an academic research enterprise directed towards a long-term, self-sustaining, nationally competitive capability in areas of mutual self-interest to NASA and Oklahoma. Our final technical summary pie chart demonstrates the strong successes we have achieved during this period as a result of the award.
Author
Universities; Oklahoma; NASA Programs; Research Management; Multidisciplinary Design Optimization

20030001839 NASA Ames Research Center, Moffett Field, CA USA
Sources of Uncertainty in the Prediction of LAI / fPAR from MODIS
Dungan, Jennifer L., NASA Ames Research Center, USA; Ganapol, Barry D., Arizona Univ., USA; Nov. 10, 2002; 1p; In English; American Geophysical Union Fall Meeting, 6-10 Dec. 2002, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA
Contract(s)/Grant(s): RTOP 749-30-10; No Copyright; Avail: Issuing Activity; Abstract Only
To explicate the sources of uncertainty in the prediction of biophysical variables over space, consider the general equation: where z is a variable with values on some nominal, ordinal, interval or ratio scale; y is a vector of input variables; u is the spatial support of y and z ; x and u are the spatial locations of y and z , respectively; f is a model and B is the vector of the parameters of this model. Any y or z has a value and a spatial extent which is called its support. Viewed in this way, categories of uncertainty

are from variable (e.g. measurement), parameter, positional. support and model (e.g. structural) sources. The prediction of Leaf Area Index (LAI) and the fraction of absorbed photosynthetically active radiation (fPAR) are examples of z variables predicted using model(s) as a function of y variables and spatially constant parameters. The MOD15 algorithm is an example of f, called f(sub 1), with parameters including those defined by one of six biome types and solar and view angles. The Leaf Canopy Model (LCM)2, a nested model that combines leaf radiative transfer with a full canopy reflectance model through the phase function, is a simpler though similar radiative transfer approach to f(sub 1). In a previous study, MOD15 and LCM2 gave similar results for the broadleaf forest biome. Differences between these two models can be used to consider the structural uncertainty in prediction results. In an effort to quantify each of the five sources of uncertainty and rank their relative importance for the LAI/fPAR prediction problem, we used recent data for an EOS Core Validation Site in the broadleaf biome with coincident surface reflectance, vegetation index, fPAR and LAI products from the Moderate Resolution Imaging Spectrometer (MODIS). Uncertainty due to support on the input reflectance variable was characterized using LANDSAT ETM+ data. Input uncertainties were propagated through the LCM2 model and compared with published uncertainties from the MOD15 algorithm.
Author
Imaging Spectrometers; Satellite Imagery; Leaf Area Index; Photosynthetically Active Radiation; Predictions; Vegetation; Radiative Transfer; Reflectance

20030001971 Army Engineer Research and Development Center, Coastal and Hydraulic Lab., Vicksburg, MS USA
A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Riverine Floodplains in the Northern Rocky Mountains ***Final Report***
Hauer, F. Richard; Cook, Bradley J.; Gilbert, Michael C.; Clairain, Ellis J., Jr.; Smith, R. Daniel; Aug. 2002; 182p; In English; Original contains color images; --Original contains color plates: All DTIC reproductions will be in black and white. Prepared in cooperation with Flathead Lake Biological Station, Univ. of Montana, Polson, MT
Report No.(s): AD-A407773; ERDC/EL-TR-02-21; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The Hydrogeomorphic (HGM) Approach is a collection of concepts and methods for developing functional indices and subsequently using them to assess the capacity of a wetland to perform functions relative to similar wetlands in a region. The approach was initially designed to be used in the context of the Clean Water Act Section 404 Regulatory Program permit review sequence to consider alternatives, minimize impacts, assess unavoidable project impacts, determine mitigation requirements, and monitor the success of mitigation projects. However, a variety of other potential applications for the approach have been identified including: determining minimal effects under the Food Security Act, designing mitigation projects, and managing wetlands. This report uses the HGM Approach to develop a Regional Guidebook for assessing the functions of riverine floodplains in the northern Rocky Mountains. The report: (a) introduces the HGM developmental history, (b) provides a brief overview of the major components of the HGM Approach and discusses the development and application phases, (c) characterizes factors that influence wetland functions on riverine floodplains in the northern Rocky Mountains, (d) discusses the wetland functions, model variables, and functional indices, and (e) provides the necessary assessment protocols, field methods, and computing procedures.
DTIC
Geomorphology; Wetlands; Hydrogeology

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ENERGY PRODUCTION AND CONVERSION

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

20030000463 National Renewable Energy Lab., Golden, CO USA
Validation of New Wind Resource Maps
Elliott, D.; Schwartz, M.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-32536; NREL/CP-500-32536; No Copyright; Avail: National Technical Information Service (NTIS)
The National Renewable Energy Laboratory (NREL) recently led a project to validate updated state wind resource maps for the northwestern USA produced by a private U.S. company, TrueWind Solutions (TWS). The independent validation project was a cooperative activity among NREL, TWS, and meteorological consultants. The independent validation concept originated at a May 2001 technical workshop held at NREL to discuss updating the Wind Energy Resource Atlas of the USA. Part of the workshop, which included more than 20 attendees from the wind resource mapping and consulting community, was dedicated

to reviewing the latest techniques for wind resource assessment. It became clear that using a numerical modeling approach for wind resource mapping was rapidly gaining ground as a preferred technique and if the trend continues, it will soon become the most widely-used technique around the world. The numerical modeling approach is a relatively fast application compared to older mapping methods and, in theory, should be quite accurate because it directly estimates the magnitude of boundary-layer processes that affect the wind resource of a particular location. Numerical modeling output combined with high resolution terrain data can produce useful wind resource information at a resolution of 1 km or lower. However, because the use of the numerical modeling approach is new (last 35 years) and relatively unproven, meteorological consultants question the accuracy of the approach. It was clear that new state or regional wind maps produced by this method would have to undergo independent validation before the results would be accepted by the wind energy community and developers.
NTIS
Mathematical Models; Renewable Energy; Thematic Mapping; Windpower Utilization; Wind (Meteorology)

20030000497 Texas Univ., El Paso, TX USA
Thermal Desalination using MEMS and Salinity-Gradient Solar Pond Technology
Lu, H.; Walton, J. C.; Hein, H.; Aug. 2002; 98p; In English
Report No.(s): PB2003-100120; REPT-80; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
MEMS (multi-effect, multi-stage) flash desalination (distillation) driven by thermal energy derived from a salinity-gradient solar pond is investigated in this study for the purpose of improving the thermodynamic efficiency and economics of this technology. Three major tasks are performed: (1) a MEMS unit is tested under various operating conditions at the El Paso Solar Pond site; (2) the operation and maintenance procedures of the salinity-gradient solar pond coupled with the MEMS operation is studied; and (3) previous test data on a 24-stage, falling-film flash distillation unit (known as the Spinflash) is analyzed and compared with the performance of the MEMS unit. The data and information obtained from this investigation is applicable to a variety of thermal desalination processes using other solar options and/or waste heat.
NTIS
Distillation; Thermal Energy; Solar Ponds (Heat Storage); Microelectromechanical Systems

20030000506 National Renewable Energy Lab., Golden, CO USA
Applicability of Nacelle Anemometer Measurements for Use in Turbine Power Performance Tests
Smith, B.; Link, H.; Randall, G.; McCoy, T.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-32494; NREL/CP-500-32494; No Copyright; Avail: National Technical Information Service (NTIS)
Collection of accurate wind speed data is one of the more problematic elements in conducting wind turbine power performance tests. IEC 61400-12 specifies meteorological tower placement between two and four rotor diameters upwind of the test turbine. However, use of an upwind meteorological tower can be difficult at some sites. In some cases, complex terrain near the turbine may make placement of an upwind tower impossible. In addition, purchase and erection of a meteorological tower can be expensive, particularly as the hub height of large turbines increases. Because of these concerns, wind farm owners and turbine manufacturers have expressed interest in the use of turbine nacelle-mounted anemometers for collection of wind speed data. The most significant problem with this practice is that wind flow is disturbed by the rotor and nacelle, so wind speed measurements collected by an anemometer mounted at the back of the nacelle do not accurately represent free-stream wind speeds experienced by the rotor. This problem can be addressed if the measurements can be adjusted; however, in order to perform such an adjustment, data must be collected to describe the relationship between the free-stream wind speeds at the rotor and nacelle anemometer. Such data collection would typically involve erecting an upwind meteorological tower, which is the specific activity that nacelle anemometer wind speed measurements intend to avoid.
NTIS
Anemometers; Nacelles; Wind Turbines; Windpower Utilization; Performance Tests

20030000507 National Renewable Energy Lab., Golden, CO USA
Tool to Market Customer-Sited Small Wind Systems
Jimenez, T.; George, R.; Forsyth, T.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-32352; NREL/CP-500-32352; No Copyright; Avail: National Technical Information Service (NTIS)
In order to make the Wind Powering America effort a success, homeowners and landowners interested in purchasing grid-connected small wind energy systems must be provided with assistance and education. The Clean Power Estimator (CPE) program is a valuable tool for these individuals. In support of this educational effort, the National Renewable Energy Laboratory's

(NRELs) National Wind Technology Center (NWTC) is integrating the CPE program with site-specific wind resource data. This paper describes how the CPE program works, how end users can determine the cost-effectiveness of wind for a specific location, and how companies can use the program to identify high-value wind locations.
NTIS
Renewable Energy; Windpower Utilization; Market Research; Computer Programs

20030000508 National Renewable Energy Lab., Golden, CO USA
Photovoltaics for Buildings: New Applications and Lessons Learned
Hayter, S.; Torcellini, P.; Deru, M.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-32158; NREL/CP-550-32158; No Copyright; Avail: National Technical Information Service (NTIS)
Photovoltaics (PV) for buildings system applications are experiencing exponential growth. This increased activity is the result of building owners becoming more confident with this new technology, designers becoming more comfortable incorporating PV into architectural and building electrical designs, decreasing PV system cost, the heightened public awareness of depleting conventional energy resources, and issues related to power reliability and stability. Usually, these systems meet primary objectives to offset building electrical loads, decrease building electrical demand, or provide continuous power supply during utility grid outages; but because of design flaws, installation errors, or improper maintenance, these systems can perform below the design expectations.
NTIS
Buildings; Photovoltaic Conversion; Technology Utilization; Renewable Energy

20030000603 Wayne State Univ., Detroit, MI USA
Report on Project to Characterize Multi-Junction Solar Cells in the Stratosphere using Low-Cost Balloon and Communication Technologies
Mirza, Ali, Wayne State Univ., USA; Sant, David, Wayne State Univ., USA; Woodyard, James R., Wayne State Univ., USA; Johnston, Richard R., Lawrence Technological Univ., USA; Brown, William J., High Altitude Research Corp., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 137-144; In English; Also announced as 20030000584; Original contains color illustrations
Contract(s)/Grant(s): NAG3-2180; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche
Balloon, control and communication technologies are under development in our laboratory for testing multi-junction solar cells in the stratosphere to achieve near AM0 conditions. One flight, Suntracker I, has been carried out reported earlier. We report on our efforts in preparation for a second flight, Suntracker II, that was aborted due to hardware problems. The package for Suntracker I system has been modified to include separate electronics and battery packs for the 70 centimeter and 2 meter systems. The collimator control system and motor gearboxes have been redesigned to address problems with the virtual stops and backlash. Surface mount technology on a printed circuit board was used in place of the through-hole prototype circuit in efforts to reduce weight and size, and improve reliability. A mobile base station has been constructed that includes a 35' tower with a two axis rotator and multi-element yagi antennas. Modifications in Suntracker I and the factors that lead to aborting Suntracker II are discussed.
Author
Low Cost; Solar Cells; Stratosphere; Balloon Flight; Technology Utilization; Telecommunication; Control Systems Design; Junction Transistors

20030000607 NASA Glenn Research Center, Cleveland, OH USA
Single Junction InGaP/GaAs Solar Cells Grown on Si Substrates using SiGe Buffer Layers
Ringel, S. A., Ohio State Univ., USA; Carlin, J. A., Ohio State Univ., USA; Andre, C. L., Ohio State Univ., USA; Hudait, M. K., Ohio State Univ., USA; Gonzalez, M., Ohio State Univ., USA; Wilt, D. M., NASA Glenn Research Center, USA; Clark, E. B., NASA Glenn Research Center, USA; Jenkins, P., NASA Glenn Research Center, USA; Scheiman, D., NASA Glenn Research Center, USA; Allerman, A., Sandia National Labs., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 160-177; In English; Also announced as 20030000584; Original contains color illustrations
Contract(s)/Grant(s): NREL-ACQ-1-30619-06; ARO-57000138; NCC3-899; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche
Single junction InGaP/GaAs solar cells displaying high efficiency and record high open circuit voltage values have been grown by metalorganic chemical vapor deposition on Ge/graded SiGe/Si substrates. Open circuit voltages as high as 980 mV under AM0 conditions have been verified to result from a single GaAs junction, with no evidence of Ge-related sub-cell

photoresponse. Current AM0 efficiencies of close to 16% have been measured for a large number of small area cells, whose performance is limited by non-fundamental current losses due to significant surface reflection resulting from greater than 10% front surface metal coverage and wafer handling during the growth sequence for these prototype cells. It is shown that at the material quality currently achieved for GaAs grown on Ge/SiGe/Si substrates, namely a 10 nanosecond minority carrier lifetime that results from complete elimination of anti-phase domains and maintaining a threading dislocation density of approximately 8 x 10(exp 5) per square centimeter, 19-20% AM0 single junction GaAs cells are imminent. Experiments show that the high performance is not degraded for larger area cells, with identical open circuit voltages and higher short circuit current (due to reduced front metal coverage) values being demonstrated, indicating that large area scaling is possible in the near term. Comparison to a simple model indicates that the voltage output of these GaAs on Si cells follows ideal behavior expected for lattice mismatched devices, demonstrating that unaccounted for defects and issues that have plagued other methods to epitaxially integrate III-V cells with Si are resolved using SiGe buffers and proper GaAs nucleation methods. These early results already show the enormous and realistic potential of the virtual SiGe substrate approach for generating high efficiency, lightweight and strong III-V solar cells.
Author
Gallium Arsenides; Gallium Phosphides; Indium Phosphides; Solar Cells; Substrates; Germanium; Silicon; Crystal Growth

20030000608 NASA Glenn Research Center, Cleveland, OH USA
Quantum Dot Solar Cells
Raffaelle, Ryne P., Rochester Inst. of Tech., USA; Castro, Stephanie L., Ohio Aerospace Inst., USA; Hepp, Aloysius, NASA Glenn Research Center, USA; Bailey, Sheila G., NASA Glenn Research Center, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 178-186; In English; Also announced as 20030000584; Original contains color illustrations
Contract(s)/Grant(s): NCC3-710; NCC3-563; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche
We have been investigating the synthesis of quantum dots of CdSe, CuInS2, and CuInSe2 for use in an intermediate bandgap solar cell. We have prepared a variety of quantum dots using the typical organometallic synthesis routes pioneered by Bawendi, et. al., in the early 1990's. However, unlike previous work in this area we have also utilized single-source precursor molecules in the synthesis process. We will present XRD, TEM, SEM and EDS characterization of our initial attempts at fabricating these quantum dots. Investigation of the size distributions of these nanoparticles via laser light scattering and scanning electron microscopy will be presented. Theoretical estimates on appropriate quantum dot composition, size, and inter-dot spacing along with potential scenarios for solar cell fabrication will be discussed.
Author
Quantum Dots; Solar Cells; Synthesis (Chemistry); Fabrication; Nanotechnology; Organometallic Compounds

20030000610 NASA Glenn Research Center, Cleveland, OH USA
A Summary of The 2000-2001 NASA Glenn Lear Jet AM0 Solar Cell Calibration Program
Scheiman, David, Ohio Aerospace Inst., USA; Brinker, David, NASA Glenn Research Center, USA; Snyder, David, NASA Glenn Research Center, USA; Baraona, Cosmo, NASA Glenn Research Center, USA; Jenkins, Phillip, Ohio Aerospace Inst., USA; Rieke, William J., NASA Glenn Research Center, USA; Blankenship, Kurt S., NASA Glenn Research Center, USA; Tom, Ellen M., Federal Aviation Administration, USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 195-201; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche
Calibration of solar cells for space is extremely important for satellite power system design. Accurate prediction of solar cell performance is critical to solar array sizing, often required to be within 1%. The NASA Glenn Research Center solar cell calibration airplane facility has been in operation since 1963 with 531 flights to date. The calibration includes real data to Air Mass (AM) 0.2 and uses the Langley plot method plus an ozone correction factor to extrapolate to AM0. Comparison of the AM0 calibration data indicates that there is good correlation with Balloon and Shuttle flown solar cells. This paper will present a history of the airplane calibration procedure, flying considerations, and a brief summary of the previous flying season with some measurement results. This past flying season had a record 35 flights. It will also discuss efforts to more clearly define the ozone correction factor.
Author
NASA Space Programs; Lear Jet Aircraft; Solar Cell Calibration Facility; Systems Engineering; Flight Tests

20030000621 National Renewable Energy Lab., Golden, CO USA

Residential Fuel Cell Demonstration Handbook

Torrero, E.; McClelland, R.; Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-32455; NREL/SR-560-32455; No Copyright; Avail: National Technical Information Service (NTIS)

This report is a guide for rural electric cooperatives engaged in field testing of equipment and in assessing related application and market issues. Dispersed generation and its companion fuel cell technology have attracted increased interest by rural electric cooperatives and their customers. In addition, fuel cells are a particularly interesting source because their power quality, efficiency, and environmental benefits have now been coupled with major manufacturer development efforts. The overall effort is structured to measure the performance, durability, reliability, and maintainability of these systems, to identify promising types of applications and modes of operation, and to assess the related prospect for future use. In addition, technical successes and shortcomings will be identified by demonstration participants and manufacturers using real-world experience garnered under typical operating environments.

NTIS

Fuel Cells; Handbooks; Residential Areas; Field Tests

20030000626 RAND Corp., Santa Monica, CA USA

Generating Electric Power in the Pacific Northwest. Implications of Alternative Technologies

Pernin, Christopher G.; Bernstein, Mark A.; Mejia, Andrea; Shih, Howard; Rueter, Fred; Jan. 2002; 75p; In English

Report No.(s): AD-A407473; RAND/MR-1604-PCT; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Pacific Northwest faces some critical energy issues over the next 20 years. There is significant uncertainty about energy supplies, energy prices, and the implications of competitive energy markets. Therefore, as energy demands continue to rise, it is important for the states in the region to understand the risks and opportunities of different energy supply and demand options. This report addresses issues in electricity supply and demand for four states in the Pacific Northwest: Idaho, Montana, Oregon, and Washington. For much of the past 50 years, these states have relied heavily on hydroelectric power to meet their energy needs, and this inexpensive electricity has helped keep electricity rates low in the region, compared with the rest of the USA. However, the region cannot add much new hydroelectric capacity, so increasing demands for electricity in the future will have to be met by other sources. It is expected that the bulk of new electricity-generating capacity will come from natural-gas-fired power plants. While the combined share of electricity generated by hydroelectric and natural-gas-fired plants is expected to remain the same through 2010 (together, they provide 86 percent of the capacity in the region, the remainder being provided primarily by coal and nuclear plants), the proportion generated by natural gas will rise dramatically. Table S.1 summarizes the shares of current and future expected generating capacity in the region. The changes in the shares provided by the two major sources will have a number of consequences for the states in the region.

DTIC

Power Supplies; USA

20030000655 Environmental Protection Agency, Washington, DC USA

Kentucky State Primer. A Primer on Developing Kentucky's Landfill Gas-to-Energy Potential

May 2000; 30p; In English

Report No.(s): PB2003-101122; EPA/430/R-00/003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Throughout the country, the number of landfill gas-to-energy (LFGTE) projects is growing. Recovering methane gas at solid waste landfills provides significant environmental and economic benefits by eliminating methane emissions while capturing the emissions energy value. The methane captured from landfills can be transformed into a cost-effective fuel source for generating electricity and heat, firing boilers, or even powering vehicles. Permits, incentive programs, and policies for LFGTE project development vary greatly from state to state. to guide LFGTE project developers through the state permitting process and to help them to take advantage of state incentive programs, the U.S. Environmental Protection Agencys (EPAs) Landfill Methane Outreach Program (LMOP) has worked with state agencies to develop individual primers for states participating in the State Ally Program. by presenting the latest information on federal and state regulations and incentives affecting LFGTE projects in this primer, the LMOP and Kentucky state officials hope to facilitate development of many of the landfills listed in Table A. to develop this primer, the Commonwealth of Kentucky identified all the permits and funding programs that could apply to LFGTE projects developed in Kentucky. It should be noted, however, that the regulations, agencies, and policies described are subject to change. Changes are likely to occur whenever a state legislature meets, or when the federal government imposes new directions on state

and local governments. LFGTE project developers should verify and continuously monitor the status of laws and rules that might affect their plans or the operations of their projects.
NTIS
Project Management; Environment Protection; Cost Effectiveness

20030000659 Federal Transit Administration, Transit Cooperative Research Program, Washington, DC USA
Fuel Cell Demonstration Project at a Sunline Transit Agency ***Final Report***
Hsiung, S.; Sep. 02, 2001; 59p; In English
Report No.(s): PB2003-100068; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This is the final report summarizing the Fuel Cell Demonstration Project activities of the XCELLSIS Zebus (zero emissions bus) performance at the SunLine Transit Agency in Thousand Palms, California. Under this demonstration project, SunLine participated with XCELLSIS in the fueling, training, operating, and testing of this prototype fuel cell bus. The report presents a summary of project activities, including the results of the 13-month test of the XCELLSIS Zebus performance at SunLine Transit. This final report includes data relating to Zebus performance, along with the successes achieved beyond the technical realm. The study concludes that the project was very useful in establishing operating parameters and environmental testing in extreme heat conditions and in transferring technology to a transit agency. At the end of the 13-month test period, the Zebus ran flawlessly in the Michelin Challenge Bibendum from Los Angeles to Las Vegas, a 275-mile trek. SunLine refueled the Zebus in transit to Baker, California, 150 miles from its home base. Everyone who encountered or rode the Zebus was impressed with its smoothness, low engine noise, and absence of emissions. The study states that the future for the Zebus looks very bright. Fuel cell projects are anticipated to continue in California and Europe with the introduction new buses equipped with Ballard P5 and other fuel cell engines as early as the first half of 2003.
NTIS
Fuel Cells; Hydrogen

20030001027 Naval Postgraduate School, Monterey, CA USA
A Feasibility Study of Oscillating-Wing Power Generators
Lindsey, Keon; Sep. 2002; 81p; In English; Original contains color images
Report No.(s): AD-A407079; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Mankind is continually searching for new sources of energy or methods to harness known sources. Recently, renewable and zero-pollution energy supplies are of great interest. Consequently, power generation from a fluttering wing is studied numerically and experimentally. Previous studies have suggested that an oscillating-wing used to extract energy from a fluid flow could deliver power comparable to windmills. Several studies are examined. An oscillating-wing power generator is designed and tested. The experimental results are compared with numerical predictions. Finally, commercial applications of the ”environmentally friendly” oscillating-wing generator are investigated.
DTIC
Navier-Stokes Equation; Oscillations; Lift; Wind Turbines; Clean Energy; Electric Generators

20030001803 Lawrence Livermore National Lab., Livermore, CA USA
Ambient-Temperature Passive Magnetic Bearings for Flywheel Energy Storage Systems
Post, R. F.; Bender, D. A.; May 26, 2002; In English; This document is color dependet and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-792729; UCRL-JC-137411; No Copyright; Avail: National Technical Information Service (NTIS)
Based on prior work at the Lawrence Livermore National Laboratory ambient-temperature passive magnetic bearings are being adapted for use in highpower flywheel energy storage systems developed at the Trinity Flywheel Power company. En route to this goal specialized test stands have been built and computer codes have been written to aid in the development of the component parts of these bearing systems. The Livermore passive magnetic bearing system involves three types of elements, as follows: (1) axially symmetric levitation elements, energized by permanent magnets, (2) electrodynamic stabilizers employing axially symmetric arrays of permanent magnet bars (Halbach arrays) on the rotating system, interacting with specially wound electrically shorted stator circuits, and, (3) eddy-current-type vibration dampers, employing axially symmetric rotating pole assemblies interacting with stationary metallic discs. The theory of the Livermore passive magnetic bearing concept describes specific quantitative stability criteria.
NTIS
Magnetic Bearings; Energy Storage; Flywheels

20030001910 Sandia National Labs., Albuquerque, NM USA

Blade System Design Studies Volume I: Composite Technologies for Large Wind Turbine Blades

Griffin, D.; Jul. 2002; 64p; In English

Report No.(s): DE2002-800994; SAND2002-1879; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As part of the U.S. Department of Energy's Wind Partnerships for Advanced Component Technologies (WindPACT) program, Global Energy Concepts LLC (GEC) is performing a study concerning innovations in materials, processes and structural configurations for application to wind turbine blades in the multi-megawatt range. The project team for this work includes experts in all areas of wind turbine blade design, analysis, manufacture, and testing. Constraints to cost-effective scaling-up of the current commercial blade designs and manufacturing methods are identified, including self-gravity loads, transportation, and environmental considerations. A trade-off study is performed to evaluate the incremental changes in blade cost, weight, and stiffness for a wide range of composite materials, fabric types, and manufacturing processes.

NTIS

Turbine Blades; Wind Turbines

20030001911 Sandia National Labs., Albuquerque, NM USA

Status and Needs of Power Electronics for Photovoltaic Inverters

Qin, Y. C.; Mohan, N.; West, R.; Bonn, R.; Jun. 2002; 185p; In English

Report No.(s): DE2002-800985; SAND2002-1535; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Photovoltaics is the utility connected distributed energy resource (DER) that is in widespread use today. It has one element, the inverter, which is common with all DER sources except rotating generators. The inverter is required to transfer dc energy to ac energy. With all the DER technologies, (solar, wind, fuel cells, and microturbines) the inverter is still an immature product that will result in reliability problems in fielded systems. Today, the PV inverter is a costly and complex component of PV systems that produce ac power. Inverter MTFF (mean time to first failure) is currently unacceptable. Low inverter reliability contributes to unreliable fielded systems and a loss of confidence in renewable technology. The low volume of PV inverters produced restricts the manufacturing to small suppliers without sophisticated research and reliability programs or manufacturing methods. Thus, the present approach to PV inverter supply has low probability of meeting DOE reliability goals.

NTIS

Inverters; Electric Power Supplies

20030001950 College of the Desert, Energy Technology Training Center, Palm Desert, CA USA

Hydrogen Fuel Cell Engines and Related Technologies

Dec. 2001; 520p; In English

Report No.(s): PB2003-100184; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

The Hydrogen Fuel Cell Engines and Related Technologies report documents the first training course ever developed and made available to the transportation community and general public on the use hydrogen fuel cells in transportation. The course is designed to train a new generation of technicians in gaining a more complete understanding of the concepts, procedures, and technologies involved with hydrogen fuel cell use in transportation purposes. The manual contains 11 modules (chapters). The first eight modules cover (1) hydrogen properties, use and safety; and (2) fuel cell technology and its systems, fuel cell engine design and safety, and design and maintenance of a heavy duty fuel cell bus engine. The different types of fuel cells and hybrid electric vehicles are presented, however, the system descriptions and maintenance procedures focus on proton-exchange-membrane (PEM) fuel cells with respect to heavy duty transit applications. Modules 9 and 10 are intended to provide a better understanding of the acts, codes, regulations and guidelines concerning the use of hydrogen, as well as the safety guidelines for both hydrogen maintenance and fueling facilities. Module 11 presents a glossary and conversions.

NTIS

Education; Fuel Cells; Hydrogen-Based Energy; Transportation

45
ENVIRONMENT POLLUTION

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

20030000451 Environmental Protection Agency, Washington, DC USA
Health Assessment Document for Diesel Engine Exhaust
May 2002; In English; This document is color dependent and/or landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-101331; EPA/600/8-90/057F; No Copyright; Avail: National Technical Information Service (NTIS)

This assessment examined information regarding the possible health hazards associated with exposure to diesel engine exhaust (DE), which is a mixture of gases and particles. The assessment concludes that long-term (i.e., chronic) inhalation exposure is likely to pose a lung cancer hazard to humans, as well as damage the lung in other ways depending on exposure. Short-term (i.e., acute) exposures can cause irritation and inflammatory symptoms of a transient nature, these being highly variable across the population. The assessment also indicates that evidence for exacerbation of existing allergies and asthma symptoms is emerging. The assessment recognizes that DE emissions, as a mixture of many constituents, also contribute to ambient concentrations of several criteria air pollutants including nitrogen oxides and fine particles, as well as other air toxics. The assessments health hazard conclusions are based on exposure to exhaust from diesel engines built prior to the mid-1990s. The health hazard conclusions, in general, are applicable to engines currently in use, which include many older engines. As new diesel engines with cleaner exhaust emissions replace existing engines, the applicability of the conclusions in this Health Assessment Document will need to be reevaluated.
NTIS
Diesel Engines; Air Pollution; Health

20030000465 NASA Marshall Space Flight Center, Huntsville, AL USA
NASA Principal Center for Review of Clean Air Act Regulations
Clark-Ingram, Marceia, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMPET, 16-18 Sep. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Clean Air Act (CAA) regulations have greatly impacted materials and processes utilized in the manufacture of aerospace hardware. Code JE/ NASA's Environmental Management Division at NASA Headquarters recognized the need for a formal, Agency-wide review process of CAA regulations. Marshall Space Flight Center (MSFC) was selected as the 'Principal Center for Review of Clean Air Act Regulations'. This presentation describes the centralized support provided by MSFC for the management and leadership of NASA's CAA regulation review process.
Author
Air Quality; Regulations

20030000499 National Inst. for Occupational Safety and Health, Cincinnati, OH USA
Health Hazard Evaluation Report: HETA 2001-0496-2866, Oklahoma City Community College, Oklahoma City, Oklahoma
Dec. 2001; 28p; In English
Report No.(s): PB2003-100095; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from employees at the Oklahoma City Community College Bookstore on August 13, 2001. Employees were concerned that the temporary location of the bookstore in the school's gymnasium was exposing them to excessive noise from activities occurring in the gymnasium. Following a cheerleading camp held in the summer of 2001, one employee experienced pain and ringing in the ears from the yelling and screaming by the participants. The bookstore employees were also concerned about mold and dust in the bookstore that they felt resulted in additional sickness for the workers. A NIOSH investigator visited the campus bookstore on October 17-19, 2001, to make noise measurements in the bookstore while a Fall Break Camp was held in the gymnasium.
NTIS
Noise Measurement; Health; Safety; Hazards

20030000500 Environmental Protection Agency, Chesapeake Bay Program, Annapolis, MD USA
Who's Who in the Chesapeake Bay Program
Aug. 2002; 150p; In English
Report No.(s): PB2003-100093; CBP/TRS-259/02; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The Chesapeake Bay Program is the unique regional partnership that's been directing and conducting the restoration of the Chesapeake Bay since the singing of the historic Chesapeake Bay Agreement of 1983. The Bay Program partners include the states of Maryland, Pennsylvania and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; the U.S. Environmental Protection Agency (EPA), representing the federal government; and participating advisory groups. As the largest estuary in the USA and one of the most productive in the world, the Chesapeake Bay was this nation's first estuary targeted for restoration and protection. Scientific and estuarine research on the Bay in the late 1970s and early 1980s pinpointed three areas requiring immediate attention: nutrient over-enrichment, dwindling underwater Bay grasses and toxic pollution. Once the initial research was completed, the Bay Program evolved as the means to restore this exceptionally valuable resource.
NTIS
Watersheds; Water Pollution; Water Quality

20030000501 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Hazardous Air Pollutant Emissions from Mercury Cell Chlor-Alkali Plants. Background Information Document for Proposed Standards
Feb. 2002; 103p; In English
Report No.(s): PB2003-100007; EPA/453/R-02/007; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This background information document (BID) provides information relevant to the proposal of national emission standards for hazardous air pollutants (NESHAP) for limiting mercury emissions from mercury cell chlor-alkali plants. The standards are being developed according to section 112(d) of Title III of the Clean Air Act (CAA) as amended in 1990. Chapter 2 presents a description of the mercury cell chlor-alkali industry and process. Chapter 3 discusses the techniques sued to control mercury emissions from the mercury emission sources at mercury cell chlor-alkali plants. Chapter 4 describes the regulatory alternatives considered by the Environmental Protection Agency (EPA) for proposal. Chapters 5 and 6 discuss the estimation of environmental and energy impacts and cost impacts, respectively, of the regulatory alternatives on the industry. Chapter 7 presents the detailed rationale behind the selection of the proposed NESHAP.
NTIS
Air Pollution; Air Quality; Exhaust Emission; Pollution Control

20030000509 NASA Ames Research Center, Moffett Field, CA USA
Improving Land Cover Product-Based Estimates of the Extent of Fragmented Cover Types
Hlavka, Christine A., NASA Ames Research Center, USA; Dungan, Jennifer, NASA Ames Research Center, USA; [2002]; 1p; In English; LCLUC Science Team Meeting, 20-22 Nov. 2002, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The effects of changing land use/land cover on regional and global climate ecosystems depends on accurate estimates of the extent of critical land cover types such as Arctic wetlands and fire scars in boreal forests. to address this information requirement, land cover products at coarse spatial resolution such as Advanced Very High Resolution Radiometer (AVHRR) -based maps and the MODIS Land Cover Product are being produced. The accuracy of the extent of highly fragmented cover types such as fire scars and ponds is in doubt because much (the numerous scars and ponds smaller than the pixel size) is missed. A promising method for improving areal estimates involves modeling the observed distribution of the fragment sizes as a type of truncated distribution, then estimating the sum of unobserved sizes in the lower, truncated tail and adding it to the sum of observed fragment sizes. The method has been tested with both simulated and actual cover products.
Author
Land Use; Maps; Spatial Resolution; Pixels; Estimating

20030000639 NASA Ames Research Center, Moffett Field, CA USA
Enhancement of Cloud Cover and Suppression of Nocturnal Drizzle in Stratocumulus Polluted by Haze
Ackerman, Andrew S., NASA Ames Research Center, USA; Toon, O. B., Colorado Univ., USA; Stevens, D. E., Lawrence Livermore National Lab., USA; Coakley, J. A., Jr., Oregon State Univ., USA; [2002]; 4p; In English
Contract(s)/Grant(s): RTOP 622-65-52-02; Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; Distribution as joint owner in the copyright; Distribution as joint owner in the copyright
Recent satellite observations indicate a significant decrease of cloud water in ship tracks, in contrast to an ensemble of in situ ship-track measurements that show no average change in cloud water relative to the surrounding clouds. We find through large-eddy simulations of stratocumulus that the trend in the satellite data is likely an artifact of sampling only overcast clouds. The simulations instead show cloud cover increasing with droplet concentrations. Our simulations also show that increases in

cloud water from drizzle suppression (by increasing droplet concentrations) are favored at night or at extremely low droplet concentrations.
Author
Satellite Observation; Large Eddy Simulation; Atmospheric Models; Cloud Cover; Stratocumulus Clouds; Nocturnal Variations; Precipitation (Meteorology)

20030000669 ENVIRON International Corp., Novato, CA USA
Photochemical Modeling Study of the July 1995 NARSTO-Northeast Episode. Volume 1 ***Final 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): PB2003-101283; No Copyright; Avail: National Technical Information Service (NTIS)
The Coordinating Research Council (CRC) has sponsored the NARSTO-Northeast air quality modeling study under CRC Project A-24 and A-35A. This study is applying the Comprehensive Air-quality Model with extensions (CAMx) and the EPA Models-3 Community Multiscale Air Quality (CMAQ) modeling systems to the July 1995 NARSTO Northeast ozone episode that occurred in the northeastern USA. During the summer of 1995, a field study was conducted in the northeastern US that collected enhanced surface and aloft meteorological and ambient air quality measurements under the direction of the North American Research Strategy for Tropospheric Ozone (NARSTO). The period of July 12-15, 1995 during the NARSTO-Northeast study experienced elevated ozone concentrations along the entire Northeast Corridor. CRC has sponsored several studies of the July 1995 NARSTO-Northeast episode including meteorological modeling using the 5th generation Mesoscale Model (MM5) in CRC Project A-12 by Pennsylvania State University (PSU) and a data analysis study by a group of scientists led by ENVIRON under CRC Project A-17.
NTIS
Air Quality; Photochemical Reactions; Environment Models; Gas Composition

20030001041 NASA Ames Research Center, Moffett Field, CA USA
Analysis of Salinity Intrusion in the San Francisco Bay-Delta using a GA- Optimized Neural Net, and Application of the Model to Prediction in the Elkhorn Slough Habitat
Thompson, David E., NASA Ames Research Center, USA; Rajkumar, T., Science Applications International Corp., USA; [2002]; 1p; In English; American Geophysical Union Meeting, 6-10 Dec. 2002, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The San Francisco Bay Delta is a large hydrodynamic complex that incorporates the Sacramento and San Joaquin Estuaries, the Burman Marsh, and the San Francisco Bay proper. Competition exists for the use of this extensive water system both from the fisheries industry, the agricultural industry, and from the marine and estuarine animal species within the Delta. As tidal fluctuations occur, more saline water pushes upstream allowing fish to migrate beyond the Burman Marsh for breeding and habitat occupation. However, the agriculture industry does not want extensive salinity intrusion to impact water quality for human and plant consumption. The balance is regulated by pumping stations located alone the estuaries and reservoirs whereby flushing of fresh water keeps the saline intrusion at bay. The pumping schedule is driven by data collected at various locations within the Bay Delta and by numerical models that predict the salinity intrusion as part of a larger model of the system. The Interagency Ecological Program (IEP) for the San Francisco Bay/Sacramento-San Joaquin Estuary collects, monitors, and archives the data, and the Department of Water Resources provides a numerical model simulation (DSM2) from which predictions are made that drive the pumping schedule. A problem with this procedure is that the numerical simulation takes roughly 16 hours to complete a C:~ prediction. We have created a neural net, optimized with a genetic algorithm, that takes as input the archived data from multiple stations and predicts stage, salinity, and flow at the Carquinez Straits (at the downstream end of the Burman Marsh). This model seems to be robust in its predictions and operates much faster than the current numerical DSM2 model. Because the system is strongly tidal driven, we used both Principal Component Analysis and Fast Fourier Transforms to discover dominant features within the IEP data. We then filtered out the dominant tidal forcing to discover non-primary tidal effects, and used this to enhance the neural network by mapping input-output relationships in a more efficient manner. Furthermore, the neural network implicitly incorporates both the hydrodynamic and water quality models into a single predictive system. Although our model has not yet been enhanced to demonstrate improve pumping schedules, it has the possibility to support better decision-making procedures that may then be implemented by State agencies if desired. Our intention is now to use this model in the smaller Elkhorn Slough complex near Monterey Bay where no such hydrodynamic model currently exists. At the Elkhorn Slough, we are fusing the neural

net model of tidally-driven flow with in situ flow data and airborne and satellite remote sensation data. These further constrain the behavior of the model in predicting the longer-term health and future of this vital estuary.
Author
Salinity; Water Quality; Tides; Mathematical Models; Neural Nets; Evolvable Hardware; Direct Numerical Simulation; Prediction Analysis Techniques

20030001109 NASA Ames Research Center, Moffett Field, CA USA
Analytical/Operational Requirements for the In Situ Chemical Analysis of Cometary and Planetary Environments Using GC-IMS
Kojiro, Daniel R., NASA Ames Research Center, USA; Stimac, Robert M., Ion Applications, Inc.; Kaye, William J., Ion Applications, Inc.; Takeuchi, Norishige, ManTech Systems Engineering Corp., USA; [2002]; 1p; In English; 11th International Conference on Ion Mobility Spectrometry, San Antonio, TX, USA
Contract(s)/Grant(s): RTOP 344-36-20-49; Copyright; Avail: Issuing Activity; Abstract Only
Exobiology flight experiments require highly sensitive instrumentation for the in situ analysis of the volatile chemical species that occur in the atmospheres and surfaces of various bodies within the solar system. The complex mixtures encountered place a heavy burden on the analytical instrumentation to detect and identify all species present. The minimal resources available onboard for such missions mandate that the instruments provide maximum analytical capabilities with minimal requirements of volume, weight and consumables. The miniCIDEX instrument was developed for the chemical analysis of a cemetery environment. It combined a Gas Chromatograph (GC) with a helium based Ion Mobility Spectrometer (IMS) to fulfill the analytical requirements of a cemetery exobiology mission: universal response; ppb sensitivity; low mass, volume and consumable MiniCIDEX is now a candidate for the chemical analysis instrument of a Titan Aero-rover Mission. The complexity of the analyses will be similar to the comet application with a heavier emphasis on organic molecules. Because the Titan Aero-Rover will be a balloon powered rover, much more attention is placed on the total mass of the instrument package. The GC will likely be a Micro-Electro-Mechanical-System (MEMS) design, smaller than the initial miniCIDEX GC by a factor of ten (with a similar reduction in consumable use). Similar miniaturization of the helium-based IMS will be necessary while maintaining the analytical capabilities. The two mission applications, the analytical requirements, and the evolution of the IMS design to accommodate these requirements will be presented.
Author
Chemical Analysis; Planetary Environments; Microelectromechanical Systems; Exobiology

20030001643 ENVIRON International Corp., Novato, CA USA
Development, Application, and Evaluation of an Advanced Photochemical Air Toxics Modeling System *Final Report*
Sep. 27, 2002; In English
Report No.(s): PB2003-101284; No Copyright; Avail: CASI; C01, CD-ROM
Exposure to air toxics and associated risk is an increasing concern in urban areas across the USA. Urban air toxics include compounds that have been traditionally associated with gasoline and diesel combustion (mobile sources), such as diesel particles, benzene, 1m3-butadiene, formaldehyde, and acetaldehyde, compounds associated with other industrial activities, such as carbon tetrachloride and hexavalent chromium, and heavy metals (e.g., mercury and cadmium). The US Environmental Protection Agency (EPA) has several programs underway to assess exposure to air toxics and to develop mitigation strategies. The evaluation of alternative control strategies for air toxics is performed using air quality modeling. The Coordinating Research Council (CRC) and the Department of Energy (DOE) are interested in advancing the state-of-science for air toxics modeling. CRC/DOE funded Project A-42-1 to review air toxics modeling techniques and make recommendations for improvements (Seigneur, Lohman, and Pun, 2001). This was followed by CRC/DOE Project A-42-2 to implement air toxics modeling capability into a state of-science multi-scale photochemical grid model, which is the subject of this report.
NTIS
Photochemical Reactions; Pollution Monitoring; Air Pollution

20030001672 Atmospheric and Environmental Research, Inc., San Ramon, CA USA
Air Toxics Modeling *Final Report*
Seigneur, C.; Pun, B.; Lohman, K.; Wu, S. Y.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2003-100218; CPO79-02-3; No Copyright; Avail: National Technical Information Service (NTIS)
This report consists of two phases: Phase 1-Atmospheric and Environmental Research (AER) reviews the current status of air toxics modeling and provides insight into the strengths and potential weaknesses of existing modeling approaches. This critical

review provides the basis for the development of an integrated modeling approach that is presented in Phase II. Some facets of this modeling approach are exemplified by means of case studies for two air toxics, benzene and diesel particles. Recommendations for applications of other aspects of this integrated modeling approach are provided to conclude Phase II.
NTIS
Air Quality; Mathematical Models; Pollution Monitoring; Hazardous Wastes

20030001836 General Accounting Office, Washington, DC USA
Air Pollution: Meeting Future Electricity Demand Will Increase Emissions of Some Harmful Substances
Oct. 2002; 52p; In English
Report No.(s): PB2003-100956; GAO-03-49; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Electric power plants burn fuels that can produce harmful emissions, such as carbon dioxide, mercury, nitrogen oxides, and sulfur dioxide, which can pose human health and environmental risks. to assess the potential risks of meeting future electricity demand, congressional committees asked GAO to (1) report on the Energy Information Administration's (EIA's) national and regional projections of such emissions by 2020, and (2) determine how the projections would change using alternative assumptions about future economic growth and other factors that advisers in these fields recommended. GAO also assessed the potential effects of future electricity demand on water demand and supply.
NTIS
Air Pollution; Fuels

20030001929 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Capacity Investigation of Brine-Bearing Sands for Geologic Sequestration of CO(2)
Doughty, C.; Benson, S. M.; Pruess, K.; 2002; 8p; In English
Report No.(s): DE2002-802045; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The capacity of brine-bearing formations to sequester carbon dioxide (CO2) is investigated using mathematical modeling of CO2 injection and storage. CO2 is injected in a supercritical state that has a much lower density and viscosity than the brine it displaces. In situ it forms a gas-like phase, and also partially dissolves in the aqueous phase. The capacity factor is defined as the volume fraction of the subsurface available for CO2 storage and is conceptualized as a product of four factors that account for (1) two-phase flow and transport processes, (2) formation geometry, (3) formation heterogeneity, and (4) formation porosity. The key properties that impact the capacity factor include permeability anisotropy and relative permeability, brine/CO2 density and viscosity ratios, brine salinity, the shape of trapping structure, formation porosity, and the presence of low-permeability layering. The space and time domains used to define capacity factor must be chosen carefully to obtain meaningful results. Often, there is no unique choice for the volume on which to base the capacity factor. One possible convention is to define a dynamic capacity factor that makes use of the self-similar nature of the Buckley-Leverett solution for the propagation of the CO2 front away from the injection well.
NTIS
Capacity; Brines; Injection; Carbon Dioxide

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.

20030000432 NASA Marshall Space Flight Center, Huntsville, AL USA
Plasmasphere Empirical Modeling with the IMAGE Mission
Gallagher, D. L., NASA Marshall Space Flight Center, USA; Adrian, M. L., NASA Marshall Space Flight Center, USA; Fung, S. F., NASA Goddard Space Flight Center, USA; Green, J. L., NASA Goddard Space Flight Center, USA; Sandel, B., Arizona Univ., USA; [2002]; 2p; In English; XXVIIth General Assembly of the International Union of Radio Science, 17-24 Aug. 2002, Maastricht, Netherlands; No Copyright; Avail: Issuing Activity; Abstract Only
Empirical models of plasmaspheric properties date from the pioneering work of Storey where he developed the analysis of ground whistler observations that lead to his estimate for the equatorial plasma density at L=3. The most recent in situ satellite study takes us to 1000 CRRES satellite passes and a statistical analysis of the plasmapause location at all local times and for varying geomagnetic conditions by Moldwin et al. These and many other studies over the intervening 49 years have given us a strong familiarity with the distribution of cold plasmaspheric ions throughout the magnetosphere. The major components of inner

plasmasphere, nightside bulge, sunward convection tail, and plasmapause are all well established. Storm-time erosion and the resulting ionospheric refilling has been encompassed, even if not completely understood. Small-scale density variations near the plasmapause and extending at least to geosynchronous orbit have been characterized in a variety of ways, even though we do not yet understand their origin. This paper will present early empirical modeling results from the inversion of IMAGE/EW global intensity images to density distributions. Densities are obtained in this initial study through use of forward image modeling with a simple 3-parameter plasmaspheric and plasmapause mathematical model. Individual interior plasmaspheric density profiles and plasmapause locations are obtained every 10 degrees in magnetic local time for each E W image analyzed. Derived profile parameters are statistically characterized in the context of storm magnitude and evolution. Identified patterns in the appearance of plasmaspheric structures, plasmapause erosion, and refilling will be presented. Comparisons to existing empirical plasmaspheric models and the implications for new modeling will be presented. Additional information is included in the original extended abstract.
Author
Plasmasphere; Cold Plasmas; Earth Magnetosphere; Extreme Ultraviolet Radiation; Mathematical Models

20030000442 California Univ., Davis, CA USA
Studies of Quasar Outflows *Final Report*
Arav, Nahum, California Univ., USA; Nov. 22, 2002; 2p; In English
Contract(s)/Grant(s): NAG5-9540; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The main aim of this research program is to determine the ionization equilibrium and abundances in quasar outflows. Especially in the broad absorption line QSO PG 0946+301. We find that the outflow's metalicity is consistent with being solar, while the abundance ratio of phosphorus to other metals is at least ten times solar. These findings are based on diagnostics that are not sensitive to saturation and partial covering effects in the BALs (Broad Adsorption Lines), which considerably weakened previous claims for enhanced metalicity. Ample evidence for these effects is seen in the spectrum.
Author
Absorption Spectra; Quasars; Ionization; Metals; Equilibrium Flow

20030000464 NASA Ames Research Center, Moffett Field, CA USA
Ice Cloud Formation and Dehydration in the Tropical Tropopause Layer
Jensen, Eric, NASA Ames Research Center, USA; [2002]; 1p; In English; American Meteorological Society Middle Atmosphere Meeting, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only
Stratospheric water vapor is important not only for its greenhouse forcing, but also because it plays a significant role in stratospheric chemistry. Several recent studies have focused on the potential for dehydration due to ice cloud formation in air rising slowly through the tropical tropopause layer (TTL). Holton and Gettelman showed that temperature variations associated with horizontal transport of air in the TTL can drive ice cloud formation and dehydration, and Gettelman et al. recently examined the cloud formation and dehydration along kinematic trajectories using simple assumptions about the cloud properties. In this study, a Lagrangian, one-dimensional cloud model has been used to further investigate cloud formation and dehydration as air is transported horizontally and vertically through the TTL. Time-height curtains of temperature are extracted from meteorological analyses. The model tracks the growth, advection, and sedimentation of individual cloud particles. The regional distribution of clouds simulated in the model is comparable to the subvisible cirrus distribution indicated by SAGE II. The simulated cloud properties and cloud frequencies depend strongly on the assumed supersaturation threshold for ice nucleation. The clouds typically do not dehydrate the air along trajectories down to the temperature minimum saturation mixing ratio. Rather the water vapor mixing ratio crossing the tropopause along trajectories is 10-50% larger than the saturation mixing ratio. I will also discuss the impacts of Kelvin waves and gravity waves on cloud properties and dehydration efficiency. These simulations can be used to determine whether observed lower stratospheric water vapor mixing ratios can be explained by dehydration associated with in situ TTL cloud formation alone.
Author
Tropopause; Ice Clouds; Dehydration; Atmospheric Models

20030000538 NASA Marshall Space Flight Center, Huntsville, AL USA
ALTUS Cumulus Electrification Study (ACES)
Kim, Tony, NASA Marshall Space Flight Center, USA; Blakeslee, Richard, NASA Marshall Space Flight Center, USA; Sep. 06, 2002; 1p; In English; Technical Analysis and Applications Center Conference, 28-30 Oct. 2002, Santa Fe, NM, USA
Contract(s)/Grant(s): RTOP 688-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

The ALTUS Cumulus Electrification Study (ACES) is an uninhabited aerial vehicle (UAV)-based project that will investigate thunderstorms in the vicinity of the Florida Everglades in August 2002. ACES is being conducted to both investigate storm electrical activity and its relationship to storm morphology, and validate Tropical Rainfall Measurement Mission (TRMM) satellite measurements. In addition, as part of NASA's UAV-based science demonstration program, this project will provide a scientifically useful demonstration of the utility and promise of UAV platforms for Earth science and applications observations. Part of the demonstration involves getting approvals from the Federal Aviation Administration and the NASA airworthiness flight safety review board. ACES will employ the ALTUS II aircraft, built by General Atomics - Aeronautical Systems, Inc. Key science objectives simultaneously addressed by ACES are to: (1) investigate lightning-storm relationships, (2) study storm electrical budgets, and (3) provide Lightning Imaging Sensor validation. The ACES payload, already developed and flown on ALTUS, includes electrical, magnetic, and optical sensors to remotely characterize the lightning activity and the electrical environment within and around thunderstorms. ACES will contribute important electrical and optical measurements not available from other sources. Also, the high altitude vantage point of the UAV observing platform (up to 55,000 feet) offers a useful 'cloud-top' perspective. by taking advantage of its slow flight speed (70 to 100 knots), long endurance, and high altitude flight, the ALTUS will be flown near, and when possible, above (but never into) thunderstorms for long periods of time, allowing investigations to be conducted over entire storm life cycles. In addition, concurrent ground-based observations will enable the UAV measurements to be more completely interpreted and evaluated in the context of the thunderstorm structure, evolution, and environment.
Author
Pilotless Aircraft; Thunderstorms; Electrical Measurement

20030000564 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA
Contrasting Vertical Structures of the Stable Boundary Layer
Mahrt, L.; Vickers, Dean; Jan. 2002; 4p; In English
Contract(s)/Grant(s): DAAD19-99-1-0249
Report No.(s): AD-A407324; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Wyngaard (1973) introduced the concept of z-less stratification for cases where the stratification is sufficiently strong, that the turbulence no longer is in significant communication with the surface (see also Holtslag and Nieuwstadt, 1986). Then z is no longer a primary scaling variable, nor is the boundary-layer depth. The eddies are vertically constrained by strong stratification. However, the z-less concept implies more than small eddies, since vertically continuous turbulence can still organize according to z even if the eddies at any level are small compared to z. For example, with local similarity where the relevant Obukhov length must be recast in terms of local fluxes at level z instead of surface fluxes (Nieuwstadt, 1984), the overall vertical structure is still posed in terms of z/h even if the eddy size is small compared to z. In this sense, local similarity still satisfies the criteria for traditional boundary layers. On the other hand, continuous turbulence between the surface and level z might still qualify as primarily z-less turbulence if the principal source of turbulence is detached from the surface and the distance above the ground surface is only a secondary influence.
DTIC
Vertical Distribution; Stability; Turbulence; Atmospheric Boundary Layer; Surface Properties

20030000975 NASA Marshall Space Flight Center, Huntsville, AL USA
Self-Consistent Magnetosphere-Ionosphere Coupling and Associated Plasma Energization Processes
Khazanov, G. V., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Astrophysical Particle Acceleration in Geospace and Beyond, 6-10 Oct. 2002, Chattanooga, TN, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Magnetosphere-Ionosphere (MI) coupling and associated with this process electron and ion energization processes have interested scientists for decades and, in spite of experimental and theoretical research efforts, are still ones of the least well known dynamic processes in space plasma physics. The reason for this is that the numerous physical processes associated with MI coupling occur over multiple spatial lengths and temporal scales. One typical example of MI coupling is large scale ring current (RC) electrodynamic coupling that includes calculation of the magnetospheric electric field that is consistent with the ring current (RC) distribution. A general scheme for numerical simulation of such large-scale magnetosphere-ionosphere coupling processes has been presented earlier in many works. The mathematical formulation of these models are based on "modified frozen-in flux theorem" for an ensemble of adiabatically drifting particles in the magnetosphere. by tracking the flow of particles through the inner magnetosphere, the bounce-averaged phase space density of the hot ions and electrons can be reconstructed and the magnetospheric electric field can be calculated such that it is consistent with the particle distribution in the magnetosphere. The new a self-consistent ring current model has been developed that couples electron and ion magnetospheric dynamics with calculation of electric field. Two new features were taken into account in addition to the RC ions, we solve an electron kinetic equation in our model, self-consistently including these results in the solution. Second, using different analytical relationships,

we calculate the height integrated ionospheric conductances as the function of precipitated high energy magnetospheric electrons and ions as produced by our model. This results in fundamental changes to the electric potential pattern in the inner magnetosphere, with a smaller Alfven boundary than previous potential formulations would predict but one consistent with recent satellite observations. This leads to deeper penetration of the plasma sheet ions and electrons into the inner magnetosphere and more effective ring current ions and electron energization.
Author
Magnetosphere-Ionosphere Coupling; Plasma Physics; High Energy Electrons; Ions; Magnetohydrodynamic Waves

20030000986 NASA Marshall Space Flight Center, Huntsville, AL USA
Evolution of Ionospheric Convection during a Double Transpolar Arc Phenomenon on February 11, 1999
Narita, Y., NASA Marshall Space Flight Center, USA; Maezawa, K., NASA Marshall Space Flight Center, USA; Spann, J. F., NASA Marshall Space Flight Center, USA; Parks, G. K., NASA Marshall Space Flight Center, USA; Marklund, G. T., NASA Marshall Space Flight Center, USA; Kullen, A., NASA Marshall Space Flight Center, USA; Ivchenko, N., NASA Marshall Space Flight Center, USA; Greenwald, R. A., NASA Marshall Space Flight Center, USA; Sato, N., NASA Marshall Space Flight Center, USA; Yamagishi, H., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

An evolution of ionospheric convection was studied for a double transpolar arc phenomenon on February 11, 1999. While one transpolar arc split from the auroral oval in the morning sector and drifted duskward, another arc appeared in the evening sector. The convection was investigated with three velocity data sets: E B drift velocities from the ASTRID-2 satellite; Ion Driftmeter data from the DMSP satellites; and Doppler-shift data from the Super-DARN radars. We inferred convection cells from these data sets and found that the number of convection cells changed from three to four as the dominance of IMF changed from a negative by to a positive Bz. Our result suggests that the ionospheric convection that has been so far discussed for various conditions of IMF may be applied even to the cases accompanied by transpolar arcs.
Author
Evolution (Development); Ionospheres; Convection

20030001008 NASA Marshall Space Flight Center, Huntsville, AL USA
The Living With a Star Geospace Investigations
Spann, Jim, NASA Marshall Space Flight Center, USA; Kintner, Paul, Cornell Univ., USA; [2002]; 1p; In English; 4th Oersted International Workshop, 23-27 Sep. 2002, Copenhagen, Denmark; No Copyright; Avail: Issuing Activity; Abstract Only

The Living With a Star Geospace Investigations is established to effectively address those phenomena the Geospace environment that directly affect life and society. The priority science questions focus on two broad areas: (1) ionospheric variability, especially at mid-latitudes, that affects navigation and communications and (2) the source, acceleration mechanisms, and sinks of the radiation belts that degrade satellite lifetimes, produce surface charging, and threaten manned space flight. Candidate missions to address these science foci will be presented as well as possible additional investigations and experiments that would enable an understanding of the Geospace at the system level.
Author
Radiation Belts; Earth Ionosphere

20030001017 NASA Ames Research Center, Moffett Field, CA USA
INTEX-NA: Intercontinental Chemical Transport Experiment - North America
Singh, Hanwant B., NASA Ames Research Center, USA; Jacob, D., Harvard Univ., USA; Pfister, L., NASA Ames Research Center, USA; [2002]; 1p; In English; Scientific Workshop EXPORT-E2 (European Export of Precursors and Ozone by Long-Range Transport: EUROTRAC-2)/INTEX-NA, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

INTEX-NA is an integrated atmospheric chemistry field experiment to be performed over North America using the NASA DC-8 and P-3B aircraft as its primary platforms. It seeks to understand the exchange of chemicals and aerosols between continents and the global troposphere. The constituents of interest are ozone and its precursors (hydrocarbons, NOX and HOX), aerosols, and the major greenhouse gases (CO2, CH4, N2O). INTEX-NA will provide the observational database needed to quantify inflow, outflow, and transformations of chemicals over North America. INTEX-NA is to be performed in two phases. Phase A will take place during the period of May-August 2004 and Phase B during March-June 2006. Phase A is in summer when photochemistry is most intense and climatic issues involving aerosols and carbon cycle are most pressing, and Phase B is in spring when Asian transport to North America is at its peak. INTEX-NA will coordinate its activities with concurrent measurement programs including satellites (e. g. Terra, Aura, Envisat), field activities undertaken by the North American Carbon Program (NACP), and other U.S. and international partners. However, it is being designed as a 'stand alone' mission such that its successful execution

is not contingent on other programs. Synthesis of the ensemble of observation from surface, airborne, and space platforms, with the help of global/regional models is an important It is anticipated that approximately 175 flight hours for each of the aircraft (DC-8 and P-3B) will be required for each Phase. Principal operational sites are tentatively selected to be Bangor, ME; Wallops Island, VA; Seattle, WA; Rhinelander, WI; Lancaster, CA; and New Orleans, LA. These coastal and continental sites can support large missions and are suitable for INTEX-NA objectives. The experiment will be supported by forecasts from meteorological and chemical models, satellite observations, surface networks, and enhanced O3,-sonde releases. In addition to characterizing Atlantic-outflow and Pacific-inflow, INTEX-NA will characterize air masses transported between the U.S., Canada, and Mexico. INTEX-NA will be the first continental scale inflow, outflow, and transformation experiment to be performed over North America. It will provide the most comprehensive observational data set to date to understand the O3/NOX/HOX/aerosol photochemical system and the carbon cycle. One of the critical needs of the carbon cycle research is to obtain large-scale vertical and horizontal concentration gradients of CO2, throughout the troposphere over continental source/sink regions. INTEX-NA is ideally suited to perform this role. Coastal and continental operational sites will allow us to develop a curtain profile of greenhouse gases (e. g. CO2,) and other key pollutants across North America. Such information is central to our quantitative understanding of chemical budgets on the continental scale. We expect to provide a number of satellite under-flights over land and water to test and validate observations from the appropriate satellite platform (e. g. Aura). We plan to develop strong collaborations with other national and international observational programs. Results from INTEX-NA should directly benefit the development of environmental policy for air quality and climate change.
Author
Atmospheric Models; Atmospheric Chemistry; Transport Properties; Carbon Cycle; Carbon Dioxide; Nitrogen Oxides; Meteorology; Aerosols

20030001108 NASA Ames Research Center, Moffett Field, CA USA
Biogeochemistry of Microbial Mats
DesMarais, David J., NASA Ames Research Center, USA; [2002]; 1p; In English; GeoBiology Summer 2002 Field Course, 19-27 Jul. 2002, Catalina Island, CA, USA
Contract(s)/Grant(s): RTOP 344-50-92-02; No Copyright; Avail: Issuing Activity; Abstract Only
The hierarchical organization of microbial ecosystems determines the rates of processes that shape Earth's environment, define the stage upon which major evolutionary events occurred, and create biosignatures in sediments and atmospheres. In cyanobacterial mats, oxygenic photosynthesis provides energy, organic substrates and oxygen to the ecosystem. Incident light changes with depth in the mat, both in intensity and spectral composition, and counteracting gradients of oxygen and sulfide shape the chemical microenvironment. A combination of benefits and hazards of light, oxygen and sulfide promotes the allocation of the various essential mat processes between light and dark periods and to various depths in the mat. Microliters produce hydrogen, small organic acids, nitrogen and sulfur species. Such compounds fuel a flow of energy and electrons in these ecosystems and thus shape interactions between groups of microorganisms. Coordinated observations of population distribution, abundance, and activity for an entire community are making fundamental questions in ecology accessible. These questions address those factors that sustain the remarkable diversity of microorganisms that are now being revealed by molecular techniques. These questions also target the processes that shape the various kinds of biosignatures that we will seek, both in ancient rocks from Earth and Mars, and in atmospheres of distant planets beyond our Solar System.
Author
Biogeochemistry; Microorganisms; Ecosystems; Planetary Atmospheres; Photosynthesis; Oxygen; Nitrogen

20030001123 Computer Sciences Corp., USA
Global Reference Atmospheric Model and Trace Constituents
Justus, C., Computer Sciences Corp., USA; Johnson, D., NASA Marshall Space Flight Center, USA; Oct. 02, 2002; 1p; In English; COSPAR 2002 World Space Congress, 10-19 Oct. 2002, Houston, TX, USA
Contract(s)/Grant(s): NAS8-60000; No Copyright; Avail: Issuing Activity; Abstract Only
Global Reference Atmospheric Model (GRAM-99) is an engineering-level model of the Earth's atmosphere. It provides both mean values and perturbations for density, temperature, pressure, and winds, as well as monthly- and geographically-varying trace constituent concentrations. From 0-27 km, thermodynamics and winds are based on National Oceanic and Atmospheric Administration Global Upper Air Climatic Atlas (GUACA) climatology. Above 120 km, GRAM is based on the NASA Marshall Engineering Thermosphere (MET) model. In the intervening altitude region, GRAM is based on Middle Atmosphere Program (MAP) climatology that also forms the basis of the 1986 COSPAR Intemationa1 Reference Atmosphere (CIRA). MAP data in GRAM are augmented by a specially-derived longitude variation climatology. Atmospheric composition is represented in GRAM by concentrations of both major and minor species. Above 120 km, MET provides concentration values for N2, O2, Ar, O, He,

and H. Below 120 km, species represented also include H2O, O3, N2O, CO, CH, and CO2. Water vapor in GRAM is based on a combination of GUACA, Air Force Geophysics Laboratory (AFGL), and NASA Langley Research Center climatologies. Other constituents below 120 km are based on a combination of AFGL and h4AP/CIRA climatologies. This report presents results of comparisons between GRAM Constituent concentrations and those provided by the Naval Research Laboratory (NRL) climatology of Summers (NRL,/MR/7641-93-7416, 1993). GRAM and NRL concentrations were compared for seven species (CH4, CO, CO2, H2O, N2O, O2, and O3) for months January, April, July, and October, over height range 0-115 km, and latitudes -90deg to + 90deg at 10deg increments. Average GRAM-NRL correlations range from 0.878 (for CO) to 0.975 (for O3), with an average over all seven species of 0.936 (standard deviation 0.049).
Author
Trace Elements; Atmospheric Models; Atmospheric Composition; Reference Atmospheres; Geophysics; Water Vapor; Thermodynamics

20030001691 Air Force Research Lab., Hanscom AFB, MA USA
An Experimental Test to Compare Viability of Various Theories of Atmospheric Velocity Fluctuations ***Interim Report***
Dewan, Edmond M.; Jun. 25, 2001; 26p; In English
Contract(s)/Grant(s): Proj-2301
Report No.(s): AD-A407863; AFRL-VS-TR-2001-1618; ERP-1241; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Several theories of velocity fluctuations in the atmosphere are discussed in the context of the horizontal wavenumber power spectral density (PSD). The main purpose of this report is to provide an experimental method to decide the question of which of these various theories are viable. The presently existing explanations of this PSD fall into the following categories: (a) quasi-two-dimensional turbulence theories as proposed by Gage and by Lilly; (b)theories of waves in cascade as proposed by Dewan; (c) ”separable” gravity wave theories which explain horizontal wavenumber PSD slopes in terms of vertical wavenumber and temporal frequency PSD slopes, as proposed by Gardner et al., and (d) the diffusive filtering theory, as proposed by Gardner. The experimental test proposed in this report is based on the horizontal wavenumber PSD observations of Nastrom and of Bacmeister et al, who reported that, under certain circumstances, this PSD exhibited a change of slope (going from -5/3 to -3) as the wavenumber increased.
DTIC
Wind Velocity; Gravity Waves; Atmospheric Physics; Wind (Meteorology)

20030001698 Massachusetts Univ., Center for Atmospheric Research, Lowell, MA USA
Design and Testing of a Low-Power DISS Sounder
Reinisch, Bodo; Sales, Gary; Feb. 28, 2002; 25p; In English; Original contains color images
Contract(s)/Grant(s): F19628-96-C-0159; Proj-1010
Report No.(s): AD-A407895; AFRL-VS-TR-2002-1613; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The University of Massachusetts Lowell Center for Atmospheric Research investigated the design of a low power Portable Digital Sounder (LP-DPS) that would meet Air Force requirements for replacement of the FMQ-12 Digital Ionospheric Sounder network. The new system contains all the electronics in a single chassis. Multi-Dimensional Processing makes weighted decisions verifying that received signals are sounder echoes before passing them on for post processing analysis. The raw or partially processes samples were moved out of the DSP so that the next measurement could proceed while the Main or Auxiliary computer executes the DSP algorithms in parallel with the sounder’s DSP operations. This required high-speed transfer of large quantities of data, which was accomplished by streamlining the data transfer protocol between the DSP board and the main computer. The present analog receivers will be replaced with a digital receiver chip.
DTIC
Digital Systems; Atmospheric Sounding; Power Transmission; Performance Tests; Ionosondes; Portable Equipment

20030001813 Lawrence Livermore National Lab., Livermore, CA USA
Joint Inversion of Geophysical Data for Site Characterization and Restoration Monitoring
Berge, P. A.; Berryman, J. G.; Bertete-Aquirre, H.; Bonner, B. P.; Roberts, J. J.; Jul. 31, 2000; In English; This document is color dependent and/or in landscape layout. It is currently available only on CD-ROM
Report No.(s): DE2002-793556; UCRL-ID-128343; No Copyright; Avail: National Technical Information Service (NTIS)
The purpose of this project was to conduct basic research leading to significant improvements in the state-of-the-art of geophysical imaging of the shallow subsurface. Geophysical techniques are commonly used for underground imaging for site characterization and restoration monitoring. In order to improve subsurface imaging, our objective was to develop improved

methods for interpreting geophysical data collected in the field, by developing better methods for relating measured geophysical properties, such as seismic velocity and electrical conductivity, to hydrogeology parameters of interest such as porosity, saturation, and soil composition. We met our objectives using an approach that combined laboratory experiments, comparison to available field data, rock physics theories, and modeling, to find relationships between geophysical measurements, hydrogeological parameters and soil composition.
NTIS
Geophysics; Imaging Techniques; Restoration

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20030000433 NASA Marshall Space Flight Center, Huntsville, AL USA
GOES Cloud Detection at the Global Hydrology and Climate Center
Laws, Kevin, NASA Marshall Space Flight Center, USA; Jedlovec, Gary J., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; AMS Conference 83rd Annual Meeting of the American Meteorological Society, 9-13 Feb. 2003, Long Beach, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The bi-spectral threshold (BTH) for cloud detection and height assignment is now operational at NASA's Global Hydrology and Climate Center (GHCC). This new approach is similar in principle to the bi-spectral spatial coherence (BSC) method with improvements made to produce a more robust cloud-filtering algorithm for nighttime cloud detection and subsequent 24-hour operational cloud top pressure assignment. The method capitalizes on cloud and surface emissivity differences from the GOES 3.9 and 10.7-micrometer channels to distinguish cloudy from clear pixels. Separate threshold values are determined for day and nighttime detection, and applied to a 20-day minimum composite difference image to better filter background effects and enhance differences in cloud properties. A cloud top pressure is assigned to each cloudy pixel by referencing the 10.7-micrometer channel temperature to a thermodynamic profile from a locally -run regional forecast model. This paper and supplemental poster will present an objective validation of nighttime cloud detection by the BTH approach in comparison with previous methods. The cloud top pressure will be evaluated by comparing to the NESDIS operational CO2 slicing approach.
Author
Clouds (Meteorology); Detection; Emissivity; Cloud Height Indicators

20030000473 Computational Physics, Inc., Fairfax, VA USA
Long-term Global Morphology of Gravity Wave Activity Using UARS Data ***Quarterly Report, 18 Jun. - 18 Sep. 2000***
Eckermann, Stephen D., Computational Physics, Inc., USA; Sep. 18, 2000; 14p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-98045
Report No.(s): NRA-97-MTPE-04; Rept-5090-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An extensive body of research this quarter is documented. Further methodical analysis of temperature residuals in Cryogenic Limb Array Etalon Spectrometer (CLAES) Version 8 level 3AT data show signatures during December 1992 at middle and high northern latitudes that, when compared to Naval Research Laboratory/Mountain Wave Forecast Model (NRL)/(MWFM) mountain wave hindcasts, reveal evidence of long mountain waves in these data over Eurasia, Greenland, Scandinavia and North America. The explicit detection of gravity waves in limb-scanned Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere (CRISTA) temperatures is modeled at length, to derive visibility functions. These insights are used to convert CRISTA gravity wave temperature residuals into data that more closely resemble gravity wave fluctuations detected in data from other satellite instruments, such as Microwave Limb Sounder (MLS), Limb Infrared Monitor of the Stratosphere (LIMS) and Global Positioning System/Meteorology (GPS)/(MET). Finally, newly issued mesospheric temperatures from inversion of CRISTA 15gin emissions are analyzed using a new method that uses separate Kalman fits to the ascending and descending node data. This allows us to study global gravity wave amplitudes at two local times, 12 hours apart. In the equatorial mesosphere, where a large diurnal tidal temperature signal exists, we see modulations of gravity wave activity that are consistent with gravity wave-tidal interactions produced by tidal temperature variability.
Author
Gravity Waves; Upper Atmosphere Research Satellite (UARS); Data Acquisition; Meteorology; Satellite Instruments; Geomorphology

20030000480 NASA Marshall Space Flight Center, Huntsville, AL USA

The Most Extreme Thunderstorms on Earth

Goodman, Steven J., NASA Marshall Space Flight Center, USA; Cecil, Daniel J., Alabama Univ., USA; [2002]; 1p; In English; 17th International Lightning Detection Conference (ILDC), 16-18 Oct. 2002, Tucson, AZ, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This study presents a comprehensive examination of the spectrum of storm types and their attributes worldwide (between 35N and 35S latitude), and as a function of season, location, and convective regime using the observed lightning, microwave scattering, and reflectivity signatures from NASA's Tropical Rainfall Measuring Mission (TRMM) low-Earth orbiting observatory. A global, multi-year data set (1998-2000) indicates that the deepest thunderstorms (having reflectivity in excess of 50 dBZ at 9 km altitude) occur in all the sub-tropical continents and occasionally over the open ocean, but are most common over the Americas. The most intense storms have the greatest lightning rates, lowest brightness temperatures and greatest depth of reflectivity- all indicative of strong updrafts and a well-developed volume of precipitation-sized ice particles. Mesoscale convective systems occurring within or in association with forcing from the sub-tropical continents are the most prolific lightning producers. The greatest flash rate to date of 993 flashes per minute was observed by NASA's Lightning Imaging Sensor on May 6, 1999 during an overpass of a pre-frontal squall line extending from Tennessee to Louisiana. The global distribution and frequency of thunderstorms, and the most recent summary of the extreme storms observed from space, in particular, will be discussed in greater detail.

Author

Thunderstorms; Lightning; Trmm Satellite

20030000512 NASA Ames Research Center, Moffett Field, CA USA

Calibration and Data Retrieval Algorithms for the NASA Langley/Ames Diode Laser Hygrometer for the NASA Trace-P Mission

Podolske, James R., NASA Ames Research Center, USA; Sachse, Glen W., NASA Langley Research Center, USA; Diskin, Glenn S., NASA Langley Research Center, USA; [2002]; 1p; In English

Contract(s)/Grant(s): RTOP 622-63-01-10; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes the procedures and algorithms for the laboratory calibration and the field data retrieval of the NASA Langley / Ames Diode Laser Hygrometer as implemented during the NASA Trace-P mission during February to April 2000. The calibration is based on a NIST traceable dewpoint hygrometer using relatively high humidity and short pathlength. Two water lines of widely different strengths are used to increase the dynamic range of the instrument in the course of a flight. The laboratory results are incorporated into a numerical model of the second harmonic spectrum for each of the two spectral window regions using spectroscopic parameters from the HITRAN database and other sources, allowing water vapor retrieval at upper tropospheric and lower stratospheric temperatures and humidity levels. The data retrieval algorithm is simple, numerically stable, and accurate. A comparison with other water vapor instruments on board the NASA DC-8 and ER-2 aircraft is presented.

Author

Diodes; Lasers; Hygrometers; Calibrating; Data Retrieval; Algorithms

20030000542 NASA Marshall Space Flight Center, Huntsville, AL USA

Urban Climatology

Brazel, Anthony J., Arizona State Univ., USA; Quattrochi, Dale A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This section on Urban Climates provides a basic understanding of what comprises the urban climate and what factors control the overall development of the urban climate. We also discuss in this section, methods for evaluating urban climate characteristics and forcing functions as well as how the urban heat island effect comes into play as a dynamic influence on urban climatology. Additionally, we examine and discuss the major radiation and energy balance of city (i.e., shortwave and longwave radiation, albedo, net all-wave radiation, total energy balance, and sensible latent, and storage heat) and the interactions of these energy balances with the lower atmosphere. The use of remote sensing to measure urban surface temperatures as a driving force in the development of the urban heat island effect is presented. We also discuss how the overall moisture, precipitation, humidity, and air movement in cities (i,e,, wind speeds and wind direction) and wind environment of the city affects urban climatology.

Author

Cities; Climatology; Remote Sensing; Wind (Meteorology); Atmospheric Temperature

20030000668 Geological Survey, Tacoma, WA USA

Near-Real-Time Simulation and Internet-Based Delivery of Forecast-Flood Inundation Maps Using Two-Dimensional Hydraulic Modeling: A Pilot Study of the Snoqualmie River, Washington

Jones, J. L.; Fulford, J. M.; Voss, F. 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): PB2003-101340; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Abstract; Introduction; Two-Dimensional Simulation of Flood Inundation for the Snoqualmie River, Washington; Automated Processing and Display of Forecast-Flood Information; Internet Map Server Development; Summary; References and Appendix A: File Processing Programs and Model Input Example File.

NTIS

Computerized Simulation; Floods; Forecasting

20030001030 Naval Postgraduate School, Monterey, CA USA

A Numerical Study of the Forcing Mechanisms of the Leeuwin Current System

Kennedy, Richard A., Jr.; Sep. 2002; 117p; In English; Original contains color images

Report No.(s): AD-A407071; No Copyright; Avail: CASI; A06, Hardcopy

To investigate the role of wind forcing, bottom topography and thermohaline gradients in the Leeuwin Current System (LCS), several experiments are conducted with a sigma coordinate primitive equation model on a beta-plane. Results show that the LCS is an anomalous eastern boundary current (EBC) that generates a coastal poleward current, an equatorward undercurrent, and highly energetic mesoscale features such as meanders and eddies. Thermohaline gradient effects were shown to be the primary mechanism in the generation of a poleward (equatorward) current (undercurrent) , eddies and meanders in the LCS. Inshore of the poleward surface flow, next to the coast, wind forcing plays an important role in generating an equatorward coastal current and upwelling. Bottom topography is shown to be an important mechanism for intensifying and trapping currents near the coast, weakening subsurface currents and intensifying eddies off capes. Overall, the results of the study compare well with available observations in the LCS.

DTIC

Ocean Currents; Meteorology; Temperature Gradients; Ocean Bottom

20030001032 Naval Postgraduate School, Monterey, CA USA

The New Data Assimilation System at the Italian Air Force Weather Service: Design and Preliminary Results

Bonavita, Massimo; Sep. 2002; 90p; In English; Original contains color images

Report No.(s): AD-A407065; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

A new data assimilation system has been designed and implemented at the National Center for Aeronautic Meteorology and Climatology of the Italian Air Force (CNMCA) in order to improve its numerical weather prediction capabilities and provide more accurate guidance to operational forecasters. The system, which is undergoing testing before eventual operational use, is based on an ”observation space” version of the 3D-Var method for the objective analysis component, and on the High Resolution Regional Model (H.R.M) of CNMCA for the prognostic component. New features of the system include completely rewritten correlation functions in spherical geometry, derivation of the objective analysis parameters from a statistical analysis of the innovation increments, introduction of an anisotropic component in the correlation functions, solution of analysis equations by a conjugate gradient descent method. The analysis and forecast fields derived from the assimilation system are subjectively and statistically evaluated through comparisons with parallel runs based on European Centre for Medium Range Weather Forecast (ECMWF): preliminary results of these studies are also presented.

DTIC

Italy; Numerical Weather Forecasting; Armed Forces (Foreign); Systems Engineering

20030001122 NASA Marshall Space Flight Center, Huntsville, AL USA

The NASA Thunderstorm Observations and Research (ThOR) Mission: Lightning Mapping from Space to Improve the Short-term Forecasting of Severe Storms

Goodman, S. J., NASA Marshall Space Flight Center, USA; Christian, H. J., NASA Marshall Space Flight Center, USA; Boccippio, D. J., NASA Marshall Space Flight Center, USA; Koshak, W. J., NASA Marshall Space Flight Center, USA; Cecil, D. J., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 2002 NWA Annual Meeting, 21-25 Oct. 2002, Fort Worth, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ThOR mission uses a lightning mapping sensor in geostationary Earth orbit to provide continuous observations of thunderstorm activity over the Americas and nearby oceans. The link between lightning activity and cloud updrafts is the basis

for total lightning observations indicating the evolving convective intensification and decay of storms. ThOR offers a national operational demonstration of the utility of real-time total lightning mapping for earlier and more reliable identification of potentially severe and hazardous storms. Regional pilot projects have already demonstrated that the dominance in-cloud lightning and increasing in-cloud lash rates are known to precede severe weather at the surface by tens of minutes. ThOR is currently planned for launch in 2005 on a commercial or research satellite. Real-time data will be provided to selected NWS Weather Forecast Offices and National Centers (EMC/AWC/SPC) for evaluation.
Author
Thunderstorms; Lightning; Weather Forecasting; Storms (Meteorology); Geosynchronous Orbits

20030001126 NASA Marshall Space Flight Center, Huntsville, AL USA
Bridging the Gap Between Research and Operations in the National Weather Service: The Huntsville Model
Darden, C., National Weather Service, USA; Carroll, B., National Weather Service, USA; Lapenta, W., NASA Marshall Space Flight Center, USA; Jedlovec, G., NASA Marshall Space Flight Center, USA; Goodman, S., NASA Marshall Space Flight Center, USA; Bradshaw, T., National Weather Service, USA; Gordon, J., National Weather Service, USA; [2002]; 1p; In English; 2002 NWA Annual Meeting, 21-25 Oct. 2002, Fort Worth, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The National Weather Service Office (WFO) in Huntsville, Alabama (HUN) is slated to begin full-time operations in early 2003. With the opening of the Huntsville WFO, a unique opportunity has arisen for close and productive collaboration with scientists at NASA Marshall Space Flight Center (MSFC) and the University of Alabama Huntsville (UAH). As a part of the collaboration effort, NASA has developed the Short-term Prediction Research and Transition (SPoRT) Center. The mission of the SPoRT center is to incorporate NASA earth science technology and research into the NWS operational environment. Emphasis will be on improving mesoscale and short-term forecasting in the first 24 hours of the forecast period. As part of the collaboration effort, the NWS and NASA will develop an implementation and evaluation plan to streamline the integration of the latest technologies and techniques into the operational forecasting environment. The desire of WFO HUN, NASA, and UAH is to provide a model for future collaborative activities between research and operational communities across the country.
Author
Earth Sciences; Mesometeorology; Weather Forecasting; Meteorological Services

20030001708 NASA Marshall Space Flight Center, Huntsville, AL USA
The North Alabama Severe Thunderstorm Observations, Research, and Monitoring Network (STORMnet)
Goodman, S. J., NASA Marshall Space Flight Center, USA; Blakeslee, R., NASA Marshall Space Flight Center, USA; Christian, H., NASA Marshall Space Flight Center, USA; Boccippio, D., NASA Marshall Space Flight Center, USA; Koshak, W., NASA Marshall Space Flight Center, USA; Bailey, J., NASA Marshall Space Flight Center, USA; Hall, J., NASA Marshall Space Flight Center, USA; Bateman, M., NASA Marshall Space Flight Center, USA; McCaul, E., NASA Marshall Space Flight Center, USA; Buechler, D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 17th International Lighting Detection Conference (ILDC), 16-18 Oct. 2002, Tucson, AZ, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Severe Thunderstorm Observations, Research, and Monitoring network (STORMnet) became operational in 2001 as a test bed to infuse new science and technologies into the severe and hazardous weather forecasting and warning process. STORMnet is collaboration among NASA scientists, National Weather Service (NWS) forecasters, emergency managers and other partners. STORMnet integrates total lightning observations from a ten-station 3-D VHF regional lightning mapping array, the National Lightning Detection Network (NLDN), real-time regional NEXRAD Doppler radar, satellite visible and infrared imagers, and a mobile atmospheric profiling system to characterize storms and their evolution. The storm characteristics and life-cycle trending are accomplished in real-time through the second generation Lightning Imaging Sensor Demonstration and Display (LISDAD II), a distributed processing system with a JAVA-based display application that allows anyone, anywhere to track individual storm histories within the Tennessee Valley region of north Alabama and Tennessee, a region of the southeastern U.S. well known for abundant severe weather.
Author
Thunderstorms; Weather Forecasting; Lightning; Computer Networks

20030001795 Woods Hole Oceanographic Inst., MA USA
Long-Term Evolution and Coupling of the Boundary Layers in the Stratus Deck Regions of the Eastern Pacific (STRATUS) Data Report
Vallee, Charlotte; Huang, Kelan; Weller, Robert; Jan. 1999; 127p; In English
Contract(s)/Grant(s): NA81RJ1223
Report No.(s): AD-A407847; WHOI-2002-06; UOP-2002-03; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The surface mooring component of the CLIVAR Long Term Evolution and Coupling of the Boundary Layers in the Stratus Deck Regions study (STRATUS) took place from October 2000 in the eastern tropical Pacific. As part of the Eastern Pacific Investigation of Climate Processes in the Coupled Ocean-Atmosphere System (EPIC), STRATUS is a CLIVAR study with the goal of investigating links between sea surface temperature variability in the eastern tropical Pacific and climate over the American continents. This study started a three-year occupation off Chile in order to collect accurate time series of surface forcing and upper ocean variability. The Upper Ocean Processes (UOP) Group at WHOI deployed one fully instrumented surface mooring near 20 deg. S 85 deg. W in October 2000, at the western edge of the stratocumulus cloud deck found west of Peru and Chile, to achieve a good understanding of the role of clouds in the eastern Pacific in modulating atmosphere-ocean coupling. Data from the moorings will improve our understanding of the air-sea fluxes and be used to examine the processes that control sea surface temperature in the cold tongue/intertropical convergence zone (ITCZ) and in the stratus deck region. The first surface mooring (Stratus 1) was deployed in October 2000 by the UOP group and replaced by a second mooring one year later with almost identical instrumentation (Stratus 2). Stratus 1 was equipped with meteorological instrumentation, including two Improved Meteorological (IMET) systems. The mooring also carried Vector Measuring Current Meters (VMCMs), single point temperature, salinity and conductivity recorders, and an Acoustic Doppler Current Profiler (ADCP) to monitor the upper 500m of the ocean. In addition to the traditional instruments, several other experimental instruments were deployed with limited success on the mooring line including an acoustic current meter, bio-optical instrumentation packages, and an acoustic rain gauge.
DTIC
Oceans; Air Water Interactions; Sea Surface Temperature

20030001817 Lawrence Livermore National Lab., Livermore, CA USA
Clear Sky Identification Using Data from Remote Sensing Systems at ARM's Southern Great Plains Site
Monache, L. D.; Rodriguez, D.; Cederwall, R.; Jun. 27, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-793575; UCRL-ID-139553; No Copyright; Avail: National Technical Information Service (NTIS)
Clouds profoundly affect our weather and climate due, in large part, to their interactions with radiation. Unfortunately, our understanding of these interactions is, at best, incomplete, making it difficult to improve the treatment of atmospheric radiation in climate models. The improved treatment of clouds and radiation, and a better understanding of their interaction, in climate models is one of the Department of Energy's Atmospheric Radiation Measurement (ARM) Program's major goals. to learn more about the distribution of water and ice, i.e., clouds, within an atmospheric column, ARM has chosen to use the remote sensing of clouds, water vapor and aerosols at its three climatologically-diverse sites as its primary observational method. ARM's most heavily instrumented site, which has operated continuously for more than a decade, is its Southern Great Plains (SGP) Central Facility, located near Lamont, OK. Cloud-observing instruments at the Central Facility include the Whole Sky Imager, ceilometers, lidar, millimeter cloud radar, microwave radiometers and radiosondes.
NTIS
Radiometers; Water Vapor; Atmospheric Radiation; Optical Radar

20030001959 Woods Hole Oceanographic Inst., MA USA
Long-Term Evolution of the Coupled Boundary Layers (STRATUS), Mooring Recovery and Deployment Cruise Report, NOAA Research Vessel R H Brown
Vallee, Charlotte; Weller, Robert A.; Bouchard, Paul R.; Ostrom, WIlliam M.; Lord, Jeff; Feb. 2002; 176p; In English; Original contains color images
Contract(s)/Grant(s): NA96GPO429; NA17RJ1223
Report No.(s): AD-A407950; WHOI-2002-02; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
This report documents the work done on cruise RB-O1-08 of the NOAA R/V Ron Brown. This was Leg 2 of R/V Ron Brown's participation in Eastern Pacific Investigation of Climate (EPIC) 2001, a study of air-sea interaction, the atmosphere, and the upper ocean in the eastern tropical Pacific. The science party included groups from the Woods Hole Oceanographic Institution (WHOI), NOAA Environmental Technology Laboratory (ETL), the University of Washington (UW), the University of California, Santa Barbara (UCSB), and the University National Autonoma de Mexico (UNAM). The work done by these groups is summarized in this report. In addition, the routine underway data collected while aboard R/V Ron Brown is also summarized here.
DTIC
Ships; Ocean Surface; Boundary Layers; Air Water Interactions; Research Vehicles; Climate; Evolution; Pacific Ocean; Surface Temperature

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.

20030000660 Westinghouse Savannah River Co., Aiken, SC USA

Comparison of MTI and Ground Truth Sea Surface Temperatures at Nauru

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

Report No.(s): DE2002-801015; WSRC-TR-2002-00294; No Copyright; Avail: National Technical Information Service (NTIS)

Surface water temperatures calculated from Multispectral Thermal Imager (MTI) brightness temperatures and the robust retrieval algorithm, developed by the Los Alamos National Laboratory (LANL), are compared with ground truth measurements at a warm water site in the tropical western Pacific. Temperatures calculated for eighty-eight (88) images are compared with water temperatures measured at Nauru at image time and with data from the National Atmospheric Administration (NOAA) buoy network. The bulk water temperature from Nauru and ocean buoys were corrected for warm layer (diurnal) and cool skin effects before comparison with each other, and with the surface temperatures calculated with the robust algorithm.

NTIS

Ground Truth; Sea Surface Temperature; Algorithms; Ocean Surface; Imaging Techniques; Multispectral Radar

20030001640 National Centers for Environmental Prediction, National Centers for Environmental Prediction, Silver Spring, MD USA

National Weather Service DAMBRK Model

Nov. 1991; In English; Hardware/Software requirements: 5 Mb hard disk space and a FORTRAN compiler if the user wishes to modify the program. Documentation is included: PB2003-100401

Report No.(s): PB2003-500003; No Copyright; Avail: National Technical Information Service (NTIS)

DAMBRK is a FORTRAN program which, when given the final breach bottom width and side slopes, computes the physical dimensions of a dam breach as it forms. Breach formation may be initiated by flow overtopping the dam or piping through it. The program can subsequently or simultaneously compute reservoir outflow through the breach and route that flow through the downstream channel/valley. Effects of reservoir inflow, outflow, and storage are considered in the computations, as are downstream channel roughness, tail water elevation, valley storage, and the physical characteristics of downstream bridges and dams. Failure of multiple dams on a single river may also be modeled. Flow through the analysis reach may be sub-critical, supercritical, or mixed. The routed flow may be either Newtonian in nature (water) or non-Newtonian (mud/debris). The dam breach hydrograph may be computed or input. Tributary inflows, river sinuosity, levees, and tidal effects are each properly considered during the downstream propagation of the flood. High water profiles along the valley, flood arrival times, and hydrographs at user elected locations are sanding model output. Model input/output may be in either English or metric units. The governing equations of the model are the one dimensional Saint-Venant equations of unsteady flow coupled with internal boundary conditions (dams. bridges. etc.) and external boundary conditions (at the upstream and downstream ends of the routing reach). The system of equations is solved by a simultaneous nonlinear weighted four-point implicit finite difference method.

