National Aeronautics and
Space Administration
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Scientific and Technical Aerospace Reports

STAR

Volume 42 Issue 16

August 13, 2004

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- Domestic and foreign dissertations and theses

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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

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 42, AUGUST 13, 2004

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*.

20040084339 National Renewable Energy Lab., Golden, CO
Modeling of the UAE Wind Turbine for Refinement of Fast AD
Jonkman, J. M.; Dec. 2003; In English
Report No.(s): DE2003-15005920; NREL/TP-500-34755; No Copyright; Avail: National Technical Information Service (NTIS)

The Unsteady Aerodynamics Experiment (UAE) research wind turbine was modeled both aerodynamically and structurally in the FAST(-)AD wind turbine design code, and its response to wind inflows was simulated for a sample of test cases. A study was conducted to determine why wind turbine load magnitude discrepancies-inconsistencies in aerodynamic force coefficients, rotor shaft torque, and out-of-plane bending moments at the blade root across a range of operating conditions-exist between load predictions made by FAST(-)AD and other modeling tools and measured loads taken from the actual UAE wind turbine during the NASA-Ames wind tunnel tests. The acquired experimental test data represent the finest, most accurate set of wind turbine aerodynamic and induced flow field data available today.
NTIS
Aerodynamic Characteristics; Aerodynamic Forces; Flow Distribution; Fluid Flow; Wind Tunnel Tests; Wind Turbines

20040084341 National Renewable Energy Lab., Golden, CO, National Aerospace Lab., Emmeloord, Netherlands
Wind Tunnel Aeroacoustic Tests of Six Airfoils for Use on Small Wind Turbines
Migliore, P.; Oerlemans, S.; Dec. 2003; In English
Report No.(s): DE2003-15005925; NREL/CP-500-35090; No Copyright; Avail: National Technical Information Service (NTIS)

Aeroacoustic tests of seven airfoils were performed in an open jet anechoic wind tunnel. Six of the airfoils are candidates for use on small wind turbines operating at low Reynolds number. One airfoil was tested for comparison to benchmark data. Tests were conducted with and without boundary layer tripping. In some cases a turbulence grid was placed upstream in the test section to investigate inflow turbulence noise. An array of 48 microphones was used to locate noise sources and separate airfoil noise from extraneous tunnel noise. Trailing edge noise was dominant for all airfoils in clean tunnel flow. With the boundary layer untripped, several airfoils exhibited pure tones that disappeared after proper tripping was applied. In the presence of inflow turbulence, leading edge noise was dominant for all airfoils.
NTIS
Acoustic Properties; Aeroacoustics; Aerodynamic Noise; Test Chambers; Wind Tunnel Tests; Wind Turbines

20040084346 Nanjing Univ., China
Journal of Nanjing University of Aeronautics and Astronautics, Volume 36, Number 2, April 2004
Dewang, L.; 2004; 144 pp.; In Chinese
Report No.(s): PB2004-105310; Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
Research and Development; Aeronautical Engineering; Aerospace Engineering

20040084347 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics and Astronautics, Volume 36, Number 1, February 2004
Dewang, L.; 2004; 148 pp.; In Chinese
Report No.(s): PB2004-105311; Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Aeronautical Engineering; Aerospace Engineering; Research and Development

20040084691 Lawrence Livermore National Lab., Livermore, CA
May 2003 Working Group Meeting on Heavy Vehicle Aerodynamic Drag: Presentations and Summary of Comments and Conclusions
McCallen, R.; Salari, K.; Ortega, J.; Browand, F.; Hammache, M.; May 01, 2003; In English
Report No.(s): DE2004-15006458; UCRL-ID-154886; No Copyright; Avail: National Technical Information Service (NTIS)
A Working Group Meeting on Heavy Vehicle Aerodynamic Drag was held at Lawrence Livermore National Laboratory on May 29-30, 2003. The purpose of the meeting was to present and discuss suggested guidance and direction for the design of drag reduction devices determined from experimental and computational studies.
NTIS
Aerodynamic Drag; Drag Reduction

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 Thermodynamics*.

20040084366 Army Aviation and Missile Command, Moffett Field, CA, USA
Rotor Flapping Response to Active Control
Nguyen, Khanh; Johnson, Wayne; [2004]; 3 pp.; In English
Contract(s)/Grant(s): RTOP 712-10-12; No Copyright; Avail: CASI; A01, Hardcopy
Rotor active control using higher harmonic blade pitch has been proposed as a means to reduce both rotor radiated noise and airframe vibration and to enhance rotor performance. The higher harmonic input, however, can affect rotor thrust and cyclic flapping - the basic trim characteristics of the rotor. Some of the trim changes can negate the active control benefits. For example, wind tunnel test results of a full scale BO-105 rotor with individual-blade control indicate some rotor performance improvements, accompanied with changes in rotor trim, using two-per-rev blade pitch input. The observed performance benefits could therefore be a simple manifestation of the trim change rather than an efficient redistribution of the rotor airloads. More recently, the flight test of the BO-105 helicopter equip,ped with individual-blade-control actuators also reported trim changes whenever the two-per-rev blade pitch for noise reduction was activated. The pilot had to adjust the trim control to maintain the aircraft under a constant flight path. These two cases highlight the, importance of trim considerations in the application of active control to rotorcraft.
Derived from text
Active Control; Flapping; Bo-105 Helicopter; Rotor Aerodynamics; Aerodynamic Loads

20040084446 NASA Ames Research Center, Moffett Field, CA, USA
Genetic Algorithms Applied to Multi-Objective Aerodynamic Shape Optimization
Holst, Terry L.; May 04, 2004; 39 pp.; In English; AIAA 1st Intelligent Systems Tech Conference, 20-22 Sep. 2004, Chicago, IL, USA; No Copyright; Avail: CASI; A03, Hardcopy
A genetic algorithm approach suitable for solving multi-objective optimization problems is described and evaluated using a series of aerodynamic shape optimization problems. Several new features including two variations of a binning selection algorithm and a gene-space transformation procedure are included. The genetic algorithm is suitable for finding pareto optimal solutions in search spaces that are defined by any number of genes and that contain any number of local extrema. A new masking array capability is included allowing any gene or gene subset to be eliminated as decision variables from the design space. This allows determination of the effect of a single gene or gene subset on the pareto optimal solution. Results indicate that the genetic algorithm optimization approach is flexible in application and reliable. The binning selection algorithms

generally provide pareto front quality enhancements and moderate convergence efficiency improvements for most of the problems solved.
Author
Genetic Algorithms; Shape Optimization; Aerodynamic Configurations; Parameterization

20040084568 NASA Ames Research Center, Moffett Field, CA, USA
High-speed Imaging of Global Surface Temperature Distributions on Hypersonic Ballistic-Range Projectiles
Wilder, Michael C.; Reda, Daniel C.; March 29, 2004; 1 pp.; In English; 26th International Congress on High-Speed Photography and Photonics, 19-24 Sep. 2004, Alexandria, VA, USA; No Copyright; Avail: Other Sources; Abstract Only

The NASA-Ames ballistic range provides a unique capability for aerothermodynamic testing of configurations in hypersonic, real-gas, free-flight environments. The facility can closely simulate conditions at any point along practically any trajectory of interest experienced by a spacecraft entering an atmosphere. Sub-scale models of blunt atmospheric entry vehicles are accelerated by a two-stage light-gas gun to speeds as high as 20 times the speed of sound to fly ballistic trajectories through an 24 m long vacuum-rated test section. The test-section pressure (effective altitude), the launch velocity of the model (flight Mach number), and the test-section working gas (planetary atmosphere) are independently variable. The model travels at hypersonic speeds through a quiescent test gas, creating a strong bow-shock wave and real-gas effects that closely match conditions achieved during actual atmospheric entry. The challenge with ballistic range experiments is to obtain quantitative surface measurements from a model traveling at hypersonic speeds. The models are relatively small (less than 3.8 cm in diameter), which limits the spatial resolution possible with surface mounted sensors. Furthermore, since the model is in flight, surface-mounted sensors require some form of on-board telemetry, which must survive the massive acceleration loads experienced during launch (up to 500,000 gravities). Finally, the model and any on-board instrumentation will be destroyed at the terminal wall of the range. For these reasons, optical measurement techniques are the most practical means of acquiring data. High-speed thermal imaging has been employed in the Ames ballistic range to measure global surface temperature distributions and to visualize the onset of transition to turbulent-flow on the forward regions of hypersonic blunt bodies. Both visible wavelength and infrared high-speed cameras are in use. The visible wavelength cameras are intensified CCD imagers capable of integration times as short as 2 ns. The infrared camera uses an Indium Antimonide (InSb) sensor in the 3 to 5 micron band and is capable of integration times as short as 500 ns. The projectiles are imaged nearly head-on using expendable mirrors offset slightly from the flight path. The proposed paper will discuss the application of high-speed digital imaging systems in the NASA-Ames hypersonic ballistic range, and the challenges encountered when applying these systems. Example images of the thermal radiation from the blunt nose of projectiles flying at nearly 14 times the speed of sound will be given.
Author
Aerothermodynamics; Ballistic Ranges; Ballistic Trajectories; Hypersonic Speed; Imaging Techniques; Projectiles; Temperature Distribution

20040084639 NASA Lewis Research Center, Cleveland, OH, USA
NASA Advanced Propeller Research
Groeneweg, John F.; Bober, Lawrence J.; [1988]; 31 pp.; In English; Advanced Propellers and Their Installation on Aircraft, 26-27 Sep. 1988, Cranfield, UK
Contract(s)/Grant(s): 22-781-30-50
Report No.(s): NASA-TM-101361; E-4393; No Copyright; Avail: CASI; A03, Hardcopy