NTIS

Applications Programs (Computers); Mathematical Models; Hydrology; Flood Predictions; Weather Forecasting

20030001641 National Centers for Environmental Prediction, National Centers for Environmental Prediction, Silver Spring, MD USA

National Weather Service BREACH Erosion Model

Aug. 1991; In English; Hardware requirements: 5 Mb hard disk space. Documentation is included on the CD in PDF format

Report No.(s): PB2003-500002; No Copyright; Avail: National Technical Information Service (NTIS)

BREACH is a FORTRAN program which predicts breach characteristics (size, shape, rate of formation) and the breach outflow hydrograph resulting from dam failure. Failure may be initiated by water overtopping or piping through the dam. Sudden collapse of sections of the breach may also be simulated. The model is physically based on the principles of hydraulics, sediment transport, soil mechanics, the geometric and material properties of the dam, and the reservoir properties (storage volume, spillway characteristics, and the time dependent reservoir inflow rate). The dam may be either man-made or naturally formed (as the result of a landslide). The critical material properties of the dam are the internal friction angle, cohesive strength, and average grain size diameter. The model uses equations of Weir or Orifice flow to simulate the outflow entering a channel that is gradually eroded through an earthen dam. Conservation of reservoir inflow, storage volume, and outflow determines the time-dependent reservoir

outflow. A sediment transport relation is used to predict the transport capacity of the breach flow. The breach material properties (internal friction angle and cohesive strength) are used in determining the extent of enlargement of the trapezoidal breach. The dam may consist of three different materials: an inner core, an outer portion of the dam, and a thin armoring layer along the downstream face of the dam. The model has a simple iterative computational structure which has well behaved and efficient numerical properties.
NTIS
Applications Programs (Computers); Erosion; Weather Forecasting; Hydrology; Mathematical Models

20030001670 National Centers for Environmental Prediction, National Centers for Environmental Prediction, Silver Spring, MD USA
National Weather Service River Mechanics Suite (FLDWAV, SMPDBK, & BREACH)
2000; In English
Report No.(s): PB2003-500006; No Copyright; Avail: CASI; C01, CD-ROM
The FLDWAV allows users to build a mathematical model of a river system and to calibrate their model to observed data (if available). The program may then be used to compute eater surface elevations and discharges throughout the model for any given inflows or stages defined at the boundaries of the model. The program is also able to compute discharges resulting from the failure of a dam and to and to subsequently, or simultaneously, route the discharge downstream. The SMPDBK program allows users to build (easily and quickly) a simplified mathematical model of a dam/channel/valley, simulate a dam breach, and compute approximate flood peak stages, discharges, times of arrival, and duration. The BREACH program allows the user to build a mathematical model of an earthen dam based on fill material characteristics and dam dimensions. The dam may then be breached using various failure scenarios. The final result of the model is a computed discharge hydrograph through the breach.
NTIS
Hydrology; Mathematical Models; Rivers; Applications Programs (Computers)

20030001671 National Centers for Environmental Prediction, National Centers for Environmental Prediction, Silver Spring, MD USA
National Weather Service FLDWAV Model
Jun. 2000; In English
Report No.(s): PB2003-500004; No Copyright; Avail: CASI; C01, CD-ROM
FLDWAV is a generalized flood routing model (written in FORTRAN) which performs unsteady flow simulation. It replaces the National Weather Service DAMBRK and DWOPER models because it combines their capabilities and provides additional hydraulic simulation features. The governing equations of the model are the complete one-dimensional Saint-Venant equations of unsteady flow which are coupled with internal boundary equations representing the rapidly varied (broad-crested weir) flow through structures such as dams and bridge/embankments which can develop a user-specified time-dependent breach. Appropriate external boundary equations at the upstream and downstream ends of the routing reach are utilized. The system of equations is solved by an iterative, nonlinear, weighted four-point implicit finite-difference method. The flow may be subcritical, supercritical, or a combination of both, varying in space and time from one to the other. Fluid properties may obey either the principles of Newtonian flow (water) or non-Newtonian flow (mud/debris).The flow may occur in a single waterway or a system of interconnected waterways. The hydrograph to be routed may be user-specified or developed by the model with user-specified breach parameters (size, shape time of development). Special modeling features include time-dependent dam breaches, multiple levee overtopping and crevasse, time-dependent gate controlled flows, assorted spillway flows, bridge and embankment effects, tidal flap gates, downstream dams which may be breached, tributary inflows, river sinuosity, and tidal effects. The user may specify multiple routing techniques (dynamic-implicit/explicit,diffusion, level-pool) throughout the river system. An option to use a real-time Kalman filter estimator for updating real-time predictions is included. FLDWAV can be automatically calibrated for a single channel ora dendritic system of channels; calibration is achieved through an automatic adjustment of the manning in coefficient that varies with location and flow or water-surface elevation. The model provides an option for automatic selection of critical computational time and distance steps. FLDWAV can be used to analyze a wide range of unsteady flow applications including real-time flood forecasting in a dendritic system of rivers. Dam-breach analysis for sunny-day piping or overtopping associated with a probable maximum flood, design of waterwayimprovements, flooodplain inundation mapping, and storm sewer analysis/design. Parameter data is user-specified in an input file. Highwater profiles along the valley, flood arrival times, and discharge and water-surface elevation hydrographs at user-selected locations are standard model output (tabular and graphic). Model input and output may be in either English or metric (SI) units.
NTIS
Floods; Hydrology; Water Flow; Weather Forecasting; Mathematical Models

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.

20030000455 Scripps Research Inst., La Jolla, CA USA
Breast Tumor Kinetics in Mice Overexpressing Cyclin E and Heterozygous for Tumor Suppressor p53 or Rb ***Annual Report, 1 May 2001-30 Apr. 2002***
Smith, Adrian P.; Reed, Steven I.; Lee, John A.; May 2002; 19p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0427
Report No.(s): AD-A407356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Deregulated expression of cyclin E may play a role in tumorigenesis through the induction of genomic instability. We generated mice heterozygous for the tumor suppressor p53 or Rb and with an inducible transgene of either wildtype human cyclin E or a hyperstable allele (T380A) expressed in the mammary epithelia. While no mammary tumors were observed in any Rb heterozygote strain, there was synergy between the hyperstable T380A transgene and p53 heterozygosity; increasing mammary tumor penetrance from 8% and 12% respectively in p53 and T380A controls to 50% in the doubly engineered mice (p less than 0.0001). However, despite the increase in tumor penetrance there was no decrease in latency with the onset of mammary tumorigenesis approximately corresponding to reproductive senescence. Tumor cells demonstrated loss of p53 heterozygosity and constitutive expression of the cyclin E transgene. These preliminary data strongly support the hypothesis that deregulated expression of cyclin E induces tumorigenesis through genomic instability and suggests that inactivation of p53 and deregulated expression of cyclin E may confer a growth advantage in mammary epithelial cells. However, in this mouse model, not unlike human sporadic cases, these tumors may not form until the onset of reproductive senescence when hormonal influence may play a key role.
DTIC
Mammary Glands; Tumors

20030000456 Cleveland Clinic Foundation, Cleveland, OH USA
Characterization of Prostate-Specific Membrane Antigen (PSMA) for Use in Therapeutic and Diagnostic Strategies Against Prostate Cancer
O'Keefe, Denise S.; Heston, Warren D.; Jun. 2002; 55p; In English
Contract(s)/Grant(s): DAMD17-99-1-9523
Report No.(s): AD-A407353; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Prostate-Specific Membrane Antigen (PSMA) appears to be an ideal prostate cancer marker and potential therapeutic target, however there have been reports of PSMA expression in non-prostatic tissues, including brain, kidney and liver. Such expression of PSMA could weaken the potential of the gene as a prostate cancer marker or at least produce confusing and conflicting data. Prior to this project, we had demonstrated that there was another human gene, 97% identical to PSMA, which we termed the PSMA-Like gene. The first aim of this project was to characterize the differences between the non-prostatic and prostatic forms of PSMA and to determine strategies to specifically target PSMA expressed in prostate or prostate tumors. The second aim of the project was to define the minimal regulatory regions of the PSMA gene, for future utilization in gene therapy strategies, by analyzing deletion constructs of the gene regulatory regions. to date we have cloned and characterized the PSMA-Like gene, and determined ways of distinguishing the two genes at the DNA, RNA and protein levels which will aid in designing new diagnostic and therapeutic anti-prostate cancer strategies.
DTIC
Antigens; Prostate Gland; Cancer; Gene Therapy

20030000458 Texas Univ. Health Science Center, San Antonio, TX USA
Prostate Cancer Metastases to Bone: Role of High Bone Turnover Induced by Androgen Deprivation ***Annual Report, 1 May 2001-30 Apr. 2002***
Padalecki, Susan S.; May 2002; 21p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0105
Report No.(s): AD-A407345; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Most patients with advanced prostate cancer have bone metastases. These metastases contribute significantly to the morbidity and mortality associated with advanced prostate cancer. Unfortunately, our knowledge of how and why prostate cancer

metastasizes to bone is limited. The standard treatment for patients with advanced prostate cancer is androgen deprivation therapy. Treatment with androgen deprivation therapy leads to an increase in bone turnover as indicated by the loss of bone mineral density and the increase in markers of bone turnover in patients on treatment. This increase in bone turnover may result in an increase in bone metastases in patients with advanced prostate cancer. We have developed a mouse model which mimics the clinical scenario where men treated with androgen deprivation therapy develop bone metastases. Furthermore, we have used this model to test the effectiveness of zoledronic acid, a potent inhibitor of bone resorption, as a preventative treatment for prostate cancer bone metastases. Our data indicates that prevention of bone resorption by agents such as zoledronic acid beginning at onset of androgen deprivation therapy may result in significantly fewer bone metastases in patients with advanced prostate cancer.
DTIC
Bones; Prostate Gland; Cancer; Metastasis

20030000459 University of Southern California, Los Angeles, CA USA
Molecular Determinants of Prostate Cancer Progression Across Race-Ethnicity. Project A: The Human 5RD5A2 Gene and Prostate Cancer Progression. Project B: Androgen Receptor (AR) Signaling in Prostate Cancer Progression ***Annual Report, 15 Apr. 2001-14 Apr 2002***
Ross, Ronald R.; Reichardt, Juergen; Coetzee, Gerhard A.; Cote, Richard; Henderson, Brian E.; May 2002; 39p; In English
Contract(s)/Grant(s): DAMD17-00-1-0102
Report No.(s): AD-A407343; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This Prostate Cancer Center initiation grant has been designed to identify genetic and molecular markers of prostate cancer progression within and between racial ethnic groups (African-Americans, Latinos, Whites, Japanese) at substantially distinct underlying risk of prostate cancer. Our Epidemiology Core has obtained signed tissue releases from prostate cancer patients to date identified during follow-up of the Hawaii/Los Angeles Multiethnic Cohort study. Two hundred thirty-nine tissue samples have been received and processed histopathologically by Project C, which has begun immunohistochemical staining for COX-2, p27, p2l, p16 and Caveolin-l markers with additional markers to follow. Project B, studying the androgen receptor (AR) gene in detail, has identified 54 sequence variants in 90 samples analyzed to date. Two functional assays were developed this year to better assess these sequence variants. In Project A, studying the SRD5A2 gene in detail, in 87 tumors, the 13 mutations detected to date have been reconstructed by site-directed mutagenesis.
DTIC
Epidemiology; Ethnic Factors; Genetics; Prostate Gland; Mutagenesis; Molecular Biology

20030000460 Virginia Univ., Charlottesville, VA USA
UG311, an Oncofetal Marker Lost With Prostate Cancer Progression ***Annual Report, 1 Apr. 2001-31 Mar. 2002***
Sikes, Robert A.; Shea, Margaret C.; Szmoju, Barbara; Nicholson, Brian E.; Frierson, Henry F., Jr; Apr. 2002; 53p; In English
Contract(s)/Grant(s): DAMD17-00-1-0049
Report No.(s): AD-A407342; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The mRNA expression of a paralogous human sequence to UG311, a murine urogenital sinus expressed sequence tag, was found to decrease with androgen independent progression in the LNCaP model of human prostate cancer progression as determined by RNA blotting. Analysis of the sequence of UG311 determined significant homology to a single-stranded nucleic acid binding protein, nmt55. To exclude nmt55 as the gene corresponding to UG311, antibodies and cDNAs were acquired. Scope: As members of the single-stranded nucleic acid binding protein family, nmt55 and UG311 may play a role in DNA repair or RNA splicing. Both functions are currently under evaluation for nmt55. Either of these functions is likely to have impact on the progression and potential therapeutic outcome for prostate cancer patients. Improper splicing would lead to entire classes of proteins being disrupted. Loss of DNA repair enzymes would lead to increased genomic instability and accelerated progression. Major Findings/progress: We have attempted to focus on the cloning of the UG311 paralog with a minor emphasis on completing the exclusion of nmt55 as the UG311 paralog. The UG311 insert was used as a high stringency probe to screen the C4-2 lambda ZAP library. Ten strong plaques after two rounds of purification were analyzed for the size and sequence of the insert acquired. All inserts matched to the NONO sequence. This is a candidate as it shows significant ho insert sequence. Unfortunately, this sequence shows an increase expression in the human prostate cancer cell lines as compared to previous data from 11.
DTIC
Cancer; Cloning (Biology); Genome; Prostate Gland; Oncogenes; Biomarkers

20030000461 Baylor Coll. of Medicine, Houston, TX USA
Sprouty-1, an Inhibitor of Prostate Cancer Signal Transduction ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Ittmann, Michael; Jul. 2002; 8p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0021
Report No.(s): AD-A407340; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There is abundant evidence that increased expression of growth factors and increased activity growth factor receptors, particularly those of the fibroblast growth factor (FGF) and epidermal growth factor (EGF) families, play an important role in human prostate cancer. The sprouty gene was originally identified as a negative regulator of FGF and EGF receptor signaling in Drosophila. Based on our preliminary data, sprouty-1 is the major human sprouty homologue expressed in human prostate and it is significantly downregulated in approximately 70% of extensive, clinically localized prostate cancers. Loss of this negative regulator of growth factor signaling may enhance tumor aggressiveness and be correlated with clinical, pathological and biological parameters of aggressive clinical behavior in human prostate cancer. We have now shown that expression of sprouty. 1 in human prostate cancer cells, either by stable transfection or by expression via replication deficient adenovirus, markedly inhibits proliferation of prostate cancer cell lines. Future work, using the reagents during this initial funding period or currently being generated, will allow us to comprehensively evaluate the expression of sprouty-1 in human prostate cancer and determine its effect on the biological behavior of prostate cancer cells both in vitro and in vivo.
DTIC
Cancer; Prostate Gland; Receptors (Physiology); Genetics; Cells (Biology)

20030000474 John Wayne Inst. for Cancer Treatment and Research, Santa Monica, CA USA
Antisense Oligonucleotides to Glucosylceramide Synthase Can Reverse Multidrug Resistance in Breast Cancer ***Final Report, 1 Jun. 2001-31 May 2002***
Liu, Yong-Yu; Jun. 2002; 35p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0536
Report No.(s): AD-A407440; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Glucosylceramide synthase (GCS) catalyzes ceramide glycosylation, disrupts ceramide- induced apoptosis elicited by chemotherapy, and appeared to be a major cause of multidrug resistance (MDR) in cancer. Previous studies pinpoint GCS as a therapeutic target for MDR. In this work, we have synthesized antisense GCS oligodeoxyribonucleotides (asGCS cDNs) to block GCS mRNA transcription, and tested several of the oligos for chemotherapy- enhancing properties in drug resistant cancer cell models. Antisense GCS ODN-7 suppressed OCS mRNA expression (RT-PCR) by 80%, and GCS protein (Western blot) by 40%, and affected 30-fold increases in sensitivity to Adriamycin in drug resistant breast cancer MCF-7-AdrR (EC50 0.25 vs. 7.8 %). Further, asGCS ODN-7 increased MCF-7-AdrR cell sensitivity to Taxol, Vinblastine, and Actinomycin D by 3-, 9- and 11-fold, respectively. Compared to asGCS ODN-7, the GCS chemical inhibitor, PDMP (D-threo-l-phenyl-2-decanoylamino-3-morpholino-l-propanol), was less efficient and increased Adriamycin sensitivity approximately 4-fold. Subsequent studies revealed that asGCS ODN-7 overcomes drug resistance by enhancing ceramide-induced apoptosis and drug uptake. In conclusion, antisense CCs oligonucleotides effectively depress GCS expression, enhance apoptosis and drug uptake, and increase chemotherapy sensitivity, making them promising agents for cancer therapy.
DTIC
Enzymes; Oligomers; Tolerances (Physiology); Chemotherapy; Mammary Glands; Cancer

20030000475 California Univ., San Diego, La Jolla, CA USA
The Role of N-CoR During Normal Mammary Gland Development ***Annual Report, 2 Jul. 2001-1 Jul 2002***
Bong-Gun, Ju; Rosenfeld, Michael G.; Aug. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-01-1-0184
Report No.(s): AD-A407439; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Recently, coactivator and corepressor complexes required for function of estrogen receptor (ER), and other nuclear receptors, have been identified, with critical implications for aspects of etiology and therapy of breast cancer. Studies of the mechanisms of estrogen receptor and tamoxifen actions in ours and in other laboratories have permitted new insights to breast cancer diagnosis and therapy. Previous results have shown that the most widely utilized anti-estrogen in the treatment of breast cancer, Tamoxifen causes ER to associate with the N-CoR corepressor complex, and that this association is required for its anti-estrogen effects. Inhibition of N-CoR binding actually causes a switch in tamoxifen function from inhibition to activation. Thus, we hypothesize that resistance in ER- positive tumors is frequently based on alterations in levels or on post-transcriptional modifications in N-CoR, or other members of the corepressor complex that will abolish recruitment of the corepressor complex to the receptor resulting in a ”switch” from antagonist to agonist actions. I propose to test this hypothesis using a genetic approach. My experiments will determine the levels of expression of N-CoR protein and mRNA during normal mammary gland development, as well as to determine the cellular localization patten of N-CoR with respect to ER during development. Next, two genetic approaches will be utilized to test the biological role of N-CoR during normal development. First, analysis of mammary glands

of mice in which N-CoR has been deleted will be performed over the course of normal mouse mammary development. Tissues from N-CoR gene-deleted mice will be treated with the carcinogen DMBA to determine if deletion or expression of N-CoR enhances or suppresses mammary tumors.
DTIC
Mammary Glands; Cancer; Estrogens; Ontogeny

20030000477 Georgetown Univ., Washington, DC USA
Early Detection Based on Angiogenic Growth Factors in Nipple Aspirate Fluid ***Final Report, 1 Jul. 1998-30 Jun. 2002***
Trock, Bruce J.; Jul. 2002; 37p; In English
Contract(s)/Grant(s): DAMD17-98-1-8097
Report No.(s): AD-A407437; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this proposal is to develop new methods of early breast cancer detection by identifying increases in angiogenic growth factor secretion in nipple aspirate fluid (NAF). Specifically, the study is examining basic fibroblast growth factor (FGF-2) and vascular endothelial growth factor (VEGF), two of the most potent angiogenic molecules whose expression is thought to increase as an early event in breast carcinogenesis. This project has been delayed repeatedly by unavoidable problems in staffing, collaborators leaving the institution, the PI's own move to a different institution, institutional IRE problems, and competition for patients. The net result is that, at the conclusion of the funding period, sufficient patient samples have not been accrued to complete the study goals. However, the PI has funding from the National Cancer Institute to study other potential biomarkers of early detection in NAF, specifically protein expression patterns. Samples from this study will he used to supplement those already obtained with DOD funding, and analyses for FGF-2 and VEGF will be performed using institutional funds available to the PI.
DTIC
Fibroblasts; Secretions; Growth; Mammary Glands; Cancer

20030000478 Georgetown Univ., Medical Center, Washington, DC USA
A Novel Serine Protease Target for Prevention of Breast Cancer by a Soy Bean-Derived Inhibitor ***Final Report, 1 Jul. 1999-30 Jun. 2002***
Dickson, Robert B.; Jul. 2002; 56p; In English
Contract(s)/Grant(s): DAMD17-99-1-9192
Report No.(s): AD-A407435; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This project established the interactions of a novel transmembrane, protease, matritpase, with the chemopreventive Bowman Birk Inhibitor (BBI), compared to its cognate, physiological inhibitor HAI-1. We first established the inhibitory interaction between matriptase and HAI- 1, and between matriptase and BBI; we built a 3-D structure of the protease domain of matriptase, based on the homology modeling using the X-ray structure of human thrombin as template. This modeled matriptase structure was used in a structure-based screening of inhibitors. Screening the NCI small compounds database, allowed discovery of bis-benramidines as potent matriptase inhibitors. We also identified natural trypsin inhibitor, SFTI, from sunflower seed, as a potent inhibitor of matriptase. We found that in non-transformed mammary epithelial cells, matriptase can be activated by lipid phosphates; the activated matriptase is then quickly binds to HAI-1, and is shed into media. Thus, engagement of membrane-bound matriptase with HAI-1 leads to its extracellular shedding. in addition, we identified hepatocyte growth factor and pro-uPA as likely physiological protein substrates of matriptase. Finally, we found that breast cancer cells constitutively activate matriptase, but that cells are not modulated in their proliferation or differentiation by matriptase inhibition in vitro, probably due to the lack of relevant matriptase substrates.
DTIC
Epithelium; Phosphates; Soybeans; Mammary Glands; Cancer

20030000487 Chicago Univ., Chicago, IL USA
Estrogen Receptor Inhibition of kappaB Activity in Breast Cancer ***Annual Report, 28 May 2001-27 May 2002***
Nettles, Kendall W.; Greene, Geoffrey; Jun. 2002; 9p; In English
Contract(s)/Grant(s): DAMD17-01-1-0198
Report No.(s): AD-A407396; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Estrogen receptor-alpha (ER) mediated inhibition of NF-kB contributes to the anti-inflammatory and protective effects of estrogen in bone, cardiovasculature, and perhaps breast cancer. Cross talk could be caused by direct or indirect association of these transcription factors, or by competition for other components of the transcriptional apparatus. In order to distinguish among these possibilities, we identified clonal variants of ER(+) MCF-7 breast cancer cells that either do (MCF-7 SI), or do not (MCF-SS)

display ER mediated inhibition of NF-kB transcriptional activity. Transient transfection of various coactivators into the MCF-7 SS cells revealed that only CBP was able to promote an inhibitory effect of estradiol on NF-kB activity. Western Blot analysis showed that CBP protein levels were reduced in this cell line relative to the MCF-7 SS cells. Both immunofluorescent microscopy and co- immunoprecipitation showed an association between ER and NF-kB in the MCF-SS cells. CBP also immunprecipitated with ER and NF-kB in these cells. Gel shift analysis showed that estrogen treatment had no effect on the TNF-alpha induced DNA binding capability of NF-kB, suggesting that other mechanisms must be involved. ER binding to the CH/3 domain of CBP may be crucial to this effect.
DTIC
Estrogens; Cancer; Genetics; Mammary Glands; Receptors (Physiology)

20030000489 University of South Florida, Tampa, FL USA
Development, Optimization and Evaluation of CAD System for Breast Cancer ***Annual Report, 14 May 2001-14 May 2002***
Qian, Wei; Jun. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-01-1-0395
Report No.(s): AD-A407392; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This proposed training program is planned for undergraduates majoring in electrical engineering, medicine science or radiology. The program was designed as following: They were guided to visit the clinical site of related devices for mammography, the biopsy process for patients with suspicious breast tumor in Moffitt cancer center. They visited the process of film-screen image converting and transmitting and display of processed medical images in the laboratory of Digital Medical Imaging Program (DMIP) in the cancer research institute. It helped trainees to set up perceptive understanding on mammography for breast cancer diagnosis. The trainees were given a series of lectures on the basic principle of mammography, medical imaging, image processing, CAD methods, generation of databases and truth files, evaluation of CAD methods by means of lecture and seminars. The purpose was to teach trainees to have basic theory and technique on the breast cancer study. Trainees practiced on development of CAD modules and completed small scale projects related to CAD modules for breast cancer under mentors' direction. They submitted scientific report before the end of training program.
DTIC
Cancer; Computer Aided Design; Diagnosis; Mammary Glands; Medical Science

20030000490 State Univ. of New York, Stony Brook, NY USA
Antiangiogenic Action of Chemically Modified Tetracyclines in Breast Cancer ***Annual Report, 15 May 2001-14 May 2002***
Simon, Sanford R.; Jun. 2002; 25p; In English
Contract(s)/Grant(s): DAMD17-01-0346
Report No.(s): AD-A407391; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The long term objective of this project is to evaluate the capacity of a group of nonantimicrobial chemically modified tetracyclines (CMTs) to downregulate the angiogenic response which maintains breast tumor growth and proliferation. In this first year we determined levels of the angiogenic factor VEGF released by two breast tumor cell lines, MCF-7 and MDA-MB-23 1 and demonstrated dose-dependent inhibition of VEGF release from both cell lines cultured for 24 hours with CMT-3 or CMT-308. CMT-308 was the more potent inhibitor of the two CMTs at all doses. Neither CMT was cytotoxic to either cell line at doses which can be achieved in patients. Addition of the growth factor TGF-p to either cell line resulted in factor-dose-dependent increases in levels of released VEGF, but the augmented VEGF levels could be diminished somewhat by CMT-3 and more significantly by CMT-308. VEGF levels released by either cell line were unaffected by IGF-1. The human monocytoid line Mono Mac 6 also released VEGF in the absence of added stimuli; VEGF levels from Mono Mac 6 were not affected by TGF-beta or IGF-1, but were diminished somewhat in the presence of CMT-3 and markedly (to virtually undetectable levels) in the presence of CMT-308. CMT-3 and CMT-308 were not cytotoxic to confluent human umbilical vein endothelial cells at doses which inhibited VEGF release from the breast tumor cell lines and Mono Mac 6 cells. These results suggest that CMTs, especially CMT-308, may be of use as antiangiogenic agents in management of breast cancer.
DTIC
Tetracyclines; Cancer; Mammary Glands; Tumors

20030000491 Indiana Univ., Indianapolis, IN USA
Tumor Restrictive Gene Therapy for Metastatic Prostate Cancer ***Annual Report, 15 Nov. 2000-14 Nov 2001***
Gardner, Thomas A.; Dec. 2001; 25p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0027
Report No.(s): AD-A407390; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this proposal is to evaluate the ability of a replication-restrictive adenovirus (Ad-OC-Ela) to specifically target and lyse cells of an androgen independent prostate cancer osseous metastasis, which account for a majority of the morbidity and mortality experience by men with prostate cancer. The scope of this project to perform the studies outlined in proposal to prove the hypothesis that conditional replication under the guidance of the osteocalcin promoter can exert a prostate cancer-specific cell kill in well defined pre-clinical models of human androgen independent prostate cancer metastases. More specifically, Specific Aim I seeks to evaluate the specificity of the tumor-restrictive replication of Ad-OC-Ela using in vitro assays on prostate and non-prostate cancer cells. The ability of the Ad-OC-Ela to have at least a 100 fold killing differential favoring OC + cell lines (LNCaP, C4-2, PC-3) over OC- cell lines (LOVO, PrSC). Specific Aim II evaluates the growth inhibition of human prostate cancer xenografts attributable to Ad-OC-ELA 1 a administration, as well as, the tissue distribution and toxicity profile of such injections. The ability to Ad-OC-Ela to completely destroy both androgen-dependent and androgen-independent human prostate cancer cells in xenografts supports the hypothesis being studied.
DTIC
Tumors; Gene Therapy; Metastasis; Prostate Gland; Cancer; In Vitro Methods and Tests

20030000492 Texas Univ. Health Science Center, San Antonio, TX USA
Molecular Characteristics of a Multicorn, a New Large Proteolytic Assembly and Potential Anti-Cancer Drug Target, in Human Breast Cancer Cells ***Annual Report, 1 May 2001-30 Apr. 2002***
Gaczynaka, Maria E.; May 2002; 15p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0410
Report No.(s): AD-A407389; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Proper regulation of cell division and differentiation are major factors preventing neoplastic growth, and proteolysis is one of controlling mechanism of these processes. We have discovered a new giant proteolytic complex ubiquitous among Eukaryotes. The enzyme named multicorn apparently takes part in cell cycle regulation and is involved in partial overcoming the physiological effects of inhibitors targeting a well- known drug target, proteasome . The multicorn may constitute an attractive target for anti-cancer drugs, a marker for neoplastic transformation and may influence success of drugs targeting proteasome. The studies conducted lead toward understanding biological role of this enzyme. Our findings up to date: (1) The multicorn, which was first found in the cytosol, is present in the nucleus of mitotic cells. Importantly, it is detectable only in nucleus of the control MCF-10A breast cells, and not in the MCF-7 cancerous cells. (2) The human multicorn is built from a single subunit. The oligomerization and activity of multicorn apparently is regulated by phosphorylation of this subunit in several distinct sites. (3) The pattern of phosphorylation is specific for the particular cellular fraction, and differs between nonsynchronous, mitotic and overconfluent cells, and between control and cancerous cells.
DTIC
Drugs; Cell Division; Physiology; Phosphorylation; Cancer; Mammary Glands; Nuclei (Cytology)

20030000493 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Molecular Changes in pp32 in Prostate Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Pasternack, Gary R.; Sep. 2001; 10p; In English
Contract(s)/Grant(s): DAMD17-99-1-9030
Report No.(s): AD-A407388; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Our previous work demonstrated that prostate cancers differ from benign prostatic epithelium in their expression of oncogenic members of the pp32 gene family. Whereas benign prostatic epithelium solely expresses pp32, a tumor suppressor, prostate cancers express pp32rl and pp32r2, which are oncogenic. The purpose of the study is to confirm and extend these preliminary results, to develop practical means to assay pp32 gene family members in clinical samples, and to determine the clinical significance of their presence. The approved proposal encompassed four broad tasks: 1 characterization of the pp32 expression phenotype of a larger sample of 40 prostatic adenocarcinomas; 2 development of a practical molecular pathology assay for altered pp32 transcripts; 3 adaptation of the assay to paraffin-embedded tissue; and 4 preliminary determination of the clinical utility of pp32rl and pp32r2 expression in prostatic adenocarcinoma. Unanticipated difficulties were encountered with the assay developed during the previous funding period. During the present funding period, a competitive quantitative PCR assay compatible with RNA from paraffin sections was developed. In the period beyond the funding period, these tools shall finally be applied to completion of Task 1 and Task 4.
DTIC
Clinical Medicine; Prostate Gland; Cancer; Carcinogens; Epithelium; Tumors

20030000494 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
Studies of Prostate Tumor Development via Cre/LoxP Technology ***Annual Report, 15 Apr. 2001-14 Apr 2002***
COnti, Claudio J.; May 2002; 9p; In English
Contract(s)/Grant(s): DAMD17-01-0068
Report No.(s): AD-A407387; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Although considerable progress in the understanding of prostate cancer has been made in the last few years, the basic knowledge of the biology of this disease remains elusive. The development of this cancer is related to the male sexual hormone (testosterone) but the actual mechanisms by which testosterone affects the development of this cancer is not known. The prostate gland has at least three different types of cells that contribute to the physiology of the gland: basal, luminal and neuroendocrine cells. It is not totally clear what the relationship is between these different cell types, how testosterone affects them and which one is the target cell in prostate cancer development. We will use new transgenic technology that allows tagging of a particular cell population and following its behavior over the life of the animal. These experiments will be performed in mice because this technology is well developed in these animals and there is a basic knowledge of the rodent prostate. The studies proposed here will clarify some of the basic aspects of the biology of the prostate gland and the process of carcinogenesis in this organ.
DTIC
Prostate Gland; Organs; Cancer

20030000495 Centers for Disease Control and Prevention, Atlanta, GA USA
Chronic Disease Notes and Reports, Volume 15, No. 1, Winter 2002. No One Left Behind: Focusing Research on Health Disparities
2002; In English; This document is color dependent and/or landscape layout. It is currently on available on CD-ROM
Report No.(s): PB2003-100785; No Copyright; Avail: National Technical Information Service (NTIS)
This issue of Chronic Disease Notes & Reports focuses on research that promises to improve people's lives, particularly those populations hardest hit by chronic diseases. This agenda is based on two priorities: (1) focusing on diseases and conditions that most affect health, longevity, and quality of life; and (2) eliminating health disparities.
NTIS
Health; Diseases

20030000498 Michigan State Univ., Museum, East Lansing, MI USA
Blunt Knee Insults Causing a Post-Traumatic Osteoarthritis ***Final Report, 1 Sep. 1998 - 31 Aug. 01***
Haut, R. C.; Nov. 2001; 32p; In English
Report No.(s): PB2003-100113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This renewal project addresses two biomechanical issues of trauma to the patella-femoral joint: off-axis loads and rate of loading. Approximately 70% of insults to this joint occur in non 'pure' frontal collisions. Impact scenarios representative of automotive impact pulse times are being studied. This research project also addresses injury to the tibial-femoral joint in the knee. This injury occurs during lower extremity entrapment, as well as in the home, sports and workplace environments. The research project addresses use of blood and urine markers to help diagnose an 'injured knee' early. As a means to slow or even mitigate a disease process, following a severe blunt trauma to a joint chondro-protective drugs are also being studied. These drugs are gaining use for more advanced stages of disease, but in this research early diagnosis and intervention strategy will be essential for mitigation of the chronic disease after blunt insult. New injury criteria are being developed using experimental data and mathematical models. Criteria are being developed for 'safe' design of protective systems and for the automobile interior.
NTIS
Arthritis; Injuries; Knee (Anatomy)

20030000513 Albany Medical Coll., NY USA
Molecular Disruption of Breast Tumor Angiogenesis ***Annual Report, 15 Jun. 2001-14 Jun 2002***
Higgins, Paul J.; Jul. 2002; 13p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0124
Report No.(s): AD-A407423; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Continued growth of a malignant tumor beyond a certain critical size is dependent on the development of a network of feeder blood vessels. Findings from a number of laboratories have indicated that this 'angiogenic switch' is highly-dependent on the temporally-regulated and focalized localization of several extracellular proteases and protease inhibitors involving members of both the plasmin-based and metalloproteinase cascades. In vitro analysis of the requirements for the formation of endothelial tubular networks in various culture model systems implicated both urokinase plasminogen activator (uPA) and its fast-acting

type-1 inhibitor (PAI- 1) as necessary to achieve complete angiogenesis, consistent with the ”balanced proteolysis” concept of endothelial cell migration. Recent data in mice genetically-engineered to be deficient in expression of genes that encode specific elements of the plasmin activation system has confirmed the critical importance of PAl-1 synthesis in tumor-induced angiogenesis. Indeed, the absence of host PAI-1 cpmpletely inhibited local invasion and vascularization of transplanted malignant tumors in PAI-1 null mice. This inability to mount an angiogenic response, moreover, prevented invasive growth by an aggressive and metastatic tumor type.
DTIC
Mammary Glands; Cancer; Blood Vessels

20030000514 Miami Univ., FL USA
Multiparametric Evaluation of Marker Expression ***Annual Report, 1 Jun. 2001-31 May 2002***
Ganju-Krishan, Awtar; Nadji, Wahrdad; Jun. 2002; 10p; In English
Contract(s)/Grant(s): DAMD17-00-1-0342
Report No.(s): AD-A407422; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We have developed flow cytometric methods for the analysis of androgen and vitamin D receptor expression in nuclei isolated from archival breast tumors of both male and female patients. Our data shows that in male breast tumors androgen receptor expression is less than that of the female tumors. In both male and female tumors, sub-populations with diploid DNA content had lower receptor expression than in nuclei with aneuploid DNA content. In contrast the expression of vitamin D receptors in diploid and aneuploid tumors was similar. The methods developed are rapid, quantitative and allow for multiparametric analysis of receptor expression in archival breast tumors.
DTIC
Mammary Glands; Cancer; Calciferol

20030000515 Georgetown Univ., Washington, DC USA
Cadherin-11 and Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***
Byers, Stephen; May 2002; 30p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0245
Report No.(s): AD-A407421; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Cadherin-11 is unique amongst cadherins in that it exists as two alternatively spliced forms that are expressed together in the same cell. In year 1 of this grant we show that expression of wild-type cadherin-11 with or without co-expression of the C-terminal truncated splice variant, promotes epithelial differentiation of the cadherin-negative SKBR3 cell line. Exogenous wild-type cadherin-11 association with and membrane recruitment of beta catenin and p120 is unaffected by co-expression of the truncated variant. Cadherin-11 expressing cells exhibited modest changes in cell proliferation and no change in anchorage independent growth. However, co-expression of wild-type cadherin-11 and the splice variant promoted a dramatic increase in the ability of SKBR3 cells and E-cadherin positive MCF-7 cells to traverse Matrigel-coated filters. Biochemical studies indicate that the truncated variant is secreted from the cell and enters a detergent-insoluble extracellular compartment. These data suggest that the presence of the cadherin- ii splice variant promotes invasion of cadherin-11 I positive breast cancer cells, perhaps by promoting cell-ECM interactions. In other studies a new antibody specific for cadherin-11 variant was developed and a series of cell lines expressing cadherin-11 ribozymes have been made.
DTIC
Mammary Glands; Cancer

20030000516 Texas Univ. Health Science Center, San Antonio, TX USA
Functions of Human Rad51 and Other Recombination Factors in DNA Double-Strand Break Repair ***Annual Report***
Sigurdsson, Stefan; Jun. 2002; 21p; In English
Contract(s)/Grant(s): DAMD17-01-1-0412
Report No.(s): AD-A407420; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Genes of the RAD52 epistasis group function in the repair of DNA double strand breaks. Genetic and biochemical studies have suggested that the function of the RAD52 group genes are highly conserved from yeast to humans and interestingly the efficiency of DNA double strand break repair in mammals is dependent on the tumor suppressors BRCAl and BRCA2. This underscores the importance of studying the mechanistic basis of the recombination machinery. The human Rad5 1 protein can catalyze homologous DNA pairing and strand exchange reaction. The reaction is stimulated by RPA but interestingly; RPA can also compete with Rad5 1 for binding sites on the DNA and therefore suppress the pairing and strand exchange activity of Rad5 1. Various proteins called recombination mediators are able to overcome the suppressive nature of the single strand binding

proteins in prokaryotes and yeast cells. Interestingly five Rad5 1 like proteins, called Rad5 1 paralogs, have been identified in human cells. Here we show that two of those Rad5 1 paralogs, RadS 1 B and Rad5 1 C, are associated in a complex in human cells. Importantly, the complex is able to promote the Rad5 1 homologous pairing and strand exchange under conditions were Rad5 1 must compete with RPA for binding sites on the ssDNA template.
DTIC
Genetics; Mammary Glands; Cancer

20030000517 California Univ., Los Angeles, CA USA
Antibody-Cytokine Fusion Proteins for the Therapy of Breast Cancer ***Final Report, 1 Jul. 1999-30 Jun. 2002***
Morrision, Sherie L.; Jul. 2002; 133p; In English
Contract(s)/Grant(s): DAMD17-99-1-9098
Report No.(s): AD-A407419; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
In this grant we proposed to explore the use of genetically engineered antibodies as therapeutic agents specifically attempting to augment and potentiate the host immune defense systems against breast cancer. The antibodies were to be specific for HER2/neu, a molecule present on the surface of many breast cancers; its increased expression is associated with poor prognosis. To these antibodies we proposed to join the cytokines IL-2, IL-12, and GM-CSF. Expression of these cytokines by cancer cells has been shown to render them immunogenic. The anti- HER2/neu antibody fusion proteins were intended to localize the cytokine at the tumor where it is expected to elicit an immune response. to accomplish our goals we proposed three specific aims. Specific Aim 1: to produce rL-2, IL-12, GM-CSF antibody fusion proteins specific for HER2/ neu. Specific Aim 2: to evaluate the properties of the antibody fusion proteins in vitro. Specific Aim 3: to determine the properties of the antibody fusion proteins in vivo and their effectiveness in causing anti-tumor response. These there specific aims have been accomplished by the end of the third year of the present award.
DTIC
Antibodies; Mammary Glands; Cancer; Proteins

20030000518 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
A Molecular Approach for Metastatic Progression of Breast Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Vadlamudi, Ratna K.; Jun. 2002; 17p; In English
Contract(s)/Grant(s): DAMD17-01-1-0646
Report No.(s): AD-A407418; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Heregulin (HRG) and HER2/neu signaling pathways play an important role in the progression of breast tumors to a more motile phenotype. Cell motility I adhesion is also controlled by Focal adhesion kinase (FAK), which is also over expressed in breast tumors. to explore the molecular participation of FAK in HRG and HER2- signaling, we characterized the pattern of activation of FAK, SRc and paxillin, all components of functional focal adhesion complex using phosphospecific antibodies. In breast cancer cell line MCF-7, HRG differentially regulate Tyr-phosphorylation of FAK, paxillin and c-SRc in a dose dependent manner. At low dose, HRG induced Tyr phosphorylation FAK at Tyr 577, 925, 405 while at higher dose HRG induced selective dephosphorylation of FAK at Tyr 577, 925, 405. Interestingly, HRG at higher dose induced phosphorylation of FAK at Tyr-861 and SRc at Tyr-215 . We conclude that HER2, HRG system differentially regulate signaling from FAK by selectively dephosphorylating or activating some tyrosine residues and thus increase their migratory potential rather than adhesion. Phosphospecific antibodies against FAKTyr-861 and SRc Tyr-215 may potentially be used as an effective reagent to screen I identifying the putative metastatic/motile potential of breast tumors.
DTIC
Metastasis; Mammary Glands; Cancer

20030000519 Children's Hospital of Los Angeles, Los Angeles, CA USA
Photodynamic Therapy Oxidative Stress as a Molecular Switch Controlling Therapeutic Gene Expression for the Treatment of Locally Recurrent Breast Carcinoma ***Final Report, 1 Jun. 1999-31 May 2002***
Gomer, Charles J.; Jun. 2002; 37p; In English
Contract(s)/Grant(s): DAMD17-99-1-9126
Report No.(s): AD-A407417; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Photodynamic Therapy (PDT) is a developing therapeutic modality which continues to show promise in the clinical treatment of cancer, including locally recurrent breast carcinoma. Our application is directly related to using novel molecular technologies to improve the effectiveness of PDT for treating locally recurrent breast cancers. In PDT, properties of photosensitizer localization in tumor tissue and photochemical generation of reactive oxygen species are combined with precise delivery of laser-generated

light to produce a procedure offering local tumoricidal activity. We have demonstrated that PDT-mediated oxidative stress is a strong transcriptional inducer of stress proteins belonging to the heat shock protein (hsp) and glucose regulated protein (grp) families. We have also shown that the hsp and grp promoters can drive inducible expression of heterologous genes following PDT mediated oxidative stress. Inducible expression and function of p53 as well as inducible expression, secretion and biological activity of TNF-a have been demonstrated in human tumor cells. We have also demonstrated PDT inducible expression of the suicide gene HSV-thymidine kinase and enhanced tumoricidal action when PDT is combined with inducible HSV-TX gene therapy. These studies address a critical problem associated with improving treatments for locally recurrent breast cancer using new approaches which will minimize systemic toxicity and maximize a patient's quality of life.
DTIC
Mammary Glands; Cancer; Therapy; Photochemical Reactions

20030000520 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
Reduction of Radiation- or Chemotherapy-Induced Toxicity by Specific Expression of Anti-Apoptotic Molecules in Normal Cells ***Annual Report, 1 Jun. 2001-11 May 2002***
Ueno, Naoto T.; Jun. 2002; 10p; In English
Contract(s)/Grant(s): DAMD17-01-1-0304
Report No.(s): AD-A407406; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Adjuvant radiation and chemotherapy confer a survival benefit in breast cancer , but both treatments can damage normal tissues in ways that can adversely affect quality of life (e.g., by skin desquamation, mucositis, pulmonary fibrosis, cardiomyopathy, peripheral neuropathy). These effects on normal tissues are generally due to apoptosis (programmed death) of normal cells. We hypothesize that ectopic overexpression of the anti-apoptotic molecule Bcl-2 will inhibit the chemotherapy- and radiation-induced apoptosis of normal cells and thus reduce the toxicity of these treatments. We found that overexpressing Bcl-2 in murine fibroblast NIH3T3 cells and breast epithelial MCF 1 0A cells resulted in resistance to chemotherapy and radiation. We also prepared a heterogeneous plasmid that expresses Bcl-2 cDNA in front of a minimal promoter regulated by multiple wild-type p53 DNA-binding sites. Because cells with wild-type p53-but not p53-mutated or p53-deleted cancer cells-respond to genotoxic damage (e.g., chemotherapy or radiation) by upregulated expression of p53 and Bcl-2, we reasoned that specific transfection of normal cells with a Bcl-2 vector would prevent those cells from undergoing radiation- or chemotherapy-induced apoptosis. Progress is described in generation of the transfectant cell lines and tests of cytotoxicity upon exposure to doxombicin, paclitaxel, and gamma-radiation.
DTIC
Chemotherapy; Mammary Glands; Cancer

20030000521 Colorado Univ., Health Sciences Center, Denver, CO USA
Identification of Structural Domains of ESX Required for Breast Cell Transformation ***Annual Report, 1 Jun. 2001-31 May 2002***
Gutierrez-Hartmann, Arthur; Jun. 2002; 58p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0476
Report No.(s): AD-A407404; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
ESX encodes an Ets family transcription factor gene that is potentially important in breast cancer because the ESX genomic region (chromosome 1q32.l) is amplified in 50% of early breast cancers and ESX mRNA is over-expressed in human breast ductal carcinoma in situ (DCIS) . However, the precise molecular mechanism by which ESX mediates breast cell transformation remains unknown. We have previously shown that the non-transformed MCF-l2A cell line fails to express ESX, while the transformed T47D breast cancer cell line does express ESX. When we enforce ESX expression in MCF-l2A cells, they display a transformed phenotype, whereas abrogation of endogenous ESX expression in T47D cells results in a marked reduction of T47D colony formation. We generated a GFP-ESX fusion to determine its subcellular localization, via confocal microscopy, in NCF-l2A cells stably expressing GFP- ESX. to our surprise, we found that GFP-ESX is initially expressed in the nucleus and then stably appears in the peri-nuclear cytoplasmic region. Since these GFP-ESX stable cell lines also display the transformed phenotype, the question arises as to how a putative transcription factor residing in the cytoplasm mediates cellular transformation? Supporting this notion is that immuno-histochemical analysis of primary human breast cancer specimens and T47D cells, also show that ESX localization is primarily cytoplasmic. These data indicate that ESX functions primarily via cytoplasmic mechanisms.
DTIC
Transformations; Mammary Glands; Cancer

20030000522 Burnham Inst., La Jolla, CA USA

Are Diadenosine Polyphosphates and/or FHIT Involved in Anoikis? ***Annual Report, 1 Jun. 2001-31 May 2002***

Prisch, Steven M.; Jun. 2002; 5p; In English

Contract(s)/Grant(s): DAMD17-01-1-0167

Report No.(s): AD-A407403; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Anoikis protects the organism against the inappropriate growth of epithelial cells released during normal turnover. Downstream of the 'anoikis receptors', many signaling components have been identified, but many others are undoubtedly remaining to be discovered. One of the primary limitations appears to be the tendency to focus on two second messengers, phosphorylation and lipids. While these are unquestionably important, many other signaling mediators are emerging at present, whose role in anoikis is totally unexplored, even though they (and others) may potentially be essential to the mechanism. In this light, we propose to examine the role of a class of molecules represented by diadenosine triphosphate (Ap3A) and diadenosine tetraphosphate (Ap4A) in anoikis. These molecules occur in all organisms, accumulate in response to cellular stress, and have quite recently been implicated in apoptosis in mammalian cells. A tumor suppressor gene that is frequently altered in various human cancers, FHIT (Fragile Histidine Triad), is an Ap3A and Ap4A hydrolase, connecting these dinucleotides with cancer. ApnAs probably act as cofactors for Fhit's effector function (analogous to the function of GIP for ras.) The FHIT gene is altered in 82% of BRCA2-linked breast carcinomas and 40% of sporadic cases, implicating FHIT as a breast cancer-relevant, ApnA-regulated protein that may be involved in regulating apoptosis. Given the particular importance of anoikis-resistance in the development of breast cancer, the purpose of this IDEA project is to determine whether Ap3A/Ap4A and/or FHIT can regulate anoikis in normal and transformed mammary epithelial cells; the second goal is to establish the functional relationship between mammary tumor-related oncogenes and this new component in regulating anoikis.

DTIC

Mammary Glands; Cancer

20030000523 Temple Univ., Philadelphia, PA USA

P270 AND THE SWI/SNF Complex in Breast Cancer ***Annual Report, 15 May 2001-14 May 2002***

Wang, Xiaomei; Moran, Elizabeth; Jun. 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-00-1-0453

Report No.(s): AD-A407402; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Breast cancer arises from a series of harmful mutations to genes important for the normal regulation of cell growth and differentiation. Identification of the gene products whose loss is important in the development of the cancer is the primary means of determining who is at risk. There is an acute need for a more comprehensive understanding of the gene products that contribute to regulation, and the consequences of their failures. Gene products implicated in estrogen-responsive pathways are particularly likely to be significant in tumongenesis because exposure to estrogen is one of the most important contributory factors for the development of breast cancer. Our lab has cloned a new gene, p270, which codes for a protein that has structural characteristics and biochemical properties suggesting that it plays a significant role in the regulation of gene expression in response to estrogen. This project is designed to test this possibility by analyzing p270 expression and function in normal and breast cancer cells. This analysis will advance our understanding of the molecular mechanisms underlying normal breast development and carcinogenesis. These studies are likely to identify new markers for diagnosis and prognosis. They may ultimately lead to the design of therapeutic strategies based on the function of p270. These studies are particularly likely to open up new perspectives and stimulate new initiatives in the search for a cure for breast cancer.

DTIC

Mammary Glands; Cells (Biology); Carcinogens; Growth

20030000524 Beth Israel Deaconess Medical Center, Boston, MA USA

Tamoxifen Dependent Interaction Between the Estrogen Receptor and a Novel P21 Activated Kinase ***Annual Report, 1 Jun. 2001-31 May 2002***

Balk, Steven P.; Jun. 2002; 20p; In English

Contract(s)/Grant(s): DAMD17-00-1-0114

Report No.(s): AD-A407401; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The estrogen receptor alpha (ER(alpha)) plays an important role in breast cancer and a large fraction of ER(alpha) positive breast cancers respond to tamoxifen. We cloned a novel p21 activated kinase (PAK), termed PAK6, which binds to the androgen receptor (AR) and selectively to the tamoxifen liganded ER(alpha). PAKs are a family of seilne/threonine kinases that bind to and are regulated by the Rho family small (p21) GTPases, CDC42 and Rac. PAKs are involved in translating extracellular signals into cellular responses. Although PAK6 binds to CDC42, it lacks the CDC42 regulated autoinhibitory domain found in other PAKs

and can instead be activated by steroid receptor binding. Binding is mediated by at least two sites on PAK6, one at the N-terminus and another towards the middle of the protein. PAK6 inhibits ER(alpha) and AR transcriptional activity. PAK6 is highly expressed in brain and testes, is also expressed in mammary epithelium and prostate, and its expression in breast cancer cell lines has been confirmed by a polyclonal antibody. Further studies of PAK6 protein expression in breast cancer are in progress, and breast cancer cell lines expressing wild type and mutant PAK6 have been generated to assess functions in breast cancer.
DTIC
Estrogens; Mammary Glands; Cancer

20030000525 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
Role of GCN5 in Estrogen Responses, Tumor Suppression, and Breast Development in Mice ***Annual Report, 1 Jun. 2001-31 May 2002***
Dent, Sharon Y.; Jun. 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-00-1-0462
Report No.(s): AD-A407400; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Nucleosomes are folded together into chromatin structures that inhibit transcription. Studies here test the idea that an enzyme, Gcn5, that regulates chromatin folding is important for p53 functions and for estrogen responses. Experiments were proposed to (1) determine whether Gcn5 serves as a coactivator for activation of gene expression by the estrogen receptor (2) examine biochemical, molecular, and genetic connections between Gcn5 and p53 and 93) to generate a mammary gland specific knock out' of Gcn5 in mice to create a mouse model for Gcn5 functions in breast development and tumor formation. We have made good progress towards all three aims. We have examined Gcn5-dependence of estrogen responses in ER+ cell lines. We have generated mice that carry null alleles for both Gcn5 and p53 in cis on chromosome 11. We have generated mice that carry a conditional disruption allele for Gcn5 that will allow us to do the breast-specific knock out in the coming year. Our studies will provide new information about breast cancer biology. Moreover, they will allow us to determine whether histone acetyltransferases might provide targets for development of new drug therapies or diagnostic agents, furthering our advancement towards eradication of this disease.
DTIC
Estrogens; Mammary Glands; Cancer

20030000526 New York Univ., School of Medicine, New York, NY USA
TGF-Beta and Breast Cancer Induction ***Annual Report***
Dabovic, Branka B.; Rifkin, Daniel B.; Jul. 2002; 15p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9319
Report No.(s): AD-A407399; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We attempted to generate mice that produced active TGF-Beta in the breast by the use of a transgene containing the WAP promoter driving the expression of a truncated form of the latent TGF-Beta binding protein (LTBP) . TCF-a is normally produced in a latent form and is part of a complex consisting of TGF-Beta, the TGP-Beta propeptides and (LTBP) . We had shown that the expression of this type of transgene using the Kl4 promoter resulted in the production of active TGP-Beta in the skin and the suppression of growth. We hypothesized that mice expressing this transgene would produce active TGP-Beta, which would block the growth of epithelial cells and suppress tumor induction if expressed in mice with a high incidence of mammary tumors. Mice were produced that expressed the appropriate transgene in the breast. However, no consistent effect on the development of the glandular system in the breast was observed at 9, 24 or 36 weeks of age. The reasons for this may relate to the limited temporal expression of the WAP promoter. The effect of the transgene in mice susceptible to mammary tumors was not tested because of the failure to observe an effect in control mammary gland development.
DTIC
Genes; Cancer; Mammary Glands; Tumors

20030000527 California Univ., Davis, CA USA
Aberrant Chromatin Modification as a Mechanism of Prostate Cancer Progression ***Annual Report, 1 Jun. 2001-31 May 2002***
Chen, Hongwu; Jun. 2002; 69p; In English
Contract(s)/Grant(s): DAMD17-01-1-0033
Report No.(s): AD-A407398; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Progression of prostate cancer (PCa) from hormone-dependent to hormone-refractory state represents one of the major hurdles in the successful treatment of cancer patients. Early studies showed that nearly all cancers retain androgen receptor (AR)

-mediated signaling pathway. One of the working models has been that shifts from paracrine to autocrine expression of growth factors and abnormal function of their receptors contributes to the progression to androgen-independent cancer through modulating the function of AR. We proposed a new hypothesis that chromatin histone modification and remodeling could be a key step in PCa progression. The purpose of this study is to test this new hypothesis. We proposed to identify altered histone modification patterns linked to progression of prostate cancer and then identify the enzymatic activities that are responsible for the alteration. The cope of this study is to first analyze histone acetylation and phosphorylation patterns on androgen receptor (AR) target genes such as PSA and other genes important for cell proliferation in malignant prostate cancer cells at different stages as well as normal prostate epithelial cells. Comparison of the patterns of histone modifications between these cells will allow us to identify the chromatin modifications that are altered during the progression of prostate cancer. Identification of specific changes in hi stone modifications between normal and cancer cells will then help identify the responsible enzymatic activities.
DTIC
Prostate Gland; Phosphorylation; Cancer; Aberration; Abnormalities

20030000528 Burnham Inst., La Jolla, CA USA
Cripto: A Target for Breast Cancer Treatment ***Annual Report, 1 Jun. 2001-31 May 2002***
Adamson, Eileen D.; Jun. 2002; 18p; In English
Contract(s)/Grant(s): DAMD17-01-1-0165
Report No.(s): AD-A407397; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Cripto is a growth factor that is important in breast cancer, leading to increases in cell proliferation and to increased survival of cells. Specific receptors for this factor have not been defined for breast cells but there is evidence from published work that Cripto acts as a co-factor for the Nodal factor, previously thought to be present and active only in early embryonic development. This work will define the importance of this route of Cripto signaling in breast cells compared with the other known route involving Pas and the MAPK/Erk pathway. A number of possible ways that Cripto could effect a proliferative signal to breast cells has been described by the SI in the following review article: Eileen D. Adamson, Gabriella Minchiotti, and David. S. Salomon, (2002) CRIPTO: A Tumor Growth Factor and More, J Cell Physiol. 190, 267-278. The experimental studies for exploring the activation mechanism of breast cancer cells by Cripto is underway with the aim of making peptides that block Cripto and its tumorigenic effects.
DTIC
Mammary Glands; Cancer; Receptors (Physiology); Regeneration (Physiology); Survival; Targets

20030000529 McMaster Univ., Hamilton, Ontario Canada
The Role of Phosphatidylinositol 3' -OH Kinase Signaling in Mammary Tumorigenesis ***Annual Report, 1 Jun. 2001-1 Jun 2002***
Hutchinson, John N. G.; Muller, William; Jul. 2002; 40p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0334
Report No.(s): AD-A407386; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objective of this research is to elucidate the roles of the phosphatidylinositol 3'-OH kinase (PI3K) and its downstream target Akt kinase in the induction of mammary tumors. to assess the role of Akt in mammary development and tumorigenesis, we generated transgenic mice that express an activated Akt (Akt-DD) in the mammary epithelium. Although expression of Akt-DD interferes with apoptosis during normal mammary gland involution, mammary tumors are not observed in these strains. to explore the role of Akt in mammary tumorigenesis, mice co-expressing Akt-DD and activated ErbB-2 or a mutant form of Polyomavirus middle T (PyV mT) antigen de-coupled from PI3K/Akt signaling were generated. Co-expression of Akt-DD with mutant PyV mT resulted in dramatic acceleration of mammary tumorigenesis. This acceleration was further correlated with reduced apoptotic cell death, phosphorylation of FKHR and overexpression of cyclin Dl. However, activation of Akt does not to affect metastatic progression. Akt activation also contributes to ErbB- 2 mediated mammary tumori genes is as bi-transgenics co-expressing Akt-DD and activated ErbB-2 transgenes show higher rates of tumorigenesis correlated with increased proliferation and overexpression of cyclin Dl. These observations indicate that Akt activation can impede mammary gland regression and contribute to tumor progression by providing survival and proliferation signals.
DTIC
Mammary Glands; Cancer

20030000530 California Univ., San Francisco, CA USA
The Cellular Targets of Estrogen in Mammary Ductal Development ***Final Report, 1 Jun. 1999-31 May 2002***
Kushner, Peter J.; Jun. 2002; 41p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9109
Report No.(s): AD-A407385; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is known that the actions of estrogen in mammary development are mediated primarily by the estrogen receptor alpha (ER alpha). It is not known whether ER alpha in epithelium (the tissue in which breast cancer develops) contribute to mammary cell proliferation and ductal development, or whether ER% target genes with classical estrogen response elements (EREs) or with alternative response elements, especially AP-i and CRE elements, mediate proliferation. We have been successful in developing transgenic mice with expression of wild type and AP-1/CRE superactive human ER alpha (K206A) in mammary gland and reproductive track (vaginal-cervical) epithelium. We used the keratin 14 gene promoter to drive expression in mammary basal epithelial cells and cervical-vaginal epithelium, and the MMTV promoter to drive expression throughout the mammary epithelium. In the K14 transgenics, expression in the genital tract was efficient and caused hypoproliferation, cyclin D1 over-expression and organ enlargement. Expression of human ERs in the mammary basal cells was less strong, but excessive proliferation and lobular development occurred after estrogen treatment in these animals. We have applied for funding from NIH to finish the study of the mammary gland in these animals and in the MMTV transgenics, which appear to have good expression of the transgene in mammary glands. We tentatively conclude that human ER alpha can function to mediate proliferation in the epithelial cells of the reproductive track and mammary gland, and that the target genes with AP-1/CRE elements are important in this process. If further studies confirm these observations it will suggest that the ER alpha pathway to AP-1/CRE target genes is a key target for interventions to prevent breast cancer.
DTIC
Estrogens; Mammary Glands; Cancer

20030000531 Utah Univ., Salt Lake City, UT USA
Individualized Strategies for Breast Cancer Surveillance Based on Aggregated Familial Information ***Final Report, 1 Jan. 1999-30 Jun. 2002***
Yakovlev, A.; Boucher, K.; Tsodikov, A.; Kerber, R.; Gregori, G.; Jul. 2002; 95p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8256
Report No.(s): AD-A407384; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This final report is concerned with stochastic modeling of breast cancer detection and estimation problems associated with the two-variate distribution of age and tumor size at diagnosis. Our methodological approach is designed to accommodate generally-structured data. Another research avenue was related to optimal scheduling of breast cancer screening by maximizing the expected reduction of tumor size at detection. We developed a Monte-Carlo EM algorithm for estimation of biologically meaningful parameters incorporated into the joint distribution of age and tumor size at detection. The proposed estimation techniques were tested by computer simulations and applied to epidemiological data on individuals identified through the Utah Population Database (UPDB) and Utah Cancer Registry. We studied various indicators of family history and used one of them to stratify the data on breast cancer obtained from the UPDB. An optimal schedule has been constructed for low- and high-risk groups of individuals identified through the UPDB. While the efficacy of the optimal schedule tends to be higher in high-risk families, its structure appears to be robust to variations in breast cancer risk.
DTIC
Data Bases; Cancer; Mammary Glands

20030000532 Indiana Univ., Indianapolis, IN USA
DNA Base Excision Repair (BER) and Cancer Gene Therapy: Use of the Human N-Methylpurine DNA Glycosylase (MPG) to Sensitive Breast Cancer Cells to Low Dose Chemotherapy ***Annual Report, 15 May 2001-14 May 2002***
Rinne, Mikael L.; Kelley, Mark R.; Jun. 2002; 17p; In English
Contract(s)/Grant(s): DAMD17-00-1-0296
Report No.(s): AD-A407383; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To ensure that the genome is not compromised, elaborate mechanisms of DNA repair are essential to the cell. The DNA Base Excision Repair (BER) pathway is responsible for the repair of alkylation and oxidative DNA damage. The short patch BER pathway begins with the simple glycosylase N- methylpurine DNA glycosylase (MPG), which is removes damaged bases such as N3-methyladenine, hypoxanthine, and 1,N6-ethenoadenine from the DNA. The resulting AP site is further processed by the other enzymes of the BER pathway to complete repair of the damaged DNA. Using mammalian expression vectors for stable and adenovirally-mediated transient overexpression, MPG has been overexpressed in two breast cancer cell lines.
DTIC
Mammary Glands; Cancer

20030000533 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Cellular Origin of Breast Tumors With Invasive Potential ***Final Report, 1 Jul. 2001-30 Jun. 2002***
Radice, Glenn L.; Jul. 2002; 5p; In English
Contract(s)/Grant(s): DAMD17-01-1-0600
Report No.(s): AD-A407382; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A major problem in breast cancer treatment and the leading cause of mortality is invasion and metastasis of primary breast tumors. The cell type from which the tumor arises may dictate its potential for aggressive behavior. The mammary gland consists of different cell types including the cap cell; a less differentiated, highly proliferative cell basally located in the terminal end bud (TEB) of the murine mammary gland. The TEBs invade the fatty stroma of the pubertal gland establishing the ductal network. These specialized structures are reported to be targets for carcinogen-induced DNA damage. Their human counterparts are called intralobular ducts and are also sites of cancerous lesions. We hypothesize that genetic change specific to the cap cell population of the TEB will lead to aggressive tumors and metastatic disease. P-cadherin is normally expressed in the cap cells of the TEB and its progenitors. to test whether the less differentiated P- cadherin-positive cells have greater metastatic potential, the neu/HER-2 proto-oncogene will be targeted specifically to the cap cell population using the endogenous P-cadherin promoter. The goal of this research is to determine whether the highly proliferative and invasive cap cell population is a target for metastatic breast cancer.
DTIC
Mammary Glands; Cancer

20030000534 Toronto General Hospital, Toronto, Ontario Canada
Epidermal Growth Factor Receptor Overexpression as a Target for Auger Electron Radiotherapy of Breast Cancer ***Final Report, 1 Jul. 1998-1 Jul 2002***
Reilly, Raymond M.; Aug. 2002; 58p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8171
Report No.(s): AD-A407381; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

EGFR are overexpressed in the majority of ER-negative, hormone-resistant and poor prognosis breast cancers. Our goal is to exploit EGFR overexpression to selectively target the Auger electron-emitting radiopharmaceutical, 1111n-hEGF to breast cancer cells for treatment of the disease. 1111n-hEGF was highly radiotoxic in vitro to MDA-MB-468 breast cancer cells overexpressing EGFR (1-2 X 106 receptors/cell) but not to MCF-7 breast cancer cells with a 100-fold lower level of EGFR. 1111n-hEGF was greater than 85-500 fold more cytotoxic to MDA-MB-468 cells than chemotherapeutic agents (IC50 70 pM vs. 6-30 nM) and low concentrations (70 pM) of 1111n-hEGF produced the same growth inhibition as 4 Gy of gamma-radiation. The radiopharmaceutical exhibited dose-related and strong selective anti-tumor effects against MDA-MB-468 tumors overexpressing EGFR implanted into mice. There were no changes in body weight, histopathological examination of liver and kidneys and serum ALT and Cr levels. There was a slight but not significant decrease in WBC and platelets. The radiopharmaceutical was most effective against small, non-established tumors. Our results are highly promising for the development of 1111n-hEGF as a novel treatment for breast cancer.
DTIC
Hormones; Epidermis; Mammary Glands; Radiation Therapy; Growth; Cancer

20030000536 Louisiana State Univ., Health Science Center, Shreveport, LA USA
High eIF4E Overexpression in Node Negative Breast Cancer as Predictor for Recurrence ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Li, Benjamin; Jul. 2002; 18p; In English
Contract(s)/Grant(s): DAMD17-99-1-9256
Report No.(s): AD-A407374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The quantity of available eukaryotic Initiation Factor 4E (elF4E) in cells plays a critical role in the regulation of protein synthesis. EIF4E overexpression has been found in human malignancies. Furthermore, there appears to be an association of eIF4E overexpression and clinical outcomes. The purpose of the study is to determine if high eIF4E overexpression % greater than 7-fold increase) in patients with node negative breast cancer is associated with a statistically significant increased risk (2.5-fold) for cancer recurrence when compared to patients with low eIF4E overexpression. The study involves 255 patients treated with definitive local therapy (i.e. breast conservation therapy or modified radical mastectomy) and offered systemic adjuvant therapy per standard of care. The cancer specimens are quantified for elF4E overexpression by Western blot analysis. Each patient undergoes identical clinical surveillance. Initial clinical stage, elF4E overexpression, and clinical outcomes data are coded and researchers are blinded until data analysis at the end of the study. The primary endpoint measured is breast cancer recurrence; local,

regional and/or distant. The projected study accrual time is 3 years, with targeted study completion in 5 years. to date 142 patients have been accrued, 133 patients have cancer specimens quantified for eIF4E level. In an interim analysis of 111 patients, in patients with the highest tertile of elF4E level (greater than 14-fold), the relative risk for cancer recurrence was 6.2 x that of the low eIF4E group (less than 7-fold) (p=O.O26).
DTIC
Mammary Glands; Cancer

20030000545 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Endourethral MRI Guidance for Prostatic RF Ablation ***Annual Report, 1 Jun. 2001-31 May 2002***
Atalar, Ergin; Jun. 2002; 11p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0064
Report No.(s): AD-A407434; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
MR imaging of the prostate can be greatly improved by using a phased array that combines the signals from individual receiver coils to form a composite image. Endourethral coils and a dual-coil endorectal probe were constructed and combined with a surface coil in a phased array system. Various phased array configurations were tested with in vivo canine experiments, which resulted in high-resolution images that clearly showed the anatomy of the prostate and surrounding structures such as the neurovascular bundles. The endourethral coils were useful in imaging the anterior portion of the prostate, while the endorectal coils provided high SNR in the posterior region of the prostate.
DTIC
Imaging Techniques; Prostate Gland; Cancer; Ablation

20030000546 Occupational Safety and Health Administration, Washington, DC USA
Access to Medical and Exposure Records
Jan. 2001; 9p; In English; Original contains color images
Report No.(s): AD-A407432; OSHA3110; No Copyright; Avail: CASI; A02, Hardcopy
This booklet provides a generic overview of standards-related topic. Persons that should read this book are employees that have possible exposure to or use toxic substances or harmful physical agents at their work site or an employer who has employees that may be exposed. Employees who may have been exposed to toxic substances or harmful physical agents in the workplace, OSHA's regulation may help you detect, prevent and treat occupational disease. Employees have the right to access relevant employee medical records and to know how OSHA's standard covers them.
DTIC
Personnel; Occupational Diseases; Records

20030000547 Van Andel Research Inst., Grand Rapids, MI USA
Molecular Based Imaging Determination of Breast Cancer Prognosis ***Final Report, 29 May 2001-28 May 2002***
Resau, James H.; Jun. 2002; 19p; In English
Contract(s)/Grant(s): DAMD17-01-1-0561
Report No.(s): AD-A407431; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Human breast cancer prognosis has traditionally been determined by the stage and grade of the primary tumor with lymph node involvement as the major determining factor. For even those with the best prognosis (small, 1 cm diameter-size lesions and no node involvement), there is not a satisfactory method to predict who is in need of additional therapy besides surgery. of 10 patients who present with this profile, 6-7 will be cured by surgery and 3-4 of them will have progressive disease. We have evaluated two sets of breast cancer cases using protein expression for prognosis. In a pilot study (n=40), we evaluated expression of c-Met and HER2 in primary breast cancers and their lymph node metastases. Neither c-Met nor HER2 expression in primary tumors correlated with established prognostic factors such as age, lymph node involvement, ER, PR, tumor size, or grading. However, c- Met overexpression alone identified high-risk patients independent of HER2. Five-year DFS associated with c-Met overexpressing tumors was 17% compared to 55% in remaining patients (p=0.037; RR 3.0). These results identify c-Met as a target for therapeutic approaches, particularly in HER2 negative patients. We have expanded this to study a series of nearly 200 cases and the analysis of them is still ongoing. The imaging is complete and the correlations will be completed in early 2003.
DTIC
Mammary Glands; Cancer; Investigation

20030000548 Cleveland Clinic Foundation, Lerner Research Inst., Cleveland, OH USA
Enzymatic Wound Disinfectants ***Annual Report, 1 Sep. 2001-31 Aug. 2002***
Hazen, Stanley L.; Sep. 2002; 12p; In English
Contract(s)/Grant(s): DAMD17-01-1-0826
Report No.(s): AD-A407428; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wound infection and tissue damage are common and sever complications of injuries and burns sustained in battle. The surgical excision of dead and devitalized tissue, antibiotics, and the removal of foreign matter are the mainstay of current therapies. Prevailing treatment strategies are restricted, however, by the inability to initiate effective countermeasures until removal from the uncontrolled environment of the field of battle. This results in high rates of infections and serious medical complications. Mammalian secretory fluids maintain antimicrobial activity as part of host defenses against invading bacteria, parasites, and viruses. Among the agents that provide antimicrobial protection in these fluids are the copper-containing protein ceruloplasmin, and the leukocyte-derived hemoprotein enzymes myeloperoxidase and eosinophil peroxidase. Peroxidases and ceruloplasmin interact with microbes and may serve as Enzymatic Wound Disinfectants by catalyzing the formation of reactive oxidants and diffusible radical species that inflict oxidative damage upon invading parasites and pathogens. We propose to develop and test Enzymatic Wound Disinfectants as a practical, rapid, and effective treatment for wounds and burns. Molecular biological efforts will focus on the cloning, expression, isolation, and engineering of thermostable, protease-resistant peroxidases and ceruloplasmin. Biochemical and physiological initiatives will focus on characterizing enzymatic activity and stability, mechanisms of action, and clinical utility.
DTIC
Injuries; Antiseptics; Enzymes

20030000549 Uniformed Services Univ. of the Health Sciences, Bethesda, MD USA
Tropical Medicine Imaging Project (TMIP) Phase II ***Final Report, 1 Apr. 2000-1 Aug. 2001***
Smirniotopoulos, James G.; Reeder, Maurice; Sep. 2001; 33p; In English
Contract(s)/Grant(s): MIPR-OGC65E0095
Report No.(s): AD-A407427; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this Tropical Medicine Central Resource (TMCR) is to create a global resource for health care providers on Tropical Medicine, with emphasis on the radiology of tropical diseases. This resource would be available on CD-ROM, but would be more universally available over the Internet. by having such a resource available, it will be much more likely that appropriate diagnoses will be made in a timely fashion with corresponding definitive treatment. This will result in decreased morbidity and mortality in both civilian and military populations, and a tremendous cost saving from deferred medical transports and decreased treatment time. Implementation of the project will happen in various phases: a. Gleaning optimal images and information for the various diseases (performed by subject matter experts) b. Digitizing approved images/photographs c. Inserting images and text into an electronic format d. Connecting images/text into a database-driven search/retrieve engine e. Displaying information over the internet and reproducing information on CD-ROM Deliverables listed on original SOW: 1. Produce a working demonstration 'Tropical Medicine Website' from a subset of archived collection of images. 2. Produce a 'Tropical Medicine CD-ROM' from a subset of the archived collection of images.
DTIC
Medical Science; Internet Resources; Public Health; Telemedicine; CD-ROM; Imaging Techniques

20030000550 University of Southern California, Los Angeles, CA USA
Genetic Determinants of Aromatase Expression and Susceptibility to Postmenopausal Breast Cancer ***Annual Report, 1 Jun. 3001-31 May 2002***
Ingles, Sue A.; Jun. 2002; 7p; In English
Contract(s)/Grant(s): DAMD17-99-1-9376
Report No.(s): AD-A407426; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The major source of estrogen in postmenopausal women is conversion of androstenedione in adipose tissue to estrone by the enzyme aromatase. In adipose tissue, the aromatase gene, CYP19, is regulated by the cytokines TNF-alpha and IL-6, which act on a regulatory region of the CYP19 gene called the 1.4 promoter. The objective of this study is to determine whether polymorphism in the TNF-alpha gene, in the IL-6 gene, or in the CYP19 gene 1.4 promoter is associated with (1) the plasma estrone (El) to androstenedione (A) ratio, a phenotypic measure of aromatase expression, or with (2) risk of post- menopausal

breast cancer. This investigation is being carried out using DNA and serum samples from 1360 women enrolled in the Hawaii-Los Angeles Multiethnic cohort study.
DTIC
Hormones; Genetics; Mammary Glands; Cancer

20030000551 Thomas Jefferson Univ., Philadelphia, PA USA
Leptin (Obesity Protein) and Breast Cancer Metastasis ***Annual Report, 2 Jul. 2001-1 Jul 2002***
Surmacz, Eva; Aug. 2002; 9p; In English
Contract(s)/Grant(s): DAMD17-01-1-0651
Report No.(s): AD-A407425; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Obesity in the USA has reached the alarming rate of approx. 60% and is considered a second, after smoking, major killer. The link between obesity and breast cancer development has been postulated but the molecular mechanisms involved are not clear. Leptin, a 16 kDa protein product of the OB (obesity) gene is a cytokine reported to be secreted mainly from adipocytes and has been shown to control body fat mass and food intake by providing information to the central nervous system. The abundance of leptin is greater in females than in males and is regulated by steroid hormones and growth factors, such as estradiol, insulin and insulin-like growth factor 1. The levels of these substances are elevated in individuals with upper body obesity. This type of obesity correlates with increased breast cancer risk in post-menopausal women. In addition to its role as a regulator of appetite and metabolism, leptin can be involved in other processes, such as hematopoiesis, reproduction, and immunity. Recently, it has been demonstrated that leptin can act as a mitogen, chemoattractant, and angiogenic factor in different cell models. New data documented that human breast cancer cell lines and breast tumors may express leptin and leptin receptor (Ob-R). In addition, leptin has been show to induce DNA synthesis in MCF-7 and T47D breast cancer cell lines. We hypothesized that in obese women, locally elevated levels of estrogens and insulin might increase the synthesis of leptin in adipocytes and/or epithelial cells, in effect leading to increased proliferation and/or migration in primary breast tumor.
DTIC
Obesity; Mammary Glands; Cancer

20030000552 Health Research, Inc., Rensselaer, NY USA
Antibody Probes to Estrogen Receptor-Alpha Transcript-Specific Upstream Peptides: Alternate ER-Alpha Promoter Use and Breast Cancer Etiology/Outcome ***Annual Report, 23 Apr. 2001-22 Apr 2002***
Pentecost, Brian T.; May 2002; 21p; In English
Contract(s)/Grant(s): DAMD17-01-1-0261
Report No.(s): AD-A407424; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Positive Estrogen Receptor alpha (ER) status correlates with a reduced incidence of breast cancer recurrence in the first years after resection of tumors, and predicts a favorable response to adjuvant anti-estrogens. ER-protein in breast tumors increases with patient age. The project develops novel antibody reagents to probe the expression of ER from alternate promoters taking advantage of short peptides encoded in regions of the ER mRNAs that are promoter specific and not shared. In the first year we have proof of principal that antibodies can be made against the short upstream peptides but the first generation immunoreagents are neither sensitive enough nor sufficiently specific for either use in evaluating tumors. Studies are proceeding, in line with the original statement of work, to generate stronger immunoreagents. In a complementary area, we have improved our methods for estimation of ER mRNA levels by developing assays which use RealTime PCR' in the Roche LightCycler(TM). These assays reduce amounts of RNA needed for assays, are faster and are more robust.
DTIC
Mammary Glands; Cancer; Antibodies; Estrogens

20030000554 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Repair Machinery for Radiation-Induced DNA Damage ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Thompson, Lawrence H.; Jul. 2002; 15p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9252
Report No.(s): AD-A407373; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Understanding DNA repair mechanisms for ionizing radiation (IR)-induced DNA damage and having prior knowledge of a patient's IR-specific repair capacity will help determine which patients will be most responsive to radiation therapy and design more effective treatment regimes. The objective of this work has been to define the contributions of the mammalian protein Apel, and other candidate nucleases, to the repair of IR-induced genetic damage. We are currently constructing cell lines that lack Apel protein and will determine the sensitivity of these mutant cells to various DNA-damaging agents, particularly IR. We have

constructed a hamster CEO cell line that has conditional expression of the human Apel protein under the control of a tetracycline-responsive promoter (Tet-off system of Clonetech). These cells are being used in gene targeting DNA transfection experiments to obtain a knockout mutation in Apel. Extensive analysis has been done to design highly sensitive PCR (polymerase chain reaction) screening procedures to identify and recover cells have Apel recombination events. So far, we have seen numerous gene targeting events that involve recombination of the right arm, but not the left arm, of the targeting vector. Ongoing studies are focused aggressively on getting the knockout mutant and performing extensive characterization of its radiation responses.
DTIC
Deoxyribonucleic Acid; Ionizing Radiation; Mammary Glands; Cancer; Radiation Effects

20030000555 Georgetown Univ., Medical Center, Washington, DC USA
Combined M.D./Ph.D. and Ph.D. Training Program in Breast Cancer Prevention ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Dickson, Robert; Jul. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-99-1-9198
Report No.(s): AD-A407370; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The goal of this training program is to dramatically extend our existing, highly successful Interdisciplinary Doctoral Training Program in Tumor Biology with a track which integrates genetics, molecular epidemiology, and prevention of breast cancer. This track offers both MD/PhD and PhD training opportunities, and integrates new faculty from the Lombardi Cancer Center Program in Cancer Prevention and Control, and Cancer Genetics. The program is enriched by new courses, as well as practical research experience. This new programmatic initiative makes use of the existing organizational structure of the Interdisciplinary Doctoral Training Program in Tumor Biology and incorporates a multi- disciplinary faculty who are devoted to research and education in breast cancer. We recruited 3 MDs to the program in the third year. All three MDs have had a successful first year and are continuing into their second year of enrollment in the program. Two courses, Genetics Health and Society in the 2lst Century and Applied Biostatistics had a successful first year and will continue to be offered. Finally, a new course in genetics, Human and Microbial Genetics, will be offered in the fall semester.
DTIC
Education; Clinical Medicine; Mammary Glands; Cancer

20030000556 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
The Roles of Histone Deacetylase and DNA Methylation in Estrogen Receptor alpha Expression in Breast Cancer ***Annual Report, 1 Jun. 2000-31 May 2002***
Huang, Yi; Jun. 2002; 10p; In English
Contract(s)/Grant(s): DAMD17-00-1-0301
Report No.(s): AD-A407368; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The proposal tests the hypothesis that hi stone deacetylase activity contributes to the transcriptional repression of the methylated estrogen receptor a (ER) gene. It further postulates that inhibition of histone deacetylase (HDAC) and DNA methylation may act together to reactivate the ER gene. Studies to date show that the HDAC inhibitor trichostatin A, can reactivate ER expression in ER- negative breast cancer cell lines. Combined treatment with HDAC inhibitors and demethylating agents can synergistically reactivate expressions of ER in ER-negative breast cancer cell lines.
DTIC
Estrogens; Mammary Glands; Cancer

20030000558 Alabama Univ., Birmingham, AL USA
Targeting of Adenovirus Vectors to Breast Cancer Mediated by Soluble Receptor-Ligand Fusion Proteins ***Annual Report, 15 May 2001-14 May 2002***
Dmitriev, Igor P.; Kashentseva, Elena A.; Jun. 2002; 33p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0115
Report No.(s): AD-A407364; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The use of adenovirus (Ad) vectors for cancer gene therapy is currently limited by several factors, including broad Ad tropism associated with expression of coxsackie virus and adenovirus receptor (CAR) in normal human tissues, and limited CAR levels in tumor cells. to target breast cancer cell types, we proposed using soluble CAR (sCAR) ectodomain fused with a ligand to simultaneously achieve both blocking of CAR-dependent tropism and Ad infection through a novel receptor overexpressed in target cells.
DTIC
Mammary Glands; Cancer; Viruses; Gene Therapy

20030000559 Texas Univ., M D Anderson Cancer Center, Houston, TX USA

Investigation of Alpha6 Integrins and Their Signaling Intermediate as Prognostic Markers for Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***

Gilcrease, Michael Z.; May 2002; 9p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0298

Report No.(s): AD-A407363; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We are investigating the role of alpha 6 beta 4 integrin expression in the progression of breast cancer. No amplification of the beta 4 gene was detected using probes derived from BAC clones. Cell lines MDA-MB-231 and BT474 (with high alpha 6 beta 4 expression) showed increased phosphorylation of PI3KP110 but no change in the phosphorylation of P13KP85 upon clustering surface beta 4. When surface alpha 6 was clustered, MDA-MB-23l and MDA-MB-l34 showed increased phosphorylation of FAK, and MCF-7 showed increased phosphorylation of Akt.

DTIC

Mammary Glands; Cancer

20030000560 National Inst. of Health, Bethesda, MD USA

Clinical Management of the Transplant Patient

Kuo, Paul C.; Schroeder, Rebecca A.; Johnson, Lynt B.; Jan. 2001; 14p; In English

Report No.(s): AD-A407358; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Transplantation has rapidly gained acceptance as the treatment of choice for most non-malignant end-stage organ dimensions. In the past 50 years, this field has evolved from an experimental curiosity to the preferred option for most patients with kidney, liver, lung, islet and heart failures. However, unlike many established therapies, transplantation, remains a rapidly changing discipline.

DTIC

Clinical Medicine; Transplantation

20030000561 Army Research Inst. of Environmental Medicine, Natick, MA USA

A Cell Culture Hypoxia Chamber

Cullivan, Michael L.; Mullen, Stephen; Sheldon, Holly K.; Waldstein, Nikki; Lilly, Craig M.; Oct. 2002; 24p; In English

Report No.(s): AD-A407334; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe a chamber that can be used to study the effects of hypoxia on cells in culture. The chamber fits inside a standard cell culture incubator. Hypoxic conditions are created and sustained by flushing a hypoxic gas mixture through an impermeable chamber at defined rates. The fractional oxygen and carbon dioxide contents of the chamber are monitored through use of an in-line oximeter/carbon dioxide analyzer that is connected to the outflow port of the chamber. The tests described in this report show that by flushing the chamber at 1.7 liters/minute (L/min) with 1.0% O2 and 5.3% CO2 for 35-minutes and then reducing the gas flow to 1.0 L/min, steady-state gas fractions of less than 1.5% O2 (less than 11 mmHg) and 4.9 to 5.3% CO2 (35 to 40 mmHg, depending on the effectiveness of humidification) can be achieved and maintained for up to 2.7 days. However, because of the lack of an airlock, the current design of the chamber allows only one time point to be studied, as the chamber cannot be opened without almost complete return to room air gas composition. The design, construction and testing of this chamber was supported by ILIR funds in 1997 (Protocol S97-02) and 2000 (Protocol H00-16).

DTIC

Cells (Biology); Culture Techniques; Hypoxia; Genetics; Chambers

20030000563 Howard Univ., Washington, DC USA

Characterization of Sigma Receptor Mediated Apoptosis in Breast Tumor Cells ***Final Report, 1 May 1997-31 May 2001***

Crawford, Keith W.; Jun. 2001; 29p; In English

Contract(s)/Grant(s): DAMD17-97-1-7083

Report No.(s): AD-A407327; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have previously reported that sigma-2 receptor activation results in a caspase-independent apoptosis in breast tumors, and also differing temporal patterns of intracellular calcium release. Other researchers have demonstrated involvement of sigma-2 receptors with tumor cell proliferation. We have also shown that sigma-2 receptor agonists can increase intracellular ceramide levels and decrease sphingomyelin. Sphingosylphosphorylcholine (SPC) and other sphingoid bases have been similarly shown to regulate diverse cellular functions including cell proliferation, release of calcium from intracellular stores, and apoptotic cell death. We report here that sigma-2 receptor agonist produce dose-dependent increases in sphingosylphosphorylcholine in metastatic breast tumor cell lines (SKBr3, MCF-7/Adr-), with a peak affect occurring at 15 minutes. This effect is antagonized

by the sigma-2 receptor antagonist AC-927. In detergent extracts of tumor cells (1% Trition X-lOO, CHAPS 7 mM), structurally-diverse sigma-2 receptor agonists increase the hydrolysis of sphingomyelin to SPC in a concentration dependent manner. This deacylation of sphingomyelin is catalyzed by the enzyme Sphingolipid Ceramide N-deacylase (SCDase). SCDase can also acylate sphingosine to produce ceramide. In a detergent extract of breast tumor cells, sigma-2 receptor agonists increase the acylation of sphingosine to ceramide in a concentration-dependent fashion. These findings suggest that the effects of sigma-2 receptor activation may be mediated by SPC. Furthermore, the ability of sigma-2 receptor agonists to modulate both the deacylation of sphingomyelin to SPC, and acylation of sphingosine to ceramide, in a cell free system provides evidence for the direct receptor modulation of SCDase.
DTIC
Apoptosis; Cells (Biology); Mammary Glands; Tumors; Receptors (Physiology)

20030000627 Case Western Reserve Univ., Cleveland, OH USA
The Role of Clusterin in Estrogen Deprivation-Mediated Cell Death in Breast Cancer Cells ***Annual Report, 4 Jun. 2001-3 Jun 2002***
Leskov, Konstantin S.; Boothman, David A.; Jul. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-01-1-0196
Report No.(s): AD-A407480; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
During the first year of work on this Proposal, we determined that the nCLU protein in human breast cancer cells is translated starting at an AUG-34 start site from within its 'IRNA'. This start site meant that this protein is translated at an unique site from that of sCLU. Furthermore, we showed that nCLU mRNA is created by alternative splicing, exon II is omitted and exons I and II are spliced together. The loss of estrogen receptor in C4:2W cells correlated with a higher level of nCLU protein, and concomitant low levels of Ku70 when compared to the parental estrogen-dependent T47D breast cancer cell line. Our previous data indicated that the N-terminal coiled-coil (Nterm) and C-terminal coiled-coil domains of nCLU interact with each other. Here, we demonstrated that conditional over-expression of the Nterm in MCF7 breast cancer cells results in radioresistance at clinically-relevant doses of IR (0.5 and 1 Gy). This finding, in combination with our data that nCLU is a pro-apoptotic protein, leads us to conclude that Nterm acts as a dominant-negative deletion mutant of nCLU. These data are consistent with our original hypothesis. In conclusion, our data indicate that the nCLU protein plays an important role in breast cancer cell radiation survival, and that the efficiency of radiation therapy of breast cancer may be a function of the estrogen dependency of the particular cancer.
DTIC
Estrogens; Mammary Glands; Cancer

20030000629 Fox Chase Cancer Center, Philadelphia, PA USA
Validate Mitotic Checkpoint and Kinetochore Motor Proteins in Breast Cancer Cells as Targets for the Development of Novel Anti-Mitotic Drugs ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Yen, Timothy J.; Jul. 2002; 7p; In English
Contract(s)/Grant(s): DAMD17-01-1-0239
Report No.(s): AD-A407481; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The kinetochore is a chromosomally associated structure that is essential for accurate chromosome segregation in mitosis. Kinetochores physically link chromosomes to the spindle but also monitor these interactions through the spindle checkpoint pathway. As kinetochores function specifically in mitosis, it is a highly desirable target for development of novel anti-cancer drugs. Toward this end, we are using RNAi technology to block the expression of a select group of kinetochore proteins to determine their importance to the survival of breast cancer cells. Initial studies showed that depletion of the hBUB 1 checkpoint protein from Hela cells prevented cells from arresting in mitosis in the presence of microtubule inhibitors. Loss of hBUB 1 prevented other checkpoint proteins from assembling onto kinetochores. Thus, hBUB I appears to specify the assembly of a subdomain of the kinetochore that is critical for checkpoint functions. We have expanded our studies to include the breast cancer cell lines MCF-7 and MDA-486. We will examine whether MCF7 and MDA468 cells respond in the same way as Hela cells responded to loss of hBUB 1 and other kinetochore proteins. These studies may reveal that the kinetochore is a valid target for the development of novel anti-mitotic agents. In addition, it is possible that inhibition of kinetochore functions may sensitize cells to conventional chemotherapeutics such as vinblastine and paclitaxal.
DTIC
Mammary Glands; Cancer

20030000641 McMaster Univ., Hamilton, Ontario Canada

The Role of the Integrin-Linked Kinase (ILK) in Mammary Gland Tumorigenesis and Metastasis ***Final Report, 15 Jun. 1999-15 Jun 2002***

Muller, William J.; Jul. 2002; 27p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9286

Report No.(s): AD-A407546; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The major objective of our DOD sponsored research program is to assess the role od the integrin linked kinase in mammary tumorigenesis and metastasis. Based on previous observation that ILK is overexpressed in human breast cancers, we have derived several independent transgenic strains that express ILK in the mammary epithelium. Genetic and biochemical analysis of these strains revealed that female transgenic strains developed focal mammary tumors after a long latency period. Interestingly mammary tumors derived from these strains have undergone epithelial-mesemcyhmal transition (EMT) . The results of these studies provide direct evidence that overexpression of ILK may be an important step in mammary tumor progression.

DTIC

Epithelium; Mammary Glands; Metastasis; Cancer; Chemical Analysis

20030000642 Massachusetts General Hospital, Boston, MA USA

Evaluation of Early and Prolonged Effects of Acute Neurotoxicity and Neuroprotection Using Novel Functional Imaging Techniques ***Annual Report, 15 Jul. 2001-15 Jul 2002***

Brownell, Anna-Liisa; Aug. 2002; 70p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9555

Report No.(s): AD-A407544; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have proposed to explore the relationship between impairments in functional and metabolic pathways and regional neural dysfunction, and the efficacy of neuroprotection provided by a metabotropic glutamate receptor agonist. We have conducted studies using a superThigh resolution positron tomograph to explore acute and long-term excitotoxicity mediated mechanisms in rats exposed to 3-nitroproptiomc acid (3-NP). We have also conducted studies of glucose metabolism in transgenic mice expressing Huntington's gene. Complementary magnetic resonance spectroscopy studies to explore changes in neurochemicals were conducted in both 3-NP treated rats and transgenic mice as well. We tested also neuroprotection against 3 NP induced neurotoxicity with metabotropic glutamate receptor agonist; ABHxD-I. These studies showed that ABHxD-I could protect during the injection period, but after it, 3-NP induced striatal degeneration continues. Studies of dopamine receptors (Dl and D2) as well as dopamine transporters showed a gradually decreased binding following 3-NP administrations both in protected and non-protected 3-NP rats. In HI) mice, a progressive age related degeneration of glucose metabolism was observed correlating with decrease in N-acetyl-aspartate detected with MRS. Dopamine receptor and transporter bindings were significantly reduced compared to littermate controls. Studies of glutamate receptors showed locally decreased binding in striatum and in cortex following 3-NP. In addition, technical goals of algorithm development for data acquisition, image reconstruction, and data analyses were met.

DTIC

Image Reconstruction; Imaging Techniques; Data Processing; Magnetic Resonance

20030000645 Colorado Univ., Health Sciences Center, Denver, CO USA

Role of Progesterone Receptor Isoforms in Regulation of Cell Adhesion and Apoptosis ***Final Report, 1 Jun. 2001-31 May 2002***

Richer, Jennifer K.; Manning, Nicole G.; Jun. 2002; 37p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0507

Report No.(s): AD-A407539; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Progesterone receptors (PR) and estrogen receptors (ER) are important prognostic indicators in breast cancer. We believe that PR, in addition to being an indicator of functional ER, can play a role in the progression of breast cancer in its own right. The two isoforms of PR, PR-A and PR-B, function differently both in vitro and in vivo; however, before our studies, few PR regulated genes had been identified and it was not known which of these progesterone-responsive genes were regulated via PR-A versus PR-B. Our studies have identified such genes and cloned some of the promoters of differentially regulated genes to use as indicators of isoform-specific PR activity. In addition, we have created breast cancer cells that inducibly express one or the other PR isoform. Using these cells, we have determined that the gene expression profile of breast cancer cell changes just by having PR even in the absence of ligand. Interestingly, we find that PR-A regulates more genes in a ligand-independent manner, whereas PR-B is

the stronger ligand dependent transcription factor. We have found that PR-B uniquely regulates genes involved in mammary gland differentiation, while PR-A upregulates the anti-apoptosis gene Bc1-XL and cells containing PR-A are more resistant to apoptosis.
DTIC
Gene Expression; Estrogens; Apoptosis; Hormones

20030000662 Health Research, Inc., Buffalo, NY USA
The Preclinical Evaluation of Fever-Range, Whole Body Hyperthermia as a Adjuvant to Chemotherapy and Cytokine Immunotherapy for the Treatment of Breast Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Pritchard, Michele T.; Jun. 2002; 14p; In English
Contract(s)/Grant(s): DAMD17-99-1-9364
Report No.(s): AD-A407467; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This grant was written to examine the effect of combining fever-range heat treatments (WBH) - with cytokine immunotherapy and chemotherapy in a mouse model of human breast cancer. Progress in year number three of this grant has revealed that the 4Tl mouse model is sensitive to WBH, resulting in a tumor growth delay and illustrative of similar effects of heat in other mouse models in the laboratory of the PI's mentor. In addition, it has been found that the combination of IL-l2 to whole body heat treatment enhances the anti-tumor effect of WBH alone. Mechanisms behind the observed enhancement in anti-tumor response remain to be clearly identified although work using another mouse model for human colon cancer suggests that the down stream effector molecule, IFN-gamma, may play an important role. Unfortunately, many questions remain to be answered with regards to whether or not the anti-tumor effect of a chemotherapeutic drug, Doxorubicin, in both free and liposome-encapsulated form, can be enhanced using WBH. Finally, an examination of the effect of microsphere encapsulated IL-l2 remains to be completed. However, the training value of this grant has still been exceptional over all three years and is viewed by the PI to have been the greatest opportunity and achievement of her graduate career.
DTIC
Chemotherapy; Mammary Glands; Cancer

20030000664 Scripps Research Inst., La Jolla, CA USA
Vitronectin and Integrin alphanubeta3 in Ovarian Carcinoma ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Huang, Shuang; Jul. 2002; 28p; In English
Contract(s)/Grant(s): DAMD17-00-1-0566
Report No.(s): AD-A407410; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
One specific characteristic of ovarian cancer cells is their ability to survive in the absence of adhesion. Our previous studies demonstrate that the expression of vitronectin and alphavbeta3 integrin and the interaction between them are essential for ovarian cancer cell survival in suspension. We thus hypothesize that ovarian cancer malignancies may be suppressed by blocking vitronectin and integrin expression. In the present study, we employed a newly developed technology called RNA interference for inhibiting vitronectin and beta3 integrin expression. Four sets of short interfering RNA (siRNA) were designed for vitronectin and beta3 integrin subunit mRNA, and these siRNA were expressed in ovarian cancer cells using the pSUPER system. The expression of at least one vitronectin siRNA and one beta3 integrin siRNA significantly inhibited cellular vitronectin and alphavbeta3 integrin expression. Our studies demonstrate that specific and potent siRNA can be developed to suppress vitronectin and alphavbeta3 integrin expression in ovarian cancer cells.
DTIC
Ribonucleic Acids; Cells (Biology)

20030000665 California Univ., Ernest Gallo Clinic and Research Center, San Francisco, CA USA
Plasticity of GABAergic Synapses in the Ventral Tegmental Area During Withdrawal from In Vivo Ethanol Administration ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Bonci, Antonello; Jul. 2002; 24p; In English
Contract(s)/Grant(s): DAMD17-01-1-0736
Report No.(s): AD-A407409; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Ethanol consummatory behavior seems modulated through GAEAA receptors in the ventral tegmental area (VTA). Previous exposure to ethanol enhances ethanol self-administration, but the mechanisms underlying this phenomenon is poorly understood. The purpose of Specific aim 1 was to examine changes occurring at GABA synapses onto VTA DA neurons after a single in vivo exposure to ethanol, and we have accomplished it. We observed that a single in vivo exposure to ethanol both shifted paired-pulse facilitation (PPF) to paired pulse depression (PPD) and increased ethanol self-administration. An increased frequency of spontaneous miniature GABAA IPSCs (mIPSCs) was also observed in the ethanol-treated animals. Further, the shift to PPD in

the ethanol treated mice depended upon activation of presynaptic GABAa receptors. Forskolin increased the amplitude of GABAA IPSCs and the frequency of mIPSCs in the saline- but not in the ethanol-treated mice. Conversely, a protein kinase A (PKA) inhibitor significantly decreased both frequency of spontaneous mIPSCs and amplitude of GABAA IPSCs in the ethanol-treated mice. Our results indicate that potentiation of GABAergic synapses, via a PKA-dependent mechanism, occurs in the VTA after a single in vivo ethanol exposure, and such a potentiation might be a key synaptic modification underlying increased ethanol intake.
DTIC
Electrophysiology; Physiological Defenses; In Vivo Methods and Tests; Ethyl Alcohol

20030000666 San Francisco Univ., CA USA
Analysis of Pro-Apoptotic and Antiangiogenic Activity of CC3 in Breast Cancer Cells ***Annual Report, 16 Jul. 2001-15 Jul 2002***
Shtivelman, Emma; King, Frank; Aug. 2002; 14p; In English
Contract(s)/Grant(s): DAMD17-01-1-0191
Report No.(s): AD-A407408; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
CC3 was identified as a metastasis suppressor protein in vivo. This laboratory demonstrated that CC3 impairs apoptotic resistance of cells derived from aggressive tumors and inhibits production of angiogenic factors by these cells. CC3 expression was introduced into two breast carcinoma cell lines derived from metastatic tumors and expressing very low levels of this protein. Expression of exogenous CC3 lead to enhancement of their apoptotic responses to growth factors withdrawal and treatment with cytotoxic drugs. However, there was no effect of CC3 expression on angiogenic activity of breast cancer cells which was very low even prior to introduction of CC3. Because CC3 protein has no significant homologies to other known proteins, we have conducted analysis of cellular proteins that interact with CC3. Mass-spectrometric analysis of isolated protein revealed an amazing consistency among types of proteins that form complexes with CC3. Out of seven proteins identified, five belong to the family of importins of beta class and one is exportin, i.e. all these are proteins that serve as nuclear transport receptors. This amazing specificity in CC3 interactions pointed to a possibility that CC3 might be a factor involved in regulation of nuclear transport. Indeed, CC3 associates with nuclear envelope. Future work will focus on the mechanism through which CC3, via its possible role in nuclear transport, influences apoptosis.
DTIC
Mammary Glands; Cancer; Blood Vessels

20030000667 State Univ. of New York, Stony Brook, NY USA
Integrated Cancer Research in Five Thematic Areas of Interest ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Malbon, Craig C.; Jul. 2002; 6p; In English
Contract(s)/Grant(s): DAMD17-01-1-0754
Report No.(s): AD-A407407; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The Cancer Institute of Long Island offers specialized and unique cancer research in the integrated areas of signal transduction, growth control and differentiation, molecular carcinogenesis and DNA repair, cancer genetics and gene therapy, and cancer invasion and angiogenesis. The five areas of specialization provide a platform to address fundamental questions in the prevention, early detection, molecular understanding, and therapeutic intervention of cancers, such as breast, prostate, and others that are of central importance to the Department of Defense. The proposal requests funds to (1) recruit medically and scientifically-trained, clinician-scientists; (2) to provide support for establishing a laboratory and support for technicians and/or postdoctoral researchers to assist in establishing a new laboratory; and (3) to acquire several powerful, state-of-the-art instruments essential to the conduct of forefront cancer research. These instruments include a MALDI Time-of-Flight mass spectrometer, 2-photon laser-scanning confocal microscope, quantitative polymerase chain reaction light-cyclers, an advanced Affymetrix DNA microarray system and Laboratory Informatics Management system for computational needs. These funds will be used to develop the integration of the five thematic programs that address questions in breast, prostate, and other specific cancers. The Cancer Institute is an active-matrix cancer center providing a platform for cancer research and therapy for the Long Island region that has some of the highest rates of breast cancer. Integrated Cancer Research in Five Thematic Areas of Interest Signal Transduction, Cancer Genetics, Angiogenesis, Carcinogenesis, DNA repair, Growth Control, Cancer Invasion.
DTIC
Clinical Medicine; Cancer; Mammary Glands; Systems Integration

20030000688 Queens Univ., Kingston, Ontario Canada
Analysis of hRad1, a Human G2 Checkpoint Control Gene ***Annual Report, 1 Jun. 2000-1 Feb. 2002***
Besley, Blair D.; Davey, Scott K.; Mar. 2002; 129p; In English
Contract(s)/Grant(s): DAMD17-98-1-8080
Report No.(s): AD-A407538; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
HRadl and hRad9 are human homologs of proteins originally identified in fission yeast, - which surmised to be responsible for the control of the G2/M checkpoint. We undertook studies to gain a-further understanding of the complex and phosphorylation states of the hRadl and hRad9 proteins, the results of which are discussed herein.
DTIC
Phosphorylation; Cancer; Proteins

20030000689 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
The p202 Gene as a Tumor Suppressor in Prostate Cancer Cells ***Annual Report, 1 Jun. 2001-31 May 2002***
Hung, Mien-Chie; Jun. 2002; 39p; In English; Original contains color images
Contract(s)/Grant(s): DA D17-01-1-0071
Report No.(s): AD-A407537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This current proposal is based on our previous observations that: (1) Interferons (IFNs) are capable of exerting growth inhibition and anti-tumor effects on human cancer cells; and (2) p202 expression alone is sufficient to suppress both cell growth and tumor development of human prostate and breast cancer cells. to further investigate the anti- tumor activity of p2O2 on prostate cancer and to develop a p202 gene therapy for prostate cancer, we have proposed three specific aims to accomplish our objectives. Aim 1: to determine the anti-tumor and the pro-apoptotic activities of p202 in prostate cancer cells; Aim 2: to understand the molecular mechanisms underlying the p202-mediated anti-growth, anti-tumor, and potential pro-apoptosis activities in prostate cancer; Aim 3: to test the anti-tumor activity of p202 in prostate cancer cells using preclinical gene therapy strategies and to determine the efficacy of a combined treatment with TNF-alpha in an orthotopic prostate cancer animal model. Success of those aims will constitute a scientific basis for p202-associated anti-tumor effect on prostate cells and will enable us to develop a novel p202 gene therapy strategy against prostate cancer.
DTIC
Prostate Gland; Gene Therapy; Apoptosis; Cancer

20030000690 Department of the Army, Clinical Investigation Regulatory Office Fort Sam, Houston, TX USA
Department of Clinical Investigation (DCI). Annual Research Progress Report, Fiscal Year 2001, Volume 1 ***Annual Report, 1 Oct. 2000-30 Sep. 2001***
Sjogren, Maria H.; Oct. 01, 2001; 736p; In English
Report No.(s): AD-A407536; RCS-MED-300(R)-VOL-1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche
This Annual Progress Report documents all research protocols, both new and continuing, reviewed during FY 01 by the Clinical Investigation Committee (CIC) and the Human Use Committee/Institutional Review Board (HUC/IRB) of Walter Reed Army Medical Center (WRAMC). Continuing research review is administered by the Research Review Service (RRS), Department of Clinical Investigation (DCI), WRAMC. A detail summary sheet of each protocol giving the objective, technical approach, and progress is presented. Personnel rosters, DCI accomplishments, funding information and known publications and presentations by the WRAMC professional staff are listed for FY 01.
DTIC
Clinical Medicine; Personnel

20030000691 National Inst. of Health, Bethesda, MD USA
Preclinical Evaluation of Tolerance Induction Protocols and Islet Transplantation in Non-Human Primates
Montgomery, Sean P.; Hale, Douglas A.; Hirshberg, Boaz; Harlan, David M.; Kirk, Allan D.; Oct. 01, 2001; 13p; In English
Report No.(s): AD-A407535; NMRC01-108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Clinical solid organ transplantation has advanced tremendously over the past two decades. One-year graft survival exceeds 95%, 90% and 80% for kidney, liver and heart grafts, respectively . This improvement has been fueled predominantly by the expanding repertoire of progressively more potent immunosuppressive agents at our disposal. Unfortunately, modern therapies remain imperfect. Despite excellent short-term graft survival rates and low rates of acute rejection attained routinely today, there is an inexorable decline in graft survival over each subsequent year. Five-year graft survival approximates 80%, 65% and 60% for kidney, liver and heart grafts, respectively, representing a less impressive improvement over historical results 0!. The etiology of this attrition in graft survival is largely related to limitations of the modem practice of immunosuppression. Grafts are lost not

only as a result of acute and chronic rejection, but also as a result of infection, malignancy and disease recurrence/progression. Hence, increased immunosuppression does not necessarily represent a solution insofar as the harmful effects of these agents are unlikely to be well tolerated. In addition, immunosuppressive drugs may in fact interfere with salutary immune regulation, while at the same time preventing rejection. Thus, part of the answer to the problem of chronic graft loss lies in the development of techniques capable of providing more specific immune modulation; the ultimate expression of which is known as tolerance.
DTIC
Clinical Medicine; Infectious Diseases; Transplantation; Cancer

20030000692 Children's Hospital and Medical Center, Seattle, WA USA
Metrics for Objective Assessment of Surgical Skills Workshop ***Final Report***
Satava, Richard M.; Dec. 2001; 104p; In English
Contract(s)/Grant(s): DAMD17-01-1-0207
Report No.(s): AD-A407534; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
On 9-10 July, 2001 the Metrics for Objective Assessment of Surgical Skills Workshop convened an international assemblage of subject matter experts in objective assessment of surgical technical skills and of representatives of relevant official bodies involved in surgical education, evaluation and certification. There have been recent advances in the educational science of objective assessment and the technology of medical modeling and simulation (with surrogate tissue, abstract objects or virtual reality (VR) systems) for training of technical skills. In addition, focus on identification and prevention of medical errors, the need for objective criteria for assessment of surgical skills and the increasing demand for accountability to the public has revealed that there is no infrastructure for the objective assessment of technical skills. Several investigators are validating many different systems for training and evaluation, using different tests, criteria, validation methods and even nomenclature. This workshop is an attempt to establish a standardization of nomenclature and assessment methodologies so the surgical education, training and evaluation community can communicate with a common language and have a common basis for comparing statistics from different centers. The results of this workshop are to be considered a first order approximation from the community of subject matter experts that can provide a "straw man" for future refinement.
DTIC
Computerized Simulation; Certification; Training Evaluation

20030000693 Naval Medical Research Center, Silver Spring, MD USA
Operational Medical Issues in Hypo- and Hyperbaric Conditions
Kayer, Susan R.; Dromsky, David M.; Jun. 2001; 7p; In English; Original contains color images
Report No.(s): AD-A407533; NMRC01-092; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
DECOMPRESSION SICKNESS RISK REDUCTION was sought throughout the twentieth century by adjusting dive duration and depth combinations. These adjustments hypothetically minimized inert gas supersaturation in tissues during decompression. The newest efforts in decompression sickness research by scientists at the -U.S. Naval Medical Research Center in Silver Spring Maryland are focused on fundamentally different approaches. We are seeking means of reducing decompression sickness risk by actively eliminating a critical portion of the body's inert gas load; by increasing the volume of inert gas held in solution by the blood; or by blocking the body's response to intravascular bubbles.
DTIC
Decompression Sickness; Intravascular System; Pressure Reduction; Rare Gases

20030000694 Texas Univ., Health Science Center, Houston, TX USA
Japanese Encephalitis Vaccine Cost-Benefit Analysis: Is the Pain Worth the Gain for U.S. Armend Forces Active Duty Dependents Living on Okinawa, Japan?
Hartwich, Scott A.; Aug. 2002; 45p; In English
Report No.(s): AD-A407532; CI02-625; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Japanese encephalitis (JE) is an arboviral disease of major public health importance in Asia, causing approximately 40,000 clinical cases each year. JE infection leads to a viral encephalitis in approximately 1 in 200 infections. Incidence rates of clinical infection range from 1 to 10 per 10,000 persons in areas where JE is endemic. Fatalities approach 25% and residual neurologic sequelae in 30% of cases. Culex mosquitoes, primarily Culex tritaemorhynchus, transmit the virus from viremic animals, mostly domesticated pigs and Ardeid birds (Herons/Egrets), to humans in a seasonal pattern. Drug treatment does not exist, and thus vector control and immunization are currently used as main control measures. Japanese encephalitis may result in a febrile illness with neurological symptoms ranging from headache to meningitis or encephalitis. Symptoms can include: headache, fever, meningeal signs, stupor, disorientation, coma, tremors, seizures, paresis, hypertonia, and loss of coordination. The encephalitis

cannot be clinically distinguished from other central nervous system infections. Etiological diagnosis of JE is mainly based on serological testing, using IgM-capture ELISA, which detects specific IgM in CSF or in the blood of almost patients within 4-7 days of onset of disease.
DTIC
Infectious Diseases; Immunology; Cost Analysis

20030000698 National Inst. of Health, Bethesda, MD USA
Coadministration of Either Cyclosporine or Steroids with Humanized Monoclonal Antibodies Against CD80 and CD86 Successfully Prolong Allograft Survival After Life Supporting Renal Transplantation in Cynomolgus Monkeys
Hausen, Bernad; Klupp, Jochen; Christians, Uwe; Higgins, John P.; Baumgartner, Roxanne E.; Sep. 27, 2001; 20p; In English
Report No.(s): AD-A407525; NMRC01-085; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent studies have shown some efficacy using monotherapy with monoclonal antibodies (mAb) against CD8O and CD86 receptors after life-supporting renal transplantation in non-human primates. Our study was designed to evaluate the efficacy of combinations of the same mAbs with either microemulsion cyclosporine (CsA) or steroids.
DTIC
Life Support Systems; Steroids; Grafting

20030000699 National Inst. of Health, Bethesda, MD USA
Treatment with the Humanized CD154-Specific Monoclonal Antibody, hu5C8, Prevents Acute Rejection of Primary Skin Allografts in Nonhuman Primates
Elster, Eric A.; Xu, He; Tadaki, DOuglas; Montgomery, Sean; Burkly, Linda; Nov. 15, 2001; 12p; In English
Report No.(s): AD-A407521; NMRC01-074; No Copyright; Avail: Defense Technical Information Center (DTIC)
Allogeneic skin transplantation remains a rigorous test of any immune intervention designed to prevent allograft rejection. to date no single clinically available immunosuppressant has been reported to induce long-term primary skin allograft survival in privates. We have previously shown that treatment with the humanized CD 154- specific monoclonal antibody humanized 5C8 (hu5C8) induces long-term renal allograft survival in nonhuman privates. In this study we evaluated the efficacy of hu5C8 in preventing primary skin allograft rejection in rhesus monkeys.
DTIC
Primates; Grafting; Survival

20030000700 National Inst. of Health, Bethesda, MD USA
Cytokine Polymorphic Analyses Indicate Ethnic Differences in the Allelic Distribution of Interleukin-2 and Interleukin-6
Cox, E. D.; Hoffman, Steven C.; DiMercurio, Barbara S.; Wesley, Robert A.; Harlan, David M.; Dec. 03, 2000; 8p; In English
Report No.(s): AD-A407520; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Polymorphisms in the regulatory regions of cytokine genes affect protein production and are associated with allograft outcome. Ethnic origin has been identified as a significant prognostic factor for several immune-mediated diseases and for outcome after allotransplantation. A clear relationship between cytokine polymorphisms and ethnicity has not been shown.
DTIC
Genes; Polymorphism; Grafting; Immune Systems

20030000701 National Inst. of Health, Bethesda, MD USA
Successful Conversion from Conventional Immunosuppression to Anti-CD154 Monoclonal Antibody Costimulatory Molecule Blockade in Rhesus Renal Allograft Recipients
Cho, Clifford S.; Burkly, Linda C.; Fechner, John H., Jr.; Kirk, Allan D.; Apr. 02, 2000; 13p; In English
Report No.(s): AD-A407518; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Several conventional forms of immunosuppression have been shown to antagonize the efficacy of anti-CD154 monoclonal antibody- (mAb) based costimulatory molecule blockade immunotherapy. Our objective was to determine if allograft recipients treated with a conventional immunosuppressive regimen could be sequentially converted to anti-CD154 mAb monotherapy without compromising graft survival.
DTIC
Calculi; Kidneys; Antibodies; Immunology; Transplantation

20030000703 Naval Medical Research Center, Silver Spring, MD USA
Maturation Phenomenon in Cerebral Ischemia IV
Bazan, N. G.; Ito, U.; Marcheselli, V. L.; Kuroiwa, T.; Klatzo, I.; Jan. 2001; 7p; In English
Report No.(s): AD-A407512; NMRC01-044; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Young animals were previously shown to be more resistant to ischemia than were adult animals. This difference was attributed to maturation/function of gonads and/or neurons. This study evaluated the existence of age-related changes in transcriptional expression of HSC70, HSP72, and c-fos mRNA intransient global ischemia, and their possible relationship to neuronal cell survival in CA1 hippocampus. The results indicated that ischemic response in young animals compared with that in adult animals showed: (1) more rapid and /or prolonged expression of HSC70, HSP72, and c-fos mRNAs; (2) a marked induction of HSP72 protein; and (3) enhanced pyramidal cell survival. The observed endogenous 'tolerance' of CA1 neurons in young gerbils to ischemia/reperfusion injury may be related to the expression of HSC70, HSP72 and c-fos.
DTIC
Ribonucleic Acids; Ischemia; Cells (Biology); Cerebrum; Immunity

20030000704 National Inst. of Health, Bethesda, MD USA
Human Platelets Activate Porcine Endothelial Cells through a CD154-Dependent Pathway
Xu, H.; Arnaud, F.; Tadaki, D. K.; Burkly, L. C.; Harlan, D. M.; Kirk, A. D.; Dec. 15, 2001; 9p; In English
Report No.(s): AD-A407509; NMRC01-041; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Delayed xenograft rejection is associated with endothelial cell activation platelet sequesnation and subsequent thrombosis. We evaluated whether human platelets could directly activate porcine endothelum (PEC) and if so whether this was mediated by an interaction between platelet-bound CD 154 and PEC CD40.
DTIC
Cells (Biology); Endothelium; Blood Coagulation; Platelets

20030000706 University of Western Ontario, London, Ontario Canada
Lymphatic Metastasis of Breast Cancer Cells: Development of In Vivo Video Microscopy to Study Mechanisms of Lymphatic Spread ***Final Report, 1 Jun. 2001-31 May 2002***
MacDonald, Ian C.; Jun. 2002; 20p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0668
Report No.(s): AD-A407505; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Metastasis via the lymphatic system is considered a major factor in mortality from breast cancer. At present there are no models for direct measurement of tumor cell spread by lymphatics. This is needed for understanding basic biology of lymphatic involvement developing treatments and assessing their effectiveness. Purpose: to develop and assess IVVM for imaging the morphology and fluid dynamics of lymphatic vessels in mouse models during tumor development. Scope: Assessment of the concept that in vivo video microscopy (IVVM) can be used for studying experimental cancer spread via the lymphatic system. Methods: Primary tumors were formed by intradermal injection of cancer cells (ventral midline between inguinal lymph nodes). IVVM was used to examine lymphatics on one side (skinflap under anesthesia, 1-25 days post injection); conventional histology used to examine other side. Results: Tumor formation was accompanied by a well developed lymphatic network adjacent to the tumor and enlarged lymphatic vessels with valves in tissues between the tumor and lymph nodes as seen by histology and IVVM. by IVVM, lymphatic endothelium and cells carried by lymph flow could be clearly seen. Conclusion: IVVM is a powerful tool for studying cancer cells as they interact with the lymphatic system.
DTIC
Lymphatic System; Metastasis; Cells (Biology); Mammary Glands; Cancer; Tumors

20030000707 Minnesota Univ., Minneapolis, MN USA
Role of IRS-1 Phosphorylation in IGF-1 and IL-4 Signaling in Breast Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Sachdev, Deepali; Jun. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-00-1-0347
Report No.(s): AD-A407504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Insulin-like growth factor 1 (IGF-1) stimulates proliferation of MCF-7 cells via the type I IGF(receptor (IGF 1 R) and causes phosphorylation of the adaptor protein, insulin receptor substrate-i (IRS- i). interleukin 4 (IL-4) inhibits breast cancer cells and also phosphorylates IRS-i. The hypothesis is that IGF-1 and 1L4 phosphorylate different residues with IGF-1 treatment targeting IRS-i for degradation via the proteasome. The goal of this project is to identify amino acids of IRS-i phosphorylated by IGF-1 compared to IL-4 using two dimensional electrophoresis (2DE) of phosphorylated IRS-i. Several technical difficulties and

limitations of 2DE have been encountered and impeded the completion of the tasks, Unfortunately, it appears that the large size, abundance in cells, and perhaps charge of IRS-i may make it difficult to use this technique. Despite sustained efforts, it has not been possible to detect IRS-i after 2DE. As the long-term objective of my training is to identify% new targets for breast cancer therapy, I have also worked on another project to inhibit IGF-1 action in breast cancer cells using a humanized single chain antibody against IGF - 1 R. In the coming year, work will be continued on 2DE of IRS-i along with an alternate approach of mutating residues in the putative destruction box motif of IRS-i in an attempt to inhibit the mitogenic effects of IGF-1.
DTIC
Electrophoresis; Phosphorylation; Cancer; Mammary Glands; Immune Systems

20030000708 Washington State Univ., Pullman, WA USA
Blocking HER-2-Mediated Transformation With a Dominant Negative Form of HER-3 ***Annual Report, 1 Jun. 2001-31 May 2002***
Ram, Tracy G.; Jun. 2002; 28p; In English
Contract(s)/Grant(s): DAMD17-00-1-0490
Report No.(s): AD-A407503; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Amplification of the HER-2 gene often leads to breast cancer by causing cells to make abnormally high levels of the wild-type HER-2 protein. Evidence now shows that the interaction between HER-2 and HER-3 leads to the constitutive activation of HER-2/HER-3 heterodimers in breast cancer cells with HER-2 gene amplification, and HER-2!VIER-3 potently activates multiple signal transduction pathways involved in mitogenesis. This indicates that inhibition of the interaction between HER-2 and HER-3 may be an especially effective and unique strategy for blocking the effects of HER-2 in human breast cancer cells. Therefore, we constructed a bicistronic retroviral expression vector that codes for a dominant negative form of HER-3 that can inactivate the function of HER-2/ HER-3. Dominant negative HER-3 also specifically inhibited proliferation induced by heregulin (the ligand for HER-2/HER-3) as well as the growth factor-independent (i.e. autonomous) proliferation and anchorage-independent growth of breast cancer cells with HER-2 gene amplification. We now propose to use dominant negative HER-3 vectors in experiments to determine the effectiveness of dominant negative HER-3 for blocking HER-2/HER-3 activation, signaling and growth in culture and in vivo for different breast cancer cell lines with HER-2 gene amplification.
DTIC
Genes; Cells (Biology); Proteins; Mammary Glands; Cancer; Autonomy; In Vivo Methods and Tests

20030000709 California Univ., Los Angeles, CA USA
The Advantages of Multi-Epitope Tumor Antigens as an Approach to Treating Breast Cancer ***Annual Report, 1 Jul. 1998-30 Jun. 2002***
Kiertscher, Syvia M.; Jul. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-98-1-8181
Report No.(s): AD-A407499; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Dendritic cells (DC) are an integral part of the immune system's response to cancer. In preparation for treating breast cancer patients with DC, this proposal examines a fundamental issue that needs to be resolved before proceeding with this exciting new therapy. We hypothesized that the processing and presentation of multiple tumor antigen epitopes by DC is a more efficient and effective way of stimulating T cell responses than current HLA-restricted peptide-based methods. The goal of this proposal is to develop practical methods by which immune cells from patients with breast cancer can be used to promote effective anti-tumor responses. In the past year, we have continued investigations to compare the various antigen-arming methods. We have determined that T cells stimulated with apoptotic tumor-loaded DC show both tumor-peptide-specific reactivity (as assessed by MHC-HLA-A2-E75 tetramer staining), as well as enhanced responsiveness to Her-2 and other tumor antigens (as assessed by antigen-specific interferon-y production) . In addition, we have established that helper-dependent adenoviral vectors are a viable alternative to El-deleted adenoviral vectors for the expression of tumor antigens in DC. These research findings support our overall hypothesis, and the work accomplished this year has resulted in two abstracts and two manuscripts.
DTIC
Antigens; Mammary Glands; Cancer; Cells (Biology); Peptides

20030000710 Beth Israel Deaconess Medical Center, Boston, MA USA
Rb Associated Protein 46: Roles in Progression of Proliferative Breast Cancer ***Annual Report, 15 Jun.-2001-14 Jun. 2002***
Wang, Zhao Y.; Li, Guan C.; Jul. 2002; 15p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-001-1-0156
Report No.(s): AD-A407498; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our research program is focused on the study of Rb associated protein 46 (RbAp46), a novel tumor suppressor gene we recently identified and cloned. Long term goal of this study is to understand the role of RbAp46 in abnormal growth of mammary epithelial cells, in particular, the effects of constitutive and high levels of RbAp46 expression on the early development of breast cancer. In the past year (months 13-24), we have finished in vivo xenograft experiments proposed for months 1-12. Furthermore, we have established stable cell lines that express exogenous RbAp46 from human breast cancer cells, MCF7, MDA-MB-231 and MDA-MB-436, and found that high levels of RbAp46 expression strongly inhibit malignant features of these breast cancer cells. We have also found that expression levels of beta-catenin, an important signaling molecule, were downregulated in RbAp46-transfected cells compared with control cells. The lower levels of t3-catenin were restored by treatment of cells with proteasome inhibitors. We further discovered that the levels of GSK-3 beta expression were upregulated and beta-catenin/Tcf-mediated transcription pathway was strongly downregulated in RbAp46-transfected cells.
DTIC
Proteins; Cancer; Mammary Glands; Tumors; Tissues (Biology)

20030000711 Society for In Vitro Biology, Largo, MD USA
2001 Congress on In Vitro Biology ***Final Report, 1 Jul. 2001-31 Dec. 2001***
Harbell, John W.; Jul. 2002; 102p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0784
Report No.(s): AD-A407495; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Partial contents: Risk Communication Workshop Scientists and the Public: Handling Controversial Issues, Biotechnology Risk Communication Training -In-depth Training Which Meets Your Needs, Advanced Tissue Culture Workshop: Assays for Cell Viability, Educational Outreach Program - A Hands-on Workshop to Help Students Meet New National Science Education Standards, Artificial Chromosomes, Development and Application of Cell Models for Pre-clinical Research, The Deployment of Transgenic Trees,Beyond the Genome: Functional Genomics,The Proteomics Approach to Understanding a Biological System, Interactive Poster Session: Secondary Metabolism, Interactive Poster Session: Disease Resistance, Interactive Poster Session: In Vitro Toxicology, Plenary Session: Opportunities and Challenges in Plant Biotechnology to Benefit Health and Sustainability", Insect Hormones and Applications for Pest Control, Reproductive Health: Assessing the Role of Endocrine Disruptors In Vitro, Applications of In Vitro Culture for Habitat Restoration, Contributed Paper Session: Dicot Transformation, Nutraceuticals/Edible Vaccines, ABC Transponers: Their Role in Mufti-drug Resistance, Bioavailability, and Drug-drug Interactions, Interactive Poster Session: Dicot Transformation, Interactive Poster Session: Part I: evaluation of Cryopreservation Techniques, Part II: Human Epidermal Keratinocytes... Regulatory Affairs/Public Acceptance, The Importance of Controls for In Vitro Biology.
DTIC
Biotechnology; Cells (Biology); Clinical Medicine; Culture Techniques; Metabolism; Endocrinology; In Vitro Methods and Tests

20030000712 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Nuclear Patch Clamping for Determining Ion Channel Activities of Bcl Apoptosis Proteins in Endoplasmic Reticulum and Nuclear Envelope Intracellular Membrane ***Final Report, 1 Jul. 1998-30 Jun. 2002***
Koskett, James K.; Jul. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-98-1-8229
Report No.(s): AD-A407494; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Apoptosis plays a critical role in growth and development of the mammary gland in normal and pathologic states. An important regulator of apoptosis is the bcl-2 oncogene, whose expression prevents apoptosis and is associated with poor responses to cancer therapies. Other bcl-2-related genes have been identified, defining a gene family with anti- and pro- apoptotic members. The molecular mechanisms which link bcl proteins to apoptosis are unclear. bcl-X% forms ion channels in artificial membranes. to determine whether these proteins form or regulate ion channels in the endoplasmic reticulum in vivo, we have employed a novel Xenopus oocyte nuclear envelope patch-clamp technique. During the second funding period, we have developed a novel mammalian expression system for patch clamp electrophysiology of recombinant endoplasmic reticulum localized membrane proteins. The system has been validated, and it will now be possible to use it for expression of bcl-reated proteins. We discovered that caspase 3, a key intermediate in apoptosis pathways, cleaves the inositol trisphosphate receptor calcium channel in the endoplasmic reticulum, and causes it to become spontaneously activated, leaking calcium into the cytoplasm. This observation may provide a molecular insight into disruption of calcium homeostasis observed in apoptosis. We will determine whether other caspases have similar effects. In addition, we will examine the cellular consequences of this effect, and whether its modulation affects the time- course or extent of apoptosis.
DTIC
Apoptosis; Mammary Glands; Cancer; Pathology; Oncogenes; Endoplasmic Reticulum

20030000713 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA

Downregulation of Breast Cancer Gene Expression by Small Molecule Drugs ***Annual Report, 1 Jun. 2001-31 May 02***

Yennu Nanda, Vashisht G.; Jun. 2002; 14p; In English

Contract(s)/Grant(s): DAMD17-01-1-0305

Report No.(s): AD-A407493; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over-expression of the HER-2/neu oncogene in breast cancers is associated with aggressive tumor formation, shorter relapse times and higher chemo-resistance. In an effort to transcriptionally downregulate HER-2/neu expression, we have targeted the gene promoter's TATA box with DNA minor groove-binding hairpin polyamides. The DNA-binding specificity and affinity of a 6 bp-binding hairpin polyamide for the Her-2/neu TATA box was determined by the combinatorial method REPSA and confirmed by DNase I footprinting. EMSA studies showed that the hairpin polyamide could inhibit TBP binding to the HER-2/neu TATA box at nanomolar concentrations. A preliminary analysis using a promoter reporter construct in SKBR-3 breast cancer cells revealed that this polyamide molecule could indeed interfere with transcription from the Her-2/neu promoter.

DTIC

Genes; Mammary Glands; Cancer; Drugs

20030000714 North Carolina Univ., Chapel Hill, NC USA

Developing Strategies to Block Beta-Catenin Action in Signaling and Cell Adhesion During Carcinogenesis ***Final Report, 1 Jul. 1998-30 Jun. 2002***

Peifer, Mark A.; Jul. 2002; 45p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8223

Report No.(s): AD-A407492; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To understand cancer, we must first understand normal cell behavior. Drosophila Armadillo (Arm) and its human homolog B-catenin are key players in adhesive junctions and in transduction of Wingless (Wg) /Wnt signals. Our working hypotheses are: 1) Several protein partners compete to bind Arm, and 2) Arm:dTCF activates Wg-responsive genes, while dTCF alone represses the same genes. Aim 1 is to understand how different partners compete with one another for binding Arm. Aim 2 focuses on how Arm and dTCF positively and negatively regulate Wg-responsive genes. We made significant progress on both Aims. We used the two-hybrid system to further define the Arm binding site on DE-cadherin and extended our analysis of the effect of point mutations on binding. Our collaborators at the Weizmann Institute completed a parallel analysis in mammalian cells, assessing the ability of cadherin-derived peptides to compete Beta-catenin from its endogenous partners. This work was published in Molecular Biology of the Cell. We have also introduced into transgenic flies mutant versions of DE-cadherin which should specifically block Arm or p120 catenin binding. We characterized the role of TCF and Groucho in transcriptional repression of Wg-responsive genes. This work was published in Nature. We characterized the role of the C-terminus of Armadillo in transcriptional activation this work was published in Genetics.

DTIC

Cells (Biology); Carcinogens; Mammary Glands; Genetics

20030000715 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Identifying and Reaching Populations at Risk: The Paradox of Breast Cancer Control ***Annual Report, 1 Jul. 2001 30 Jun. 2002***

Armstrong, Katrina A.; Jul. 2002; 67p; In English

Contract(s)/Grant(s): DAMD17-01-1-0596

Report No.(s): AD-A407491; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

"Identifying and Reaching Populations at Risk: the Paradox of Breast Cancer Control," examines the shifting demographics of the medically underserved and identifies sociocultural factors that act as new or previously unobserved barriers to mammogram utilization. This work will provide an expanded model of underservedness, which will form the foundation of a clinical research program to extend socio-culturally appropriate breast cancer screening to the underserved. We use qualitative methodology to document the shifting sociocultural, socioeconomic and logistical barriers to mammography and understand the underlying logic supporting and perpetuating these barriers. Results will serve as a basis for identifying inter- and intra-cultural barriers to breast cancer screening. The guiding assumption of this work is that identifying the shifting demographics of medical underservedness for mammography, identifying barriers, and making recommendations for removal of barriers across populations will improve inter-cultural compliance in breast cancer screening. Additionally, we hypothesize that understanding sociocultural barriers to breast cancer screening is the first step toward developing practical guidelines for intra-culturally-competent breast cancer

prevention, making it possible for health care practitioners to work with patients who would benefit from increased Screening efforts and new technologies that offer the promise of finding breast cancers in their earliest, most treatable stages.
DTIC
Cancer; Mammary Glands; Populations; Prevention

20030000716 Kentucky Univ., Lexington, KY USA
Research Training in Biopsychosocial Breast Cancer Research ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Andrykowski, Michael A.; Jul. 2002; 75p; In English
Contract(s)/Grant(s): DAMD17-99-1-9245
Report No.(s): AD-A407490; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report summarizes activities and accomplishments during the third year of a four year training program in biopsychosocial breast cancer (BC) research. Three trainees (1 postdoctoral; 2 predoctoral) were reappointed to the training program in July, 2001. Research training was furnished by a multidisciplinary faculty of six. The training program consists of 5 components, all of which were successfully implemented during 2001- 2002. Training faculty and trainees participated in a biweekly BC seminar which allowed for oversight of trainee activities, didactic presentation of clinical aspects of BC, and discussion of ongoing and anticipated BC-related research projects. Trainees also received supervised guidance in all phases of the research enterprise. Specifically, trainees participated in: (1) development and implementation of one group research project; (2) ongoing data collection, preparation, and analysis for 2 other ongoing group projects; and (3) manuscript preparation for 3 completed research projects. Both predoctoral trainees completed didactic course requirements. One new predoctoral and 1 new postdoctoral trainee were recruited and appointed for 2002-2003. One current predoctoral and 1 current postdoctoral trainee were reappointed for 2002-2003.
DTIC
Cancer; Mammary Glands; Medical Science

20030000717 Albany Medical Coll., NY USA
PAI-1 Gene as a Target for Breast Cancer Therapy ***Final Report, 1 Apr. 1998-31 Mar. 2002***
Higgins, Paul J.; Apr. 2002; 67p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8015
Report No.(s): AD-A407489; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This final report details in vitro and in vivo growth characteristics of stable lines of human breast carcinoma cells (developed throughout this study) that synthesized varying levels of plasminogen activator inhibitor type-1 (PAI-1) as a result of transfection with expression vectors bearing PAI-1 cDNA inserts cloned in sense and antisense orientations. A selected set of tumor cell lines (based on level of PAI-1 expression perturbation) was completely characterized with regard to specific in vitro motile traits (chemokinesis, chemotaxis, 2-D planar migration, barrier invasion). PAI-1 synthesis was required for tumor cell migration in directed as says since anti sense targeting effectively suppressed cell motility. These results were confirmed with neutralizing PAI-1 antibodies and exogenously-supplied recombinant PAI-1 protein. A expression vector was created in which PAI-1 promoter sequences were used to drive expression of a chimeric PAI-1-GFP insert. This vector confirmed PAI-1 expression in locomoting cells and PAI-1 deposition into migration trails suggesting its use as a tool to track metastatic tumor cells in vivo. PAI-1 down-regulation slowed human breast cancer implant growth in nude mice and inhibited lung colonization suggesting a therapeutic benefit to PAI-1 gene targeting.
DTIC
Mammary Glands; Gene Therapy; Cancer; Antibodies; In Vitro Methods and Tests

20030000718 Kimmel (Sidney) Cancer Center, San Diego, CA USA
Transfer of T Cell Specificity for the Treatment of Breast Cancer: A Preclinical Study ***Final Report, 4 Jun. 2001-3 Jun 2002***
Gold, Daniel P.; Lustgarten, Joseph; Jul. 2002; 7p; In English
Contract(s)/Grant(s): DAMD17-01-1-0624
Report No.(s): AD-A407487; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Overexpression of Her-2/neu is one of the major alterations in breast cancer and is associated with metastatic disease, poor prognosis and overall survival. Her-2/neu is a self antigen, therefore, self-tolerance is a major burden for the induction of effective antitumor immune responses. Clinical trials show that immunizations with neu-antigens do not promote a potent protective mediated immune response. In order to develop a therapy to target Her-2/neu expressing tumors, we have devised a strategy where we can endow T cells with antitumor specificity and bypass the effect of self-tolerance. We developed an approach by genetic

engineering where we have genetically altered T cell populations to express high affinity T cell receptors (TCR) chains specific for Her-2/neu. High affinity TCR were obtained from A2.1 transgenic mice immunized with A2. 1 -Her-2/neu immunodominant epitopes. The TCR genes from the CTLs were cloned and engineered to be expressed on T cells. T cells expressing these engineered TCR can recognize and kill Her-2/neu expressing breast tumors. These results demonstrate a novel strategy to target Her-2/neu positive tumors for the treatment of breast cancer.
DTIC
Mammary Glands; Cancer; Cells (Biology); Therapy; Tumors; Immune Systems

20030000719 Burnham Inst., La Jolla, CA USA
Sequence Motifs Specifying Homing and Metastasis to Bone ***Final Report, 1 Jul. 1998-30 Jun. 2002***
Millan, Jose L.; Jul. 2002; 25p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8165
Report No.(s): AD-A407485; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Our overall aim was to identify peptide motifs or molecules that may mediate the specific homing of metastatic tumor cells to bone. Our approaches involved the use of random peptide libraries expressed on the surface of filamentous phage as well as an expression cloning strategy using immortalized bone marrow stromal and endothelial cells to detect the binding of Cos-l cells transfected with cDNAs from the bone metastatic MDA-MB-23 I breast cancer cell line. Using both these approaches we have successfully identified two novel CDNAs (A3 and A5) by expression cloning and one novel cDNA of unknown function by a new in vivo targeting strategy. These experimental approaches will lead to the discovery of molecules that may help us uncover the basis mechanisms of bone metastasis by cancer cells which remains today one of fundamental unresolved problems in tumor biology. Furthermore, identification of bone specific homing sequences could enable us to design vectors to be used in gene therapy of genetic diseases effecting bone and/or to block bone metastasis.
DTIC
Cancer; Bones; Metastasis; Bone Marrow; Bacteriophages; Mammary Glands

20030000720 Hadassah Medical Organization, Jerusalem, Israel
Involvement of Heparanase in Breast Carcinoma Progression ***Annual Report, 1 Jun. 2001-31 May 2002***
Vlodavsky, Israel; Friedmann, Yael; Peretz, Tamar; Jun. 2002; 22p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0278
Report No.(s): AD-A407484; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Cellular localization of heparanase was found to be a major determinant of its pro-metastic and pro-angiogenic properties. While normally, the human enzyme is localized mostly in late endosomes and lysosomes, both the cellular content and secretion of heparanase were stimulated by estrogen. Estrogen may thus promote breast cancer progression through stimulation of heparanase transcription and secretion. Processing and activation of latent heparanase by MDA-435 breast carcinoma cells was inhibited by maspin, but not by BBI (Bowman-Birk inhibitor). BBI was applied to increase the yield of active heparanase, since it efficiently inhibited degradation of the enzyme by cellular proteases. Primary tumors produced by MCF-7 breast carcinoma cells over-expressing a secreted form of heparanase, elicited a potent angiogenic response and grew faster than tumors produced by MCF-7 cells expressing the intracellular enzyme. Mammary glands of pregnant transgenic mice over-expressing heparanase exhibited a massive branching of ducts, hyperplasia and basement membrane (BM) disruption, associated with intense neovascularization of the mammary tissue. we applied a ribozyme targeting approach to suppress heparanase expression in MDA-435 breast carcinoma cells. A pronounced inhibition of heparanase activity and BM invasion was obtained. We identified lead species of heparin and laminaran sulfate that efficiently inhibit the enzyme. Our results further emphasize the involvement of heparanase in breast carcinoma progression.
DTIC
Metastasis; Mammary Glands; Cancer; Degradation; Determinants; Lysosomes; Tissues (Biology); Tumors

20030000721 Northwestern Univ., Evanston, IL USA
Imaging of Early-Stage Breast Cancers Using Pulsed Confocal Microwave Technology ***Annual Report, 1 May 1999-30 Apr. 2002***
Popovic, Milica; Taflove, Allen; May 2002; 46p; In English
Contract(s)/Grant(s): DAMD17-99-1-9335
Report No.(s): AD-A407479; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The work presented in this report is motivated by the need to calibrate a new pulsed-microwave breast tumor detection system for patient-specific skin parameters. A two-dimensional time-domain inverse-scattering algorithm based upon the

finite-difference time-domain method is presented for determining the skin thickness and the relative permittivity and electric conductivity of skin in the microwave range. The algorithm traces a search trajectory in the two-dimensional parameter space. The minimal parameter estimation error along this trajectory yields a set of approximate parameter values. It is shown that the convergence of the inverse-scattering technique depends on the shape and the duration of the illuminating electromagnetic wave pulse chosen for the electrical parameter reconstruction. The time-domain nature of the inverse algorithm allows for limiting the region of inversion using causality. Thus, when the parameters of the skin are estimated, the skin thickness can be determined by comparing the measurement with a simulated all-skin response. Finally, the time-domain inverse-scattering algorithm is tested for robustness in the presence of broadband Gaussian noise. We note that the causality of the algorithm can then be exploited for the underlying breast tissue parameter recovery using the same methodology.
DTIC
Mammary Glands; Cancer

20030000722 RAND Corp., Santa Monica, CA USA
Implementing the Post-Deployment Health Practice Guideline: Lessons from the Field Demonstration
Farley, Donna 0.; Vernez, Georges; Pieklik, Suzanne; Curry, Sherilyn; Jan. 2002; 73p; In English
Contract(s)/Grant(s): DASW01-01-C-0003
Report No.(s): AD-A407471; RAND/DB-383-A; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The Office of the Secretary of Defense/Office of Health Affairs (OSD/HA) is working with the Deployment Health Clinical Center, the Army Quality Management Directorate, and the Army Center for Health Promotion and Preventive Medicine in the implementation of the Department of Defense (DoD)/Department of Veterans Affairs Veterans Health Administration (VA) practice guideline for primary care management and evaluation of patients with post-deployment health (PDH) concerns. This guideline was implemented throughout the Military Health System beginning in January 2002. Under a contract with the Army Medical Department, RAND contributed to preparation for this initiative by (1) providing technical support to the leadership team, (2) guiding design of a demonstration in which the practice guideline and implementation approaches were field-tested, and (3) performing an evaluation of the demonstration. The evaluation was designed to provide information from the field to help DoD establish policy and practices for effective use of the PDH guideline across the Military Health System. Work on this project began in December 2000 under the policy direction of OSD/HA and its collaborating agencies. A tool kit of materials to support use of the guideline was prepared and key metrics were selected for monitoring implementation progress. Three military treatment facilities (MTFs) agreed to participate in the six-month demonstration, which began in March 2001 with a two-day conference at which the MTF teams prepared implementation action plans. This documented briefing presents the results of the RAND evaluation of the field demonstration for implementation of the PDH practice guideline. The primary audience for the document is the leadership of the Military Health System, but the findings also should be of interest to policymakers and practitioners interested in effective use of practice guidelines to achieve clinical practice.
DTIC
Clinical Medicine; Medical Services

20030000798 Toronto Univ., Ontario Canada
Regulation of the Mevalonate Pathway for the Prevention of Breast Cancer ***Annual Report, 1 Jul. 2001-1 Jul 2002***
Archer, Michael C.; Aug. 2002; 22p; In English
Contract(s)/Grant(s): DAMD17-99-1-9409
Report No.(s): AD-A407549; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The central hypothesis we are addressing is that inhibition of mammary carcinogenesis by n-3 polyunsaturated fatty acids (PUFAs) can be accounted for by their inhibitory effect on the cholesterol biosynthesis (mevalonate) pathway. In Task 3, we have shown that the n-3 PUFA docosahexaenoic acid (DHA) inhibits MCF-7 cell proliferation in part though inhibition of mevalonate synthesis. Mechanisms other than inhibition of mevalonate synthesis, however, appear to be responsible for the inhibitory effects of eicosapentaenoic acid (EPA) on growth of MCF-7 cells. In Task 4 (new), we determined that mevalonate promotes the growth of mammary tumors in nude mice, and of human breast cancer cells in culture. This effect is associated with alterations in Gl regulatory proteins that support initiation of DNA synthesis. This finding has major significance for both prevention and treatment of mammary cancer, since mammary mevalonate synthesis may be increased by common treatments that lower serum cholesterol levels (e.g. use of bile acid sequesterants and statins). Our work will provide a basis for understanding the protective effects of n-3 PUFAS and perhaps other dietary factors on breast cancer development and may lead to mechanism-based strategies for the prevention of breast cancer.
DTIC
Cholesterol; Cancer; Body Fluids; Prevention; Carcinogens

20030000799 Xavier Univ. of Louisiana, New Orleans, LA USA

Involvement of Reactive Oxygen Species in Breast Cancer Cells Development, Maintenance and Death ***Final Report, 1 Jul. 2000-30 Jun. 2002***

Rosenzweig, Nitsa; O'Connor, Kim; Jansen, David; Jul. 2002; 110p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0507

Report No.(s): AD-A407551; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Oxygen Free Radicals (OFR) have different effects on cellular processes. They were implicated in cell damage, apoptosis, and carcinogenesis. The hypothesis of this proposal is that the effect of OFR is concentration dependent. At high concentration OFR cause damage, at low concentration they cause apoptosis, and at even lower concentration they fail to activate the apoptosis signal, leading to the development of cancer. to test this hypothesis we proposed to measure the level of OFR in normal and cancer breast cell lines and primary human breast tissue, and to correlate the OFR concentration with apoptosis and carcinogenesis. We have shown, in cell-line, that there is a correlation between the growth curve, number of apoptotic cells, and number of dead cells and the concentration of H202 added to the culture. We also showed correlation between Cytochrome P-450 activity and the OFR levels, connecting the regulation of OFR to the Cytochrome P-45O.

DTIC

Apoptosis; Carcinogens; Cytochromes; Death

20030000800 Georgetown Univ., Medical Center, Washington, DC USA

Structural-Based Design of ErbB-2 Selective Small Molecule Kinase Inhibitors ***Annual Report, 1 Jul. 2001-30 Jun. 2002***

Wang, Shaomeng; Jul. 2002; 10p; In English

Contract(s)/Grant(s): DAMD17-00-1-0274

Report No.(s): AD-A407553; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the first year, this task has been successfully completed. A summary on this task has been included in the 2001 Annual Report submitted to the DOD. We have used three template protein structures all with high resolution to model the active conformations of erbB-2 and EGFR. These template protein structures include the structure of the kinase domain of the insulin receptor kinase bound to an ATP analog and a peptide substrate, which was determined with X-ray crystallography to an accuracy of 1.9 A (PDB code: lIR3), the kinase domain of the human FGFRl, either alone or in the complex with a small molecule kinase inhibitor SU4984, or SU5402, or PDl73074, whose structures were determined with X-ray crystallography to an accuracy of from 2.0 to 2.5 A (PDB codes: lFGK, LAGW, lFGI and 2FGI), and the structure of the human tyrosine protein C (SRC), whose structure was determined with X-ray crystallography to an accuracy of 1.5 A (PDB code: lFMK). These proteins share the highest degree of homology with erbB-2 and EGFR in their kinase domains among all the structures in the Protein Databank (PDB). We have then performed extensive refinement of these modeled structures of erbB-2 and EGFR through molecular dynamics simulations using the CHARMM program and its latest version of the force field in explicit water environment.

DTIC

Insulin; Cancer; Field Theory (Physics); Adenosine Triphosphate; Crystallography; Homology

20030000801 Harvard Medical School, Boston, MA USA

Managed Care Penetration and the Use of Screening Mammography by Uninsured Women ***Annual Report, 1 Jun. 2001-30 Jun 2002***

Garg, Pushkal P.; Jun. 2002; 7p; In English

Contract(s)/Grant(s): DAMD17-01-1-0527

Report No.(s): AD-A407552; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Between 1991 and 1997, the rate of mammography among uninsured women decreased in 30% of states. This decline may be due to the influx of managed care in many communities, which has eroded the ability of uninsured women to receive primary care, reduced the availability of mammography facilities, and increased waiting times for mammography. In this study we propose to examine whether there is an association between managed care penetration and rates of mammography among uninsured women between 50 and 64 years of age. We will compare these rates to mammography rates for women aged 50-69 with private or public coverage, including Medicare. to examine these hypotheses, we are conducting a longitudinal study using data from the Center for Disease Control and Prevention's (CDC's) Behavioral Risk Factor Surveillance System (BRFSS), InterStudy, and the Area Resource File (ARF) of the Bureau of Health Professions for the years 1997 to 2000. The results of our study may reveal opportunities for policymakers to intervene to reduce breast cancer morbidity and mortality among women, and prompt researchers to investigate the impact of other market factors on the use of mammography.

DTIC

Penetration; Cancer; Mammary Glands; Hypotheses

20030000803 RAND Corp., Santa Monica, CA USA
The Military Health System: How Might It Be Organized?
Aug. 19, 2002; 5p; In English
Report No.(s): AD-A407614; RAND/RB-7551-OSD; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Since the end of World War II, the issue of whether to create a unified military health system has arisen repeatdly. Some observers have suggested that a joint organization could potentially lead to reduced costs, better integrated health care delivery. a more efficient administrative process, and improved readiness. A recent RAND study done for the Under Secretary of Defense (Personnel and Readiness) developed organizational alternatives for the military health system and outlined trade-offs inherent in choosing among them. This analysis as reported in Reorganizing the Military Health System: Should there be a Joint Command? by Susan D. Hosek and Gary Cecchine concluded that careful consideration should be given to reorganizing TRICARE, the military's health care program for active and retired military members and their families, but that the additional benefits of a joint command are more difficult to assess.
DTIC
Armed Forces (USA); Medical Services

20030000810 California Univ., Dept. of Biochemistry, Berkeley, CA USA
Compression of cDNA and Inkjet Microarray Images
Jornsten, Rebeka; Yu, Bin; Wang, Wei; Ramchandran, Kannan; Jan. 2002; 4p; In English
Contract(s)/Grant(s): DAAG55-98-1-0341
Report No.(s): AD-A407645; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Microarray image technology is a powerful tool for monitoring the expression of thousands of genes simultaneously. Each microarray experiment produces immense amounts of image data, and efficient storage and transmission requires compression that utilizes microarray image's structure and unique analysis goals. Hence, we have developed a progressive compression scheme for microarray images which can be either lossy or lossless. Our scheme has a coded data structure that allows fast decoding and reprocessing of image subsets, and includes summary statistics and image segmentation information. Since visual fidelity is not the end goal for microarray images, we introduce a new measure of distortion for lossy compression: the sensitivity of microarray information extraction to compression loss. We find that a lossy compression ratio of 8:1 for cDNA microarrays minimally affects downstream processing. The average lossless compression ratio is 1.83:1 for cDNA images and 2.43:1 for inkjet images, comparable to state-of-the-art loss-less schemas, yet with added flexibility and information.
DTIC
Image Processing; Genes; Deoxyribonucleic Acid; Imaging Techniques

20030000811 Colorado Univ., Health Sciences Center, Denver, CO USA
Protein Kinase Pathways that Regulate Neuronal Survival and Death ***Annual Report, 1 Aug. 2001-31 Jul. 2002***
Heidenreich, Kim A.; Aug. 2002; 94p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9481
Report No.(s): AD-A407641; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Loss of post-mitotic neurons from the adult brain underlies the pathology of neurodegenerative diseases and neurotoxin expostire Neuronal cell death occurs by two mechanisms: necrosis and apoptosis. Apoptosis is a process whereby developmental cues and environmental stimuli activate a genetic program to implement a series of steps that culminate in cell death. An important aspect of apoptosis is that it can be halted and such interventions may rescue dying neurons. The overall goal of this project is to identity key protein kinases involved in regulating neuronal survival and apoptosis. The aims for the this year of funding as described in the Statement of Work were to: 1) Continue studies on protein kinase cascades that regulate neuronal survival, 2) Modulate the protein kinase cascades regulated by neurotrophic factors and determine the consequence on neuronal survival and death, and 3) Begin studies examining the cross-talk in pro-apoptotic and anti-apoptotic protein kinase signaling cascades. The progress made in these areas has resulted in 4 published manuscripts (plus 2 submitted articles) and 9 abstracts presented at national and international scientific meetings in 2002.
DTIC
Death; Apoptosis; Proteins; Survival; Neurophysiology

20030000812 New England Medical Center Hospitals, Boston, MA USA
Contribution of the Receptor/Ligand Interaction Between CD44 and Osteopontin to Formation of Breast Cancer Metastases ***Final Report, 1 Jul. 1998-30 Jun. 2002***
Weber, Georg F.; Jul. 2002; 161p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8060
Report No.(s): AD-A407640; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Cancer is characterized by dysregulated growth control, overcoming of cellular aging, and metastasis formation. The latter distinguishes malignant tumors from benign tumors and is mediated by groups of molecules called homing receptors, cytokines, and proteinases. Expression of these molecules on tumor cells determines when and where particular types of cancer spread. The physiologic role of the relevant receptors, cytokines, and proteases in the healthy, cancer-free organism has been incompletely understood. We have studied a homing receptor, known as CD44, and its ligand. the cytokine osteopontin. In host defense, CD44 and osteopontin play key roles in mediating delayed types of immune response that are important in tuberculosis, organ transplantation, and many forms of vaccination. Macrophages are the cells that mainly determine whether an immune reaction will have delayed (cell-mediated) or acute (antibody-mediated) characteristics, and osteopontin and CD44 direct macrophages to the former. The engagement of CD44 by osteopontin also induces macrophage migration, a mechanism that metastatic tumors may utilize in the process of dissemination. We have found that other gene products that contribute to dissemination of cancerous cells similarly contribute to host defenses, and we conclude that metastasis genes are developmentally non-essential genes which physiologically mediate stress responses. inflammation, wound healing, and blood vessel formation.
DTIC
Metastasis; Osteoporosis; Cancer; Mammary Glands; Stress (Psychology); Receptors (Physiology)

20030000813 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
Tumor Suppression and Sensitization to Taxol Induced Apoptosis of E1A in Breast Cancer Cells ***Annual Report, 1 Jun. 2001-31 May 2002***
Liao, Yong; Jun. 2002; 92p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0300
Report No.(s): AD-A407638; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this project is to study the molecular mechanisms underlying ElA's proapoptotic effect and anti-tumor activity and to dissect the functional domains of ElA that are critical for its antitumor activity. Because a phase I E1A gene therapy protocol for human breast and ovarian cancers was completed and a phase II clinical trial is undergoing, we also plan to develop an alternative ElA mutant construct to maximize ElA therapeutic effects while minimizing its potential side-effects for cancer gene therapy. In trying to understand the mechanism underlying ElA's antitumor activity, we have found that ElA down-regulated VEGF expression both in vitro and in vivo. We have also identified additional two new target genes that were critically involved in ElA-mediated chemosensitization. In addition to the proposed work we have also been trying to identify other molecules that may be regulated by ElA via the genomic and proteomic approaches. These studies can provide useful information for us to better understand the molecular functions of E1A, and hopefully we can use this knowledge to better design a mutant ElA construct for cancer gene therapy in the future.
DTIC
Apoptosis; Mammary Glands; Tumors; Cancer; Cells (Biology); Retarding; Gene Therapy

20030000814 Pittsburgh Univ., Pittsburgh, PA USA
Gene Transfer Studies of the Pathogenesis and Treatment of Parkinson's Disease ***Final Report, 1 Aug. 1998-31 Jul. 2002***
Gloricso, Joseph C.; Aug. 2002; 17p; In English
Report No.(s): AD-A407633; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall aim of this research is to use a recombinant multiply deleted genomic herpes simplex virus type-l (Hsv-l) based gene transfer vector to test the hypothesis that gene transfer of the glial derived neurotrophic factor (GDNF) or bcl-2 can slow or prevent the apoptotic death of nigral neurons in animal models of PD, and that expression of Tyrosine Hydroxylase (TH) can improve symptoms.
DTIC
Nervous System; Apoptosis; Diseases; Genome; Pathogenesis; Viruses

20030000815 Cincinnati Univ., OH USA
16 K Prolactin as an Angiogenic Inhibitor in Breast Cancer ***Annual Report***
Liby, Karen; Ben-Jonsthan, Nira; Jun. 2002; 22p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9328
Report No.(s): AD-A407632; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tumors must induce the formation of new blood vessels in order to grow and metastasize. Active angiogenesis results from a dissipation in the balance between angiogenic and angiostatic factors produced by the tumor. In breast cancer, a high density

of blood vessels is inversely correlated with patient survival. Suppressing tumor growth by targeting its vasculature thus offers a promising therapeutic strategy. Prolactin (PRL) is a 23 kDa pituitary hormone that has mitogenic, morphogenic, and lactogenic actions on the breast. The role of 23K PRL in breast cancer is controversial, but its N-terminal 16K fragment suppresses proliferation of endothelial cells from several species, inhibits capillary formation in chick embryos, and antagonizes the actions of angiogenic factors. However, the ability of 16K PRL to inhibit tumors in vivo has not been tested. The purpose of this thesis work was to test the following hypotheses: 1) 16K PRL suppresses angiogenesis and tumor growth in vivo and 2) locally-produced 23K PRL promotes breast cancer growth. If our hypotheses are correct, treating breast tumors with 16K PRL should inhibit tumor vascularization and subsequent growth. In contrast, 23K PRL should increase breast cancer cell proliferation and tumor growth.
DTIC
Mammary Glands; Cancer; Angiography; Cells (Biology); Regeneration (Physiology)

20030000816 Iowa Univ., Iowa City, IA USA
Regulation of ErbB Signaling in Breast Cancer Epithelial Cells by Cb1 Proto-Oncogene Product ***Annual Report***
Lill, Nancy L.; May 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-8038
Report No.(s): AD-A407630; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A large body of evidence has shown that members of the epidermal growth factor (EUF) family play critical roles in the proliferation and differentiation of normal breast epithelial cells and are important for cell proliferation in breast cancer. The response to EGF is mediated by the transmembrane receptor tyrosine ErbB 1, or epidermal growth factor receptor (EGF-R). This receptor plays a key role in the induction of proliferation in mammary epithelial cells (MECs). Overexpression of EGF-R due to gene amplification or increased transcription is seen in a third or more of all breast cancers. Receptor overexpression may be causally linked to oncogenesis, and correlates with development and progression of tumors that are refractile to standard therapeutic approaches. Thus, EGF-R is a potential target for therapeutic intervention in the subset of women with worst prognosis on conventional treatment. Understanding and manipulating the biochemical mechanisms regulating signal transduction through EGF-R therefore represent important goals in breast cancer research, and are the focus of this study. We have proposed the hypothesis that the proto-oncoprotein Cbl provides ligand-specific negative regulation of EGF-R in epithelial cells. We and others have shown that Cbl effects EGF - mediated down-regulation, ubiquitination, and degradation of EOF-R. In the 8.5 months of this reporting period (following reactivation of the award at the place of the P.I.'s independent appointment), we have tested whether Cbl's recruitment to the receptor and its ability to ubiquitinate EGF-R depends on the nature of the stimulating ligand. In vivo, EGF stimulation of EGF-R leads to receptor down-regulation and the termination of signaling, but TGF-alpha stimulation of EUF-R leads to receptor recycling and prolonged signaling. We have found that EGF-activated EUF-R binds to Cbl and undergoes polyubiquitination, but TGF-alpha-activated EGF-Rdoes the same.
DTIC
Mammary Glands; Cancer; Cells (Biology); Tumors; Degradation; Biochemistry

20030000820 Naval Postgraduate School, Monterey, CA USA
The Impact of Emotional Arousal on Learning in Virtual Environments
Ulate, Stephen O.; Sep. 2002; 104p; In English; Original contains color images
Report No.(s): AD-A407167; No Copyright; Avail: CASI; A06, Hardcopy
Research on animals has shown that injections of adrenal in paired with a learning experience improved memory retention. Adrenalin is a key hormone in emotional arousal and flight or flight responses. It stands to reason that emotional arousal (in moderation) may also have a positive impact on human learning. The purpose of this thesis was to investigate the impact of emotional arousal on learning in virtual environments. An experiment was conducted to observe learning differences in a low-arousal condition and a high-arousal condition. A first-person shooter videogame (America's Army: Operations) was used as the virtual environment. In the low-arousal condition, participants wandered peacefully through a scenario memorizing objects they encountered. High-arousal participants wandered through the same environment, but were required to fight through the scenario while under attack. Results indicated that individuals in the high-arousal condition performed better on recall tasks immediately following the exposure and also 24 hours later.
DTIC
Arousal; Retention (Psychology); Hormones; Emotional Factors; Virtual Reality

20030000849 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA

Functional Characterization of the Murine Homologue of PLAB, a Novel TGF-B Member, in Placental and Mammary Tissues ***Annual Report, 1 Jun. 2001-31 May 2002***

Eakin, Guy S.; Jun. 2002; 9p; In English

Contract(s)/Grant(s): DAMD17-00-1-0311

Report No.(s): AD-A407448; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The relationship of extraembryonic membrane function to the progression of cancers, specifically cancers of the breast, is an understudied area of research. by understanding the factors, which control the molecular architecture of the placenta and other fetal membranes, we hope to shed light on mechanisms by which placental function is established. The initial goal of this research had been to characterize the role of the gene mPlab in mice conditionally null for the gene. mPlab is a member of the TGF-BETA superfamily of transforming growth factors, and had been previously demonstrated to be expressed at highest levels in the developing placenta. Midway through our research, we discovered that another laboratory had published the phenotype of the mPlab deficient mice. In light of this, we were forced to abandon our research on mPlab and find other areas of fetal membrane research to explore. In this report, we detail the completed work on our revised proposal. Additionally, the DOD had indicated that it would not be willing to fund research requiring work with non-human primate materials as described in the annual report dated June 2001. In order to alleviate these concerns, we submit a modification of the new research proposal to the reviewing boards.

DTIC

Mammary Glands; Tissues (Biology); Fetuses; Cancer; Genes

20030000850 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Role of Cyclin D1 and cdk Inhibitors in Breast Cancer Pathogenesis ***Annual Report, 30 Sep. 1998-30 Apr. 2002***

Roovers, Kristin; Assoian, R. K.; May 2002; 18p; In English

Contract(s)/Grant(s): DAMD17-98-1-B209

Report No.(s): AD-A407447; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cyclin Dl is frequently overexpressed in breast cancer tumors. Thus, an understanding of cyclin Dl regulation in normal and malignant cells may prove beneficial in the search for therapeutic targets. In fibroblastic cell lines, cyclin Dl expression is regulated by Rho/Rho kinase: i) when Rho/Rho kinase is active, ERK activity is sustained and consequently cyclin Dl is induced in mid-G1 phase, and ii) when Rho/Rho kinase is inactive, cyclin Dl is induce in early G1 phase through a rac-mediated pathway (implicating PI-3 kinase signaling). In this report, I examined the consequences and regulation of rac-mediated cyclin Dl expression in terms of Rho kinase-dependent stress fiber formation. Selective inhibition of Rho kinase allowed for rac-mediated cyclin Dl expression, the downregulation of p21ci pl% %% and p27 kiPl and S phase entry, indicating that cell proliferation can occur under conditions where stress fiber formation is compromised. The suppress ion of the rac pathway to cyclin Dl expression by Rho kinase did not require stress fiber formation, indicating that there is a Rho kinase effector that has a role in cyclin Dl regulation without affecting actin reorganization. Future work includes the identification of this Rho kinase effector involved in the regulation of rac-mediated cyclin Dl expression.

DTIC

Cancer; Cells (Biology); Mammary Glands; Pathogenesis; Regeneration (Physiology); Gene Expression

20030000851 Pittsburgh Univ., Pittsburgh, PA USA

How Are Breast Cancer Metastases Able to Survive and Grow in Draining Lymph Nodes? ***Final Report, 1 Jun. 2001-31 May 2002***

Basse, Per H.; Jun. 2002; 11p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-01-1-0603

Report No.(s): AD-A407445; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project was to elucidate how breast cancer metastases manage to survive and grow in draining lymph nodes surrounded by highly immuno-reactive cells. In animal models, we have observed that while most lung metastases are susceptible to infiltration by lymphocytes, some metastases form very compact nodules that are hypovascular and contain very little extracellular matrix. These compact metastases are very resistant to lymphocytic infiltration. We therefore hypothesized that lymph node (LN) metastases, in order to resist attack by nearby lymphocytes, grow with this compact morphology. While our animal model of B16 melanoma LN metastases demonstrated that both type of metastases (i.e., compact and non- compact (called ”loose”) develops, metastases in four out of six positive nodes from breast cancer patients clearly exhibited the compact phenotype. Thus, we have found clear evidence that LN metastases in humans often grow with a compact morphology which, for yet unknown reasons, protects the metastases from lymphocytic infiltration. This may explain why the metastases are able to

grow in the LN and we speculate that analysis of the metastases with respect to morphology (compact versus loose) may serve as a prognostic factor. Finally, we are investigating whether it will be possible to break the ”stealth” of the compact metastases, allowing lymphocytes and dendritic cells to gain access to the malignant cells. We anticipate that better contact between tumor cells and dendritic cells/lymphocytes will lead to the induction of strong, anti-tumor responses.
DTIC
Cancer; Cells (Biology); Lymphatic System; Mammary Glands; Metastasis; Immunology

20030000852 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA
A Novel Strategy to Isolate Invasion-Inducing Proteins from Human Breast Tumors ***Annual Report, 1 Jun. 2001-31 May 2002***
WHitehead, Ian P.; Jun. 2002; 10p; In English
Contract(s)/Grant(s): DAMD17-00-1-0365
Report No.(s): AD-A407444; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This proposal utilizes a novel screening strategy that can be applied to the identification of genes involved in metastasis and invasion. The basic approach is so make retroviral-based expression libraries from invasive tumor tissues, and then transfer the invasive phenotype to non-invasive breast tumor cells. This report describes a screen of a library derived from the highly invasive MBA-MB-23l breast tumor cell line. Four cDNAs were recovered in this screen that exhibited an invasive phenotype when retested in the non-invasive MCF-V breast cell line. These cDNAs were sequenced in their entirety and were found to encode DAP-l (a known tumor suppressor), LIPE (hormone sensitive lipase), HSPA5 (heat shock protein) and ABLIM (actin binding protein). The DAP-l cDNA was orientated in the anti-sense, and was by far the most invasive (20-fold increase vs vector). Since DAP-l had already been attributed tumor suppressor properties in other biological systems, it was selected for further analysis. Anti-sense expression of DAP-l in NIH 3T3 mouse fibroblasts caused transformation, which was associated with specific activation of the small GTPase RhoA. to summarize, we have successfully screened for invasive cDNAs, and are now characterizing these cDNAs to determine the molecular basis of their transforming activity.
DTIC
Cells (Biology); Genes; Mammary Glands; Proteins; Tumors

20030000853 Texas Univ. Health Science Center, San Antonio, TX USA
Functional Interactions of Human Rad54 with the Rad51 Recombinase ***Annual Report, 1 May 2001-30 Apr. 2002***
Komen, Stephen J. van; May 2002; 12p; In English
Contract(s)/Grant(s): DAMD17-01-1-0414
Report No.(s): AD-A407443; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Unrepaired or incorrectly repaired double strand breaks (DSBs) produced by ionizing radiation, exogenous DNA damaging chemicals, free oxygen radicals or programmed cellular mechanisms, can lead to deletions or mutations in the coding sequence of a gene, translocations, inversions, chromosome loss during or cell death. Accurate repair of DSBs is performed by a group of highly conserved genes termed the RAD54 epistatis group consisting of RAD51, RAD52, RAD54, RAD55, RAD57, RAD59, and RDH54/TIDl. A key intermediate in recombinational repair involves single-strands of the broken DNA invading and displacing DNA from an intact homologous duplex joint forming a heteroduplex DNA joint to be utilized as a template to replace lost or damaged DNA. In mammals, human genes central to homologous recombination interact with and their biochemical efficiency is governed by the tumor suppressors BRCA1 and BRCA2 indicating a role of recombinational repair in the suppression of cancer formation. The human Rad51 recombinase protein DNA pairing and strand exchange yielding heteroduplex DNA joints between ssDNA and dsDNA. Our biochemical studies address the manner in which hRad54 and hRad5l functionally interact to promote hRad5l-mediated D-loop formation and hRad54 catalyzed DNA supercoiling and transient DNA strand opening.
DTIC
Cancer; Cytology; Deoxyribonucleic Acid; Mammary Glands; Genes; Biochemistry

20030000854 Lafayette Coll., Easton, PA USA
Targeted Disruption of Tumor-Derived Chemokine Synthesis and Reversal of Tumor-Induced Immune Suppression ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Kurt, Robert A.; Jul. 2002; 14p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0288
Report No.(s): AD-A407442; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Chemokines play a pivotal role in the maturation of the immune system, and in the initiation, and maintenance of an immune response. Because of their key role in the immune response, the aberrant expression of chemokines can have a profound effect

on the ability of T cells to respond to antigen. We have found that several breast cancer cell lines produced chemokines capable of recruiting T cells. However, instead of increasing anti-tumor immunity, the tumor-derived chemokines may have prevented an effective immune response by desensitizing T-cell chemokine receptors. Our hypothesis is that disrupting the synthesis of tumor-derived chemokines (using anti-sense technology) will remove tumor-induced immune suppression and enhance the immunogenicity of the tumor. In order to test this hypothesis we have generated stable clones that lack MCP-l and RANTES production compared to the parental tumor cell line. Using these tumors we will determine whether the T cells are better able to elicit an anti-tumor immune response by comparing the immunogenicity of the tumors that do and do not express chemokines. These tumor cells will be evaluated by immunization/challenge experiments and by the ability to generate tumor-specific T cells in vaccine draining lymph nodes.
DTIC
Cells (Biology); Immunology; Tumors; Physiological Responses; Synthesis (Chemistry); Lymphatic System

20030000855 Wisconsin Univ., Madison, WI USA
Assessing the Association of Epstein-Barr Virus With Breast Carcinoma ***Final Report, 1 Jun. 2001-31 May 2002***
Sugden, Bill; Jun. 2002; 6p; In English
Contract(s)/Grant(s): DAMD17-01-1-0669
Report No.(s): AD-A407441; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Epstein-Barr Virus (EBV) contributes causally to specific lymphomas and carcinomas in people. A recent retrospective survey detected EBV DNA in 51 of 100 consecutive breast carcinoma biopsies by PCR, in 3 of 30 normal adjacent biopsies, and a viral protein, EBNA-l, in a fraction of tumor cells in 9 of 9 EBV-positive biopsies assayed immunohistochemically (Bonnet et al., J. Nati. Cancer Inst. 91:1376-1381, 1999). These data reveal a statistically meaningful association of EBV with breast carcinoma which we shall examine further to confirm or refute. The EBV in positive biopsies is either in the carcinoma cells or in surrounding normal cells such as B-lymphoid cells, a normal site for EBV's latent infection. to assess this association we shall use fixed blocks of tissue for which pairs of one normal adjacent tissue and one breast carcinoma are available. The percent of carcinoma cells present in fixed blocks will be estimated to be less than 1%, from 1% to 10%, or greater than 10%, and the amount of EBV present per cell in all samples determined by multiplex PCR and glass microarrays to measure EBV DNA from known levels of isolated sample DNAs.
DTIC
Cancer; Cells (Biology); Infectious Diseases; Mammary Glands; Viruses

20030000857 Henry Ford Health System, Detroit, MI USA
Understanding Racial Disparities in Mammography Use Among Breast Cancer Survivors ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Lafata, Jennifer E.; McCarthy, Bruce; Ford, Marvella; Harris, Katherine; Jul. 2002; 32p; In English
Contract(s)/Grant(s): DAMD17-01-1-0531
Report No.(s): AD-A407548; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Despite general consensus that breast cancer survivors should undergo annual mammography, findings indicate over 1 in 7 women fail to receive a mammogram within 2 years of breast cancer treatment, and that African Americans are almost half as likely to participate in mammography screening as Caucasians. Objectives: to develop and pilot test a survey instrument to understand what factors influence a breast cancer survivor's decision to receive mammography and whether differences exist in these factors by patient race.
DTIC
Clinical Medicine; Mammary Glands; Cancer; Patients

20030000858 New Mexico Univ., Health Sciences Center, Albuquerque, NM USA
Prognostic Value of Telomere DNA Content in Invasive Breast Cancer ***Final Report, 1 Jun. 2001-31 May 2002***
Griffith, Jeffrey K.; Jun. 2002; 42p; In English
Contract(s)/Grant(s): DAMD17-01-1-0572
Report No.(s): AD-A407547; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Telomeres, which are specialized protein-nucleic acid complexes that protect the ends of chromosomes, are shortened each time a cell divides. Although the mechanisms that drive cancer initiation and progression are not known, genomic instability occurs in most tumors and is correlated with shortened telomeres. The loss of growth control in tumor cells results in excessive telomere shortening and, by extension, phenotypic variability. We hypothesized, therefore, that very short telomeres would facilitate progression to a metastatic phenotype and, therefore, that telomere DNA content (TC), a proxy for telomere length,

would predict clinical outcome in breast cancer. Patient histories and tissues were obtained from the New Mexico Tumor Registry. TC was measured in 38 breast tumors and 38 paired specimens of tumor-associated, histologically-normal stroma. In tumor tissues, Kaplan-Meier analysis demonstrated that reduced TC was associated with disease recurrence or death and that high TC was associated with disease-free survival (p=O.00l). Unexpectedly, there was a similar association between TC and clinical outcome in the tumor-associated stroma (p.0.OOl). These findings show that TC in both breast tumors and tumor-associated, normal stroma predicts clinical outcome. This implies that telomere length is a characteristic of the cells' microenvironment, rather than a consequence of tumors' proliferation.
DTIC
Deoxyribonucleic Acid; Nucleic Acids; Metastasis; Cancer; Diseases

20030000859 Jackson (Henry M.) Foundation, Rockville, MD USA
Control of Mammary Differentiation by Ras-Dependent Signal Transduction Pathways ***Annual Report, 1 May 2001-30 Apr. 2002***
Cutler, Mary L.; Cerrito, Mari G.; Chopp, Treas; Wang, Weihan; May 2002; 24p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-01-1-0264
Report No.(s): AD-A407463; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Mammary epithelial cells undergo periodic cycles of growth, differentiation and apoptosis during pregnancy and lactation. These processes are initiated by a complex series of signals that include mammotrophic hormones and locally-derived growth factors. This study is aimed at determining the mechanism by which an important mitogenic signal transduction pathway, which is frequently activated in breast carcinoma, inhibits mammary differentiation and apoptosis. We have demonstrated that the Ras pathway is activated by EGF stimulation of HCl 1 mammary epithelial cells. This occurs in part via the increase in GTP-bound Ras in the cells. EGF stimulation results in activation of Erk and Akt signal transduction pathways and prevents lactogenic differentiation. Inhibition of either Ras (via DNRas expression) or Erk (via PD98059) or Akt (via wortmannin) can counter the effects of EGF on differentiation. The mechanism of disruption of differentiation appears to involve interference with the growth arrest that occurs prior to the induction of differentiation; the mechanism for growth arrest may require the downregulation of Mekl expression. In addition, EGF mitogenic stimulation also inhibits Stat5 binding to its DNA binding site in the beta casein promoter.
DTIC
Genetics; Mammary Glands; Stimulation; Signal Transmission; Control Theory

20030000860 Medicine and Dentistry Univ. of New Jersey, Robert Wood Johnson Medical School, Piscataway, NJ USA
Collagenases in Breast Cancer Cell-Induced Metastatic Tumor Growth and Progression ***Annual Report, 1 Jun. 2001-31 May 2002***
Selvamurugan, Nagarajan; Jun. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-01-1-0656
Report No.(s): AD-A407462; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Since collagenases (-1 and -3) degrade the extracellular bone matrix (ECM) components, collagenase-driven ECM proteolysis may facilitate cancer growth and progression. to test this hypothesis, we proposed to utilize a transgenic mouse model to overexpress collagenase- 1 under the control of the bone specific osteocalcin promoter. The expression plasmid pCMV-collagenase- 1 -V5 was constructed, which contains an eukaryotic promoter (CMV) fragment and a 1.65 kb human collagenase-l cDNA fragment, followed by a V5 epitope tag. The pCMV-collagenase-l-V5 was transiently transfected into COS-7 cells and the expression of collagenase-l-V5 was identified by Western blot using the anti-V5 antibody. The pOC-collagenase-I-V5 was constructed by replacing the CMV promoter sequence from pCMV-collagenase-l-V5 with the rat osteocalcin promoter sequence (OC). The ability of osteocalcin promoter to drive collagenase-l-V5 expression is being carried out by transient transfection assays and Western blot analysis. The 2.6 kb DNA fragment containing the osteocalcin promoter (1 kb) and collagenase- 1-V5 cDNA sequence will be excised from pOC-collagenase- 1-V5 with appropriate enzymes and used for generation of transgenic mice. In addition, the molecular mechanism(s) responsible for transforming growth factor-beta 1 (a crucial molecule in metastatic bone cancer) stimulation of collagenase-3 expression in human breast cancer cells was investigated.
DTIC
Cancer; Collagens; Mammary Glands; Cells (Biology); Transcription (Genetics); Enzymes

20030000864 Albert Einstein Coll. of Medicine, Bronx, NY USA
Taxol Resistance and Microtubule Dynamics in Breast Cancer ***Annual Report, 15 May 2001-14 May 2002***
Orr, George A.; Jun. 2002; 10p; In English

Contract(s)/Grant(s): DAMD17-01-1-0123
Report No.(s): AD-A407181; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Alterations to microtubule dynamics, leading to a less stable polymer, may be a crucial determinant in the development of resistance towards Taxol, and other drugs with a binding site on the microtubule polymer. We propose that two potential mechanisms by which breast cancer cells could alter their microtubule dynamics are by (1) differential expression of the several alpha and beta tubulin isforms and (2) differential binding of endogenous regulators of microtubule assembly to the cytoskeleton as a result of posttranslational modifications to these tubulin isforms. The overall goal of this proposal is to develop rapid and innovative protein-based technologies for both quantitating the alpha and beta-tubulin isoform composition in drug-sensitive and resistant human breast cell lines, and for characterizing the posttranslational modifications to these isoforms. It is only by thoroughly understanding Taxol resistance in human breast cancer cells that we will be able to develop ways to overcome Taxol resistance in breast cancer.

DTIC

Mammary Glands; Cancer; Resistance; Drugs

20030000866 Duke Univ., Durham, NC USA

Characterization of the Chicken Ovarian Cancer Model ***Annual Report, 15 Jul. 2001-14 Jul 2002***

Rodriguez, Gustavo C.; Aug. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-00-1-0570
Report No.(s): AD-A407179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We believe that the domestic laying hen has great potential as an animal model for ovarian cancer prevention research. Unlike other ovarian cancer models, which require experimental induction of ovarian tumors, chickens develop ovarian adenocarcinoma spontaneously, with an incidence ranging from 13 to 40 percent between four and six years of life. No investigators have taken advantage of the chicken to study ovarian cancer. Thus, the chicken ovarian cancer model has yet to be validated and developed. As part of a prevention trial in chickens funded by the Department of Defense, we have accumulated 1400 chicken reproductive tracts including 140 with adenocarcinomas, and gathered valuable data regarding the natural history of these tumors. This provides the remarkable opportunity to critically evaluate the chicken ovarian cancer animal model and determine its relevance to human ovarian cancer research. The aim of the current proposal is to increase our understanding of the molecular and histologic features of chicken ovarian cancers. In addition, we will develop a histologic classification for chicken ovarian cancers, which is a critically important prerequisite to the widespread use of this animal model for ovarian cancer research.

DTIC

Cancer; Chickens; Ovaries; Models

20030000867 Manitoba Univ., Winnipeg, Manitoba Canada

Interaction Between Estrogen Receptor-beta and the Transforming Growth Factor-beta Signaling Cascade in Human Breast Tissue ***Annual Report, 15 Jun. 2001-14 Jun 2002***

Cherlet, Tracy C.; Jul. 2002; 11p; In English
Contract(s)/Grant(s): DAMD17-01-1-0307
Report No.(s): AD-A407175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overall goal of this research is to understand the importance of the interaction between Smad3 and the estrogen receptor (ER) as it pertains to human breast tumorigenesis and breast cancer progression. Preliminary data from our laboratory had suggested that ERalpha, ERbeta1, ERbeta2 and ERbeta5 interact with Smad3 in the yeast two-hybrid system. Our current data suggests that a weak interaction between ERalpha and ERbeta1 with Smad3 exists in vitro but not in vivo. Furthermore, although Smad3 does not affect ER transcriptional activity on a vitellogenin ERE, both ERalpha and ERbeta1 inhibit Smad3 transcriptional activity on the p3TP-Lux reporter in Cos1 cells. However, the ERbeta variants, ERbeta2 and ERbeta5 did not affect Smad3 transcription. We are currently in the process of confirming these results in a human breast cancer cell line. Overall, the data support the hypothesis that ER interacts with the TGFbeta signal transduction pathway. The possible mechanisms by which ER affects Smad3 transcription are being investigated.