Acoustic and aerodynamic research at NASA Lewis Research Center on advanced propellers is reviewed including analytical and experimental results on both single and counterrotation. Computational tools used to calculate the detailed flow and acoustic i e l d s a r e described along with wind tunnel tests to obtain data for code verification . Results from two kinds of experiments are reviewed: (1) performance and near field noise at cruise conditions as measured in the NASA Lewis 8-by 6-Foot Wind Tunnel and (2) farfield noise and performance for takeoff/approach conditions as measured in the NASA Lewis 9-by 15-Font Anechoic Wind Tunnel. Detailed measurements of steady blade surface pressures are described along with vortex flow phenomena at off design conditions . Near field noise at cruise is shown to level out or decrease as tip relative Mach number is increased beyond 1.15. Counterrotation interaction noise is shown to be a dominant source at take off but a secondary source at cruise. Effects of unequal rotor diameters and rotor-to-rotor spacing on interaction noise a real so illustrated. Comparisons of wind tunnel acoustic measurements to flight results are made. Finally, some future directions in advanced propeller research such as swirl recovery vanes, higher sweep, forward sweep, and ducted propellers are discussed.
Derived from text
Acoustic Properties; Aerodynamics; Interactional Aerodynamics; Shrouded Propellers; Vortices

20040084671 NASA Dryden Flight Research Center, Edwards, CA, USA

Real-Time Unsteady Loads Measurements Using Hot-Film Sensors

Mangalam, Arun S.; Moes, Timothy R.; [2004]; 11 pp.; In English; AIAA Applied Aero Conference, 16-19 Aug. 2004, Providence, RI, USA; No Copyright; Avail: CASI; A03, Hardcopy

Several flight-critical aerodynamic problems such as buffet, flutter, stall, and wing rock are strongly affected or caused by abrupt changes in unsteady aerodynamic loads and moments. Advanced sensing and flow diagnostic techniques have made possible simultaneous identification and tracking, in real-time, of the critical surface, viscosity-related aerodynamic phenomena under both steady and unsteady flight conditions. The wind tunnel study reported here correlates surface hot-film measurements of leading edge stagnation point and separation point, with unsteady aerodynamic loads on a NACA 0015 airfoil. Lift predicted from the correlation model matches lift obtained from pressure sensors for an airfoil undergoing harmonic pitchup and pitchdown motions. An analytical model was developed that demonstrates expected stall trends for pitchup and pitchdown motions. This report demonstrates an ability to obtain unsteady aerodynamic loads in real-time, which could lead to advances in air vehicle safety, performance, ride-quality, control, and health management.

Author

Aerodynamic Loads; Buffeting; Flutter; Wing Rock; Real Time Operation; Pressure Sensors; Unsteady Aerodynamics

20040084696 Massachusetts Inst. of Tech., Lexington, MA, USA

Corridor Integrated Weather System Operational Benefits 2002-2003: Initial Estimates of Convective Weather Delay Reduction

Robinson, M.; Evans, J.; Crowe, B.; Klingle-Wilson, D.; Allan, S.; Apr. 09, 2004; In English

Report No.(s): PB2004-105279; ATC-313; No Copyright; Avail: National Technical Information Service (NTIS)

This report summarizes the preliminary results of a two-year study to determine if the Corridor Integrated Weather System (CIWS) concept would enable airspace users to increase safety and significantly reduce convective weather delays in the highly congested Great Lakes and Northeast corridors. The CIWS concept being evaluated provides en route and terminal air traffic flow managers with accurate, automated, rapidly updated information on storm locations and echo top heights along with two-hour, high resolution animated growth and decay storm forecasts. The CIWS test region for 2002-03 included five of the eight major metropolitan areas/corridors that are highlighted as focus areas for improving capacity in the recently released FAA Flight Plan 2004-08.

NTIS

Air Transportation; Air Traffic; Safety

20040084796 NASA Langley Research Center, Hampton, VA, USA, Swales Aerospace, Hampton, VA, USA, Lockheed Martin Engineering and Sciences Co., Hampton, VA, USA

An Inviscid Computational Study of the Space Shuttle Orbiter and Several Damaged Configurations

Prabhu, Ramadas K.; FROM; Merski, N. Ronald, Technical Monitor; July 2004; 27 pp.; In English

Contract(s)/Grant(s): NAS1-00135

Report No.(s): NASA/CR-2004-213241; SFCX22004D; No Copyright; Avail: CASI; A03, Hardcopy

Inviscid aerodynamic characteristics of the Space Shuttle Orbiter were computed in support of the Columbia Accident Investigation. The unstructured grid software FELISA was used and computations were done using freestream conditions corresponding to those in the NASA Langley 20-Inch Mach 6 CF4 tunnel test section. The angle of attack was held constant at 40 degrees. The baseline (undamaged) configuration and a large number of damaged configurations of the Orbiter were studied. Most of the computations were done on a half model. However, one set of computations was done using the full-model to study the effect of sideslip. The differences in the aerodynamic coefficients for the damaged and the baseline configurations were computed. Simultaneously with the computation reported here, tests were being done on a scale model of the Orbiter in the 20-Inch Mach 6 CF4 tunnel to measure the deltas . The present computations complemented the CF4 tunnel test, and provided aerodynamic coefficients of the Orbiter as well as its components. Further, they also provided details of the flow field.

Author

Accident Investigation; Aerodynamic Characteristics; Inviscid Flow; Space Shuttle Orbiters; Computational Fluid Dynamics; Columbia (Orbiter); Aerodynamic Configurations; Damage; Wind Tunnel Tests

20040084803 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Deformation Response of Unsymmetrically Laminated Plates Subjected to Inplane Loading
Ochinero, Tomoya T.; Hyer, Michael W.; [2002]; 11 pp.; In English
Contract(s)/Grant(s): NAG1-2298
Report No.(s): AIAA Paper 2002-1579; Copyright; Avail: CASI; A03, Hardcopy

This paper discusses the out-of-plane deformation behavior of unsymmetric cross-ply composite plates compressed inplane by displacing one edge of the plate a known amount. The plates are assumed to be initially flat and several boundary conditions are considered. Geometrically nonlinear behavior is assumed. The primary objectives are to study the out-of-plane behavior as a function of increasing inplane compression and to determine if bifurcation behavior and secondary buckling can occur. It is shown that, depending on the boundary conditions, both can occur, though the characteristics are different than the pre and post-buckling behavior of a companion symmetric cross-ply plate. Furthermore, while a symmetric cross-ply plate can postbuckle with either a positive or negative out-of-plane displacement, the unsymmetric cross-ply plates studied deflect out-of-plane only in one direction throughout the range of inplane compression, the direction again depending on the boundary conditions
Author
Boundary Conditions; Buckling; Deformation; Laminates; Plates (Structural Members)

20040084890 Notre Dame Univ., IN
Plasma Actuators for Separation Control on Stationary and Oscillating Airfoils
Post, Martiqua L.; Corke, T.; May 2004; 253 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0447
Report No.(s): AD-A424112; ARO-41077.2-EG; No Copyright; Avail: CASI; A12, Hardcopy

Given the importance of separation control associated with retreating blade stall on helicopters, the primary objective of this work was to develop a plasma actuator flow control device for its use in controlling leading-edge separation on stationary and oscillating airfoils. The plasma actuator consists of two copper electrodes separated by a dielectric insulator. When the voltage supplied to the electrodes is sufficiently high, the surrounding air ionizes forms plasma in the regions of high electrical field potential. The ionized air, in the presence of an electric field gradient, results in a body force on the flow.
DTIC
Actuators; Airfoils; Electrohydrodynamics; Oscillations; Plasma Control; Plasmas (Physics)

20040084906 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Experimental Investigation into the Aerodynamic Performance of Both Rigid and Flexible Wing Structured Micro-Air-Vehicles
DeLuca, Anthony M.; Mar. 2004; 174 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424137; AFIT/GAE/ENY/04-M06; No Copyright; Avail: CASI; A08, Hardcopy

The Air Force Research Lab, Munitions Directorate, Eglin Air Force Base, Florida has designed a man-portable carbon-fiber Micro-Air-Vehicle (MA V) used for on-the-spot surveillance by Special Operations Forces (SOF) for enemy reconnaissance as well as post-strike Battle Damage Assessment (BDA).The main goals of this experiment are: 1) characterize the flow quality of the new AFIT 3' x 3' wind tunnel and 2) determine the aerodynamic performance characteristics of the 24″ span, 6″ chord flexible and rigid wing MA V s. The turbulent intensity of the wind tunnel was approximately 2%. Both MA Vs had an average lift slope within 3.5% of the theoretical value. Flexible wings deformed in response to perturbations in local flow field conditions, promulgating the delay of wing stall by nearly double. Aeroelastic effects begin to dominate low speed, laminar Reynolds number effects at tunnel velocities greater than 30 miles per hour. The flexible wing MA V displayed static stability in all three principal control axes (Pitch, Roll, Yaw), while the rigid MA V was not definitively stable in any axis. All flexible wing control surface configurations resulted in predictable and consistent performance between -10 and + 10 elevon deflection. Reponses declined steadily after :+ or -10 showing dramatic direction changes.
DTIC
Aerodynamic Characteristics; Aerodynamic Forces; Flexible Wings; Rigid Wings; Wings

20040084920 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Magnetogasdynamic Flow Control of a Mach Reflection
Earp, Brian E.; Mar. 2004; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424159; AFIT/GAE/ENY/04-M07; No Copyright; Avail: CASI; A05, Hardcopy