DTIC

Estrogens; Mammary Glands; Receptors (Physiology); Genetics; Tissues (Biology)

20030000871 Retina Foundation, Schepens Eye Research Inst., Boston, MA USA
Low Vision Research at the Schepens Eye Research Institute ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
D'Amore, Patricia A.; Jul. 2002; 45p; In English
Contract(s)/Grant(s): DAMD17-01-2-0032
Report No.(s): AD-A406994; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This research proposal, Low Vision at the Schepens Eye Research Institute, is a multi-disciplinary effort aimed at advancements in low vision research. Project 1, which focuses on dry eye complications of LASIK surgery, is in progress, having been delayed by the IRB process. Work on Project 2, ocular injury and inflammation, which has studied the role of FasL in corneal inflammation, has demonstrated that soluble FasL can block corneal inflammation induced by endotoxin. Project 3, which studies restoration of endothelial function of the damaged cornea, has assessed a variety of temperature sensitive polymers and growth factor for cornea endothelial cell growth. Project 4, which focuses on remote diagnosis of retinal damage, has obtained proof of principle for the optical plan for a portable prototype instrument to image retina for potential damage. Project 5, which studies regeneration of the damaged central nervous system, has defined the mechanism of lithium effects on retinal ganglion cell axon regeneration via Bc 1-2 induction. Project 6, regulation of angiogenesis and the role of VEGF in adult, has developed transgenic mice that express a dominant negative VEGF Receptor 2 that will be used to generate mice in which VEGF signaling can be inducably blocked. Each of these efforts addresses critical and previously under-investigated elements that directly impact the health and vision of our military personnel.
DTIC
Vision; Eye (Anatomy)

20030000872 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Feasibility Assessment of Performing Surgery in a Deployable Medical System Operating Room
Toven, Lisa Ann; May 2002; 76p; In English
Report No.(s): AD-A406986; No Copyright; Avail: CASI; A05, Hardcopy

The purpose of this investigation was to assess the feasibility of performing surgery in a Deployable Medical System (DEPMEDS) operating room versus a fixed facility operating room. The focus of the research was on the implications of utilizing DEPMEDS as a substitute surgical suite. The primary study group consisted of both military and civilian hospitals, that utilized DEPMEDS, military surgical experiences during times of deployment, and military training exercises. The data analysis demonstrated evidence in favor of performing surgical procedures in DEPMEDS, as well as contributing to the training and readiness of medical personnel. Based on the variety of DEPMEDS environments presented in this paper, it is evident that DEPMEDS can enhance the ability of military medical personnel to respond to the ever-changing military medical environment. An attempt should be made to perform definitive surgical care cases in DEPMEDS whenever possible. Tracking the DEPMEDS experience from planning phase to completion is an essential and integral method, which provides an expansion of the Army Medical Department database. With the data provided, DEPMEDS may become more feasible, practical, and effective in all environments.
DTIC
Portable Equipment; Armed Forces; Medical Equipment

20030000873 Illinois Univ., Broad of Trustees, Chicago, IL USA
Breast Tumor Kinase (BRK) Signaling in Breast Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Tyner, Angela L.; Jun. 2002; 17p; In English
Contract(s)/Grant(s): DAMD17-01-1-0273
Report No.(s): AD-A407665; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The breast tumor kinase BRK is expressed in a high percentage of human breast tumors and breast tumor cell lines. We found that BRK is a nuclear tyrosine kinase that phosphorylates the RNA binding protein Sam68 (SRc associated during mitosis, 68 kDa). BRK and Sam68 colocalize in Sam68/SLM nuclear bodies (SNBs) in human breast tumor cell lines. In functional studies, expression of BRK abolished the ability of Sam68 to bind RNA and act as a cellular Rev homologue. In addition to Sam68, we found that BRK also phosphorylates the Sam68-like mammalian proteins SLM-1 and SLM-2. We examined expression of Sam68, SLM-1, and SLM-2 in the mouse mammary gland using RNase protection assays. In the normal mouse mammary gland only expression of Sam68 was detected. We are currently examining expression of SLM-I and SLM-2 in human breast tumor cell lines. While Sam68 is a substrate for SRc family kinases during mitosis, BRK is the first identified tyrosine kinase that can phosphorylate

Sam68 and regulate its activity within the nucleus, where it resides during most of the cell cycle. Since Sam68 has been implicated in cell cycle regulation, increased expression of BRK may alter the ability of Sam68 to regulate cell growth.
DTIC
Assaying; Cancer; Mitosis; Mice; Cell Division; Cells (Biology)

20030000874 California Univ., San Francisco, CA USA
Structure-Based Design of Potent and Selective Inhibitors for Stromelysin-1 and Mt1-MMP ***Annual Report, 15 May 2001-14 May 2002***
Rizzo, Robert C.; Toba, Samuel; Kuntz, Irwin D.; Jun. 2002; 16p; In English
Contract(s)/Grant(s): DAMD17-00-1-0192
Report No.(s): AD-A407662; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Matrix metalloproteinases (MMPs) represent an important class of therapeutic targets for the treatment of diseases such as cancer. MMPs play a physiological role in the degradation of structural extra-cellular matrix (ECM) proteins and thus promote angiogenesis, a condition necessary for sustained tumor growth. Consequently, the inhibition of MMP enzymes may serve as disease-modifying agents by preventing ECM degradation and angiogenesis, and ultimately act as anti-cancer agents. In this research, we are using structure-based drug design methodologies in the hopes of finding novel and selective biological inhibitors for MMPs. Specifically, we are developing, refining, and validating the computational protocols and simulations methods used to model MMPs. The focus is on (1) validating the force field parameter sets used in the docking studies by comparing the calculated results with experimental MMP-inhibitor crystal structures, and (2) evaluating which scoring functions are most accurate for estimating MMP affinities. Structure-based design targeting specific MMPs will benefit from these studies by improving the accuracy of predicted binding modes and affinities of compounds prior to purchase or synthesis.
DTIC
Enzymes; Matrix Materials; Cancer; Crystal Structure; Field Theory (Physics)

20030000876 National Jewish Medical and Research Center, Denver, CO USA
Dissecting Immunogenicity of Monoclonal Antibodies ***Annual Report, 1 Jun. 2001-31 May 2002***
Snyder, Christopher M.; Wysocki, Lawrence J.; Jun. 2002; 12p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0359
Report No.(s): AD-A407659; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The potential of monoclonal antibodies, (mAbs), for use in therapeutic and diagnostic applications has not been fully realized in part due to counter-immune responses that often arise in patient recipients of mAb. A growing research effort to ”humanize” mAb has focused primarily on the structure or sequence of the antibody variable (V) region domains. However, these approaches may ultimately suffer, as they overlook the requirement of T cell help for the immune counter-reaction and the potential of somatic hypermutation and V-D-J recombination to generate target T cell epitopes within mAb V regions. My approach focuses on this issue. In order to understand some basic principals concerning anti-immunoglobulin immune responses, I have developed a panal of T cell hybridomas and new transgenic mice. Studies with these tools strongly support our basic hypothesis that T cells are tolerant of endogenous immunoglobulin-derived diversity.
DTIC
Antibodies; Antigens; Cancer; Immune Systems

20030000877 Fox Chase Cancer Center, Philadelphia, PA USA
Antibody-Pretargeted Cytokine Therapy of Cancer ***Annual Report, 15 Apr. 2001-14 Apr 2002***
Weiner, Louis M.; May 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-99-1-9183
Report No.(s): AD-A407653; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We hypothesize that the selective accumulation of systemically administered cytokines at tumor sites can alter tumor microenvironments to favor the induction of anti-tumor immune responses. We further hypothesize that this can be accomplished by pre-targeting tumors with antibody-streptavidin immunoconjugates and then administering biotinylated cytokines. The purpose of this research program is to identify antibody-pretargeted cytokine therapy strategies that lead to tumor-selective cytokine accumulation, the development of host inflammatory cell infiltrates in tumor, and the induction of tumor-specific immunity. The ultimate goal of this research is to identify candidate strategies for clinical development, alone or in combination with tumor vaccines. We have made significant progress toward achieving these goals. Because biodistribution results did not suggest that the previously used streptavidin-biotin system would yield therapeutic results we have focused efforts in the past year

on developing new systems employing bispecific minibodies that contain anti-tumor binding domains and domains that bind to a metal chelate that can serve as a universal acceptor for metal-coniugated cytokines.
DTIC
Clinical Medicine; Antibodies; Vaccines; Acceptor Materials; Cancer

20030000878 Miami Univ., FL USA
Pro-apoptotic Changes in Brain Mitochondria After Toxin Exposure ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Sick, Thomas J.; Jul. 2002; 37p; In English
Contract(s)/Grant(s): DAMD17-99-1-9493
Report No.(s): AD-A407627; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Mitochondria normally function to provide sources of energy for vital cellular functions. However, under stressful conditions these organelles may trigger events that lead eventually to cell death. Thus, mitochondria have been implicated as major contributors to neuronal death in a variety of neurodegenerative disorders. In this report we provide evidence that certain mitochondrial toxins cause selective cell death in hippocampal subfield CAl that has previously been shown to be selectively vulnerable to hypoxia/ischemia. We have also measured changes in mitochondrial membrane potential following toxin exposure. Respiratory chain Complex I inhibitors caused mitochondrial depolarization by the degree of depolarization, although significant, was not dramatic. No mitochondrial depolarization was observed after excitotoxin or Complex II inhibition. All toxins tested produced an increase in reactive oxygen species. Our data show no evidence for mitochondrial permeability transition after toxin exposure.
DTIC
Brain; Toxins and Antitoxins; Mitochondria; Neurophysiology; Cells (Biology); Exposure

20030000879 Georgetown Univ., Washington, DC USA
Targeting of Oncogenic Proteins for Intracellular Degradation ***Final Report, 1 Jul. 1998-30 Jun. 2002***
Byers, Stephen W.; Jul. 2002; 30p; In English
Contract(s)/Grant(s): DAMD17-98-1-8089
Report No.(s): AD-A407625; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Beta-catenin, is an important component of the wnt signaling pathway and IkB(alpha) is an important regulator of the NF-KB pathway. Both proteins are phosphorylated at serines in the N-terminal region, which subsequently target them for ubiquitination by the same ubiquitin ligase complex. In the first year of the award we demonstrated proof of principle that small peptides could be constructed that would enter cells and target oncogenic proteins, such as beta-catenin and erbB2 for intracellular degradation. During the course of this work we discovered that the similarities in the regulation of beta-catenin and IKBo(alpha) ubiquitination extended to the kinases that are involved in control of their phosphorylation. The IKK complex is responsible fbr the phosphorylation of IKB(alpha) while GSK-3(beta) is thought to regulate beta-catenin phosphorylation. This work showed for the first time that IKK also exists in a complex with beta-catenin and that expression of either IKK(alpha) or IKK(beta) can decrease beta-catenin signaling. Consistent with this we found that cytokines, such as TNF(alpha) also markedly regulated beta-catenin activity. Our demonstration that cytokine and beta-catenin signaling are cross-regulated at the level of targeted protein degradation is important and points to a clinically significant relationship between inflammatory responses and oncogenic activity.
DTIC
Viruses; Cancer; Beta Particles; Mammary Glands; Phosphorylation

20030000880 George Washington Univ. Medical Center, Dept. of Medicine, Washington, DC USA
Altered CDC42 Signaling in Metastatic Breast Cancer Cells ***Annual Report***
Pirone, Dana M.; Jul. 2002; 48p; In English
Contract(s)/Grant(s): DAMD17-99-1-9201
Report No.(s): AD-A407624; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
As research in the field of cancer treatment progresses, new therapeutics are continually being developed to fight cancer. Despite these advances, cancer metastasis remains a major obstacle to effective cancer treatment and the major cause of cancer mortality. Cancer metastasis is the process whereby cancer cells leave a primary tumor, enter the circulation, extravagate and proliferate at distant sites. At a cellular level, the acquisition of a motile and invasive phenotype requires the abrogation of cell-cell contacts, the remodeling of the extracellular matrix, and changes in cell-matrix interactions, leading ultimately to the reorganization of the acting cytoskeleton and cell motility. A family of proteins called the Rho GTPases play major roles in regulating these very processes, including the regulation of the actin cytoskeleton leading to cell shape changes, the establishment of cell-cell contacts, cell-matrix interactions, and cell polarization (reviewed in Van Aelst et al., 1997). Because of the participation

of the Rho GTPases in cellular processes involved in cell motility and migration, it is not unlikely that the aberrant regulation of the Rho GTPase signaling pathways may play critical roles in cancer metastasis. Thus, understanding the proteins that bind and regulate the Rho GTPases is critical to our understanding of cell motility as well as having exciting potential applications for cancer metastasis.
DTIC
Metastasis; Cancer; Mammary Glands; Cells (Biology); Abnormalities

20030000881 Chicago Univ., Chicago, IL USA
Development of a Common Database for Digital Mammography Research ***Final Report, 15 Sep. 1994-14 Sep 2001***
Nishikawa, Robert M.; Oct. 2001; 8p; In English
Contract(s)/Grant(s): DAMD17-94-J--4076
Report No.(s): AD-A407623; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The purpose of this infrastructure project is to develop a large database of digitized mammograms that will be distributed free of charge to researchers working in all aspects of digital mammography. This database will facilitate and promote rapid development in digital mammography research. The database will consist of 1000 cases subdivided into 5 categories, 4 containing different breast lesions -- masses, microcalcifications, architectural distortions, asymmetric densities (both benign and malignant) -- and one containing normal mammograms. The mammograms will be collected and digitized (O.05-mm pixel size) at two sites: the Universities of Chicago and North Carolina. The database will be stored at the two sites and will be available over internet, and by mail on CD, tape, and magneto-optical disks. to date 630 cases have been digitized. Each case consists of index and previous exams (each having four standard views) and up to two special-view mammograms (e.g., magnification views). The computer systems for the database have been assembled and are connected to the network. The first release of 50 cases with clustered microcalcifications will be made shortly after true location of the cluster is determined. This release will be followed by another 50 cases of microcalcifications and 100 cases with masses. Along with the images, instructions on how to use the database will also be distributed. This includes an objective scoring method that we are developing based on input from radiologists.
DTIC
Data Bases; Information Systems; Mammary Glands; Diagnosis; Computer Aided Design; Magnification

20030000882 Michigan Univ., Ann Arbor, MI USA
Cellular and Molecular Roles of the Akt Protein Kinase in Breast Carcinomas ***Final Report, 4 May 1998-3 May 2002***
Vojtek, Anne B.; Jun. 2002; 23p; In English
Contract(s)/Grant(s): DAMD17-98-1-8319
Report No.(s): AD-A407622; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Akt is a serine/threonine kinase that has been implicated in the initiation and/or progression of breast cancers. In order to gain an understanding of how Akt promotes malignant transformation, we identified proteins that are regulated by Akt, including the Bm-1 transcription factor, the B-Raf serine/threonine kinase, and the Elk-1 transcription factor, Bm-1 co-associates with Akt-1 in vivo and is phosphorylated in vitro by Akt-1. The site of phosphorylation of Brni by Akt-1 was mapped to S407. This site is conserved in POU domain family members, suggesting a general role for Akt in their biology. Akt also negatively regulates the enzymatic activity of B-Raf in vitro and in vivo by phosphorylating two residues in the amino-terminal regulatory domain of B-Raf. Akt also negatively regulates the activity and level of the Elk-1 transcription factor. Thus, Akt may promote transformation and cell survival in part by altering gene expression through regulation of transcription factors and in part by regulating the Ras/Raf pathway by phosphorylating and down regulating the activity of the B-Raf kinase.
DTIC
Proteins; Mammary Glands; Cancer; Phosphorylation; In Vitro Methods and Tests

20030000883 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
Cellular Mechanisms Regulating uPA in Hormone Refractory Prostate Cancer: A Novel Therapeutic Target ***Annual Report, 12 Jun. 2001-11 Jun 2002***
Gallick, Gary E.; Jul. 2002; 27p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0524
Report No.(s): AD-A407621; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
DOD Award number DAMD17-00-1-0524, 'Cellular Mechanisms Regulating Urokinase-Type Plasminogen Activator in Hormone Refractory Prostate Cancer: A novel Therapeutic Target' has its goal inhibiting the expression of two pathways critical to prostate cancer progression, one mediated by the tyrosine kinase receptor c- Met, and the second mediated by urokinase plasminogen activator (UPA). The purpose of the research is to provide a novel therapeutic basis for the development of prostate

tumor metastases through inhibition of these growth regulatory pathways. In the past year, we have demonstrated in orthotopic mouse model systems that inhibition of both pathways greatly decreases tumorigenicity and metastatic potential of human prostate tumor cells. by inhibiting c-Met expression with an Adenovims expressing a c-Met ribozyme, tumorigenicity of PC3-LN4 cells (with high metastatic potential) was greatly reduced, and no metastases were formed. Inhibition of uPAR (urokinase plasminogen activator receptor), by the competitive inhibitor for uPA binding, A6, reduced tumorigenicity and metastatic potential. A6 also reduced cellular invasion. Thus, in the past year, we have made substantial progress in demonstrating the effectiveness of inhibition of two critical pathways in metastasis in mouse models, and providing new insights into the role of these molecules in the metastatic phenotype.
DTIC
Hormones; Growth; Prostate Gland; Cancer

20030000884 Queens Univ., Kingston, Ontario Canada
The Role of Fps in Tumor-Associated Angiogenesis ***Annual Report***
Sangrar, Waheed; Greer, Peter A.; Jul. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-01-1-0382
Report No.(s): AD-A407620; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Angiogenesis plays a critical role in the development of many types of tumors, including mammary tumorigenesis. Transgenic expression of an activated form of the cytoplamic tyrosine kinase Fps gave rise to mice with pronounced hyperplasia implicating this kinase in angiogenic mechanisms. Our work to date has focused on numerous aspects of the angiogenic mechanism that may potentially involve Fps which has led to several developments along this line of investigation. Many of these developments specifically address Objectives in the Statement of Work which were designed to investigate the nature of the role of Fps in angiogenesis. However, other developments have also arisen that were not originally anticipated. These developments have further illuminated how Fps may regulate angiogenic mechanisms. In addition to angiogenesis, Fps has also been implicated in coagulation, immunity, and inflammation, all of which are highly inter-related and are very relevant to the process of tumorigenesis. Thus, Fps may play an important role in modulating tumorigenesis not only through angiogenesis, but through these other processes as well. Understanding how Fps may fulfill this role will be crucial for developing specific therapeutics designed to combat breast cancer.
DTIC
Mammary Glands; Cancer; Blood Vessels; Enzymes

20030000885 Northwestern Univ., Evanston, IL USA
Suppressive Role of Androgen-Response Gene Calreticulin in Prostate Cancer ***Annual Report, 1 Jun. 2001-31 May 2002***
Wang, Zhong; Jun. 2002; 13p; In English
Contract(s)/Grant(s): DAMD17-01-1-0088
Report No.(s): AD-A407617; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Androgens are intimately associated with prostate cancer progression. We have previously identified more than 24 androgen-response genes. One of the genes encodes calreticulin, a highly conserved protein with demonstrated%functions in intracellular Ca% homeostasis, cell adhesion, chaperoning, and gene expression. Our studies have indicated that calreticulin overexpression is suppressive to anchorage-independent growth and metastasis of prostate cancer cells and calreticulin expression is down-regulated in human prostate tumor specimens. Thus, down-regulation of calreticulin in clinical prostate cancer specimens is likely to be an important step in prostate cancer progression. Our observations argue that part of androgen-induced gene expression program, such as calreticulin, is inactivated in the progression of prostate cancer, which represents a new concept in prostate cancer biology. Our results also provided strong basis for further exploring the mechanism by which calreticulin suppresses prostate tumor metastasis. In addition, we have generated 9 deletion mutants for calreticulin, which will allow us to determine which of the three domains, N, P, or C, is responsible for the suppression of prostate tumor metastasis.
DTIC
Prostate Gland; Cancer; Gene Expression

20030000888 Case Western Reserve Univ., Cleveland, OH USA
The Nigrostriatal Dopamine System and Methamphetamine: Roles for Excitoxicity and Environmental, Metabolic and Oxidative Stress ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Yamamoto, Bryan K.; Jul. 2002; 57p; In English
Contract(s)/Grant(s): DAMD17-99-1-9479
Report No.(s): AD-A407592; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Degeneration of the nigrostriatal dopamine system is linked to the pathophysiology of Parkinson's disease. Similarly, the psychostimulant drug, methamphetamine also produces relatively selective damage to nigrostriatal dopamine neurons and is a widespread problem and drug of abuse throughout the U. S. However, the neurochemical underpinnings that mediate methamphetamine toxicity and Parkinson's disease are unknown. Several variables common to methamphetamine toxicity and Parkinson's disease, each of which may be important but alone are insufficient, may account for the neurodegeneration of the nigrostriatal dopamine path. It is hypothesized that the convergence of excitotoxicity, free radicals and a depleted bioenergetic state produces damage to dopamine neurons. Moreover, environmental stressors, which also increase free radicals and excitatory amino acids predispose dopamine neurons to damage. Consequently, environmental stress may be synergistic with oxidative and metabolic insults as well as glutamate to culminate in dopamine cell death. The major objective is to examine the interaction between environmental stress and methamphetamine and the convergent action of excitotoxicity and bioenergetic and oxidative stress to produce damage to nigrostriatal dopamine neurons. A multidisciplinary approach will be used as well as pharmacological strategies that we posit to be neuroprotective against methamphetamine, excitotoxicity, and bioenergetic and oxidative stress will be examined.
DTIC
Dopamine; Amphetamines; Metabolism; Methamphetamine

20030000889 National Inst. of Health, Bethesda, MD USA
The HLA Dictionary 2001: A Summary of HLA-A, -B, -C, -DRB1/3/4/5, -DQB1 Alleles and Their Association with Serologically Defined HLA-A, -B, -C, -DR and -DQ Antigens
Schreuder, G. M.; Hurley, C. K.; Marsh, S. G.; Lau, M.; Maiers, M.; Aug. 2001; 33p; In English
Report No.(s): AD-A407591; NMRC01-140; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report presents the serologic equivalents of 123 HLA-A 272 HLA-B and 155 HLA-DRBL alleles. The equivalents cover over 64% of the presently identified HLA-A -B and -DRBL alleles. The dictionary is an update of the one published in 1999 and also includes equivalents for HLA-C DRB3 DRB4 DFB5 and DQB 1 alleles. The data summarize information obtained by the WHO Nomenclature Committee for Factors of the HLA System the International Cell Exchange (UCLA) the National Marrow Donor Program (NMDP) and individual laboratories. In addition a listing is provided of alleles which are expressed as antigens with serologic reaction patterns that differ from the well-established HLA specificities. The equivalents provided will be useful in guiding searches for unrelated hematopoietic stem cell donors in which patients and/or potential donors are typed by either serology or DNA-based methods. These equivalents will also serve typing and matching procedures for organ transplant programs where HLA typings from donors and from recipients on waiting lists represent mixtures of serologic and molecular typings.
DTIC
Antigens; Hematopoietic System; Organs

20030000891 Georgetown Univ., Medical Center, Washington, DC USA
Physiologic Effects of Stress in Gulf War Syndrome ***Final Report, 30 Sep. 1997-31 Mar. 2002***
Clauw, Daniel J.; Apr. 2002; 58p; In English
Contract(s)/Grant(s): DAMD17-97-1-7361
Report No.(s): AD-A407588; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Several expert panels have concluded that the constellation of overlapping symptoms characterizing POWI is not due to a single illness or cause. Rather, physical, emotional, and immune stressors are capable of causing these types of non-specific symptoms. The pattern of biological responses from these stressors depends on both properties of the stressor, as well as characteristics of the host. The major components of the stress response include the autonomic nervous system and the hypothalamic pituitary adrenal (HPA) axis,. Alterations of these systems from normal function have been identified in a number of conditions similar to PGWI such as chronic fatigue syndrome (CFS) and fibromyalgia (FM). In this project we have been intensively studying the activity of the biological stress response in individuals with PGWI, to determine if such persons display the same blunting of the stress response noted in FM and CFS. Parts of this project have been incorporated into a newer, more expansive project comparing physiologic alterations in several illnesses presenting with poorly defined, multisystem symptoms. A multidisciplinary team of investigators with established expertise in FM and CFS, and the measurements of neuroendocrine and autonomic function. In the current project a major finding has been in the area of pain response to physical stimuli. We found that stimulation with adequate pressure to cause similar pain in control and FM subjects resulted in 19 regions of increased regional cerebral blood flow in healthy controls and 12 significant regions in FM subjects. Since pain is one of the hallmark symptoms

of FM, these data, along with other data collected, strongly suggests an augmentation of pain sensitivity in patients with FM that may be related to alterations in HPA and autonomic function. These studies are significantly expanded in the new project.
DTIC
Physiological Effects; Biological Effects; Signs and Symptoms; Physiological Responses; Adrenal Gland

20030000892 North Shore Univ. Hospital, Manhasset, NY USA
Search for New Multidrug Resistant Genes by Methylation Sensitive Representational Difference Analysis (MS-RDA) in Breast Cancer ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Duffy, Hao-peng X.; Jul. 2002; 30p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0383
Report No.(s): AD-A407587; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The WTH3 gene was obtained by its N-terminal sequence that was isolated by the Methylation Sensitive-Representational Difference Analysis (MS-RDA) technique due to its hypermethylation in the human multidrug resistant (MDR) breast cancer cell line MCF7/AdrR. The WTR3 gene product is 89% and 91% identical to the human Rab6 and Rab6c proteins, but possesses an elongated C-terminal region that contains 46 extra amino acids. Nevertheless, we consider WTH3 a new member of the RabS gene family. Semi-Quantitative RT-PCR results showed that WTH3 was 15 and 4 times down regulated in MCF7/AdrR and MES-SA-Dx5 MDR cell lines. Permanent expression of the WTH3 transgene in MDR cell lines increased to varying degrees their sensitivity to several anti-cancer drugs, which include doxorubicin (DOX), taxol, vinblastine, vincristine, and etoposide, as compared to the control sublines transfected with the empty vector. Flow cytometry and fluorescence microscope experiments suggest that the WTH3 transgene stimulates the host's uptake and retention of DOX. These results imply that the WTH3 gene plays a role(s) in MDR phenotype development in breast cancer cells.
DTIC
Genes; Methylation; Cancer; Cytometry

20030000900 Hadassah Medical Organization, Jerusalem, Israel
Protease Activated Receptors (PARs) in the Malignant Invasion Process ***Annual Report, 1 Jun. 2001-31 May 2002***
Sar-Shavit, Rachel; Uziely, Beatrice; Jun. 2002; 117p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-2002
Report No.(s): AD-A407557; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Protease Activated Receptors (PARs) are G-protein - coupled receptors consisting of four family members, all which are activated via proteolytic cleavage. Our data stems from prior observations indicating that thrombin receptor, PAR1 plays a central role in breast carcinoma invasion and metastasis, The mammary gland provides a powerful tool to study developmental and pathological (breast tumor progression) aspects of the gland. We prepared now mice carrying an MMTV LTR - driven Par-1 transgenes specifically overexpressed in the mammary glands. Analysis of whole mount glands of virgin hPar1 +1- mice, showed enhanced complexity of alveolar side branching as compared with normal virgin glands. A striking ductal side branching, budding from preexisting ducts was observed in hPar1 overexpressing glands of pregnant mice. This phenotype is precociously reminiscent of the effect of several oncogenes in the mouse breast. Syk, a tandem SH2 tyrosine kinase protein widely expressed in hematopoeitic cells has been recently assigned as a potent tumor suppressor gene in human breast carcinoma. We set-out to analyze the interrelation between the breast invasive phenotype and Syk, more specifically, the mutual interactions between hParl and Syk. The recruitment of new blood vessels is a prerequisite for tumor growth and metastasis. While recently it has been shown that PAR1 plays a critical role in endothelial cell embryonic development rescuing Par 1 -/- mice from bleeding to death - its role in tumor angiogenesis is unknown. We have addressed this issue by applying the Matrigel plug assay and investigated whether hPar1 can elicit tumor angiogenesis in vivo. Our approach involving the combined analyses of tissue specific hPar1 transgenes, biopsy specimens and established cell lines may help elucidate the involvement of PAR1 in tumor metastasis and angiogenesis.
DTIC
Mammary Glands; Cancer

20030000901 Burnham Inst., La Jolla, CA USA
BAG Family Proteins: Regulators of Cancer Cell Growth Through Molecular Chaperones ***Final Report, 1 Jun. 1999-31 May 2002***
Takayama, Shinichi; Jun. 2002; 70p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9094
Report No.(s): AD-A407556; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

BAG-family proteins regulate diverse cellular functions, including cell survival, cell proliferation, and cell motility. BAG-family proteins contain a conserved domain that allows them to bind 7O-kD heat shock (Hsp70) family molecular chaperones and regulate their activity. Structural analysis of the Hsc70-binding BAG domain of BAG family protein has revealed an anti-parallel two helix bundle, proceeded by an additional long (alpha-helix). Site-directed mutagenesis has confirmed that the polar surfaces of the alpha-helices in the BAG domain are directly involved in chaperone binding, which has been confirmed by NMR experiments (BAGl and BAG4). Similarly, an 80 amino acid region (229-308) of Hsc70 has been determined to represent a minimal domain sufficient for binding the BAG domain. In addition to the Hsp7O-binding domain, BAG-family proteins also contain a diversity of additional domains, which allow them to interact with specific target proteins or which target them to specific locations within cells. The BAG-family proteins operate as bridging molecules that recruit molecular chaperones to target proteins and ultimately affecting diverse cellular behaviors including cell division, migration, differentiation, and death in cancer cells. Recently we found BAG3 as a regulator of cell growth and motility.
DTIC
Mammary Glands; Cancer; Cells (Biology)

20030000902 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Atherogenesis 2002, New Concepts in Plaque Vulnerability and C Reactive Protein
De Jong, Marla J.; Sep. 05, 2002; 12p; In English
Report No.(s): AD-A407581; AFIT-CI02-513; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The objectives of this report are to discuss the history of traditional thoughts on atherogenesis and how they have changed, discuss basic science of atherogenesis, discuss concept of plaque vulnerability, and to discuss the concept of inflammation and C- reactive protein and fibrinogen in atherogenesis.
DTIC
Lipids; Fibrinogen; Reactivity

20030000903 Dartmouth Coll., Hanover, NH USA
Genetic Analysis of a Single Nucleotide Polymorphism in the Matrix Metalloproteinase 1 Promoter in Breast Cancer ***Annual Report, 1 Jul. 2001-30 Jun. 2002***
Brinckerhoff, Constance E.; Jul. 2002; 18p; In English
Contract(s)/Grant(s): DAMD17-00-1-0221
Report No.(s): AD-A407580; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Tumor invasion requires destruction of collagen, and is accomplished by matrix metalloproteinase-l (MMP-1). A single nucleotide polymorphism (SNP) in the MMP-1 promoter enhances transcription of this gene. The SNP is at - 1607 bp in the MMP-1 promoter, where an additional guanine (G) creates a binding site (5-AGGA-3) for the Ets transcription factors. Allele frequency is: 25% =1 G homozygous, 25% =2 G homozygous, and 50% = 1G/2G heterozygous. We hypothesized that the 2G SNP was associated with aggressive breast cancer. MMP-l is on chromosome 11q22.2-22.3, a region associated with Loss of Heterozygosity (LOH) in breast cancer, and that retaining the 2G allele after LOH provided tumors with an advantage for progression. Therefore, we (1) genotyped DNA from normal tissues and metastatic breast tumors for the SNP (2) evaluated tumors for LOH, and (3) measured MMP-1 mRNA levels. of the 58 individuals genotyped, 24 were heterozygous, and of these only 5 underwent LOH, with 3 retaining the 2G allele and 2 retaining the 1G allele. mRNA analysis of tissues from 45 breast cancer patients revealed substantial MMP-l mRNA expression m 32. Thus, although LOH may not favor the 2G allele, MMP-l mRNA expression is common in breast cancer. MMP-1 may be a marker for women at risk for invasive/metastatic breast cancer.
DTIC
Genetics; Cancer; Metastasis; Chromosomes

20030000904 Air Univ., Maxwell AFB, AL USA
The Anthrax Vaccine Debate: A Medical Review for Commanders
Hersack, Richard A.; Apr. 01, 2001; 71p; In English
Report No.(s): AD-A407578; AU-FWS-10; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
There are two distinct yet related aspects to the debate over the safety and efficacy of the anthrax vaccine. An assessment of the clinical safety and efficacy of the anthrax vaccine. The policy level decision to vaccinate military personnel based on intelligence reports and assessments. The policy decision to vaccinate is based on an assessment of relative risk. The risk to an individual of developing side effects and complications after vaccination versus, the risk that Defense Department (DoD) personnel may be exposed to anthrax during an attack. Anthrax causes disease in humans through three mechanisms: cutaneous, gastrointestinal, inhalation. Cutaneous anthrax occurs primarily in unvaccinated workers in goat hair and wool factories.

Veterinary practices and vaccination have eliminated anthrax infection as an occupational risk. Inhalation anthrax is the most lethal. Death occurs in nearly 100 percent of victims with symptoms. Inhalation anthrax is the 100% most likely to be used in biological weapons. Requires aerosolization of anthrax spores down to the proper particulate size for inhalation. Aerosolization of anthrax spores is technically difficult to achieve.
DTIC
Vaccines; Gastrointestinal System; Particulates; Signs and Symptoms

20030000906 Texas Univ. at Dallas, Richardson, TX USA
Molecular Analysis of Neurotoxin Induced Apoptosis ***Annual Report, 1 Sep. 2001-31 Aug. 2002***
D'Mello, Santosh R.; Sep. 2002; 73p; In English
Contract(s)/Grant(s): DAMD17-99-1-9566
Report No.(s): AD-A407576; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Apoptotic cell-death in the brain is a common feature in a variety of neurodegenerative diseases and following exposure to neurotoxins. We hypothesize that certain components of the signaling pathways activated by pathophysiological stimuli might be shared and could serve as targets for the development of therapeutic approaches. In our application, we proposed to compare the signaling pathways activated by four different apoptotic stimuli using cultures of rat cerebellar granule neurons with the goal of identifying common signaling molecules. During the first three years, our goal was to use one of these apoptotic stimuli - potassium (K+) deprivation - and examine the role of four different apoptosis-regulatory molecules. We have now confirmed that NF-kB is a molecule central to neuronal survival and have obtained substantial information regarding the mechanism by which NF-kB activity is regulated in neurons undergoing apoptosis. We show that NF-kB activity is also affected by the neurotoxins, methylmercury and 6-hydroxydopamine. We have gathered evidence indicating that p38-beta activation is necessary for neuronal survival. We show that Akt is necessary for the survival promoting effect of IGF-l, but not of K+. In research that has just been published, we show that contrary to common belief, Akt lies downstream and not downstream of NF-kB activation.
DTIC
Apoptosis; Exposure; Toxins and Antitoxins

20030000907 California Univ., San Francisco, CA USA
Intervention to Decrease Risk for Sexually Transmitted Diseases (STDs) and the Associated Negative Reproductive Health Outcomes in Women Aboard Ships: A biopsychosocial Approach ***Annual Report, 7 Aug. 2000-6 Aug 2001***
Boyer, Cherrie; Sep. 2001; 53p; In English
Contract(s)/Grant(s): DAMD17-95-C-5077
Report No.(s): AD-A407575; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Unintended pregnancies (UlPs) and STDs with their seguelee of ectopic pregnancy continue to be epidemic among active duty enlisted women. Such reproductive health problems result in major morbidity among affected women as well as posing a potential threat to combat readiness. UIPs and STDs result from complex interactions between biological and behavioral factors in military women. The ultimate control in preventing such morbidities must rely on both behavioral and biologic strategies. The primary aim of the project is to develop, implement, and evaluate an intervention which emphasizes correct information, motivation and behavioral skills building (IMB Model) coupled with non-invasive screening using urine-based amplified DNA techniques to detect C. trachomatis and N. gonorrhoeae and urine based pregnancy testing. A pre-test, post-test experimental design was employed to evaluate the impact of the behavioral intervention on the experimental group using both self-report questionnaires (UIPs/STD psychosocial and behavioral risk factors) and results from the STD and pregnancy screening tests as measures. The control intervention will consist of a prevent ion program focusing on nutrition, breast cancer, fitness and injury prevention. Questionnaires and urine testing will be done at pre-test, mid-study, and post-test 6-12 months later. Subjects will include junior enlisted Marine women with N=lOOO in the experimental group and N=lOOO in the control group.
DTIC
Deoxyribonucleic Acid; Mammary Glands; Prevention

20030000910 Baylor Coll. of Medicine, Houston, TX USA
Regulation of NF (kappa) B-Dependent Cell Survival Signals Through the SCF (Slimb) Ubiquitin Ligase Pathway ***Annual Report, 1 Jul. 1999-30 Jun. 2002***
Harper, Jeffrey; Jul. 2002; 20p; In English
Contract(s)/Grant(s): DAMD17-99-1-9071
Report No.(s): AD-A407554; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NFkB is a transcription factor that functions to block the apoptotic response. Inappropriate activation of NFkB is thought to block apoptosis in breast cancer cells. NfkB activity is negatively regulated by a signaling pathway that responds to extracellular signals, including cytokines. Normally, NFkB is held in the cytoplasm by its inhibitor, IkB. In response to extracellular signals, IkB is destroyed by the process of ubiquitin mediated proteolysis. This process is activated through protein kinases that respond to cytokines such as TNFalpha. These kinases phosphorylate IkB, thereby activating it for ubiquitinaton. Ubiguitination involves 3 activities: an El activating enzyme, an E2 ubiguitin conjugating enzyme, and an E3 ubiguitin-protein ligase. In work supported by this grant, we have identified the molecular components involved in IkB ubiguitination. The ubiguitin ligase is composed of Skpl/Cull/Rbxl and the specificity factor beta-TRCP. We have also performed a series of biochemical experiments that have revealed a consensus sequence for association of TRCP with ubiguitination substrates and have identified residues in TRCP that function in substrate recognition.
DTIC
Apoptosis; Cancer; Mammary Glands

20030000998 NASA Marshall Space Flight Center, Huntsville, AL USA
Irradiated HMEC from A-T Heterozygous Breast Tissue
Richmond, Robert, NASA Marshall Space Flight Center, USA; Bors, Karen, NASA Marshall Space Flight Center, USA; Cruz, Angela, NASA Marshall Space Flight Center, USA; Pettengil, Olive, Dartmouth Coll., USA; [2002]; 1p; In English; Era of Hope Department of Defense Breast Cancer Research Program Meeting, 25-28 Sep. 2002, Orlando, FL, USA; Sponsored by Department of Defense, USA
Contract(s)/Grant(s): DAMD17-99-IA-9382; No Copyright; Avail: Issuing Activity; Abstract Only
Women who are heterozygous for ataxia-telangiectasia (A-T) carry a single defective ATM gene in chromosome 11 q22-23, and have been statistically determined with high significance within a defined database to be approximately 5-fold more susceptible for developing breast cancer than their noma1 counterpart. Breast cancer susceptibility of these A-T heterozygotes has been hypothesized to include consequence of response to damage caused by low levels of ionizing radiation. Prophylactic mastectomy specimens were donated by a 41 year-old obligate A-T heterozygote who was located prior to her elective surgery through an existing pedigree. Harvest of that breast tissue provided an isolate of long-term growth human mammary epithelial cells (HMEC), designated WH612/3. An isolate of presumed normal long-term growth HMEC, designated 48R, was obtained from Dr. Martha Stampfer (Lawrence Berkeley Laboratory, University of California), and the A-T heterozygous HMEC were transformed with E6 and E7 oncogenes of human papilloma virus Type-16 in the laboratory of Dr. Ray White (Hunt- Cancer Institute, University of Utah) for use in this study. The objective of this study is to study the expression of end points that may bear on cancer outcome following irradiation of HMEC. Specific end points are cell survival, cell cycle, p53 expression, and apoptosis. Survival curves, immunostaining, and flow cytometery are used to examine these end points. Radiation-induced cell killing shows less shoulder development in the survival curve for WH61U3 compared to 48R HMEC, suggesting less repair of damage in the former HMEC. Additional information is included in the original extended abstract.
Author
Mammary Glands; Cancer; Irradiation; Survival; Apoptosis; Genes; Tissues (Biology)

20030001016 NASA Ames Research Center, Moffett Field, CA USA
Protein Solvation in Membranes and at Water-Membrane Interfaces
Pohorille, Andrew, NASA Ames Research Center, USA; Chipot, Christophe, NASA Ames Research Center, USA; Wilson, Michael A., NASA Ames Research Center, USA; [2002]; 1p; In English; American Chemical Society Meeting, 18-22 Aug. 2002, Boston, MA, USA; Sponsored by American Chemical Society, USA
Contract(s)/Grant(s): RTOP 344-38-22-06; No Copyright; Avail: Issuing Activity; Abstract Only
Different salvation properties of water and membranes mediate a host of biologically important processes, such as folding, insertion into a lipid bilayer, associations and functions of membrane proteins. These processes will be discussed in several examples involving synthetic and natural peptides. In particular, a mechanism by which a helical peptide becomes inserted into a model membrane will be described. Further, the molecular mechanism of recognition and association of protein helical segments in membranes will be discussed. These processes are crucial for proper functioning of a cell. A membrane-spanning domain of glycophorin A, which exists as a helical dimer, serves as the model system. For this system, the free energy of dissociation of the helices is being determined for both the wild type and a mutant, in which dimerization is disrupted.
Author
Aqueous Solutions; Solvation; Chemical Reactions; Peptides; Cell Membranes (Biology)

20030001018 Burnham Inst., La Jolla, CA USA

Investigation of Novel Human CED-4 Homolog NAC-X in Apoptosis Regulation of Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***

Damiano, Jason S.; May 2002; 8p; In English

Contract(s)/Grant(s): DAMD17-01-1-0166

Report No.(s): AD-A407192; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Proteins containing a Caspase-Associated Recruitment Domain (CARD) have previously been shown to serve as key regulators of tumor cell survival as well as regulators of other cellular processes, such as cytokine production. Interleukin-l beta (IL-1B) is a cytokine which has been found to be expressed in breast cancer cells and may be associated with more aggressive and invasive breast tumors. Through a bioinformatics approach, we identified a novel CARD protein which also contained a nucleotide binding domain (NACHT) and a region of leucine-rich repeats (LRR). Here we report the cloning and functional characterization of CLAN (CARD, LRR, and NACHT-containing protein) - CLAN was found to be expressed in several breast cancer cell lines as well as in monocytes by RT-PCR. Co- immunoprecipitation studies revealed that the CARD of CLAN associated with the CARD of several other proteins including caspase-l, Nod2, and NAC. When assayed using an IL-1B ELISA, CLAN was found to induce the activation of caspase-l. Through its interactions with other CARD-containing proteins, CLAN may regulate the survival of breast cancer cells and could be utilized as a novel anti-tumor target or diagnostic/prognostic biomarker.

DTIC

Cells (Biology); Mammary Glands; Cancer; Apoptosis

20030001020 Beth Israel Deaconess Medical Center, Boston, MA USA

Biological Function of BRCA1 and Its Regulation by the Extracellular Matrix and PTEN in Breast Cancer ***Annual Report, 1 May 2001-30 Apr. 2002***

Miralem, Tihomir; Avraham, Hava; May 2002; 72p; In English

Contract(s)/Grant(s): DAMD17-00-1-0152

Report No.(s): AD-A407190; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A high incidence of familial breast and ovarian cancer is associated with inactivation of BRCAl. We demonstrated previously that HRG induced the phosphorylation of BRCAl, which was mediated by the phosphatidylinositol-3 kinase (PI3K)/Akt pathway. Since both extracellular matrix (ECM) and PTEN can modulate P13K/Akt pathway we hypothesized that ECM and PTEN may affect the expression and phosphorylation of BRCAl. to test this we wanted: 1) to determine the effect of ECM/integrins on BRCA1 expression, phosphorylation and nuclear translocation. 2) to characterize biological functions of BRCAl in breast cancer cells. 3) to determine the effect of PTEN on BRCAl phosphorylation. Both cell proliferation and BRCAl phosphorylation were enhanced in T47D cells seeded on laminin after treatment with heregulin (HRG). The enhanced BRCAl phosphorylation on laminin was mediated through alpha(6)beta(4) integrins. Overexpression of BRCAl inhibited HRG-dependent DNA synthesis in breast cancer cells. HRG suppressed BRCAl expression through protein degradation, which required both calpain and proteosome. ECM suppressed BRCAl mRNA expression through its C-terminus, while forced expression of PTEN inhibited HRG-dependent activation of Akt. Taken together these findings show that while BRCAl suppresses HRG-dependent DNA synthesis, ECM and/or HRG can regulate BRCAl expression and phosphorylation. Experiments with PTEN indicated that this phosphatase could affect phosphorylation of BRCA1.

DTIC

Genes; Cells (Biology); Mammary Glands; Cancer

20030001021 Virginia Univ., Charlottesville, VA USA

Identification of Novel Prostate-Causitive Gene Mutations by Representational Difference Analysis of Microdissected Prostate Cancer ***Annual Report, 15 Aug. 1998-14 Feb. 2002***

Moskaluk, Christopher; Mar. 2002; 25p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8644

Report No.(s): AD-A407188; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Representational difference analysis (RDA) was attempted on microdissected samples of human prostate cancer to identify areas of genomic homozygous deletion. Difference products were not reliably obtained with this procedure starting from DNA obtained from 5000 cells. When difference products were obtained, subsequent analysis showed that none corresponded to areas of homozygous deletion. to pursue an alternative strategy, oligonucleotide microarray analysis to identify genes that are down-regulated in malignant prostate tissue, procedures were evaluated that would allow the implementation of microarray analysis to microdissected prostate tissue samples. It was determined that approximately 10,000 cells is a reasonable compromise

between the need to maximize input material and the time required to perform microdissection. Several amplification protocols and procedures were evaluated for efficacy of amplification and quality of oligonucleotide hybridization results. A working protocol is presented that will amplify mRNA from 10,000 cells to 70 ug after 2 rounds of amplification.
DTIC
Prostate Gland; Cancer

20030001037 Texas Univ., Southwestern Medical Center, Dallas, TX USA
Tumor Oxygen Dynamics as a Prognostic Indicator of Effective Antiangiogenic Therapy ***Annual Report, 1 May 2001-30 Apr. 2002***
Zhao, Dawen; Mason, Ralph P.; May 2002; 64p; In English
Contract(s)/Grant(s): DAMD17-01-1-0108
Report No.(s): AD-A407194; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Tumor survival, growth and metastasis depend critically on the development of new blood vessels: so called angiogenesis. One major goal of this project is to fully understand and precisely assess the dynamic changes in blood perfusion and oxygenation, both during normal growth and following anti-angiogenic therapy in several prostate tumors with differential characteristics, so that we may predict response and optimize the therapy. Combined BOLD (Blood oxygen level dependent) MRI with our FREDOM (Fluorocarbon Relaxometry using Echo planar imaging for Dynamic Oxygen Mapping) MR, our results showed that significantly better oxygenation was found in the well differentiated and slower growing H and HI tumors, compared with anaplastic or metastatic, faster growing ATl and MAT-Lu tumors. These MRI data has been compared and validated by cellular and molecular biology. Compared with the level of hypoxia (pimonidazole) and vasculature (CD3l) in H and HI tumors, the ATl tumors have a higher labelling index for pimonidazole and lower vascular density. An interesting finding is that expression of HIF-la and VEGF was found in relatively well differentiated and oxygenated H and HI tumors, which did not overlap with hypoxic regions recognized by pimonidazole. However, there was no expression in the ATl tumors.
DTIC
Blood Vessels; Growth; Prostate Gland; Cancer

20030001104 NASA Ames Research Center, Moffett Field, CA USA
Studies Toward Birth and Early Mammalian Development in Space
Ronca, April E., NASA Ames Research Center, USA; [2002]; 1p; In English; The World Space Congress, Unknown
Contract(s)/Grant(s): NIMH-MH46585; RTOP 121-10-40; No Copyright; Avail: Issuing Activity; Abstract Only
Successful reproduction is the hallmark of a species' ability to adapt to its environment and must be realized to sustain life beyond Earth. Before taking this immense step, we need to understand the effects of altered gravity on critical phases of mammalian reproduction, viz., those events surrounding pregnancy, birth and the early development of offspring. No mammal has yet undergone birth in space. however studies spanning the gravity continuum from 0 to 2-g are revealing insights into how birth and early postnatal development will proceed in space. In this presentation, I will report the results of behavioral studies of rat mothers and offspring exposed from mid- to late pregnancy to either hypogravity (0-g) or hypergravity (1.5 or 2-g).
Author
Birth; Embryology; High Gravity Environments; Mammals; Pregnancy; Reproduction (Biology)

20030001105 NASA Ames Research Center, Moffett Field, CA USA
Labor Contractions Enhance Oxygenation and Behavioral Activity of Newborn Rat Pups
Mills, N. A., California Univ., USA; Baer, L. A., NASA Ames Research Center, USA; Ronca, A. E., NASA Ames Research Center, USA; [2002]; 1p; In English; International Society for Developmental Psychobiology, Unknown
Contract(s)/Grant(s): NIMH-MH46485; RTOP 121-10-40; No Copyright; Avail: Issuing Activity; Abstract Only
Labor contractions help instigate behavioral responses at birth (viz., breathing and suckling) that are vital for the newborn's adaptation to the extrauterine world (Ronca et al., 1996). In the present study, we analyzed the role of labor contractions in postpartum oxygenation and behavioral activity of newborn rat pups. Newborns were observed following either vaginal (V) or cesarean delivery. For cesarean delivery, day 21 pregnant dams' were administered a spinal transaction to eliminate lower body sensation, a laparotomy was performed and the uterus was maintained in a heated (37.5 C) bath. Four rat fetuses in one of the dams' paired uterine horn were compressed (C) to Simulate labor contractions (20 sec/min for 10 min) while four fetuses in the opposite horn were not compressed (NC). Fetuses were surgically removed from the uterus, stroked with a soft brush to mimic postnatal licking by the dam, the umbilical cord occluded. Pups were exposed to room temperature (22 C) for one hr, then nest temperature (33 C) for one hr. PO2, CO2, and O2, saturation were determined at 0, 30, 60, or 120 min post delivery using a blood gas analyzer. V and C delivered neonates showed comparable rates of PO2, CO2 and O2 saturation whereas NC neonates showed depressed

levels at all time points (pis less than 0.05). Respiratory rates of V, C and NC neonates increased significantly (pis less than 0.05) over the first two postpartum hrs and did not differ across groups. Postpartum behavioral activity was significantly greater in V and C conditions and positively correlated with postnatal oxygenation. These findings provide further evidence for importance of labor contractions in early postpartum adaptation.
Author
Contraction; Fetuses; Birth; Oxygenation

20030001110 NASA Ames Research Center, Moffett Field, CA USA
Hypergravity Effects on Rodent Pregnancy and Parturition
Ronca, A. E., NASA Ames Research Center, USA; Baer, L. A., Lockheed Martin Corp., USA; Mills, N. A., California Univ., USA; Wade, C. E., NASA Ames Research Center, USA; [2002]; 1p; In English; American Society for Gravitational and Space Biology, Unknown
Contract(s)/Grant(s): NIMH-MH46485; RTOP 121-10-50; RTOP 121-40-10; RTOP 121-10-30; No Copyright; Avail: Issuing Activity; Abstract Only

No mammal has yet undergone birth, or parturition, in the microgravity of space. Previous studies (Ronco & Alberts, 2000) have shown that mid-pregnant rat dams exposed to spaceflight (0-g) and landed 48-72 hrs before term successfully delivered robust, healthy offspring Microgravity-exposed dams exhibited twice the expected numbers of labor contractions whereas length of pregnancy, duration of labor, fetal wastage, number of neonates born and litter gender ratios were identical to controls. In the present study, we report the results of rodent pregnancy and parturition at the opposite end of the gravity spectrum, in hypergravity. Dams exposed to either: 1.0-g, 1.5-g, 1.75-g or 2.0-g from Gestational day (G) 11 and throughout the births of their litters had comparable pregnancy and labor durations, fetal wastage, numbers of neonates born and litter Tender ratios. During parturition, hypergravity-exposed dams exhibited significantly fewer labor contractions as compared to 1.0-g controls. Dams that underwent birth in hypergravity had significantly fewer offspring surviving the immediate postpartum period (P1: 1.0-g, 11.92 +/- 2.84; 1.5-g, 10.88 +/- 2.17; 1.75-g, 9.22 +/-1.99; 2.0-g, 8.83 +/- 3.31). Within 24 hrs postpartum, neonatal survival was further diminished in hypergravity [P2: 100% (1.0-g); 96% (1.5-g); 96% (1.75-g); 73% (2.0-g)] and continued to decline (P10: 100%(1.0-g.); 90%(1.5-g); 87%(1.75-g), 40%(2.0-g)]. Neonatal losses stabilized by P5 for the 1.5-g andl.75-g conditions but continued until P9 for the 2.0-g condition. Together, these findings show that postnatal, but not prenatal, survival is compromised following birth in hypergravity, Maternal and neonatal factors that contribute to peri-parturitional vulnerability to altered gravity environments will be discussed.
Author
High Gravity Environments; Pregnancy; Rodents; Vulnerability; Birth; Contraction

20030001118 NASA Ames Research Center, Moffett Field, CA USA
Peptides at Membrane Surfaces and their Role in the Origin of Life
Pohorille, Andrew, NASA Ames Research Center, USA; Wilson, Michael A., NASA Ames Research Center, USA; [2002]; 1p; In English; American Chemical Society Meeting, 18-22 Aug. 2002, Boston, MA, USA; Sponsored by American Chemical Society, USA
Contract(s)/Grant(s): RTOP 344-38-22-06; No Copyright; Avail: Issuing Activity; Abstract Only

All ancestors of contemporary cells (protocells) had to transport ions and organic matter across membranous walls, capture and utilize energy and transduce environmental signals. In modern organisms, all these functions are preformed by membrane proteins. We make the parsimonious assumption that in the protobiological milieu the same functions were carried out by their simple analogs - peptides. This, however, required that simple peptides could self-organize into ordered, functional structures. In a series of detailed, molecular-level computer simulations we demonstrated how this is possible. One example is the peptide (LSLLLSL)3 which forms a trameric bundle capable of transporting protons across membranes. Another example is the transmembrane pore of the influenza M2 protein. This aggregate of four identical alpha-helices, each built of 25 amino acids, forms an efficient and selective voltage-gated proton channel. Our simulations explain the gating mechanism in this channel. The channel can be re-engineered into a simple proton pump.
Author
Biological Evolution; Peptides; Cells (Biology); Protobiology; Organisms

20030001573 Georgia Univ., Dept. of Biochemistry, Athens, GA USA

Crystal and Solution Structure of the Photoprotein Obelin ***Final Report, 12 Mar. 1999-31 Dec. 2002***

Lee, John; Oct. 17, 2002; 5p; In English

Contract(s)/Grant(s): N00014-02-1-0230

Report No.(s): AD-A407919; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The three-dimensional structures of several types of recombinant obelin have been determined to atomic resolution. Obelin is a calcium-regulated photoprotein and the origin of the bioluminescence from the marine hydroid polyp Obelia. A W92F mutant obtained showed a violet bioluminescence emission but without change in dimensionality of the substrate binding site. The structures are typical of the super-family of calcium-binding E-F hand proteins. The high quality of the crystals also allowed a novel crystallographic method of anomalous scattering from the protein sulfur, to be demonstrated. The substrate coelenterazine is bound within the protein substituted as a 2-hydroperoxide. The NMR (nuclear magnetic resonance) study indicated that the solution secondary structure did not differ substantially from the crystal.

DTIC

Crystal Structure; Proteins; Crystals; Bioluminescence

20030001577 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Determination of the Virulence of the Pigmentation-Deficient and Pigmentation-/Plasminogen Activator-Deficient Strains of Yersinia pestis in Non-Human Primate and Mouse Models of Pneumonic Plague

Welkos, S.; Pitt, M. L.; Martinez, M.; Friedlander, A.; Vogel, P.; Jan. 2002; 11p; In English

Report No.(s): AD-A407896; No Copyright; Avail: Defense Technical Information Center (DTIC)

The current human plague vaccine, a killed Yersinia pestis whole-cell preparation, does not protect against aerosol challenge and is reactogenic and antigenically undefined. Live attenuated Y. pestis, such as pigmentation-deficient (Pgm-) strains, have been used frequently as vaccines and are efficacious. They are used widely in plague research and assumed to be safe. However, they can cause serious adverse reactions, and their aerosol infectivity is not known. We tested the virulence of a defined Pgm- variant of the C092 strain of Y. pestis in mouse and non-human primate models of pneumonic plague. The ten-fold lower median lethal dose by the aerosol compared to the subcutaneous (s.c.) routes of the Pgm -strain in mice suggested that the Pgm -strain might be less attenuated by the former than by the latter route. After exposure of 16 African green monkeys to inhaled doses ranging from 1.1 x 10e4 to 8.1 X 1Oe7 cfu, eight died and eight survived. The terminal cultures collected from five of the non-survivors were all positive for Y. pestis. Two of the remaining three non-survivors were culture-negative but had pathologic and immunologic evidence of infection with Y. pestis, specimens could not be obtained nor the cause of death determined for the third one. The deaths were not dose-related, and there were some differences in the pathology associated with infection by the Pgm- strain compared to the wild-type (wt) strain. However, the Pgm- derivative was clearly virulent for monkeys by the aerosol route. A mutant of the Pgm- strain, which has a deletion m the plasminogen activator (Pla) virulence locus (Pla), appeared to be more attenuated than was either the Pgm- single mutant (in NHPs and mice) or the Pla- single mutant strain (in mice) and has potential as a live vaccine.

DTIC

Vaccines; Diseases

20030001585 Navy Experimental Diving Unit, Panama City, FL USA

The Effects of Warm Water Diving on Performance: Neuropsychological Findings Using the Automated Neuropsychological Assessment Metrics

Lowe, Michael A.; Reeves, Dennis; Long, Edwin T.; Sep. 04, 2002; 34p; In English

Report No.(s): AD-A407859; NEDU-TR-02-11; NAVSEA-N-773; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical report partially addresses issues associated with Naval Sea Systems Command (NAVSEA) Task 99-005c and Annex A of Navy Experimental Diving Unit (NEDU) Test Protocol 99-22 (TP99-22). Operational performance and safety are important in any challenging environment. Work in extremely warm water is an unexplored subject that this study addresses. The data gathered during this series of dives provide guidelines for early identification of potential changes in diver health and for investigations of divers' reports of subtle changes in their cognitive functioning. The purposes of the study were to assess the neuropsychological safety of exposure to a warm water environment, to ensure proper documentation of the divers' neuropsychological state before and after warm water exposure, and to identify any residual effects from exposure to warm water.

DTIC

Diving (Underwater); Neurology; Health; Tolerances (Physiology); Psychology; Physiological Effects

20030001591 NASA Marshall Space Flight Center, Huntsville, AL USA

Characterization of Truncated Tumor-Associated NADH Oxidase (ttNOX)

Karr, Laurel J., NASA Marshall Space Flight Center, USA; Malone, Christine C., Universities Space Research Association, USA; Burk, Melissa, Morgan Research Corp., USA; Moore, Blake P., Alabama Univ., USA; Achari, Aniruddha, Raytheon Co., USA; [2002]; 1p; In English; XIX Congress of the International Union of Crystallography, 7 Aug. 2002, Geneva, Switzerland; Sponsored by International Union of Crystallography, UK; No Copyright; Avail: Issuing Activity; Abstract Only

Bacterial, plant and animal cells possess novel surface proteins that exhibit both NADH oxidation (NOX) or hydroquinone and protein disulfide-thiol interchange. These enzymatic activities alternate to yield oscillating patterns wjth period lengths of approximately 24 minutes. The catalytic period of NOX proteins are temperature compensated and gravity responsive. We report the cloning, expression and characterization of truncated tumor-associated NADH oxidase (ttNOX), in which the membrane spanning region has been deleted. The cDNA (originated from HeLa cells) was cloned into pET-34b and pET-14b (Novagen) vectors for E. coli expression. Optimized expression and purification protocols yielded greater than 300mg per liter of culture with greater than 95% purity. Circular dichroism data was collected from a 2.7mg/ml solution in a 0.1mm cuvette with variable scanning using an Olis RSM CD spectrophotometer. The ellipticity values were scanned from 190 to 260nm. The spectra recorded have characteristics for alpha proteins with band maxima at 216nm and a possible shoulder at 212nm at 12OC and 250 C. Protein crystal screens are in progress and, to date, only small crystals have been observed. The regular periodic oscillatory change in the ttNOX protein is indicative of a possible time-keeping functional role. A single protein possessing alternating catalytic activities, with a potential biological clock function, is unprecedented and structural determination is paramount to understanding this role. Author

Catalytic Activity; Cloning (Biology); Disulfides; Ellipticity; Escherichia; Protocol (Computers); Purification

20030001593 University of North Texas Health Science Center, North Texas Eye Research Inst., Forth Worth, TX USA

Photo-Oxidative Stress Down-Modulates the Activity of NF-kB Via Involvement of BCL-2 and Caspase-1, Leading to Apoptosis of Photoreceptor Cells

Agarwal, Neeraj, University of North Texas Health Science Center, USA; Krishnamoorthy, Raghu R., University of North Texas Health Science Center, USA; Crawford, Matthew J., University of North Texas Health Science Center, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 1-3; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Light has been extensively used as an initiator of photoreceptor cell death in a number of in vivo and in vitro experimental conditions. In vivo studies have also shown that exposure of rats to constant light results in apoptosis of photoreceptor cells. Production of lipid hydroperoxides has been observed in light exposed retinas. The retina has been shown to be susceptible to lipid peroxidation despite having high levels of antioxidants. Since photoreceptor cells in the retina are constantly exposed to light and retina is one of the highest oxygen-consuming tissues in the body, it has a high risk to oxidative damage.

Derived from text

Apoptosis; Photoreceptors; Photooxidation; Light (Visible Radiation); Cells (Biology)

20030001594 Ulm Univ., ENSOMA Lab., Germany

The Interface of Cells in Vitro, or Tissues in VIVO and Implant Materials: An Extended Study Motivating Near-Field Optical Analysis In Vitro and In Vivo

Franke, Ralf-Peter, Ulm Univ., Germany; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 4-5; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Integration of bioimplants in hard or soft body tissues requires histocompatibility of the biomaterials. Integration or non-integration of bioimplants is affected by the body's own cells, by the locotypical cells and by the so-called free cells, the leucocytes. For their proper function, both cell types need highly specific locotypical informations, which are supplied especially by the local extracellular matrix. The local extracellular matrix has to be regarded as a condensed, stored information supply of and for the cells. When cells bind to the locotypical extracellular matrix via specific receptors, the uptake of lo- cotypical information starts and the cells enter certain differentiation routes. This interaction was presented at the 1st International NOA conference last November (Franke, 2001) and it is repeated now because it is fundamental for an understanding of the interaction between body foreign biomaterials and surrounding tissues.

Derived from text

In Vitro Methods and Tests; Near Fields; Tissues (Biology); Cells (Biology); Implantation; In Vivo Methods and Tests

20030001595 California Univ., Mitochondrial and Metabolic Disease Center, San Diego, CA USA

Mitochondria, Cell Growth, and Pyrimidine Synthesis

Naviaux, Robert K., California Univ., USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 6-8; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Mitochondria are highly integrated, intracellular bioreactors that perform a diverse array of metabolic functions ranging from free radical production, oxygen consumption, water synthesis, ATP synthesis, fatty acid and amino acid oxidation, to pyrimidine nucleotide biosynthesis. The protein concentration of the mitochondrial matrix approaches 500 mg/ml. This is equivalent to the packing density and hydration state of a crystal of trypsin. The spatial packing of mitochondrial proteins in the matrix and in the inner mitochondrial membrane is highly conserved and regulated according to local environmental signals and physiologic need. This ensures that mitochondria can respond dynamically to changing cellular needs. The synthesis, transport, and efficient interconversions of pyrimidines are essential for normal cell and organ function. Particularly heavy demands are placed on these pathways during growth stimuli in embryogenesis, wound healing, and cancer. All cellular pyrimidines are ultimately derived from the synthesis of uridine, which in turn, must be synthesized from orotic acid by condensation with phosphoribosyl pyrophosphate (PRPP) and decarboxylation. The fourth and potentially rate-limiting step in the synthesis of pyrimidines is catalyzed by dihydroorotate CoQ10 oxidoreductase (DHO-QO, EC 1.3.99.11; also called dihydroorotate dehydrogenase (DHOD, EC 1.3.3.1). This enzyme is located exclusively on the inner mitochondrial membrane and is coupled to the electron transport chain via coenzyme Q10 (ubiquinone).

Derived from text

Bioreactors; Cell Division; Cytology; Mitochondria; Pyrimidines; Biosynthesis; Coenzymes

20030001596 Technion - Israel Inst. of Tech., Leonard and Diane Sherman Center for Research in Biomaterials, Haifa, Israel

Optical Actuation and Control of Biological Systems: Basic Concepts and Medical and Technological Applications

Lotan, Noah, Technion - Israel Inst. of Tech., Israel; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 9-10; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Chemical, physico-chemical and biological processes take place by overcoming an activation energy barrier. The higher this barrier is, the slower is the process. In principle, such processes can be facilitated, i.e., their rate increased, along two main routes: (a) by using chemical or biochemical catalysts, which perform their function upon lowering the activation energy barrier; (b) by providing to the system the entire activation energy required and this can be achieved upon using, for example, thermal, ultrasonic or optical means. As part of our studies, we relied on the use of optical instrumentality in order to access the most novel and multi-disciplinary area of Molecular Bio-Electronics. In the systems considered, chemical and biochemical molecular elements, as well as electroconducting polymers are integrated in multicomponent arrays. These are built to operate as molecular switches, logic elements and high-order assemblies, in order to perform complex tasks of information processing. These systems are activated and controlled by outside optical signals.

Derived from text

Biochemistry; Optical Control; Technologies; Actuation; Activity (Biology); Molecular Electronics; Optical Communication

20030001599 Medical Coll. of Wisconsin, Milwaukee, WI USA

The Use of NASA Light-Emitting Diode Near-Infrared Technology for Biostimulation

Whelan, Harry T., Medical Coll. of Wisconsin, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 32-39; In English; Also announced as 20030001592

Contract(s)/Grant(s): NAS8-01166; NAS8-99015; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Studies on cells exposed to microgravity and hypergravity indicate that human cells need gravity to stimulate growth. As the gravitational force increases or decreases, the cell function responds in a linear fashion. This poses significant health risks for astronauts in long-term spaceflight. The application of light therapy with the use of NASA LEDs will significantly improve the medical care that is available to astronauts on long-term space missions. NASA LEDs stimulate the basic energy processes in the mitochondria (energy compartments) of each cell, particularly when near-infrared light is used to activate the color sensitive chemicals (chromophores, cytochrome systems) inside. Optimal LED wavelengths include 680, 730 and 880 nm and our laboratory has improved the healing of wounds in laboratory animals by using both NASA LED light and hyperbaric oxygen. Furthermore, DNA synthesis in fibroblasts and muscle cells has been quintupled using NASA LED light alone, in a single application combining 680, 730 and 880 nm each at 4 Joules per centimeter squared. Muscle and bone atrophy are well documented in astronauts, and various minor injuries occurring in space have been reported not to heal until landing on Earth.

An LED blanket device may be used for the prevention of bone and muscle atrophy in astronauts. The depth of near-infrared light penetration into human tissue has been measured spectroscopically.
Derived from text
Light Emitting Diodes; Sensory Stimulation; NASA Space Programs; Near Infrared Radiation; Technology Utilization

20030001600 Medical Coll. of Wisconsin, Dept. of Cell Biology, Milwaukee, WI USA
Effect of 670-nm Light-Emitting Diode Light On Neuronal Cultures
Wong-Riley, Margaret T. T., Medical Coll. of Wisconsin, USA; Whelan, Harry T., Medical Coll. of Wisconsin, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 40-44; In English; Also announced as 20030001592
Contract(s)/Grant(s): NAS8-99015; NIH-R01-EY05439; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Light close to and within the near infrared range has documented benefits for promoting wound healing in human and animal studies. Our preliminary results using light-emitting diodes (LEDs) in this range have also demonstrated two-to five-fold increases in growth-phase-specific DNA synthesis in normal fibroblasts, muscle cells, osteoblasts, and mucosal epithelial cells in tissue cultures. However, the mechanisms of action of such light on cells are poorly understood. We hypothesized that the therapeutic effects of such light result from the stimulation of cellular events associated with increases in cytochrome oxidase activity. As a first step in testing our hypothesis, we subjected primary neuronal cultures to impulse blockade by tetrodotoxin (TTX), a voltage-dependent sodium channel blocker, and applied LED light at 670 nm to determine if it could partially or fully reverse the reduction of cytochrome oxidase activity by TTX. The wavelength and parameters were previously tested to be beneficial for wound healing.
Derived from text
Light Emitting Diodes; Neurophysiology; Culture Techniques; Toxins and Antitoxins; Wound Healing; Near Infrared Radiation

20030001602 Kuopio Univ., Dept. of Biochemistry, Finland
Apatite Biofilm Forming Agent: Nanobacteria as a Model System for Biomineralization and Biological Standard for NOA: A Preliminary Study
Kajander, E. Olavi, Kuopio Univ., Finland; Aho, Katja, Kuopio Univ., Finland; Segal, Vardit, Technion - Israel Inst. of Tech., Israel; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 51-57; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Nanobacteria are self-replicating particles that provide a culturable model to study primordial life strategies. In this study, we showed that nanobacteria do adhere rapidly and effectively on stainless steel and on several, but not all, organic polymer coatings. Such coatings are powerful tools to control nanobacterial biofilm formation. These findings have direct applications in planning reactors to study nanobacterial biofilms and mineralization, both under 1g and in microgravity. Such experiments should atract astrobiologists, geologists, and those from the biomaterial science and medicine disciplines. Improved coatings/matrixes might prevent pathological calcification, or improve deficient calcification in a controlled manner.
Derived from text
Biofilms; Minerals; Nanoparticles; Bacteria; Calcium Phosphates; Near Fields; Optics

20030001604 Wistar Inst. of Anatomy and Biology, Philadelphia, PA USA
Regeneration Studies In the MRL Mouse
Heber-Katz, Ellen, Wistar Inst. of Anatomy and Biology, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 66-69; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We have recently described the ability of the mouse strain, MRL/MpJ, to heal a through-and-through ear hole wound, a phenomenon also seen in other mammals. The method used to reveal this phenotype, ear hole punching, is actually a standard technique for identifying mice by number in the animal colony. In our experience, no other mouse strain tested, besides a derivative strain, the LG mouse, is capable of healing this mark. What is remarkable in rabbits and MRL mice is that their ear hole closures not only display full scar-free healing, but also show the recovery of normal architecture, collagen structure, angiogenesis, the appearance of hair follicles and sebaceous glands and cartilage. In many ways, the closure resembles what is seen in mammalian development and neonatal wounding more than it resembles adult wound healing. Since mice are available as inbred strains making breeding segregation studies easy to carry out, we generated a large population and did a complete genome-wide screen using available microsatellite markers. These studies led to identifying at least 7 loci. Most recently, we have carried out F2 crosses using different nonhealers and generated congenic mice, which will allow us to narrow the loci for the eventual identification of

the genes involved in the regenerative process. In the present paper, we will discuss the extent of regeneration in the MRL mouse, the role of scarring in regeneration, and possibly extending this type of healing to other mammals.
Derived from text
Regeneration (Physiology); Mice; Cardiovascular System; Connective Tissue

20030001606 Ulm Univ., ENSOMA Lab., Germany
Near-field Optical Analysis (NOA) Via Hydrophobic Optical Elements and Low-Intensity Light-Activated Biostimulation Effect of NOA
Sommer, Andrei P., Ulm Univ., Germany; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 78-83; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Near-field optical analysis (NOA) is a potentially inoffensive method, predicted to provide time-resolved morphological mappings of soft cell surfaces with resolutions on the nanoscale level. The performance of NOA in imaging unlabeled biosystems with continuous liquid/solid-boundary variations was recently demonstrated at the ENSOMA Laboratory in living cells attached to titanium discs. NOA via near-field scanning optical microscopy (NSOM) has produced the highest optical resolution ever achieved - a method exploiting the energy transfer from the tip of an optical element (tip diameter 120 nm) oscillating within the characteristic range of the energy transfer (approximately 10 nm) in the near-field of the sample to be analyzed. Irradiation-induced energy transfer between excited molecules (emitter) and receptor molecules (acceptor), positioned in the proximity of the emitter molecules via spacer molecules, has been confirmed experimentally. Specific irradiation-induced energy transfer is common to a number of biosystems. In mitochondria, cytochrome c oxidase, a photo-acceptor for monochromatic red to near-IR light, could provide energy transfer, discussed as one possible mechanism in low level laser therapy (LLLT). Biostimulatory effects achieved in various biosystems by using non-monochromatic light indicate, however, the action of some unspecific photobiological energy transfer mechanism within these systems.
Derived from text
Hydrophobicity; Near Fields; Luminous Intensity; Near Infrared Radiation; Sensory Stimulation; Light (Visible Radiation); Photochemical Reactions; Optics

20030001680 Navy Experimental Diving Unit, Panama City, FL USA
Automated Neuropsychological Assessment Metrics: Norms for U.S. Navy Divers
Lowe, Michael; Reeves, Dennis; May 2002; 12p; In English
Report No.(s): AD-A407944; NEDU-TR-02-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Automated Neuropsychological Assessment Metrics (ANAM) was identified as a potentially useful screening instrument for assessing the cognitive abilities of divers. Normative data from 113 USA Navy divers were collected and are presented. The instrument is computer based and provides millisecond timing while automatically scoring and summarizing. It is purported to afford the level of sensitivity
DTIC
Neurology; Psychology; Mental Performance; Diving (Underwater)

20030001759 NASA Marshall Space Flight Center, Huntsville, AL USA
Spirochaeta Americana Sp. Nov., A new Haloalkaliphilic, Obligately Anaerobic Spirochete Isolated from Soda Mono Lake in California
Hoover, Richard B., NASA Marshall Space Flight Center, USA; Pikuta, Elena V., Alabama Univ., USA; Bej, Asim K., Alabama Univ., USA; Marsic, Damien, Alabama Univ., USA; Whitman, William B., Georgia Univ., USA; Tang, Jane, American Type Culture Collection, USA; Krader, Paul, American Type Culture Collection, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

A novel obligately anaerobic, mesophilic, haloalkaliphilic spirochete, strain ASpG1(sup T), was isolated from sediments of the alkaline, hypersaline Mono Lake in California, U.S.A. The Gram-negative cells are motile and spirochete-shaped with sizes of 0.2 - 0.22 X 8-15 microns. Growth was observed over the following ranges: temperature 10 C to 44 C; optimum +37 C; NaCl concentration 2 - 12 % (w/v); optimum NaCl3 % and pH 8 - 10.5; optimum pH 9.5. The novel isolate is strictly alkaliphilic, requires high concentrations of carbonate in the medium, and is capable of utilizing D-glucose, fructose, maltose, sucrose, starch, and D-mannitol. The main end products of glucose fermentation are: H2, acetate, ethanol, and formate. Strain ASpG(sup T) is resistant to kanamycin, and rifampin, but sensitive to chloramphenicol, gentamycin and tetracycline. The G+C content of its DNA is 58.5 mol%, genome size is 2.98 x l0(exp 9) Daltons, Tm of the genomic DNA is 68 +/- 2 C, and DNA-DNA hybridization with the most closely related species, Spirocheta alkalica Strain Z-7491(sup T), exhibited 48.7% homology. On the basis of its

physiological and molecular properties, the isolate appears to be a novel species of the genus Spirochaeta; and the name Spirochaeta americana sp. nov., is proposed for the taxon (type strain ASpG1(sup T) = ATCC BAA-392(sup T) = DSMZ 14872(sup T)).
Author
Antibiotics; Deoxyribonucleic Acid; Genome; Glucose; Homology; Mesophiles; Physiology; Tetracyclines

20030001969 Mount Sinai School of Medicine, New York, NY USA
Inflammatory Response and Oxidative Stress in the Degeneration of Dopamine Neurons in Parkinson's Disease ***Annual Report, 1 Jul. 2001-1 Jul 2002***
Olanow, C. W.; Aug. 2002; 28p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9557
Report No.(s): AD-A407775; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The experiments performed during the third grant period were an extension of the 2nd year and were designed to provide more insights in the role of arachidonic acid release and metabolism in the oxidative stress-induced cell death caused by depletion of GSH. In addition we examined the time course of free radical generation in cells depleted of GSH. Our studies using primary mesencephalic cultures provided the following information. (l) Using selective inhibitors we showed that the release of arachidonic acid occurs early in the period of GSH depletion and depends on the activation of PLA2. (2) We showed that inhibition of PLA2 activity protects fully from damage only if applied early in the course of GSH depletion, while inhibition of arachidonic acid metabolism is protective at any time prior to cell death. This suggests that products of the metabolism of arachidonic acid are the major cause of toxicity. (3) We confirmed that products of arachidonic acid metabolism are very toxic particularly when GSH is depleted. (3) We demonstrated that hydrogen peroxide and other reactive oxygen species (ROS) accumulate in detectable amounts only a few hours prior to cell death. Accumulation begins within mitochondria and later involves processes and cell bodies. Anti-oxidants are protective when applied anytime following damage.
DTIC
Nervous System; Diseases; Dopamine; Oxidation; Stress (Biology)

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.

20030000450 National Inst. of Neurological Diseases and Stroke, Bethesda, MD USA
NINDS rt-PA Trials Dataset with Center ID +2 New Stroke Variables
1995; In English
Report No.(s): PB2003-500017; No Copyright; Avail: National Technical Information Service (NTIS)
The CD-ROM contains two SAS datasets (containing center ID and two new stroke variables) from the National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group Trials, 'Tissue Plasminogen Activator for Acuste Ischemic Stroke', originally published in the New England Journal of Medicine (N Engl J Med 1995 Dec 14;333(24):1581-7).
NTIS
Anticoagulants; Neurology; Ischemia

20030000977 NASA Marshall Space Flight Center, Huntsville, AL USA
Crystallization and Preliminary X-ray analysis of Human Recombinant Acid beta-glucocerebrosidase, a treatment for Gaucher's Disease
Roeber, Dana F., NASA Marshall Space Flight Center, USA; Achari, Aniruddha, NASA Marshall Space Flight Center, USA; Manavalan, Partha, Genzyme Corp., USA; Edmunds, Tim, Genzyme Corp., USA; Scott, David L., Massachusetts General Hospital, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only
Acid beta-glucocerebrosidase (N-acylsphingosyl - O - beta-D - glucoside:glucohydrolase) is a lysosomal glycoprotein that catalyzes the hydrolysis of the glycolipid glucocerebroside to glucose and ceramide. Inadequate levels of this enzyme underly the pathophysiology of Gaucher's disease. Cerezyme(R) (Genzyme Corporation, Cambridge, MA) is a partially deglycosylated form of recombinant human acid beta-glucocerebrosidase that is commercially available for the treatment of Gaucher patients. Although acid beta-glucocerebrosidase belongs to a large family of glycosidases, relatively little is known regarding its structural

biology. We report the crystallization and the initial diffraction analysis of Cerezyme(R). The crystals are C-centered orthorhombic, with unit-cell parameters of a = 285.0 A, b = 110.2 A, and c = 91.7 A. A 99.9 A complete data set has been collected to 2.75 A with an R(sub sym) of 8.8 %.
Author
Crystallization; X Ray Analysis; Acids; Glucose

20030001034 Naval Postgraduate School, Monterey, CA USA
The Effects of Reversing Sleep-Wake Cycles on Sleep and Fatigue on the Crew of USS John C. Stennis
Nguyen, John L.; Sep. 2002; 169p; In English; Original contains color images
Report No.(s): AD-A407035; No Copyright; Avail: CASI; A08, Hardcopy
This study explores the effects of reversing the work-sleep schedules of the crew aboard the USS JOHN C STENNIS. It also reviews current research in the field of sleep deprivation and the resultant performance decrements in humans. The results of the study indicate that a significant number of sailors have difficulty adjusting to working nights and sleeping days. Additionally, the study finds that individuals working topside have greater difficulty adjusting to the reversed schedule than do their counterparts who work below deck. Using a validated model of human performance and fatigue, we demonstrate that the level of fatigue and sleep deprivation observed in this study population significantly reduces individual effectiveness. The recommendations address the need for educating military personnel on the subject of fatigue and sleep logistics, possible fatigue countermeasures, and the need for further research on this topic.
DTIC
Fighter Aircraft; Circadian Rhythms; Sleep Deprivation; Aircraft Pilots

20030001114 NASA Ames Research Center, Moffett Field, CA USA
NASA Smart Surgical Probe Project
Mah, Robert W., NASA Ames Research Center, USA; Andrews, Russell J., NASA Ames Research Center, USA; Jeffrey, Stefanie S., Stanford Univ., USA; Guerrero, Michael, NASA Ames Research Center, USA; Papasin, Richard, NASA Ames Research Center, USA; [2002]; 7p; In English; International Workshop on Nanotechnology and Health Care, 11-12 Jan. 2003, Thanjavur, India; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Information Technologies being developed by NASA to assist astronaut-physician in responding to medical emergencies during long space flights are being employed for the improvement of women's health in the form of "smart surgical probe". This technology, initially developed for neurosurgery applications, not only has enormous potential for the diagnosis and treatment of breast cancer, but broad applicability to a wide range of medical challenges. For the breast cancer application, the smart surgical probe is being designed to "see" a suspicious lump, determine by its features if it is cancerous, and ultimately predict how the disease may progress. A revolutionary early breast cancer detection tool based on this technology has been developed by a commercial company and is being tested in human clinical trials at the University of California at Davis, School of Medicine. The smart surgical probe technology makes use of adaptive intelligent software (hybrid neural networks/fuzzy logic algorithms) with the most advanced physiologic sensors to provide real-time in vivo tissue characterization for the detection, diagnosis and treatment of tumors, including determination of tumor microenvironment and evaluation of tumor margins. The software solutions and tools from these medical applications will lead to the development of better real-time minimally-invasive smart surgical probes for emergency medical care and treatment of astronauts on long space flights.
Author
NASA Programs; Research and Development; Aerospace Medicine; Microelectromechanical Systems; Surgery; Bioinstrumentation

20030001128 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Strenuous Efforts Intestinal Complaints Intestinal Permeability and Intestinal Flora ***Zware, Inspanning, Darmklachten, Darmpermeabiliteit en Darmflora: Een Studie Gericht op specifieke Omstandigheden bij de Krijgsmacht***
Voorrips, L. E., Institute for Nutrition and Food Research TNO, Netherlands; vanErp-Baart, A. M. J., Institute for Nutrition and Food Research TNO, Netherlands; Jansen-vanderVliet, M., Institute for Nutrition and Food Research TNO, Netherlands; July 2002; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A00/KL/117; TNO Proj. 20363/01.01
Report No.(s): TNO-rapport-V3800/TD2002-0143; Copyright; Avail: Issuing Activity
Strenuous physical effort can lead to intestinal complaints. These complaints can be so serious that the relevant activity must be stopped. Since strenuous physical effort plays a major role in the training and activities of military personnel, it is very well possible that the complaints occurring during these activities are a reason for dropping out. In the study presented here, the

relationship between strenuous physical activity and the occurrence of complaints was at the forefront. Since it is described in the literature that with strenuous activity the permeability of the intestinal wall increases, this could be an underlying reason for the occurrence of complaints. An intact intestinal wall forms the separation between the sterile internal body and the non-sterile outside. An increased permeability of this system can reduce the barrier function and lead to the transport of larger molecules and (parts of) microorganisms into the bloodstream which can result in complaints.
Author
Physical Exercise; Intestines; Personnel; Permeability

20030001597 Semmelweis Univ. Medical School, Dept. of Diagnostic Radiology and Oncotherapy, Budapest, Hungary
How It All Started: Dr. Endre Mester's Pioneering Work
Mester, Adam R., Semmelweis Univ. Medical School, Hungary; Sommer, Andrei P., Ulm Univ., Germany; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 11-13; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The central point in the present study is the quantitative explanation of the reproducible results in Mester's pioneering laser work. The Biophysical equation inter-relating the variable irradiation parameters in photostimulation is the LILAB equation. Biologically, the parameters (E/a)(sub act) and I (sub stim) are independent of each other-an important consideration for the medical applications of photobiological effects realized via lasers (including non-coherent light sources) at low intensity and low energy density levels.
Derived from text
Biophysics; Irradiation; Activation (Biology); Luminous Intensity; Laser Beams

20030001598 Bahia Univ., School of Dentistry, Salvador, Brazil
Biomodulatory Effects of LLLT On Bone Regeneration
Pinheiro, Antonio L. B., Bahia Univ., Brazil; Ramalho, Luciana Maria Pedreira, Bahia Univ., Brazil; Oliveira, Marilia G., Pontificia Univ. Catolica, Brazil; Martins, Pedro Paulo M., Universidade Federal de Pernambuco, Brazil; MatosdeOliveira, Marcos A., Universidade Federal de Pernambuco, Brazil; Silva, Aurelicio Novaes, Jr., Pontificia Univ. Catolica, Brazil; Nicolau, Renata Amadei, Paraiba Univ., Brazil; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 14-22; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Tissue healing is a complex process with local and systemic responses. The process of wound healing involves several types of cells, enzymes, growth factors, and other substances. LLLT for wound healing has been shown effective in modulating both local and systemic responses. On soft tissues it has been shown that - depending on the wavelength, dose, and local conditions - LLLT has anti-inflammatory effects, reduces pain, quickens cell proliferation, and, consequently, induces the healing process. Bone healing differs from that observed in soft tissue because of both morphology and composition. Usually the healing process of the bone is slower than that observed in soft tissues. The natural course of bone healing is composed of consecutive phases and differs according to the type and intensity of the trauma and also the extension of the damage to the bone. The effects of LLLT on bone are still controversial as previous reports found elsewhere in the literature show different conflicting results. It is possible that LLLT effect on bone regeneration depends not only on the total dose of irradiation, but also on irradiation time and irradiation mode (CW or PLS). Most importantly, recent study has suggested that the threshold parameter energy density and intensity are biologically independent from each other. The independence accounts for the success and the failure of LLLT achieved at low-energy density levels as described previously. This paper reports observations on the effect of LLLT on bone healing.
Derived from text
Bones; Modulation; Regeneration (Physiology); Wound Healing; Laser Beams; Tissues (Biology)

20030001601 Army Medical Research Detachment., Brooks AFB, TX USA
Laser Eye Injury on the Modern Battlefield: Clinical, Research and Military Issues
Brown, Jeremiah, Jr., Army Medical Research Detachment., USA; Zwick, Harry, Army Medical Research Detachment., USA; Schuschereba, Steven, Army Medical Research Detachment., USA; Lund, David J., Army Medical Research Detachment., USA; Stuck, Bruce E., Army Medical Research Detachment., USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 46-50; In English; Also announced as 20030001592; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The military use of lasers has expanded dramatically over the past 30 years. Military applications range from low power laser training tools to devices such as rangefinders, target designators, optical countermeasures, and optical communications.

High-energy lasers are also being developed for theatre ballistic missile defense systems and lasers will also be used in chemicaVbiologica1 detection. Furthermore, threat nations have developed laser systems that can produce ocular injury at tactical ranges. The potential exists for large numbers of soldiers, aircrew and seamen sustaining laser retinal injuries. Experience with past laser injuries has shown that retinal injuries may result in permanent visual loss. The goals of treating these injuries include reducing scar formation and protecting the viability of injured photoreceptors. One challenge in the treatment of laser eye injuries is their varied presentation. Laser injuries may create an isolated retinal burn, or may result in intravitreal, intraretinal, or subretinal hemorrhage. Secondary events such as intraretinal scarring and macular holes may occur (Powell et al.; Pollack et al.; Custis et al.; Stuck et al.; Brown et al.). Furthermore, many soldiers may be expected to have bilateral injuries if their fixation is directed toward a distant source. The development of treatments for the varied types of laser retinal injuries is a priority for the Department of Defense.
Derived from text
Clinical Medicine; Defense Program; Eye (Anatomy); Lasers; Military Technology

20030001603 Walter Reed Army Inst. of Research, Dept. of Molecular Pathology, Silver Spring, MD USA
Basic Pathophysiological Mechanisms of Host Responses
Jett, Marti, Walter Reed Army Inst. of Research, USA; Das, Rina, Walter Reed Army Inst. of Research, USA; Cummings, Christanio, Walter Reed Army Inst. of Research, USA; Mendis, Chanaka, Walter Reed Army Inst. of Research, USA; Neill, Roger, Walter Reed Army Inst. of Research, USA; Hoover, David, Walter Reed Army Inst. of Research, USA; Lindler, Luther, Walter Reed Army Inst. of Research, USA; Paranavitana, Chrysanthe, Walter Reed Army Inst. of Research, USA; Huang, Xiao-Zhe, Walter Reed Army Inst. of Research, USA; Ludwig, George, Army Medical Research Inst. of Infectious Diseases, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 58-65; In English; Also announced as 20030001592; Original contains color illustrations; Sponsored in part by RAD IV and Common Diagnostic Systems
Contract(s)/Grant(s): DARPA Order H960; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche
In our changing world, there has been a significant increase in both the nature and degree of the threat posed by the use of biological agents. Studies for many years have focused on rapid detection of known biological threat agents using structural-based probes designed and directed toward features of the pathogenic agent. However, concerns relating to unidentifiable pathogens that could result from either deliberate or natural mutation processes have prompted studies to find alternative approaches. Our thesis was that an exposed individual would show gene expression responses unique to the pathogenic agent and before onset of the full illness. Therefore this study focused on using peripheral blood mononuclear cells (PBMC) as a readily accessible reservoir of historical information for developing a library of host gene expression responses to known biological threat agents. The gene responses seen in this accessible tissue would be a compilation of both primary and secondary effects on PBMC and would present a signature pattern of a specific biological threat agent. In this study, we establish a library of host responses to pathogenic agents for use to a) predict the course of impending illness especially for unidentifiable pathogens so that appropriate therapeutic intervention can be initiated, b) to characterize the degree of individual exposure in order to assist health personnel to rapidly differentiate those who will become seriously ill from ”the worried well” individuals and c) reveal new therapeutic targets that can be initiated even in late-stage illness caused by biological threat agents.
Author
Pathogens; Peripheral Circulation; Blood Cells; Gene Expression; Biological Weapons; Toxins and Antitoxins; Physiological Responses

20030001605 King Faisal Specialist Hospital and Research Centre, Laser Medicine Section, Riyadh, Saudi Arabia
Lasers in Wound Healing
Al-Watban, Farouk A. H., King Faisal Specialist Hospital and Research Centre, Saudi Arabia; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 70-77; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche
Lasers are now used in different medical applications that supersede traditional methods of healing and diagnosis. Several types of medical lasers fit almost all of these needs. Each kind of laser exhibits optical beam properties making it suitable for specific medical applications that depend on the laser light’s interaction with tissue. High-power lasers, whether continuous or pulse, are used in surgical treatments to cut, vaporize, coagulate and/or weld tissues, depending on their thermal effects. Also, high-energy pulse lasers in the near ultraviolet region of the spectrum are used to ablate tissues through uncoupling of molecular bonds. Several low power lasers modify biological materials through the photochemical effects of laser photons with the tissue, a non-thermal process that is called Biostimulation or Low Level Laser Therapy (LLLT). Over the past decade, LLLT has become widely used for the treatment of a variety of conditions, including the promotion of wound healing, the reduction of edema, and

the relief of pain of various etiologies. Many studies in animals and clinical observation have demonstrated that biostimulation has a beneficial effect on wound healing. Other research groups, however, have been unsuccessful in achieving the same effects. The most utilized system for low power laser therapy has been the helium-neon (He-Ne) laser. In contrast, comparison of the effects of wound healing using different kinds of laser wavelengths on rats has not been investigated extensively. The present study was carried out in continuation with previous studies, comparing the effects of wound healing on rats (i.e. wavelength dependency), observing the inhibitory effect (i.e. dose dependency) and the influence of treatment schedule on wound healing, and calculating the actual dose for the purpose of clinical treatment.
Derived from text
Wound Healing; Pulsed Lasers; High Power Lasers; Clinical Medicine; Sensory Stimulation

20030001607 Navy Submarine Squadron Eleven, USA
Effect of NASA Light-Emitting Diode on Wound Healing Aboard Submerged Submarines
Caviness, Jim, Navy Submarine Squadron Eleven, USA; Esquilin, Julio, USS Salt Lake City, USA; Whelan, Harry, Medical Coll. of Wisconsin, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 84-90; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

It is an accepted condition of service aboard U.S. Navy submarines that wounds, burns, and lacerations heal more slowly during submerged operations at sea than they would normally heal if not on board the submarine. This phenomenon is not understood, nor has it been studied. The submarine environment is complex, but differs significantly from normal atmosphere in several key areas. The total atmospheric pressure is typically elevated, but at times may actually be reduced, the partial pressure of oxygen is reduced, while the partial pressure of carbon dioxide is elevated, and there is the complete absence of sunlight. Additional confounding variables are the numerous atmospheric contaminants produced by the various mechanical and electrical systems on board. Similar anecdotal reports of delayed wound healing aboard U.S. spaceflights demonstrate that the environment of an artificial atmosphere alters the role of wound healing. Space differs from the undersea environment do to the absence of gravity, but otherwise the atmospheric conditions are similar with respect to sunlight, O2, and CO2. Our supposition is that the decreased amount of oxygen and increased amount of carbon dioxide result in a delay in the normal progression of wound healing.
Derived from text
Light Emitting Diodes; Submarines; Wound Healing; NASA Programs; Submerged Bodies

20030001608 Bahia Univ., Laser Dept., Salvador, Brazil
LLLT in Treating Dentinary Hypersensibility: A Histologic Study and Clinical Application
Brugnera, Aldo, Jr., Bahia Univ., Brazil; Garrini, Ana Eliza, Universidade Camilo Castelo Branco, Brazil; Pinheiro, Antonio, Bahia Univ., Brazil; Souza, Dilma Helena Campos, Universidade Camilo Castelo Branco, Brazil; Donamaria, Elisangela, Universidade Camilo Castelo Branco, Brazil; Magelhaes, Fabio, Universidade Camilo Castelo Branco, Brazil; Zanin, Fatima, Universidade Camilo Castelo Branco, Brazil; Pecora, Jesus Djalma, Sao Paulo Univ., Brazil; Takamoto, Marcia, Universidade Camilo Castelo Branco, Brazil; Ladalardo, Thereza Christinna, Universidade Camilo Castelo Branco, Brazil; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 23-31; In English; Also announced as 20030001592; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The result of the present investigation demonstrates indeed that LLLT, when based on the use of correct irradiation parameters, is effective in treating dentinal hypersensitivity as it quickly reduces pain and maintains a prolonged painless status. The authors concluded that the use of LLLT was effective on 91.27% of the cases.
Derived from text
Laser Beams; Laser Applications; Histology; Dentistry; Clinical Medicine

20030001609 Illinois Univ. at Urbana-Champaign, Lab. for Fluorescence Dynamics, Urbana, IL USA
A Multi-Dimensional Platform Technology for Non-Invasively Assessing Tissue Function: Near Infrared Frequency Domain Spectroscopy
Mantulin, William W., Illinois Univ. at Urbana-Champaign, USA; Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects; October 2002, pp. 45; In English; Also announced as 20030001592; No Copyright; Avail: Issuing Activity; Abstract Only

Near infrared (near IR) light penetrates deep into human tissue thereby permitting non-invasive examination of interior regions of the anatomy. Researchers have exploited this fact to advance methods in optical imaging of tissues (for example, optical biopsies for breast cancer detection) and a quantitative, functional assessment of tissue viability and tissue oxygenation (such as

in peripheral vascular disease and sleep apnea). As the near IR light enters the tissue it is highly scattered and the photons follow a circuitous path, modeled as photon diffusion, before emerging from the tissue. Contrast in the collected near IR data arises from differences in the recorded optical signals corresponding to oxy- and deoxy-hemoglobin. We have devised instrumentation, which is now commercially available, that operates in the frequency domain and permits quantitative measurement of the optical properties of tissues in terms of both scattering and absorption coefficients. These measurements also provide assessment of tissue oxygenation, tissue function as measured through oxygen consumption and measures of tissue viability; all collected, processed and displayed in real time. We have performed many types of tissue oxygenation measurements, and examples of applications to brain function, sleep apnea, peripheral vascular disease, sports medicine, breast cancer imaging and several other cases will be provided.
Author
Frequency Measurement; Near Infrared Radiation; Technology Utilization; Tissues (Biology); Infrared Spectroscopy; Frequency Domain Analysis; Anatomy

20030001944 Environmental Protection Agency, Office of Research and Development, Washington, DC USA
Asthma Research Strategy
Sep. 2002; 68p; In English
Report No.(s): PB2003-101324; EPA-600/R-01/061; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Asthma is a complex, multifactorial disease characterized by chronic airway inflammation, mucus secretion, airway remodeling, and reversible airway obstruction. Both genetic and environmental factors influence the development and exacerbation of asthma. More than 17 million people in the USA had asthma in 1998, double the incidence in the previous 20 years. Because the increase in asthma cannot be reconciled by changes in diagnostic categorization or by alterations in the gene pool, associations between asthma and the environment have attracted increasing attention. Since the Environmental Protection agency is required to set pollutant standards to protect susceptible populations such as asthmatics, a coordinated research to study environmental pollutants that influence the incidence and severity of asthma is needed.
NTIS
Asthma; Research

20030001980 International Space Univ., Inc., Washington, DC USA
HI-STAR. Health Improvements through Space Technologies and Resources: Executive Summary
Finarelli, Margaret G., International Space Univ., Inc., USA; Oct. 23, 2002; 14p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG13-02041; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Our mission is to develop and promote a global strategy to help combat malaria using space technology. Like the tiny yet powerful mosquito, HI-STAR (Health Improvements Through Space Technologies and Resources) is a small program that aspires to make a difference. Timely detection of malaria danger zones is essential to help health authorities and policy makers make decisions about how to manage limited resources for combating malaria. In 2001, the technical support network for prevention and control of malaria epidemics published a study. HI-STAR focuses on malaria because it is the most common and deadly of the vector-borne diseases. Malaria also shares many commonalities with other diseases, which means the global strategy developed here may also be applicable to other parasitic diseases. HI-STAR would like to contribute to the many malaria groups already making great strides in the fight against malaria. Some examples include: Roll Back Malaria, The Special Program for Research and Training in Tropical Diseases (TDR) and the Multilateral Initiative on Malaria (MIM). Other important groups that are among the first to include space technologies in their model include: The Center for Health Application of Aerospace Related Technologies (CHAART) and Mapping Malaria Risk in Africa (MARA). Malaria is a complex and multi-faceted disease. Combating it must therefore be equally versatile. HI-STAR incorporates an interdisciplinary, international, intercultural approach.called 'Malaria Early Warning Systems; Concepts, Indicators and Partners.' This study, funded by Roll Back Malaria, a World Health Organization initiative, offers a framework for a monitoring and early warning system. HI-STAR seeks to build on this proposal and enhance the space elements of the suggested framework. It is the work of fifty-three professionals and students from the International Space University's 2002 Summer Session Program held in California, USA.
Author
Parasitic Diseases; Satellite Imagery; Remote Sensing; Public Health; Geographic Information Systems; Technology Utilization; Environmental Monitoring

20030001982 International Space Univ., Inc., Washington, DC USA

Enhancing Human Health Using Space Imagery: Summary of Research ***Final Report, 29 Jun. - 30 Aug. 2002***

Finarelli, Margaret G., International Space Univ., Inc., USA; Nov. 16, 2002; 2p; In English

Contract(s)/Grant(s): NAG13-02041; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The International Space University (ISU) 2002 Summer Session was conducted in Pomona, California, June 29-August 30, 2002. Ninety-nine professionals and students from thirty-one countries attended the Summer Session. More than half of these students participated in the Student Research Design Project entitled, ”HI-STAR: Health Improvements through Space Technologies and Resources.” ISU’s interdisciplinary Student Research Design Projects are intended to have great educational value for the participants and, at the same time, to result in a product that will be useful to the field. The HI-STAR project was a success on both counts. The mission of the ISU students’ effort on HI-STAR was to develop and promote a global strategy to help combat malaria using space technology. Like the tiny yet powerful mosquito, HI-STAR is a small program that aspires to make a difference. Timely detection of malaria danger zones is essential to help health authorities and policy makers make decisions about how to manage limited resources for combating malaria. In 2001, the technical support network for prevention and control of malaria epidemics published a study called ”Malaria Early Warning Systems: Concepts, Indicators and Partners.” This study, funded by Roll Back Malaria, a World Health Organization initiative, offered a framework for a monitoring and early warning system. HI-STAR seeks to build on this proposal and enhance the space elements of the suggested framework. Malaria disease dynamics and distributions are related to environmental variables. From space, environmental conditions that support the growth of mosquito populations can be monitored, Malaria-specific information can be gathered from satellite-borne remote sensing instruments and ground-based sensors. This information can be integrated via geographic information systems (GIS) into a Malaria Information System (MIS) that can provide assessment analyses and risk maps as output. HI-STAR defines and suggests the development of an active MIS as a low-cost tool to help organizations plan their efforts to fight malaria.

Derived from text

Aerospace Engineering; Health; Remote Sensing; Imagery; Parasitic Diseases; Aerospace Medicine

20030001984 International Space Univ., Inc., Washington, DC USA

HI-STAR. Health Improvements Through Space Technologies and Resources: Final Report ***Final Report, 29 Jun. - 30 Aug. 2002***

Finarelli, Margaret G., International Space Univ., Inc., USA; 2002; 212p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG13-02041; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The purpose of this document is to describe a global strategy to integrate the use of space technology in the fight against malaria. Given the well-documented relationship between the vector and its environment, and the ability of existing space technologies to monitor environmental factors, malaria is a strong candidate for the application of space technology. The concept of a malaria early warning system has been proposed in the past’ and pilot studies have been conducted. The HI-STAR project (Health Improvement through Space Technologies and Resources) seeks to build on this concept and enhance the space elements of the suggested framework. As such, the mission statement for this International Space University design project has been defined as follows: ”Our mission is to develop and promote a global strategy to help combat malaria using space technology”. A general overview of malaria, aspects of how space technology can be useful, and an outline of the HI-STAR strategy is presented.

Derived from text

Aerospace Engineering; Health; Parasitic Diseases; Aerospace Medicine; Remote Sensing; Ecology

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BEHAVIORAL SCIENCES

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

20030000485 Albert Einstein Coll. of Medicine, Dept. of Neuroscience, Bronx, NY USA

Single-Trial Analysis of V1 Responses Suggests Two Transmission States

Shah, A. S., Albert Einstein Coll. of Medicine, USA; Knuth, K. H., NASA Ames Research Center, USA; Truccolo, W. A., Brown Univ., USA; Mehta, A. D., Albert Einstein Coll. of Medicine, USA; McGinnis, T., Kline (Nathan S.) Inst. for Psychiatric Research, USA; OConnell, N., Kline (Nathan S.) Inst. for Psychiatric Research, USA; Ding, M., Florida Atlantic Univ., USA; Bressler, S. L., Florida Atlantic Univ., USA; Schroeder, C. E., Albert Einstein Coll. of Medicine, USA; [2002]; 2p; In English; Dynamical Neuroscience Satellite Symposium, 1-2 Nov. 2002, Orlando, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Sensory processing in the visual, auditory, and somatosensory systems is often studied by recording electrical activity in response to a stimulus of interest. Typically, multiple trial responses to the stimulus are averaged to isolate the stereotypic response

from noise. However, averaging ignores dynamic variability in the neuronal response, which is potentially critical to understanding stimulus-processing schemes. Thus, we developed the multiple component, Event-Related Potential (mcERP) model. This model asserts that multiple components, defined as stereotypic waveforms, comprise the stimulus-evoked response and that these components may vary in amplitude and latency from trial to trial. Application of this model to data recorded simultaneously from all six laminae of V1 in an awake, behaving monkey performing a visual discrimination yielded three components. The first component localized to granular V1, the second was located in supragranular V1, and the final component displayed a multi-laminar distribution. These modeling results, which take into account single-trial response dynamics, illustrated that the initial activation of VI occurs in the granular layer followed by activation in the supragranular layers. This finding is expected because the average response in those layers demonstrates the same progression and because anatomical evidence suggests that the feedforward input in V1 enters the granular layer and progresses to supragranular layers. In addition to these findings, the granular component of the model displayed several interesting trial-to-trial characteristics including (1) a bimodal latency distribution, (2) a latency-related variation in response amplitude, (3) a latency correlation with the supragranular component, and (4) an amplitude and latency association with the multi-laminar component. Direct analyses of the single-trial data were consistent with these model predictions. These findings suggest that V1 has at least 2 transmission states, which may be modulated by various effects such as attention, dynamics in local EEG rhythm, or variation in sensory inputs.
Author
Electroencephalography; Neurophysiology; Sensory Perception; Visual Discrimination; Waveforms; Stimuli

20030001130 Civil Aerospace Medical Inst., Oklahoma City, OK USA
A Laboratory Comparison of Clockwise and Counter-Clockwise Rapidly Rotating Shift Schedules, Part III, Effects on Core Body Temperature and Neuroendocrine Measures ***Final Report***
Boquet, Albert, Civil Aerospace Medical Inst., USA; Cruz, Crystal E., Civil Aerospace Medical Inst., USA; Nesthus, Thomas E., Civil Aerospace Medical Inst., USA; Detwiler, Cristy A., Civil Aerospace Medical Inst., USA; Knecht, William R., Civil Aerospace Medical Inst., USA; Holcomb, Kali A., Civil Aerospace Medical Inst., USA; November 2002; 28p; In English
Contract(s)/Grant(s): HRR518
Report No.(s): DOT/FAA/AM-02/20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Most researchers suggest that shift rotation in a forward or clockwise direction produces less disruption of circadian rhythms than those that rotate in a backward or counter-clockwise direction. This is based upon extrapolation from quasi-experimental studies of shift-workers and research on the effects of jet lag, which indicate that westward travel results in less disruption of circadian rhythms. The effect of direction of rotation on cortisol, melatonin, and core body temperature was examined in participants randomly assigned to either a clockwise or counter-clockwise shift rotation. Twenty-eight participants worked a day shift (0800-1600) for one week followed by either a clockwise (n = 14) or counter-clockwise (n = 14) shift rotation for two weeks. Participants wore a flexible rectal temperature sensor for the three weeks of the study and were allowed to remove the sensor for 90 minutes each day. Saliva samples were collected at the end of the baseline week for later assay for melatonin and cortisol, and were time-locked to collection times during the two 'shiftwork' weeks. No group differences were found for cortisol for either of the workweeks. The clockwise group, however, had a significantly greater increase in melatonin during the early morning shift, compared with the counter-clockwise group. Finally, the analyses of core body temperature revealed a significantly lower amplitude and a delay of the acrophase for the counter-clockwise group during both weeks of testing. While cortisol levels did not appear to differ based on direction of shift rotation, there were inherent differences with melatonin secretion and core body temperature. Precisely why such differences exist remains unclear but may be similar to that seen with circadian resynchronization during westward travel. Furthermore, it is not clear if these differences would persist in individuals exposed to longer periods of shift rotations.
Author
Schedules; Rotation; Counter Rotation; Personnel

20030001586 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Operations Training Concepts Benchmark Study (Training in a Continuous Operations Environment)
Johnston, Alan E., NASA Marshall Space Flight Center, USA; Gilchrist, Michael, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; World Space Congress Utilization Conference, 9-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The NASA/USAF Benchmark Space Operations Training Concepts Study will perform a comparative analysis of the space operations training programs utilized by the USA Air Force Space Command with those utilized by the National Aeronautics and Space Administration. The concentration of the study will be focused on Ground Controller/Flight Controller Training for the International Space Station Payload Program. The duration of the study is expected to be five months with report completion by

30 June 2002. The U.S. Air Force Space Command was chosen as the most likely candidate for this benchmark study because their experience in payload operations controller training and user interfaces compares favorably with the Payload Operations Integration Center's training and user interfaces. These similarities can be seen in the dynamics of missions/payloads, controller on-console requirements, and currency/proficiency challenges to name a few. It is expected that the report will look at the respective programs and investigate goals of each training program, unique training challenges posed by space operations ground controller environments, processes of setting up controller training programs, phases of controller training, methods of controller training, techniques to evaluate adequacy of controller knowledge and the training received, and approaches to training administration. The report will provide recommendations to the respective agencies based on the findings. Attached is a preliminary outline of the study. Following selection of participants and an approval to proceed, initial contact will be made with U.S. Air Force Space Command Directorate of Training to discuss steps to accomplish the study.
Author
Controllers; Education; Flight Control; Payload Integration

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..

20030000769 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Station Environment Control and Life Support System Pressure Control Pump Assembly Modeling and Analysis
Schunk, R. Gregory, NASA Marshall Space Flight Center, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 24p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents the Modeling and Analysis of the Space Station Environment Control and Life Support System Pressure Control Pump Assembly (PCPA). The contents include: 1) Integrated PCPA/Manifold Analyses; 2) Manifold Performance Analysis; 3) PCPA Motor Heat Leak Study; and 4) Future Plans. This paper is presented in viewgraph form.
CASI
Life Support Systems; Space Stations; Mathematical Models; Spacecraft Environments; Pressure Regulators; Thermal Analysis; Pumps

20030000981 NASA Marshall Space Flight Center, Huntsville, AL USA
Air Purification in Closed Environments: An Overview of Spacecraft Systems
Perry, Jay L., NASA Marshall Space Flight Center, USA; LeVan, Douglas, Vanderbilt Univ., USA; [2002]; 1p; In English; Nuclear Biological Chemical Defense Collective Protection Conference, 29-31 Oct. 2002, Orlando, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The primary goal for a collective protection system and a spacecraft environmental control and life support system (ECLSS) are strikingly similar. Essentially both function to provide the occupants of a building or vehicle with a safe, habitable environment. The collective protection system shields military and civilian personnel from short-term exposure to external threats presented by toxic agents and industrial chemicals while an ECLSS sustains astronauts for extended periods within the hostile environment of space. Both have air quality control similarities with various aircraft and 'tight' buildings. This paper reviews basic similarities between air purification system requirements for collective protection and an ECLSS that define surprisingly common technological challenges and solutions. Systems developed for air revitalization on board spacecraft are discussed along with some history on their early development as well as a view of future needs. Emphasis is placed upon two systems implemented by the National Aeronautics and Space Administration (NASA) onboard the International Space Station (ISS): the trace contaminant control system (TCCS) and the molecular sieve-based carbon dioxide removal assembly (CDRA). Over its history, the NASA has developed and implemented many life support systems for astronauts. As the duration, complexity, and crew size of manned missions increased from minutes or hours for a single astronaut during Project Mercury to days and ultimately months for crews of 3 or more during the Apollo, Skylab, Shuttle, and ISS programs, these systems have become more sophisticated. Systems aboard spacecraft such as the ISS have been designed to provide long-term environmental control and life support. Challenges facing the NASA's efforts include minimizing mass, volume, and power for such systems, while maximizing their safety, reliability, and performance. This paper will highlight similarities and differences among air purification systems. Additional information is included in the original extended abstract.

Author
Manned Space Flight; Life Support Systems; Air Purification; Environmental Control; Carbon Dioxide Removal; Trace Contaminants

20030000988 Naval Postgraduate School, Monterey, CA USA
Human Disorientation as a Factor in Spacecraft Centrifuge Design
Howse, Christopher E.; Sep. 2002; 146p; In English; Original contains color images
Report No.(s): AD-A407032; No Copyright; Avail: CASI; A07, Hardcopy

Weightlessness is the major contributing factor behind the degradation of bone mass, muscle tone, and aerobic capacity during long-term space missions. With the loss of bone mass progressing at up to two percent per month, long duration and interplanetary missions shall remain the sole duty of robotic explorers until sufficient countermeasures are developed. Several countermeasures are either in use, or under development to alleviate this problem. Exercise is currently used to reduce the severity of bone loss and muscle atrophy. Exercise has proven ineffective despite the fact two hours of daily exercise together with elaborate apparatus have been devoted to simulating the load of Earth's gravity. Drug therapy and other, more exotic, countermeasures are also under consideration, but the side-effects of these other treatments and the fact that they do not directly address the root cause of the negative effects of weightlessness means that they may only reduce, not cure, those problems. Only artificial gravity addresses the root cause, weightlessness itself. This thesis addresses the need to balance the effects of Coriolis on human disorientation with the engineering costs of constructing a centrifuge for human occupation in space.
DTIC
Human Factors Engineering; Space Missions; Weightlessness; Gravitational Physiology; Artificial Gravity; Rotating Environments; Spacecraft Environments

20030001592 NASA Johnson Space Center, Houston, TX USA
Second International Conference on Near-Field Optical Analysis: Photodynamic Therapy and Photobiology Effects
Bulgher, Debra L., Editor, NASA Johnson Space Center, USA; Morrison, Dennis, NASA Johnson Space Center, USA; October 2002; 102p; In English, 31 May - 1 Jun. 2001, Houston, TX, USA; Sponsored by Defense Advanced Research Projects Agency, USA; Also announced as 20030001593 through 20030001609; Original contains color illustrations
Report No.(s): NASA/CP-2002-210786; S-896; NAS 1.55:210786; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The International NASA/DARPA Photobiology Conference held at the Johnson Space Center in Houston/TX demonstrated where low level laser therapy (LLLT), respectively low intensity light activated biostimulation (LILAB) and nanotechnological applications employing photobiomodulation techniques will presumably go in the next ten years. The conference was a continuation of the 1st International Conference on Nearfield Optical Analysis organized by Andrei Sommer (ENSOMA Lab, University of Ulm, Germany) in November 2000 at Castle Reisenburg, Germany, which started with a group of ten scientists from eight different countries. The 1st conference was co-sponsored by the American Chemical Society to evaluate the molecular mechanism of accelerated and normal wound healing processes. The 2nd conference was co-sponsored by DARPA, NASA-JSC and the Medical College of Wisconsin. Despite the short time between events, the 2nd conference hosted 40 international experts form universities, research institutes, agencies and the industry. The materials published here are expected to become milestones forming a novel platform in biomedical photobiology. The multidisciplinary group of researchers focused on LLLT/LILAB-applications under extreme conditions expected to have beneficial effects particularly in space, on submarines, and under severe battlefield conditions. The group also focused on novel technologies with possibilities allowing investigating the interaction of light with biological systems, molecular mechanisms of wound healing, bone regeneration, nerve regeneration, pain modulation, as well as biomineralization and biofilm formulation processes induced by nanobacteria.
Author
Conferences; Near Fields; Nanotechnology; Lasers; Optoelectronic Devices; Molecular Biology; Sensory Stimulation

20030001763 Navy Experimental Diving Unit, Panama City, FL USA
Development and Validation of 1.3 ATA PO2-in-He Decompression Tables for the MK 16 MOD 1 UBA
Gerth, Wayne A.; Johnson, Thomas M.; Aug. 30, 2002; 419p; In English
Report No.(s): AD-A407841; NEDU-TR-01-10; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The Navy Experimental Diving Unit (NEDU) was tasked by PMS-EOD to develop and validate repetitive helium-oxygen (He-O2) decompression tables for use with the MK 16 MOD 1 Underwater Breathing Apparatus (UBA). The present report provides details of the work that was completed to meet this tasking and produce the tables published in NEDU Technical Report 14-01. The report includes a description of the probabilistic model used as the basis for the tables, and presents a novel method

to map this model to an easily-used deterministic model. The latter produces a repetitive decompression table set of format similar to that for standard air diving in the current U.S. Navy Diving Manual, but with schedules that incur explicitly controlled estimated DCS risks.
DTIC
Underwater Breathing Apparatus; Diving (Underwater); Pressure Reduction

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.

20030000510 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
Microorganisms; Exobiology

20030000972 NASA Marshall Space Flight Center, Huntsville, AL USA
Microfossils in the Murchison and Rainbow Carbonaceous Meteorites
Hoover, Richard B., NASA Marshall Space Flight Center, USA; Rozanov, Alexei Y., Academy of Sciences (USSR), USSR; Jerman, Greg A., NASA Marshall Space Flight Center, USA; Davies, Paul C., Australian Center for Astrobiology, Australia; [2002]; 1p; In English; SPIE's Astronautical Telescopes and Instruments 2002 Conference, 20-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Astrobiologists are working to develop methodologies for the recognition of bacterial microfossils, biominerals, and chemical biomarkers in terrestrial rocks, to provide a basis for the scientific assessment of possible microfossils in meteorites and other Astromaterials. During the past 5 years, we have conducted electron microscopy investigations to understand the morphology and chemical composition of microfossils in ancient terrestrial rocks and to search for microfossils presence in meteorites. We have detected evidence of indigenous microfossils and biominerals in-situ in every carbonaceous meteorite investigated but have found no evidence for microfossils in the nickel-iron and stony meteorites studied. In this paper, we provide a brief review of prior evidence for microfossils in meteorites and present Scanning and Environmental Scanning Electron Microscope (SEM and ESEM) and Field Emission Scanning Electron Microscope (FESEM) images of microfossils found in-situ in freshly fractured surfaces of the Murchison and Rainbow meteorites. We describe the techniques and methods used to protect the samples from contamination and for the discrimination of indigenous microfossils from recent terrestrial contaminants We provide data from Energy Dispersive Spectroscopy (EDS) and Link microprobe analysis of the chemical elements and 2D x-ray maps as strong evidence that these biogenic forms are indigenous to the meteorites and cannot logically be interpreted as recent bio-contaminants. We show evidence of framboidal magnetites and pyrites and compare them with framboidal magnetites and pyrites found in Cambrian richs from the Siberian Platform.
Author
Carbonaceous Meteorites; Microanalysis; Microorganisms; Fossils; Biomarkers

20030001042 NASA Marshall Space Flight Center, Huntsville, AL USA
Anaerobic Halo-Alkaliphilic Baterial Community of Athalassic, Hypersaline Mono Lake in California
Pikuta, Elena V., Alabama Univ., USA; Hoover, Richard B., NASA Marshall Space Flight Center, USA; Marsic, Damien, Alabama Univ., USA; Ng, Joseph D., Alabama Univ., USA; [2002]; 1p; In English; SPIE's Astronautical Telescopes and

Instruments 2002 Conference, 20-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The microorganisms of soda Mono Lake and other similar athalassic hypersaline alkaline soda lakes are of significance to Astrobiology. The microorganisms of these regimes represent the best known terrestrial analogs for microbial life that might have inhabited the hypersaline alkaline lakes and evaporites confined within closed volcanic basins and impact craters during the late Noachian and early Hesperian epochs (3.6 - 4.2 Gya) of ancient Mars. We have investigated the anaerobic microbiota of soda Mono Lake in northern California. In this paper we discuss the astrobiological significance of these ecosystems and describe several interesting features of two novel new species of anaerobic halo-alkaliphilic bacteria (Spirochaeta americana, sp. nov. and Desulfonatronum paiuteum, sp. nov) that we have isolated from Mono Lake.

Author

Anaerobes; Lakes; Exobiology; Ecosystems; Salinity; Alkalinity

20030001843 NASA Marshall Space Flight Center, Huntsville, AL USA

Infrared Spectra of Hydrated Magnesium Salts and their Role in the Search for Possible Life Conditions on Jupiter Moons

Chaban, Galina, NASA Marshall Space Flight Center, USA; Huo, Winifred M., NASA Marshall Space Flight Center, USA; Lee, Timothy J., NASA Marshall Space Flight Center, USA; Aug. 15, 2002; 1p; In English; 224th ACS Meeting, 20 Aug. 2002, Boston, MA, USA; Sponsored by American Chemical Society, USA

Contract(s)/Grant(s): RTOP 274-50-00-06; No Copyright; Avail: Issuing Activity; Abstract Only

Recent observations from the Galileo satellite indicate that three of the Jupiter moons, Europa, Ganymede, and Callisto, may have subsurface oceans. Possible existence of such ocean and the nature of its composition are of great interest to astrobiologists. Data from Galileo's NIMS spectrometer indicate the possibility of hydrated salts on Europa's surface. to aid in the design of future missions, we investigated infrared spectra of MgSO4-nH20, n=1-3 using ab initio calculations. Geometry, energetics, dipole moments, vibrational frequencies and infrared intensities of pure and hydrated MgSO4 salts were determined. Significant differences are found between vibrational spectra of water molecules in complexes with MgSO4 and pure water. Some of the O-H stretching frequencies in the complexes are shifted to the red by up to 1,500 - 2,000 per cm. In addition, the SO2 stretching vibrations are found at lower frequency regions than the water vibrations. The calculated bands of water and SO2 fragments can serve as markers for the existence of the salt-water complexes on the surface of Jupiter's moon.

Author

Infrared Spectra; Infrared Astronomy; Magnesium Sulfates; Salts; Exobiology; Galilean Satellites

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.

20030000647 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Kneading Operators, Sharp Determinants and Weighted Lefschetz Zeta Functions in Higher Dimension

Baillif, M.; Mar. 2002; 40p

Report No.(s): PB2003-100602; IHES/M/02/17; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

We study transfer operators M (sup (k)) associated to a finite family (psi w) of C (sup r) (r equal to or greater than 1) transversal maps Uw right arrow R(sup n), with CR (sup n), with C (sup r) compactly supported weights g (sub w), acting on k-forms in R (sup n). Using the definitions of sharp trace Tr no. and flat trace Tr (sup b), the following formula holds between power series: Det no. (1-zM)=II(sup n)(sub k=o)Det(sup b) (1-zM (sup (k)) (sup (-1)k. Following ideas of Kitaev, we define kneading operators D(sub k) ((z)), which are kernel operators. Our main result is the equality in dimension n as formal power series. As a consequence we obtain that the weighted Lefschetz zeta-function has a positive radius of convergence. This (partially) generalized results obtained by Baladik Kitaev, Ruelle and Semmes in dimension 1, complex and real.

NTIS

Kernel Functions; Operators (Mathematics); Weighting Functions; Determinants

20030001645 National Inst. of Standards and Technology, Gaithersburg, MD USA

Glyph Toolbox for Immersive Scientific Visualization

Bullen, H. W.; Chang, J. S.; Ham, A. V.; Kelly, S. P.; Satterfield, S. G.; Oct. 30, 2002; 40p

Report No.(s): PB2003-100877; NISTIR-6924; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe a set of software, The Glyph ToolBox (GTB), for creating three dimensional (3D) glyphs. This software defines a single, general format for describing glyphs; it includes color and opacity parameters as well as location information. GTB is written with the UNIX philosophy as well as location information. GTB is written with the UNIX philosophy of small reusable programs that are text based for portability and efficiency. Version 1.0 of GTB currently contains simple figures, manipulation functions, extrusion functions, meta-figure functions, as well as additional functions such as text creators. We describe four applications for the glyph toolbox: a visualization of the Monk's problem, a relationship highlighter, a smiley emoticon, and a display algorithm for concave surfaces. We separate the creation of the glyphs from their display. We provide a filter that can incorporate the GTB format into their environment, making the creation and use of glyphs uniform across viewers.

NTIS

Display Devices; Computer Graphics

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20030000572 NASA Langley Research Center, Hampton, VA USA

A Conceptual Design for a Reliable Optical Bus (ROBUS)

Miner, Paul S., NASA Langley Research Center, USA; Malekpour, Mahyar, NASA Langley Research Center, USA; Torres, Wilfredo, NASA Langley Research Center, USA; [2002]; 10p; In English; 21st Digital Avionics Systems Conference, 27-31 Oct. 2002, Irvine, CA, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Scalable Processor-Independent Design for Electromagnetic Resilience (SPIDER) is a new family of fault-tolerant architectures under development at NASA Langley Research Center (LaRC). The SPIDER is a general-purpose computational platform suitable for use in ultra-reliable embedded control applications. The design scales from a small configuration supporting a single aircraft function to a large distributed configuration capable of supporting several functions simultaneously. SPIDER consists of a collection of simplex processing elements communicating via a Reliable Optical Bus (ROBUS). The ROBUS is an ultra-reliable, time-division multiple access broadcast bus with strictly enforced write access (no babbling idiots) providing basic fault-tolerant services using formally verified fault-tolerance protocols including Interactive Consistency (Byzantine Agreement), Internal Clock Synchronization, and Distributed Diagnosis. The conceptual design of the ROBUS is presented in this paper including requirements, topology, protocols, and the block-level design. Verification activities, including the use of formal methods, are also discussed.

Author

Architecture (Computers); Control; Bus Conductors; Optical Communication

20030001699 SRI International Corp., Menlo Park, CA USA

Time-Frequency Domain Memory and Processing ***Final Report, 1 Apr. 1998-31 Aug. 2001***

Huestis, David L.; Faris, Gregory W.; Arons, Eric A.; Feb. 28, 2002; 32p; In English

Contract(s)/Grant(s): F49620-98-C-0022

Report No.(s): AD-A407893; SRI-MP-02-004; AFRL-SR-AR-TR-02-0332; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the results of a 3-year program of research on the physics and technology needed to develop high-performance optical memory and optical processing systems based on the concept called the stimulated photon echo (SPE). The research goals were investigation, demonstration, and improvement of signal strength and fidelity, architectures and algorithms, and materials properties for optical storage and in-memory processing. Key accomplishments were (1) development and demonstration of efficient algorithms for threshold discrimination and bit-error-rate reduction in retrieved binary images with large in-frame and frame-to-frame intensity variations; (2) demonstration and characterization of information storage in Erbium-doped crystals using 1.5-micron diode lasers compatible with fiber optic communications; (3) demonstration of improved phase-encoding schemes for in-memory temporal correlation of 1.5-micron pulse trains; (4) development of concepts for high-performance radar applications based on SPE optical memory for time-delay control of the transmitter array and in-memory

image processing of the return signals; and (5) hosting the AFOSR Contractors' Meeting, "Optoelectronic Information Processing."
DTIC
Algorithms; Image Processing; Optical Memory (Data Storage); Time Domain Analysis; Pattern Recognition; Semiconductor Lasers

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.

20030000438 Miami Univ., Dept. of Physics, Coral Gables, FL USA
Ocean Observations with EOS/MODIS: Algorithm Development and Post Launch Studies ***Semiannual Report, 1 Jul. - 31 Dec. 1998***
Gordon, Howard R., Miami Univ., USA; January 1999; 173p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-31363; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Significant accomplishments made during the present reporting period include: 1) Installed spectral optimization algorithm in the SeaDas image processing environment and successfully processed SeaWiFS imagery. The results were superior to the standard SeaWiFS algorithm (the MODIS prototype) in a turbid atmosphere off the US East Coast, but similar in a clear (typical) oceanic atmosphere; 2) Inverted ACE-2 LIDAR measurements coupled with sun photometer-derived aerosol optical thickness to obtain the vertical profile of aerosol optical thickness. The profile was validated with simultaneous aircraft measurements; and 3) Obtained LIDAR and CIMEL measurements of typical maritime and mineral dust-dominated marine atmosphere in the U.S. Virgin Islands. Contemporaneous SeaWiFS imagery were also acquired.
Author (revised)
Algorithms; Oceans; Earth Observing System (EOS); Imaging Spectrometers; Observation; Satellite-Borne Instruments; Photometers

20030000650 Stanford Linear Accelerator Center, Stanford, CA USA
Geant4: A Simulation Toolkit
Agostinelli, S.; Allison, J.; Amako, K.; Apostolakis, J.; Araujo, H.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799992; SLAC-PUB-9350; No Copyright; Avail: National Technical Information Service (NTIS)
GEANT4 is a toolkit for simulating the passage of particles through matter. It includes a complete range of functionality including tracking, geometry, physics models and hits. The physics processes offered cover a comprehensive range, including electromagnetic, hadronic and optical processes, a large set of long-lived particles, eV and extending in others to the TeV energy range. It has been designed and constructed to expose the physics models utilized, to handle complex geometries, and to enable its easy adaptation for optimal use in different sets of applications. The toolkit is the result of a worldwide collaboration of physicists and software engineers. It has been created exploiting software engineering and object-oriented technology and implemented in the C++ programming language. It has been used in applications in particle physics, nuclear physics, accelerator design, space engineering and medical physics.
NTIS
Computerized Simulation; Particle Interactions; Nuclear Physics; Particle Accelerators

20030000652 NASA Langley Research Center, Hampton, VA USA
Application of Quaternions for Mesh
Samareh, Jamshid A., NASA Langley Research Center, USA; [2002]; 19p; In English; 8th International Conference on Numerical Grid Generation in Computational Field Simulations, Jun. 2002, Honolulu, HI, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new three dimensional mesh deformation algorithm, based on quaternion algebra, is introduced. A brief overview of quaternion algebra is provided, along with some preliminary results for two-dimensional structured and unstructured viscous mesh deformation.
Author
Quaternions; Grid Generation (Mathematics); Computational Fluid Dynamics; Mathematical Models; Algorithms; Deformation

20030000805 Odyssey Research Associates, Inc., Ithaca, NY USA
Computational Immunology for the Defense of Large Scale Systems ***Final Report, Aug. 1997-Aug 1999***
Marceau, Carla; Stillerman, Matthew; Stiliman, Maureen; Forrest, Stephanie; Jul. 2002; 69p; In English
Contract(s)/Grant(s): F30602-97-C-0216; DARPA ORDER-F163; AF Proj. F163
Report No.(s): AD-A407600; AFRL-IF-RS-TR-2002-141; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes the application of the computational immunology approach to a distributed object systems. The hypothesis tested was that one could characterize normal behavior of the application itself in terms of inter-object messages, and use that characterization to successfully detect rogue client attacks on the application. The goals of the research were to test and demonstrate the feasibility of intrusion detection at the application level in distributed object systems. In particular, we worked with applications built on the Common Object Resource Broker Architecture (CORBA). The report shows that the computational immunology approach reliably detects attacks on the Domain Name Server that seriously disrupt Internet service. The report analyzes the components required for a definition of 'self' that is applicable to computer programs. The report also conducts experiments that show that a straightforward definition of 'self' can detect rogue client attacks on CORBA systems. The project resulted in building a prototype system to aid in the analysis of experimental data and helped generate descriptions of normal application behavior. The prototype intrusion detection system for CORBA can be used with a broad class of definitions of 'self'.
DTIC
Computer Programs; Computer Information Security; Access Control; Computer Networks

20030000825 Naval Postgraduate School, Monterey, CA USA
A Computer Code for Rapid Calculation of Bending Frequencies of Rotor Blades
Akin, Hakki E.; Sep. 2002; 219p; In English; Original contains color images
Report No.(s): AD-A407002; No Copyright; Avail: CASI; A10, Hardcopy
This thesis provides a MATLABGR code and graphical user interface (GUI) which rapidly estimates the bending frequencies of rotating beams from the knowledge of bending frequencies of nonrotating beams. The approach is based on the Rayleigh energy method developed by Yntema. The beams may be rotating or nonrotating, cantilever or hinged, uniform or with linear mass and stiffness distributions, with or without root offsets from the axis of rotation; or uniform with or without tip mass. Especially, the frequencies of both nonrotating and rotating cases can be estimated for (a) beams with and without offset which have mass and stiffness distributions which can be approximated by linear relations and (b) beams with uniform mass and stiffness distributions plus a concentrated mass at the tip. Also, as a part of the MATLABGR code, the bending frequencies of rotating beams with arbitrary stiffness and mass distributions can be estimated given that the stiffness and mass distributions as well as mode shapes of the rotating beam are provided. In latter case, the mode shapes of nonrotating beams may be used to get rough estimations. The code also presents the nonrotating bending-mode shapes in conjunction with the bending frequencies. The code and GUI are intended for use as a subprogram of JANRAD computer program developed at the Naval Postgraduate School, but can also be used as a stand-alone MATLABGR program.
DTIC
Applications Programs (Computers); Rotor Blades; Vibration Mode; Stiffness; Axes of Rotation

20030000832 NASA Langley Research Center, Hampton, VA USA
Managing MDO Software Development Projects
Townsend, J. C., NASA Langley Research Center, USA; Salas, A. O., NASA Langley Research Center, USA; [2002]; 11p; In English; 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, 4-6 Sep. 2002, Atlanta, GA, USA; Sponsored by International Society for Structural and Multidisciplinary Optimization, USA
Report No.(s): AIAA Paper 2002-5442; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights
Over the past decade, the NASA Langley Research Center developed a series of 'grand challenge' applications demonstrating the use of parallel and distributed computation and multidisciplinary design optimization. All but the last of these applications were focused on the high-speed civil transport vehicle; the final application focused on reusable launch vehicles. Teams of

discipline experts developed these multidisciplinary applications by integrating legacy engineering analysis codes. As teams became larger and the application development became more complex with increasing levels of fidelity and numbers of disciplines, the need for applying software engineering practices became evident. This paper briefly introduces the application projects and then describes the approaches taken in project management and software engineering for each project; lessons learned are highlighted.
Author
Multidisciplinary Design Optimization; Distributed Processing; Computer Networks; Software Engineering; Computer Aided Design; Applications Programs (Computers); Project Management; Parallel Computers

20030000908 Naval Postgraduate School, Monterey, CA USA
Generic Bluetooth Data Module
Aljuaied, Ali M.; Sep. 2002; 75p; In English; Original contains color images
Report No.(s): AD-A407574; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Sensors are being used in many industrial and military applications. The most common ones are temperature and pressure sensors. Communicating with sensors has long been limited either to wired connections between the sensing element and the control station or to expensive, proprietary wireless communications protocols. The emerging Bluetooth technology enables fast, efficient sensor communication, which eliminates wired connections and the associated manual tasks of initiating, checking, and changing sensor connections. It will be useful for a broad range of data-acquisition, measurement, control, monitoring, and similar applications. Bluetooth products currently available in the market support many usage models such as printer, headset, etc. This thesis discusses and investigates the feasibility of interfacing sensors with Bluetooth modules by using off-the-shelf components. A prototype interface board was developed and connected to a Bluetooth module. Testing results showed that it is viable to implement Bluetooth-based wireless sensors for shipboard applications.
DTIC
Computer Programs; Computerized Simulation; Local Area Networks; Wireless Communication; Pressure Sensors

20030000990 Naval Postgraduate School, Monterey, CA USA
Windows XP Operating System Security Analysis
Goktepe, Meftun; Sep. 2002; 126p; In English; Original contains color images
Report No.(s): AD-A407022; No Copyright; Avail: CASI; A07, Hardcopy
Windows XP, released in October 2001, brought new features to improve the work environment throughout organizations. The purpose of this research is to determine if Windows XP, when used as a workstation operating system in domain-based networks, provides adequate security policy enforcement for organizations. In this research we performed a security analysis of the Windows XP operating system, assessed its vulnerabilities and made recommendations for XP configurations and use as an extension of enterprise network. In order to analyze Windows XP, we set up a Windows 2000 Server based-domain. Windows XP was installed on one of the workstations in the domain. In this lab environment, the security architecture and all new security features of Windows XP have been analyzed. Then we made vulnerability scans to assess the security of Windows XP in three configurations: after clean installation, after applying current patches and updates, and after applying security templates. Windows XP comes with selectable built-in templates. A new security template was created by combining the best of these templates. The new template also contains additional security settings not found in the built-in templates. This study provides recommendations for secure Windows XP configuration in Windows 2000 domains.
DTIC
Operating Systems (Computers); Computer Information Security; Windows (Computer Programs); Access Control

20030001022 CACI Technologies, Inc., Chantilly, VA USA
Synthetic Force Structure Simulation (SFSS) ***Final Report, Feb.-Oct. 2001***
Blank, Gary; Jun. 2002; 15p; In English; Original contains color images
Contract(s)/Grant(s): F30602-00-D-0221; DARPA Order 558T; AF Proj. 407T
Report No.(s): AD-A407185; AFRL-IF-RS-TR-2002-144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
C++ library classes for Force Structure Simulation (FSS) based on the parallel simulation framework called SPEEDES (Synchronous Parallel Environment for Emulation and Discrete-Event Simulation) was developed. These classes derive from and/or utilize the SPEEDES Application Programming Interface (API), and the SPEEDES simulation methodology for execution on high-performance multiprocessor systems. These FSS classes were designed to be the foundation of a R&D simulation

framework for researching predictive course of action analysis. The software will prove an easily extensional means to accommodate an increasingly detailed, powerful and elaborate assessment tool.
DTIC
Computer Programming; Combat; Simulation

20030001024 Naval Postgraduate School, Monterey, CA USA
XML Based Adaptive IPSEC Policy Management in a Trust Management Context
Mohan, Raj; Sep. 2002; 89p; In English; Original contains color images
Report No.(s): AD-A407100; No Copyright; Avail: CASI; A05, Hardcopy

TCP/IP (Transmission Control Protocol/Internet Protocol) provided the impetus for the growth of the Internet and the IPsec protocol now promises to add to it the desired security strength IPsec provides users with a mechanism to enforce a range of security services for both confidentiality and integrity, enabling them to securely pass information across networks, Dynamic parameterization of IPsec further enables security mechanisms to adjust the level of security service ”on-the-fly” to respond to changing network and operational conditions, The IPsec implementation in OpenESD works in conjunction with the Trust Management System, KeyNote, to achieve this, However the KeyNote engine requires that an IPsec policy be defined in the KeyNote specification syntax, Defining a security policy in the KeyNote Specification language is, however, extremely difficult and the complexity of the language could lead to incorrect specification of the desired policy, thus degrading the security of the network, This thesis looks into an alternative XML (Extensible Markup Language) representation of this language and a graphical user interface to evolve a consistent and correct security policy, The interface has the simplicity of a simple menu-driven editor that not only provides KeyNote with a policy in the specified syntax but also integrates techniques for correctness verification and validation.
DTIC
Object-Oriented Programming; Data Transmission; Protocol (Computers)

20030001025 Naval Postgraduate School, Monterey, CA USA
Visual Meta-Programming Language Graphical User Interface for Generative Programming
Carpenter, Steven; Sep. 2002; 107p; In English; Original contains color images
Report No.(s): AD-A407095; No Copyright; Avail: CASI; A06, Hardcopy

A Visual Meta-Programming Language allows the user to see a graphic representation of the data flow between components. Like the visual programming concepts for common programming languages in use today, this language makes it easier to build software by putting together graphical elements that correspond to larger and more complex pieces of code. This research will develop the implementation of a visual meta-programming language graphical user interface for program generation. The objective is to create an interface that represents programming data flow using the visual meta-programming language, allows the user to add, modify, and delete elements of the program, and generates formatted output that can be used by generative programs to produce code. Areas of study will include efficient data structure design to capture the nature and characteristics of visual elements of the language and translation of visual design to a format suitable for use by other programs.
DTIC
Programming Languages; Graphical User Interface

20030001117 Research Inst. for Advanced Computer Science, Moffett Field, CA USA
Realizing Aspects by Transforming for Events
Filman, Robert E., Research Inst. for Advanced Computer Science, USA; Havelund, Klaus, Kestrel Technology, LLC, USA; [2002]; 8p; In English; ASE 2002 Conference, 2002, USA; Sponsored by American Science and Engineering, Inc., USA
Contract(s)/Grant(s): NAS2-00065; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We explore the extent to which concerns can be separated in programs by program transformation with respect to the events required by these concerns. We describe our early work on developing a system to perform event-driven transformation and discuss possible applications of this approach.
Author
Computer Programming; Events

20030001137 University of Southern Mississippi, Hattiesburg, MS USA

Object-Oriented Distributed Database Design and Spatial Data Modeling ***Final Report, 30 Sep. 1997-29 Jun. 2002***

Cobb, Maria; Jan. 2002; 303p; In English

Contract(s)/Grant(s): N00014-97-1-G909

Report No.(s): AD-A407824; 64-6000818; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

Work for this grant enabled the advancement of the state of research for areas of fuzzy spatial data modeling, uncertainty and conflation. Specific published work supported by this grant included a range of topics, including: fuzzy spatial relationship refinements, spatial query interfaces, uncertainty in distributed spatial information systems, spatial relationship querying, distributed spatial object-based systems, spatial indexing, distributed conflation model and issues, and an integrated image change detection/conflation algorithm. Special journal issues co-edited by the grant recipient on ”Spatial Data Management,” ”Uncertainty in Geographic Information Systems and Spatial Data” and ”Distributed Object-Oriented Systems” resulted in newly published works from some of the foremost researchers in the area, including Michael Goodchild, Peter Fisher, Hans Guesgen, Douglas Schmidt and others.

DTIC

Object-Oriented Programming; Algorithms; Geographic Information Systems; Change Detection

20030001140 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

RIACS FY2002 Annual Report ***Annual Report, Oct. 2001 - Sep. 2002***

Leiner, Barry M., Research Inst. for Advanced Computer Science, USA; November 2002; 206p; In English

Contract(s)/Grant(s): NCC2-1006

Report No.(s): RIACS-TR-AR-02; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Research Institute for Advanced Computer Science (RIACS) carries out basic research and technology development in computer science, in support of the National Aeronautics and Space Administration’s missions. Operated by the Universities Space Research Association (a non-profit university consortium), RIACS is located at the NASA Ames Research Center, Moffett Field, California. It currently operates under a multiple year grant/cooperative agreement that began on October 1, 1997 and is up for renewal in September 2003. Ames has been designated NASA’s Center of Excellence in Information Technology. In this capacity, Ames is charged with the responsibility to build an Information Technology (IT) Research Program that is preeminent within NASA. RIACS serves as a bridge between NASA Ames and the academic community, and RIACS scientists and visitors work in close collaboration with NASA scientists. RIACS has the additional goal of broadening the base of researchers in these areas of importance to the nation’s space and aeronautics enterprises. RIACS research focuses on the three cornerstones of IT research necessary to meet the future challenges of NASA missions: 1) Automated Reasoning for Autonomous Systems; 2) Human-Centered Computing; and 3) High Performance Computing and Networking. In addition, RIACS collaborates with NASA scientists to apply IT research to a variety of NASA application domains including aerospace technology, earth science, life sciences, and astrobiology. RIACS also engages in other activities, such as workshops, seminars, visiting scientist programs and student summer programs, designed to encourage and facilitate collaboration between the university and NASA IT research communities.

Derived from text

Information Systems; NASA Programs; Aeronautical Engineering; Research and Development; Computer Techniques; Reports

20030001555 NASA Marshall Space Flight Center, Huntsville, AL USA

Mission Engineering of a Rapid Cycle Spacecraft Logistics Fleet

Holladay, Jon, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The requirement for logistics re-supply of the International Space Station has provided a unique opportunity for engineering the implementation of NASA’s first dedicated pressurized logistics carrier fleet. The NASA fleet is comprised of three Multi-Purpose Logistics Modules (MPLM) provided to NASA by the Italian Space Agency in return for operations time aboard the International Space Station. Marshall Space Flight Center was responsible for oversight of the hardware development from preliminary design through acceptance of the third flight unit, and currently manages the flight hardware sustaining engineering and mission engineering activities. The actual MPLM Mission began prior to NASA acceptance of the first flight unit in 1999 and will continue until the de-commission of the International Space Station that is planned for 20xx. Mission engineering of the MPLM program requires a broad focus on three distinct yet inter-related operations processes: pre-flight, flight operations, and post-flight turn-around. Within each primary area exist several complex subsets of distinct and inter-related activities. Pre-flight processing includes the evaluation of carrier hardware readiness for space flight. This includes integration of payload into the carrier, integration of the carrier into the launch vehicle, and integration of the carrier onto the orbital platform. Flight operations

include the actual carrier operations during flight and any required real-time ground support. Post-flight processing includes de-integration of the carrier hardware from the launch vehicle, de-integration of the payload, and preparation for returning the carrier to pre-flight staging. Typical space operations are engineered around the requirements and objectives of a dedicated mission on a dedicated operational platform (i.e. Launch or Orbiting Vehicle). The MPLM, however, has expanded this envelope by requiring operations with both vehicles during flight as well as pre-launch and post-landing operations. These unique requirements combined with a success-oriented schedule of four flights within a ten-month period have provided numerous opportunities for understanding and improving operations processes. Furthermore, it has increased the knowledge base of future Payload Carrier and Launch Vehicle hardware and requirement developments. Discussion of the process flows and target areas for process improvement are provided in the subject paper. Special emphasis is also placed on supplying guidelines for hardware development. The combination of process knowledge and hardware development knowledge will provide a comprehensive overview for future vehicle developments as related to integration and transportation of payloads.
Author
Logistics; Schedules; Real Time Operation; Launch Vehicles; Flight Operations

20030001566 NASA Ames Research Center, Moffett Field, CA USA
Implementation of the NAS Parallel Benchmarks in Java
Frumkin, Michael A., NASA Ames Research Center, USA; Schultz, Matthew, NASA Ames Research Center, USA; Jin, Haoqiang, NASA Ames Research Center, USA; Yan, Jerry, NASA Ames Research Center, USA; Oct. 04, 2002; 9p; In English; International Workshop on Java for Parallel and Distributed Programming, 22-26 Apr. 2003, Nice, France; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Several features make Java an attractive choice for High Performance Computing (HPC). In order to gauge the applicability of Java to Computational Fluid Dynamics (CFD), we have implemented the NAS (NASA Advanced Supercomputing) Parallel Benchmarks in Java. The performance and scalability of the benchmarks point out the areas where improvement in Java compiler technology and in Java thread implementation would position Java closer to FORTRAN in the competition for CFD applications.
Author
Computational Fluid Dynamics; Java (Programming Language); Supercomputers

20030001588 Lockheed Martin Corp., Huntsville, AL USA
Software Design Methodology Migration for a Distributed Ground System
Ritter, George, Lockheed Martin Corp., USA; [2002]; 1p; In English; Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Marshall Space Flight Center's (MSFC) Payload Operations Center (POC) ground system has been developed and has evolved over a period of about 10 years. During this time the software processes have migrated from more traditional to more contemporary development processes. The new Software processes still emphasize requirements capture, software configuration management, design documenting, and making sure the products that have been developed are accountable to initial requirements. This paper will give an overview of how the Software Process have evolved highlighting the positives as well as the negatives. In addition, we will mention the COTS tools that have been integrated into the processes and how the COTS have provided value to the project .
Author
Computer Programs; Configuration Management; Payloads

20030001589 Lockheed Martin Corp., Huntsville, AL USA
Secure Remote Access Issues in a Control Center Environment
Pitts, Lee, Lockheed Martin Corp., USA; [2002]; 1p; In English; Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ISS finally reached an operational state and exists for local and remote users. Onboard payload systems are managed by the Huntsville Operations Support Center (HOSC). Users access HOSC systems by internet protocols in support of daily operations, preflight simulation, and test. In support of this diverse user community, a modem security architecture has been implemented. The architecture has evolved over time from an isolated but open system to a system which supports local and remote access to the ISS over broad geographic regions. This has been accomplished through the use of an evolved security strategy, PKI, and custom design. Through this paper, descriptions of the migration process and the lessons learned are presented.

This will include product decision criteria, rationale, and the use of commodity products in the end architecture. This paper will also stress the need for interoperability of various products and the effects of seemingly insignificant details.
Author
Interoperability; Payloads; Protocol (Computers); Remote Control; Security

20030001590 NASA Marshall Space Flight Center, Huntsville, AL USA
Launch Vehicle/Carrier Interaction, Improving the Analytical Integration Process
Shariett, Charles A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A goal of the aerospace industry is to reduce the cost of space transportation by a significant within the next decade. The present cost of launching a space transportation system which includes propulsion system, vehicle, carrier, and payload integrated together to form a system, encompasses much more than the design of the propulsion system and vehicle. The total cost includes the recurring cost of the process of integrating carriers, and payloads into the vehicle for each flight. The recurring cost of the integration of carrier/payloads systems is driven by the interaction of the vehicle. If the interaction can be well characterized and made to be very predictable for a range of payloads, or if it can be minimized then the cost of integrating a payload can be reduced significantly from today's levels. The Space Shuttle is very interactive with the payload. The interaction has been well characterized through finite element modeling and is reasonably predictable for a specific payload. Experience has shown, however, that the interaction is very manifest dependent, and small changes in one portion of a payload complement can change the interaction significantly in another portion. That is the affects of one on the other are such that if one or the other is changed slightly the environment at the interfaces can change significantly. to date the Shuttle has made in excess of one hundred flights. For each of these flights several iterations of dynamic analyses have been required in the development of each vehicle/carrier/payload system. The iterative analyses are needed because of the sensitivity of the interaction of the launch vehicle to the attached carrier/payload. The Multi Purpose Logistics Module (MPLM) is a carrier designed for flight in the Space Shuttle carrying a wide variation of cargo, supplies, and experiments to and from Space Station. Its integration process provides a unique area for improvement in the template in use today for transporting items to space. Discussion of the present MPLM integration analysis requirements and possible areas for improvement of the process are provided in the subject paper. Special emphasis is placed on reduction of requirements based on similarity of items being transported, and the use of carrier hardware for protection of the Shuttle Orbiter.
Author
Analogies; Finite Element Method; Logistics; Mathematical Models; Payloads; Propulsion; Launch Vehicles

20030001664 Sandia National Labs., Albuquerque, NM USA
Risk Management Plan Sandia National Laboratories ASCI V&V Program
Hodges, A. L.; Froelich, G. K.; Pilch, M.; Peercy, D. E.; Apr. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800945; SAND2002-1048; No Copyright; Avail: National Technical Information Service (NTIS)

This document describes a proactive plan for assessing and controlling sources of risk for the ASCI Verification & Validation (V&V) program at Sandia National Laboratories. It offers a graded approach for identifying, analyzing, prioritizing, responding to, and monitoring risks.
NTIS
Management Planning; Risk; Nuclear Weapons; Computerized Simulation; Control Theory

20030001678 Sandia National Labs., Albuquerque, NM USA
General Concepts for Experimental Validation of ASCI Code Applications
Trucano, T. G.; Pilch, M.; Oberkampf, W. L.; Mar. 2002; In English
Report No.(s): DE2002-800777; SAND2002-0341; No Copyright; Avail: CASI; C01, CD-ROM

This report presents general concepts in a broadly applicable methodology for validation of Accelerated Strategic Computing Initiative (ASCI) codes for Defense Programs applications at Sandia National Laboratories. The concepts are defined and analyzed within the context of their relative roles in an experimental validation process. Examples of applying the proposed methodology to three existing experimental validation activities are provided in appendices, using an appraisal technique recommended in this report.
NTIS
Defense Program; Program Verification (Computers)

20030001679 Sandia National Labs., Albuquerque, NM USA

DAKOTA, A Multilevel Parallel Object-Oriented Framework for Design Optimization, Parameter Estimation, Uncertainty Quantification, and Sensitivity Analysis. Version 3.0 User's Manual

Eldred, M. S.; Giunta, A. A.; van Bloemen Waanders, B. G.; Wojtkiewicz, S. F.; Hart, W. E.; Apr. 2002; In English

Report No.(s): DE2002-800774; SAND2001-3796; No Copyright; Avail: CASI; C01, CD-ROM

DAKOTA has grown significantly beyond its original focus as a toolkit of optimization methods. In addition to having many state-of-the-art optimization methods, DAKOTA now includes methods for sensitivity analysis, parameter estimation, design-of-experiments, uncertainty quantification, and multidimensional surface mapping. Underlying all of these methods is support for parallel computation; ranging from the level of a desktop multiprocessor computer up to massively parallel computers found at national laboratories and supercomputer centers. The objective of the public release of the DAKOTA software is to facilitate collaborations among the developers of DAKOTA at Sandia National Laboratories and other institutions, including academic, governmental, and corporate entities. We are interested in developing relationships with persons or groups who would like to assist us in extending the capabilities of DAKOTA. We feel that this goal is best pursued by making the source code of our software freely available to others. In doing so, we expect that some of our errors will be found and corrected, and that new capabilities will be added to future versions of DAKOTA. Currently, DAKOTA is licensed for public release under a GNU General Public License.

NTIS

User Manuals (Computer Programs); Design Optimization; Sensitivity Analysis

20030001841 NASA Ames Research Center, Moffett Field, CA USA

Building Blocks for Reliable Complex Nonlinear Numerical Simulations

Yee, H. C., NASA Ames Research Center, USA; Jul. 10, 2002; 1p; In English; CNLS 22nd Annual International Conference: Frontiers of Simulation, 19-23 Aug. 2002, Los Alamos, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This talk describes some of the building blocks to ensure a higher level of confidence in the predictability and reliability (PAR) of numerical simulation of multiscale complex nonlinear problems. The focus is on relating PAR of numerical simulations with complex nonlinear phenomena of numerics. To isolate sources of numerical uncertainties, the possible discrepancy between the chosen partial differential equation (PDE) model and the real physics and/or experimental data is set aside. The discussion is restricted to how well numerical schemes can mimic the solution behavior of the underlying PDE model for finite time steps and grid spacings. The situation is complicated by the fact that the available theory for the understanding of nonlinear behavior of numerics is not at a stage to fully analyze the nonlinear Euler and Navier-Stokes equations. The discussion is based on the knowledge gained for nonlinear model problems with known analytical solutions to identify and explain the possible sources and remedies of numerical uncertainties in practical computations. Examples relevant to turbulent flow computations are included. Author

Numerical Analysis; Partial Differential Equations; Computational Grids; Simulation; Mathematical Models

20030001912 Sandia National Labs., Albuquerque, NM USA

Final Report for the Account Creation/Deletion Reengineering Task for the Scientific Computing Department

Jennings, B.; McAllister, P.; Apr. 2000; 30p; In English

Report No.(s): DE2002-800815; SAND2002-1000; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In October 2000, the personnel responsible for administration of the corporate computers managed by the Scientific Computing Department assembled to reengineer the process of creating and deleting users computer accounts. Using the Carnegie Mellon Software Engineering Institute (SEI) Capability Maturity Model (CMM) for quality improvement process, the team performed the reengineering by way of process modeling, defining and measuring the maturity of the processes, per SEI and CMM practices. The computers residing in the classified environment are bound by security requirements of the Secure Classified Network (SCN) Security Plan. These security requirements delimited the scope of the project, specifically mandating validation of all user accounts on the central corporate computer systems. System administrators, in addition to their assigned responsibilities, were spending valuable hours performing the additional tacit responsibility of tracking user accountability for user-generated data. For example, in cases where the data originator was no longer an employee, the administrators were forced to spend considerable time and effort determining the appropriate management personnel to assume ownership or disposition of the former owners data files. In order to prevent this sort of problem from occurring and to have a defined procedure in the event of an anomaly, the computer account management procedure was thoroughly reengineered, as detailed in this document. An

automated procedure is now in place that is initiated and supplied data by central corporate processes certifying the integrity, timeliness and authentication of account holders and their management.
NTIS
Message Processing; Software Engineering

20030001965 Erc International, Inc., San Diego, CA USA
SUPREM-DSMC: A New Scalable, Parallel, Reacting, Multidimensional Direct Simulation Monte Carlo Flow Code
Campbell, David; Wadsworth, Dean; VanGilder, Douglas; Wysong, Ingrid; Kaplan, Carolyn; Apr. 2000; 8p; In English
Report No.(s): AD-A407889; AFRL-PR-ED-TP-2000-085; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
An AFRL/NRL team has recently been selected to develop a scalable, parallel, reacting, multidimensional (SUPREM) Direct Simulation Monte Carlo (DSMC) code for the DoD user community under the High Performance Computing Modernization Office (HPCMO) Common High Performance Computing Software Support Initiative (CHSSI). This paper will introduce the JANNAF Exhaust Plume community to this three-year development effort and present the overall goals, schedule, and current status of this new code.
DTIC
Computerized Simulation; Exhaust Gases; Monte Carlo Method; Architecture (Computers); Parallel Computers; Numerical Analysis

20030001968 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
The 2-3TR-Tree, A Trajectory-Oriented Index Structure for Fully Evolving Valid-Time Spatio-Temporal Datasets
Givsudan, J.; Abdelguerfi, M.; Shaw, Kevin B.; Ladner, Roy V.; May 20, 2002; 23p; In English
Report No.(s): AD-A407777; NRL/PP/7440--02-1015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Supporting large volumes of multi-dimensional data is an inherent characteristic of modem database applications, such as Geographical Information Systems (GIS), Computer Aided design (CAD), and Image and Multimedia Databases. Such databases need underlying systems with extended features like query languages, data models, and indexing methods, as compared to traditional databases, mainly because of the complexity of representing and retrieving data. The presented work deals with access methods for databases that accurately model the real world. More precisely, the focus is on index structures that can capture the time varying nature of moving objects, namely spatio-temporal structures. A new taxonomy to classify these structures has been defined according to data set characteristics and query requirements. Then, a new spatio-temporal access method, the 2-3TR-tree, has been designed to process specific data sets and fulfill specific query requirements that no other existing spatio-temporal index could handle.
DTIC
Data Bases; Spatial Distribution; Indexes

20030001970 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Model-Based Verification: Abstraction Guidelines
Hudak, John; Comella-Dorda, Santiago; Gluch, David P.; Lewis, Grace; Weinstock, Chuck; Oct. 2002; 58p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A407774; CMU/SEI-2002-TN-011; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Model-Based Verification (MBV) is a systematic approach to finding defects (errors) in software requirements, designs, or code. The approach judiciously incorporates mathematical formalism, in the form of models, to provide a disciplined and logical analysis practice, rather than a 'proof of correctness' strategy. This technical note presents a number of abstraction techniques that can be used to build essential models of system behavior in the context of MBV and details a methodology for creating state machine models using those techniques. In building essential models, abstraction is used to hide details and expose the entities, variables, states, and transitions needed to construct a state machine model. Through illustrative examples, this technical note identifies the types of simplifications that are useful and effective, and highlights the importance of the perspective in determining what important elements to include in an abstracted model.
DTIC
Software Engineering; Systems Analysis; Program Verification (Computers)

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20030000567 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Automated Generation of Message-Passing Programs: An Evaluation Using CAPTools
Hribar, Michelle R., MRJ Technology Solutions, Inc., USA; Yan, Jerry C., MRJ Technology Solutions, Inc., USA; Jin, Haoqiang, MRJ Technology Solutions, Inc., USA; [2002]; 6p; In English; PDCS '98, Oct. 1998, Las Vegas, NV, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Scientists at NASA Ames Research Center have been developing computational aeroscience applications on highly parallel architectures over the past ten years. During that same time period, a steady transition of hardware and system software also occurred, forcing us to expend great efforts into migrating and re-coding our applications. As applications and machine architectures become increasingly complex, the cost and time required for this process will become prohibitive. In this paper, we present the first set of results in our evaluation of interactive parallelization tools. In particular, we evaluate CAPTool's ability to parallelize computational aeroscience applications. CAPTools was tested on serial versions of the NAS Parallel Benchmarks and ARC3D, a computational fluid dynamics application, on two platforms: the SGI Origin 2000 and the Cray T3E. This evaluation includes performance, amount of user interaction required, limitations and portability. Based on these results, a discussion on the feasibility of computer aided parallelization of aerospace applications is presented along with suggestions for future work.
Author
Applications Programs (Computers); Computers; Parallel Processing (Computers)

20030000658 Commerce Dept., Washington, DC USA
Understanding Broadband Demand: A Review of Critical Issues
Sep. 23, 2002; 30p; In English
Report No.(s): PB2003-100952; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The following analysis examines the state of broadband demand and usage in the USA, identifying successes, challenges and actions to promote more aggressive uptake. Our goal is to identify trends, issues and opportunities for policy makers and business leaders. Over the past year the Technology Administration (TA) at the U.S. Department of Commerce has focused its attention on demand side issues impacting broadband roll-out and adoption. Based upon our investigations and analyses to-date, we believe demand side factors ready availability of easily understood, value-adding business and consumer applications at reasonable prices are critical determinants of the pace with which broadband is adopted and merit greater attention. Wildly popular services and applications drove adoption of earlier technologies, and they will be the key to accelerating broadband deployment as well.
NTIS
Broadband; Communication Networks; Deployment

20030000687 AZ Technology, Inc., Huntsville, AL USA
Novel Advancements in Internet-Based Real-Time Data Technologies
Myers, Gerry, AZ Technology, Inc., USA; [2002]; 9p; In English; SpaceOps 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA
Contract(s)/Grant(s): NAS8-01163; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

AZ Technology has been working with NASA MSFC (Marshall Space Flight Center) to find ways to make it easier for remote experimenters (RPI's) to monitor their International Space Station (ISS) payloads in real-time from anywhere using standard/familiar devices. That effort resulted in a product called 'EZStream' which is in use on several ISS-related projects. Although the initial implementation is geared toward ISS, the architecture and lessons learned are applicable to other space-related programs. This paper begins with a brief history on why Internet-based real-time data is important and where EZStream or products like it fit in the flow of data from orbit to experimenter/researcher. A high-level architecture is then presented along with explanations of the components used. A combination of commercial-off-the-shelf (COTS), Open Source, and custom components are discussed. The use of standard protocols is shown along with some details on how data flows between server and client. Some examples are presented to illustrate how a system like EZStream can be used in real world applications and how care was taken to make the end-user experience as painless as possible. A system such as EZStream has potential in the commercial (non-ISS) arena and some possibilities are presented. During the development and fielding of EZStream, a lot was learned. Good and not

so good decisions were made. Some of the major lessons learned will be shared. The development of EZStream is continuing and the future of EZStream will be discussed to shed some light over the technological horizon.
Author
Space Station Payloads; Internet Resources; Real Time Operation; Data Transfer (Computers); Architecture (Computers); Computer Networks; Interoperability; Systems Compatibility

20030000807 University of Southern California, Information Sciences Inst., Marina del Rey, CA USA
Topology Based Domain Search (TBDS) ***Final Report, Jun. 1999-Aug. 2001***
Manning, William; Jun. 2002; 62p; In English
Contract(s)/Grant(s): F30602-99-1-0523; DARPA ORDER-B550; AF Proj. H550
Report No.(s): AD-A407598; AFRL-IF-RS-TR-2002-140; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This effort will explore radical changes in the way Domain Name System (DNS) is used by endpoints in a network to improve the resilience of the endpoint and its applications in the face of dynamically changing infrastructure topology. This project will exploit the opportunity to remove the intrinsic dependence of a single, fixed root context for the DNS and develop a scalable architecture and localized optimization algorithms for constructing a dynamic, topologically sensitive root context for any network topology.
DTIC
Information Transfer; Computer Networks

20030000817 Communications Research Centre, Ottawa, Ontario Canada
Sub-Network Access Control Technology Demonstrator: Software Design of the Network Management System ***Final Report***
Lukasik, Henryk; Aug. 2002; 73p; In English; Original contains color images
Report No.(s): AD-A407628; DRDC-TR-2002-073; CRC-RP-2002-003; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This final report provides a record of the results of the network management portion of the Sub-Network Access Control Technology Demonstrator project. It summarizes the concepts behind this development effort, and describes the completed design and implementation work. This project is part of an on-going effort to build an IP based network using wireless technologies. However, the goal behind this project remains the production of an exploratory prototype. In other words, it is one more step towards the goal of transitioning wireless technologies to the Canadian Operational Fleet. The proposed IP network presents several unique challenges to network management, due to its low bandwidth wireless links and continually changing topology, that existing products have not been designed to handle. These challenges are explored in order to provide a better understanding of the requirements they impose on network management. A network management tool design is then proposed and the implementation of its prototype is described.
DTIC
Systems Engineering; Project Management; Computer Programs; Communication Networks; Management Systems

20030000868 National Inst. of Standards and Technology, Gaithersburg, MD USA
Procedures for Handling Security Patches: Recommendations of the National Institute of Standards and Technology
Mell, Peter; Tracy, Miles C.; Aug. 2002; 101p; In English; Original contains color images
Report No.(s): AD-A407174; NIST-800-40; No Copyright; Avail: CASI; A06, Hardcopy
This document presents a systematic approach for identifying and installing necessary security patches or otherwise mitigating a vulnerability. Following this systematic approach will reduce the number of incidents in an organization. However, it does not address specific patches or vulnerabilities (except as examples) or how vulnerabilities might be mitigated beyond installing the appropriate patch.
DTIC
Computer Information Security; Data Processing; Systems Engineering; Software Engineering

20030001023 Naval Postgraduate School, Monterey, CA USA
Multiple Additive Regression Trees a Methodology for Predictive Data Mining for Fraud Detection
DA Silva Monteiro, Antonio J. F.; Sep. 2002; 112p; In English; Original contains color images
Report No.(s): AD-A407108; No Copyright; Avail: CASI; A06, Hardcopy
The Defense Finance Accounting Service DFAS-Operation Mongoose (Internal Review - Seaside) is using new and innovative techniques for fraud detection. Their primary techniques for fraud detection are the data mining tools of classification

trees and neural networks as well as methods for pooling the results of multiple model fits. In this thesis a new data mining methodology, Multiple Additive Regression Trees (MART) is applied to the problem of detecting potential fraudulent and suspect transactions (those with conditions needing improvement - CNI's). The new MART methodology is an automated method for pooling a "forest" of hundreds of classification trees. This study shows how MART can be applied to fraud data. In particular it shows how MART identified classes of important variables and that MART is as effective with iaw input variables as it is with the categorical variables currently constructed individually by DFAS. MART is also used to explore the effects of the substantial amount of missing data in the historical fraud database. In general MART is as accurate as existing methods, requires much less effort to implement saving many man days, handles missing values in a sensible and transparent way, and provides features such as identifying more important variables.
DTIC
Detection; Computer Networks; Data Mining; Computer Information Security

20030001026 Naval Postgraduate School, Monterey, CA USA
Enterprise Implementations of Wireless Network Technologies at the Naval Postgraduate School and Other Military Educational Institutions
Roth, Joseph L.; Sep. 2002; 212p; In English; Original contains color images
Report No.(s): AD-A407193; No Copyright; Avail: CASI; A10, Hardcopy
The purpose of all information systems is to assist people in transitioning data into information, and then information into knowledge. In order to reach IT modernity, three things need to occur: a convergence of single open platform data exchange (e.g., Extensible Markup Language (XML)), the development of new doctrine to manage this information (e.g., Net Centric Warfare), and the creation of a robust mobile secure network (e.g., 802.11). The heart of this research will focus on the last element. Future wars will be fought using wireless mobile networks. Wireless research is being realized at the Naval Postgraduate School (NPS) Wireless Warrior Group. The Wireless Warrior Group is designing and implementing the new unclassified wireless network at the NPS using the IEEE 802.11 standard. The Wireless Group was founded by the author of this thesis and is currently made of 150 members consisting of staff, faculty, and students from a variety of different curriculums. The purpose of Wireless Warrior is to develop the doctrine of wireless networking by making it a part of every student, staff, and faculty daily communication and production. Only through constant scrutiny and use can real solutions emerge. The entire campus becomes a computer lab. Wireless Warrior provides a fertile ground for students to write new applications, to communicate and collaborate in ways unthinkable just a few years ago. Wireless computing does to computers what the cell phone did to the wired telephone. It is an educational and operational force multiplier. Wireless mobility is the future of warfare, and usable, supportable, secure mobile communication is what wins wars. This thesis documents the NPS journey into the wireless domain.
DTIC
Communication Networks; Wireless Communication; Education; Navy

20030001029 Naval Postgraduate School, Monterey, CA USA
Evaluation of Enterprise Application Integration (EAI) and Web Services at Fitting Out and Supply Support Assistance Center (FOSSAC Under NMCI
Lark, Jeffrey L.; Reyes, Mark A.; Sep. 2002; 97p; In English; Original contains color images
Report No.(s): AD-A407074; No Copyright; Avail: CASI; A05, Hardcopy
Information technology has woven itself into the fabric of every organization. As organizations grow and develop specialized needs, specialized software applications emerge to address the needs. Often the business processes take shape around the capabilities of the software applications and the technology infrastructure, until the two are inseparable from one another. When an organization decides to incorporate new processes or upgrade its information architecture, the new system may lack compatibility with the old system. The old, incompatible software is typically referred to as a "legacy application". In an effort to integrate the old applications with the new, organizations are typically faced with expensive, proprietary Enterprise Application Integration solutions. Fitting Out and Supply Support Assistance Center (FOSSAC) is an organization facing a legacy application integration challenge with the implementation of the Navy-Marine Corps Internet. This thesis examines the applicability of traditional Enterprise Application Integration (EAI) methodologies for FOSSAC as way to preserve access to its legacy applications. As an alternative integration solution, this thesis explores the potential of the emerging Web Services architecture. The Web Services architecture employs standard Internet protocols to facilitate application integration and information sharing across a variety of computing-platforms.
DTIC
Information Systems; Computer Networks; Network Control

20030001115 NASA Ames Research Center, Moffett Field, CA USA

Automated CFD Parameter Studies on Distributed Parallel Computers

Rogers, Stuart E., NASA Ames Research Center, USA; Aftosmis, Michael, NASA Ames Research Center, USA; Pandya, Shishir, NASA Ames Research Center, USA; Tejnil, Edward, Eloret Corp., USA; Ahmad, Jasim, Eloret Corp., USA; [2002]; 4p; In English; 16th AIAA Computational Fluid Dynamics 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

The objective of the current work is to build a prototype software system which will automated the process of running CFD jobs on Information Power Grid (IPG) resources. This system should remove the need for user monitoring and intervention of every single CFD job. It should enable the use of many different computers to populate a massive run matrix in the shortest time possible. Such a software system has been developed, and is known as the AeroDB script system. The approach taken for the development of AeroDB was to build several discrete modules. These include a database, a job-launcher module, a run-manager module to monitor each individual job, and a web-based user portal for monitoring of the progress of the parameter study. The details of the design of AeroDB are presented in the following section. The following section provides the results of a parameter study which was performed using AeroDB for the analysis of a reusable launch vehicle (RLV). The paper concludes with a section on the lessons learned in this effort, and ideas for future work in this area.

Derived from text

Computational Fluid Dynamics; Parallel Computers; Automatic Control; Information Management; Distributed Processing

20030001129 SRI International Corp., Menlo Park, CA USA

Modular Certification

Rushby, John, SRI International Corp., USA; December 2002; 48p; In English

Contract(s)/Grant(s): NCC1-377; RTOP 728-30-10-01

Report No.(s): NASA/CR-2002-212130; NAS 1.26:212130; SRI-11003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Airplanes are certified as a whole: there is no established basis for separately certifying some components, particularly software-intensive ones, independently of their specific application in a given airplane. The absence of separate certification inhibits the development of modular components that could be largely ”precertified” and used in several different contexts within a single airplane, or across many different airplanes. In this report, we examine the issues in modular certification of software components and propose an approach based on assume-guarantee reasoning. We extend the method from verification to certification by considering behavior in the presence of failures. This exposes the need for partitioning, and separation of assumptions and guarantees into normal and abnormal cases. We then identify three classes of property that must be verified within this framework: safe function, true guarantees, and controlled failure. We identify a particular assume-guarantee proof rule (due to McMillan) that is appropriate to the applications considered, and formally verify its soundness in PVS.

Author

Avionics; Certification; Modularity; Systems Integration; Software Engineering

20030001551 NASA Marshall Space Flight Center, Huntsville, AL USA

A Ground Systems Architecture Transition for A Distributed Operations System

Sellers, Donna, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Marshall Space Flight Center (MSFC) Ground Systems Department (GSD) recently undertook an architecture change in the product line that serves the ISS program. As a result, the architecture tradeoffs between data system product lines that serve remote users versus those that serve control center flight control teams were explored extensively. This paper describes the resulting architecture that will be used in the ISS payloads program, and the resulting functional breakdown of the products that support that architecture. It also describes the lessons learned from the path that was followed, as a migration of products cause the need to reevaluate the allocation of functions across the architecture. The result is a set of innovative ground system solutions that is scalable so it can support facilities of wide-ranging sizes, from a small site up to large control centers. Effective use of system automation, custom components, design optimization for data management, data storage, data transmissions, and advanced local and wide area networking architectures, plus the effective use of Commercial-Off-The-Shelf (COTS) products, provides flexible Remote Ground System options that can be tailored to the needs of each user. This paper offers a description of the efficiency and effectiveness of the Ground Systems architectural options that have been implemented, and includes successful implementation examples and lessons learned.

Author

Architecture (Computers); Data Systems; Systems Engineering; Payloads; Ground Support Systems; Flight Operations

20030001580 Naval Postgraduate School, Monterey, CA USA

Network Survivability Analysis of the Navy and Marine Corps Intranet (NMCI)

Fahrenthold, Alex B.; Sep. 2002; 225p; In English; Original contains color images

Report No.(s): AD-A407874; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

NMCI is a mechanism to transform the Navy and Marine Corps information systems and prepare 21st century warfare. Just as the Internet has transformed business and commerce around the globe, NMCI may transform the U.S. Navy and Marine Corps by harnessing the power of an integrated network. The Navy and Marine Corps Intranet constitutes the first major step into a truly network-centric warfare environment and makes them full participants in the cyber world. This network will handle the data on which an increasing percentage of the Navy and Marine Corps mission essential services will rely. Yet, the hardware and software that make up these systems have demonstrated vulnerabilities that put these mission essential functions at risk. Consequently, the Navy and Marine Corps must consider systems and strategies that address the need for survivability of the mission essential functions in the same manner applied to major weapons systems on the battlefield. ”Network survivability” is a field of study that addresses exactly this issue. Developed in 199S under a Department of Defense contract by the Carnegie Mellon University Software Engineering Institute, network survivability addresses the need of a network to fulfill its essential mission in the presence of failures, compromise, or attack. This thesis examines the Navy and Marine Corps Intranet mission and structure in an attempt to determine its inherent survivability and ability to support the needs of the Navy and Marine Corps team. It focuses on identifying the network mission functions and the ability of the network architecture to produce the required survivability characteristics. Based on this examination I propose a mission definition for NMCI and highlight the need within the security architecture to achieve a survivable NMCI network.

DTIC

Computer Networks; Internets; Navy; Computer Information Security; Architecture (Computers); Software Engineering

20030001583 Department of Defense, Office of the Inspector General, Arlington, VA USA

Information System Security: Government Information Security Reform Act Implementation: Defense Security Assistance Management System

Young, Shelton R.; Caprio, Kimberley A.; Schraden, Tilghman A.; Palmer, Kathryn L.; Bohinski, Walter S.; Aug. 30, 2002; 31p; In English

Report No.(s): AD-A407864; IG/DOD-D-2002-142; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To gather data on assessments of the effectiveness of DoD information assurance policies, procedures, and practices, DoD developed a GISR Act collection matrix for automated information systems. DoD selected a sample of 560 automated information systems from the almost 4,000 automated information systems in DoD. For those 560 systems, DoD reported the aggregate results of the assessments for FY 2001 in ”GISR Report FY01: Government Information Security Reform Act, Report of the Department of Defense,” October 2001. of the 560 systems, the Office of the Inspector General of the Department of Defense, the Defense Information Systems Agency Inspector General, and Military Department audit agencies assessed a sample of 115 systems. This report is one in a series of GISR Act audits and is an assessment of the Defense Security Assistance Management System. The Defense Security Assistance Management System is a mission-essential system developed to produce and track security assistance-related contractual documents (sales agreements between governments).

DTIC

Defense Program; Governments; Information Systems; Computer Information Security

20030001688 Illinois Univ., Champaign, IL USA

Building a Dynamic Interoperable Security Architecture for Active Networks ***Final Report, May 1998-Jun. 2002***

Campbell, Roy H.; Mickunas, M. D.; Oct. 2002; 90p; In English

Contract(s)/Grant(s): F30602-98-1-0192; DARPA ORDER-G378; Proj-G378

Report No.(s): AD-A407881; AFRL-IF-RS-TR-2002-262; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Security is viewed as one of the major obstacles to the widespread deployment active networks. A significant challenge is to develop mechanisms to change software state on routers dynamically, without sacrificing protection guarantees. The Seraphim projects leverages the inherent dynamism in the paradigm to build dynamic security mechanisms for active networks. Seraphim’s security architecture is component based, dynamically extensible, and reflective, and supports a variety of policy strategies and enforcement mechanisms. This enabled the development of customizable, interoperable, domain-specific, or task-specific security policies and mechanisms, to meet the security requirements of active network entities. Administrators were able to develop security policies as active network capsules, called dynamic policies, and enforce these policies by executing them in a suitable software context on active network routers. A suite of confidentiality, integrity, authentication and access-control mechanisms was developed to secure the node of an active network. This suite was based on standardized APIs and provided

support for customized Quality of Protection guarantees. Customized dynamic policies were created and installed at run-time, trading functionality for performance, to implement low-overhead solutions that were able to successfully counter threats and attack, without sacrificing protection guarantees.
DTIC
Computer Networks; Computer Information Security; Architecture (Computers); Computer Systems Programs; Interoperability

20030001704 Computer Sciences Corp., Moffett Field, CA USA
NAS Parallel Benchmarks, 2.4
VanderWijngaart, Rob, Computer Sciences Corp., USA; Aug. 21, 2002; 8p; In English; Supercomputing 2002, 16-22 Nov. 2002, Baltimore, MD, USA
Contract(s)/Grant(s): RTOP 704-40-24; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
We describe a new problem size, called Class D, for the NAS Parallel Benchmarks (NPB), whose MPI source code implementation is being released as NPB 2.4. A brief rationale is given for how the new class is derived. We also describe the modifications made to the MPI (Message Passing Interface) implementation to allow the new class to be run on systems with 32-bit integers, and with moderate amounts of memory. Finally, we give the verification values for the new problem size.
Author
Problem Solving; Massively Parallel Processors; Architecture (Computers); Parallel Processing (Computers); Computational Grids

20030001818 Lawrence Livermore National Lab., Livermore, CA USA
Performance Analysis of Distributed Applications Using Automatic Classification of Communication Inefficiencies
Vetter, J.; Nov. 01, 1999; 16p; In English
Report No.(s): DE2002-793599; UCRL-JC-136200; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present a technique for performance analysis that helps users understand the communication behavior of their message passing applications. Our method automatically classifies individual communication operations and it reveals the cause of communication inefficiencies in the application. This classification allows the developer to focus quickly on the culprits of truly inefficient behavior, rather than manually foraging through massive amounts of performance data. Specifically, we trace the message operations of MPI applications and then classify each individual communication event using decision tree classification, a supervised learning technique. We train our decision tree using microbenchmarks that demonstrate both efficient and inefficient communication. Since our technique adapts to the target system's configuration through these microbenchmarks, we can simultaneously automate the performance analysis process and improve classification accuracy. Our experiments on four applications demonstrate that our technique can improve the accuracy of performance analysis, and dramatically reduce the amount of data that users must encounter.
NTIS
Evaluation; Distributed Processing; Parallel Processing (Computers)

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.

20030000541 NASA Marshall Space Flight Center, Huntsville, AL USA
Implementation of Adaptive Digital Controllers on Programmable Logic Devices
Gwaltney, David A., NASA Marshall Space Flight Center, USA; King, Kenneth D., NASA Marshall Space Flight Center, USA; Smith, Keary J., NASA Marshall Space Flight Center, USA; [2002]; 25p; In English; 5th Annual Military and Aerospace Programmable Logic Devices (MAPLD) International Conference, 10-12 Sep. 2002, Laurel, MD, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Much has been made of the capabilities of FPGA's (Field Programmable Gate Arrays) in the hardware implementation of fast digital signal processing. Such capability also makes an FPGA a suitable platform for the digital implementation of closed loop controllers. Other researchers have implemented a variety of closed-loop digital controllers on FPGA's. Some of these controllers include the widely used proportional-integral-derivative (PID) controller, state space controllers, neural network and fuzzy logic based controllers. There are myriad advantages to utilizing an FPGA for discrete-time control functions which include the capability for reconfiguration when SRAM-based FPGA's are employed, fast parallel implementation of multiple control

loops and implementations that can meet space level radiation tolerance requirements in a compact form-factor. Generally, a software implementation on a DSP (Digital Signal Processor) or microcontroller is used to implement digital controllers. At Marshall Space Flight Center, the Control Electronics Group has been studying adaptive discrete-time control of motor driven actuator systems using digital signal processor (DSP) devices. While small form factor, commercial DSP devices are now available with event capture, data conversion, pulse width modulated (PWM) outputs and communication peripherals, these devices are not currently available in designs and packages which meet space level radiation requirements. In general, very few DSP devices are produced that are designed to meet any level of radiation tolerance or hardness. The goal of this effort is to create a fully digital, flight ready controller design that utilizes an FPGA for implementation of signal conditioning for control feedback signals, generation of commands to the controlled system, and hardware insertion of adaptive control algorithm approaches. An alternative is required for compact implementation of such functionality to withstand the harsh environment encountered on spacecraft. Radiation tolerant FPGA's are a feasible option for reaching this goal.
Author
Field-Programmable Gate Arrays; Evolvable Hardware; Signal Processing; Controllers; Radiation Tolerance; Spacecraft Equipment; Digital Systems

20030000862 Naval Postgraduate School, Monterey, CA USA
Spectral Analysis and Sonification of Simulation Data Generated in a Frequency Domain Experiment
Wu, Hsin-Fu; Sep. 2002; 112p; In English; Original contains color images
Report No.(s): AD-A407183; No Copyright; Avail: CASI; A06, Hardcopy
In this thesis, we evaluate the frequency domain approach for data farming and assess the possibility of analyzing complex data sets using data sonification. Data farming applies agent-based models and simulation, computing power, and data analysis and visualization technologies to help answer complex questions in military operations. Sonification is the use of data to generate sound for analysis. We apply a frequency domain experiment (FDE) to a combat simulation and analyze the output data set using spectral analysis. We compare the results from our FDE with those obtained using another experimental design on the same combat scenario, Our results confirm and complement the earlier findings. We then develop an auditory display that uses data sonification to represent the simulation output data set with sound. We consider the simulation results from the FDE as a waveshaping function and generate sounds using sonification software. We characterize the sonified data by their noise, signal, and volume. Qualitatively, the sonified data match the corresponding spectra from the FDE. Therefore, we demonstrate the feasibility of representing simulation data from the FDE with our sonification. Finally, we offer suggestions for future development of a multimodal display that can be used for analyzing complex data sets.
DTIC
Computer Programs; Data Processing; Diagnosis; Frequency Domain Analysis; Auditory Signals; Auditory Perception

20030000887 Naval Research Lab., Mapping Charting and Geodesy Branch, Stennis Space Center, MS USA
Fuzzy Spatial Querying With Inexact Inference
Shaw, Kevin B.; Petry, Frederick E.; Yang, Huiqing; Cobb, Maria; Ali, Dia; Apr. 24, 2002; 9p; In English; Original contains color images
Report No.(s): AD-A407593; NRL/PP/7440--02-1012; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The issue of spatial database accuracy bas been viewed as critical to the successful implementation and long-term viability of the geographic information system (GIS) technology. In order to improve the spatial querying accuracy and quality, the problems associated with the areas of fuzziness and uncertainty are of great common in the spatial databases. In this paper, we are dedicated to develop an approach that can perform fuzzy spatial querying under uncertainty. An inferring strategy under uncertainty is investigated. The study shows that the fuzzy set and the certainty factor can work together to deal with spatial querying. Querying examples implemented by FuzzyClips are also provided.
DTIC
Fuzzy Sets; Information Retrieval; Inference

20030001563 Space and Naval Warfare Systems Center, San Diego, CA USA
After Action Report to the Unmanned Ground Vehicles/Systems-Joint Program Office: Center for the Robotic Assisted Search and Rescue (CRASAR) Related Efforts at the World Trade Center
Blackburn, Michael R.; Everett, H. R.; Laird, Robin T.; Aug. 2002; 38p; In English; Original contains color images
Report No.(s): AD-A407901; SSC/SD-TD-3141; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This report provides a quick summary of the introduction of small teleoperated robots to disaster-related search and rescue operations following the 11 September 2001 terrorist attack upon the World Trade Center in New York City. This report also lists

certain lessons learned from that event and proposes recommendations based upon those lessons for future development, deployment, and operation of urban search and rescue robotic tools.
DTIC
Robots; Rescue Operations; Telerobotics

20030001674 Sandia National Labs., Albuquerque, NM USA
Autonomous Dynamic Soaring Platform for Distributed Mobile Sensor Arrays
Jun. 2002; In English
Report No.(s): DE2002-801001; SAND2002-1896; No Copyright; Avail: CASI; C01, CD-ROM
This project makes use of biomimetic behavioral engineering in which adaptive strategies used by animals in the real world are applied to the development of autonomous robots. The key elements of the biomimetic approach are to observe and understand a survival behavior exhibited in nature, to create a mathematical model and simulation capability for that behavior, to modify and optimize the behavior for a desired robotics application, and to implement it. The application described in this report is dynamic soaring, a behavior that certain sea birds use to extract flight energy from laminar wind velocity gradients in the shallow atmospheric boundary layer directly above the ocean surface. Theoretical calculations, computational proof-of- principle demonstrations, and the first instrumented experimental flight test data for dynamic soaring are presented to address the feasibility of developing dynamic soaring flight control algorithms to sustain the flight of unmanned airborne vehicles (UAVs). Both hardware and software were developed for this application.
NTIS
Flight Control; Robotics; Animals; Pilotless Aircraft; Biomimetics

20030001696 Universitaet der Bundeswehr, Fachbereich Elektrotechnik, Hamburg, Germany
On the Learning Process of Back-Propagation Nets on the Basis of Stochastic Computation ***Zum Lernverhalten von Backpropagation-Netzen auf der Basis stochastischer Rechentechnik***
Zhu, Liyun; Jun. 2000; 151p; In German
Report No.(s): AD-A407931; X5-X5; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
The dissertation entails a detailed examination of the adaptive or learning process of a back-propagation net, used for the building of massive parallel neural networks, and based on the level of mathematical induction, stochastic computation, and software simulation. Firstly are the introductory bases of the back-propagation new discussed. Parameters and an adaptive process are then selected, followed by limitations and countermeasures. The results of the examination and software simulation demonstrate the simultaneously occurring work and learning processes do not seem to exert any negative influence on the convergence progress. The more precise and quantitative scalability of the entire process is evaluated in the study's final chapter.
DTIC
Neural Nets; Stochastic Processes; Machine Learning

20030001854 STI Technologies, Inc., Rochester, NY USA
In-Flight Engine Diagnostics and Prognostics Using a Stochastic-Neuro-Fuzzy Inference System
Ghiocel, Dan M., STI Technologies, Inc., USA; Altmann, J., STI Technologies, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 165-195; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche
The paper will present the concept of a generalized physics-based approach to stochastic nonlinear mechanics problems. The generalized approach that is based on a multiple local-averaging of stochastic response. The "patches" are the local-averaging subdomains in stochastic parameter space. The proposed approach is practical and highly applicable to complex physics problems, such as the HCF prediction and large nonlinear systems behavior. The proposed approach can accurately incorporate complex nonlinear statistical dependencies within uncertainty propagation in large systems. Using the proposed approach a Patched-Based Monte Carlo (PBMC) simulation technique is developed. The proposed PBMC simulation technique assumes that the nonlinear system response surfaces are non-stationary physics-based stochastic fields defined by a set of nonlinearly correlated stochastic variables. The PBMC simulation technique can be applied to partition large-size stochastic systems in cascaded subsystems, being capable of transmitting accurately the all the key physics-based uncertainties and their complex statistical dependencies. In contrast to the standard Response Surface Monte Carlo (RSMC), PBMC assumes no functional form for the approximation of stochastic response and its correlation structure. PBMC is much more efficient for high-dimensional highly-nonlinear problems than the standard RSMC. Also, it provides more insights in the stochastic system behavior.
Author
Fuzzy Systems; Mechanics (Physics); Stochastic Processes; Systems Engineering; Engine Tests; Nonlinear Systems

20030001951 New York Gas Group, New York, NY USA

Design, Construction and Field Demonstration of EXPLORER: A Long-range Untethered Live Gasline Inspection Robot System ***Annual Report, 1 Oct. 02 - 31 Mar. 02***

Vradis, G. C.; Schempf, H.; May 2002; 28p; In English

Report No.(s): DE2002-801215; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The goal of this program is to construct and demonstrate EXPLORER, a modular, remotely controllable, self-powered, untethered robot system for the inspection of live gas distribution 150 mm (6-inch) to 200 mm (8-inch) diameter mains. The system, which was designed in an earlier effort, is built in a modular fashion in order to accommodate various components intended to accomplish different inspection, repair, sample retreival, and other in-pipe tasks. The purpose for EXPLORER is to be able to access live gas mains, inserts the system in the piping network, and remotely 'drive' it within the gas main and its laterals through distances of five to ten thousand feet.