Two-dimensional regular and Mach reflections have been studied in the Mach 4.96 dual-solution domain for a 25 and 26 double-fin inlet. The steady-state computational Mach and regular reflections were subjected to magnetogasdynamic forces to determine whether these forces could be used as a possible flow control mechanism. The numerical code employed for this research solved the inviscid Euler equations with added source terms for the ponderomotive force and accompanying energy interactions. The 25 regular reflection was determined to be extremely sensitive to a decelerating Lorentz force. Transient application of the force led to the transition of the regular reflection to a Mach reflection, increasing the total pressure losses and decreasing the compression ratio. Sustained application of the force resulted in inlet unstart. An accelerating Lorentz force was also examined with the goal of transitioning the 26 Mach reflection to a more efficient regular reflection. The location of the accelerating force and the parameters governing its magnitude were examined. Such forces push the Mach reflection back to a more stable location and reduce the Mach stem height. For the interaction parameters considered, fully regular reflections were not obtained. However, the accelerating Lorentz force proved capable of increasing the total pressure recovery and the static pressure compression beyond the regular reflection values.
DTIC
Hypersonic Flow; Mach Reflection; Magnetohydrodynamics

20040085004 Tennessee Univ., Tullahoma, TN
High Angle of Attack Aerodynamics by Excitation of the Locked Leeside Vortex
, A. D; Wu, J. M.; Bhat, M. K.; Sep. 1988; 135 pp.; In English
Contract(s)/Grant(s): F33615-86-C-3607; Proj-2403
Report No.(s): AD-A424329; AFRL-VA-WP-TR-2003-3087; No Copyright; Avail: CASI; A07, Hardcopy
The control of flow over a multi-element wing has been investigated. At large incidence angles, the flow becomes fully separated. The wing geometry was considered critical to management of flow energy through organization of vorticity and controlling its shedding on the upper wing surface. A flat plate wing, with the planform of a F-15 wing, was reconfigured to accommodate the locked vortex. Spanwise blowing was used to initiate and/or increase the strength of the vortical flow. It was anticipated that in this manner an excited, stable, concentrated and strong vortex would be created on the wing. Using flow visualization as well as force measurements, it was found that the presence of the locked vortex favorably changed the flow pattern over the wing. Force measurements indicate moderate improvements on most configurations. One configuration showed more significant effect; but this should be considered preliminary.
DTIC
Aerodynamics; Angle of Attack; Excitation; Vortices

20040085379 NASA Langley Research Center, Hampton, VA, USA
Experimental Hypersonic Aerodynamic Characteristics of the Space Shuttle Orbiter for a Range of Damage Scenarios
Brauckmann, Gregory J.; Scallion, William I.; [2004]; 23 pp.; In English; 37th AIAA Thermophysics Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA
Contract(s)/Grant(s): 20-376-70-30-08
Report No.(s): AIAA Paper 2004-2280; No Copyright; Avail: CASI; A03, Hardcopy
Aerodynamic tests in support of the Columbia accident investigation were conducted in two hypersonic wind tunnels at the NASA Langley Research Center, the 20-Inch Mach 6 Air Tunnel and the 20-Inch CF4 Tunnel. The primary purpose of these tests was to measure the forces and moments generated by a variety of outer mold line alterations (damage scenarios) using 0.0075-scale models of the Space Shuttle Orbiter. Simultaneously acquired global heat transfer mappings were obtained for a majority of the configurations tested. Test parametrics included angles of attack from 38 to 42 deg, unit Reynolds numbers from 0.3 x 10(exp 6) to 3.0 x 10(exp 6) per foot, and normal shock density ratios of 5 (Mach 6 air) and 12 (CF4). The damage scenarios evaluated included asymmetric boundary layer transition, gouges in the windward surface thermal protection system tiles, wing leading edge damage (partially and fully missing reinforced carbon-carbon (RCC) panels), deformation of the wing windward surface, and main landing gear and/or door deployment. The measured aerodynamic increments for the damage scenarios examined were generally small in magnitude, as were the flight-derived values during most of the entry prior to loss of communication. A progressive damage scenario is presented that qualitatively matches the flight observations for the STS-107 entry.
Author
Aerodynamic Characteristics; Damage; Hypersonic Wind Tunnels; Scale Models; Space Shuttle Orbiters; Columbia (Orbiter)

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport 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*.

20040084856 Civil Aeromedical Inst., Oklahoma City, OK
Prevalence of Selective Serotonin Reuptake Inhibitors in Pilot Fatalities of Civil Aviation Accidents, 1990-2001
Akin, Ahmet; Chaturvedi, Arvind K.; May 2003; 22 pp.; In English
Report No.(s): AD-A423836; DOT/FAA/AM-03/7; No Copyright; Avail: CASI; A03, Hardcopy

Selective serotonin reuptake inhibitors (SSRIs) are popularly prescribed for treating depression. With a few exceptions, these psychotropic medications are not approved by aeromedical regulatory authorities for use by aviators. Since SSRIs have the potential for impairing performance and causing drug-drug interactions, the prevalence of SSRIs in pilot fatalities of civil aviation accidents was evaluated. Postmortem samples from pilots involved in fatal civil aircraft accidents are submitted to the Civil Aerospace Medical Institute (CAMI) for toxicological evaluation. Findings from such evaluations are maintained in the CAMI Toxicology Database. This database was examined for the presence of SSRIs in pilot fatalities of the accidents that occurred during 1990-2001. Out of 4,184 fatal civil aviation accidents from which CAMI received samples, there were 61 accidents in which pilot fatalities had SSRIs. Of these accidents, 56 were of the general aviation category, 2 were of the air taxi and commuter category, 2 were of the agricultural category, and 1 was of the ultralight category. Blood concentrations of SSRIs in the fatalities were 11-1,121 ng/ mL(exp -1) for fluoxetine; 47-13,102 ng/mL(exp -1) for sertraline; 68-1,1441 ng/ mL(exp -1) for paroxetine; and 314- 462 ng/mL(exp -1) for citalopram. In 39 of the 61 pilots, other drugs (e.g., analgesics, antihistaminics, benzodiazepines, narcotic analgesics, and/or sympathomimetics) and/or ethanol were also present. As determined by the National Transportation Safety Board, the use of an SSRI with or without other drug(s) and/or ethanol has been a contributory factor in at least 9 of the 61 accidents. Numbers of SSRI-involved accidents were low, and blood SSRI concentrations in the associated pilot fatalities ranged from subtherapeutic to toxic levels. However, the interactive effects of other drugs, ethanol, and/or even altitude hypoxia in producing adverse effects in the pilots cannot be ruled out. (8 tables, 51 refs.)7
DTIC
Accident Investigation; Aircraft Accidents; Civil Aviation; Enzymes; Inhibitors; Serotonin; Toxicology

20040085352 NASA Dryden Flight Research Center, Edwards, CA, USA
The NASA Dryden AAR Project: A Flight Test Approach to an Aerial Refueling System
Hansen, Jennifer L.; Murray, James E.; Campos, Norma V.; [2004]; 19 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 16-19 Aug. 2004, Providence, FL, USA; No Copyright; Avail: CASI; A03, Hardcopy

The integration of uninhabited aerial vehicles (UAVs) into controlled airspace has generated a new era of autonomous technologies and challenges. Autonomous aerial refueling would enable UAVs to travel further distances and loiter for extended periods over time-critical targets. The NASA Dryden Flight Research Center recently has completed a flight research project directed at developing a dynamic hose and drogue system model to support the development of an automated aerial refueling system. A systematic dynamic model of the hose and drogue system would include the effects of various influences on the system, such as flight condition, hose and drogue type, tanker type and weight, receiver type, and tanker and receiver maneuvering. Using two NASA F/A-18 aircraft and a conventional hose and drogue aerial refueling store from the Navy, NASA has obtained flight research data that document the response of the hose and drogue system to these effects. Preliminary results, salient trends, and important lessons are presented.
Author
Air to Air Refueling; Flight Tests; Flight Conditions

20040085380 Nebraska Univ., Omaha, NE, USA
Journal of Air Transportation, Volume 9, No. 2
Bowen, Brent, Editor; Kabashkin, Igor, Editor; Gudmundsson, Sveinn Vidar, Editor; Scarpellini, Nanette, Editor; 2004; ISSN 15446980; In English; See also 20040085381 - 20040085386
Report No.(s): LC-HE761.1.J68; Copyright; Avail: CASI; C01, CD-ROM

The following articles from the ″Journal of Air Transportation″ were processed: Future Requirements and Concepts for Cabins of Blended Wing Body Configurations:A Scenario Approach; Future Scenarios for the European Airline Industry: A

Marketing-Based Perspective; An Application of the Methodology for Assessment of the Sustainability of the Air Transport System; Modeling the Effect of Enlarged Seating Room on Passenger Preferences of Domestic Airlines in Taiwan; Developing a Fleet Standardization Index for Airline Pricing; and Future Airport Capacity Utilization in Germany: Peaked Congestion and/or Idle Capacity).
Derived from text
Air Transportation; Airline Operations; Aircraft Design

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*.