NTIS

Robots; Tethering; Gas Pipes; Remote Control; Systems Engineering; Pipelines

20030001954 Sandia National Labs., Albuquerque, NM USA

Pattern Recognition Feature Optimization Tool Using the Visual Empirical Region of Influence Algorithm

Martinez, R. F.; Jun. 2002; 28p; In English

Report No.(s): DE2002-800997; SAND2002-1881; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This document is the second in a series that describe graphical user interface tools developed to control the Visual Empirical Region of Influence (VERI) algorithm. In this paper we describe a user interface designed to optimize the VERI algorithm results. The optimization mode uses a brute force method of searching through the combinations of features in a data set for features that produce the best pattern recognition results. With a small number of features in a data set an exact solution can be determined. However, the number of possible combinations increases exponentially with the number of features and an alternate means of finding a solution must be found. We developed and implemented a technique for finding solutions in data sets with both small and large numbers of features.

NTIS

Algorithms; Pattern Recognition; Optimization; Software Development Tools

64
NUMERICAL ANALYSIS

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

20030000683 NASA Langley Research Center, Hampton, VA USA

Elliptic Relaxation of a Tensor Representation of the Pressure-Strain and Dissipation Rate

Carlson, John R., NASA Langley Research Center, USA; Gatski, Thomas B., NASA Langley Research Center, USA; [2002]; 6p; In English; 2002 Joint US ASME-European Fluids Engineering Division Summer Meeting, 14-18 Jul. 2002, Montreal, Quebec, Canada; Sponsored by American Society of Mechanical Engineers, USA

Report No.(s): FEDSM2002-31259; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A formulation to include the effects of wall-proximity in a second moment closure model is presented that utilizes a tensor representation for the redistribution term in the Reynolds stress equations. The wall-proximity effects are modeled through an elliptic relaxation process of the tensor expansion coefficients that properly accounts for both correlation length and time scales as the wall is approached. DNS data and Reynolds stress solutions using a full differential approach at channel Reynolds number of 590 are compared to the new model.

Author

Strain Rate; Dissipation; Mechanical Properties; Mathematical Models; Tensor Analysis; Elliptic Differential Equations; Pressure Gradients; Relaxation Method (Mathematics)

20030000833 NASA Langley Research Center, Hampton, VA USA

Coupling Finite Element and Meshless Local Petrov-Galerkin Methods for Two-Dimensional Potential Problems

Chen, T., Army Research Lab., USA; Raju, I. S., NASA Langley Research Center, USA; [2002]; 28p; In English; 43rd AIAA/ASME/ASCE/AHS/ASC 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 2002-1659; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A coupled finite element (FE) method and meshless local Petrov-Galerkin (MLPG) method for analyzing two-dimensional potential problems is presented in this paper. The analysis domain is subdivided into two regions, a finite element (FE) region and a meshless (MM) region. A single weighted residual form is written for the entire domain. Independent trial and test functions are assumed in the FE and MM regions. A transition region is created between the two regions. The transition region blends the trial and test functions of the FE and MM regions. The trial function blending is achieved using a technique similar to the 'Coons patch' method that is widely used in computer-aided geometric design. The test function blending is achieved by using either FE or MM test functions on the nodes in the transition element. The technique was evaluated by applying the coupled method to two potential problems governed by the Poisson equation. The coupled method passed all the patch test problems and gave accurate solutions for the problems studied.

Author

Finite Element Method; Galerkin Method; Poisson Equation; Problem Solving; Coupling; Structural Analysis

20030001112 Computer Sciences Corp., Moffett Field, CA USA

An Analysis of Performance Enhancement Techniques for Overset Grid Applications

Djomehri, J. J., Computer Sciences Corp., USA; Biswas, R., NASA Ames Research Center, USA; Potsdam, M., Army Aviation and Missile Command, USA; Strawn, R. C., Army Aviation and Missile Command, USA; Oct. 01, 2002; 15p; In English; International Parallel and Distributed Processing Symposium (IPDPS), Apr. 2003, Nice, France

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The overset grid methodology has significantly reduced time-to-solution of high-fidelity computational fluid dynamics (CFD) simulations about complex aerospace configurations. The solution process resolves the geometrical complexity of the problem domain by using separately generated but overlapping structured discretization grids that periodically exchange information through interpolation. However, high performance computations of such large-scale realistic applications must be handled efficiently on state-of-the-art parallel supercomputers. This paper analyzes the effects of various performance enhancement techniques on the parallel efficiency of an overset grid Navier-Stokes CFD application running on an SGI Origin2000 machine. Specifically, the role of asynchronous communication, grid splitting, and grid grouping strategies are presented and discussed. Results indicate that performance depends critically on the level of latency hiding and the quality of load balancing across the processors.

Author

Computational Grids; Computational Fluid Dynamics; Efficiency; Navier-Stokes Equation; Applications Programs (Computers)

65
STATISTICS AND PROBABILITY

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

20030000630 Defence Science and Technology Organisation, Electronics and Surveillance Research, Salisbury, Australia

Fitting the Most Likely Curve through Noisy Data

Newsam, Garry N.; Redding, Nicholas J.; May 2002; 45p; In English

Report No.(s): AD-A407528; DSTO-RR-0242; DODA-AR-012-374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

At present the preferred method for fitting a general curve through scattered data points in the plane is orthogonal distance regression, i.e., by minimising the sum of squares of the distances from each data point to its nearest neighbor on the curve. While generally producing good fits, in theory orthogonal distance regression can be both biased and inconsistent: in practice this manifest itself in overfitting of convex curves or underfitting of corners. The paper postulates this occurs because orthogonal distance regression is based on an incomplete stochastic model of the problem. It therefore presents an extension of the standard model that takes into accounts both the noisy measurement of points on the curve and their underlying distribution along the curve.

It then derives the likelihood function of a given curve being observed under this model. Although this cannot be evaluated exactly for anything other than the simplest curves, it lends itself naturally to asymptotic approximation. Orthogonal distance regression corresponds to a first order approximation to the maximum likelihood estimator in this model: the paper also derives a second order approximation, which turns out to be a simple modification of the least squares penalty that includes a contribution from the curvature at the closest point. Analytical and numerical examples are presented to demonstrate the improvement achieved using the higher order estimator.
DTIC
Regression Analysis; Curve Fitting; Asymptotic Methods; Approximation; Curvature

20030000705 Carleton Univ., Ottawa, Ontario Canada
A Modified Marquardt-Levenberg Parameter Estimation Routine for Matlab
Fahlman, Andreas; Sep. 2001; 21p; In English; Original contains color images
Contract(s)/Grant(s): Proj-M0099
Report No.(s): AD-A407508; NMRC-01-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A non-linear parameter estimation routine was written for the Matlab language. The program used the methods of least squares for parameter estimation, and a modification was made to allow estimation based on the method of maximum likelihood,
DTIC
Nonlinear Systems; Maximum Likelihood Estimates

20030000870 Naval Postgraduate School, Monterey, CA USA
Probabilistic Modeling and Simulation of Metal Fatigue Life Prediction
Heffern, Thomas V.; Sep. 2002; 134p; In English; Original contains color images
Report No.(s): AD-A406999; No Copyright; Avail: CASI; A07, Hardcopy
As fiscal constraints demand maximum utilization, engineers must develop more rigorous methods to predict the life limits of aircraft components Current Navy policy requires that aircraft and aircraft parts be retired before they reach 100% FLE (fatigue life expended). An investigation has been initiated that would attempt to quantify the probability of failure if aircraft parts were extended in service life beyond 100% FLE. The work of this thesis was to investigate the probability distributions of test data taken for aluminum 7050-T7451, and to attempt to develop a probability based model from the variation of the four fatigue life constants (sigma f,epsilon f,b,c). The goal was to create strain-life-probability curves that would more accurately describe the likelihood of failure at a given strain amplitude The investigator determined that the test data did not demonstrate any consistent known probability density function, The investigator cautioned against assuming a normal distribution before it could be completely established as the predominate probability density function, Possible consequences of invalid assumptions were presented, Attempts were made to explain the disparity of sample data between two different laboratories testing of the same material Assuming random behavior within an established range, probability based models were developed using the four strain-life constants, It was determined that in order to create a complete probability based model, an accurate regression of the test data must fit all strain levels to include the intermediate strain level's "knee" In an attempt to solve that problem, eight parameter equations were explored, Methods to predict the eight parameters included random number simulation combined with non-linear least squares curve fits, evolutionary algorithms and genetic algorithms.
DTIC
Service Life; Fatigue Life; Strain Measurement; Aircraft Equipment; Metal Working; Aluminum; Simulation; Coffin-Manson Law

20030001863 Southwest Research Inst., USA
DARWIN(tm) Enhancements for Probabilistic Risk Assessment
Millwater, Harry, Southwest Research Inst., USA; Enright, Mike, Southwest Research Inst., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 323-357; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche
The Analysis using DARWIN enhancements for probabilistic risk assessment are presented. This paper is in viewgraph form.
CASI
Risk; Gas Turbine Engines; Mathematical Models; Fracture Mechanics; Probability Theory

20030001870 Cruse (Thomas A.), Pagosa Springs, CO USA
Verification and Validation
Cruse, Thomas A., Cruse (Thomas A.), USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine

Engines; October 2002, pp. 475-479; In English; Also announced as 20030001844; No Copyright; Avail: CASI; A01, Hardcopy; A10, Microfiche

This viewgraph presentation provides a discussion of verification and validation as processes used in the development of probability theory models. Military planners and industrial engineers are interested in applying these models to predicting component life durability and failure rates. The authors define verification as the process of determining that a computational software implementation correctly represents a defined model while validation is the degree to which a computer model is an accurate representation of the real world. Both processes can be applied to deterministic and probabilistic elements of modeling.
CASI

Component Reliability; Probability Theory; Applications Programs (Computers); Evaluation; Life (Durability); Failure Analysis

20030001878 Statistical Engineering, Palm Beach Gardens, FL USA

Math Stats Results for Applied Probabilistics

Annis, Charles, Statistical Engineering, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 653-700; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Did you know that ”probability” and ”statistics” are not synonymous terms? Did you know that probability has two different definitions, both part of mainstream statistical thought, yet fundamentally in conflict? Do you know what the likelihood function is, and where it comes from, and why you should care? Ever heard of the Fisher Information Matrix? Do you know what the Central Limit Theorem says and why it is central to successful Engineering Probabilistics? Were you aware that two variables can have a perfect functional relationship and yet have zero correlation? Do you know the difference between a condition distribution and a marginal distribution? Or a joint distribution? Or when you can get from one to another - and when you cannot? If you have an analytically predicted stress of 50 KSI and a strain gage measurement that’s different, which should you believe? How would you resolve the difference? (The common practice of adding the difference to the analytical result as a ”correction” is dangerous. Do you know why?) This paper will describe and discuss these and other interesting, important, and especially useful, results from Math Stats as they apply to Probabilistic Engineering Analysis.
Author

Probability Theory; Statistical Analysis; Functions (Mathematics); Mechanical Engineering

20030001879 Lehigh Univ., Dept. of Mechanical Engineering and Mechanics, Bethlehem, PA USA

The Disparity Between Mechanistic and Empirical Modeling of Variability in Materials Damage Processes

Harlow, Gary, Lehigh Univ., USA; Wei, Robert P., Lehigh Univ., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 701-710; In English; Also announced as 20030001844; Original contains color illustrations

Contract(s)/Grant(s): F49620-98-1-0198; NSF DMR-96-32994; No Copyright; Avail: CASI; A02, Hardcopy; A10, Microfiche

Analyses of the variability in material properties and damage processes are increasingly being used for reliability and durability assessments in the life-cycle design and management of engineered aircraft systems, e.g., gas turbine engines. It is widely recognized that the traditional statistical and empirical methods are inadequate. These are appropriate for interpolations of existing data, but their usefulness for extrapolations outside that data is limited and questionable. Effective predictors, i.e., those that provide precise estimates beyond the range of conditions employed in the development of supporting data and assessments of risk, must be based upon mechanistic models that capture the functional dependence of all the key internal and external variables. to reflect typical engineering applications, this type of modeling requires multidisciplinary and integrated research that considers the underlying processes that control damage evolution in materials and quantifies the stochastic aspects of these processes. This paper provides an exposition and critical comparison between a mechanistically based probability modeling methodology and a statistically based approach. The crucial differences between the two approaches are highlighted and demonstrated through modeling of the creep crack growth response of a high-strength steel. The impact of these differences on structural reliability and durability analyses for life-cycle design and management is discussed.
Author

Damage; Durability; Life (Durability); Reliability Analysis; Design Analysis; Performance Prediction

20030001880 NASA Glenn Research Center, Cleveland, OH USA

The Use of Probabilistic Methods to Evaluate the Systems Impact of Component Design Improvements on Large Turbofan Engines

Packard, Michael H., NASA Glenn Research Center, USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 711-746; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche

Probabilistic Structural Analysis (PSA) is now commonly used for predicting the distribution of time/cycles to failure of turbine blades and other engine components. These distributions are typically based on fatigue/fracture and creep failure modes of these components. Additionally, reliability analysis is used for taking test data related to particular failure modes and calculating failure rate distributions of electronic and electromechanical components. How can these individual failure time distributions of structural, electronic and electromechanical component failure modes be effectively combined into a top level model for overall system evaluation of component upgrades, changes in maintenance intervals, or line replaceable unit (LRU) redesign? This paper shows an example of how various probabilistic failure predictions for turbine engine components can be evaluated and combined to show their effect on overall engine performance. A generic model of a turbofan engine was modeled using various Probabilistic Risk Assessment (PRA) tools (Quantitative Risk Assessment Software (QRAS) etc.). Hypothetical PSA results for a number of structural components along with mitigation factors that would restrict the failure mode from propagating to a Loss of Mission (LOM) failure were used in the models. The output of this program includes an overall failure distribution for LOM of the system. The rank and contribution to the overall Mission Success (MS) is also given for each failure mode and each subsystem. This application methodology demonstrates the effectiveness of PRA for assessing the performance of large turbine engines. Additionally, the effects of system changes and upgrades, the application of different maintenance intervals, inclusion of new sensor detection of faults and other upgrades were evaluated in determining overall turbine engine reliability.

Author

Engine Design; Engine Parts; Performance Prediction; Reliability Analysis; Structural Analysis; Structural Failure; Turbofan Engines; Probability Theory; Design Analysis

20030001958 General Electric Co., Cincinnati, OH USA

A Methodology for the Assessment of the Capability of Inspection Systems for Detection of Subsurface Flaws in Aircraft Turbine Engine Components ***Final Report***

Burkel, R. H.; Chiou, C. -P.; Keyes, T. K.; Meeker, W. Q.; Rose, J. H.; Sep. 2002; 138p; In English; Prepared in collaboration with Iowa State Univ., Ames

Report No.(s): AD-A407952; DOT/FAA/AR-01/96; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A new methodology for determining probability of detection is described. Physical models are used heavily during the inspection process to minimize the amount of empirical data that must be gathered. This report includes a general review of various methodologies for determining probability of detection as well as a detailed discussion of the new approach that is being applied to the ultrasonic detection of internal inclusions in the rotating components of aircraft engines. Results of its application to the ultrasonic detection of flat-bottom holes and synthetic hard-alpha inclusions in laboratory measurements on flat plate samples are presented as well as a comparison to results obtained by other methodologies. This report summarizes the ongoing experiments and analysis aimed at validating the methodology of full geometry components in an industrial setting and extending its predictions to the detection of naturally occurring flaws. New tools will further reduce the need for empirical experiments through the use of physical models of microstructural effects on the ultrasonic response are included.

DTIC

Methodology; Aircraft Engines; Probability Theory; Gas Turbines; Defects

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20030001492 Research and Technology Organization, Modelling and Simulation Group, Neuilly-sur-Seine, France

Future Modelling and Simulation Challenges ***Defis Futurs pour la Modelisation et la Simulation***

Future Modeling and Simulation Challenges; November 2002; 314p; In English; In French, 12-14 Nov. 2001, Breda, Netherlands; Also announced as 20030001493 through 20030001516; CD-ROM contains full text document in PDF and PowerPoint formats

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The 3rd NATO Modelling and Simulation (M&S) Conference was organized by the NMSG and hosted by The Netherlands, at the Royal Netherlands Military Academy in Breda (12 to 14 November 2001). The specific topics were as follows: 1) Future trends and limits in M&S: Gaming Industry and NATO needs and Incorporating the human element into M&S; 2) M&S best practice and policy: Standards and architecture and Integration of M&S systems to C3I systems, Verification, Validation and Accreditation (VV&A) of M&S systems; and 3) Support to Operations, Exercising and Training: Decision Support, Campaign Planning and Mission Rehearsal.
Derived from text
Conferences; Computerized Simulation; Mathematical Models; Architecture (Computers); Artificial Intelligence; Game Theory

20030001493 Slovak Air Force Academy, Kosice, Slovakia
CAX Training and Simulation for the Slovak Armed Forces
Olejnik, Frantisek, Slovak Air Force Academy, Slovakia; Necas, Pavel, Slovak Air Force Academy, Slovakia; Betka, Frantisek, Slovak Air Force Academy, Slovakia; Future Modeling and Simulation Challenges; November 2002, pp. 1-1 - 1-6; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche
Modeling and simulation has long been utilized to improve training, develop doctrine, tactics and materials, and improve combined and joint coordination. The ability to develop a versatile CAX planning and execution procedures for Training and simulation centers equipped with standard tools has always been a challenge.
Author
Computerized Simulation; Armed Forces (Foreign); Slovakia; Education; Military Operations

20030001494 Swedish Defence Research Establishment, Dept. of Command and Control Warfare Technology, Sweden
The Modelling and Simulation Paradigm: A Swedish Perspective
Palmgren, Soeren A., Swedish Defence Research Establishment, Sweden; Roxstroem, Git, Swedish Defence Research Establishment, Sweden; Future Modeling and Simulation Challenges; November 2002, pp. 2-1 - 2-6; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche
The prevalence of Modelling and Simulation (M&S) in virtually all areas from research and development to education and training means that M&S has become a paradigm of modern science and technology. In order to respond to the general development of M&S itself as well as possible and suitable military applications in the Swedish Armed Forces, a national defence initiative was taken at the beginning of the year 2000. The various steps in this initiative will be described as well as the strategy behind the idea of establishing a self-regulated knowledge network in the area of M&S.
Author
Military Technology; Research and Development; Computerized Simulation; Sweden; Mathematical Models

20030001495 Ministry of Defense, Military Education Center, Ljubljana Slovenia
Development of the Slovenian Simulation Center
Savsek, Tomaz, Ministry of Defense, Slovenia; Future Modeling and Simulation Challenges; November 2002, pp. 3-1 - 3-6; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche
Currently Military Education Center's greatest concern is how best to improve the level of education and training in military education programs and the command and staff abilities of the Slovenian Armed Forces. There is no doubt that this can be achieved through the establishment of a simulation center, where, through battlefield simulations, a realistic training environment in the areas of tactics, operations and staff work can be created and made available to military school and command participants. In this way particular commands can test their battle plans and arrays and play out particular military scenarios on a battlefield simulator. Computer assisted staff exercises are the most up-to-date form of training. Today many armed forces use this form of training at higher levels of command training in the coordination of joint alliance command work. The development of a simulation center is clearly an important step in the direction of bringing military training and practice in the Slovenian Armed Forces up to modern standards. Locating the simulation center within the Military Education Center (MEC) infrastructure is not an accident of chance. Many simulation centers are located within the military educational infrastructure of other countries, because they stimulate both pedagogical and research work.
Author
Military Operations; Computerized Simulation; Education; Slovakia

20030001496 Ministere des Armees, Div. TSIC, Armees France

Operative Level HQ Training Tool ***L'Outil d'Entrainement d'Etats-Majors au Niveau Operatif***

Cazoulat, Christian, Ministere des Armees, France; Buenavida, Henri, Delegation Generale de l'Armement, France; Future Modeling and Simulation Challenges; November 2002, pp. 4-1 - 4-7; In French; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

According to the joint M&S policy document, France decides to focus on the setting up of a HQ training system for the operative level, interoperable with the allied systems. This system, built too for the training of the executives, should be operational in 2003. The ALLIANCE project has been developed to reach this goal and will allow to elaborate the military characteristics of the future system. Training assisted by computers allows to generate a common vision to the whole command post staff. It permits to make them interact at the right time and without risks, in order to co-ordinate the activities or to analyze the possible solutions to the current problems. The preparation of the forces to the crisis management which is the main challenge, relies on the control of the environment and then on the technical control. In order to fulfil this new type of preparation forces, the French computer assisted exercise concept is built on the STIMULATION and the SIMULATION. The operative level HQ training tool, based on this concept, must provide the capability to train the CJTF HQ and different component command (Land, Air, Maritime, Special Forces, Joint Logistic..) in real deployment conditions. Firstly, the priorities focused in the joint M&S policy document will be mentioned. Afterwards, the French simulation concept for the CJTF HQ training will be presented. Lastly, the training tool dedicated to operative level training, based on the federation of distributed simulations and on environmental tools will be introduced.

Derived from text

Computerized Simulation; Computer Techniques; Management Methods; France; Education

20030001497 Norwegian Defence Research Establishment, Kjeller, Norway

Improving Combat Dynamic Intuition: The Minimalist Approach

Bakken, Bjorn Tallak, Norwegian Defence Research Establishment, Norway; Gilljam, Martin, Norwegian Defence Research Establishment, Norway; Bakken, Bent Erik, Norwegian Defence Research Establishment, Norway; Future Modeling and Simulation Challenges; November 2002, pp. 5-1 - 5-7; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

This paper presents an approach to improve military commanders' operational training by focussing on combat dynamic intuition (CDI). CDI is the ability to intuitively comprehend what are the likely combined outcomes of the inherent dynamics governing the situation, and the decisions made to act upon the situation. In the first part of the paper we comment on current training practice (with its shortcomings), before we describe the minimalist concept for training higher-level commanders: based on simple, single-focus training models, running in compressed time on stand-alone PCs with small groups or even individuals as decision makers. In the second part of the paper we report from an experiment with minimalism in practice. Based on the experimental results, we point out directions for further research on the minimalist training concept. The experiment indicates that the "train as you fight" paradigm may need to be augmented by other paradigms as far as efficient commander training is concerned.

Author

Combat; Education; Computerized Simulation; Personnel

20030001498 Alenia Aeronautica, Lab. Sistemi e Simulazione, Turin, Italy

From Legacy Simulation to Interoperable Distributed Simulation: Alenia Aeronautics Experience

Fabbri, M., Alenia Aeronautica, Italy; Cerutti, S., Alenia Aeronautica, Italy; Future Modeling and Simulation Challenges; November 2002, pp. 6-1 - 6-9; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

In recent years, a growing need for distributed simulation systems has arisen. This has brought a great challenge to the Modelling & Simulation community, in terms of new interoperability issues and problems related to the reuse of legacy simulators. The issue is undoubtedly a very complex one, so much so that the entire HLA technology (High Level Architecture) has been developed to specifically address these problems, and meet the many challenges posed by distributed simulations. Alenia is evaluating this technology, and integrating it within their Flight Simulation department. This paper describes activities carried out at Alenia Aeronautica to demonstrate technical feasibility, as well as planned development towards a systematic use of this novel architecture. In view of growing requirements and to anticipate future demands, Alenia is also working towards the extension of their Synthetic Environment to geographically separated, external simulation facilities.

Derived from text

Flight Simulation; Interoperability; Aeronautics; Distributed Processing; Computerized Simulation

20030001499 Institute for Human Factors TNO, Soesterberg, Netherlands

Modelling Command and Control Teams

VandenBroek, J., Institute for Human Factors TNO, Netherlands; Essens, P. J. M. D., Institute for Human Factors TNO, Netherlands; Post, W. M., Institute for Human Factors TNO, Netherlands; Future Modeling and Simulation Challenges; November 2002, pp. 7-1 - 7-13; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

This paper describes a computational approach to modelling and simulating C2-team behaviour. Within this approach team models may be used to develop, test, and compare different C2-architectures, that is different structures and processes, without the need for real teams. The advantage of this method is to be able to identify the critical factors determining effective team functioning and to eliminate design inefficiencies at an early stage. Furthermore, different ”what if” questions can be put to the test. The aim of the current approach is to develop and test credible concepts of how to organize C2-teams, not to produce complete one-on-one blueprints for future C2-teams. The approach described below emphasizes the contingency relations between C2-structure and the characteristics of the mission and mission environment. Different environments require different C2-team behaviours: Therefore, flexibility, workload balancing, and team adaptation are important elements in our model. C2-teams are complex because they consist of a large number of members and difficult interaction patterns. This means that we view team performance not only as an aggregation of the individual performances but also as the quality of interaction among the team members. In this approach the interaction between team members is modelled as activation spreading through a task network. For implementing the task network, we used the IPME modelling and simulation package. The model also provides a workload-visualization tool that gives designers an overview of the functions that are being performed within the team. The overview of the workload distribution offers the designers insight in the team processes and possible bottlenecks. This insight can then be used to optimize the team architecture in an analyze-and-redesign loop. The overview is created by mapping the tasks and their workloads to a function taxonomy.

Author

Command and Control; Computerized Simulation; Teams; Mathematical Models

20030001500 Army Communications-Electronics Command, Fort Monmouth, NJ USA

SINCE a New Way of Doing Business

Klose, Dirk R., Army Communications-Electronics Command, USA; Sheth, Chandrakant, Army Communications-Electronics Command, USA; Rodriguez, Albert, Army Communications-Electronics Command, USA; Future Modeling and Simulation Challenges; November 2002, pp. 8-1 - 8-12; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

In this paper the objectives and goals of the US national portion of the joint German (GE) and US Simulation and C2 Information Systems Connectivity Experiments (SINCE) program will be described. In SINCE the US is using Modeling and Simulation (M&S) technologies as an essential part of our C2 systems and supporting capabilities research and development (R&D) process. In the US SINCE program M&S is being used to change the way the US Army defines, designs, develops, integrates, tests and evaluates new concepts, technologies and equipments for the future battlefield. M&S provides a cost-efficient means for evaluating the application of new/evolving C2 system technologies and associated operational concepts with military users in a more flexible and cost effective environment than traditional live hardware/software demonstrations. by enabling the technical and operational user communities to actively participate in the development, application and evaluation of new technologies/concepts for implementation of future C2 systems, M&S is helping accelerate the transition of these new products and systems capabilities into full-scale development programs. The U.S. Army team of technical and military subject matter experts supporting the SINCE program are composed of participants from the US Army Communication Electronics Command (CECOM), Command and Control Directorate (C2D), Fort Monmouth NJ, and the US Army TRADOC Mounted Maneuver Battle Laboratory (MMBL), Ft Knox KY and Battle Command Battle Laboratory (BCBL), Ft Leavenworth KS, and the US Multilateral Interoperability Program (MIP) and Simulation to C4I Interoperability (SIMCI) activities. This paper will describe the establishment and implementation of US simulation/stimulation capabilities for brigade and below C2 systems and associated M&S interoperability support activities being conducted to meet the requirements for planned SINCE Phases 1, 2, 3, and 4 experimentation efforts. Virtual simulation capabilities that include the integration of live hardware/software systems will be implemented to support SINCE experimentation activities. Constructive, or ”war game” simulations will be used to determine the joint combat effectiveness of Command and Control Information System (C2IS) technology and ”fill out” the battlefield during virtual-live experiments. This paper will describe how the US expects to use these tools as part of the overall C2IS engineering development process. This paper will also discuss how these SINCE experiments will be leveraging High-Level Architecture (HLA) concepts and solutions to evolve towards a collaborative C2 information systems engineering and interoperability experimentation support environment. In addition to describing US national SINCE program approach and

technical implementation strategies, this paper will also address and describe the international aspects of the joint SINCE program with the Federal Republic of Germany. One of the key objectives of the joint US/GE SINCE program is to define, implement, experiment, and demonstrate generic solutions for interfacing, networking and using emerging Brigade (BDE) and Battalion (BN) Modeling and Simulation (M&S) support capabilities and appropriate C2IS in support of future international C2 experimentation activities.
Author
Command and Control; Computerized Simulation; Computer Programs; Technology Utilization; Information Systems

20030001501 G. S. Rakovski Defence and Staff Coll., Defense Advance Research Inst., Sofia, Bulgaria
The Tendencies of Modelling and Simulation Development in the Bulgarian Army
Karakaneva, Juliana, G. S. Rakovski Defence and Staff Coll., Bulgaria; Future Modeling and Simulation Challenges; November 2002, pp. 9-1 - 9-7; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

This paper examines different aspects of the Modeling and Simulation application. The discussion about the development of this area in the Bulgarian Army is very important according to the reform and the National Program for Preparation and Accession to NATO. The future acquisition of modern defence systems is a new challenge for the Bulgarian Armed Forces. In the present context are emphasized the concepts and tendencies of the Modeling and Simulation field in the Bulgarian Army. This article is an attempt to give reasons for the necessity of Simulation Systems deployment to achieve a maximum interoperability and to prepare armed forces for participation in international joint operations and missions.
Author
Computerized Simulation; Bulgaria; Military Operations; Systems Engineering; Armed Forces (Foreign)

20030001502 Defence Research Establishment Valcartier, Val Belair, Quebec Canada
Developing Vehicle Survivability on a Virtual Battlefield
Rapanotti, John, Defence Research Establishment Valcartier, Canada; DeMontigny, Annie, Defence Research Establishment Valcartier, Canada; Cantin, Andre, Defence Research Establishment Valcartier, Canada; Palmarini, Marc, Onix Integration, Inc., Canada; Future Modeling and Simulation Challenges; November 2002, pp. 10-1 - 10-8; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

Modern anti-tank weapons and the requirement of rapid deployment have significantly reduced the use of passive armour in protecting land vehicles. This new development will eventually lead to replacing the main battle tank by a light armoured vehicle with at least the same level of survivability achievable through advances in sensor, computer and countermeasure technology to detect, identify and defeat potential threats. The integration of various technologies into a Defensive Aids Suite (DAS) can be designed and analyzed by combining field trials and laboratory data with modelling and simulation of armed forces. This complementary approach will make an optimal use of available resources and encourage collaboration with other researchers working towards a common goal. A procedure has been developed, based on ModSAF (Modular Semi-Automated Forces), to analyze the performance of the DAS equipped vehicle on a virtual battlefield. Factors that influence performance can be placed in three broad categories and include environmental factors such as terrain and atmospheric attenuation, human factors, and the nature of the technology including sensor, countermeasure and algorithm effectiveness. ModSAF is being developed to analyze field trials and plan future trials more effectively, to analyze the effectiveness of a particular component or subsystem in various fixed battles and to provide the battlefield environment for a platoon of Hardware-In-the-Loop (HIL) simulators. The analysis of a specific DAS component can be undertaken more directly than has been possible in the past. Using this approach, the component can also be modelled phenomenologically to any degree required. The use of HIL simulators is important not only for training and crew development but also in developing the man-machine interface to specific DAS configurations. ModSAF is being used meet the challenge of developing a modular DAS configurable for a wide range of missions. The acceptance of this approach will require defining and meeting the requirements of not only the scientists who develop the technology, but also the operations research community and the military. Future applications of HIL simulators with ModSAF environments will include planning and training for specific missions and operations in the urban environment. These concepts and approach will be discussed in the paper.
Author
Human Factors Engineering; Defense Program; Surface Vehicles; Technology Utilization; Military Technology; Countermeasures

20030001503 Military Academy General Mihailo Apostolski, Dept. for Control and Information Systems, Skopje, Macedonia

Modelling of Combat Actions via Fuzzy Expert System

Gacovski, Zoran M., Military Academy General Mihailo Apostolski, Macedonia; Deskovski, Stojce, Military Academy General Mihailo Apostolski, Macedonia; Future Modeling and Simulation Challenges; November 2002, pp. 11-1 - 11-16; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

In this paper we describe new approach for modelling of combat actions- via fuzzy expert system. We will comprehend two combat actions in our paper- battle dynamics between two opposite sides with Lanchester and Dinner equations. First, we will describe classical mathematical models of these combat actions. After it, we will define two expert systems containing different rule bases, which give an alternate solution for the decreasing of the number of combat units and for initial fire power. We will identify fuzzy rules for these combat actions, fuzzy variables and accompanied fuzzy sets. In the second part of the paper, we will focus on evaluation of the rules from the fuzzy knowledge bases, and obtaining of appropriate output variable possibility distribution, as well as it's defuzzified (crisp) value. We will show some simulation results obtained by Matlab's Fuzzy Toolbox, and compare them with the classical mathematical models of these two combat actions. In the last section of this paper, we give an overview of a reasoning expert system we have developed and implemented in Visual Basic. It is based on fuzzified Petri nets, with rule-based decision-making and appropriate knowledge base (KB).

Author

Combat; Expert Systems; Fuzzy Sets; Mathematical Models

20030001504 Escuela de Informatica del Ejercito, Madrid, Spain

A Tactical Planning Approach by Using Artificial Intelligence Procedures

Castillo, Jose Miguel, Escuela de Informatica del Ejercito, Spain; deArriaga, Fernando, Universidad Politecnica de Madrid, Spain; Future Modeling and Simulation Challenges; November 2002, pp. 12-1 - 12-19; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

Within the tactical maneuver it is vital that there be an Artillery support that allows the advancement of a Brigade, either in an offensive action or in a defensive one. An offensive action tries to break the enemy defensive position. The artillery preparation plan is the key to neutralizing the enemy defensive positions giving our infantry units the opportunity to accomplish their mission. A defensive action tries to obstruct the enemy's initiative. The artillery counter preparation plan is in this case the key to avoiding the enemy's action. The artillery planning begins with a list of targets, which has been acquired by the tactical acquisition echelon. The targets on the list are classified to be fired on in different phases. All of these phases are related to the different actions that our tactical units carry out and the possible enemy reactions in order to thwart our advancement, in case of an offensive manoeuvre; and vice versa in case of a defensive manoeuvre. After this classification, it is essential to distribute the scarce means of fire that a unit such as a Division or a Brigade has under its command. In this distribution it is necessary to seek a balanced solution that permits the preparation plan to be developed successfully by saving some Artillery Units that surely we must use in simultaneous and unexpected actions. A computer aided plan would support the Artillery Command Post by proposing a faster and probably better solution than the manual human calculated one. On the other hand, it will be feasible to redistribute the targets and the artillery units in little time if the action diverges from the original plan. This paper provides a solution by dividing each artillery plan into two problems: classification of targets, and distribution of targets among artillery units.

Author

Artificial Intelligence; Neural Nets; Artillery; Targets; Management Planning

20030001505 Micro Analysis and Design, Boulder, CO USA

Incorporating Aspects of Human Decision Making in Task-Network Simulation Tools

Warwick, Walter, Micro Analysis and Design, USA; Archer, Susan, Micro Analysis and Design, USA; Future Modeling and Simulation Challenges; November 2002, pp. 13-1 - 13-7; In English; Also announced as 20030001492; Original contains color illustrations

Contract(s)/Grant(s): N00014-01-C-0198; N61339-99-C-0103; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

In this paper we describe three ongoing projects intended to improve the representation of human decision-making in military simulations. Each project addresses a different aspect of decision making. The first project extends the functionality of the Improved Performance Research Integration Tool (IMPRINT) by allowing the user to create a detailed model of a goal-oriented human agent. A simulation running in IMPRINT predicts what the human is likely to do based on the currently relevant goals and the status of other parallel simulations. The focus of the second project is to predict the likelihood of a particular decision being made successfully given the quality of information available at the time the decision is made. The underlying idea is to use a

task-network model to represent who knew what and when. In our third project, we are working to represent the human decision-making process in time-pressured, stressful situations. We have turned to Klein's theory of the Recognition-Primed Decision (RPD) as a model of what people actually do in such situations. RPD theory differs from traditional, analytical theories of decision making in-sofar as the emphasis lies on situation assessment rather than the comparison of options and thus poses a novel set of computational challenges.
Author
Computerized Simulation; Decision Making; Computer Networks; Military Technology; Human Performance; Software Development Tools

20030001506 Royal Military Coll. of Science, Shrivenham, UK
A Low Cost Dismounted Infantry Trainer Derived from Gaming Technology
Wright, David N., Royal Military Coll. of Science, UK; Future Modeling and Simulation Challenges; November 2002, pp. 14-1 - 14-9; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

This report gives the reader with an insight into the potential of state-of-the-art computer games and how they might be employed for certain aspects of dismounted infantry training. A description of an example system, its configuration and execution for training purposes and the modifications which can be made to meet individual user requirements are all discussed below. It is not the intention of the author to define the limits of the system but simply to illustrate what uses might be made of it in order to stimulate ideas and discussion within the modelling & simulation community.
Author
Low Cost; Training Devices; Technology Utilization; Games

20030001507 Mathematiques Appliquees S.A. Group, Paris, France
An Integrated Platform for Military Simulation Based on the DirectIA Kernel: Tactical Exercise Reconstruction Results
Une Plate-Forme Integree Autour du Noyau DirectIA Pour la Simulation Militaire: Resultats d'une Etude Reproduisant un Exercice Tactique
Chiva, Emmanuel, Mathematiques Appliquees S.A. Group, France; Donnart, Jean-Yves, Mathematiques Appliquees S.A. Group, France; Future Modeling and Simulation Challenges; November 2002, pp. 15-1 - 15-21; In French; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

Over the past years, simulation has become a tool of primary importance for defense, for the teaching and training of troops as well as for the engineering and development of the doctrine for use, planning or acquisition. Simulation applications are faced with a number of technological challenges, including the modeling of human ehavior, which is indispensable for making automated simulation. In fact, currently the tactical environment (allied, neutral or enemy forces) of a modeled system is simplistically represented and often generated by an operator. This can be very time-consuming when the simulation scenario is complex, as in the case of staff training. Thus, certain NATO exercises can take hundreds of people to provide the necessary tactical environment.
CASI
Computerized Simulation; Military Technology; Systems Integration; Automatic Control

20030001508 Office of the Deputy Under Secretary of the Army for Operations Research, Modeling and Simulation and Light Force Studies, Washington, DC USA
SIMTECH 2007 ... and Beyond
McGlynn, Lana, Office of the Deputy Under Secretary of the Army for Operations Research, USA; Starr, Stuart H., Mitre Corp., USA; Future Modeling and Simulation Challenges; November 2002, pp. 16-1 - 16-9; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

During the course of over a decade, the Military Operations Research Society (MORS) has sponsored a sequence of workshops on the subject of simulation technology. The broad objectives of these workshops were to identify and prioritize the needs of the users of military modeling and simulation (M&S), assess the probable evolution of M&S technology, and to identify potential user shortfalls and opportunities to ameliorate them. This paper summarizes the major findings and recommendations of the last of these workshops, Simulation Technology (SIMTECH) 2007. It focuses on the M&S needs for three major user groups: analysts, acquirers of systems, and educators and trainers. For each of these user groups, a vision is articulated and

recommendations are posed to realize those visions. The paper concludes with a brief look at promising new M&S initiatives in each of these functional areas as well as major residual issues that confront the M&S community.
Author
Military Operations; Operations Research; Systems Simulation; Technology Utilization; Mathematical Models

20030001509 Military Univ. of Technology, Faculty of Cybernetics, Warsaw, Poland
The Method of Construction and Learning of Local Combat Generator
Najgebauer, Andrzej, Military Univ. of Technology, Poland; Nowicki, Tadeusz, Military Univ. of Technology, Poland; Rulka, Jaroslaw, Military Univ. of Technology, Poland; Future Modeling and Simulation Challenges; November 2002, pp. 17-1 - 17-9; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

A new approach to military conflict modeling and analysis is presented. The combat models for local clashes are implemented in a simulation language in the application. The construction process of local combat generator is presented. Main components of the tool are described and the process of input and output identification is considered. The mathematical model of the combat generator there is a multidimensional table. The procedure of fulfilling the table there is the learning process based on the set of simulation experiments. Another procedure there is utilization of knowledge consisted in the table. Possible directions of the development and utilization of the local combat generator are discussed.
Author
Combat; Mathematical Models; Military Technology; Computerized Simulation; Training Devices

20030001510 NASA Ames Research Center, Moffett Field, CA USA
Multiagent Work Practice Simulation: Progress and Challenges
Clancey, William J., NASA Ames Research Center, USA; Sierhuis, Maarten, Research Inst. for Advanced Computer Science, USA; Future Modeling and Simulation Challenges; November 2002, pp. 18-1 - 18-16; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

Modeling and simulating complex human-system interactions requires going beyond formal procedures and information flows to analyze how people interact with each other. Such work practices include conversations, modes of communication, informal assistance, impromptu meetings, workarounds, and so on. To make these social processes visible, we have developed a multiagent simulation tool, called Brahms, for modeling the activities of people belonging to multiple groups, situated in a physical environment (geographic regions, buildings, transport vehicles, etc.) consisting of tools, documents, and computer systems. We are finding many useful applications of Brahms for system requirements analysis, instruction, implementing software agents, and as a workbench for relating cognitive and social theories of human behavior. Many challenges remain for representing work practices, including modeling: memory over multiple days, scheduled activities combining physical objects, groups, and locations on a timeline (such as a Space Shuttle mission), habitat vehicles with trajectories (such as the Shuttle), agent movement in 3d space (e.g., inside the International Space Station), agent posture and line of sight, coupled movements (such as carrying objects), and learning (mimicry, forming habits, detecting repetition, etc.).
Author
Mathematical Models; Computerized Simulation; Complex Systems; Systems Engineering; Human Factors Engineering

20030001511 QinetiQ Ltd., Aircraft Test and Evaluation, Boscombe Down UK
Ten Commandments for Modelling and Simulation Fitness for Purpose
Maguire, Richard, QinetiQ Ltd., UK; Future Modeling and Simulation Challenges; November 2002, pp. 19-1 - 19-9; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

Decision makers need confidence that models and simulations are fit to support their decision making process, such that their decisions are useful to their specific project or program. Current validation & verification (V&V) methods seldom give an inclusive and widely understood 'happy' feeling about the credibility of a model, simulation or constituent component. Discussions between collaborating partners concerning what exactly is the measure of 'realism', credibility and 'fitness for purpose' whilst discussing the coverage of V&V evidence can be very distracting and ultimately use up expensive program time. This paper seeks to identify the Top Ten reasons why models and simulations are or become unfit for purpose, from some original research. Further, to invert the negative logic of 'unfitness' to derive "Ten Commandments for Modelling and Simulation". This

could ultimately lead to more credible models being more fit for purpose, which would benefit all stakeholders as well as reducing the need to repeat validation and verification exercises.
Author
Decision Making; Computerized Simulation; Methodology; Mathematical Models

20030001512 Turkish Navy, Scientific Decision Support Center, Ankara Turkey
A Methodology for Verification and Validation of Models and Simulations: Acquirers' View Point
Molyer, Orhun O., Turkish Navy, Turkey; Future Modeling and Simulation Challenges; November 2002, pp. 20-1 - 20-8; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

The most challenging and common problem of the acquirers of the M&S is the assessment of the acceptability of an intermediate/end product of a model/simulation development. The objectives of this paper are to propose a methodology to be followed by the acquirer for verification and validation of the intermediate/end products to be developed, and to present the observations obtained from the experimentation on this proposed methodology. The acquirers who lack of knowledge about the verification and validation, specifically, of the models and simulations are the targeted audience of this paper. The proposed methodology is a road map for the driver who drives his/her car on the modeling and simulation roads. This road map may only help the drivers to find an appropriate direction to his/her destination. The driving conventions are left to the driver himself /herself.
Author
Methodology; Mathematical Models; Computerized Simulation; Project Planning

20030001513 National Aerospace Lab., Information and Communications Technology Div., Amsterdam, Netherlands
Challenges for Distributed Exercise Management: The SmartFED Approach
Keuning, M. F. R., National Aerospace Lab., Netherlands; vandeSluis, E., National Aerospace Lab., Netherlands; tenDam, A. A., National Aerospace Lab., Netherlands; Future Modeling and Simulation Challenges; November 2002, pp. 21-1 - 21-11; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

Distributed simulation requires a novel approach to exercise management and Verification, Validation and Accreditation (VV&A). With the introduction of (geographically) distributed simulations, exercise management consists of managing a multitude of simulators in a common scenario. This imposes new challenges with respect to managing the distributed responsibilities of the simulation. As with exercise management, distributed simulations impose new challenges on VV&A with respect to distributed responsibilities. NLR's exercise management tool SmartFED (Scenario Manager for Real-Time Federation Directing) is designed to meet these new challenges. This paper provides insight into SmartFED's concepts and practical experiences in the field of distributed real-time (training) simulations.
Author
Computerized Simulation; Real Time Operation; Training Simulators; Distributed Processing; Object-Oriented Programming

20030001514 Competence Center Informatik G.mb.H., Meppen, Germany
Areas of Simulation Standards
Neugbauer, E., Competence Center Informatik G.mb.H., Germany; Steinkamp, D., Competence Center Informatik G.mb.H., Germany; Future Modeling and Simulation Challenges; November 2002, pp. 22-1 - 22-20; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

This report is the result of an exploratory study for the identification of a NATO Technical Activity Program (TAP) on M&S standards and was performed in the context of the NATO Modelling and Simulation Group 13 (MSG-013). The aim of this report is to define areas where standards for M&S are required, to compare the situation with the currently available standards, and to draw some appropriate conclusions. In Chapter 1, we give a short introduction into this work. In Chapter 2, we describe areas, where standards for M&S are required and why these standards are required, taking the virtual system lifecycle as a guiding principle. In Chapter 3, an overview is given on already existing standards in the area of M&S, the extent they possibly could be used and their deficiencies. In Chapter 4, we present some ideas how to adapt existing standards and will give general descriptions of standards which still have to be developed. In Chapter 5, we discuss the feasibility of missing standards, especially organizational implications and costs-aspects.
Author
Computerized Simulation; Program Verification (Computers); Systems Engineering; Standards; Architecture (Computers); Mathematical Models

20030001515 European Aeronautic Defence and Space Co. Launch Vehicles, Les Mureaux, France

Generic Toolbox for Interoperable Systems: GTI6 ***Environnement Modulaire Pour l'Interoperabilite des Systemes: GT16***

Saillour, Vincent, European Aeronautic Defence and Space Co. Launch Vehicles, France; Claude, Daniel, European Aeronautic Defence and Space Co. Launch Vehicles, France; Future Modeling and Simulation Challenges; November 2002, pp. 23-1 - 23-13; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A03, Hardcopy; A03, Microfiche

GTI6 has been developed by EADS LAUNCH VEHICLES as an effective environment to support largescale applications of Distributed Interactive Simulations as well as Collaborative Engineering platforms. Different teams can in such a way interact each other from their own location, simultaneously accessing and operating on remote applications, global data repositories or archives. These teams can also interconnect their Simulation Facilities together and make them interoperable in real-time and in closeloop in spite of the network distance. They can as well collectively create, manipulate and review documents, project data and simulation objects with the support of a concurrent multipoint groupware and work sharing system. This is a common need in the current frame of closer and closer collaborations among the world-wide industries. GTI6 has been developed, tested and qualified in the Space industry and is now ready to improve the competitiveness of other sectors by sharing the benefits of 'distributed and interoperable systems' concept, for example with the following domains: distributed engineering of complex and innovative concepts (trains, planes, cars), distributed training in transportation industry, telemedicine or teleoperations in hazardous situations.

Derived from text

Distributed Interactive Simulation; Interoperability; Computer Systems Simulation; Systems Engineering; Launch Vehicles; Computer Networks

20030001516 Mitre Corp., Intelligent Information Management and Exploitation, McLean, VA USA

The Agent Based Simulation Opportunity

Barry, Philip, Mitre Corp., USA; Future Modeling and Simulation Challenges; November 2002, pp. 24-1 - 24-8; In English; Also announced as 20030001492; Original contains color illustrations; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A03, Microfiche

Agent based approaches offer a tremendous opportunity to drastically enhance our ability to everything simulate everything from human behaviour to large complex computer networks. This paper examines this recent simulation paradigm and looks at how it can be applied to current military modeling and simulation (M&S) challenges. First, a foundation discussion is provided that examines the meaning of agent based simulation. Next, the paper looks at a representative sample of research of agent based simulations. The paper then concludes with a current opportunity for using agent based approaches in the verification and validation of simulations.

Author

Computerized Simulation; Computer Networks; Software Engineering; Mathematical Models; Military Technology; Artificial Intelligence

20030001579 Naval Postgraduate School, Monterey, CA USA

A Social Network Analysis of the National Materials Competency at Naval Air Systems Command

Moore, Dale L.; Sep. 2002; 197p; In English; Original contains color images

Report No.(s): AD-A407878; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This thesis presents a social network analysis for the Naval Air Systems Command National Materials Competency. This geographically dispersed organization is responsible for conducting full-spectrum materials science and engineering across the full lifecycle of NAVAIR weapons systems. A Social Network Analysis (SNA) software tool was used to identify and diagnose the flow of knowledge and expertise across the enterprise. The SNA analysis is particularly important for the National Materials Competency because of a pressing need to provide advanced materials technologies and critical safety-related engineering solutions to the warfighter. For this research, the leaders of the National Materials Competency provided input regarding work interactions, communications and knowledge flows. The SNA software generated graphic visualizations that were used to analyze existing flow patterns. Analysis of the visualizations led to the identification of network topologies, structural holes, one- and two-way communication flows, and levels of cohesion within groups and sites. Based on the findings, recommendations for improved organizational performance include enhancements to network connectivity and cohesion, social capital, organizational processes and policies, information technology and knowledge management.

DTIC

Information Systems; Network Analysis; Navy; Software Engineering; Knowledge Based Systems

20030001797 Universitaet der Bundeswehr, Fachbereich Maschinenbau, Hamburg Germany
Synthese von Geradfuehringen mit ebenen Viergelenkgetrieben (Synthesis of Crosshead Guides with Even Four-Bar Mechanisms)
Gassmann, Volker; Jan. 2000; 112p; In German
Report No.(s): AD-A407854; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The study treats the historical development of the synthesis process, then ultimately produces suggestions as to which characteristic values are the most significant for which tasks, and what sort of secondary sources would be relevant thereto. Due to the preponderance of synthesis methods, the author concludes that no one core principle can be pedestaled. The results from the study broach in particular the selection of Chebyshev crosshead guides and the crosshead guides with unending adjacent points and yielding of frame positions. The most important outcome is nevertheless the demonstration of the existence of Chebyshev crosshead guides with unsymmetrical coupler curves.
DTIC
Synthesis; Chebyshev Approximation; Couplers

20030001967 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Illuminating the Fundamental Contributors to Software Architecture Quality
Bachmann, Felix; Bass, Len; Klein, Mark; Aug. 2002; 77p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A407778; CNU/SEI-2002-TR-025; ESC-TR-2002-025; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
An architectural tactic is a design decision that helps achieve a specific quality-attribute response. Such a tactic must be motivated by a quality-attribute analysis model. This report presents the basic concepts of analysis models for two quality attributes-modifiability and performance, identifies a collection of tactics that can be used to control responses within those models, and discusses how to analyze the models in terms of these tactics. This report also describes how to interpret architectural designs in terms of analysis models and how to apply those models to specific architectures. In addition, it presents the analysis of several different architectural patterns taken from current literature.
DTIC
Quality Control; Systems Analysis; Computer Programs

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THEORETICAL MATHEMATICS

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

20030000725 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Lectures on Open Strings, and Noncommutative Gauge Theories
Nekrasov, N. A.; Mar. 2002; 18p
Report No.(s): PB2003-100599; IHES/P/02/14; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The background independent formulation of the gauge theories on D-branes in flat space-time is considered, some examples of the solutions of their equations of motion are presented, the solutions of Dirac equation in these backgrounds are analyzed, and the generalizations to the curved spaces, like orbifolds, conifolds, and K3 surfaces, are discussed.
NTIS
Gauge Theory; String Theory; Relativity; Equations of Motion

20030001966 Nebraska Univ., Dept. of Mathematics and Statistics, Lincoln, NE USA
A Second-Order Self-Adjoint Dynamic Equation on a Time Scale
Messer, Kirsten R.; Jul. 03, 2002; 11p; In English
Report No.(s): AD-A407858; CI02-523; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In this paper we are concerned with the second-order self-adjoint dynamic equation P(T)X (SUP TRIANGLE UP)(T) (sup triangle down) + q(t)x(t) = 0 on a time scale. Little work has been done on this equation, which combines both the delta and nabla derivatives. Here, we establish some preliminary results, including an analogue of the Lagrange Identity. We then explore zeros of solutions and disconjugacy.
DTIC
Differential Equations; Conjugates; Time

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.

20030000448 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
High Current Experiment: First Results
Seidl, P.; Jun. 11, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799645; No Copyright; Avail: National Technical Information Service (NTIS)
The High Current Experiment (HCX) is being assembled at Lawrence Berkeley National Laboratory as part of the US program to explore heavy-ion beam transport at a scale representative of the low-energy end of an induction linac driver for fusion energy production. The primary mission of this experiment is to investigate aperture fill factors acceptable for the transport of space-charge dominated heavy-ion beams at high spacecharge intensity over long pulse durations. This machine will test transport issues at a driver-relevant scale resulting from nonlinear space-charge effects and collective modes, beam centroid alignment and beam steering, matching, image charges, halo, lost-particle induced electron effects, and longitudinal bunch control.
NTIS
Heavy Ions; Electron Bunching; High Current; Beam Steering

20030000496 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Deconstruction of Time
Berezhiani, Z.; Gorsky, A.; Kogan, I. I.; Mar. 2002; 12p; In English
Report No.(s): PB2003-100597; IHES/P/02/12; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
In this note we discuss the possibility to get a time rather than space in the scenario of (de)construction of new dimension.
NTIS
Dimensions; Construction

20030000648 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
N-Commutators on Vector Fields
Dzhumadil-daev, A. S.; Mar. 2002; 50p
Report No.(s): PB2003-100601; IHES/M/02/11; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
No abstract available.
NTIS
Commutators; Vectors (Mathematics); Polynomials; Quadratic Equations

20030000649 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France
Milne Universe, Tachyons, and Quantum Group
Nekrasov, N. A.; Mar. 2002; 20p
Report No.(s): PB2003-100598; IHES/P/02/13; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
We analyze the spectrum of the bosonic and superstring on the orbifold of the space-time by a boost, leading to the cosmological singularity. We show that the modular invariance leads to the spectrum where the twisted sector tachyon, together with all other twisted sector fields, present in the Euclidean version of the orbifold, is absent. This makes impossible to resolve the singularity by a marginal deformation of the worldsheet CFT. We also establish a relation between the resolution of rotational orbifolds in Euclidean and Larentzian setups, and quantum groups. The analysis confirms the impossibility of resolving the cosmological orbifold singularity.
NTIS
Cosmology; String Theory; Tachyons; Milne Method; Quantum Mechanics; Spectra

20030000848 NASA Langley Research Center, Hampton, VA USA
Geometric, Kinematic and Radiometric Aspects of Image-Based Measurements
Liu, Tianshu, NASA Langley Research Center, USA; [2002]; 30p; In English; 22nd AIAA Aerodynamics Measurement Technology and Ground Testing Conference, 24-26 Jun. 2002, Saint Louis, MO, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2002-3239; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

This paper discusses theoretical foundations of quantitative image-based measurements for extracting and reconstructing geometric, kinematic and dynamic properties of observed objects. New results are obtained by using a combination of methods in perspective geometry, differential geometry. radiometry, kinematics and dynamics. Specific topics include perspective projection transformation. perspective developable conical surface, perspective projection under surface constraint, perspective invariants, the point correspondence problem. motion fields of curves and surfaces. and motion equations of image intensity. The methods given in this paper arc useful for determining morphology and motion fields of deformable bodies such as elastic bodies. viscoelastic mediums and fluids.

Author

Kinematics; Differential Geometry; Imaging Techniques; Projection; Equations of Motion; Image Analysis

20030001768 Argonne National Lab., IL USA

Superconducting Solenoid and Press for Permanent Magnet Fabrication

Mulcahy, T. M.; Hull, J. R.; Aug. 2002; 8p; In English

Report No.(s): DE2002-799824; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

For the first time, a superconducting solenoid (SCM) was used to increase the remnant magnetization of sintered NdFeB permanent magnets (PMs). In particular, improved magnetic alignment of commercial-grade PM powder was achieved, as it was axial die pressed into 12.7-mm diameter cylindrical compacts in the 76.2-mm warm bore of a 9-T SCM. The press used to compact the powder is unique and was specifically designed for use with the SCM. Although the press was operated in the batch mode for this proof of concept study, its design is intended to enable automated production. In operation, a simple die and punch set made of nonmagnetic materials was filled with powder and loaded into a nonmagnetic press tube. The cantilevered press tube was inserted horizontally, on a carrier manually advanced along a track, into the SCM. The robustness of the mechanical components and the SCM, in its liquid helium dewar, were specifically designed to allow for insertion and extraction of the magnetic powder and compacts, while operating at 9 T.

NTIS

Fabrication; Magnetization; Permanent Magnets; Solenoids; Superconductivity

20030001782 Stanford Linear Accelerator Center, USA

Adjustable Permanent Quadrupoles Using Rotating Magnet Material Rods for the Next Linear Collider

DiMarco, J.; Foster, G. W.; Fowler, W.; Kashikhin, V. S.; Makarov, A.; Aug. 2002; 8p; In English

Report No.(s): DE2002-799917; SLAC-PUB-8991; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper reports on two styles of permanent magnet adjustable quadrupoles for the next linear collider (NLC). of the two types the wedge tuner is closest to meeting all the requirements for NLC. The strength of the gradient and higher harmonics are within specifications. Further work on balancing the strength of the tuning rods is required to meet the specification of a center shift of 1 micrometer. The effects of radiation exposure to the particular material used in the magnets needs to be understood. With the proper selection of material and shielding permanent magnet quadrupoles should be viable for the life of the NLC.

NTIS

Permanent Magnets; Quadrupoles; Rotation; Accelerators; Linearity

20030001830 Technische Univ., Delft, Netherlands

Drift Compression and Final Focus Systems for Heavy Ion Inertial Fusion

de Hoon, M. J. L.; Littlejohn, R. G.; Wurtele, J. S.; Peterson, P. F.; Apr. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-802044; No Copyright; Avail: National Technical Information Service (NTIS)

Longitudinal compression of space-charge dominated beams can be achieved by imposing a head-to-tail velocity tilt on the beam. This tilt has to be carefully tailored, such that it is removed by the longitudinal space-charge repulsion by the time the beam reaches the end of the drift compression section. The transverse focusing lattice should be designed such that all parts of the beam stay approximately matched, while the beam smoothly expands transversely to the larger beam radius needed in the final focus system following drift compression. In this thesis, several drift compression systems were designed within these constraints, based on a given desired pulse shape at the end of drift compression. The occurrence of mismatches due to a rapidly increasing current was analyzed.

NTIS

Heavy Ions; Focusing; Beams (Radiation)

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.

20030000623 National Inst. of Standards and Technology, Boulder, CO USA
Representation of Acoustic Waves in Unbounded Domains
Alpert, B. K.; Chen, Y.; Oct. 2002; 26p; In English
Report No.(s): PB2003-100878; NISTIR-6623; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Compact, time-harmonic, acoustic sources produce waves that decay too slowly to be square-integrable on a line away from the sources. We introduce an inner product, arising directly from Green's second theorem, to form a Hilbert space of these waves, and present examples of its computation.
NTIS
Sound Generators; Sound Waves; Acoustics; Electromagnetic Radiation

20030000702 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia
Theory Pertaining to Comparison and Calibration in an Experiment to Measure Acoustic Reflection Coefficients
Blair, David G.; Mar. 2002; 96p; In English
Report No.(s): AD-A407517; DSTO-TN-0417; DODA-AR-012-280; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

For the purpose of analyzing data to determine underwater acoustic reflection coefficients at low megahertz frequencies, relevant theory is developed. For a target that may be in the near field, the three-dimensional point spread function for image points close to the target, is derived for rather general arrays and waveforms. The model of the active system is extended to allow a coded signal, a spherical transmitter, and a transmitter not in the receiver array plane. Here and elsewhere, conditions of validity are carefully obtained. Conditions are derived under which a ball target (used for calibration in the experiment) behaves as a point reflector. The image of a rectangular target, described by an angle-dependent reflection coefficient, is obtained. The preceding results lead to an integral relationship,' or energy conservation' relationship, proved for a point target and conjectured to hold generally. It is shown how this result would enable one to analyze the experiment to determine absolute reflection coefficients.
DTIC
Acoustic Resonance; Calibrating; Experimentation

20030000724 NASA Langley Research Center, Hampton, VA USA
Ultrasonic Measurement of Aircraft Strut Hydraulic Fluid Level
Allison, Sidney G., NASA Langley Research Center, USA; [2002]; 11p; In English; 2002 SAE World Aviation Congress and Display, 5-7 Nov. 2002, Phoenix, AZ, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Original contains color illustrations
Report No.(s): SAE-02WAC-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An ultrasonic method is presented for non-intrusively measuring hydraulic fluid level in aircraft struts in the field quickly and easily without modifying the strut or aircraft. The technique interrogates the strut with ultrasonic waves generated and received by a removable ultrasonic transducer hand-held on the outside of the strut in a fashion that is in the presence or absence of hydraulic fluid inside the strut. This technique was successfully demonstrated on an A-6 aircraft strut on the carriage at the Aircraft Landing Dynamics Research Facility at NASA Langley Research Center. Conventional practice upon detection of strut problem symptoms is to remove aircraft from service for extensive maintenance to determine fluid level. No practical technique like the method presented herein for locating strut hydraulic fluid level is currently known to be used.
Author
Ultrasonic Radiation; Nondestructive Tests; Hydraulic Fluids; Struts; Aircraft Maintenance

20030000828 NASA Langley Research Center, Hampton, VA USA
A Method for Optimizing Non-Axisymmetric Liners for Multimodal Sound Sources
Watson, W. R., NASA Langley Research Center, USA; Jones, M. G., NASA Langley Research Center, USA; Parrott, T. L., NASA Langley Research Center, USA; Sobieski, J., 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 2002-2516; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Central processor unit times and memory requirements for a commonly used solver are compared to that of a state-of-the-art, parallel, sparse solver. The sparse solver is then used in conjunction with three constrained optimization methodologies to assess the relative merits of non-axisymmetric versus axisymmetric liner concepts for improving liner acoustic suppression. This assessment is performed with a multimodal noise source (with equal mode amplitudes and phases) in a finite-length rectangular duct without flow. The sparse solver is found to reduce memory requirements by a factor of five and central processing time by a factor of eleven when compared with the commonly used solver. Results show that the optimum impedance of the uniform liner is dominated by the least attenuated mode, whose attenuation is maximized by the Cremer optimum impedance. An optimized, four-segmented liner with impedance segments in a checkerboard arrangement is found to be inferior to an optimized spanwise segmented liner. This optimized spanwise segmented liner is shown to attenuate substantially more sound than the optimized uniform liner and tends to be more effective at the higher frequencies. The most important result of this study is the discovery that when optimized, a spanwise segmented liner with two segments gives attenuations equal to or substantially greater than an optimized axially segmented liner with the same number of segments.
Author
Design Optimization; Amplitude Modulation; Acoustic Ducts; Aircraft Engines; Acoustic Properties; Problem Solving; Linings; Numerical Analysis

20030000834 NASA Langley Research Center, Hampton, VA USA
Measurement of Trailing Edge Noise Using Directional Array and Coherent Output Power Methods
Hutcheson, Florence V., NASA Langley Research Center, USA; Brooks, Thomas F., NASA Langley Research Center, USA; [2002]; 18p; 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 2002-2472; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

The use of a directional (or phased) array of microphones for the measurement of trailing edge (TE) noise is described and tested. The capabilities of this method arc evaluated via measurements of TE noise from a NACA 63-215 airfoil model and from a cylindrical rod. This TE noise measurement approach is compared to one that is based on thc cross spectral analysis of output signals from a pair of microphones placed on opposite sides of an airframe model (COP method). Advantages and limitations of both methods arc examined. It is shown that the microphone array can accurately measures TE noise and captures its two-dimensional characteristic over a large frequency range for any TE configuration as long as noise contamination from extraneous sources is within bounds. The COP method is shown to also accurately measure TE noise but over a more limited frequency range that narrows for increased TE thickness. Finally, the applicability and generality of an airfoil self-noise prediction method was evaluated via comparison to the experimental data obtained using the COP and array measurement methods. The predicted and experimental results are shown to agree over large frequency ranges.
Author
Microphones; Noise Measurement; Aircraft Noise; Wind Tunnel Models; Wind Tunnel Tests; Frequency Ranges; Prediction Analysis Techniques; Noise Prediction (Aircraft)

20030001005 NASA Langley Research Center, Hampton, VA USA
Broadband Noise Predictions Based on a New Aeroacoustic Formulation
Casper, J., NASA Langley Research Center, USA; Farassat, F., NASA Langley Research Center, USA; [2002]; 12p; 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 2002-0802; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

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 specified analytically from a result that is 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 turbulence. The results are compared with experimental data previously reported by Paterson and Amiet. Good agreement between predictions and measurements is

obtained. The predicted results also agree very well with those of Paterson and Amiet, who used a frequency-domain approach. Finally, an alternative form of Formulation 1B is described for statistical analysis of broadband noise.
Author
Broadband; Noise Prediction; Aeroacoustics; Thin Airfoils; Pressure Distribution; Time Domain Analysis

20030001578 Naval Research Lab., Washington, DC USA
Broadband Models for Predicting Bistatic Bottom, Surface, and Volume Scattering Strengths
Gauss, Roger C.; Gragg, Robert F.; Wurmser, Daniel; Fialkowski, Joseph M.; Nero, Redwood W.; Sep. 30, 2002; 51p; In English; Original contains color images
Report No.(s): AD-A407887; NRL/FR/7100--02-10; 042; No Copyright; Avail: Defense Technical Information Center (DTIC)
Multistatic active system performance can be driven by reverberation from the ocean boundaries and biologics. Providing accurate sonar performance predictions of reverberation, in turn, relies on providing accurate estimates of bistatic scattering strengths. This report presents new three-dimensional models that provide physics-based estimates of the dependence of scattering strength on the incident and scattered grazing angles, the bistatic angle, the acoustic frequency (10 to 10000 Hz), and physical descriptors of the environment (such as bottom properties for the bottom model, wind speed for the surface model, and fish properties for the volume model). The bottom model describes scattering from rough, elastic interfaces while the surface model describes scattering from both the rough air-sea interface and subsurface bubbles. The volume models describe scattering from dispersed bladdered fish, including boundary-interference effects. For all, parameter studies along with data-model comparisons demonstrate the importance of using physics-based scattering models to describe the complex acoustic interaction processes at the active performance/reverberation models (such as the Comprehensive Acoustic System Simulation (CASS) or the Bistatic Range-dependent Active System Performance (BiRASP) models) and inverse algorithms (such as environmentally adaptive techniques).
DTIC
Broadband; Mathematical Models; Oceans; Acoustic Scattering; Underwater Acoustics

20030001873 Alpha STAR Corp., Long Beach, CA USA
Durability and Fatigue of Composite Structures in Acoustic Environment
Li, Qiu-Zhan, Alpha STAR Corp., USA; Minnetyan, Levon, Clarkson Univ., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 539-554; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche
Engine structures are designed to function in acoustic fatigue environments where excitation levels can only be defined non-deterministically. Power Spectral Density (PSD) is used to describe the frequency contents and intensities of random vibrations. Random excitations can be applied in the form of accelerations, pressures or forces. Degradation of a structure is usually represented by reduction of the natural frequency during the application of PSD loading. A computational tool is developed to simulate the degradation response of composite structures under a PSD type fatigue loading condition. Quantitative predictions of damage initiation, damage progression and propagation to fracture are monitored. Iteration of the program is based on a step-by-step update of time during damage progression under PSD loading. For each equilibrium point natural frequencies of the structure are computed. The degradation of frequency response is determined with the increment of time steps. The Excitation level-Time relationship is predicted from the output of several simulations at different PSD levels. An adhesively bonded PMC test coupon is simulated on a dynamic shaker by imposing the PSD of base accelerations. Failure mechanisms and their locations are identified.
Author
Composite Structures; Acoustic Fatigue; Resonant Frequencies; Vibration Simulators; Computerized Simulation; Loads (Forces); Fatigue Life; Performance Prediction; Probability Theory

20030001961 Naval Postgraduate School, Monterey, CA USA
The Modeling of Bistatic Scattering with Moving Platforms
Ziomek, Lawrence J.; Oct. 16, 2002; 73p; In English
Report No.(s): AD-A407947; NPS-EC-03-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The complex frequency response of the ocean is derived for three different bistatic scattering problems. The derivations are based on treating the speed of sound and ambient density of the ocean as constants, and solving for the direct ray path between transmitter and discrete point scatterer, and from discrete point scatterer to receiver. The bistatic scattering problems considered are: 1) no motion, 2) only the discrete point scatterer is in motion, and 3) all three platforms (the transmitter, discrete point scatterer, and receiver) are in motion. The first bistatic scattering problem yields a time-invariant, space-variant complex frequency

response while the remaining two bistatic scattering problems yield time-variant, space-variant complex frequency responses. For problems involving motion, the exact time-varying ranges between the transmitter and discrete point scatterer, and between the discrete point scatterer and receiver are derived, and the exact time-varying angles of incidence at the discrete point scatterer, and the exact time-varying angles of scatter at the receiver are also derived. The solutions for the exact time-varying ranges are also valid in an inhomogeneous ocean where the speed of sound and ambient density are functions of position since solving for a range represents a problem in mechanics not wave propagation.
DTIC
Scattering; Acoustic Velocity

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.

20030000505 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of Time-Dependent CP Asymmetries and the CP-odd Fraction in the Decay B(sup o) Yields D*+D*-: The BABAR Collaboration
Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799951; SLAC-PUB-9299; No Copyright; Avail: National Technical Information Service (NTIS)
We present a measurement of time-dependent CP asymmetries and an updated determination of the CP-odd fraction in the decay B0 -->D(asterick)+D(asterick). The measurements are derived from a data sample of 88 X 10(sup 6) BB pairs collected by the BABAR detector at the PEP-II energy asymmetric B Factory at SLAC. All results are preliminary.
NTIS
Asymmetry; Time Dependence; Cp Violation; Standard Model (Particle Physics)

20030000633 Stanford Linear Accelerator Center, Stanford, CA USA
Measurement of the First Hadronic Spectral Moment from Semileptonic B Decays
Jul. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799964; SLAC-PUB-9314; No Copyright; Avail: National Technical Information Service (NTIS)
A preliminary determination of the first moment of the hadronic mass distribution (M (sup2)(sub x)-overlined m (sup 2)(sub D)) in semileptonic B decays has been obtained as a function of the minimum lepton momentum, ranging from 0.9 to 1.6 GeV/c. The measurement is based on a new technique involving B overlined B events in which one fully reconstructed B meson decays hadronically and the recoiling B decays semileptonically. The mass of the hadrons in the semileptonic decay is determined from a kinematic fit to the whole event. For different minimum lepton momenta, the mass distribution is decomposed into contributions from various charm resonant states and a non-resonant contribution, allowing for the determination of the first moment. From these moments the Heavy Quark Effective Theory (HQET) parameters lambda(sub 1) and overlined upside down V can be derived. For lepton momenta in the B rest frame above 1.5GeV/c, we find a first moment that is compatible with existing measurements. However, if we extend the measurement to lower values of lepton momenta, the data can only be described by Operator Product Expansion calculations if we use significantly di.erent values for overlined upside down V and lambda (sub 1) than obtained from earlier measurements based on lepton momentum spectra and the photon spectrum in b right arrow sgamma transitions.
NTIS
Hadrons; Leptons; Particle Decay; Particle Accelerators

20030000634 Stanford Linear Accelerator Center, Stanford, CA USA
Search for Decays of B(o) Mesons into Pairs of Leptons: 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): DE2002-799963; SLAC-PUB-9313; No Copyright; Avail: National Technical Information Service (NTIS)
We present a search for the decays B(sup 0) right arrow e(sup +)e(sup -), B(sup o) right arrow micro(sup +)micro(sup -), and B(sup o) right arrow e(sup + or -) micro(sup + or -) in data collected at the gamma(4S) with the BABAR detector at the SLAC

B Factory. Using a data set of 54.4 fb to the minus one power, we find no evidence for a signal and set the following preliminary upper limits at the 90% confidence level.
NTIS
Mesons; Pair Production; Particle Decay; Leptons

20030000635 Stanford Linear Accelerator Center, Stanford, CA USA
Simultaneous Measurement of the B(sup 0) Meson Lifetime and Mixing Frequency with B(sup 0) Yields D(*)-l+nu(sub l) Decays: The BABAR Collaboration
Jul. 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): DE2002-799958; SLAC-PUB-9307; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Frequencies; Mesons; Particle Decay; Standard Model (Particle Physics)

20030000636 Stanford Linear Accelerator Center, Stanford, CA USA
Search for CP Violation in B(sup 0)/B-bar(sup 0) Decays to pi+pi-pi(sup 0) and K + or - pi - or + pi(sup 0) in Regions Dominated by the rho + or - Resonance: The BABAR Collaboration
Jul. 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): DE2002-799954; SLAC-PUB-9303; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Cp Violation; Particle Decay; Resonance; Standard Model (Particle Physics)

20030000637 Stanford Linear Accelerator Center, Stanford, CA USA
Study of the Rare Decays B(sup o) Yields Ds(*) +pi- and B(sup 0) Yields Ds(*)-K+: The BABAR Collaboration
Jul. 23, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799953; SLAC-PUB-9302; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Particle Decay; Mesons; Field Theory (Physics); Elementary Particles

20030000676 Stanford Linear Accelerator Center, Stanford, CA USA
Unique Identification of Gravitation Exchange Effects in e+e- Collisions
Rizzo, T. G.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799948; SLAC-PUB-9295; No Copyright; Avail: National Technical Information Service (NTIS)
Many types of new physics can lead to contact interaction-like modifications in e+e- processes below direct production threshold. We examine the possibility of uniquely identifying the effects of graviton exchange, which are anticipated in many extra dimensional theories, from amongst this large set of models by using the moments of the angular distribution of the final state particles.
NTIS
Particle Interactions; Electron Scattering; Particle Collisions; Gravitation Theory

20030000890 Pennsylvania State Univ., University Park, PA USA
Modeling of Free Electron Laser Ablation ***Final Report, Sep. 1998-Aug. 2001***
Garrison, Barbara J.; Zhigilei, Leonid V.; Oct. 22, 2002; 4p; In English
Contract(s)/Grant(s): N00014-98-1-0868
Report No.(s): AD-A407589; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A novel breathing sphere model was developed in order to make microscopic molecular dynamics simulations tractable for laser ablation. The results of the simulations have allowed us to distinguish between desorption and ablation, predict velocity distributions of ablated particles, predict the fluence dependence of the ablation yield, explain the forward peaked angular

distributions and predict the acoustic pressure wave characteristics. Numerous favorable comparisons with experimental data have been made.
DTIC
Ablation; Laser Applications; Molecular Dynamics; Elastic Waves; Angular Distribution

20030001015 NASA Ames Research Center, Moffett Field, CA USA
Effect of Electronic Excitation on Hydrogen Atom Transfer (Tautomerization) Reactions for the DNA Base Adenine
Chaban, Galina M., NASA Ames Research Center, USA; Salter, Latasha M., NASA Ames Research Center, USA; Aug. 15, 2002; 1p; In English; 224th ASC Meeting, 18-22 Aug. 2002, Boston, MA, USA; Sponsored by American Society for Composites, USA
Contract(s)/Grant(s): RTOP 274-50-00-06; No Copyright; Avail: Issuing Activity; Abstract Only

Geometrical structures and energetic properties for four different tautomers of adenine are calculated in this study, using multi-configurational wave functions. Both the ground and the lowest single excited state potential energy surface are studied. The energetic order of the tautomers on the ground state potential surface is 9H less than 7H less than 3H less than 1H, while on the excited state surface this order is found to be different: 3H less than 1H less than 9H less than 7H. Minimum energy reaction paths are obtained for hydrogen atom transfer (9 yields 3 tautomerization) reactions in the ground and the lowest excited electronic state. It is found that the barrier heights and the shapes of the reaction paths are different for the ground and the excited electronic state, suggesting that the probability of such tautomerization reaction is higher on the excited state potential energy surface. The barrier for this reaction in the excited state may become very low in the presence of water or other polar solvent molecules, and therefore such tautomerization reaction may play an important role in the solution phase photochemistry of adenine.
Author
Hydrogen Atoms; Atomic Excitations; Atomic Interactions; Wave Functions; Tautomers; Adenines

20030001142 NASA Ames Research Center, Moffett Field, CA USA
Quantal Study of the Exchange Reaction for N + N2 using an ab initio Potential Energy Surface
Wang, Dunyou, NASA Ames Research Center, USA; Stallcop, James R., NASA Ames Research Center, USA; Huo, Winifred M., NASA Ames Research Center, USA; Dateo, Christopher E., Eloret Corp., USA; Schwenke, David W., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; [2002]; 13p; In English
Contract(s)/Grant(s): NAS2-0062; RTOP 344-38-12-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The N + N2 exchange rate is calculated using a time-dependent quantum dynamics method on a newly determined ab initio potential energy surface (PES) for the ground A” state. This ab initio PES shows a double barrier feature in the interaction region with the barrier height at 47.2 kcal/mol, and a shallow well between these two barriers, with the minimum at 43.7 kcal/mol. A quantum dynamics wave packet calculation has been carried out using the fitted PES to compute the cumulative reaction probability for the exchange reaction of N + N2(J=O). The J - K shift method is then employed to obtain the rate constant for this reaction. The calculated rate constant is compared with experimental data and a recent quasi-classical calculation using a LEPS PES. Significant differences are found between the present and quasiclassical results. The present rate calculation is the first accurate 3D quantal dynamics study for N + N2 reaction system and the ab initio PES reported here is the first such surface for N3.
Author
Potential Energy; Reaction Kinetics; Time Dependence; Nitrogen; Quantum Mechanics; Harmonic Analysis

20030001650 Argonne National Lab., IL USA
Optical Systems Design for High-Energy Particle Beam Diagnostics
Yang, B.; 2002; In English
Report No.(s): DE2002-801573; No Copyright; Avail: CASI; C01, CD-ROM

Radiation generated by high-energy particle beams is widely used to characterize the beam properties. While the wavelengths of radiation may vary from visible to x-rays, the physics underlying the engineering designs are similar. In this tutorial, we discuss the basic considerations for the optical system design in the context of beam instrumentation and the constraints applied by high-radiation environments. We cover commonly used optical diagnostics: fluorescence flags, visible and x-ray synchrotron radiation imaging. Emphases will be on achieving desired resolution, accuracy, and reproducibility.
NTIS
Light (Visible Radiation); Optical Equipment; Particle Beams; Systems Engineering; Design Analysis

20030001667 Argonne National Lab., IL USA

Two Frequency Operation of the Argonne ECR Ion Source

Vondrasek, R. C.; Scott, R. H.; Pardo, R. C.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-799796; No Copyright; Avail: National Technical Information Service (NTIS)

The demand for high charge-state high-intensity beams has motivated the return to two-frequency heating. A new program for the production of super-heavy nuclei has begun which requires intense beams of rare isotopes. In order to limit the consumption of the expensive isotopic material required to produce these beams, an increase in source efficiency and beam production is required. Two-frequency heating is one component in a program to accomplish these goals and further optimize source performance.

NTIS

Cyclotron Resonance; Frequencies; Heavy Nuclei; Ion Sources

20030001749 Eloret Corp., USA

Dissociative Ionization of Pyridine by Electron Impact

Dateo, Christopher, Eloret Corp., USA; Huo, Winifred, NASA Ames Research Center, USA; [2002]; 1p; In English; 55th Annual Gaseous Electronic Conference, 15-18 Oct. 2002, Minneapolis, MN, USA

Contract(s)/Grant(s): NAS2-00062; No Copyright; Avail: Issuing Activity; Abstract Only

In order to understand the damage of biomolecules by electrons, a process important in radiation damage, we undertake a study of the dissociative ionization (DI) of pyridine (C5H5N) from the low-lying ionization channels. The methodology used is the same as in the benzene study. While no experimental DI data are available, we compare the dissociation products from our calculations with the dissociative photoionization measurements of Tixier et al. using dipole (e, e(+) ion) coincidence spectroscopy. Comparisons with the DI of benzene is also made so as to understand the difference in DI between a heterocyclic and an aromatic molecule.

Author

Dissociation; Ionization; Pyridines; Electron Impact

20030001775 Stanford Linear Accelerator Center, Stanford, CA USA

Recent Experiments on the Effect of Coherent Synchrotron Radiation on the Electron Beam of CTF II

Braun, H. H.; Doebert, S.; Groening, L.; Borland, M.; Kabel, A.; Aug. 2002; 8p; In English

Report No.(s): DE2002-799995; SLAC-PUB-9353; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The drive beam of CTF II can provide single electron bunches with charges of more than 1.5 nC and rms lengths of less than 0.13mm. If the bunches are bent in the dipoles of a magnetic bunch compressor, they emit coherent synchrotron radiation with strongly enhanced intensity with respect to incoherent synchrotron radiation. Here we report on the experimental and theoretical study of the effect of this coherent radiation emission on the distribution of the electrons in the six-dimensional phase space.

NTIS

Coherent Radiation; Electron Beams; Linear Accelerators

20030001780 Stanford Linear Accelerator Center, USA

Status of the LCLS X-Ray FEL Program

Arthur, J.; Jun. 04, 2002; 12p; In English

Report No.(s): DE2002-799937; SLAC-PUB-9251; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Linac Coherent Light Source (LCLS) program involves a collaboration of several US National Laboratories and universities with the goal of designing and building the first 4th-generation hard x-ray source, an x-ray free-electron laser (FEL). This FEL will utilize extremely short, intense, low-emittance electron pulses created by the high-energy linear accelerator at the Stanford Linear Accelerator Center. The FEL radiation produced will feature unprecedented peak brightness, short pulse length, and spatial coherence, tunable over an energy range of 0.8-8 keV. With favorable funding, major construction will begin by 2004 and the LCLS will be operating late in 2006. The LCLS facility will include experimental stations for carrying out groundbreaking experiments in several scientific fields. Current R&D efforts are directed at experimentally studying the physics of high-gain FELs, and refining the details of the plan for the LCLS facility. The FEL experiments, at Argonne and Brookhaven National Labs (along with experiments carried out at the German laboratory DESY), have confirmed the basic physical concepts upon which LCLS is based, and have demonstrated that many of the stringent technical requirements can already be met.