20040084364 NASA Langley Research Center, Hampton, VA, USA
Overview of Transonic to Hypersonic Stage Separation Tool Development for Multi-Stage-to-Orbit Concepts
Murphy, Kelly J.; Bunning, Pieter G.; Pamadi, Bandu N.; Scallion, William I.; Jones, Kenneth M.; [2004]; 22 pp.; In English; 24th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 28 Jun. 1 Jul. 2004, Portland, OR, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-372-20-80
Report No.(s): AIAA Paper 2004-2595; No Copyright; Avail: CASI; A03, Hardcopy

An overview of research efforts at NASA in support of the stage separation and ascent aerothermodynamics research program is presented. The objective of this work is to develop a synergistic suite of experimental, computational, and engineering tools and methods to apply to vehicle separation across the transonic to hypersonic speed regimes. Proximity testing of a generic bimese wing-body configuration is on-going in the transonic (Mach numbers 0.6, 1.05, and 1.1), supersonic (Mach numbers 2.3, 3.0, and 4.5) and hypersonic (Mach numbers 6 and 10) speed regimes in four wind tunnel facilities at the NASA Langley Research Center. An overset grid, Navier-Stokes flow solver has been enhanced and demonstrated on a matrix of proximity cases and on a dynamic separation simulation of the bimese configuration. Steady-state predictions with this solver were in excellent agreement with wind tunnel data at Mach 3 as were predictions via a Cartesian-grid Euler solver. Experimental and computational data have been used to evaluate multi-body enhancements to the widely-used Aerodynamic Preliminary Analysis System, an engineering methodology, and to develop a new software package, SepSim, for the simulation and visualization of vehicle motions in a stage separation scenario. Web-based software will be used for archiving information generated from this research program into a database accessible to the user community. Thus, a framework has been established to study stage separation problems using coordinated experimental, computational, and engineering tools.
Author
Stage Separation; General Overviews; Transonic Speed; Hypersonic Speed; Multistage Rocket Vehicles; Aerothermodynamics; Aerodynamic Configurations; Wind Tunnel Tests; Computational Fluid Dynamics

20040084395 NASA Langley Research Center, Hampton, VA, USA
Boundary Layer Control for Hypersonic Airbreathing Vehicles
Berry, Scott A.; Nowak, Robert J.; Horvath, Thomas J.; [2004]; 14 pp.; In English; 34th AIAA Fluid Dynamics Conference and Exhibit, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-794-40-3F
Report No.(s): AIAA Paper 2004-2246; No Copyright; Avail: CASI; A03, Hardcopy

Active and passive methods for tripping hypersonic boundary layers have been examined in NASA Langley Research Center wind tunnels using a Hyper-X model. This investigation assessed several concepts for forcing transition, including passive discrete roughness elements and active mass addition (or blowing), in the 20-Inch Mach 6 Air and the 31-Inch Mach 10 Air Tunnels. Heat transfer distributions obtained via phosphor thermography, shock system details, and surface streamline patterns were measured on a 0.333-scale model of the Hyper-X forebody. The comparisons between the active and passive methods for boundary layer control were conducted at test conditions that nearly match the Hyper-X nominal Mach 7 flight test-point of an angle-of-attack of 2-deg and length Reynolds number of 5.6 million. For passive roughness, the primary parametric variation was a range of trip heights within the calculated boundary layer thickness for several trip concepts. The passive roughness study resulted in a swept ramp configuration, scaled to be roughly 0.6 of the calculated boundary layer thickness, being selected for the Mach 7 flight vehicle. For the active blowing study, the manifold pressure was systematically

varied (while monitoring the mass flow) for each configuration to determine the jet penetration height, with schlieren, and transition movement, with the phosphor system, for comparison to the passive results. All the blowing concepts tested, which included various rows of sonic orifices (holes), two- and three-dimensional slots, and random porosity, provided transition onset near the trip location with manifold stagnation pressures on the order of 40 times the model surface static pressure, which is adequate to ensure sonic jets. The present results indicate that the jet penetration height for blowing was roughly half the height required with passive roughness elements for an equivalent amount of transition movement.
Author
Air Breathing Engines; Boundary Layer Control; Hypersonic Boundary Layer; Wind Tunnel Tests; X-43 Vehicle; Aircraft Models

20040084420 Old Dominion Univ., VA, USA
Wright Flyer Project
[2004]; 3 pp.; In English
Contract(s)/Grant(s): NCC1-02027; No Copyright; Avail: CASI; A01, Hardcopy

The wind tunnel test results have been published in the literature as summarized at the end of this report. As part of the education program, an introduction to engineering course module was designed and tested on 80 freshman engineering students at Old Dominion University. The five-week module required that five-person teams design, build and fly a radio-controlled airplane using only the wind tunnel data developed by the Wright brothers in 1902. That module is described in Sparks and Ash (2001). The Principal Investigator has co-authored one dozen publications resulting from this research, as listed at the end of this report. The Principal Investigator has given fourteen lectures on the Wright brother testing program and has appeared in two documentary television programs (summarized at the end of this report). Speaking invitations have continued since the completion of the project.
Derived from text
Education; Students; Models

20040084443 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Review of Methods for Aircraft Blast Vulnerability Analysis
Timpert, L. J.; December 2003; 30 pp.; In English
Contract(s)/Grant(s): B02/KLu/500; TNO Proj. 014.14186
Report No.(s): TD-2002-0244; PML-2003-A70; Copyright; Avail: Other Sources

Today's aircraft consist of a wide variety of materials and constructions, for which evaluating their vulnerability to blast effects is not a straightforward matter. Also, modern (missile) threats are more able to reduce the miss-distances with air targets. This makes it increasingly important to incorporate the combined warhead effects in vulnerability assessments and calls for a review of methods for evaluating blast vulnerability. Due to the different natures of the blast load and the structural response, it is usual to treat these two issues separately. The review led to the identification of a suitable Finite Element Model (LS-DYNA) and a way ahead for the modelling of combined warhead effects against airframes.
Author
Airframes; Vulnerability; Blast Loads

20040084503 Morgan Aircraft and Consulting, USA
Hanging On by a Thread
Morgan, Ray; ASK Magazine, No. 18; June 2004, pp. 22-23; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

The first solar plane we developed at AeroVironment was named the Gossamer Penguin. The word ″gossamer″ was an apt description of the appearance of this strange-looking aircraft that had a structural weight of only 54 pounds, with a wing span of 71 feet. Much was sacrificed to save weight and maximize span, and this presented serious problems when handling the aircraft on the ground. The Penguin was barely strong enough to stay together in the light winds and low turbulence of the early and low turbulence of the early morning. Moving the Penguin back to the hangar at the end of a morning flight was much like walking a 71-foot span kite home from the park.
Derived from text
Aircraft Design; Structural Weight; Wing Span

20040084506 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fixing What's Broken
Snow, Frank; ASK Magazine, No. 18; June 2004, pp. 10-13; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

We planned to launch in July 2000. Heading into March that year we were on schedule, under budget, meeting all of our performance requirements, and ready for the final testing Near the end of the day, it was time for the sign burst test. For 200 milliseconds we would put a non-feedback force on our system, which meant we couldn't adjust or halt the test in progress. Something went wrong, terribly wrong during the sign burst test. For 200 milliseconds we would put a non-feedback force on our system, which meant we couldn't adjust or halt the test in process. Something went wrong, terribly wrong during the sign burst test. As mission manager, I was standing just ten feet away from the spacecraft when this happened. It sounded like a clap of thunder. With the test stopped, we moved in closer to see what had happened - and we knew immediately that we had damaged our spacecraft. How much, we didn't know.
Derived from text
Feedback; Launching; Accident Investigation

20040084566 University Corp. for Atmospheric Research, USA
Deployment of a Fast-GCMS System to Measure C2 to C5 Carbonyls, Methanol and Ethanol Aboard Aircraft
Apel, Eric C.; [2004]; 37 pp.; In English
Contract(s)/Grant(s): NCC1-420
Report No.(s): UCAR-2000-117; No Copyright; Avail: CASI; A03, Hardcopy

Through funding of this proposal, a fast response gas chromatograph/mass spectrometer (FGCMS) instrument to measure less than or equal to C4 carbonyl compounds and methanol was developed for the NASA GTE TRACE-P (Global Tropospheric Experiment, Transport And Chemical Evolution Over The Pacific) mission. The system consists of four major components: sample inlet, preconcentration system, gas chromatograph (GC), and detector. The preconcentration system is a custom-built cryogen-conservative system. The GC is a compact, custom-built unit that can be temperature programmed and rapidly cooled. Detection is accomplished with an Agilent Technologies 5973 mass spectrometer. The FGCMS instrument provides positive identification because the compounds are chromatographically separated and mass selected. During TRACE-P, a sample was analyzed every 5 minutes. The FGCMS limit of detection was between 5 and 75 pptv, depending on the compound. The entire instrument package is contained in a standard NASA instrument rack (106 cm x 61 cm x 135 cm), consumes less than 1200 watts and is fully automated with LabViEW 6i. Methods were developed or producing highly accurate gas phase standards for the target compounds and for testing the system in the presence of potential interferents. This report presents data on these tests and on the general overall performance of the system in the laboratory and aboard the DC-8 aircraft during the mission. Vertical profiles for acetaldehyde, methanol, acetone, propanal, methyl ethyl ketone, and butanal from FGCMS data collected over the entire mission are also presented.
Author
Gas Chromatography; Methyl Alcohol; Ethyl Alcohol; Carbonyl Compounds; Mass Spectrometers; Dc 8 Aircraft

20040084587 NASA Ames Research Center, Moffett Field, CA, USA
NASA HPCC Technology for Aerospace Analysis and Design
Schulbach, Catherine H.; November 29, 1999; 23 pp.; In English; RCI North American 11th Annual Member Executive Conference, 2-4 Nov. 1999, Alexandria, VA, USA
Contract(s)/Grant(s): 509-10-00; No Copyright; Avail: CASI; A03, Hardcopy

The Computational Aerosciences (CAS) Project is part of NASA's High Performance Computing and Communications Program. Its primary goal is to accelerate the availability of high-performance computing technology to the US aerospace community-thus providing the US aerospace community with key tools necessary to reduce design cycle times and increase fidelity in order to improve safety, efficiency and capability of future aerospace vehicles. A complementary goal is to hasten the emergence of a viable commercial market within the aerospace community for the advantage of the domestic computer hardware and software industry. The CAS Project selects representative aerospace problems (especially design) and uses them to focus efforts on advancing aerospace algorithms and applications, systems software, and computing machinery to demonstrate vast improvements in system performance and capability over the life of the program. Recent demonstrations have served to assess the benefits of possible performance improvements while reducing the risk of adopting high-performance computing technology. This talk will discuss past accomplishments in providing technology to the aerospace community, present efforts, and future goals. For example, the times to do full combustor and compressor simulations (of aircraft engines) have been reduced by factors of 320:1 and 400:1 respectively. While this has enabled new capabilities in engine simulation,

the goal of an overnight, dynamic, multi-disciplinary, 3-dimensional simulation of an aircraft engine is still years away and will require new generations of high-end technology.
Author
Supercomputers; NASA Programs; Technology Utilization; Aerospace Engineering; Software Engineering