NTIS

Free Electron Lasers; Linear Accelerators

20030001783 Stanford Linear Accelerator Center, USA
Optics Characterization and Correction at PEP-II
Safranek, J.; Donald, M. H.; Aug. 2002; 8p; In English
Report No.(s): DE2002-799907; SLAC-PUB-8116; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The PEP-II collider consists of two storage rings - a high energy ring (HER) for 9 GeV electrons and a low energy ring (LER) for 3 GeV positrons. The storage rings are each 2.2 km long, and they intersect at a single interaction point (IP) to produce collisions for high energy physics experiments.
NTIS
High Energy Interactions; Storage Rings (Particle Accelerators); Optics; Beams (Radiation)

20030001784 Jefferson (Thomas) Lab. Computer Center, Newport News, VA USA
Nucleon Form Factors Using Spin Degrees of Freedom
Jones, M. K.; 2002; 16p; In English
Report No.(s): DE2002-799889; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This document presents an overview of recent measurements of the neutron and proton electromagnetic form factors from double polarization experiments. Spin observables are sensitive to the product of nucleon form factor which allows access to the small nucleon electric form factors.
NTIS
Degrees of Freedom; Form Factors; Nucleons; Electromagnetic Fields; Spin

20030001785 Argonne National Lab., IL USA
Linear Theory of Ionization Cooling and Emittance Exchange
Wang, C. X.; Je Kim, K.; 2002; 8p; In English
Report No.(s): DE2002-799845; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The study of ionization cooling considered for muon colliders requires a full 6D treatment because of the need to exchange the longitudinal and transverse emittances. A general cooling channel consists of solenoids and quadrupoles for focusing, dipoles to generate dispersion, wedge absorbers for cooling and emittance exchange, and rf cavities for reacceleration. The quadrupole strengths can be adjusted so that the net focusing is cylindrically symmetric. The beam moments in such a system are completely specified in terms of five generalized emittances. We derive a set of coupled first-order differential equations describing the evolution of the generalized emittances due to the damping and excitation processes. The framework for lattice design is considered.
NTIS
Cooling; Emittance; Ionization; Linearization; Beams (Radiation)

20030001823 Stanford Linear Accelerator Center, USA
Goniometer Control System for Coherent Bremsstrahlung Production
Acousta, V. M.; Aug. 15, 2002; 24p; In English
Report No.(s): DE2002-800023; SLAC-PUB-9395; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A system for the generation of a high-intensity, quasi-monochromatic photon beam is discussed. The theory behind coherent bremsstrahlung photon beam production is analyzed and developed. The mechanics of a goniometer control system are presented. The software developed for remote control of the goniometer is also discussed. Finally, the results from various performance measurements are included.
NTIS
Goniometers; Control

20030001826 Stanford Linear Accelerator Center, Stanford, CA USA
New Diagnostics and Cures for Coupled-Bunch Instabilities
Byrd, J. M.; De Santis, S.; Stover, G.; Teytelman, D.; Fox, J.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800049; SLAC-PUB-9430; No Copyright; Avail: National Technical Information Service (NTIS)
As circular accelerators move towards larger numbers of bunches and higher beam currents, the task of diagnosing and curing coupled-bunch instabilities becomes ever harder. This paper describes the use of phase space tracking, i.e. reconstruction of bunch phase space trajectories, as a comprehensive instability diagnostic. A new instability cure is also presented, based on recent

insights into the dynamics of unevenly-filled rings. Data is shown from PEP-II and the ALS, where 'optimally shaped' uneven fills have yielded significant increases in instability thresholds.
NTIS
Beam Currents; Diagnosis; Spacecraft Tracking

20030001840 NASA Ames Research Center, Moffett Field, CA USA
Dissociative Ionization of Benzene by Electron Impact
Huo, Winifred, NASA Ames Research Center, USA; Dateo, Christopher, Eloret Corp., USA; Sep. 06, 2002; 1p; In English; 55th Gaseous Electronics Conference, 15-18 Oct. 2002, Minneapolis, MN, USA
Contract(s)/Grant(s): RTOP 344-38-12-16; No Copyright; Avail: Issuing Activity; Abstract Only
We report a theoretical study of the dissociative ionization (DI) of benzene from the low-lying ionization channels. Our approach makes use of the fact that electron motion is much faster than nuclear motion and DI is treated as a two-step process. The first step is electron-impact ionization resulting in an ion with the same nuclear geometry as the neutral molecule. In the second step the nuclei relax from the initial geometry and undergo unimolecular dissociation. For the ionization process we use the improved binary-encounter dipole (iBED) model. For the unimolecular dissociation step, we study the steepest descent reaction path to the minimum of the ion potential energy surface. The path is used to analyze the probability of unimolecular dissociation and to determine the product distributions. Our analysis of the dissociation products and the thresholds of the productions are compared with the result dissociative photoionization measurements of Feng et al. The partial oscillator strengths from Feng et al. are then used in the iBED cross section calculations.
CASI
Dissociation; Ionization; Benzene; Electron Impact

20030001906 Argonne National Lab., IL USA
Probing the Gateway to Superheavy Nuclei in Cranked Relativistic Hartree-Bogoliubov Theory
Afanasjev, A. V.; Khoo, T. L.; Frauendorf, S.; Ahmad, I.; Lalazissis, G. A.; 2002; 12p; In English
Report No.(s): DE2002-801589; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The possible existence of shell-stabilized superheavy nuclei, predicted with realistic nuclear potentials and the macroscopic-microscopic (MM) method, has been a driving force behind experimental and theoretical efforts to investigate the superheavy nuclei. These investigations pose a number of experimental and theoretical challenges. On the theoretical side, no consensus has been achieved on the question of what are the magic shell gaps in superheavy nuclei. The situation is illustrated in this document, where the predictions of different models are summarized. The accuracy of predictions of spherical shell closures depends sensitively on the accuracy of describing the single-particle energies, which becomes especially important for superheavy nuclei, where the level density is very high.
NTIS
Heavy Nuclei; Relativistic Effects

20030001913 Argonne National Lab., IL USA
Operational Improvements of the Argonne ECR Sources
Vondrasek, R. C.; Scott, R. H.; Pardo, R. C.; Koivisto, H.; 2002; 6p; In English
Report No.(s): DE2002-799797; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The performance of the recently upgraded ATLAS 10.5 GHz ECR ion source (ECR 1) has continued to improve with a factor of 12 increase in the intensity of high charge state ions (O7+, Ne9+, Ni16+, Kr17+) and greater source stability. Use of the sputter technique with a natural nickel sample has produced a 58Ni17+ beam with an intensity of 16.0 e(micro)A The solenoid power supplies are presently running at their maximum rated output and replacement of these supplies is planned to further increase the axial magnetic field. The MIVOC method has been employed at the 14 GHz ECR ion source (ECR 2) to produce a 56Fe15+ beam with a peak performance of 25.0 e(micro)A Efficiency into the 15+ charge state has been measured at 0.47%. A high temperature oven was used to produce a 50Ti12+ beam with an intensity of 6.9 e(micro)A 238U37+ beam with an intensity of 3.0 emA was produced using the sputter technique. Use of a second frequency has been restored with a 50-100% increase over single frequency operation in the intensities of the medium charge states and a factor of 2 to 5 increase in the higher charge states.
NTIS
Ion Sources; Nickel Isotopes; Performance Tests; Magnetic Fields; Charged Particles

20030001940 Lawrence Livermore National Lab., Livermore, CA USA
STEW: A Nonlinear Data Modeling Computer Program
Chen, H.; Mar. 21, 2000; 18p; In English
Report No.(s): DE2002-792692; UCRL-ID-138276; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A nonlinear data modeling computer program, STEW, employing the Levenberg-Marquardt algorithm, has been developed to model the experimental Plutonium 239(n,f) and Uranium 235(n,f) cross sections. This report presents results of the modeling of the Plutonium 239(n,f) and Uranium 235(n,f) cross-section data. The calculation of the fission transmission coefficient is based on the doublehumped-fission-barrier model of Bjornholm and Lynn. Incident neutron energies of up to 5 MeV are considered.
NTIS
Algorithms; Computer Programs; Nonlinearity; Mathematical Models; Data Processing

20030001955 Stanford Linear Accelerator Center, Stanford, CA USA
Studies of Breakdown in High Gradient X-Band Accelerator Structures Using Acoustic Emission
Frisch, J.; Nelson, J.; Le Pimpec, F.; Jobe, K.; McCormick, D.; Aug. 2002; 8p; In English
Report No.(s): DE2002-800085; SLAC-PUB-9469; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
X-band accelerator structures meeting the Next Linear Collider (NLC) design requirements have been found to suffer damage due to RF breakdown when processed to high gradients. Improved understanding of these breakdown events is desirable for the development of structure designs, fabrication procedures, and processing techniques that minimize structure damage. Acoustic emission sensors attached to an accelerator structure can detect both nominal and breakdown RF pulses. Using an array of acoustic sensors, we have been able to pinpoint both the cell and azimuth location of individual breakdown events. This allows studies of breakdown time and position sequences so that underlying causes can be determined. The technique provided a significant advance in studies of breakdown in the structure input coupler. In this paper we present acoustic emission sensor data and analysis from the breakdown studies in several x-band accelerator structures.
NTIS
Acoustic Emission; Radio Frequencies; Superhigh Frequencies; Electron Accelerators; Gradients

73
NUCLEAR PHYSICS

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

20030000467 Stanford Linear Accelerator Center, Stanford, CA USA
Prospects for Multi-TeV Two-Beam Linear Colliders
Ruth, R. D.; Aug. 2002; In English; This document is color dependent and/or landscape layout. It is currently only available in CD-ROM
Report No.(s): DE2002-800018; SLAC-PUB-9378; No Copyright; Avail: National Technical Information Service (NTIS)
The study shows that electron positron linear colliders have an energy reach far in excess of 1 TeV. In particular we show that an X-band linear collider powered with conventional sources might be upgraded using two-beam techniques to an energy far above 1 TeV. Thus, the linear collider offers a platform for continued exploration at the energy frontier of High Energy Physics.
NTIS
Electrons; Positrons; Superhigh Frequencies

20030000503 Stanford Linear Accelerator Center, Stanford, CA USA
Standing Wave Linear Accelerators: An Investigation of the Fundamental Field Stability and Tuning Characteristics
Lin, E.; Aug. 13, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800020; SLAC-PUB-9386; No Copyright; Avail: National Technical Information Service (NTIS)
The first accelerators were designed as a tool in high-energy particle physics. Their development has given rise to numerous applications in industry, such as materials processing, sterilization, food preservation, and radiopharmaceutical product generation (Barbalat, 1994). Modern day linear accelerators for particle physics accelerate multiple bunches of electrons and positrons up to 50 GeV. Accelerators of the next generation, such as the Next Linear Collider (NLC), aim to accelerate the bunches initially to a center of mass of 500GeV and later to 1.5 TeV (Decking 2001, Miyamoto 2002, Phinney 2002). The NLC will operate

under gradient fields on the order of 70 MV/m (Phinney, 2002). For all accelerators, two issues are fundamental for their construction: maximizing the efficiency of acceleration while, at the same time, preserving the luminosity of the beam. These issues are critically important in the design of the NLC.
NTIS
Linear Accelerators; Tuning; Standing Waves

20030000504 Stanford Linear Accelerator Center, Stanford, CA USA
High Power Beam at SLAC
Decker, F. J.; Erickson, R. A.; Fieguth, T.; Iverson, R.; Smith, H.; Jul. 2002; In English; This document is color dependent and/or landscape layout.It is currently only available on CD-ROM.
Report No.(s): DE2002-800000; SLAC-PUB-9359; No Copyright; Avail: National Technical Information Service (NTIS)
The fixed target experiment E-158 has been running with an electron beam close to the highest possible charge and energy available at the Stanford Linear Accelerator Center (SLAC). A charge of 2.5 x 1011 electrons per pulse at 45 GeV and 30 Hz was routinely delivered for the E-158 commissioning run in April and May, 2001. We have calculated that energies and charges of 45 and 48 GeV with 6.5 x 1011 and 4.5 x 1011 particles respectively can be delivered in 370 and 280 ns long beam pulses. Beam loading in the linac was compensated by setting the charge distribution according to a slowly decreasing function, chosen to counteract the rising RF slope of the SLED pulse (SLAC Energy Development). Simultaneous operation with the PEP-II B-Factory posed an additional challenge. Beam pulses with up to 50% different energies had to be accelerated in the linac and then matched to the different beam lines. Pulsed devices have been implemented to enable a fast pulse-by-pulse switching between this beam and the PEP-II injection beams. The commissioning and performance of these devices, along with recent beam measurements are described.
NTIS
Linear Accelerators; Electron Beams

20030000632 Stanford Linear Accelerator Center, Stanford, CA USA
Physics at Future Hadron Colliders
Baur, S.; Brock, R.; Parsons, J.; Jan. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799980; SLAC-PUB-9335; No Copyright; Avail: National Technical Information Service (NTIS)
We discuss the physics opportunities and detector challenges at future hadron colliders. As guidelines for energies and luminosities we use the proposed luminosity and/or energy upgrade of the LHC (SLHC), and the Fermilab design of a Very Large Hadron Collider (VLHC). We illustrate the physics capabilities of future hadron colliders for a variety of new physics scenarios (supersymmetry, strong electroweak symmetry breaking, new gauge bosons, compositeness and extra dimensions). We also investigate the prospects of doing precision Higgs physics studies at such a machine, and list selected Standard Model physics rates.
NTIS
Electroweak Interactions (Field Theory); Hadrons; Broken Symmetry; Standard Model (Particle Physics)

20030000651 Stanford Linear Accelerator Center, Stanford, CA USA
New Diagnostics and Cures for Coupled-Bunch Instabilities
Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799991; SLAC-PUB-9349; No Copyright; Avail: National Technical Information Service (NTIS)
As circular accelerators move towards larger numbers of bunches and higher beam currents, the task of diagnosing and curing coupled-bunch instabilities becomes ever harder. This paper describes the use of phase space tracking, i.e. reconstruction of bunch phase space trajectories, as a comprehensive instability diagnostic. A new instability cure is also presented, based on recent insights into the dynamics of unevenly-filled rings. Data is shown from PEP-II and the ALS, where optimally shaped uneven fills have yielded significant increases in instability thresholds.
NTIS
Stability; Beams (Radiation); Bunching; Algorithms; Beam Currents

20030000675 Stanford Linear Accelerator Center, Stanford, CA USA
Longitudinal Space Charge Effect in Slowly Converging/Diverging Relativistic Beams
Bane, K. L.; Chao, A. W.; Jul. 20, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799952; SLAC/PUB-9300; No Copyright; Avail: National Technical Information Service (NTIS)
Beginning with the Green function for a rod beam in a round beam pipe we derive the space charge induced average energy change and rms spread for relativistic beams that are slowly converging or diverging in round beam pipes, a result that tends to be much larger than the 1/gamma(sup 2) dependence for parallel beams. Our results allow for beams with longitudinal-transverse correlation, and for slow variations in beam pipe radius. We calculate, in addition, the space charge component of energy change and spread in a chicane compressor. This component indicates source regions of coherent synchrotron radiation (CSR) energy change in systems with compression. We find that this component, at the end of example compressors, approximates the total induced voltage obtained by more detailed CSR calculations. Our results depend on beam pipe radius (although only weakly) whereas CSR calculations do not normally include this parameter, suggesting that results of such calculations, for systems with beam pipes, are not complete.
NTIS
Coherent Radiation; Green'S Functions; Space Charge; Synchrotron Radiation

20030000677 Stanford Linear Accelerator Center, Stanford, CA USA
New BaBar Results on Rare Letonic B Decays
Halyo, V.; Jul. 03, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799942; SLAC-PUB-9275; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available.
NTIS
Leptons; Particle Decay; Standard Model (Particle Physics); Detectors

20030001689 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
Measurements of Neutron Induced Surface and Bulk Defects in 4H Silicon Carbide
Jones, Kent T.; Mar. 2002; 109p; In English; Original contains color images
Report No.(s): AD-A407869; AFIT/GNE/ENP/02M-03; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The effects of neutron irradiation was investigated in both n- and p-type 4H silicon carbide. Photoluminescence (PL), deep level transient spectroscopy (DLTS), and Hall effect measurements where used to observe optical and electrical characteristics and identify changes in basic material properties. The material was irradiated using an open pool research reactor. Highly doped n-and p-type materials (ND-NA ^ 1.2E17 and NA-ND ^ 1.5E18 cm-3 respectively) were chosen to aid in device fabrication. The material demonstrated no measurable effect to 1 MeV neutrons at fluences of up to 1E14 n/cm2 and devices were unable to be constructed when exposed to fluences greater then 1E16 n/cm2. The effective suppression of the near bandgap zero phonon PL luminescence lines was shown as a function of increasing neutron fluence, and attributed to the dislocation of neutral nitrogen donors. Deep level defects sites also developed and where shown to increase in density with increased neutron fluence. Hall measurements generally agreed with theoretical expectations but failed to yield conclusive results. Capacitance rollover was observed near 510 K beginning with fluences of around 5E15 n/cm2. Irradiated devices also showed unexpectedly permanent degradation after hour-long exposure to temperatures exceeding 600 K during DLTS measurements.
DTIC
Photoluminescence; Silicon Carbides; Neutron Irradiation; Optical Properties

20030001771 Lawrence Livermore National Lab., Livermore, CA USA
Simulations of Electron-Cloud Build Up. Summary of Session 3
Furman, M. A.; 2002; 8p; In English
Report No.(s): DE2002-799638; LBNL-50762; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This is a summary of the talks presented in Session III (Simulations of Electron-Cloud Build Up) of the Mini-Workshop on Electron-Cloud Simulations for Proton and Positron Beams ECLOUD-02, held at CERN, 15-18 April 2002.
NTIS
Computerized Simulation; Electron Clouds; Positrons; High Energy Interactions

20030001776 Stanford Linear Accelerator Center, Stanford, CA USA

Stability Analysis of Longitudinal Beam Dynamics Using Non-Canonical Hamiltonian Methods and Energy Principles

Venturini, M.; Aug. 2002; 20p; In English

Report No.(s): DE2002-799993; SLAC-PUB-9351; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the presence of RF focusing and a purely inductive impedance bunch equilibria in the form of Haissinski distributions - when they exist - are linearly stable. This is the case whether the potential well distortion associated with the impedance causes bunch lengthening or shortening. We provide a general proof of this fact using Hamiltonian methods and energy principles. In the presence of bunch shortening our analysis indicates that there is a critical current for linear stability. However, this threshold is identical to the critical current defining the condition for the very existence of a Haissinski equilibrium.

NTIS

Beams (Radiation); Storage Rings (Particle Accelerators)

20030001799 Lawrence Livermore National Lab., Livermore, CA USA

High Energy Gamma Rays from p+X, X=Cu, Ag, Au at 34 MeV

Mar. 07, 2000; In English; This document is color dependent and/or in landscape format. It is currently only available on CD-ROM

Report No.(s): DE2002-792341; UCRL-JC-133090; No Copyright; Avail: National Technical Information Service (NTIS)

In this paper we present results from the measurement of the gamma ray yield in the reaction of 34-MeV protons on Cu, Ag and Au. The protons were produced by the University of Washington superconducting linac. The gamma rays were measured using a large NaI and two large BaF2 detectors. Angular distributions were obtained for each of the three targets. Data for the Cu and Ag target were taken at six lab angles between 35 and 135 degrees, while data were taken at eight lab angles between 35 and 135 degrees for the Au target. The data were compared to several models. These included Hauser-Feshbach and direct-semidirect (DSD) calculations. We also compared the measurements to proton-nucleus bremsstrahlung calculations. The bremsstrahlung calculations greatly underpredicted the cross section and produced an angular distribution which was too flat. The Hauser-Feshbach calculations reproduced the yield of the softer portion of the spectrum reasonably well for all three targets. The DSD calculations reproduced the yield and angular distributions quite well for energies above about 20 MeV. However, the yields were underpredicted in the 15-18 MeV region, which suggests that multistep mechanisms may be needed for this target.

NTIS

Gamma Rays; Superconducting Magnets; Linear Accelerators

20030001807 Lawrence Livermore National Lab., Livermore, CA USA

Energetic Proton Generation in Ultra-Intense Laser-solid Interactions

Wilks, S. C.; Langdon, A. B.; Cowan, T. E.; Roth, M.; Singh, M.; Mar. 01, 2000; 24p; In English

Report No.(s): DE2002-793448; UCRL-ID-137814; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An explanation for the energetic ions observed in the PetaWatt experiments is presented. In solid target experiments with focused intensities exceeding 10(sub 20) W/cm(sub 2), high-energy electron generation, hard bremsstrahlung, and energetic protons have been observed on the backside of the target. In this report, we attempt to explain the physical process present that will explain the presence of these energetic protons, as well as explain the number, energy, and angular spread of the protons observed in experiment. In particular, we hypothesize that hot electrons produced on the front of the target are sent through to the back off the target, where they ionize the hydrogen layer there. These ions are then accelerated by the hot electron cloud, to tens of MeV energies in distances of order tens of microns, whereupon they end up being detected in the radiographic and spectrographic detectors.

NTIS

Electromagnetic Interactions; Protons; High Energy Electrons; Ionization; Detectors

20030001816 Lawrence Livermore National Lab., Livermore, CA USA

Case for a 500 GeV e+e- Linear Collider

Baggers, J.; Baltay, C.; Barker, T.; Barlow, T.; Bauer, U.; Jul. 05, 2000; 70p; In English

Report No.(s): DE2002-793574; UCRL-ID-139524; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Several proposals are being developed around the world for an e+e- linear collider with an initial center of mass energy of 500 GeV. In this paper, we will discuss why a project of this type deserves priority as the next major initiative in high energy physics.

NTIS

Linear Accelerators; Physics

20030001827 Argonne National Lab., IL USA

Wakefield Acceleration in Structures

Conde, M. E.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-801577; No Copyright; Avail: National Technical Information Service (NTIS)

Wakefield acceleration in dielectric loaded structures is discussed in this paper. We present a description of the dielectric wakefield accelerator concept, comparing some features of the collinear and the two beam accelerator configurations. The Argonne Wakefield Accelerator Facility (AWA) is discussed in detail, including major upgrades that are presently taking place. The basic features and capabilities of the facility are presented, and the dielectric wakefield acceleration results are briefly summarized. Possible variants of the two beam accelerator configuration are discussed, and work on planar dielectric structures in various institutions is presented. We conclude this report mentioning prospective achievements of dielectric wakefield accelerating structures.

NTIS

Electron Beams; Electron Accelerators

20030001828 Argonne National Lab., IL USA

Thermomechanical Analysis of High-Heat-Load Components for the Canted-Undulator Front End

Jaski, Y.; Trakhtenberg, E.; Collins, J.; Benson, C.; Brajuskovic, B.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-801613; No Copyright; Avail: National Technical Information Service (NTIS)

In order to increase the total number of beamlines available to users, canted undulators are used, which will produce two beams with 1 mrad horizontal separation. Each undulator is 2.07 m long. The center of one undulator will be 1.25 m upstream of the center of the straight section, and the center of the another undulator will be 1.25 m downstream of the center of the straight section. The front-end thermal management components from upstream to downstream include first fixed mask (FM1), second fixed mask (FM2), first photon shutter (PS1), second photon shutter (PS2), exit splitter mask and beryllium window. The dual beams are contained within the same aperture until going through the exit splitter mask. The fixed masks are used to collimate the x-ray beams and limit beam missteering, whereas the photon shutters are used to fully intercept the beams. However, both components are designed to withstand the full x-ray beams from the canted undulators. This paper focuses on the design and analysis of the photon shutters and fixed masks.

NTIS

Thermodynamics; Photon Density

20030001908 Thomas Jefferson National Accelerator Facility, Newport News, VA USA

Cumulative Beam Breakup with Random Displacement of Cavities and Focusing Elements

Delayen, J. R.; 2002; 8p; In English

Report No.(s): DE2002-801207; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have recently developed an analytical formalism for cumulative beam breakup in linear accelerators with arbitrary beam profile. The same formalism could be used to investigate the beam breakup-enhanced displacement due to the misalignment of the cavities and the focusing elements. In this paper this analytical formalism is extended and applied to investigate the behavior of beams in misaligned pulsed and cw linear accelerators.

NTIS

Linear Accelerators; Beam Currents

20030001937 Lawrence Livermore National Lab., Livermore, CA USA

Direct Energy Conversion for Fast Reactors

Brown, N. W.; Vogt, D.; Cooper, J.; Chapline, G.; Turchi, P.; Jul. 2000; 30p; In English

Report No.(s): DE2002-793577; UCRL-ID-139627; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Thermoelectric generators (TEG) are a well-established technology for compact low power output long-life applications. Solid state TEGs are the technology of choice for many space missions and remote earth-based applications. Use of solid state TEGs in these applications requires engineering designs that minimize the weight and volume of the device. Thermal to electric conversion efficiency, while an important design consideration, is not the principal design factor. However, design of a TEG for a fast reactor nuclear power plant requires higher thermal efficiencies in order to achieve competitive power generation costs.

NTIS

Energy Conversion Efficiency; Fast Nuclear Reactors; Thermoelectric Generators; Thermodynamic Efficiency

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OPTICS

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

20030000483 NASA Marshall Space Flight Center, Huntsville, AL USA
Fabrication and Characterization of Tilted Fiber Optic Bragg Grating Filters over Various Wavelengths
Grant, Joseph, NASA Marshall Space Flight Center, USA; Jackson, Kurt V., NASA Marshall Space Flight Center, USA; Wang, Y., Alabama Agricultural and Mechanical Univ., USA; Sharma, A., Alabama Agricultural and Mechanical Univ., USA; [2002]; 1p; In English; 2002 OSA Annual Meeting and Exhibit/LS-XVIII, 29 Sep. - 3 Oct. 2002, Orlando, FL, USA; Sponsored by Optical Society of America, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Fiber Optic Bragg Grating taps are fabricated and characterized at various wavelengths using a modified Talbot interferometric technique. Gratings are fabricated by tilting the photosensitive fiber to angles up to 45 degrees w.r.t. the writing angle. Diffraction characteristics of the tilted grating is monitored in first and second orders.
Author
Taps; Bragg Gratings; Fabrication

20030000539 NASA Marshall Space Flight Center, Huntsville, AL USA
Study of Lightweight Ni-Co Alloy Mirrors Obtained by Electroforming Techniques
Jones, Ruth, NASA Marshall Space Flight Center, USA; Muntele, Iulia, Alabama Agricultural and Mechanical Univ., USA; Muntele, Claudiu, Alabama Agricultural and Mechanical Univ., USA; Zimmerman, Robert, Alabama Agricultural and Mechanical Univ., USA; Ila, Daryush, Alabama Agricultural and Mechanical Univ., USA; [2002]; 1p; In English; Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

One contribution in reducing the costs of optics in space can be provided by production of ultralight mirrors. The decrease in the weight of the primary mirror of a telescope is anticipated to lead to the possibility of increasing the size of the telescopes, therefore increasing the amount and distance from which information is received. An electroplating process of ultralight replica mirrors from nickel sulfamate solution will be described. Based on an experimental setup with cylindrical symmetry, flat mirrors with a diameter of 7 inches and thickness of 1.5 mm are made from a Ni-Co alloy. The composition of the resulting deposit is analyzed using Rutherford Backscattering Spectrometry (RBS) and Proton Induced X-ray Emission (PIXE). In order to resolve Ni and Co, 10 MeV nitrogen ions are used as projectiles in the RBS measurements. Solution parameters monitored during the deposition process using optical absorption and polarography will be correlated with the final concentration of Ni and Co in the deposit. Bath parameters like temperature, current density, agitation level and acidity are chosen at certain values and maintained constant from one sample to another throughout the deposition process. The purpose of the experiment is to obtain mirrors with near zero stress, and predetermined composition and hardness. This study is an intermediate step in obtaining through the same process, but with a larger scale setup, ultralight large aperture replica mirrors.
Author
Mirrors; Fabrication; Electroforming; Electroplating

20030000575 NASA Marshall Space Flight Center, Huntsville, AL USA
Production of Ultra-Light Normal Incidence Mirrors
Jones, Ruth, NASA Marshall Space Flight Center, USA; Muntele, Iulia, Alabama Agricultural and Mechanical Univ., USA; Muntele, Claudiu, Alabama Agricultural and Mechanical Univ., USA; Zimmerman, Robert L., Alabama Agricultural and Mechanical Univ., USA; Ila, Daryush, Alabama Agricultural and Mechanical Univ., USA; [2002]; 1p; In English; Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Mirrors fabrication for large aperture telescopes is an important aspect in space exploration programs. One of the cost effective techniques to obtain such mirrors is electroplating of Ni-Co alloys from sulfamate solution. The Center for Irradiation of Materials at Alabama A&M University - Research Institute has been involved in a NASA-MSFC project for producing ultra-light Ni-Co alloy mirrors since the summer of year 2000. The goal of this project is to obtain ultra-light, high strength electroformed large aperture normal incidence replicated mirrors, (weighting less than 5 kg/m2), free of stress, with a good figure and reproducible thickness variation. In order to simplify the control of parameters such as temperature gradient, concentration gradient, distribution of the electric field lines and flow control, the proposed geometry involves a cylindrical main tank contained in another cylindrical tank, which plays the role of a weir. Designs were created to accommodate the new horizontal position of the mandrel and the pipes fitting through the outer tank's lid. The inner tank contains the working electrodes and a series of sensors for monitoring temperature, flow, stress and pH. The outer tank holds the electric heaters, the filters and a part of the piping system. Another two tanks complete the setup and serve for rinsing/preheating and equilibrating the electroplating bath. This paper will

describe advantages of the new experimental setup and the parameters achieved in the electroplating bath for the proposed geometry.
Author
Mirrors; Fabrication; Electroplating; Electroforming

20030000770 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Analysis of Next-Generation Space Telescope (NGST) Mirrors During Optical Testing in the X-Ray Calibration Facility (XRCF)
Page, Tim, NASA Marshall Space Flight Center, USA; Sutherlin, Steven, Raytheon Information Technology and Scientific Services, USA; Twelfth Thermal and Fluids Analysis Workshop; July 2002; 14p; In English; Also announced as 20030000727; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy

This paper presents Thermal Analysis of the Next Generation Space Telescope (NGST) Mirrors During Optical Testing in the X-Ray Calibration Facility (XRCF). The contents include: 1) NGST Spacecraft Concept; 2) NGST Mirror Development Testing; 3) NGST Development Mirror; 4) Knudsen Number; 5) Free-Molecular Conduction; 6) Accomodation Coefficient; and 7) Results and Recommendations. This paper is presented in viewgraph form.
CASI
Mirrors; Thermal Analysis; Next Generation Space Telescope Project; X Ray Optics; Spaceborne Telescopes

20030000898 Tufts Univ., Electro-optics Technology Center, Medford, MA USA
Non-Linear Optical Signal Processing ***Final Report, 31 Aug. 1994-30 Aug 1995***
Cronin-Golomb, Mark; Khoury, Jed; Aug. 1995; 5p; In English
Contract(s)/Grant(s): F30602-94-C-0262; AF Proj. 2305
Report No.(s): AD-A407564; AFRL-SN-HS-2002-040; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this work we presented a two port nonlinear joint transform correlator with two complimentary results. This correlator is based on a two port photorefractive limiting quadratic processor. In the limiting regime we demonstrated experimentally and by computer simulation, that the correlation operation is like a phase extraction correlator operation, regardless of the sign 0 the coupling coefficient. However, for positive coupling coefficients and intermediate beam ratios, one port performs as a phase-only filter and the other as a classical matched filter.
DTIC
Signal Processing; Optical Communication

20030000973 NASA Marshall Space Flight Center, Huntsville, AL USA
The Development of Hard-X-Ray Optics at MSFC
Ramsey, Brian D., NASA Marshall Space Flight Center, USA; Elsner, R. F., NASA Marshall Space Flight Center, USA; Engelhaupt, D. E., Alabama Univ., USA; Kolodziejczak, J. J., NASA Marshall Space Flight Center, USA; ODell, S. L., NASA Marshall Space Flight Center, USA; Speegle, C. O., Raytheon Information Technology and Scientific Services, USA; Weisskopf, M. C., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; SPIE Conference on X-Ray and Gamma-Ray Telescopes and Instruments for Astronomy, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We are fabricating optics for the hard-x-ray region using electroless nickel replication. The attraction of this process, which has been widely used elsewhere, is that the resulting full shell optics are inherently table and thus can have very good angular resolution. The challenge with this process is to develop lightweight optics (nickel has a relatively high density of 8.9 g / cu cm), and to keep down the costs of mandrel fabrication. We accomplished the former through the development of high-strength nickel alloys that permit very thin shells without fabrication- and handling-induced deformations. For the latter, we have utilized inexpensive grinding and diamond turning to figure the mandrels and then purpose-built polishing machines to finish the surface. In-house plating tanks and a simple water-bath separation system complete the process. to date we have built shells ranging in size from 5 cm diameter to 50 cm, and with thickness down to 100 micron. For our HERO (high energy replicated optics) balloon program, we are fabricating over 200 iridium-coated shells, 250 microns thick, for hard-x-ray imaging up to 75 keV. Early test results on these have indicated half-power-diameters of 15 arcsec. The status of these and other hard-x-ray optics will be reviewed.
Author
X Ray Optics; Thin Walled Shells; Fabrication; Electroless Deposition; Nickel Alloys

20030001003 NASA Marshall Space Flight Center, Huntsville, AL USA

Partial Wave Analysis of Coupled Photonic Structures

Fuller, Kirk A., National Space Science and Technology Center, USA; Smith, David D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; OSA Conference on Optics in the Southeast, 24-25 Oct. 2002, Huntsville, AL, USA; Sponsored by Optical Society of America, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The very high quality factors sustained by microcavity optical resonators are relevant to applications in wavelength filtering, routing, switching, modulation, and multiplexing/demultiplexing. Increases in the density of photonic elements require that attention be paid to how electromagnetic (EM) coupling modifies their optical properties. This is especially true when cavity resonances are involved, in which case, their characteristics may be fundamentally altered. Understanding the optical properties of microcavities that are near or in contact with photonic elements---such as other microcavities, nanostructures, couplers, and substrates---can be expected to advance our understanding of the roles that these structures may play in VLSI photonics, biosensors and similar device technologies. Wc present results from recent theoretical studies of the effects of inter- and intracavity coupling on optical resonances in compound spherical particles. Concentrically stratified spheres and bispheres constituted from homogeneous and stratified spheres are subjects of this investigation. A new formulation is introduced for the absorption of light in an arbitrary layer of a multilayered sphere, which is based on multiple reflections of the spherical partial waves of the Lorenz-Mie solution for scattering by a sphere. Absorption efficiencies, which can be used to profile cavity resonances and to infer fluorescence yields or the onset of nonlinear optical processes in the microcavities, are presented. Splitting of resonances in these multisphere systems is paid particular attention, and consequences for photonic device development and possible performance enhancements through carefully designed architectures that exploit EM coupling are considered.
Author

Photonics; Electromagnetic Coupling; Optical Resonators; Spheres; Particles; Scattering

20030001582 Air Force Inst. of Tech., Dept. of Engineering Physics, Wright-Patterson AFB, OH USA

Development of a TM:HO:YLF-Laser-Pumped Orientation-Patterned Gallium Arsenide Optical Parametric Oscillator

Harm, Michael D.; Mar. 2002; 77p; In English; Original contains color images

Report No.(s): AD-A407867; AFIT/GEO/ENP/02-01; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Coherent optical sources in the mid-infrared region (mid-IR) are important fundamental tools for infrared countermeasures and battlefield remote sensing. Nonlinear optical effects can be applied to convert existing near-IR laser sources to radiate in the mid-IR. This research focused on achieving such a conversion with a quasi-phase matched optical parametric oscillators using orientation-patterned gallium arsenide (OPGaAs), a material that can be quasi-phased matched by periodically reversing the crystal structure during the epitaxial growth process. Although non-linear optical conversion was not ultimately achieved during this research, many valuable lessons were learned from working with this material. This thesis reviews the theory of nonlinear optics and explores the importance of accurate refractive index measurements to proper structure design. The details of four nonlinear optical experiments are presented recommendations are offered for the design of future OPGaAs crystals. Recommendations are also made for improved experimental techniques.
DTIC

Nonlinear Optics; Gallium Arsenides; Solid State Lasers; Oscillators

20030001687 Arizona Univ., Dept. of Electrical and Computer Engineering, Tucson, AZ USA

The Jigsaw Project

Neifeld, Mark; Marcellin, Michael; Nov. 04, 2002; 16p; In English

Contract(s)/Grant(s): DAAD17-01-C-0073

Report No.(s): AD-A407932; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These viewgraphs show the sensor geometry/physical setup, overview of the compression engine, and volumetric image compression for the Arizona JIGSAW project which is comprised of volumetric compression/restoration for LADAR imagery.
DTIC

Data Compression; Optical Radar

20030001690 Focused Research, Inc., Middleton, WI USA

Demonstration of a Low Cost, High-Speed Fiber Optic Transceiver ***Final Report, Jun. 1997-Jun 2000***

Dooley, Terri L.; Emmel, Grant R.; Hohenwarter, Gert K.; Nesnidal, Michael P.; Marsland, Robert A.; Sep. 2002; 161p; In English; Original contains color images

Contract(s)/Grant(s): F30602-97-C-0144; DARPA ORDER-B667; Proj-B667

Report No.(s): AD-A407865; AFRL-SN-RS-TR-2002-238; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A high-speed serial optical link suitable for a range of commercial and military short-haul applications, operating over a distance of up to 300 meters was developed. At the heart of the link lie a vertical-cavity surface-emitting laser (VCSEL) diode transmit and a gallium arsenide (GaAs) photo detector, driven and amplified by custom-designed GaAs integrated circuits. The transmit or receiver is individually hermetically sealed in a metal-ceramic surface-mounted package with a multimode fiber pigtail aligned to the laser or photodiode respectively. The transmitter and receiver are nearly identical externally and each is less than 0.2 cm in volume. The link is capable of> 10 gigabit per second operation, independent of signaling protocol and can transmit over distances of up to 300 meters on high-bandwidth multimode fiber.
DTIC
Fiber Optics; Low Cost; Military Technology; Transmitter Receivers; Lasers; Photodiodes

20030001774 Stanford Linear Accelerator Center, Stanford, CA USA
Linear Optics Verification for PEP-II Using Model-Independent Analysis
Yan, Y. T.; Cai, Y.; Irwin, J.; Sullivan, M.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800009; SLAC-PUB-9368; No Copyright; Avail: National Technical Information Service (NTIS)
We verify all quadrupole strengths (both normal and skew) and determine sextupole feed-downs as well as all BPM gains and BPM cross-plane couplings by an SVD-enhanced least-squares fitting of the phase advances (only those which are accurately determined) and the Green's functions (specified by the local transfer matrix components R12, R34, R32, and R14). The phase advances and the Green's functions are obtained by analyzing turn-by-turn Beam Position Monitor (BPM) data from high resolution model-independent analysis (MIA). Once the magnet strengths are verified, a magnet correction priority sequence can be exercised in the computer before one tries to correct the real accelerator. Results from PEP-II LER measurement are presented.
NTIS
Beams (Radiation); Quadrupoles; Matrices (Mathematics)

20030001798 Lawrence Livermore National Lab., Livermore, CA USA
Optics Technology for the National Ignition Facility. Inertial Confinement Fusion, January-March 1999, Volume 9, No. 2
1999; 128p; In English
Report No.(s): DE2002-791659; UCRL-LR-105821-99-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Contents include the following: Properties of and Manufacturing Methods for NIF Laser Glasses; Diffractive Optics for the NIF; Producing KDP and DKDP Crystals for the NIF Laser; Engineering High-Damage-Threshold NIF Polarizers and Mirrors; Improved Antireflection Coatings for the NIF; Developing Optics Finishing Technologies for the National Ignition Facility; Laser-Damage Testing and Modeling Methods for Predicting the Performance of Large-Area NIF Optics; Development of the NIF Target Chamber First Wall and Beam Dumps.
NTIS
Ignition; Inertial Confinement Fusion; Optics; Technology Utilization; Manufacturing

20030001804 Lawrence Livermore National Lab., Livermore, CA USA
Modeling and Demonstration of a Saturated Ni-like Mo X-ray Laser
Nilsen, J.; Li, Y.; Dunn, J.; Barbee, T. W.; Osterheld, A. L.; Aug. 21, 2000; 14p; In English
Report No.(s): DE2002-792753; UCRL-JC-137691; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The technique of using a nsec pulse to preform and ionize the plasma followed by a psec pulse to heat the plasma has enabled us to achieve saturated laser output for low-Z neon-like and nickel-like ions driven by smatl lasers with less than ten joules of energy. In this work we present and model recent experiments done using the COMET laser at Lawrence Livermore National Laboratory to illuminate slab targets of Mo up to 1 cm long with a one joule, 600 ps prepulse followed 700 psec later by a five joule, one psec drive pulse. The experiments demonstrate saturated output on the N-like Mo 3d94d lSO-+ 3d94p lPl laser line at 18.9 nm. The small signal gain and gain length product are estimated by measuring the laser output versus target length. Experiments are done using multilayer mirrors to obtain two-dimensional images of the output aperture of the laser and to measure the total laser energy as a function of various parameters such as the delay between the short and long pulses and the energy of the two pulses. to model the experiments the LASNEX code is used to calculate the hydrodynamic evolution of the plasma and provide the temperatures and densities to the XRASER code, which then does the kinetics calculations to determine the gain. The temporal and spatial evolution of the plasma is studied both with and without radiation transport included for the 4f and 4p + 3d

Ni-like Mo resonance lines. High gains are predicted for both the 3d'4d 'SO+ 3d94p 'P, laser line at 18.9 nm and the 3d94f 'P, + 3d'4d 'P, photopumped line which is observed to Iase at 22.6 nm.
NTIS
Nickel; X Ray Lasers; Mathematical Models; Saturation; Molybdenum Alloys; Resonance

20030001815 Lawrence Livermore National Lab., Livermore, CA USA
LLNL Measurements of Graded-Index Multi-Mode Optical Fiber (ITF 47)
Saito, T. T.; May 01, 2000; 16p; In English
Report No.(s): DE2002-793560; UCRL-ID-139428; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Russian Federal Nuclear Center-All Russian Research Institute of Technical Physics, located in the Nuclear City of Snezhinsk, east of the Ural mountains and the Lawrence Livermore National Laboratories have been investigating the possibility of establishing a commercial optical fiber manufacturing facility. These discussions began in the summer of 1998. At that time three samples (single mode and multi-mode) of optical fiber were left at the Sandia National Laboratory. Sandia measured two of the segments and sent them to LLNL. The optical loss at 1550 nm and 1300 nm were higher than commercially available fiber. The measurements were complicated because the geometry of the fibers also did not meet specification. Since the core was not adequately centered coupling of optical energy into the fiber being tested varied widely depending on which end of the fiber was used for insertion. The results of these measurements were summarized in the informal report dated June 11, 1999, which was hand carried by Dr. Paul Herman during his July 1999 visit. During the July visit a 1.2-km long section of graded-index multimode fiber, ITF 47, was given to Herman. We had requested samples longer than the earlier ones (which were (approx) 0.1 km long) in order that a cutback method could be used for the transmission measurements. The optical loss using the cutback technique and the transmission spectral measurements in the 600-1700 mn region are reported. Also physical measurements are reported of the fiber's diameter, concentricity, ellipticity and tensile strength (proof test).
NTIS
Optical Fibers; Measurement; Manufacturing; Specifications

20030001953 Sandia National Labs., Albuquerque, NM USA
Small-Scale High-Performance Optics
Wilson, C. W.; Spletzer, B. L.; Leger, C. L.; Jun. 2002; 34p; In English
Report No.(s): DE2002-801002; SAND2002-1906; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The application of micro-scale technologies to the realization of high-performance optical imaging systems is a new field. to achieve the full potential of such devices requires the development of new MEMS structures, optical configurations, and control and image manipulation techniques. As a first step towards reaching this goal we proposed to implement a new optical configuration with potential for small-scale application at a large-scale proof of concept level. This allowed us to develop some of the image control and image correction techniques that will be required for small-scale implementation. In parallel, we investigated resolution limitations for various mirror geometries based on blur spot analysis and developed optimization tools for mirror design. This work focuses on demonstrating the feasibility of a new optical configuration applicable to a MEMS scale high-performance imaging system.
NTIS
Optics; Microelectromechanical Systems; Imaging Techniques; Optimization

20030001973 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of High Resolution Mirrors and Cd-Zn-Te Detectors for Hard X-ray Astronomy
Ramsey, Brian D., NASA Marshall Space Flight Center, USA; Speegle, Chet O., Raytheon Information Technology and Scientific Services, USA; Gaskin, Jessica, Alabama Univ., USA; Sharma, Dharma, NASA Marshall Space Flight Center, USA; Engelhaupt, Darell, Alabama Univ., USA; [2002]; 2p; In English; Optical Society of America: Optics in the Southeast: Topical Meeting and Tabletop Exhibit, 24-25 Oct. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
We describe the fabrication and implementation of a high-resolution conical, grazing- incidence, hard X-ray (20-70 keV) telescope. When flown aboard stratospheric balloons, these mirrors are used to image cosmic sources such as supernovae, neutron stars, and quasars. The fabrication process involves generating super-polished mandrels, mirror shell electroforming, and mirror testing. The cylindrical mandrels consist of two conical segments; each segment is approximately 305 mm long. These mandrels are first, precision ground to within approx. 1.0 micron straightness along each conical segment and then lapped and polished to less than 0.5 micron straightness. Each mandrel segment is the super-polished to an average surface roughness of approx. 3.25 angstrom rms. by mirror shell replication, this combination of good figure and low surface roughness has enabled us to achieve 15 arcsec, confirmed by X-ray measurements in the Marshall Space Flight Center 102 meter test facility. To image the focused

X-rays requires a focal plane detector with appropriate spatial resolution. For 15 arcsec optics of 6 meter focal length, this resolution must be around 200 microns. In addition, the detector must have a high efficiency, relatively high energy resolution, and low background. We are currently developing Cadmium-Zinc-Telluride fine-pixel detectors for this purpose. The detectors under study consist of a 16x16 pixel array with a pixel pitch of 300 microns and are 1 mm and 2 mm thick. At 60 keV, the measured energy resolution is around 2%.
Author
X Ray Telescopes; Fabrication; Mandrels; Mirrors; Electroforming; Tests; Focal Plane Devices

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PLASMA PHYSICS

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

20030000685 NASA Glenn Research Center, Cleveland, OH USA
Plasma Emission Characteristics From a High Current Hollow Cathode in an Ion Thruster Discharge Chamber
Foster, John E., NASA Glenn Research Center, USA; Patterson, Michael J., NASA Glenn Research Center, USA; November 2002; 20p; In English; 38th Joint Propulsion Conference and Exhibit, 7-10 Jul. 2002, Indianapolis, IN, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 755-B4-04
Report No.(s): NASA/TM-2002-211876; NAS 1.15:211876; E-13558; AIAA Paper 2002-4102; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The presence of energetic ions produced by a hollow cathodes operating at high emission currents (greater than 5A) has been documented in the literature. In order to further elucidate these findings, an investigation of a high current cathode operating in an ion thruster discharge chamber has been undertaken. Using Langmuir probes, a low energy charged particle analyzer and emission spectroscopy, the behavior of the near-cathode plasma and the emitted ion energy distribution was characterized. The presence of energetic ions was confirmed. It was observed that these ions had energies in excess of the discharge voltage and thus cannot be simply explained by ions falling out of plasma through a potential difference of this order. Additionally, evidence provided by Langmuir probes suggests the existence of a double layer essentially separating the hollow cathode plasma column from the main discharge. The radial potential difference associated with this double layer was measured to be of order the ionization potential.
Author
High Current; Hollow Cathodes; Plasmas (Physics); Plasma Radiation; Electric Discharges; Thrust; Ion Engines

20030000976 NASA Marshall Space Flight Center, Huntsville, AL USA
Nonlinear Drift-Kinetic Equation in the Presence of a Circularly Polarized Wave
Khazanov, G. V., NASA Marshall Space Flight Center, USA; Krivorutsky, E. N., Alabama Univ., USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Equations of the single particle motion and nonlinear kinetic equation for plasma in the presence of a circularly polarized wave of arbitrary frequency in the drift approximation are presented. The nonstationarity and inhomogeneity of the plasma-wave system are taken into account. The time dependent part of the ponderomotive force is discussed.
Author
Nonlinear Equations; Kinetic Equations; Wave Equations; Plasma Waves

20030000987 NASA Marshall Space Flight Center, Huntsville, AL USA
NASA/Marshall Space Flight Center's Contributions to Space Plasma Physics
Adrian, M. L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Meeting of the Southeast Section of American Physical Society, 31 Oct. - 2 Nov. 2002, Auburn, AL, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since the mid-l970's, the Space Plasma Physics Group at NASA's Marshall Space Flight Center has contributed critical instrumentation to numerous satellite and sounding rocket missions exploring the plasmas of near-Earth space. This talk will

review major discoveries in Earth's ionosphere, plasmasphere, and magnetosphere directly attributable to the researchers of the Space Plasma Physics Group and the significance of these discoveries to the field of plasma physics.
Author
Plasmas (Physics); Plasma Physics; Space Plasmas

20030000997 NASA Marshall Space Flight Center, Huntsville, AL USA
Design of a Plasma Injector for a Pulsed Plasma Accelerator
Cassibry, J. T., NASA Marshall Space Flight Center, USA; Thio, Y. C. F., NASA Marshall Space Flight Center, USA; Markusic, T. E., NASA Marshall Space Flight Center, USA; Sommers, J., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; American Physical Society Division of Plasma Physics Annual Meeting, 15-17 Nov. 2002, Orlando, FL, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In recent years, a pulsed plasma accelerator has been proposed as a candidate stand-off driver for the formation of an imploding liner in magnetized target fusion. For a near-term physics exploratory experiment to study the feasibility of this standoff approach, a plasma accelerator has been proposed that requires the controlled introduction and preparation of the initial plasma for acceleration. This includes uniform injection of the propellant downstream of the breech with a high degree of ionization. The design of a plasma feed is presented, which injects a high conductivity, highly collisional propellant transverse to the conductor. The plasma injector is designed to establish an initial plasma with a moderate Hall parameter at the trailing edge of the plasma slug, high Hall parameter behind the slug for magnetic insulation, and a short diffusion length in comparison with characteristic dimensions of the plasma slug to avoid propellant loss at the trailing edge.
Author
Plasma Accelerators; Magnetization; Injectors; Linings; Implosions; Magnetic Diffusion

20030001013 NASA Marshall Space Flight Center, Huntsville, AL USA
Pulsed Electromagnetic Acceleration of Plasma: A Review
Thio, Y. C. Francis, NASA Marshall Space Flight Center, USA; Turchi, Peter J., Air Force Research Lab., USA; Markusic, Thomas E., NASA Marshall Space Flight Center, USA; Cassibry, Jason T., NASA Marshall Space Flight Center, USA; Sommer, James, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; American Physical Society Division of Plasma Physics Annual Meeting, 11-15 Nov. 2002, Orlando, FL, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Much have been learned in the acceleration mechanisms involved in accelerating a plasma electromagnetically in the laboratory over the last 40 years since the early review by Winston Bostik of 1963, but the accumulated understanding is very much scattered throughout the literature. This literature extends back at least to the early sixties and includes Rosenbluth's snowplow model, discussions by Ralph Lovberg, Colgate's boundary-layer model of a current sheet, many papers from the activity at Columbia by Robert Gross and his colleagues, and the relevant, 1-D unsteady descriptions developed from the U. of Maryland theta-pinch studies. Recent progress on the understanding of the pulsed penetration of magnetic fields into collisionless or nearly collisionless plasmas are also be reviewed. Somewhat more recently, we have the two-dimensional, unsteady results in the collisional regime associated with so-called wall-instability in large radius pinch discharges and also in coaxial plasma guns (e.g., Plasma Flow Switch). Among other things, for example, we have the phenomenon of a high- density plasma discharge propagating in a cooaxial gun as an apparently straight sheet (vs paraboloid) because mass re-distribution (on a microsecond timescale) compensates for the 1/r- squared variation of magnetic pressure. We will attempt to collate some of this vast material and bring some coherence tc the development of the subject.
Author
Electromagnetic Acceleration; Plasmas (Physics); Current Sheets; Magnetic Fields; Theta Pinch; Magnetohydrodynamic Flow

20030001668 Princeton Univ., Plasma Physics Lab., NJ USA
ECR Plasma Source for Heavy Ion Beam Charge Neutralization
Efthimion, P. C.; Gilson, E.; Grishman, L.; Kolchin, P.; Davidson, R. C.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-799662; No Copyright; Avail: National Technical Information Service (NTIS)

Highly ionized plasmas are being considered as a medium for charge neutralizing heavy ion beams in order to focus beyond the space-charge limit. Calculations suggest that plasma at a density of 1 - 100 times the ion beam density and at a length of approximately 0.1-2 m would be suitable for achieving a high level of charge neutralization. An ECR source has been built at the Princeton Plasma Physics Laboratory (PPPL) to support a joint Neutralized Transport Experiment (NTX) at the Lawrence Berkeley National Laboratory (LBNL) to study ion beam neutralization with plasma. The ECR source operates at 13.6 MHz and

with solenoid magnetic fields of 1-10 gauss. The goal is to operate the source at pressures of approximately 10(sup -6) torr at full ionization. The initial operation of the source has been at pressures of 10(sup -4) - 10(sup -1). Electron densities in the range of 108 - 10(sup 11) per cubic centimeter have been achieved. Low-pressure operation is important to reduce ion beam ionization. A cusp magnetic field has been installed to improve radial confinement and reduce the field strength on the beam axis. In addition, axial confinement is believed to be important to achieve lower-pressure operation. To further improve breakdown at low pressure, a weak electron source will be placed near the end of the ECR source.
NTIS
Ion Beams; Plasmas (Physics); Magnetic Fields; Cyclotron Resonance; Ionic Collisions

20030001692 Washington Univ., Aeronautics and Astronautics, Seattle, WA USA
Magnetic Mode Analysis in the Zap Flow-Stabilized Z-Pinch Experiment
Bright, Justin E.; Jan. 2002; 134p; In English; Original contains color images
Report No.(s): AD-A407862; CI02--511; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The Zap Flow-Stabilized Z-pinch experiment at the University of Washington studies the stabilizing effects of sheared flow on a Z-pinch. An internal eight-probe azimuthal array is used to measure the magnetic field. Fourier analysis of the magnetic field yields information on the structure of the plasma. The m=1 mode is related to the radial offset of the plasma, while the m=2 mode is related to the elongation of the plasma. Using this information, a non-linear fitting routine was developed to determine the radial position and structure of the plasma. The plasma is simulated as two independent current-carrying filaments. to improve speed and accuracy, a neural net was developed. The neural net attempts to simulate the non-linear fit as closely as possible while performing at speeds up to twenty times faster. Unlike a non-linear fitting routine, the neural net requires no initial guesses, and thus runs independently of the user. Testing of both the neural net and the non-linear fitting routine show that both techniques compute results which fit the experimental m=1 data well. Both techniques display similar error, although the neural net is less accurate during periods is which the plasma is unstable. Further work is being done to improve the calculation of the separation between the two filaments.
DTIC
Magnetic Fields; Shear Flow; Zeta Pinch; Coupled Modes; Stability; Functions (Mathematics)

20030001755 Lawrence Livermore National Lab., Livermore, CA USA
Oblique Stimulated Raman Scattering of a Short Laser Pulse in a Plasma Channel
Turano, E. J.; McKinstrie, C. J.; Feb. 22, 2000; 36p; In English
Report No.(s): DE2002-793447; UCRL-ID-137815; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Early work on the spatiotemporal evolution of parametric instabilities was described by Bers. Recently, there has been a resurgence of interest in the spatiotemporal evolution of stimulated Raman scattering (SRS) and simulated Brillouin scattering (SBS), driven by the realization that the transient phase of these instabilities dominates many experiments. This current work serves to expand and unify our previous works by developing an analytic model of parametric instabilities within a plasma channel which includes the effects of two spatial dimensions, damping, finite pulse and plasma boundaries, and oblique reflections of the daughter waves induced by lateral density variations.
NTIS
Mathematical Models; Plasmas (Physics); Raman Spectra; Stability; Parameterization; Laser Plasmas; Obliqueness

20030001769 Maryland Univ., College Park, MD USA
End-to-End Simulation: The Front End
Haber, F.; Bieniosek, F. M.; Celata, C. M.; Friedman, A.; Grote, D. P.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently available only on CD-ROM
Report No.(s): DE2002-799659; No Copyright; Avail: National Technical Information Service (NTIS)
For the intense beams in heavy ion fusion accelerators, details of the beam distribution as it emerges from the source region can determine the beam behavior well downstream. This occurs because collective space-charge modes excited as the beam is born remain undamped for many focusing periods. Traditional studies of the source region in particle beam systems have emphasized the behavior of averaged beam characteristics, such as total current, rms beam size, or emittance, rather than the details of the full beam distribution function that are necessary to predict the excitation of these modes. Simulations of the beam in the source region and comparisons to experimental measurements at LBNL and the University of Maryland are presented to illustrate some of the complexity in beam characteristics that has been uncovered as increased attention has been devoted to developing

a detailed understanding of the source region. Also discussed are methods of using the simulations to infer characteristics of the beam distribution that can be difficult to measure directly.
NTIS
Particle Beams; Distribution Functions; Simulation

20030001777 Stanford Linear Accelerator Center, USA
Plasma Wakefield Acceleration for Ultra High Energy Cosmic Rays
Chen, P.; Tajima, T.; Takahashi, Y.; Sep. 2002; 10p; In English
Report No.(s): DE2002-799975; SLAC/PUB-9330; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A cosmic acceleration mechanism is introduced which is based on the wakefields excited by the Alfven shocks in a relativistically flowing plasma. We show that there exists a threshold condition for transparency below which the accelerating particle is collision-free and suffers little energy loss in the plasma medium. The stochastic encounters of the random accelerating-decelerating phases results in a power-law energy spectrum. As an example, we discuss the possible production of super-GZK ultra high energy cosmic rays (UHECR) in the atmosphere of gamma ray bursts. The estimated event rate in our model agrees with that from UHECR observations.
NTIS
Cosmic Rays; Plasma Physics; Accelerators

20030001796 Universitaet der Bundeswehr Muenchen, Neubiberg, Germany
Entwicklung eines Breitstrahl-Plasmabrenners zur Behandlung planarer Oberflaechen (The Development of a Wide-Beam Plasma Burner for the Treatment of Planary Surfaces)
Hartmann, Ralf; Jan. 2000; 123p; In German; Original contains color images
Report No.(s): AD-A407850; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
The study describes the development of an innovative wide-beam plasma burner which avoids the hitherto commonly found limitations in plasma burners and might open up new fields of application as well. The new plasma burner is compared to its predecessors in chapters two and three, the latter of which also includes a description of the usage parameters and potential of reactive plasma gases. Important characteristics of the arc discharge are discussed in chapter four. The stability of the arc discharge and the quality of the plasma lame are examined in chapter five by means of adapted electrical, magnetic, optical, acoustic, and calorimetric processes of measuring. The new burner shows marked improvement in safety, work conditions, and process gas composition.
DTIC
Plasmas (Physics); Burners; Calorimeters; Stability

20030001802 Lawrence Livermore National Lab., Livermore, CA USA
EUV Engineering Test Stand
Tichenor, D. A.; Kubiak, G. D.; Replogle, W. C.; Klebanoff, L. E.; Wronosky, J. B.; Feb. 14, 2000; 26p; In English
Report No.(s): DE2002-792716; UCRL-JC-137668; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Engineering Test Stand (ETS) is an EUV laboratory lithography tool. The purpose of the ETS is to demonstrate EUV full-field imaging and provide data required to support production-tool development. The ETS is configured to separate the imaging system and stages from the illumination system. Environmental conditions can be controlled independently in the two modules to maximize EUV throughput and environmental control. A source of 13.4 nm radiation is provided by a laser plasma source in which a YAG laser beam is focused onto a xenon-cluster target. A condenser system, comprised of multilayer-coated mirrors and grazing-incidence mirrors, collects the EUV radiation and directs it onto a-reflecting reticle. A four-mirror, ring-field optical system, having a numerical aperture of 0.1, projects a 4x-reduction image onto the wafer plane. This design corresponds to a resolution of 70nm at a kl of 0.52. The ETS is designed to produce full-field images in step: and-scan mode using vacuum-compatible, one-dimension-long-travel magnetically levitated stages for both reticle and wafer. Reticle protection is incorporated into the ETS design. This paper provides a system overview of the ETS design and specifications.
NTIS
Extreme Ultraviolet Radiation; Lithography; Systems Engineering; Design Analysis; Laser Beams; Imaging Techniques

20030001806 Lawrence Livermore National Lab., Livermore, CA USA
Spherical Torus Center Stack Design
Neumeyer, C.; Heitzenroeder, P.; Kessel, C.; Ono, M.; Peng, M.; Jan. 2002; 14p; In English
Report No.(s): DE2002-793024; PPPL-3652; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The low aspect ratio spherical torus (ST) configuration requires that the center stack design be optimized within a limited available space, using materials within their established allowables. This paper presents center stack design methods developed by the National Spherical Torus Experiment (NSTX) Project Team during the initial design of NSTX, and more recently for studies of a possible next step ST (NSST) device.
NTIS
Low Aspect Ratio; Toruses; Design Analysis; Spherical Coordinates; Design Optimization

20030001809 Lawrence Livermore National Lab., Livermore, CA USA
Final Report Sustained Spheromak Physics Project FY 1997 - FY 1999
Hooper, E. B.; Hill, D. N.; Feb. 29, 2000; 38p; In English
Report No.(s): DE2002-793450; UCRL-ID-137784; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
There are two bolometry systems on SSPX, one that measures the total radiated power and a 16-channel array to measure the radiation profile. The first collimates the radiation through two slits in the horizontal plane spaced a distance s = 1.2 cm apart. The slit heights are h = l/100 th of an inch, and the detector material is behind the second one. The number of electrons generated per photon is proportional to the photon energy (except for a factor of 3-4 enhancement in efficiency in the visible) so that the current of electrons is proportional to the power received. The power is in turn the product of the flux hitting the detector material and the projected perpendicular area of the slab material to the line of sight (which is often at an angle to the slab).
NTIS
Experimentation; Spheromaks

20030001814 Lawrence Livermore National Lab., Livermore, CA USA
Preliminary Report on Supersonic Jet Modeling
Lasinski, B.; Jun. 06, 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-793559; UCRL-ID-139231; No Copyright; Avail: National Technical Information Service (NTIS)
The accompanying figures show the problem setup and radiation temperature (Tr) results for a simulation of a solid gold half-hohlra irradiated with the 12 specified Omega laser beams using the incident pulse shape for shot 18080. The experimental package is not included in this modeling; the hohlraum has a solid gold wall at the experimental package position. Figure-l shows the initial zoning and focusing of the two sets of laser beams. Figure 2 identifies the 4 regions over which we track the Tr as the simulation proceeds Figures 3a-3d are plots of Tr in keV versus time in ns for the regions specified in Figure 2. Figure 4 is a plot of Tr in keV versus time in ns. This Tr is computed from the emitted radiation flux using the original size of the laser entrance hole.
NTIS
Supersonic Jet Flow; Irradiation; Laser Beams

20030001819 Lawrence Livermore National Lab., Livermore, CA USA
Modeling the Backscatter and Transmitted Light of High Power Smoothed Beam with pF3D, a Massively parallel Laser Plasma Interaction Code
Berger, R. L.; Glenzer, S. H.; Hinkel, D. E.; Kirkwood, R. K.; Langdon, A. B.; Jun. 2000; 12p; In English
Report No.(s): DE2002-793610; UCRL-JC-137900; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Using the three-dimensional wave propagation code, F3D, and the massively parallel version pF3D, we have computed the transmitted and reflected light for laser and plasma conditions in experiments that simulated ignition hohlraum conditions. The frequency spectrum and the wavenumber spectrum of the transmitted light are calculated and used to identify the relative contributions of stimulated forward Brillouin and self-focusing in hydrocarbon-filled balloons, commonly called gasbags. The effect of beam smoothing, smoothing by spectral dispersion (SSD) and polarization smoothing (PS), on the stimulated Brillouin backscatter (SBS) from Scale-1 NOVA hohlraums was simulated with the use nonlinear saturation models that limit the amplitude of the driven acoustic waves.
NTIS
Plasmas (Physics); Wave Propagation; Ignition

20030001825 Stanford Linear Accelerator Center, USA
Status of the Plasma Wakefield Acceleration Experiment at the Stanford Linear Accelerator Center
Muggli, P.; Hogan, M. J.; Blue, B. E.; O'Connell, C.; Siemann, R. H.; Aug. 2002; 8p; In English
Report No.(s): DE2002-800030; SLAC-PUB-9412; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A plasma wakefield acceleration experiment is conducted at the Stanford Linear Accelerator Center. This experiment addresses the issues relevant to a meter-long plasma accelerator module in the context of a high-energy accelerator.
NTIS
Plasma Accelerators; Linear Accelerators

20030001933 Lawrence Livermore National Lab., Livermore, CA USA
Electron Cloud Effects in Intense, Ion Beam Linacs Theory and Experimental Planning for HIF
Molvik, A. W.; Cohen, R. H.; Lund, S. M.; Bieniosek, F. M.; Lee, E. P.; May 21, 2002; 7p; In English
Report No.(s): DE2002-799650; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Heavy-ion accelerators for HIF will operate at high aperture-fill factors with high beam current and long pulses. This will lead to beam ions impacting walls: liberating gas molecules and secondary electrons. Theory and particle-in-cell simulations suggest that electrons, from ionization of residual and desorbed gas and secondary electrons from vacuum walls, will be radially trapped in the approximately 4 kV ion beam potential. Diagnostics are being developed tto measure the energy and flux of electrons and gas evolved from walls, and the net charge and gas density within magnetic quadrupoles, as well as their effect on the ion beam.
NTIS
Ion Accelerators; Ion Beams; Linear Accelerators; Electron Clouds

20030001935 Lawrence Livermore National Lab., Livermore, CA USA
Angular Dependence of 3 omega (sub o)/2 Spectra from Laser-Produced Plasmas
Young, P. E.; Moody, J. D.; Rozmus, W.; Aug. 25, 1999; 10p; In English
Report No.(s): DE2002-793600; UCRL-JC-128895; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Scattered light at three-halves of the incident laser frequency from solid targets is observed at five different angles. When the incident laser intensity is low enough, rescattering of two plasmon decay (TPD) instability electron plasma waves by ion acoustic waves is not significant. In this regime, Thomson scattering measurements of the electron temperature and the plasma flow velocity allow quantitative comparison of the angular dependence of the spectrum to theory.
NTIS
Angular Distribution; Plasmas (Physics); Light Scattering; Laser Beams; Spectra

20030001938 Lawrence Livermore National Lab., Livermore, CA USA
Hybrid Ray/Wave Optics for Laser-Plasma Interaction
Ratowsky, R. P.; Kallman, J. S.; Afeyan, B. B.; Feit, M. D.; Feb. 18, 1999; 14p; In English
Report No.(s): DE2002-792778; UCRL-ID-133168; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This aim of this FY 1998 LDRD project was to create a computational tool which bridges the gap between wave and ray optical regimes, important for application areas such as laser propagation in plasma and multimode photonics. We used phase space methods, where a set of rays distributed in a particular way in position and angle retain many essential features of wave optics. To characterize and enhance our understanding of the method, we developed a GUI-based photonics tool which can analyze light propagation in systems with a variety of axial and transverse refractive index distributions.
NTIS
Geometrical Optics; Laser Plasma Interactions; Photonics; Wave Propagation

20030001939 Lawrence Livermore National Lab., Livermore, CA USA
Scope of Work for Integration Management and Installation Services of the National Ignition Facility Beampath Infrastructure System
Coyle, P. D.; Mar. 19, 2000; 264p; In English
Report No.(s): DE2002-792694; NIF-0045051-REV-1; UCRL-ID-138208; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The goal of the National Ignition Facility (NIF) project is to provide an above ground experimental capability for maintaining nuclear competence and weapons effects simulation and to provide a facility capable of achieving fusion ignition using solid-state lasers as the energy driver. The facility will incorporate 192 laser beams, which will be focused onto a small target located at the center of a spherical target chamber-the energy from the laser beams will be deposited in a few billionths of a second. The target will then implode, forcing atomic nuclei to sufficiently high temperatures and densities necessary to achieve a miniature fusion reaction. The NIF is under construction, at Livermore, California, located approximately 50 miles southeast of San Francisco, California. The University of California, Lawrence Livermore National Laboratory (LLNL), operating under Prime Contract

W-7405-ENG. 48 with the U.S. Department of Energy (DOE), shall subcontract for Integration Management and Installation (IMI) Services for the Beampath Infrastructure System (BIS). The BIS includes Beampath Hardware and Beampath Utilities. Conventional Facilities work for the NIF Laser and Target Area Building (LTAB) and Optics Assembly Building (OAB) is over 86 percent constructed. This Scope of Work is for Integration Management and Installation (IMI) Services corresponding to Management Services, Design Integration Services, Construction Services, and Commissioning Services for the NIB BIS. The BIS includes Beampath Hardware and Beampath Utilities. Beampath Hardware and Beampath Utilities include beampath vessels, enclosures, and beam tubes; auxiliary and utility systems; and support structures. A substantial amount of GFE will be provided by the University for installation as part of the infrastructure packages.
NTIS
Ignition Systems; Systems Integration; Project Management; Installing; Laser Beams

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SOLID-STATE PHYSICS

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

20030000435 NASA Marshall Space Flight Center, Huntsville, AL USA
Surface Processes of Faceted Growth
Chernov, A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 14th American Conference on Crystal Growth and Epitaxy, 5-9 Aug. 2002, Seattle, WA, USA
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

Atomic force microscopy and high precision optical interferometry allow to analyze the processes that are in the core of our present understanding of faceted crystal growth. Some of these processes will be reviewed. Recent experiments suggest that the Gibbs-Thomson Law (GTL) may not be applicable to the weakly fluctuating strongly polygonized steps, with low kink density. Propagation rate of a straight short step segment changes with the segment length much steeper than predicted by GTL. If the step fluctuations are still well developed, the typical transition length may be determined just by the radius of rounded comers of the polygonized step. If fluctuations do not have enough time to develop, the kinetic effects may be essential. Indeed, 'communications' between comers of a short straight step segment may occur and, thus, the GTL may be implemented only via kink exchange. E.g., dissolutions of this short segment at macroscopic equilibrium occurs as follows: The kinks are split from one comer as a result of fluctuations, and annihilate with kinks of the opposite sign generated by another comer. Similarly, an exchange via chain of kinks on a rough step is the mechanism to implement the GT Law. If there is a supersaturation with respect to a large crystal, the kinks not only diffuse along the step, but move back the generating comers. This 'wind' prevents communication between the comers and places upper limit supersaturation only below which GTL is applicable. Steps replace kinks in the 3D case, though, of course, another dimensionality brings about another physics. Another specific problem to think about is if fluctuations are always fast enough to provide enough kinks for linear dependence of step rate on supersaturation. Increasing azimuthal polygonization of growth hillocks is a sign of insufficient fluctuation rate. Morphological stability of vicinal faces is usually considered on the basis of mutually parallel steps. Azimuthal anisotropy and interlacing of step bunches inducing the well known bunch splitting is another challenge. Among other challenging problems are: existence of surface diffusion on the crystal/so1ution interface, step interaction in solutions, achievement of step flow modes from liquids, impurity effects. New phenomena essential in biomacromolecular crystallization is another interesting area.
Author
Surface Diffusion; Supersaturation; Crystal Growth; Surface Properties; Crystal Defects

20030000443 NASA Marshall Space Flight Center, Huntsville, AL USA
DMA Modulus as a Screening Parameter for Compatibility of Polymeric Containment Materials with Various Solutions for use in Space Shuttle Microgravity Protein Crystal Growth (PCG) Experiments
Wingard, Charles Doug, NASA Marshall Space Flight Center, USA; [2002]; 6p; In English; North American Thermal Analysis Society (NATAS) Conference, 23-25 Sep. 2002, Pittsburgh, PA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Protein crystals are grown in microgravity experiments inside the Space Shuttle during orbit. Such crystals are basically grown in a five-component system containing a salt, buffer, polymer, organic and water. During these experiments, a number of different polymeric containment materials must be compatible with up to hundreds of different PCG solutions in various concentrations for durations up to 180 days. When such compatibility experiments are performed at NASA/MSFC (Marshall

Space Flight Center) simultaneously on containment material samples immersed in various solutions in vials, the samples are rather small out of necessity. DMA4 modulus was often used as the primary screening parameter for such small samples as a pass/fail criterion for incompatibility issues. In particular, the TA Instruments DMA 2980 film tension clamp was used to test rubber O-rings as small in I.D. as 0.091 in. by cutting through the cross-section at one place, then clamping the stretched linear cord stock at each end. The film tension clamp was also used to successfully test short length samples of medical/surgical grade tubing with an O.D. of 0.125 in.
Author
Spaceborne Experiments; Protein Crystal Growth; Microgravity; Materials Selection; Compatibility; Containment; Polymer Blends

20030000661 Sandia National Labs., Albuquerque, NM USA
Microstructures, Phase Formation, and Stress of Reactively-Deposited Metal Hydride Thin Films
Adams, D. P.; Romero, J. A.; Rodriguez, M. A.; Floro, J. A.; Kotula, P. G.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800984; SAND2002-1466; No Copyright; Avail: National Technical Information Service (NTIS)
This document summarizes research of reactively deposited metal hydride thin films and their properties. Reactive deposition processes are of interest, because desired stoichiometric phases are created in a one-step process. In general, this allows for better control of film stress compared with two-step processes that react hydrogen with pre-deposited metal films. Films grown by reactive methods potentially have improved mechanical integrity, performance and aging characteristics. The two reactive deposition techniques described in this report are reactive sputter deposition and reactive deposition involving electron-beam evaporation. Erbium hydride thin films are the main focus of this work. ErHx films are grown by ion beam sputtering erbium in the presence of hydrogen.
NTIS
Deposition; Metal Hydrides; Microstructure; Thin Films; Erbium; Reactivity; Stoichiometry

20030000673 Stanford Linear Accelerator Center, Stanford, CA USA
DIRC: The Particle Identification System for BaBar
Leith, D. W. G.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800026; SLAC-PUB-9406; No Copyright; Avail: National Technical Information Service (NTIS)
The author has the pleasure of reporting on the status of the DIRC particle identification sub-system of the BaBar Detector, running at the asymmetric B Factory at SLAC. The acronym DIRC stands for 'Detection of Internally Reflected Cherenkov Light.' This device grows out of our group's experience with ring-imaging Cherenkov devices founded on a long partnership with Tom Ypsilantis and in particular with the CRID device for the SLD experiment(5). Blair Ratcliff had the brilliant idea of using the totally internally reflected Cherenkov light created in quartz bars, and transported out to the photon detectors by those same quartz bars, to provide excellent pi, K, p particle identification in the momentum range important for the B Factory. His naming of this new instrument was aptly 'CRID' spelled backwards. The detailed design, building and commissioning of the DIRC sub-system was the work of a large international collaboration of French and U.S. groups. The device has proven to be a very robust detector, with the promised performance essentially fully realized, and is being effectively utilized in almost all of the current BaBar physics analysis.
NTIS
Storage Rings (Particle Accelerators); Asymmetry; Detectors; Cerenkov Counters

20030000674 Stanford Linear Accelerator Center, Stanford, CA USA
Harmonic Cavities and Longitudinal Beam Stability in Electron Storage Rings
Byrd, J. M.; DeSantin, S.; Stover, G.; Teytelman, D.; Fox, J.; Aug. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800008; SLAC-PUB-9367; No Copyright; Avail: National Technical Information Service (NTIS)
Harmonic cavities have been used in storage rings to increase beam lifetime and Landau damping by lengthening the bunch. The need for lifetime increase is particularly great in the present generation of low to medium energy synchrotron light sources where the small transverse beam sizes lead to realitively short life-times from large-angle intrabeam (Touschek) scattering. We review the beam dynamics of harmonic radiofrequency (RF) systems and discuss effects on longitudinal beam stability.
NTIS
Cavities; Storage Rings (Particle Accelerators); Beams (Radiation); Harmonics; Electrons; Longitudinal Waves; Stability

20030000696 Stanford Linear Accelerator Center, Stanford, CA USA

Study of Time-Dependent CP Asymmetry in B(sup 0) Yields J/(Psi) (Pi(sup o)) Decays

Jul. 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): DE2002-799950; SLAC-PUB-9298; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available.

NTIS

Asymmetry; Time Dependence; Cp Violation; Standard Model (Particle Physics); Particle Decay

20030001010 NASA Marshall Space Flight Center, Huntsville, AL USA

Bridgman Growth of Germanium Crystals in a Rotating Magnetic Field

Volz, M. P., NASA Marshall Space Flight Center, USA; Schweizer, M., Universities Space Research Association, USA; Cobb, S. D., NASA Marshall Space Flight Center, USA; Walker, J. S., Illinois Univ., USA; Szofran, F. R., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 14th American Conference on Crystal Growth, 4-9 Aug. 2002, Seattle, WA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A series of (100)-oriented gallium-doped germanium crystals have been grown by the Bridgman method and under the influence of a rotating magnetic field (RMF). The RMF has a marked affect on the interface shape, changing it from concave to nearly flat. The onset of time-dependent flow instabilities occurs when the critical magnetic Taylor number is exceeded, and this can be observed by noting the appearance of striations in the grown crystals. The critical magnetic Taylor number is a sensitive function of the aspect ratio and, as the crystal grows under a constant applied magnetic field, the induced striations change from nonperiodic to periodic, undergo a period-doubling transition, and then cease to exist. Also, by pulsing the RMF on and off, it is shown that intentional interface demarcations can be introduced.

Author

Bridgman Method; Crystal Growth; Germanium; Magnetic Fields; Rotation

20030001012 NASA Marshall Space Flight Center, Huntsville, AL USA

Application of Powder Diffraction Methods to the Analysis of the Atomic Structure of Nanocrystals: The Concept of the Apparent Lattice Parameter (ALP)

Palosz, B., Polish Academy of Sciences, Poland; Grzanka, E., Polish Academy of Sciences, Poland; Gierlotka, S., Polish Academy of Sciences, Poland; Stelmakh, S., Polish Academy of Sciences, Poland; Pielaszek, R., Polish Academy of Sciences, Poland; Bismayer, U., Hamburg Univ., Germany; Weber, H.-P., European Synchrotron Radiation Facility, France; Palosz, W., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; XIX Congress of the International Union of Crystallography, 6-15 Aug. 2002, Geneva, Switzerland; Sponsored by International Union of Crystallography, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The applicability of standard methods of elaboration of powder diffraction data for determination of the structure of nano-size crystallites is analysed. Based on our theoretical calculations of powder diffraction data we show, that the assumption of the infinite crystal lattice for nanocrystals smaller than 20 nm in size is not justified. Application of conventional tools developed for elaboration of powder diffraction data, like the Rietveld method, may lead to erroneous interpretation of the experimental results. An alternate evaluation of diffraction data of nanoparticles, based on the so-called 'apparent lattice parameter' (alp) is introduced. We assume a model of nanocrystal having a grain core with well-defined crystal structure, surrounded by a surface shell with the atomic structure similar to that of the core but being under a strain (compressive or tensile). The two structural components, the core and the shell, form essentially a composite crystal with interfering, inseparable diffraction properties. Because the structure of such a nanocrystal is not uniform, it defies the basic definitions of an unambiguous crystallographic phase. Consequently, a set of lattice parameters used for characterization of simple crystal phases is insufficient for a proper description of the complex structure of nanocrystals. We developed a method of evaluation of powder diffraction data of nanocrystals, which refers to a core-shell model and is based on the 'apparent lattice parameter' methodology. For a given diffraction pattem, the alp values are calculated for every individual Bragg reflection. For nanocrystals the alp values depend on the diffraction vector Q. by modeling different a0tomic structures of nanocrystals and calculating theoretically corresponding diffraction patterns using the Debye functions we showed, that alp-Q plots show characteristic shapes which can be used for evaluation of the atomic structure of the core-shell system. We show, that using a simple model of a nanocrystal with spherical shape and centro-symmetric strain at the surface shell we obtain theoretical alp-Q values which match very well the alp-Q plots determined experimentally for Sic, GaN, and diamond nanopowders. The theoretical models are defined by the lattice parameter of the grain core, thickness of the surface shell, and the magnitude and distribution of the strain field in the surface shell. According to our calculations, the part of the diffraction pattern measured at relatively low diffraction vectors Q (below 10/angstrom) provides information on the surface

strain, whle determination of the lattice parameters in the grain core requires measurements at large Q-values (above 15 - 20/angstrom).
Author
Atomic Structure; Diffraction; Nanocrystals; Lattice Parameters

20030001553 NASA Marshall Space Flight Center, Huntsville, AL USA
Characterizing Thermal Properties of Melting Te Semiconductor: Thermal Diffusivity Measurements and Simulation
Zhu, Shen, Universities Space Research Association, USA; Su, Ching-Hua, NASA Marshall Space Flight Center, USA; Li, C., Alabama Univ., USA; Lin, B., Alabama Univ., USA; Ben, H., Alabama Univ., USA; Scripa, R. N., Alabama Univ., USA; Lehoczky, S. L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Fourteenth American Conference on Crystal Growth and Epitaxy, 5 Aug. 2002, Seattle, WA, USA
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

Tellurium is an element for many II-VI and I-III-VI(sub 2) compounds that are useful materials for fabricating many devises. In the melt growth techniques, the thermal properties of the molten phase are important parameter for controlling growth process to improve semiconducting crystal quality. In this study, thermal diffusivity of molten tellurium has been measured by a laser flash method in the temperature range from 500 C to 900 C. A pulsed laser with 1064 nm wavelength is focused on one side of the measured sample. The thermal diffusivity can be estimated from the temperature transient at the other side of the sample. A numerical simulation based on the thermal transport process has been also performed. by numerically fitting the experimental results, both the thermal conductivity and heat capacity can be derived. A relaxation phenomenon, which shows a slow drift of the measured thermal conductivity toward the equilibrium value after cooling of the sample, was observed for the first time. The error analysis and the comparison of the results to published data measured by other techniques will be discussed in the presentation.
Author
Thermal Conductivity; Thermal Diffusivity; Melts (Crystal Growth); Tellurium

20030001694 NASA Marshall Space Flight Center, Huntsville, AL USA
A Proposed Model for Protein Crystal Nucleation and Growth
Pusey, Marc, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Seminar at University of Alabama in Huntsville, 30 Aug. 2002, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

How does one take a molecule, strongly asymmetric in both shape and charge distribution, and assemble it into a crystal? We propose a model for the nucleation and crystal growth process for tetragonal lysozyme, based upon fluorescence, light, neutron, and X-ray scattering data, size exclusion chromatography experiments, dialysis kinetics, AFM, and modeling of growth rate data, from this and other laboratories. The first species formed is postulated to be a 'head to side' dimer. Through repeating associations involving the same intermolecular interactions this grows to a 4(sub 3) helix structure, that in turn serves as the basic unit for nucleation and subsequent crystal growth. High salt attenuates surface charges while promoting hydrophobic interactions. Symmetry facilitates subsequent helix-helix self-association. Assembly stability is enhanced when a four helix structure is obtained, with each bound to two neighbors. Only two unique interactions are required. The first are those for helix formation, where the dominant interaction is the intermolecular bridging anion. The second is the anti-parallel side-by-side helix-helix interaction, guided by alternating pairs of symmetry related salt bridges along each side. At this stage all eight unique positions of the P4(sub3)2(sub 1),2(sub 1) unit cell are filled. The process is one of a) attenuating the most strongly interacting groups, such that b) the molecules begin to self-associate in defined patterns, so that c) symmetry is obtained, which d) propagates as a growing crystal. Simple and conceptually obvious in hindsight, this tells much about what we are empirically doing when we crystallize macromolecules. by adjusting the growth parameters we are empirically balancing the intermolecular interactions, preferentially attenuating the dominant strong (for lysozyme the charged groups) while strengthening the lesser strong (hydrophobic) interactions. In the general case for proteins the lack of a singularly defined association pathway may lead to formation of multiple species, i.e., amorphous precipitation. Weak interactions, such as hydrogen bonds, are promiscuous, serving to strengthen rather than define specific interactions. Participation in an interaction sequesters that surface from subsequent interactions, and we expect the strongest bonds to form first. This model, its basis, how it fits into the currently understood osmotic second virial coefficient approach to crystallization, and what it suggests will be discussed.
Author
Protein Crystal Growth; Crystallization; Crystal Structure; Molecular Interactions; Nucleation

20030001705 NASA Marshall Space Flight Center, Huntsville, AL USA

Surface Kinetics and Stability of Faceted Crystal Growth

Chernov, A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 14th American Conference on Crystal Growth, 4-9 Aug. 2002, Seattle, WA, USA

Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

The applicability of Gibbs-Thompson Law and other fundamental rules to faceted crystal growth will be discussed. Tutorial lecture will include fundamentals of interface kinetics.

Author

Crystal Growth; Kinetics; Surface Stability

20030001710 NASA Marshall Space Flight Center, Huntsville, AL USA

Effect of the Chemical State of the Surface on the Relaxation of the Surface Shell Atoms in SiC and GaN Nanocrystals

Palosz, B., Warsaw Univ., Poland; Grzanka, E., Warsaw Univ., Poland; Stelmakh, S., Warsaw Univ., Poland; Pielaszek, R., Warsaw Univ., Poland; Bismayer, U., Hamburg Univ., Germany; Weber, H. P., European Synchrotron Radiation Facility, France; Janik, J. F., University of Mining and Metallurgy, Poland; Palosz, W., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; XIX Congress of International Union of Crystallography, 6-15 Aug. 2002, Geneve, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

The effect of the chemical state of the surface of nanoparticles on the relaxation in the near-surface layer was examined using the concept of the apparent lattice parameter (alp) determined for different diffraction vectors Q. The apparent lattice parameter is a lattice parameter determined either from an individual Bragg reflection, or from a selected region of the diffraction pattern. At low diffraction vectors the Bragg peak positions are affected mainly by the structure of the near-surface layer, while at high Q-values only the interior of the nano-grain contributes to the diffraction pattern. Following the measurements on raw (as prepared) powders we investigated powders cleaned by annealing at 400C under vacuum, and the same powders wetted with water. Theoretical alp-Q plots showed that the structure of the surface layer depends on the sample treatment. Semi-quantitative analysis based on the comparison of the experimental and theoretical alp-Q plots was performed. Theoretical alp-Q relations were obtained from the diffraction patterns calculated for models of nanocrystals with a strained surface layer using the Debye functions.

Author

Nanocrystals; Surface Properties; Diffraction; Diffraction Patterns; Lattice Parameters

20030001757 Argonne National Lab., IL USA

Improving Exchange-Spring Magnets with Interfacial Modification

Jiang, J. S.; Pearson, J. E.; Bader, S. D.; Liu, J. P.; Aug. 2002; 16p; In English

Report No.(s): DE2002-799840; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Using magnetic thin film multilayers as model exchange-spring systems proves to be the promising intellectual path that helps generate the mechanistic and materials insights needed to create high-performance permanent magnet materials. We demonstrate a new route to improve exchange-spring magnets whereby the hard/soft interface in epitaxial Sm-Co/Fe and Sm-Co/Co bilayer thin film structures is modified via thermal processing. The effect of thermal processing is modeled with a graded interfacial region across which the material parameters vary linearly. We discuss the mechanism for improved exchange-spring behavior and the implication on magnet processing toward realizing the full potential of the exchange-spring principle.

NTIS

Epitaxy; Magnetic Materials; Thin Films; Mechanical Properties; Nanotechnology

20030001766 Argonne National Lab., IL USA

Biaxially Aligned Template Films Fabricated by Inclined-Substrate Deposition for YBCO-Coated Conductor Applications

Ma, B.; Li, M.; Koritala, R. E.; Fisher, B. L.; Markowitz, A. R.; 2002; 8p; In English

Report No.(s): DE2002-799836; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

No abstract available.

NTIS

Coatings; Conductors; Deposition; Substrates; YBCO Superconductors; Thin Films; Fabrication

20030001770 California Univ., Berkeley, CA USA

Radiative Transitions in InGaN Quantum-Well Structures

Shapiro, N. A.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-799651; No Copyright; Avail: National Technical Information Service (NTIS)

InGaN based light emitting devices demonstrate excellent luminescence properties and have great potential in lighting applications. Though these devices are already being produced on an industrial scale, the nature of their radiative transition is still not well understood. In particular, the role of the huge, built-in electric field in these transitions is still under debate. The luminescence characteristics of InGaN quantum well structures were investigated as a function of excitation power, temperature, and biaxial strain, with an intent of discerning the effects of the electric field and inhomogenous indium distribution in the QW on the radiative transition.

NTIS

Quantum Wells; Indium Compounds; Indium; Excitation

20030001821 Lawrence Livermore National Lab., Livermore, CA USA

Dislocation Multiplication in the Early Stage of Deformation in Mo Single Crystals

Hsiung, L. M.; Lassila, D. H.; Mar. 02, 2000; 12p; In English

Report No.(s): DE2002-793617; UCRL-JC-137859; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The main purpose of this study is to examine, analyze the initial dislocation structure and deformation substructure of Mo single crystals in order to provide detailed physical mechanisms to facilitate multi-scale modeling and dislocation dynamics simulation. For the success of simulation, it is of paramount importance to have a systematic and rigorous study on dynamic properties of dislocations including dislocation multiplication, motion, and dislocation interaction. Since the initial dislocation structures (dislocation density, dislocation configuration, free dislocation link length, kink and jog density) can all affect dislocation dynamics during subsequent plastic deformation, the dislocation substructures in as-annealed and quasi-statically compressed Mo crystals were studied and compared. Emphasis has been placed upon the role of initial dislocation structures in dislocation multiplication and motion during early stages of plastic deformation.

NTIS

Molybdenum; Crystal Dislocations; Single Crystals

20030001822 Stanford Linear Accelerator Center, USA

Power Density Spectral Analysis as a Method of Compact Object Determination in X-ray Binary Systems

Lee, J.; Aug. 14, 2002; 26p; In English

Report No.(s): DE2002-800021; SLAC-PUB-9391; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Mass determinations and X-ray energy spectral analyses are among the methods used to distinguish between the types of compact objects present in X-ray binary systems. We test a method of distinguishing between neutron stars and black holes proposed by Sunyaev and Revnivtsev where power density spectra are used, particularly in the 500-1000Hz range. Sunyaev and Revnivtsev found that only neutron stars appear to have significant power in this frequency range. We apply this criterion to 12 X-ray binary systems (six neutron stars and six black holes) using USA data and cannot reproduce Sunyaev and Revnivtsev's result. The reason for this discrepancy is most likely a USA instrumental effect which manifests itself as excess power in the frequency range of interest. Future work on correcting this problem should provide more accurate analyses that may yield a different result.