20040084618 Defence Science and Technology Organisation, Fishermans Bend, Australia
A Record of the Australian Mirage Wing Fatigue Test
Bruton, R. A.; Patching, C. A.; Krieser, R., Editor; Molent, L., Editor; March 2004; 94 pp.; In English
Report No.(s): DSTO-TR-1561; DODA-AR-013-047; Copyright; Avail: Other Sources

A full-scale fatigue test was completed in August 1974 on a Mirage III0 starboard wing utilising a loading spectrum as specified by the Royal Australian Air Force (RAAF). To satisfy a variety of RAAF missions, twelve (12) servo-hydraulic actuators situated at critical locations on the wing reproduced the measured flight strains. The fatigue loading flight-by-flight sequence was derived from fatigue meter data that was obtained from the Mirage fleet and from continuous records from an instrumented Mirage in the squadron service. The conduct and results of this innovative test are summarized here.
Author
Fatigue Tests; Full Scale Tests; Wing Loading; Wings

20040084665 NASA Dryden Flight Research Center, Edwards, CA, USA
A Six-Node Curved Triangular Element and a Four-Node Quadrilateral Element for Analysis of Laminated Composite Aerospace Structures
Martin, C. Wayne; Breiner, David M.; Gupta, Kajal K., Technical Monitor; December 2000; 58 pp.; In English
Contract(s)/Grant(s): NAS4-97007; NAS4-50079; NCA2-318; NCA2-497; 710-55-24-E8-RR
Report No.(s): NASA/CR-2004-210725; H-2469; No Copyright; Avail: CASI; A04, Hardcopy

Mathematical development and some computed results are presented for Mindlin plate and shell elements, suitable for analysis of laminated composite and sandwich structures. These elements use the conventional 3 (plate) or 5 (shell) nodal degrees of freedom, have no communicable mechanisms, have no spurious shear energy (no shear locking), have no spurious membrane energy (no membrane locking) and do not require arbitrary reduction of out-of-plane shear moduli or under-integration. Artificial out-of-plane rotational stiffnesses are added at the element level to avoid convergence problems or singularity due to flat spots in shells. This report discusses a 6-node curved triangular element and a 4-node quadrilateral element. Findings show that in regular rectangular meshes, the Martin-Breiner 6-node triangular curved shell (MB6) is approximately equivalent to the conventional 8-node quadrilateral with integration. The 4-node quadrilateral (MB4) has very good accuracy for a 4-node element, and may be preferred in vibration analysis because of narrower bandwidth. The mathematical developments used in these elements, those discussed in the seven appendices, have been applied to elements with 3, 4, 6, and 10 nodes and can be applied to other nodal configurations.
Author
Aircraft Structures; Composite Structures; Sandwich Structures; Aerospace Engineering; Nodes (Standing Waves); Mindlin Plates

20040084775 Physics and Electronics Lab. TNO, The Hague, Netherlands
UAVs and their Added Support of THGKLu
Bos, A. H. W.; Cambien, K. P. H.; Visser, B. J.; April 2004; 111 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32845
Report No.(s): FEL-03-A244; TD-2003-0104; Copyright; Avail: Other Sources

Since operation Allied Force, where UAVs were employed for the first time in large numbers, the presence of UAVs during conflicts has steadily been increasing. During the US operations in Afghanistan air-to-surface weapons were employed from UAVs for the first time. As a result of these developments, the Tactical Helicopter Group (THGKLu) of the Royal Netherlands Air Force has voiced a need for a research project into the possible roles of UAVs and their added value in support of THGKLu operations. It resulted that some concepts of cooperation between UAVs and helicopters offer a clear added value and may positively influence the efficiency or safety of helicopter missions. A concept that seems especially promising is that of direct teaming between a UAV and a helicopter. The direct control of the helicopter pilot over the UAV will increase both his situational awareness and his survivability by enabling him to operate from a standoff position.
Author
Pilotless Aircraft; Netherlands; Armed Forces (Foreign); Military Operations

20040084928 Air Force Inst. of Tech., Wright-Patterson AFB, OH

An Analysis of the Impact of Base Support Resources on the Availability of Air Mobility Command Aircraft

Randall, Christian E.; Mar. 2004; 94 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424191; AFIT/GLM/ENS/04-15; No Copyright; Avail: CASI; A05, Hardcopy

The AMC Directorate of Logistics is responsible for ensuring AMC aircraft are available to accomplish the mission. Currently, however, the organization lacks an objective tool for assessing the impact of proposed operations on the health of the fleet, To improve this process, the Directorate has initiated the development of a Mobility Aircraft Availability Forecast (MAAF) simulation model designed to identify alternatives and associated impacts on aircraft availability, manpower, and cost. This research seeks to assist the MAAF development effort by identifying and demonstrating how different base support factors impact the availability of AMC aircraft. To address this research objective, multiple simulation models were developed using the Airfield Simulation Tool (AST). The impact of changing resource levels was assessed for different locations and aircraft arrival profiles. Results of this research yield practical implications for developers of the MAAF model and air mobility planners.

DTIC

Computerized Simulation; Logistics; Mobility; Support Systems; Transport Aircraft

20040084942 Army War Coll., Carlisle Barracks, PA

The Unmanned Aerial Vehicle's Identity Crisis

Larm, Dennis; Mar. 19, 2004; 35 pp.; In English

Report No.(s): AD-A424221; No Copyright; Avail: CASI; A03, Hardcopy

Strategic leaders of the information age face a future of ambiguous threats and challenges as well as potential technological advancements never before envisioned just a few years ago. Many lessons of the past may no longer apply to vastly complex conditions of the future. However past experiences provide the foundation from which leaders can best align and posture themselves to take rational leaps of visionary faith. Hopefully such instrumental leaps will have ideal direction and enough momentum to land on stable approaches to best traverse grounds of future threats and challenges. The unmanned aerial vehicle's (UAV's) sense of identity is ambiguous due to past experiences. It is still in an infancy stage when compared to the advanced evolutionary lines and numerous roles and missions of manned aircraft. This paper examines the history and background of the UAV to identify and document principal reasons for its immaturity. Strategic visionaries must have open minds to explore new ways of developing transforming and employing assets. They must search for new approaches in order to best support effective application of all instruments of power. The USA of America can no longer simply respond to the changing environment with belated modifications to existing systems and strategies. In order to remain the world's greatest superpower US strategic leaders must be openly aggressive in the pursuit of innovation.

DTIC

Drone Vehicles; Identities; Military Operations; Pilotless Aircraft; Strategy

20040084943 Army War Coll., Carlisle Barracks, PA

Tactical Airpower with Strategic Leverage: An Analysis of the Use of Tactical Airpower in Ground Attack to Support the Combined Bomber Offensive, 1943-1945

Saffold, Timothy L.; Mar. 19, 2004; 28 pp.; In English

Report No.(s): AD-A424222; No Copyright; Avail: CASI; A03, Hardcopy

Much historical analysis of the World War II Combined Bomber Offensive (CBO) has focused on the heavy bomber aspects of Combined Bomber Offensive strategy. However one aspect of the offensive that has received little attention has been the use of tactical air assets specifically fighter- bombers to support and augment heavy bomber operations. This has meant that a comprehensive analysis of the CBO has been unavailable leaving a gap in the historical record and in our understanding of the full use of air assets in wartime. This research breaks new ground in World War II CBO analysis. By explaining tactical fighter aviation's important contribution to this campaign it expands airpower perspectives and validates key airpower theoretical and doctrinal tenets. It examines the offensive from an ″airmindedness″ perspective instead of stove piping strategically significant decisions and events into either tactical or strategic categories based on aircraft type or whether missions directly or indirectly supported land forces. This is critically important because its relevance to airpower employment has timeless applicability. Furthermore this research explores effects- based logic and decision-making and shows that this mode of thinking is not necessarily new in today's airpower lexicon. Moreover this research provides fresh insight into this complex and dynamic application of combat power in the skies over Europe. Without digressing into a combat chronology it tells an important story of ingenuity adaptability and the evolutionary nature of CBO strategy driven in part by operational failure in part by operational success and immeasurably by strong and competitive airpower leadership. It highlights the

complexities of inter and intra-service rivalry fueled by competition for finite airpower resources while simultaneously examining the intricate and often not so subtle demands created by the Anglo-American alliance.
DTIC
Bomber Aircraft; Logistics; Military Operations; Strategy

20040084945 Alphatech, Inc., Burlington, MA
Low-Observable Nonlinear Trajectory Generation for Unmanned Air Vehicles
Misovec, K.; Inanc, T.; Wohletz, J.; Murray, R.; Mar. 2003; 24 pp.; In English
Contract(s)/Grant(s): F33615-01-C-3149; Proj-ARPF
Report No.(s): AD-A424225; AFRL-VA-WP-TP-2003-303; No Copyright; Avail: CASI; A03, Hardcopy

This paper explores low observablity flight path planning of unmanned air vehicles in the presence of radar detection systems. The probability of detection model of an aircraft near an enemy radar depends on aircraft attitude, range, and configuration. A detection model is coupled with a simplified aircraft dynamics model. The Nonlinear Trajectory Generation (NTG) software package developed at Caltech is used. NTG algorithm is a gradient descent optimization method that combines three technologies: B-splines, output space collocation and nonlinear optimization tools. Implementations are formulated with temporal constraints that allow periods of high observablity interspersed with periods of low observablity. Illustrative examples of optimized routes for low observablity are presented.
DTIC
Computer Programs; Drone Vehicles; Nonlinearity; Observation; Trajectories

20040084975 Illinois Univ. at Urbana-Champaign, Urbana, IL
Development of Self-Healing Structural Composite Materials
Shang, Jian-Ku; Jan. 2000; 11 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0094
Report No.(s): AD-A424277; AFRL-SR-AR-TR-04-0364; No Copyright; Avail: CASI; A03, Hardcopy

Thermosetting polymers, used in a wide variety of applications ranging from microelectronics to composite airplane wings, are susceptible to damage in the form of cracking. Often these cracks form deep within the structure where detection is difficult and repair is virtually impossible. Regardless of the application, once cracks have formed within polymeric materials, the integrity of the structure is significantly compromised. Inspired by biological systems in which damage triggers a healing response, this project focuses on the development of a new structural polymeric material with the ability to autonomically heal cracks. This work will lead to safer and more reliable materials in a wide range of applications and represents the first step in developing materials systems that possess greatly extended lifetimes.
DTIC
Composite Materials; Cracking (Fracturing); Healing

20040084976 American Inst. of Aeronautics and Astronautics, Reston, VA
AIAA Student Aircraft Design, Build & Fly Competition. Volume 1
Page, Gregory; Bovias, Chris; Apr. 25, 2004; 1036 pp.; In English
Contract(s)/Grant(s): N00014-98-1-0493
Report No.(s): AD-A424278; 2004DBF7630; No Copyright; Avail: CASI; A99, Hardcopy

This report is made up of the combined reports of 37 separate teams of students who entered the 2004 Design, Build & Fly Competition. The objectives of the Design, Build & Fly Competition were to have students teams design, build and fly unmanned remote control electric aircraft designed for two specific missions: a ferry mission and a fire bomber mission. A ″fly-off' took place on the Cessna Air Field in Wichita, KS, in April 2004. Winners of the contest: 1st place, Oklahoma State University; 2nd, Oklahoma State University; 3rd, University of Illinois at Urbana-Champaign. Cessna, the Office of Naval Research and the AIAA Foundation supported the Design, Build & Fly Competition.
DTIC
Aircraft Design; Competition; Students

20040084977 American Inst. of Aeronautics and Astronautics, Reston, VA
AIAA Student Aircraft Design, Build & Fly Competition. Volume 2
Page, Gregory; Bovias, Chris; Apr. 25, 2004; 908 pp.; In English
Contract(s)/Grant(s): N00014-98-1-0493
Report No.(s): AD-A424279; 2004DBF7630; No Copyright; Avail: CASI; A99, Hardcopy

This report is made up of the combined reports of 37 separate teams of students who entered the 2004 Design, Build & Fly Competition. The objectives of the Design, Build & Fly Competition were to have students teams design, build and fly unmanned remote control electric aircraft designed for two specific missions: a ferry mission and a fire bomber mission. A ″fly-off' took place on the Cessna Air Field in Wichita, KS, in April 2004. Winners of the contest: 1st place, Oklahoma State University; 2nd, Oklahoma State University; 3rd, University of Illinois at Urbana-Champaign. Cessna, the Office of Naval Research and the AIAA Foundation supported the Design, Build & Fly Competition.
DTIC
Aircraft Design; Competition; Students

20040084981 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Evolution of Control Programs for a Swarm of Autonomous Unmanned Aerial Vehicles
Milam, Kevin M.; Mar. 2004; 134 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424283; AFIT/GCS/ENG/04-15; No Copyright; Avail: CASI; A07, Hardcopy

Unmanned aerial vehicles (UAVs) are rapidly becoming a critical military asset. In the future, advances in miniaturization are going to drive the development of insect size UAVs. New approaches to controlling these swarms are required. The goal of this research is to develop a controller to direct a swarm of UAVs in accomplishing a given mission. While previous efforts have largely been limited to a two- dimensional model, a three-dimensional model has been developed for this project. Models of UAV capabilities including sensors, actuators and communications are presented. Genetic programming uses the principles of Darwinian evolution to generate computer programs to solve problems. A genetic programming approach is used to evolve control programs for UAV swarms. Evolved controllers are compared with a hand- crafted solution using quantitative and qualitative methods. Visualization and statistical methods are used to analyze solutions. Results indicate that genetic programming is capable of producing effective solutions to multi-objective control problems.
DTIC
Autonomy; Drone Vehicles; Miniaturization; Pilotless Aircraft

20040085005 Air Force Research Lab., Tyndall AFB, FL
Post-Fire Damage Assessment of a Composite Wingbox
Yarlagadda, S.; Chatterjee, A.; Gillespie, J. W., Jr.; Kiel, Jennifer C.; Dierdorf, Doug S.; May 2004; 17 pp.; In English
Report No.(s): AD-A424330; AFRL-ML-TY-TP-04-4516; No Copyright; Avail: CASI; A03, Hardcopy

An evaluation of Composite Wing Boxes has been conducted to demonstrate the severity of composite fires and evaluate damage assessment techniques for large-scale composites. The fire test objective was to simulate the fire that would occur following a fuel spill from a large composite aircraft. The test fires simulate the fire that might occur following a pool fire under a static airplane for two scenarios: the first simulates an immediate response to a pool fire by a person located near the aircraft and the second fire simulates a response, five minutes after fire ignition. After the burn, samples from both scenarios were evaluated for changes in rheological and mechanical properties. Properties measured include weight loss, Tg change, thermomechanical properties (storage and loss modulus) and short beam shear strengths. Results from these tests will be presented and discussed. A fire damage description and damage evaluation methodology is outlined that is applicable to a variety of composite materials.
DTIC
Damage Assessment; Fire Damage; Wings

20040085034 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Experimental and Computational Analysis of Modes in a Partially Constrained Plate
Vandawaker, Robert M.; Mar. 2004; 171 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424381; AFIT/GAE/ENY/04-M15; No Copyright; Avail: CASI; A08, Hardcopy

The field of structural health monitoring (SHM) attempts to reduce labor and cost by allowing technicians to monitor selected properties of an aircraft's structure to detect impending failure. This research examines methods to detect damage to a thermal protection system (TPS) tile using representative 2024-T3 aluminum plates. Plates are subjected to modal analysis in single and joined conditions in an attempt to provide the capability of sensing damage to a tile on the surface of a vehicle while the sensors remain on the superstructure of the airframe. Jointly, the development of a means to model the system using finite element techniques is explored. It is found that the finite element modeling technique produces correlating modal

frequencies within a 7. 19% worst case average when compared to the physical tests. This leads to the ability to compare mode shapes and frequencies to detect damage in a system.
DTIC
Aircraft Maintenance; Analysis (Mathematics); Medical Equipment

20040085381 Chung Yuan Christian Univ., Chung-Li, Taiwan, Province of China
Modeling the Effect of Enlarged Seating Room on Passenger Preferences of Domestic Airlines in Taiwan
Lu, Jin-Long; Tsai, Li-Nung; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 83-96; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

This study focuses on measuring the effect on Taiwanese airlines if they were to enlarge the seating room in airplanes per passengers preferences. A stated choice experiment is used to incorporate passengers trade-offs regarding preferred measurements; furthermore, a binary logic model is used to model the choice behavior of airline passengers. The findings show that the type of seat is a major significant variable; price and the airline company are also significant. The conclusion is that airlines should put more emphasis on the issue of improving the quality of seating comfort.
Author
Civil Aviation; Comfort; Commercial Aircraft; Seats; Stellar Models

20040085382 Technische Univ., Munich, Germany
Future Requirements and Concepts for Cabins of Blended Wing Body Configurations: A Scenario Approach
Eelman, Stephen; Schmitt, Dieter; Becker, Axel; Granzeier, Werner; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 4-22; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The strong influence of unpredictable factors on the development of future concepts for cabins of Blended Wing Body (BWB) aircraft favors the methodology of scenario techniques. The scenario process performed at Technische Universitat Munchen together with Airbus Deutschland GmbH, DaimlerChrysler Society and Technology Research Group and industrial Design Studio comprises the development of three different scenarios, the implication of specific requirements and the realization of preliminary cabin concepts. On the basis of current cabin standards of the A380, new standards for the BWB cabin designs were quantitatively derived for each scenario. According to these inputs, two-dimensional cabin layouts and specific system solutions have been developed and sketched to visualize the concepts. In a final step, specific requirements and technologies have been evaluated in all scenarios to identify their compatibility in the respective future environments.
Author
Cabins; Layouts; Blended-Wing-Body Configurations

20040085396 Physics and Electronics Lab. TNO, The Hague, Netherlands
Recent Developments Unmanned Aerial Vehicles (UAVs)
Cambien, K. P. H.; Visser, B. J.; Rijgersberg, T. J.; vanderHorst, R. M.; deVries, S. C.; June 2003; 76 pp.; In Dutch
Contract(s)/Grant(s): TNO Proj. 015.32097
Report No.(s): TD-2003-0056; FEL-03-A024; Copyright; Avail: Other Sources

This report is one of a series of publications, which provide an overview of recent developments in the field of Unmanned Aerial Vehicles (UAVs). The information provided is based on open sources, such as periodicals and research reports. The time period covered by this report is August 2002 through December 2002.
Author
Fabrication; Pilotless Aircraft

07
AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; 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*.

20040084433 Kettering Univ., Flint, MI, USA
Development of a Computationally Efficient, High Fidelity, Finite Element Based Hall Thruster Model
Jacobson, David, Technical Monitor; Roy, Subrata; [2004]; 26 pp.; In English
Contract(s)/Grant(s): NAG3-2520; No Copyright; Avail: CASI; A03, Hardcopy