NTIS

Compact Galaxies; Spectrum Analysis

20030001907 Argonne National Lab., IL USA

Texture Development of MgO Buffer Layers Grown by Inclined Substrate Deposition

Koritala, R. E.; Miller, D. J.; Ma, B.; Li, M.; Fisher, B. L.; Jul. 2002; 10p; In English

Report No.(s): DE2002-801594; ANL/ET/CP-106990; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Biaxially texture magnesium oxide films used as template layers for YBCO-coated conductors have been grown efficiently and consistently by inclined substrate deposition (ISD). Further improvement in texture and a decrease in surface roughness were obtained by depositing a homoepitaxial magnesium oxide layer on the ISD at an elevated temperature and flat angle. The texture

of the ISD layer was studied as a function of thickness by X-ray diffraction and scanning and transmission electron microscopy. Surface roughness of the ISD and homoepitaxial layers was investigated by atomic force microscopy.
NTIS
Magnesium Oxides; Substrates

20030001926 NASA Marshall Space Flight Center, Huntsville, AL USA
A Model for Tetragonal Lysozyme Crystal Nucleation and Growth
Pusey, Marc L., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Macromolecular crystallization is a complex process, involving a system that typically has 5 or more components (macromolecule, water, buffer + counter ion, and precipitant). Whereas small molecules have only a few contacts in the crystal lattice, macromolecules generally have 10's or even 100's of contacts between molecules. These can range from hydrogen bonds (direct or water-mediated), through van der Waals, hydrophobic, salt bridges, and ion-mediated contacts. The latter interactions are stronger and require some specificity in the molecular alignment, while the others are weaker, more prevalent, and more promiscuous, i.e., can be readily broken and reformed between other sites. Formation of a consistent, ordered, 3D structure may be difficult or impossible in the absence of any or presence of too many strong interactions. Further complicating the process is the inherent structural asymmetry of monomeric (single chain) macromolecules. The process of crystal nucleation and growth involves the ordered assembly of growth units into a defined 3D lattice. We suggest that for many macromolecules, particularly those that are monomeric, this involves a preliminary solution-phase assembly process into a growth unit having some symmetry prior to addition to the lattice, recapitulating the initial stages of the nucleation process. If this model is correct then fluids and crystal growth models assuming a strictly monodisperse nutrient solution need to be revised. This model has been developed from experimental evidence based upon face growth rate, AFM, and fluorescence energy transfer data for the nucleation and growth of tetragonal lysozyme crystals.
Author
Nucleation; Crystal Growth; Lysozyme; Macromolecules; Models

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

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

20030000447 National Inst. of Standards and Technology, Gaithersburg, MD USA
Volume Visualization of Bose-Einstein Condensates
Ketcham, P. M.; Feder, D. L.; Clark, C. W.; Satterfield, S. G.; Griffin, T. J.; Apr. 30, 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2001-104058; NISTIR-6739; No Copyright; Avail: National Technical Information Service (NTIS)

Theoretical aspects of Bose-Einstein condensates are investigated by conducting computer simulations of their behavior. Scientific visualization techniques are employed in order to examine the large amount of data generated by simulation. Visualization of this simulated data demonstrates theoretical predictions, influences, and the research process, accelerates scientific understanding, and stimulates further investigation.
NTIS
Bose-Einstein Condensates; Computerized Simulation; Scientific Visualization; Data Simulation

20030001756 Stanford Linear Accelerator Center, USA
Complicated Bunch Pattern in PEP-II
Decker, F. J.; Donald, M. H. R.; Field, R. C.; Kulikov, A.; Seeman, J.; Jul. 2002; 8p; In English
Report No.(s): DE2002-800001; SLAC-PUB-9360; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

PEP-II, the asymmetric B-Factory at SLAC, has delivered a luminosity of 3.1 x 10 33 cm (-2) S(-1). This was achieved with 692 bunches in a basic 'by-3' bunch pattern. Many gaps in the bunch train were necessary to suppress a blow-up of the positron beam due to an electron cloud instability (ECI). The actual pattern had 10 bunches in a row (every third bucket), then 6 bunches missing. This 48-bucket long pattern was repeated till the last bucket (3320) before the ion clearing gap.
NTIS
Electron Bunching; Storage Rings (Particle Accelerators)

20030001778 Stanford Linear Accelerator Center, USA
Measurement of B(sup o) --> D(*)/s (sup +)D(sup *)(sup -) Branching Fractions and Polarization in the Decay B(sup o) --> D(sup*+)(sub s)D(sup*-) with a Partial Reconstruction Technique. The BABAR Collaboration
Jul. 25, 2002; 26p; In English
Report No.(s): DE2002-799970; SLAC-PUB-9321; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Polarization (Charge Separation); Radioactive Decay; Fractions

20030001779 Stanford Linear Accelerator Center, USA
Search for the Exclusive Radiative Decays B yields (rho)(gamma) and B(sup o) yields (omega)(gamma). The BABAR Collaboration
Jul. 24, 2002; 22p; In English
Report No.(s): DE2002-799969; SLAC-PUB-9319; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
No abstract available.
NTIS
Mesons; Radioactive Decay

20030001824 Stanford Linear Accelerator Center, Stanford, CA USA
Preliminary Study of D(sup o) --> K pi pi (sup o) Decays with Dalitz Plots
Gresham, M.; Aug. 13, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800024; SLAC-PUB-9401; No Copyright; Avail: National Technical Information Service (NTIS)
Particle physicists study the smallest particles and most basic rules of their interactions in humankind's current scope. The Charm analysis working group (CWG) of the BaBar Collaboration studies decays involving the charm quark. They currently study mixing in D decay, an interesting and poorly understood phenonmenon in current physics models.
NTIS
Quarks; Charm (Particle Physics)

20030001930 California Univ., Lawrence Berkeley National Lab., 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): DE2002-802035; 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 open bosonic string field theory and possible ramifications of this analogy are briefly mentioned.
NTIS
Gauge Theory; String Theory

20030001952 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Upgrade of CEBAF to 12 GeV: Physics Motivations and Technical Aspects
Mecking, B. A.; Cardman, L. S.; Aug. 26, 2002; 14p; In English
Report No.(s): DE2002-801026; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Continuous Electron Beam Accelerator Facility (CEBAF) makes use of electron and photon beams with an energy up to 6 GeV to investigate the electromagnetic structure of mesons, nucleons, and nuclei. We discuss the physics motivation for updgrading the facility to a maximum energy of 12 GeV and some of the key technical aspects of the upgrade.
NTIS
Electron Beams; Linear Accelerators; Particle Theory; Nuclei (Nuclear Physics)

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20030000670 Performance Inst., Arlington, VA USA
Creating a Performance-Based Electronic Government, Fiscal Year 2002 Progress
Oct. 30, 2002; 108p; In English
Report No.(s): PB2003-101198; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
;Table of Contents: Summary; Project objectives and rationale; FY 2002 Year-in-Review-Status and trends in e-Government; Managing e-Government Initatives-Lessons learned and Recommendations for the future; Show Me the Measures; Appendix A: FY 2002 Case Studies from Agencies and Appendix B: Project Sponsors.
NTIS
Management Planning; Computer Information Security

20030000671 Commerce Dept., Washington, DC USA
Summary Report on Federal Laboratory Technology Transfer. Agency Approaches: FY 2001 Activity Metrics and Outcomes
Sep. 2002; 114p; In English
Report No.(s): PB2003-101128; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This Summary Report provides a review and analysis of the Federal laboratories1 utilization of the technology transfer authorities opened to them by Federal law.2 It is the first edition in a new annual report series for the President and Congress in response to the Technology Transfer Commercialization Act of 2000 (P.L. 106-404, signed November 1, 2000). The report covers Federal laboratory technology transfer activities through FY 2001.
NTIS
Technology Transfer; Commercialization

20030000996 NASA Marshall Space Flight Center, Huntsville, AL USA
The Impact of Trust on Organization Commitment
Robinson, Kimberly, Alabama Univ., USA; [2002]; 1p; In English; American Society of Engineering Management, 2-5 Oct. 2002, Tampa, FL, USA; Sponsored by American Society for Engineering Management, USA; No Copyright; Avail: Issuing Activity; Abstract Only
As the global economy continues to spawn competitive forces, organizations have sought to become more competitive by cutting costs, eliminating non-value added work, and using more automation. Jobs have become broader and more flexible leading to a leaner workforce with higher-level knowledge and skills and more responsibility for day-to-day decisions. More than ever, organizations depend on employees as the innovators and designers of products and processes and as a source of strategic advantage. Therefore employee commitment among knowledge workers is needed to maintain organizational viability. It would seem that stronger relationships due to greater dependency, involvement, and investment would develop between employers and high-technology workers resulting in more committed employees. However, the opposite has been evidenced as key knowledge workers are changing jobs frequently. This may be due to a perceived lack of commitment by management to its employees. The notion of exchange may dominate the development of organizational commitment whereby an individual decides what to give a firm (commitment, extra effort, better performance, etc.) based on what the firm gives them (e.g., trust and security). It is the relationship between an employee's organizational commitment and the responding level of trust in the organization that is examined in this paper. An experiment is described that will seek to identify this relationship. Preliminary results are expected to show a positive relationship whereby employee commitment is positively correlated with organizational trust.
Author
Employment; Personnel; Employee Relations; Organizations

20030001564 NASA Marshall Space Flight Center, Huntsville, AL USA
Maximally Expressive Task Modeling
Japp, John, NASA Marshall Space Flight Center, USA; Davis, Elizabeth, NASA Marshall Space Flight Center, USA; [2002]; 2p; In English; SpaceOps 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only
Planning and scheduling systems organize "tasks" into a timeline or schedule. The tasks are defined within the scheduling system in logical containers called models. The dictionary might define a model of this type as "a system of things and relations satisfying a set of rules that, when applied to the things and relations, produce certainty about the tasks that are being modeled."

One challenging domain for a planning and scheduling system is the operation of on-board experiment activities for the Space Station. The equipment used in these experiments is some of the most complex hardware ever developed by mankind, the information sought by these experiments is at the cutting edge of scientific endeavor, and the procedures for executing the experiments are intricate and exacting. Scheduling is made more difficult by a scarcity of space station resources. The models to be fed into the scheduler must describe both the complexity of the experiments and procedures (to ensure a valid schedule) and the flexibilities of the procedures and the equipment (to effectively utilize available resources). Clearly, scheduling space station experiment operations calls for a ”maximally expressive” modeling schema. Modeling even the simplest of activities cannot be automated; no sensor can be attached to a piece of equipment that can discern how to use that piece of equipment; no camera can quantify how to operate a piece of equipment. Modeling is a human enterprise-both an art and a science. The modeling schema should allow the models to flow from the keyboard of the user as easily as works of literature flowed from the pen of Shakespeare. The Ground Systems Department at the Marshall Space Flight Center has embarked on an effort to develop a new scheduling engine that is highlighted by a maximally expressive modeling schema. This schema, presented in this paper, is a synergy of technological advances and domain-specific innovations.
Author
Support Systems; Mission Planning; Models; Scheduling

20030001666 Sandia National Labs., Albuquerque, NM USA
Laboratory Directed Research and Development
2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-800780; No Copyright; Avail: National Technical Information Service (NTIS)
This report summarizes progress from the Laboratory Directed Research and Development (LDRD) program during fiscal year 2001. In addition to a programmatic and financial overview, the report includes progress reports from 295 individual projects in 14 categories.
NTIS
Research and Development; Laboratories; Reports; Technology Utilization

20030001800 Lawrence Livermore National Lab., Livermore, CA USA
Scope of Work for Integration Management and Installation Services of the National Ignition Facility Beampath Infrastructure System
Coyle, P. D.; Apr. 25, 2000; 262p; In English
Report No.(s): DE2002-792693; UCRL-ID-138208-REV-1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The goal of the National Ignition Facility (NIF) project is to provide an aboveground experimental capability for maintaining nuclear competence and weapons effects simulation and to provide a facility capable of achieving fusion ignition using solid-state lasers as the energy driver. The facility will incorporate 192 laser beams, which will be focused onto a small target located at the center of a spherical target chamber-the energy from the laser beams will be deposited in a few billionths of a second. The target will then implode, forcing atomic nuclei to sufficiently high temperatures and densities necessary to achieve a miniature fusion reaction. The NIF is under construction, at Livermore, California, located approximately 50 miles southeast of San Francisco, California.
NTIS
Ignition Systems; Laser Beams; Systems Integration; Project Management; Installing; Nuclei (Nuclear Physics)

20030001850 QSS Group, Inc., Cleveland, OH USA
SAE G-11, AIAA, PMC Overview
Singhal, Suren, QSS Group, Inc., USA; Fifth Annual Workshop on the Application of Probabilistic Methods for Gas Turbine Engines; October 2002, pp. 49-94; In English; Also announced as 20030001844; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A10, Microfiche
Suren Singhal will focus on (1) the need, implementation issues, challenges, and order of magnitude cost & time saving benefits of implementing nontraditional approach in our industries and government agencies, (2) the need for training in academic institutions as well as within the industry and government agencies, and (3) the systems perspective for enabling mission-reliable, risk-averse, and safe yet economically-viable and internationally-competitive engineering practice in routine as well as highly complex strategic systems. Examples of already accrued benefits by using probabilistic approaches will be presented. The discussion will be linked with the role of professional societies. The discussion will include the genesis, progress, status, and future plans of the SAE G-11 Reliability, Maintainability, Supportability, and Logistics (RMSL) Division and especially the Probabilistic

Methods Committee (PMC). The PMC comprises more than one hundred industry, government, and academia engineers, scientists, managers, and professors. Some of the best professionals known nationally and internationally are actively involved in the PMC. They are working on documents including: (1) state-of-the-art probabilistic methods and software tools, (2) applications such as those for airworthiness, design, and manufacturing, (3) barriers to implementation of probabilistic methods, (4) legal issues in real-life applications, etc. The discussion will include the role and activities of the PMC co-group, the PM Leadership Council comprising of senior executives from industry, government, and academia. The AIAA activities in the area of non-deterministic approaches will also be presented. The discussion will conclude with recommendations for a national agenda to fully realize the potential of nontraditional approaches in engineering and non-engineering economies.
Author
Cost Reduction; Industries; Education; Systems Analysis; Engineering

20030001927 BJK Associates, Maplewood, NJ USA
Influence of R and D Expenditures on New Firm Formation and Economic Growth
Oct. 2002; 36p; In English
Report No.(s): PB2003-100698; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper describes research designed to determine whether university R&D activity affects the local rate of new firm formations and economic growth. We created a file of university R&D expenditures by Labor Market Area (LMA) in the U.S. and combined this with data on new business formations by LMA. The hypothesized relationships were tested using multiple regression analysis, while controlling for other relevant exogenous socio-economic variables. The results show that university R&D expenditures are significantly related to new firm formations in the same LMA. In addition, we tested for a relationship between R&D expenditures and local economic growth, measured as employment growth by LMA. The results show that university R&D expenditures are not significantly related to economic growth, once one has controlled for the birth rate in the previous period. However, the variations in the birth rates, which are affected by R&D spending, are strongly associated with the growth rates at the LMA level.
NTIS
Research and Development; Economic Development

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DOCUMENTATION AND INFORMATION SCIENCE

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

20030000643 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Ice Jams in Alaska. Ice Engineering. Number 16, February 1997
Eames, Heidi J.; White, Kate; Feb. 1997; 5p; In English; Original contains color images
Report No.(s): AD-A407543; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
An ice jam is an accumulation of ice in rivers that restricts flow and can cause destructive floods costly to riverine communities. Freezeup jams occur in early to midwinter when ice first forms in rivers. Breakup jams form in early spring when rising air temperature and/or rain events lead to rapid snowmelt, increases in runoff, and rapid increases in flow discharge. Ice covers break up and the resulting ice floes can become lodged at river bends, bridges, or narrow sections on the river or, more often, stop and accumulate where the river slope suddenly changes from relatively steep to mild. The ensuing blockage of the river cross section can cause a rapid rise in water levels that often leaves little time to prepare for flooding. Besides upstream flooding, ice jams often create serious problems to navigation. Damages to areas downstream of the ice jam can also be severe when the jam releases. The resulting water and ice surge can lead to the loss of barges and towboats, damages to mooring areas, bed and bank erosion, damage to wildlife and its habitat, and failure of bridges and other riverine structures.
DTIC
Data Bases; Water Flow; Ice Formation

20030000644 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Ice Jams, Winter 1996-1997
Peterson, Erika K.; Herrin, Lourie; White, Kate; Jun. 1998; 5p; In English; Original contains color images
Report No.(s): AD-A407542; No Copyright; Avail: Defense Technical Information Center (DTIC)

Rivers, streams, and lakes in cold regions freeze during winter months. Ice jams may form during initial ice cover formation (freezeup jams) or when ice cover breaks up (breakup jams). Both freezeup and breakup jams cause backwater flooding and damage to low-lying areas and municipal structures. Costly damages to riverine communities are a direct result of these ice jams, which often leave little time for engineers and state officials to prepare for flooding and evacuate the communities or structures to be affected by rapidly rising waters. Ice jams can cause an estimated $100 million in damages annually in the United States. Roads may be flooded and closed to traffic, or bridges weakened or destroyed, limiting emergency and medical relief to the affected areas. The potential exists for death or serious injury due to jam and flood conditions, or during evacuations. Engineers and state officials work together to prevent damages due to ice jams, and many are working to anticipate future measures required to prevent serious ice jams from forming. These efforts depend upon accurate and reliable ice jam data. The U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) Ice Jam Database is a compilation of freezeup and breakup ice jam events in the USA. Currently, there are more than 10, 500 entries in the database, dating from 1780. CRREL's Ice Jam Database is a reliable resource used to research previous ice jams and to predict and assess conditions that may increase the probability of an ice jam formation.
DTIC
Data Bases; Ice Formation

20030000723 Air War Coll., Maxwell AFB, AL USA
Legal Constraints on Information Warfare
Shulman, Mark R.; Mar. 1999; 36p; In English; Original contains color images
Report No.(s): AD-A407469; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
As societies and economies increasingly rely on electronic telecommunications, they grow more vulnerable to threats from other computer systems. At the same time, states' military and intelligence organizations are increasingly developing the capability to attack and defend these assets. As with the introduction of earlier weapons systems, some would-be users express the belief that the laws restraining warfare no longer apply. This essay seeks to explain the emerging relationship between technology, electronic telecommunications, and the laws of war. In particular, this essay seeks to show how the norm requiring the discrimination between military and civilian objectives may be retained in an era of long-distance warfare. Finally, it presents a model protocol to guide warriors and lawyers in planning or judging the legitimacy of information operations.
DTIC
Electronic Warfare; Vulnerability; Law (Jurisprudence)

20030000806 Naval Postgraduate School, Monterey, CA USA
Demonstration of Quality of Security Service Awareness for IPsec
Spyropoulou, Evdoxin; Levin, Timothy E.; Irvine, Cynthia E.; Sep. 2002; 37p; In English
Contract(s)/Grant(s): M IPR-00-E583
Report No.(s): AD-A407599; NPS-CS-02-005; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Quality of Security Service (QoSS) refers to the ability to provide security services according to user and system preferences, policies and conditions. Thus, security can be managed as a responsive 'service' for which quantitative measurement of service 'efficiency' is possible. We present our demonstration of how a specific underlying security mechanism, IPsec, can be modulated to provide different levels for security in response to changing QoSS requirements.
DTIC
Computer Networks; Computer Information Security; Information Resources Management

20030000861 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Ice Jams, Winter 1998-1999. Ice Engineering. Number 23, December 1999
Dec. 1999; 5p; In English; Original contains color images
Report No.(s): AD-A407450; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Ice jams are accumulations of ice in rivers that restrict water flow. Ice jams can cause destructive floods that are costly to riverine communities. Areas below the ice jam can also be affected when the jam releases, sending water and ice downstream. The rapid increase in water levels associated with jams often leaves little time to prepare for flooding. Damages caused by ice jams can be great, affecting roads, bridges, buildings, and homes. Accurate and reliable ice jam data are essential to the work of engineers in preventing and alleviating the damages caused by ice jams. The Cold Regions Research and Engineering Laboratory (CRREL) Ice Jam Database is a compilation of freezeup and breakup ice jam events in the USA. Currently there are nearly 12,000 records in the database, with the earliest account dating from 1780. For each ice jam event, the database provides the river name, city, state, jam date, jam type, damages, a short description, a listing of publications, latitude and longitude, U.S. Geological

Survey hydrological unit code, and USGS gage number, if available. Many entries rely on annual USGS Water Resources reports (USGS 1999) and other USGS gaging station data. Information also comes from newspapers, books, historical records, trip reports, and other historical accounts of ice jams. The Ice Jam Database is a useful tool in characterizing ice jams for specific areas and for providing information during emergency ice jam flood situations.
DTIC
Geological Surveys; Ice; Water Resources; Winter; Chronology; Hydrology

20030000886 Naval Postgraduate School, Monterey, CA USA
KeyNote Policy Files and Conversion to Disjunctive Normal Form for Use in IPsec
Spyropoulou, Evdoxia; Levin, Timothy E.; Irvine, Cynthia E.; Jan. 2002; 50p; In English
Contract(s)/Grant(s): MIPR-00-E583
Report No.(s): AD-A407594; NPS-CS-02-001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We describe a utility for converting a KeyNote policy file to Disjunctive Normal Form, so that it can be further utilized in our research on Quality of Security Service for IPsec. We also provide background information on KeyNote and IPsec, on the Disjunctive Normal Form of logical expressions, as well as on the lex and yacc tools employ by our utility.
DTIC
Networks; Security

20030000911 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Ice Motion Detector System. Ice Engineering. Number 4, September 1993
Zufelt, Jon; Sep. 1993; 5p; In English; Original contains color images
Report No.(s): AD-A407550; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This issue describes the design and testing of an ice motion detector system, which was developed to give downstream communities advance warning that an ice cover had broken up and begun moving, in an effort to reduce damages associated with ice runs and jamming. Why Have a Detector System? Ice jams result in more than $125 million in damages annually; much of this sum represents damage to personal property. A significant amount of research has concentrated on the stages associated with ice jams and their frequency of occurrence, as well as methods of ice jam control and flooding reduction. Current research is addressing ice jam formation and jamming location. In areas where ice jamming and flooding present a recurrent threat, measures usually are taken to predict the occurrence of ice jams and to minimize their impact. In these cases, advance warning that an ice run has begun and that flooding is possible could allow downstream communities to evacuate flood-prone areas, close bridges, and mobilize flood fighting efforts in a timely manner.
DTIC
Ice Formation; Flood Control; Warning Systems; Damage

20030001047 University of Central Florida, Orlando, FL USA
Intelligent Text Retrieval and Knowledge Acquisition from Texts for NASA Applications: Preprocessing Issues *Final Report*
[2002]; 7p; In English
Contract(s)/Grant(s): NAG10-306; NASA Proj. 16-40-201; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
A system that retrieves problem reports from a NASA database is described. The database is queried with natural language questions. Part-of-speech tags are first assigned to each word in the question using a rule based tagger. A partial parse of the question is then produced with independent sets of deterministic finite state a utomata. Using partial parse information, a look up strategy searches the database for problem reports relevant to the question. A bigram stemmer and irregular verb conjugates have been incorporated into the system to improve accuracy. The system is evaluated by a set of fifty five questions posed by NASA engineers. A discussion of future research is also presented.
Author
Data Bases; Artificial Intelligence; Natural Language (Computers); Information Retrieval; Words (Language)

20030001550 NASA Marshall Space Flight Center, Huntsville, AL USA

Telescience Resource Kit

Schneider, Michelle, NASA Marshall Space Flight Center, USA; Lippincott, Jeff, NASA Marshall Space Flight Center, USA; Chubb, Steve, NASA Marshall Space Flight Center, USA; Whitaker, Jimmy, NASA Marshall Space Flight Center, USA; Rice, Jim, NASA Marshall Space Flight Center, USA; Gillis, Robert, NASA Marshall Space Flight Center, USA; Sims, Chris, NASA Marshall Space Flight Center, USA; Sellers, Donna, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002, 9-19 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Telescience Resource Kit (TReK) is a PC based ground control system. It can be used by a single individual or in a group environment to monitor and control spacecraft systems and payloads. Capabilities include data receipt, data processing, data storage, data management, and data transmission. Commercial-Off-The-Shelf (COTS) hardware and software have been employed to reduce development costs, operations and maintenance costs, and to effectively take advantage of new commercial products as they become available. The TReK system is currently being used to monitor and control payloads aboard the International Space Station. It is located at sites around the world.

Author

Communication Networks; Computer Programs; Payloads; Spacecraft Control

20030001552 NASA Marshall Space Flight Center, Huntsville, AL USA

Managing Radiation Degradation of CCDs on the Chandra X-ray Observatory

ODell, Stephen L., NASA Marshall Space Flight Center, USA; Blackwell, William C., Sverdrup Technology, Inc., USA; Minow, Joseph I., Sverdrup Technology, Inc., USA; Cameron, Robert A., Smithsonian Astrophysical Observatory, USA; Morris, David C., Smithsonian Astrophysical Observatory, USA; Virani, Shanil N., Smithsonian Astrophysical Observatory, USA; [2002]; 1p; In English; SPIE Meeting on Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The CCDs on the Chandra X ray Observatory are sensitive to radiation damage particularly from low-energy protons scattering off the telescope's mirrors onto the focal plane. In its highly elliptical orbit, Chandra passes through a spatially and temporally varying radiation environment, ranging from the radiation belts to the solar wind. Translating thc Advanced CCD Imaging Spectrometer (ACIS) out of the focal position during radiation-belt passages has prevented loss of scientific utility and eventually functionality. However, carefully managing the radiation damage during the remainder of the orbit, without unnecessarily sacrificing observing time, is essential to optimizing the scientific value of this exceptional observatory throughout its planned 10-year mission. In working toward this optimization, the Chandra team developed aid applied radiation-management strategies. These strategies include autonomous instrument safing triggered by the on-board radiation monitor, as well as monitoring, alerts, and intervention based upon real-time space-environment data from NOAA and NASA spacecraft. Furthermore, because Chandra often spends much of its orbit out of the solar wind (in the Earth's outer magnetosphere and magnetosheath), the team developed the Chandra Radiation Model to describe the complete low-energy-proton environment. Management of the radiation damage has thus far succeeded in limiting degradation of the charge-transfer inefficiency (CTI) to less than 4.4*10^-6 and 1.4*10^-6 per year for the front-illuminated and back-illuminated CCDs, respectively.

Author

Autonomy; Charge Coupled Devices; Imaging Spectrometers; Radiation Damage; Real Time Operation; X Ray Astrophysics Facility

20030001559 Universitaet der Bundeswehr, Fachbereich Maschinenbau, Hamburg Germany

Integration of Innovation into a Knowledge-Based System ***Integration von Innovationstechniken in ein wissensbasiertes System***

Reuter, Matthias; Jan. 2000; 127p; In German

Report No.(s): AD-A407910; X5-X5; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The dissertation begins with the uses of innovation, how it can and should be generated and to what heights it might aspire. Then turning his attention to knowledge-based systems such as computer technology, the author reveals the current state of research in that field, including artificial intelligence and expert systems, and how creativity and contradiction orientation promote development. The middle section of the dissertation focuses on innovation as it helps re-mold expert systems and integral systems, respectively. Ensuing findings concern knowledge acquisition and the application environment, both of which are used as variables in the final chapter, which features an experimental model. The dissertation begins with the uses of innovation, how it can and should be generated and to what heights it might aspire. Then turning his attention to knowledge-based systems such as computer technology, the author reveals the current state of research in that field, including artificial intelligence and expert systems, and how creativity and contradiction orientation promote development. The middle section of the dissertation focuses

on innovation as it helps re-mold expert systems and integral systems, respectively. Ensuing findings concern knowledge acquisition and the application environment, both of which are used as variables in the final chapter, which features an experimental model.
DTIC
Artificial Intelligence; Expert Systems; Knowledge Based Systems; Knowledge Bases (Artificial Intelligence); Computer Systems Design

20030001568 NASA Marshall Space Flight Center, Huntsville, AL USA
Console Log Keeping Made Easier - Tools and Techniques for Improving Quality of Flight Controller Activity Logs
Scott, David W., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002 Conference, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

At the Marshall Space Flight Center's (MSFC) Payload Operations Integration Center (POIC) for International Space Station (ISS), each flight controller maintains detailed logs of activities and communications at their console position. These logs are critical for accurately controlling flight in real-time as well as providing a historical record and troubleshooting tool. This paper describes logging methods and electronic formats used at the POIC and provides food for thought on their strengths and limitations, plus proposes some innovative extensions. It also describes an inexpensive PC-based scheme for capturing and/or transcribing audio clips from communications consoles. Flight control activity (e.g. interpreting computer displays, entering data/issuing electronic commands, and communicating with others) can become extremely intense. It's essential to document it well, but the effort to do so may conflict with actual activity. This can be more than just annoying, as what's in the logs (or just as importantly not in them) often feeds back directly into the quality of future operations, whether short-term or long-term. In earlier programs, such as Spacelab, log keeping was done on paper, often using position-specific shorthand, and the other reader was at the mercy of the writer's penmanship. Today, user-friendly software solves the legibility problem and can automate date/time entry, but some content may take longer to finish due to individual typing speed and less use of symbols. File layout can be used to great advantage in making types of information easy to find, and creating searchable master logs for a given position is very easy and a real lifesaver in reconstructing events or researching a given topic. We'll examine log formats from several console position, and the types of information that are included and (just as importantly) excluded. We'll also look at when a summary or synopsis is effective, and when extensive detail is needed.
Author
Display Devices; Flight Control; Payload Integration; Real Time Operation; Consoles

20030001569 NASA Marshall Space Flight Center, Huntsville, AL USA
Operational Limitations of the High Rate Frame Multiplexer (HRFM) Onboard the International Space Station(ISS)-and How These Limitations Affect Payload Developers (PDs) and International Partners (IPs)
Mixson, Charles D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Space Ops 2002, 9-12 Oct. 2002, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The data system onboard the USA Operating Segment (USOS) of the ISS is currently used to capture, route, record and downlink high-rate science data from experiments inside the US Lab. Once NASDA's Japanese Experiment Module (JEM) and ESA's Attached Pressurized Module (APM) are launched - in the 2004 to 2005 timeframe - data from these facilities will also be routed to the ground using the USOS data system. A critical component of the USOS data system is the High Rate Frame Multiplexer (HRFM). The HRFM combines multiple data/video inputs and combines them into one data stream. This Ku-band data stream is then routed through the Tracking and Data Relay Satellite (TDRS) system to the ground. The Data Management Coordinator (DMC) - located at the Marshall Space Flight Center's Payload Operations Center (POC) - is responsible for commanding and controlling the HRFM. The HRFM can multiplex a maximum of eight digital data sources and four digital video sources. Thus far, this limitation has not been constraining to operations. However, once the JEM and APM are integrated, the HRFM limitations will become a major constraint to science operations onboard. The purpose of this paper is to characterize the limitations of the HRFM and to explain how these limitations can be successfully managed. With this information, Payload Developers and International Partners will be able to more effectively utilize the data systems onboard the ISS. Ultimately, more science data can be captured and downlinked to Flight Controllers and Scientists on the ground.
Author
Japanese Space Program; Multiplexing; Payloads; Spacecraft Modules; Data Systems; Flight Operations

20030001570 Sandia National Labs., Albuquerque, NM USA
Red Teaming of Advanced Information Assurance Concepts
Wood, Bradley J.; Duggan, Ruth A.; Nov. 29, 1999; 10p; In English

Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): AD-A407925; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Red Teaming is an advanced form of assessment that can be used to identify weaknesses in a variety of cyber systems. It is especially beneficial when the target system is still in development when designers can readily affect improvements. This paper discusses the red team analysis process and the author's experiences applying this process to five selected Information Technology Office (ITO) projects. Some detail of the overall methodology, summary results from the five projects, and lessons learned are contained within this paper.

DTIC

Information Systems; Computer Information Security

20030001571 Universitaet der Bundeswehr, Inst. Fuer Mechanik, Hamburg, Germany

Fundamentals of Mechanics: Examination Problems ***Grundzuege der Mechanik Pruefungsaufgaben***

Witfeld, H.; Lammering, R.; Apr. 2000; 104p; In German
Report No.(s): AD-A407924; X5-X5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This booklet contain four examinations form the following courses: Fundamentals of Mechanics I and II and Fundamentals of Mechanic III. Each examination comes in two parts and is provided for two entry years, 1997 and 1998. The 1997 students then have four exams over the period July 1998-April 1999, and the 1998 students from July 1999 to March 2000. Whereas most of the exams have the answers following directly after the text, and answer key as appendix is provided to the first Fundamentals of Mechanics I and II exam from the 1997 year, as well as to the first Mechanics III exam from the 1998 class, which was given in January 2000. Each section covers between 8-12 pages and is to last four hours.

DTIC

Students; Texts; Mechanical Engineering; Training Evaluation

20030001702 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Victoria, Australia

Integrated Data Acquisition System (IDAS)

Harvey, J. F.; Cameron, K.; Spataro, M.; Holland, O. F.; Bird, F. J.; May 2002; 49p; In English; Original contains color images
Report No.(s): AD-A407886; DSTO-GD-0325; DODA-AR-012-337; X5-X5; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A data acquisition system based on commercially available personal computer hardware is described. This system was developed to meet the requirements of the Royal Australian Navy in conduct of flight trials with helicopters operating at sea from ships fitted with helicopter flight decks. All aspects of the system are controlled by software, enabling rapid setup of sample rates, gains, and filter characteristics. Data may be displayed in real-time, and further analysis of recorded data performed post-flight.

DTIC

Data Acquisition; Systems Integration; Computer Systems Programs; Flight Mechanics

20030001762 Defence Research and Development Canada, Ottawa, Ontario Canada

Knowledge Management in Defence R&D Canada

McIntyre, S. G.; Jul. 01, 2002; 51p; In English
Report No.(s): AD-A407840; DRDC-TM-2002-003; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Defence R&D Canada undertook a knowledge management audit to determine how well it managed knowledge creation and use and what could be done to improve the use and leveraging of knowledge. A qualitative study was employed using a purposeful random sample and an interview format. Five themes emerged from the results: 1. There is a need to focus on the organizational mission and clarify priorities; 2. Information management tools are required as essential building blocks in a Defence R&D Canada knowledge management initiative; 3. Sharing in-house expertise is critical for knowledge leveraging, business development, cross-disciplinary work and efficiencies; 4. Enhanced exchange of foreign information is required to supplement informal exchanges; and 5. A mutual vision for future technology planning is needed for Defence R&D Canada and the Canadian Forces clients.

DTIC

Data Management; Information Management; Research Management; Technological Forecasting

20030001812 Lawrence Livermore National Lab., Livermore, CA USA

DataFoundry Data Warehousing and Integration for Scientific Data Management

Musick, R.; Critchlow, T.; Ganesh, M.; Fidelis, K.; Zemla, A.; Feb. 29, 2000; 10p; In English
Report No.(s): DE2002-793555; UCRL-ID-127593; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Data warehouses and data marts have been successfully applied to a multitude of commercial business applications as tools for integrating and providing access to data located across an enterprise. Although the need for this capability is as vital in the scientific world as in the business domain, working warehouses in our community are scarce. A primary technical reason for this is that our understanding of the concepts being explored in an evolving scientific domain change constantly, leading to rapid changes in the data representation. When any database providing information to a warehouse changes its format, the warehouse must be updated to reflect these changes, or it will not function properly. The cost of maintaining a warehouse using traditional techniques in this environment is prohibitive. This paper describes ideas for dramatically reducing the amount of work that must be done to keep a warehouse up to date in a dynamic, scientific environment. The ideas are being applied in a prototype warehouse called DataFoundry. DataFoundry, currently in use by structural biologists at LLNL, will eventually support scientists at the Department of Energy's Joint Genome Institute.
NTIS
Data Bases; Genetics; Computer Programs; Data Management; Data Storage

20030001842 NASA Ames Research Center, Moffett Field, CA USA
Visualizing 2D Probability Distributions from Satellite Image-Derived Data
Kao, David, NASA Ames Research Center, USA; Dungan, Jennifer, NASA Ames Research Center, USA; Pang, Alex, California Univ., USA; Sep. 23, 2002; 1p; In English; Vision Computing 2002 Conference, Unknown
Contract(s)/Grant(s): RTOP 704-40-42; No Copyright; Avail: Issuing Activity; Abstract Only

Creating maps of biophysical and geophysical variables using Earth Observing System (EOS) satellite image data is an important component of Earth science. These 2D maps have a single value at every location and standard techniques are used to visualize them. Current tools fall short, however, when it is necessary to describe a distribution of values at each location. Distributions may represent a frequency of occurrence over time, frequency of occurrence from multiple runs of an ensemble forecast or possible values from an uncertainty model. 'Distribution data sets' are described, then a case study is presented to visualize such 2D distributions. Distribution data sets are different from multivariate data sets in the sense that the values are for a single variable instead of multiple variables. Our case study data consists of multiple realizations of percent forest cover, generated using a geostatistical technique that combines ground measurements and satellite imagery to model uncertainty about forest cover. We present several approaches for analyzing and visualizing such data sets. The first is a pixel-wise analysis of the probability density functions for the 2D image while the second is an analysis of features identified within the image. Such pixel-wise and feature-wise views will give Earth scientists a more complete understanding of distribution data sets.
Author
Earth Observing System (EOS); Probability Distribution Functions; Mapping; Forests; Satellite Imagery

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TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

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

20030000819 Naval Postgraduate School, Monterey, CA USA
Use of USCG Differential GPS Beyond Nominal Range
Valascho, Daniel W.; Sep. 2002; 127p; In English; Original contains color images
Report No.(s): AD-A407168; No Copyright; Avail: CASI; A07, Hardcopy

The USA Coast Guard makes Differential GPS available to all maritime vessels in US coastal and inland waters to ensure 10 meter (2drms) horizontal accuracy. The Coast Guard guarantees this accuracy if the maritime user is within nominal range of the beacon transmitter. Maritime user's can often receive the differential correction beyond the nominal range, but the accuracy begins to degrade as baseline distance increases. After gathering differential corrections from varying distances, at different times of the day, at different latitudes, and different signal strengths, operational statistics have been calculated to describe the Differential GPS accuracy beyond the USCG's nominal range.
DTIC
Coastal Water; Global Positioning System; Differential Equations; Waterways

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ASTRONOMY

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

20030000445 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Astronometric Follow-up of Faint Near Earth Objects ***Annual Report, 1 Jan. - 31 Dec. 2002***
Spahr, Timothy, Smithsonian Astrophysical Observatory, USA; December 2002; 2p; In English
Contract(s)/Grant(s): NAG5-11444; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
An annual performance report for the period of January 1, 2002 through December 31, 2002 is presented.
CASI
Faint Objects; Near Earth Objects; Observation; Astrometry

20030000468 NASA Marshall Space Flight Center, Huntsville, AL USA
Neutron Stars and Pulsar: Three Years of Chandra Operations
Weisskopf, M. C., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 34th Joint Committee on Space Research (COSPAR) Scientific Assembly and 2nd World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only
We present a brief review of Chandra Observations of neutron stars, with a concentration on neutron stars in supernova remnants. Three years of Chandra results clearly demonstrate how critical the angular resolution has been in order to separate the neutron star emission from the surrounding nebulosity.
Author
Neutron Stars; Supernova Remnants; Angular Resolution

20030000471 NASA Marshall Space Flight Center, Huntsville, AL USA
Software Development for the Hobby-Eberly Telescope's Segment Alignment Maintenance System using LABView
Hall, Drew P., NASA Marshall Space Flight Center, USA; Ly, William, NASA Marshall Space Flight Center, USA; Howard, Richard T., NASA Marshall Space Flight Center, USA; Weir, John, NASA Marshall Space Flight Center, USA; Rakoczy, John, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikoloa, HI, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The software development for an upgrade to the Hobby-Eberly Telescope (HET) was done in LABView. In order to improve the performance of the HET at the McDonald Observatory, a closed-loop system had to be implemented to keep the mirror segments aligned during periods of observation. The control system, called the Segment Alignment Maintenance System (SAMs), utilized inductive sensors to measure the relative motions of the mirror segments. Software was developed in LABView to tie the sensors, operator interface, and mirror-control motors together. Developing the software in LABView allowed the system to be flexible, understandable, and able to be modified by the end users. Since LABView is built using block diagrams, the software naturally followed the designed control system's block and flow diagrams, and individual software blocks could be easily verified. LABView's many built-in display routines allowed easy visualization of diagnostic and health-monitoring data during testing. Also, since LABView is a multi-platform software package, different programmers could develop the code remotely on various types of machines. LABView s ease of use facilitated rapid prototyping and field testing. There were some unanticipated difficulties in the software development, but the use of LABView as the software "language" for the development of SAMs contributed to the overall success of the project.
Author
Software Development Tools; Telescopes; Alignment; Maintenance; Control Systems Design; Systems Health Monitoring

20030000482 NASA Marshall Space Flight Center, Huntsville, AL USA
Highlights from Three Years of the Chandra X-Ray Observatory
Weisskopf, Martin C., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; 69th Annual Meeting of the Southern Section of the American Physical Society, 31 Oct. - 2 Nov. 2002, Auburn, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only
August 12, 2002 marked the third anniversary of the first light observed with the Chandra X-Ray Observatory (CXO) which had been launched on July 23 of that same year. The CXO is the X-ray component of NASA's Great Observatory Program that also includes the Hubble Space Telescope for observations in the visible portion of the electromagnetic spectrum, the now defunct Compton Gamma-Ray Observatory and the soon-to-be-launched Space Infra-Red Telescope Facility. The scientific return from

the Observatory has been spectacular. Images of objects as local as the moon's of Jupiter and comets, to those which show the details of the emission of the hot gas pervading clusters of galaxies have been obtained. The technical status of the instrumentation and the performance of the X-ray optics will be reviewed and an overview of some of the exciting results will be presented.
Author
X Ray Astrophysics Facility; Spaceborne Telescopes; X Ray Optics

20030000540 NASA Marshall Space Flight Center, Huntsville, AL USA
Sunyaev-Zeldovich Effect Imaging of MACS Galaxy Clusters at z greater than 0.5
Laroque, S. J., NASA Marshall Space Flight Center, USA; Joy, M., NASA Marshall Space Flight Center, USA; Carlstrom, J. E., NASA Marshall Space Flight Center, USA; Ebeling, H., NASA Marshall Space Flight Center, USA; Bonamente, M., NASA Marshall Space Flight Center, USA; Dawson, K. S., NASA Marshall Space Flight Center, USA; Edge, A., NASA Marshall Space Flight Center, USA; Holzapfel, W. L., NASA Marshall Space Flight Center, USA; Miller, A. D., NASA Marshall Space Flight Center, USA; Nagai, D., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present 30 GHz interferometric SZE measurements of a redshift limited, X-ray selected cluster sample from the Massive Cluster Survey (MACS). All eight of the high redshift (z.0.5, dec greater than -15) galaxy clusters were detected. Additional observations were made at 4.8 GHz with the Very Large Array to help constrain the amount of point source contamination to the SZE decrements. From SZE data alone, we derive electron temperatures in the range 5.5-18.5 keV and total masses between 1.5 and 2.6 x 10 circumflex 14 M_sun within a 65 arcsecond radius for the eight clusters. Six of the clusters are MACS discoveries, while two (C10016+1609 and MS 0451.6-0305) were detected by previous X-ray observations and have been recently observed with the Chandra observatory. The X-ray derived temperatures and masses for Cl0016+ 1609 and MS 0451.6-0305 are in good agreement with the SZE-derived values. Strong detections of the SZE signal in this sample of MACS objects confirms that they are hot, massive clusters.
Author
Galactic Clusters; Imaging Techniques; Sunyaev-Zeldovich Effect; Astronomical Interferometry

20030000544 NASA Marshall Space Flight Center, Huntsville, AL USA
The 2001 April Burst Activation of SGR 1900+14: Pulse Properties and Torque
Woods, P. M., Universities Space Research Association, USA; Kouveliotou, C., NASA Marshall Space Flight Center, USA; Goegues, E., Universities Space Research Association, USA; Finger, M. H., Universities Space Research Association, USA; Feroci, M., Consiglio Nazionale delle Ricerche, Italy; Mereghetti, S., Consiglio Nazionale delle Ricerche, Italy; Swank, J. H., NASA Goddard Space Flight Center, USA; Hurley, K., California Univ., USA; Heise, J., Space Research Organization Netherlands, Netherlands; Smith, D., Michigan Univ., USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We report on observations of SGR 1900+14 made with the Rossi X-ray Timing Explorer (RXTE) and BeppoSAX during the April 2001 burst activation of the source. Using these data, we measure the spindown torque on the star and confirm earlier findings that the torque and burst activity are not directly correlated. We compare the X-ray pulse profile to the gamma-ray profile during the April 18 intermediate flare and show that (i) their shapes are similar and (ii) the gamma-ray profile aligns closely in phase with the X-ray pulsations. The good phase alignment of the gamma-ray and X-ray profiles suggests that there was no rapid spindown following this flare, in contrast to the August 27 giant flare. The absence of rapid spindown in the hours following the April 18 flare suggests that there was no significant outflow of material as was believed to be present following the August 27 flare. Finally, we discuss how these observations further constrain magnetic field reconfiguration models for the large flares of SGRs.
Author
Torque; X Ray Timing Explorer; Gamma Ray Bursts; Solar Flares; Gamma Ray Astronomy

20030000574 NASA Marshall Space Flight Center, Huntsville, AL USA
9.1 Years of All-Sky Hard X-Ray Monitoring with BATSE
Wilson, C. A., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Workshop on X-Ray Binaries in the Chandra and XMM-Newton Era, 13-15 Nov. 2002, Cambridge, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The hard X-ray sky was continuously monitored with the BATSE experiment on the Compton Gamma Ray Observatory using the Earth Occultation method. Known sources were monitored twice every orbit and transients could be detected at about the approximately 50 crab level on a daily basis. Long-term, post-processing of the complete BATSE dataset will produce all-sky, hard X-ray maps at a sensitivity level of approximately 5 mCrab in un-crowded regions. For long period pulsars (greater than 1 second), Fourier transforms and epoch-folded searches were used to measure pulse frequency and pulsed flux. Using these

methods, 3 black hole candidates and 6 x-ray pulsars were discovered with BATSE during its 9 years in orbit. I will present highlights from BATSE observations of X-ray binaries from 9 years of monitoring the hard X-ray sky.
Author
Gamma Ray Observatory; Black Holes (Astronomy); X Ray Astronomy; Occultation

20030000576 NASA Marshall Space Flight Center, Huntsville, AL USA
Reducing the Requirements and Cost of Astronomical Telescopes
Smith, W. Scott, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Proceedings of SPIE Conference, Astronomical Telescopes and Instrumentation, 21-28 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Limits on astronomical telescope apertures are being rapidly approached. These limits result from logistics, increasing complexity, and finally budgetary constraints. In an historical perspective, great strides have been made in the area of aperture, adaptive optics, wavefront sensors, detectors, stellar interferometers and image reconstruction. What will be the next advances? Emerging data analysis techniques based on communication theory holds the promise of yielding more information from observational data based on significant computer post-processing. This paper explores some of the current telescope limitations and ponders the possibilities increasing the yield of scientific data based on the migration computer post-processing techniques to higher dimensions. Some of these processes hold the promise of reducing the requirements on the basic telescope hardware making the next generation of instruments more affordable.
Author
Telescopes; Apertures; Cost Reduction

20030000577 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Measurement of Precision Geometric Distances to Three Anchor Points in the Local Universe ***Annual Report, 1 Feb. 2002 - 31 Jan. 2003***
Reid, Mark J., Smithsonian Astrophysical Observatory, USA; December 2002; 2p; In English
Contract(s)/Grant(s): NAG5-10311; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Our program, funded by a NASA/SARA 3-yr grant, is designed to measure distances directly with accuracies of 5% to three anchor points in the Local Universe. We are attacking this problem on three fronts, using Very Long Baseline Interferometry (VLBI) observations of NGC 4258, M 33, and Sgr A*. We plan to provide distance estimates, with a minimum of systematic uncertainty, that can be used to re-calibrate several 'standard candles,' such as Cepheid and RR Lyrae variables. This will place the Galactic and extragalactic distance scales on much firmer ground. The program will provide crucial, independent checks and calibrations of extragalactic distance measurements, and will contribute to the ultimate success and impact of the HST Key Project on Extragalactic Distances, the Full-Sky Astrometric Mapping Explorer (FAME), and any future NASA astrometric missions. Additionally, since distances are fundamental to astrophysics, our results will affect a large number of general projects on NASA facilities such as the HST (Hubble Space Telescope), CXO (Chandra X-Ray Observatory), and NGST (Next Generation Space Telescope).
Author
Astrometry; Astronomical Maps; Distance; Estimates; Data Acquisition; Data Processing

20030000578 NASA Marshall Space Flight Center, Huntsville, AL USA
Chandra Observations of Faint LMXB's
Wilson, Colleen A., NASA Marshall Space Flight Center, USA; Patel, S. K., National Space Science and Technology Center, USA; Kouveliotou, C., National Space Science and Technology Center, USA; vanderKlis, M., Amsterdam Univ., Netherlands; Belloni, T., Brera Astronomical Observatory, Italy; Lewin, W. H. G., Massachusetts Inst. of Tech., USA; [2002]; 1p; In English; Workshop on X-Ray Binaries in the Chandra and XMM-Newton Era, 13-15 Nov. 2002, Cambridge, MA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

There exists a group of persistently faint galactic X-ray sources that based on their location in the galaxy, high Lx/Lopt, association with X-ray bursts, and absence of X-ray pulsations are thought to be low-mass X-ray binaries (LMXBs). We present results from Chandra observations for 7 of these systems: 1708-409, 1711-339, 1735-269, 1736-297, 1746-331, 1746.7-3224, and 1812-12. Improved locations for all sources, excluding 1736-297 and 1746-331 (which were not detected) are presented. Our observations are consistent with previously reported transient behavior of 1736-297, 1746-331, and 1711-339 (which we detect in one of two observations). Energy and power spectra are presented for 1735-269, 1711-339, and 1746.7-3224. The energy

spectra are hard, consistent with typical faint LMXB spectra. Further, we present a newly discovered source, a very faint, soft, source, separated by 2.7' from 1746.7-3224.
Author
Mass; X Ray Binaries; X Ray Astrophysics Facility; Galaxies

20030000974 NASA Marshall Space Flight Center, Huntsville, AL USA
Chandra Observations of the Anomalous X-ray Pulsar 4U 0142+61
Patel, Sandeep K., NASA Marshall Space Flight Center, USA; Kouveliotou, Chryssa, NASA Marshall Space Flight Center, USA; Woods, Peter M., NASA Marshall Space Flight Center, USA; Tennant, Allyn F., NASA Marshall Space Flight Center, USA; Weisskopf, Martin C., NASA Marshall Space Flight Center, USA; Finger, Mark H., NASA Marshall Space Flight Center, USA; Wilson-Hodge, Colleen, NASA Marshall Space Flight Center, USA; Gogus, Ersin, NASA Marshall Space Flight Center, USA; VanderKlis, Michiel, NASA Marshall Space Flight Center, USA; Belloni, Tomaso, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present X-ray imaging, timing, and phase resolved spectroscopy of the anomalous X-ray pulsar 4U 0142+61 using the Chandra X-ray Observatory. The spectrum is well described by a power law plus blackbody model with Gamma = 3.35(2), kT=0.458(3) keV, and N-H = 0.91(2) x 10(exp 22)/sq cm); we find no significant evidence for spectral features (0.5 - 7.0 keV). Time resolved X-ray spectroscopy shows evidence for evolution in phase in either Gamma, or kT or some combination thereof as a function of pulse phase. We derive a precise X-ray position for the source and determine its spin period, P=8.68866(30) s. We have detected emission beyond 4 arcsec from the central source and extending beyond 100 arcsec, likely due to dust scattering in the interstellar medium.
Author
X Rays; X Ray Sources; Spectra; Pulsars; Interstellar Matter

20030000978 NASA Marshall Space Flight Center, Huntsville, AL USA
Analytical Verifications in Cryogenic Testing of NGST Advanced Mirror System Demonstrators
Cummings, Ramona, NASA Marshall Space Flight Center, USA; Levine, Marie, NASA Marshall Space Flight Center, USA; VanBuren, Dave, NASA Marshall Space Flight Center, USA; Kegley, Jeff, NASA Marshall Space Flight Center, USA; Green, Joseph, NASA Marshall Space Flight Center, USA; Hadaway, James, NASA Marshall Space Flight Center, USA; Presson, Joan, NASA Marshall Space Flight Center, USA; Cline, Todd, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; SPIE Astronomical Telescopes and Instrumentation, 22-28 Aug. 2002, Waikola, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Ground based testing is a critical and costly part of component, assembly, and system verifications of large space telescopes. At such tests, however, with integral teamwork by planners, analysts, and test personnel, segments can be included to validate specific analytical parameters and algorithms at relatively low additional cost. This paper opens with strategy of analytical verification segments added to vacuum cryogenic testing of Advanced Mirror System Demonstrator (AMSD) assemblies. These AMSD assemblies incorporate material and architecture concepts being considered in the Next Generation Space Telescope (NGST) design. The test segments for workmanship testing, cold survivability, and cold operation optical throughput are supplemented by segments for analytical verifications of specific structural, thermal, and optical parameters. Utilizing integrated modeling and separate materials testing, the paper continues with support plan for analyses, data, and observation requirements during the AMSD testing, currently slated for late calendar year 2002 to mid calendar year 2003. The paper includes anomaly resolution as gleaned by authors from similar analytical verification support of a previous large space telescope, then closes with draft of plans for parameter extrapolations, to form a well-verified portion of the integrated modeling being done for NGST performance predictions.
Author
Spaceborne Telescopes; Quality Control; Cryogenics; Mirrors; Vacuum Tests

20030000984 National Optical Astronomy Observatories, USA
Enabling a Giant Segmented Mirror Telescope for the Astronomical Community
November 2002; In English; CD-ROM contains full text document in PDF format, Microsoft Internet Explorer and Microsoft Photo Editor; No Copyright; Avail: CASI; C01, CD-ROM

This report represents the culmination of an 18-month effort by AURA's New Initiatives Office (NIO) to conduct a study of a Giant Segmented Mirror Telescope (GSMT) - the next generation optical/infrared telescope recommended by the National Research Council (NRC) decadal survey as its highest priority ground-based program for federal investment between 2001 and 2010. The study comprises three major elements: 1) Developing a quantitative science case and initial performance requirements

for the GSMT; 2) Developing a point design aimed at identifying key technical issues and serving as the basis for evaluating system requirements and costs; and 3) Carrying out technical and other supporting studies common to all community-based efforts to develop concepts and designs for a GSMT.
Derived from text
Segmented Mirrors; Infrared Telescopes; Spaceborne Astronomy; Systems Engineering; Fabrication; Adaptive Optics

20030001039 NASA Marshall Space Flight Center, Huntsville, AL USA
Status of NASA Mirror Technology Development for Large Space Telescopes
Stahl, H. Philip, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; SPIE Astronomy Conference, 22-27 Aug. 2002, Waikoloa, HI, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only
This talk will present the current status of several NASA technology development activities, including: SBMD, NMSD, AMSD (Advanced Mirror System Demonstrator), etc.. and will discuss how these activities map into future NASA mission requirements, including: NGST (Next Generation Space Telescope), SAFIR, SUVO, etc.
Author
Mirrors; Spaceborne Telescopes

20030001565 NASA Ames Research Center, Moffett Field, CA USA
SOFIA's Choice: Scheduling Observations for an Airborne Observatory
Frank, Jeremy, NASA Ames Research Center, USA; Kurklu, Elif, NASA Ames Research Center, USA; [2002]; 11p; In English; 13th International Conference on Artificial Intelligence and Planning and Scheduling, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We describe the problem of scheduling observations for an airborne observatory. The problem is more complex than traditional scheduling problems in that it incorporates complex constraints relating the feasibility of an astronomical observation to the position and time of a mobile observatory, as well as traditional temporal constraints and optimization criteria. We describe the problem, its proposed solution and the empirical validation of that solution.
Author
Observation Scheduling; Astronomical Observatories

20030001693 NASA Marshall Space Flight Center, Huntsville, AL USA
EXIST (Energetic X-ray Imaging Survey Telescope): The Next Large GRB Observatory
Fishman, G. J., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Rome Gamma-Ray Burst Conference, 17-22 Sep. 2002, Rome, Italy; No Copyright; Avail: Issuing Activity; Abstract Only
Studies have begun on the EXIST (Energetic X-ray Imaging Survey Telescope) Mission. It is planned as a very wide-field, sensitive coded aperture telescope with a sensitive area of the order of 6-8 m^2 and having a positional accuracy for GRBs (Gamma ray bursts) better than one arc-minute. EXIST will use SWIFT as a pathfinder mission; the findings of SWIFT will refine the scientific objectives of EXIST and will help to determine many of its design parameters. It would study early star formation and early galaxy formation at very high redshifts through observations of thousands of GRBs, their afterglows and environments. It is intended that the international GRB community will play as large role in EXIST through direct participation as well as with complementary observational programs, both space-based and ground-based. Some preliminary design features and capabilities of the EXIST Mission will be presented.
Author
X Ray Telescopes; Spaceborne Telescopes; Mission Planning; Astronomical Observatories

20030001811 Lawrence Livermore National Lab., Livermore, CA USA
Laser Research and Development Studies for Laser Guide Star Systems
Pennington, D. M.; Beach, R.; Ebbers, C.; Erbert, G. V.; Nguyen, H. H.; Feb. 23, 2000; 38p; In English
Report No.(s): DE2002-793459; UCRL-ID-137684; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The generation of sodium guide stars for adaptive optics requires very precise control of the frequency and bandwidth of the laser to maximize the brightness of the generated guide star. Several laser technologies have been investigated to generate visible light at the sodium D-line for laser guide-star applications. Dye lasers can generate 589 nm light directly but are limited to a few watts in the CW mode due to thermal issues in the dye jet, as well as the limited pump power available. Pulsed dye lasers have been scaled to the kilowatt level with excellent beam quality and tunable single line output. However, these lasers are complex and have high operation and maintenance costs. There are also issues with the toxicity and flammability of the dye mixture. The

ruggedness, efficiency and ease of use of a solid state laser system has great potential for improving the reliability and power of the laser guide star over the dye laser systems currently used. Solid-state lasers generating 589 nm light have been demonstrated by using sum frequency mixing in a non linear material. The systems to date have had a pulsed format, requiring very precise timing of the two independent cavities, as well as high power to generated sufficient intensity in the nonlinear crystal external to the laser cavity. The resulting systems are extremely complicated, high cost and easily damaged, limiting their acceptance in the adaptive optics community. In addition, the high pump powers required for efficient external cavity sum-frequency generation make it challenging to maintain near diffraction limited beam quality. In this white paper we consider two CW solid state laser approaches to a 589 nm LGS system. Both are based on the technique of sum-frequency generation, but differ in the cavity architecture.
NTIS
Star Trackers; Telescopes; Phase Conjugation; Laser Guide Stars

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ASTROPHYSICS

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

20030000431 NASA Marshall Space Flight Center, Huntsville, AL USA
Large Torque Variations in Two Soft Gamma Repeaters
Woods, Peter M., Universities Space Research Association, USA; Kouveliotou, Chryssa, NASA Marshall Space Flight Center, USA; Gogus, Ersin, National Space Science and Technology Center, USA; Finger, Mark H., Universities Space Research Association, USA; Swank, Jean, NASA Goddard Space Flight Center, USA; Markwardt, Craig B., NASA Goddard Space Flight Center, USA; Hurley, Kevin, California Univ., USA; vanderKlis, Michiel, Astronomical Inst., Netherlands; Astrophysical Journal; Sep. 01, 2002; Volume 576, pp. 381-390; In English
Contract(s)/Grant(s): NAG5-9350; NCC8-200; NSF PHY-99-07949; Copyright; Avail: Issuing Activity
We have monitored the pulse frequencies of the two soft gamma repeaters SGR 1806-20 and SGR 1900+14 through the beginning of year 2001 using primarily Rossi X-Ray Timing Explorer Proportional Counter Array observations. In both sources, we observe large changes in the spin-down torque up to a factor of approximately 4, which persist for several months. Using long-baseline phase-connected timing solutions as well as the overall frequency histories, we construct torque noise power spectra for each SGR (Soft Gamma Repeater). The power spectrum of each source is very red (power-law slope is approximately -3.5). The torque noise power levels are consistent with some accreting systems on timescales of approximately 1 yr, yet the full power spectrum is much steeper in frequency than any known accreting source. to the best of our knowledge, torque noise power spectra with a comparably steep frequency dependence have been seen only in young, glitching radio pulsars (e.g., Vela). The observed changes in spin-down rate do not correlate with burst activity; therefore, the physical mechanisms behind each phenomenon are also likely unrelated. Within the context of the magnetar model, seismic activity can not account for both the bursts and the long-term torque changes unless the seismically active regions are decoupled from one another.
Author
X Ray Astronomy; X Rays; Gamma Ray Bursts; Soft Gamma Repeaters; Torque; Noise Spectra

20030000486 NASA Ames Research Center, Moffett Field, CA USA
A Simplified Model for an Evolving Protoplanetary Nebula
Davis, Sanford S., NASA Ames Research Center, USA; [2002]; 1p; In English
Contract(s)/Grant(s): RTOP 247-52-00-50; No Copyright; Avail: Issuing Activity; Abstract Only
The dynamical evolution of the protoplanetary nebula is investigated using analytical solutions of the surface density transport equations. Constant and beta viscosity turbulence models are compared with a functional analytical model and the well-known alpha viscosity formulation. The beta viscosity model, heretofore used for steady-state disks, is shown to be a viable tool for separating dynamic and thermodynamic properties of an evolving disk.
Author
Turbulence Models; Viscosity; Protoplanetary Disks; Astronomical Models

20030000511 NASA Ames Research Center, Moffett Field, CA USA
Deuterated PAHs in Space
Peeters, Els, NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Hudgins, Douglas M., NASA Ames Research Center, USA; Sandford, Scott

A., NASA Ames Research Center, USA; Tielens, A. G. G. M., NASA Ames Research Center, USA; Oct. 02, 2002; 1p; In English
Contract(s)/Grant(s): RTOP 188-02-04-02; No Copyright; Avail: Issuing Activity; Abstract Only

The cosmic deuterium to hydrogen (D/H) ratio is of key importance from a cosmological and stellar evolution perspective since deuterium originates from big-bang nucleosynthesis and is destroyed by stellar thermonuclear reactions. Further, from the interstellar perspective, the galactic distribution of deuterium and the D/H ratio among various molecular species also traces interstellar chemical evolution. Over the past few decades, radio observations have enabled the study of a handful of small, deuterated interstellar species. However, the number of deuterated species detected and environments probed are limited, raising issues of selection effects that hamper generalization and applications to other environments. Infrared spectroscopy of the interstellar medium offers a distinct advantage in this regard as the extent of deuteration of entire chemical families, rather than one species, can be probed. These observations require spaceborne telescopes because the molecular vibrations involving D which produce the strongest IR bands fall in spectral regions which are obscured by terrestrial CO2 absorption. Here we report the tentative detection of the C-D stretching vibration from deuterated interstellar polycyclic aromatic hydrocarbons in the Orion nebula. Since the PAH emission features are widespread and probe many different types of cosmic environments, follow up observations of deuterated PAHs will provide fundamental, far reaching new insight and perspective into galactic and extragalactic processes.

Author

Deuterium Compounds; Polycyclic Aromatic Hydrocarbons; Cosmology; Radio Astronomy; Infrared Astronomy

20030000568 NASA Ames Research Center, Moffett Field, CA USA

Planet Formation

Lissauer, Jack J., NASA Ames Research Center, USA; Oct. 09, 2002; 1p; In English, Austin, TX, USA
Contract(s)/Grant(s): RTOP 344-30-50-01
Report No.(s): Rept-1; No Copyright; Avail: Issuing Activity; Abstract Only

Modern theories of star and planet formation and of the orbital stability of planetary systems are described and used to discuss possible characteristics of undiscovered planetary systems. The most detailed models of planetary growth are based upon observations of planets and smaller bodies within our own Solar System and of young stars and their environments. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth as do terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates. These models predict that rocky planets should form in orbit about most single stars. It is uncertain whether or not gas giant planet formation is common, because most protoplanetary disks may dissipate before solid planetary cores can grow large enough to gravitationally trap substantial quantities of gas. A potential hazard to planetary systems is radial decay of planetary orbits resulting from interactions with material within the disk. Planets more massive than Earth have the potential to decay the fastest, and may be able to sweep up smaller planets in their path. The implications of the giant planets found in recent radial velocity searches for the abundances of habitable planets are discussed, and the methods that are being used and planned for detecting and characterizing extrasolar planets are reviewed.

Author

Planetary Evolution; Planetary Orbits; Planetary Systems; Protoplanetary Disks

20030000625 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA

Polytype Distribution in Presolar SiC: Microstructural Characterization by Transmission Electron Microscopy

Daulton, T. L.; Lewis, R. S.; Amari, S.; Oct. 17, 2001; 3p; In English
Report No.(s): AD-A407470; NRL/PP/7400--01-2; XB-NRL/PP/7400; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Presolar dust grains predate the formation of the solar system, originating from circumstellar outflows and supernova ejecta. The two most abundant forms of presolar grains isolated from primitive meteorites are nm-sized diamond and mm to submm-sized SiC. Both are ubiquitous in primitive chondritic meteorites at 300 - 1800 ppm (diamond) and 1 - 28 ppm (SiC). Silicon carbide is particularly interesting because it is known to form hundreds of different polytype structures and the formation of a particular polytype is sensitive to growth conditions. The first astronomical evidence of SiC in dusty envelopes of carbon stars came from a relatively broad 11.3 mm infrared (IR) feature. Later attempts to identify crystallographic structure of circumstellar SiC from IR spectra of carbon stars have generated controversy over the techniques and interpretation of the data. The outstanding question of polytype has bearing on physical conditions, such as temperatures and pressures. at which SIC condense from circumstellar

outflows or supernova ejecta. Therefore, using transmission electron microscopy (TEM), we unambiguously determine the distribution of polytypes in presolar SiC grains, isolated by acid dissolution from the Murchison CM2 carbonaceous meteorite. DTIC

Crystal Structure; Silicon Carbides; Interstellar Matter

20030001744 NASA Ames Research Center, Moffett Field, CA USA

Detection of HCN and C2H2 in ISO Spectra of Oxygen-Rich AGB Stars

Carbon, Duane F., NASA Ames Research Center, USA; Chiar, Jean, NASA Ames Research Center, USA; Goorvitch, David, NASA Ames Research Center, USA; [2002]; 1p; In English; American Astronomical Society Meeting, 5-9 Jan. 2002, Seattle, WA, USA

Contract(s)/Grant(s): NRA-99-01-ADP-073; NRA-399-20-61-02; No Copyright; Avail: Issuing Activity; Abstract Only

Cool oxygen-rich AGB stars were not expected to have organic molecules like HCN in either their photospheres or circumstellar envelopes (CSEs). The discovery of HCN and CS microwave emission from the shallowest CSE layers of these stars was a considerable surprise and much theoretical effort has been expended in explaining the presence of such organics. to further explore this problem, we have undertaken a systematic search of oxygen-rich AGB stellar spectra in the Infrared Space Observatory (ISO) data archive. Our purposes are to find evidence regarding critical molecular species that could be of value in choosing among the proposed theoretical models, to locate spectral features which might give clues to conditions deeper in the CSEs, and to lay the groundwork for future SIRTF (Space Infrared Telescope Facility) and SOFIA (Stratospheric Observatory for Infrared Astronomy) observations. Using carefully reduced observations, we have detected weak absorption features arising from HCN and possibly C2H2 in a small number of oxygen-rich AGB stars. The most compelling case is NML Cyg which shows both HCN (14 microns) and CO2 (15 microns). VY CMa, a similar star, shows evidence for HCN, but not CO2. Two S-type stars show evidence for the C-H bending transitions: W Aql at 14 microns (HCN) and both W Aql and S Cas at 13.7 microns (C2H2). Both W Aql and S Cas as well as S Lyr, a SC-type star, show 3 micron absorption which may arise from the C-H stretch of HCN and C2H2. In the case of NML Cyg, we show that the HCN and CO2 spectral features are formed in the CSE at temperatures well above those of the outermost CSE layers and derive approximate column densities. In the case of the S-stars, we discuss the evidence for the organic features and their photospheric origin.

Author

Acetylene; Hydrocyanic Acid; Stellar Spectra; Infrared Spectroscopy; Astronomical Spectroscopy; Infrared Astronomy; Asymptotic Giant Branch Stars

20030001919 NASA Marshall Space Flight Center, Huntsville, AL USA

Non-Thermal Hard X-Ray Emission in Galaxy Clusters Observed with the BeppoSAX PDS

Nevalainen, Jukka H., Alabama Univ., USA; Oosterbroeck, T., European Space Agency. European Space Research and Technology Center, ESTEC, Netherlands; Bonamente, Max, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We studied the X-ray emission in a sample of clusters using the BeppoSAX PDS instrument in the 20 -- 80 keV energy band. We estimated the non-thermal cluster emission (HXR) by modeling the thermal contribution from the cluster gas and the non-thermal contamination from the AGN in the field, and propagating the corresponding uncertainties. We also evaluated and propagated the systematic uncertainties due to the background fluctuations. The resulting non-thermal component is detected at a sigma level in approx. 50 % of the non-significantly AGN-contaminated clusters, i.e. in clusters A2142, A2256, A3376, Coma, Ophiuchus and Virgo. Furthermore, Virgo is detected at a 4 sigma level. All the clusters detected at a 2 sigma level exhibit some degree of merger signatures, i.e. deviations from the azimuthally symmetric brightness and temperature distributions, while the relaxed clusters are detected at a lower confidence. The data are consistent with a scenario whereby relaxed clusters have no non-thermal hard X-ray component, whereas merger clusters do, with a 20 -- 80 keV luminosity of approx. 10(exp 42-44)((h(sub 50))(exp -2))(erg/s). Consistent with merger boosting of cluster temperatures, the non-thermal luminosity increases by 2-3 orders of magnitude between the average cluster temperatures 2 and 10 keV, as L(sub NTE) is proportional to T(sup j) with j = 2.4+/-0.3. These results corroborate the assumption which is the essential element in most non-thermal hard X-ray emission models. The co-added spectrum of all non-significantly AGN-contaminated clusters indicates a power-law spectrum for the non-thermal component with a photon index of 1.5+/-0.25 at 1 sigma confidence level. Unless there is a high energy cut-off in the electron velocity distribution, the total spectrum implies that Inverse Compton scatter of Cosmic Microwave Background photons from electron population dominates over the non-thermal bremsstrahlung in producing hard X-rays in clusters on the merger shock acceleration of electrons in clusters.

Author

X Ray Astronomy; X Rays; Galactic Clusters; Emission; Active Galactic Nuclei

20030001972 Computer Sciences Corp., USA

Video Observations Encompassing the 2002 Leonid Storm: First Results and a Revised Photometric Procedure for Video Meteor Analysis

Cooke, William J., Computer Sciences Corp., USA; Suggs, Robert M., NASA Marshall Space Flight Center, USA; Swift, Wesley, Raytheon Co., USA; Gural, Peter S., Science Applications International Corp., USA; Brown, Peter, University of Western Ontario, Canada; Jul. 30, 2002; 1p; In English; International Conference ASTEROIDS, COMETS, METEORS: ACM2002, 29 Jul. - 2 Aug. 2002, Berlin, Germany

Contract(s)/Grant(s): NAS8-60000; No Copyright; Avail: Issuing Activity; Abstract Only

During the 2001 Leonid storm, Marshall Space Flight Center, with the cooperation of the University of Western Ontario and the USA Air Force, deployed 6 teams of observers equipped with intensified video systems to sites located in North America, the Pacific, and Mongolia. The campaign was extremely successful, with the entire period of enhanced Leonid activity (over 16 hours) captured on video tape in a consistent manner. We present the first results from the analysis of this unique, 2 terabyte data set and discuss the problems involved in reducing large amounts of video meteor data. In particular, the question of how to determine meteor masses though photometric analysis will be re-examined, and new techniques will be proposed that eliminate some of the deficiencies suffered by the techniques currently employed in video meteor analysis.

Author

Leonid Meteoroids; Video Data; Photometry

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20030000601 NASA Glenn Research Center, Cleveland, OH USA

Solar Flight on Mars and Venus

Landis, Geoffrey A., NASA Glenn Research Center, USA; LaMarre, Christopher, Illinois Univ., USA; Colozza, Anthony, Analex Corp., USA; 17th Space Photovoltaic Research and Technology Conference; October 2002, pp. 126-127; In English; Also announced as 20030000584; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Solar powered aircraft are of interest for exploring both Mars and Venus. The thin atmosphere of Mars presents a difficult environment for flying. It is clear that a new approach is needed. by making a totally solar airplane, we can eliminate many of the heavy components, and make an airplane that can fly without fuel. Using high efficiency solar cells, we can succeed with an airplane design that can fly for up to 6 hours in near-equatorial regions of Mars (4 hours of level flight, plus two hours of slow descent), and potentially fly for many days in the polar regions. by designing an airplane for a single day flight. In particular, this change means that we no longer have to cope with the weight of the energy storage system that made previous solar powered airplanes for Mars impractical). The new airplane concept is designed to fly only under the optimal conditions: near equatorial flight, at the subsolar point, near noon. We baseline an 8 kg airplane, with 2 kg margin. Science instruments will be selected with the primary criterion of low mass. Solar-powered aircraft are also quite interesting for the exploration of Venus. Venus provides several advantages for flying a solar-powered aircraft. At the top of the cloud level, the solar intensity is comparable to or greater than terrestrial solar intensities. The atmospheric pressure makes flight much easier than on planets such as Mars. The atmospheric pressure on Venus is presented. From an altitude of approximately 45 km (pressure = 2 bar), to approximately 60 km (pressure = 0.2 bar), terrestrial airplane experience can be easily applied to a Venus airplane design. At these flight altitudes, the temperature varies from 80 C at 45 km, decreasing to -35 C at 60 km. Also, the slow rotation of Venus allows an airplane to be designed for flight within continuous sunlight, eliminating the need for energy storage for nighttime flight. These factors make Venus a prime choice for a long-duration solar-powered aircraft. Fleets of solar-powered aircraft could provide an architecture for efficient and low-cost comprehensive coverage for a variety of scientific missions. Exploratory planetary mapping and atmospheric sampling can lead to a greater understanding of the greenhouse effect not only on Venus but on Earth as well.

Derived from text

Mars (Planet); Solar Powered Aircraft; Venus (Planet); Space Flight; Mars Exploration

20030000829 NASA Langley Research Center, Hampton, VA USA

Mars Smart Lander Parachute Simulation Model

Queen, Eric M., NASA Langley Research Center, USA; Raiszadeh, Ben, NASA Langley Research Center, USA; [2002]; 6p; 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
Report No.(s): AIAA Paper 2002-4617; Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

A multi-body flight simulation for the Mars Smart Lander has been developed that includes six degree-of-freedom rigid-body models for both the supersonically-deployed and subsonically-deployed parachutes. This simulation is designed to be incorporated into a larger simulation of the entire entry, descent and landing (EDL) sequence. The complete end-to-end simulation will provide attitude history predictions of all bodies throughout the flight as well as loads on each of the connecting lines. Other issues such as recontact with jettisoned elements (heat shield, back shield, parachute mortar covers, etc.), design of parachute and attachment points, and desirable line properties can also be addressed readily using this simulation.
Author
Flight Simulation; Parachutes; Mars Landing; Trajectory Analysis; Evaluation; Loads (Forces)

20030000914 NASA Langley Research Center, Hampton, VA USA
Mars Smart Lander Simulations for Entry, Descent, and Landing
Striepe, S. A., NASA Langley Research Center, USA; Way, D. W., NASA Langley Research Center, USA; Balaram, J., Jet Propulsion Lab., California Inst. of Tech., USA; [2002]; 20p; 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
Report No.(s): AIAA Paper 2002-4412; Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Distribution under U.S. Government purpose rights; Distribution under U.S. Government purpose rights

Two primary simulations have been developed and are being updated for the Mars Smart Lander Entry, Descent, and Landing (EDL). The high fidelity engineering end-to-end EDL simulation that is based on NASA Langley's Program to Optimize Simulated Trajectories (POST) and the end-to-end real-time, hardware-in-the-loop simulation testbed, which is based on NASA JPL's (Jet Propulsion Laboratory) Dynamics Simulator for Entry, Descent and Surface landing (DSENDS). This paper presents the status of these Mars Smart Lander EDL end-to-end simulations at this time. Various models, capabilities, as well as validation and verification for these simulations are discussed.
Author
Mars Landing; Mars Missions; Landing Simulation; Roving Vehicles; Hardware-In-The-Loop Simulation; Systems Engineering

20030001124 Computer Sciences Corp., Albuquerque, NM USA
Mars-Gram Validation with Mars Global Surveyor Data
Justus, C. G., Computer Sciences Corp., USA; Johnson, D., NASA Marshall Space Flight Center, USA; Oct. 02, 2002; 1p; In English; COSPAR 2002 World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown
Contract(s)/Grant(s): NAS8-60000; No Copyright; Avail: Issuing Activity; Abstract Only

Mars Global Reference Atmospheric Model (Mars-GRAM 2001) is an engineering-level Mars atmosphere model widely used for many b4ars mission applications. From 0-80 km, it is based on NASA Ames Mars General Circulation Model (MGCM), while above 80 km it is based on University of Arizona Mars Thermospheric General Circulation Model. Mars-GRAM 2001 and MGCM use surface topography from Mars Global Surveyor Mars Orbiting Laser Altimeter (MOLA). Validation studies are described comparing Mars-GRAM with Mars Global Surveyor Radio Science (RS) and Thermal Emission Spectrometer (TES) data. RS data from 2480 profiles were used, covering latitudes 75deg S to 72deg N, surface to approx. 40 km, for seasons ranging from areocentric longitude of Sun (Ls) = 70-160deg and 265-310deg. RS data spanned a range of local times, mostly 0-9 hours and 18-24 hours. For interests in aerocapture and precision landing, comparisons concentrated on atmospheric density. At a fixed height of 20 km, measured RS density varied by about a factor of 2.5 over the range of latitudes and Ls values observed. Evaluated at matching positions and times, average RS/Mars-GRAM density ratios were generally lf0.05, except at heights above approx. 25 km and latitudes above approx.50deg N. Average standard deviation of RS/Mars-GRAM density ratio was 6%. TES data were used covering surface to approx. 40 km, over more than a full Mars year (February, 1999 - June, 2001, just before start of Mars global dust storm). Depending on season, TES data covered latitudes 85deg S to 85deg N. Most TES data were concentrated near local times 2 hours and 14 hours. Observed average TES/Mars-GRAM density ratios were generally 1+/-0.05, except at high altitudes (15-30 km, depending on season) and high latitudes (> 45deg N), or at most altitudes in the southern hemisphere at Ls approx. 90 and 180deg). Compared to TES averages for a given latitude and season, TES data had average density standard deviation about the mean of approx. 6.5-10.5% (varying with height) for all data, or approx. 5- 12%, depending on time of day and dust optical depth. Average standard deviation of TES/Mars-GRAM density ratio was 8.9% for local time 2 hours and 7.1%

for 1o:al time 14 hours. Thus standard deviation of observed TES/Mars-GRAM density ratio, evaluated at matching positions and times, is about the same as the standard deviation of TES data about the TES mean value at a given position and season.
Author
Mars Global Surveyor; Atmospheric General Circulation Models; Atmospheric Density; Topography; Mars Atmosphere; Atmospheric Models

20030001125 Computer Sciences Corp., USA
Global Summary MGS TES Data and Mars-Gram Validation
Justus, C., Computer Sciences Corp., USA; Johnson, D., NASA Marshall Space Flight Center, USA; Oct. 02, 2002; 1p; In English; COSPAR 2002 World Space Congress, 10-19 Oct. 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown
Contract(s)/Grant(s): NAS8-60000; No Copyright; Avail: Issuing Activity; Abstract Only
Mars Global Reference Atmospheric Model (Mars-GRAM 2001) is an engineering-level Mars atmosphere model widely used for many Mars mission applications. From 0-80 km, it is based on NASA Ames Mars General Circulation Model (MGCM), while above 80 km it is based on University of Arizona Mars Thermospheric General Circulation Model. Mars-GRAM 2001 and MGCM use surface topograph$ from Mars Global Surveyor Mars Orbiting Laser Altimeter (MOLA). Validation studies are described comparing Mars-GRAM with a global summary data set of Mars Global Surveyor Thermal Emission Spectrometer (TES) data. TES averages and standard deviations were assembled from binned TES data which covered surface to approx. 40 km, over more than a full Mars year (February, 1999 - June, 2001, just before start of a Mars global dust storm). TES data were binned in 10-by-10 degree latitude-longitude bins (i.e. 36 longitude bins by 19 latitude bins), 12 seasonal bins (based on 30 degree increments of Ls angle). Bin averages and standard deviations were assembled at 23 data levels (temperature at 21 pressure levels, plus surface temperature and surface pressure). Two time-of day bins were used: local time near 2 or 14 hours local time). Two dust optical depth bins wereused: infrared optical depth either less than or greater than 0.25 (which corresponds to visible optical depth either less than or greater than about 0.5). For interests in aerocapture and precision entry and landing, comparisons focused on atmospheric density. TES densities versus height were computed from TES temperature versus pressure, using assumptions of perfect gas law and hydrostatics. Mars-GRAM validation studies used density ratio (TES/Mars-GRAM) evaluated at data bin center points in space and time. Observed average TES/Mars-GRAM density ratios were generally 1+/-0.05, except at high altitudes (15-30 km, depending on season) and high latitudes (> 45 deg N), or at most altitudes in the southern hemisphere at Ls approx. 90 and 180deg). Compared to TES averages for a given latitude and season, TES data had average density standard deviation about the mean of approx. 65-10.5% (varying with height) for all data, or approx. 5-12%, depending on time of day and dust optical depth. Average standard deviation of TES/Mars-GRAM density ratio was 8.9% for local time 2 hours and 7.1% for local time 14 hours. Thus standard deviation of observed TES/Mars-GRAM density ratio, evaluated at matching positions and times, is about the same as the standard deviation of TES data about the TES mean value at a given position and season.
Author
Mars Global Surveyor; Atmospheric General Circulation Models; Infrared Radiation; Laser Altimeters; Surface Temperature; Atmospheric Density

20030001639 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Characterizing the Oxidizing Properties of Mars' Polar Regions *Final Report*
Hendrix, Amanda, Jet Propulsion Lab., California Inst. of Tech., USA; Simmons, Karen, Colorado Univ., USA; [2002]; 2p; In English
Contract(s)/Grant(s): NAG5-9590; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This project had two primary goals. The first was to restore and archive the Ultraviolet Spectrometer (UVS) data from the 1971 Mariner 9 (MM71) mission to Mars. The second was to use this revised data set to analyze data of Mars' polar regions to look for and map out the ozone (03) and hydrogen peroxide (H2O2,) features. Data restoration and archiving activities for this project have resulted in the restoration of 100% of the original Mariner 9 raw data set as well as many of the secondary analysis data sets. These data sets have been submitted to the Planetary Data System (PDS) Atmospheric Node, long with their PDS labels and descriptive metadata.
Author
Data Management; Mars Missions; Data Storage; Mars Surface; Polar Regions; Oxidation

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SOLAR PHYSICS

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

20030000543 NASA Marshall Space Flight Center, Huntsville, AL USA
Large Scale Flows through the Solar Cycle
Hathaway, D. H., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; Local and Global Helioseismology: The Present and Future, 27 Oct. - 2 Nov. 2002, Big Bear Lake, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Large scale flows within the solar convection zone are the primary drivers of the Sun's magnetic activity cycle. Differential rotation amplifies the magnetic field and converts poloidal fields into toroidal fields. Poleward meridional flow near the surface carries magnetic flux that reverses the magnetic poles and converts toroidal fields into poloidal fields. The deeper, equatorward meridional flow carries magnetic flux toward the equator where it must reconnect with oppositely directed fields in the other hemisphere. These axisymmetric flows are themselves driven by large scale convective motions. Given these intimate connections between the large scale flows and solar activity, it would be surprising if there weren't solar cycle variations in the flow characteristics. Some variations, namely the torsional oscillations, are well established. Other variations, namely changes in the meridional flow and in the convective motions themselves, are more controversial. In this presentation I will describe the observed characteristics of the large scale flows and discuss possible variations associated with the solar cycle.
Author
Solar Cycles; Meridional Flow; Solar Activity; Magnetic Fields

20030001011 NASA Marshall Space Flight Center, Huntsville, AL USA
Flow in Streamer Boundaries and Streamer Stability
Suess, S. T., NASA Marshall Space Flight Center, USA; Nerney, S., Ohio Univ., USA; [2002]; 1p; In English; COSPAR/World Space Congress, October 2002, Houston, TX, USA; Sponsored by Committee on Space Research, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

Streamers can extend to many solar radii but the closed field regions, or helmets, probably never reach higher than 2-4 solar radii. The brightness boundary defining streamers therefore is a boundary between different flow regimes rather than between static plasma and expanding solar wind. It is reasonable to assume that this boundary divides fast coronal hole wind from slow wind. Flow inside this boundary can be studied using simple MHD models and is a type of stagnation flow. We will present examples of what this flow can be like. The flow effects the stability of the underlying helmet, which can be subject to leakage out the cusp similar to the small mass releases observed with the SOHO/LASCO coronagraph. It can also cause the helmet to be more or less susceptible to being carried away in a coronal mass ejection.
Author
Solar Physics; Boundary Layer Flow; Solar Magnetic Field; Magnetohydrodynamics; Stagnation Flow

20030001928 NASA Marshall Space Flight Center, Huntsville, AL USA
Forecasting Coronal Mass Ejections from Vector Magnetograms
Moore, R. L., NASA Marshall Space Flight Center, USA; Falconer, D. A., NASA Marshall Space Flight Center, USA; Gary, G. A., NASA Marshall Space Flight Center, USA; Haygard, M. J., NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; NASA's Living with a Star Science Workshop, 13-15 Nov. 2002, Laurel, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Identification of active regions from which Earthward halo Coronal Mass Ejections (CMEs) are likely to originate is important both for understanding how CMEs are produced and for prediction of hazardous space weather. In previous work, from a set of 17 MSFC (Marshall Space Flight Center) vector magnetograms of 12 bipolar active regions situated within +/- 2 days of rotation from central meridian, we have evaluated four different measures of the global nonpotentiality of the magnetic field of each active region, and have found that the nonpotentiality of these active regions is strongly correlated with their CME productivity during the time interval of +/- 2 days centered on the day of the magnetogram: strongly nonpotential bipolar active regions are much more likely to produce a CME during this interval that are weakly nonpotential bipolar active regions. to further establish the use of active-region nonpotentiality for forecasting CMEs, we have expanded the sample to 19 additional bipolar active regions, with vector magnetograms taken with the upgraded MSFC vector magnetograph from September 2000 through June 2001 with support from our LWS grant (M. J. Hagyard, PI). The four global measures of nonpotentiality are the length of strong-shear, strong-field main neutral line, the net current, and two other measures of the overall twist in the magnetic field of the active-region bipole. We find: 1) The statistical significance of the correlation of the nonpotentiality of active regions with their CME productivity within +/- 2 days of the day of the magnetogram is greater than 99%. 2) 67% of the strongly nonpotential

active regions produced CMEs within the +/- 2 day window, while only 17% of the weakly nonpotential ones did. 3) The statistical significance of the correlation of the nonpotentiality of active regions with their CME productivity during 0-2 days after the day of the magnetogram is about 97%. 4) 42% of the strongly nonpotential active regions produced CMEs within the 0-2 day window, while only 10% of the weakly nonpotential ones did. 5) The four different measures of an active region's nonpotentiality agree most of the time in their classification of the nonpotentiality as strong or weak (75%-90% depending on the pair of measurements). Additional information is included in the original extended abstract.
Author
Forecasting; Coronal Mass Ejection; Magnetic Signatures; Solar Physics

20030001975 NASA Marshall Space Flight Center, Huntsville, AL USA
Magnetic TRAnsition Region Probe (MTRAP)
Moore, R. L., NASA Marshall Space Flight Center, USA; Davis, John, NASA Marshall Space Flight Center, USA; Hathaway, David, NASA Marshall Space Flight Center, USA; [2002]; 1p; In English; NASA's Living with a Star Science Workshop, 13-15 Nov. 2002, Laurel, MD, USA; No Copyright; Avail: Issuing Activity; Abstract Only

MTRAP (Magnetic Transition Region Probe) will reveal the fine-scale physical processes in the Sun's magnetic transition region, the complex layer from the upper photosphere to the upper chromosphere/lower transition region. In the magnetic transition region plasma forces and magnetic forces are of comparable strength, which results in complex interplay of the two, which interplay governs the coupling of the convectively-driven deeper layers to the magnetically-driven upper transition region and inner corona. The fine-scale magnetic structure, processes, and events in the magnetic transition region are key to the genesis of the Sun's entire hot, dynamic outer atmosphere and to the initiation of large eruptive events. MTRAP will be a single spacecraft in Sun-synchronous Earth orbit. Because MTRAP will probe and measure the 3-D structure and dynamics of the magnetic field and plasma in the chromosphere and transition region with unprecedented resolution, the required telescope size and telemetry rates dictate that MTRAP be in Earth orbit, not in deep space. The observations will feature visible and infrared maps of vector magnetic and velocity fields in the magnetic transition region and photosphere. These will have large field of view (greater than 100,000 km), high resolution (greater than 100 km), and high sensitivity (greater than 30 G in transverse field). These observations of the lower atmosphere will be complemented by UV maps of the structure, velocity, and magnetic field (including the full vector field if technically feasible) higher up, in the upper chromosphere and lower transition region. MTRAP will also have an EUV imaging spectrograph observing coronal structure and dynamics in the same field of view with comparable resolution. Specific phenomena to be analyzed include spicules, bright points, jets, the base of plumes, and the triggering of eruptive flares and coronal mass ejections. Additional information is included in the original extended abstract.
Author
Ultraviolet Astronomy; Solar Magnetic Field; Magnetic Field Configurations; Spaceborne Telescopes; Solar Transition Region; Infrared Astronomy

20030001983 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA
TIMED Solar EUV Experiment: Phase E *Annual Report, 2002*
Woods, Tom, Colorado Univ., USA; Eparvier, Frank, Colorado Univ., USA; Woodraska, Don, Colorado Univ., USA; Rottman, Gary, Colorado Univ., USA; Solomon, Stan, National Center for Atmospheric Research, USA; Roble, Ray, National Center for Atmospheric Research, USA; deToma, Guliana, National Center for Atmospheric Research, USA; White, Dick, National Center for Atmospheric Research, USA; Lean, Judith, Naval Research Lab., USA; Tobiska, Kent, National Oceanic and Atmospheric Administration, USA; Bailey, Scott, Alaska Univ., USA; [2002]; 12p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-11408; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The timed Solar EUV Experiment (SEE) Phase E Annual Report for 2002 is presented. The contents include: 1) SEE Science Overview; 2) SEE Instrument Overview and Status; 3) Summary of SEE Data Products; 4) Summary of SEE Results; 5) Summary of SEE Related Talks and Papers; and 6) Future Plans for SEE Team. This paper is in viewgraph form.
CASI
Extreme Ultraviolet Radiation; Solar Radiation; Irradiance; Solar Terrestrial Interactions

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SPACE RADIATION

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

20030001048 NASA Marshall Space Flight Center, Huntsville, AL USA
An Extended Burst Tail from SGR 1900+14 with a Thermal X-ray Spectrum
Lenters, Geoffrey T., Hope Coll., USA; Woods, Peter M., NASA Marshall Space Flight Center, USA; Goupell, Johnathan E., Hope Coll., USA; Kouveliotou, Chryssa, NASA Marshall Space Flight Center, USA; Goegues, Ersin, NASA Marshall Space Flight Center, USA; Hurley, Kevin, California Univ., USA; Frederiks, Dmitry, Academy of Sciences (Russia), Russia; Golenetskii, Sergey, Academy of Sciences (Russia), Russia; Swank, Jean, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The Soft Gamma Repeater, SGR 1900+14, entered a new phase of activity in April 2001 initiated by the intermediate flare recorded on April 18. Ten days following this flare, we discovered an abrupt increase in the source flux between consecutive RXTE orbits. This X-ray flux excess decayed over the next several minutes and was subsequently linked to a high fluence burst from SGR 1900+14 recorded by other spacecraft (Ulysses and KONUS) while the SGR was Earth-occulted for RXTE. We present here spectral and temporal analysis of both the burst of 28 April and the long X-ray tail following it. We draw comparisons with other bursts and flares from SGR 1900+14 which have shown extended X-ray excesses (e.g. 1998 August 29) and discuss their physical origin.
Author
Bursts; Tail Surfaces; X Ray Timing Explorer; Spectra

20030001767 Argonne National Lab., IL USA
Use of Superconducting Bearings to Measure the Polarization of the Cosmic Microwave Background Radiation
Hanany, S.; Matsumura, T.; Johnson, B.; Jones, T.; Hull, J. R.; Aug. 2002; 12p; In English
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Measurements of the polarization of the cosmic microwave background (CMB) radiation are expected to significantly increase our understanding of the early universe. We present a design for a CMB polarimeter in which a cryogenically cooled half wave plate rotates by means of a high-temperature superconducting (HTS) bearing. The design is optimized for implementation in MAXIPOL, a balloon-borne CMB polarimeter. A prototype bearing, consisting of commercially available ring-shaped permanent magnet and an array of YBCO bulk HTS material, has been constructed. We report on measurements of the coefficient of friction as a function of temperature between 15 and 80 K, of rotation frequency between 0.3 and 3.5 Hz, of levitation distance between 6 and 10 mm, and of ambient pressure between 1 and 10 torr. The low rotational drag of the HTS bearing allows rotations for long periods of time with minimal input power and negligible wear and tear thus making this technology suitable for a future satellite mission.
NTIS
Cosmic Microwave Background Radiation; High Temperature Superconductors; Polarization (Waves); Background Radiation; Bearings

20030001976 NASA Marshall Space Flight Center, Huntsville, AL USA
The Focal Surface of EUSO Telescope
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The Extreme Universe Space Observatory (EUSO) is a science mission under conceptual design for the detection of extremely high energy cosmic rays and neutrinos by the observation of time-resolved images of atmospheric fluorescence photons generated along the extensive air shower, in the near ultraviolet wavelength region. A refractive telescope with double-sided double Fresnel lens will be employed to achieve a large field of view of 60 degrees. The energy and arrival direction of the primary particles will be determined by observing the time evolution of the airshower. The focal surface of the EUSO telescope will be segmented to a few hundred thousand pixels to resolve the entire field of view with the angular resolution of the order of 0.1 degree.

The time evolution will be observed with the time resolution of 0.8 microsecond. A large scale array of multianode photomultiplier (MAPMT) is being studied as the EUSO focal surface. The MAPMT array is capable of detecting near ultraviolet photons at single photoelectron level. In this contribution, we will report the present status of the focal surface design including the optimization of anode segmentation and the minimization of the dead area and discuss overall experimental performance in detecting extensive airshowers.

Author

Spaceborne Telescopes; Ultraviolet Astronomy; Ultraviolet Telescopes; Fresnel Lenses; Focal Plane Devices

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