This report documents the development of a two dimensional finite element based numerical model for efficient characterization of the Hall thruster plasma dynamics in the framework of multi-fluid model. Effect of the ionization and the recombination has been included in the present model. Based on the experimental data, a third order polynomial in electron temperature is used to calculate the ionization rate. The neutral dynamics is included only through the neutral continuity equation in the presence of a uniform neutral flow. The electrons are modeled as magnetized and hot, whereas ions are assumed magnetized and cold. The dynamics of Hall thruster is also investigated in the presence of plasma-wall interaction. The plasma-wall interaction is a function of wall potential, which in turn is determined by the secondary electron emission and sputtering yield. The effect of secondary electron emission and sputter yield has been considered simultaneously, Simulation results are interpreted in the light of experimental observations and available numerical solutions in the literature. Author

Mathematical Models; Numerical Analysis; Electron Energy; Finite Element Method; Hall Thrusters; Thrust

20040084442 Ohio Aerospace Inst., Cleveland, OH, USA

Multidisciplinary Design Optimization for Aeropropulsion Engines and Solid Modeling/Animation via the Integrated Forced Methods

[2004]; 16 pp.; In English

Contract(s)/Grant(s): NCC3-453; No Copyright; Avail: CASI; A03, Hardcopy

The grant closure report is organized in the following four chapters: Chapter describes the two research areas Design optimization and Solid mechanics. Ten journal publications are listed in the second chapter. Five highlights is the subject matter of chapter three. CHAPTER 1. The Design Optimization Test Bed CometBoards. CHAPTER 2. Solid Mechanics: Integrated Force Method of Analysis. CHAPTER 3. Five Highlights: Neural Network and Regression Methods Demonstrated in the Design Optimization of a Subsonic Aircraft. Neural Network and Regression Soft Model Extended for PX-300 Aircraft Engine. Engine with Regression and Neural Network Approximators Designed. Cascade Optimization Strategy with Neural network and Regression Approximations Demonstrated on a Preliminary Aircraft Engine Design. Neural Network and Regression Approximations Used in Aircraft Design.

Derived from text

Aircraft Design; Aircraft Engines; Engine Design; Multidisciplinary Design Optimization

20040084641 NASA Glenn Research Center, Cleveland, OH, USA

An Interactive Microsoft(registered tm) Excel Program for Tracking a Single Evaporating Droplet in Crossflow

Liew, K. H.; Urip, E.; Yang, S. L.; Marek, C. J.; July 2004; 60 pp.; In English

Contract(s)/Grant(s): NAG3-2759; WBS 22-714-20-10

Report No.(s): NASA/TM-2004-212910; E-14342; No Copyright; Avail: CASI; A04, Hardcopy

Droplet interaction with a high temperature gaseous crossflow is important because of its wide application in systems involving two phase mixing such as in combustion requiring quick mixing of fuel and air with the reduction of pollutants and for jet mixing in the dilution zone of combustors. Therefore, the focus of this work is to investigate dispersion of a two-dimensional atomized and evaporating spray jet into a two-dimensional crossflow. An interactive Microsoft Excel program for tracking a single droplet in crossflow that has previously been developed will be modified to include droplet evaporation computation. In addition to the high velocity airflow, the injected droplets are also subjected to combustor temperature and pressure that affect their motion in the flow field. Six ordinary differential equations are then solved by 4th-order Runge-Kutta method using Microsoft Excel software. Microsoft Visual Basic programming and Microsoft Excel macrocode are used to produce the data and plot graphs describing the droplet's motion in the flow field. This program computes and plots the data sequentially without forcing the user to open other types of plotting programs. A user's manual on how to use the program is included.

Author

Drops (Liquids); Evaporation; Computer Programs; Spreadsheets; Cross Flow; Jet Engine Fuels

20040084662 NASA Stennis Space Center, Bay Saint Louis, MS, USA

Facility Activation and Characterization for IPD Workhorse Preburner and Oxidizer Turbopump Hot-Fire Testing at NASA Stennis Space Center

Sass, J. P.; Raines, N. G.; Ryan, H. M.; May 10, 2004; 29 pp.; In English; 52nd JANNAF Propulsion Meeting, 10-13 May 2004, Las Vegas, NV, USA

Contract(s)/Grant(s): SSC/FED-99-006-03

Report No.(s): SSTI-8080-0001; No Copyright; Avail: CASI; A03, Hardcopy

The Integrated Powerhead Demonstrator (IPD) is a 250K lbf (1.1 MN) thrust cryogenic hydrogen/oxygen engine technology demonstrator that utilizes a full flow staged combustion engine cycle. The Integrated Powerhead Demonstrator (IPD) is part of NASA's Next Generation Launch Technology (NGLT) program, which seeks to provide safe, dependable, cost-cutting technologies for future space launch systems. The project also is part of the Department of Defense's Integrated High Payoff Rocket Propulsion Technology (IHPRPT) program, which seeks to increase the performance and capability of today s state-of-the-art rocket propulsion systems while decreasing costs associated with military and commercial access to space. The primary industry participants include Boeing-Rocketdyne and GenCorp Aerojet. The intended full flow engine cycle is a key component in achieving all of the aforementioned goals. The IPD Program recently achieved a major milestone with the successful completion of the IPD Oxidizer Turbopump (OTP) hot-fire test project at the NASA John C. Stennis Space Center (SSC) E-1 test facility in June 2003. A total of nine IPD Workhorse Preburner tests were completed, and subsequently 12 IPD OTP hot-fire tests were completed. The next phase of development involves IPD integrated engine system testing also at the NASA SSC E-1 test facility scheduled to begin in late 2004. Following an overview of the NASA SSC E-1 test facility, this paper addresses the facility aspects pertaining to the activation and testing of the IPD Workhorse Preburner and the IPD Oxidizer Turbopump. In addition, some of the facility challenges encountered during the test project shall be addressed.
Author
Combustion; Cryogenic Equipment; Engine Tests; Hydrogen Oxygen Engines

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*.

20040084415 NASA Ames Research Center, Moffett Field, CA, USA
Monitoring the Performance of a Neuro-Adaptive Controller
Schumann, Johann; Gupta, Pramod; [2004]; 1 pp.; In English; 24th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering (MTNS2004), 25-30 Jul. 2004, Garching, Germany; No Copyright; Avail: Other Sources; Abstract Only

Traditional control has proven to be ineffective to deal with catastrophic changes or slow degradation of complex, highly nonlinear systems like aircraft or spacecraft, robotics, or flexible manufacturing systems. Control systems which can adapt toward changes in the plant have been proposed as they offer many advantages (e.g., better performance, controllability of aircraft despite of a damaged wing). In the last few years, use of neural networks in adaptive controllers (neuro-adaptive control) has been studied actively. Neural networks of various architectures have been used successfully for online learning adaptive controllers. In such a typical control architecture, the neural network receives as an input the current deviation between desired and actual plant behavior and, by on-line training, tries to minimize this discrepancy (e.g.; by producing a control augmentation signal). Even though neuro-adaptive controllers offer many advantages, they have not been used in mission- or safety-critical applications, because performance and safety guarantees cannot b e provided at development time-a major prerequisite for safety certification (e.g., by the FAA or NASA). Verification and Validation (V&V) of an adaptive controller requires the development of new analysis techniques which can demonstrate that the control system behaves safely under all operating conditions. Because of the requirement to adapt toward unforeseen changes during operation, i.e., in real time, design-time V&V is not sufficient.
Author
Adaptive Control; Complex Systems; Controllability; Neural Nets; Real Time Operation; On-Line Systems

20040084434 NASA Dryden Flight Research Center, Edwards, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Verification and Validation Methodology of Real-Time Adaptive Neural Networks for Aerospace Applications
Gupta, Pramod; Loparo, Kenneth; Mackall, Dale; Schumann, Johann; Soares, Fola; [2004]; 1 pp.; In English; International Conference on Computational Intelligence on Modeling, Control and Automation (CIMCA), 12-14 Jul. 2004, Gold Coast, Australia; Copyright; Avail: Other Sources; Abstract Only

Recent research has shown that adaptive neural based control systems are very effective in restoring stability and control of an aircraft in the presence of damage or failures. The application of an adaptive neural network with a flight critical control system requires a thorough and proven process to ensure safe and proper flight operation. Unique testing tools have been developed as part of a process to perform verification and validation (V&V) of real time adaptive neural networks used in

recent adaptive flight control system, to evaluate the performance of the on line trained neural networks. The tools will help in certification from FAA and will help in the successful deployment of neural network based adaptive controllers in safety-critical applications. The process to perform verification and validation is evaluated against a typical neural adaptive controller and the results are discussed.
Author
Real Time Operation; Neural Nets; Adaptive Control; Flight Control; Safety

20040084579 NASA Ames Research Center, Moffett Field, CA, USA
Pilots Rate Augmented Generalized Predictive Control for Reconfiguration
Soloway, Don; Haley, Pam; [2004]; 6 pp.; In English; 6th IASTED International Conferece on Intelligent Systems and Control (ISC 2004), 23-25 Aug. 2004, Honolulu, HI, USA; No Copyright; Avail: CASI; A02, Hardcopy

The objective of this paper is to report the results from the research being conducted in reconfigurable fight controls at NASA Ames. A study was conducted with three NASA Dryden test pilots to evaluate two approaches of reconfiguring an aircraft's control system when failures occur in the control surfaces and engine. NASA Ames is investigating both a Neural Generalized Predictive Control scheme and a Neural Network based Dynamic Inverse controller. This paper highlights the Predictive Control scheme where a simple augmentation to reduce zero steady-state error led to the neural network predictor model becoming redundant for the task. Instead of using a neural network predictor model, a nominal single point linear model was used and then augmented with an error corrector. This paper shows that the Generalized Predictive Controller and the Dynamic Inverse Neural Network controller perform equally well at reconfiguration, but with less rate requirements from the actuators. Also presented are the pilot ratings for each controller for various failure scenarios and two samples of the required control actuation during reconfiguration. Finally, the paper concludes by stepping through the Generalized Predictive Control's reconfiguration process for an elevator failure.
Author
Control Surfaces; Predictions; Controllers; Steady State; Neural Nets; Errors

20040084804 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Deformations of Flat Unsymmetric Laminates Subjected to Inplane Loads
Hyer, Michael W.; Ochinero, Tomoya T.; Majeed, Majed; [2004]; 10 pp.; In English
Contract(s)/Grant(s): NAG1-2298
Report No.(s): Paper-2037; No Copyright; Avail: CASI; A02, Hardcopy

The geometrically nonlinear deformation response of initially flat unsymmetric cross-ply laminates subjected to an inplane compressive load and two sets of boundary conditions is studied. Stability of the deformations is considered. At issue is whether or not the plate remains flat with increased compressive loading, and whether it buckles. A semi-infinite unsymmetric cross-ply laminate is used to show the combined effects of geometric nonlinearities and bending-stretch coupling. Finite element results for finite laminates are then presented, and it is shown that to a large degree the boundary conditions control the character of the deformation response. It appears that clamped boundary conditions support buckling behavior, in the classic sense of bifurcation, whereas simply-supported conditions do not.
Author
Laminates; Boundary Conditions; Compression Loads; Finite Element Method; Deformation

20040085026 Air Force Inst. of Tech., Wright-Patterson AFB, OH
An Investigation Relating Longitudinal Pilot- Induced Oscillation Tendency Rating to Describing Function Predictions for Rate-Limited Actuators
Witte, Joel B.; Mar. 2004; 154 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424366; AFIT/GAE/ENY/04-M16; No Copyright; Avail: CASI; A08, Hardcopy

The purpose of this study was to investigate pilot- induced oscillations (PIO) and determine a method by which PIO tendency rating could be predicted. In particular, longitudinal PIO in the presence of rate-limited actuators were singled out for examination. Sinusoidal input/triangular output describing function techniques using Nichols charts were used. A new criterion dubbed Gap Criterion was calculated for PIO sensitivity. This criterion consists of the product of pilot gain necessary to cause PIO and the normalized maximum amplitude of the commanded actuator. These results were paired with simulator and flight test PIO tendency rating data. The PIO rating scale used was the PIO tendency classification of MIL-HDBK-1797. This concept was applied to two historical test databases, HAVE PREVENT and HAVE OLOP. Additional PIO data was gathered in the Large Amplitude Multimode Aerospace Simulator (LAMARS) at the Air Force Research Laboratory (AFRL),

Wright- Patterson AFB, Ohio and the USAF NF-16D Variable In-flight Stability Test Aircraft (VISTA) at Edwards AFB, California. Correlation between PIO tendency rating and Gap Criterion was determined for each dataset. Most datasets exceeded a confidence level of 95% that a correlation existed. Follow-on analysis for best curve fit was also accomplished with a logarithmic fit deemed best. Datasets were combined with success to demonstrate the universality of Gap Criterion for correlating PIO tendency ratings for longitudinal PIO involving rate-limited actuators.
DTIC
Actuators; Flight Control; Pilot Induced Oscillation; Ratings

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)*.

20040084590 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Safe Field Storage of Ammunition and Explosives, Part 3, Quantity-Distances for Exposed Sites
Rhijnsburger, M. P. M.; vanDeursen, J. R.; vanDongen, P.; December 2003; 78 pp.; In English
Contract(s)/Grant(s): A01/KL/402; TNO Proj. 014.13324.01.06
Report No.(s): TD-2002-0226-Pt-3; PML-2003-A52-Pt-3; Copyright; Avail: CASI; A05, Hardcopy

The semi-permanent field storage of ammunition and explosives during military missions out of area is riskier for military personnel and civilians than the permanent storage in military storage sites. Depending on the mission's mandate, the circumstances and possible external threats, the probability of an accidental explosion of own ammunition storage in the field is considerably higher than permanent storage. Driven by military operational demands aid the limited space inside a compound or temporary airfield, the distance between the ammunition and explosives storage and personnel is often less than for comparable permanent storage. This has as result that the consequences of an accidental explosion would also be significantly higher. This makes the risk - being the probability of an unwanted event times the consequences of that event - also significantly higher. Taking adequate structural and organizational measures to reduce the risk to an acceptable level is therefore essential. The Research Programme V103, 'Safe field storage of ammunition and explosives', was started at TNO Prins Maurits Laboratory in order to address this problem. The Research Programme V 103 is subdivided into six research themes. These themes are subsequently addressing: 1 the prevention of sympathetic detonations of acceptor ammunition; 2. the targets (Exposed Sites) to be tested in the full scale explosion trial; 3. prediction of explosion effects and structural response; 4. the setup of a full-scale 5 tonne explosion validation trial; 6. the performance of the full scale explosion trial; and 6. the evaluation of the trial results and an update of the Quantity-Distances advice.
Derived from text
Ammunition; Storage; Explosives; Risk; Prevention

20040084677 NASA Langley Research Center, Hampton, VA, USA
Active Flow Control Activities at NASA Langley
Anders, Scott G.; Sellers, William L., III; Washburn, Anthony E.; [2004]; 22 pp.; In English; 2nd AIAA Flow Control Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-762-55-MF
Report No.(s): AIAA Paper 2004-2623; No Copyright; Avail: CASI; A03, Hardcopy

NASA Langley continues to aggressively investigate the potential advantages of active flow control over more traditional aerodynamic techniques. This paper provides an update to a previous paper and describes both the progress in the various research areas and the significant changes in the NASA research programs. The goals of the topics presented are focused on advancing the state of knowledge and understanding of controllable fundamental mechanisms in fluids as well as to address engineering challenges. An organizational view of current research activities at NASA Langley in active flow control as supported by several projects 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 are to be demonstrated either in bench-top experiments, wind-tunnel investigations, or in flight as part of the fundamental NASA R&D program and then transferred to more applied research programs within NASA, DOD, and U.S. industry.
Author
Active Control; NASA Programs; Research Facilities; Flow Regulators

20040085385 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne, Germany
Future Airport Capacity Utilization in Germany: Peaked Congestion and/or Idle Capacity
Urbatzka, Eckhard; Wilken, Dieter; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 111-132; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The air traffic situation at German airports is characterized by intense capacity utilisation at the most important airports and rather low utilisation at many other airports. Although since 2001 overall traffic stagnates, air transport movements (ATMs) at hub airports are growing further. In this paper, we will describe airport traffic and capacity, discuss traffic forecasts and compare future volumes of ATMs with capacity at German airports. Means of de-peaking the spatial utilisation of airports will be presented. It will be shown that in less than 10 years time Germany needs additional runway capacity, which will most likely not be provided. Lacking this solution supply spreading measures and business models are discussed.
Author
Air Traffic; Airports; Congestion; Utilization

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*.

20040084254 NASA Langley Research Center, Hampton, VA, USA
Orbit Determination Accuracy for Comets on Earth-Impacting Trajectories
Kay-Bunnell, Linda; Jan. 6, 2004; 90 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): 319-30-02
Report No.(s): NASA/TM-2004-213230; L-19030; No Copyright; Avail: CASI; A05, Hardcopy

The results presented show the level of orbit determination accuracy obtainable for long-period comets discovered approximately one year before collision with Earth. Preliminary orbits are determined from simulated observations using Gauss' method. Additional measurements are incorporated to improve the solution through the use of a Kalman filter, and include non-gravitational perturbations due to outgassing. Comparisons between observatories in several different circular heliocentric orbits show that observatories in orbits with radii less than 1 AU result in increased orbit determination accuracy for short tracking durations due to increased parallax per unit time. However, an observatory at 1 AU will perform similarly if the tracking duration is increased, and accuracy is significantly improved if additional observatories are positioned at the Sun-Earth Lagrange points L3, L4, or L5. A single observatory at 1 AU capable of both optical and range measurements yields the highest orbit determination accuracy in the shortest amount of time when compared to other systems of observatories.
Author
Comets; Orbit Determination; Trajectories; Hypervelocity Impact; Earth Surface; Mathematical Models

20040084435 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Safe Field Storage of Ammunition and Explosives, Part 4, Setup Full-Scale 5 Ton Explosion Trial
vandeKasteele, R. M.; vanWees, R. M. M.; Rhijnsburger, M. P. M.; vanDongen, P.; December 2003; 50 pp.; In English
Contract(s)/Grant(s): A01/KL/402; TNO Proj. 014.13224
Report No.(s): TD-2002-0227; PML-2003-A53; Copyright; Avail: Other Sources

The semi-permanent field storage of ammunition and explosives during military missions out of area is riskier for military personnel and civilians than the permanent storage in military storage sites. Depending on the mission's mandate, the circumstances and possible external threats, the probability of an accidental explosion of own ammunition storage in the field is considerably higher. Driven by military operational demands and the limited space inside a compound or temporary airfield, the distance between the ammunition and explosives storage and personnel is often less than for comparable permanent storage. This has as result that the consequences of an accidental explosion would also be significantly higher. This makes the risk-being the probability of an unwanted event times the consequences of that event-also significantly higher. Taking adequate structural and organizational measures to reduce the risk to an acceptable level is therefore essential. Therefore Research

Programme V103, Safe field storage of ammunition and explosives , was started at TNO Prins Maurits Laboratory (TNO-PML) in order to address this problem.
Derived from text
Military Operations; Military Personnel; Risk; Explosives; Storage

20040084898 North Dakota Univ., Grand Forks, ND
Cluster Orbits With Perturbations of Keplerian Elements Equations
McLaughlin, Craig A.; Dec. 31, 2003; 45 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0411
Report No.(s): AD-A424125; No Copyright; Avail: CASI; A03, Hardcopy

This effort was performed jointly with Chris Sabol of AFRL/DEBI. The Cluster Orbit with Perturbations of Keplerian Elements (COWPOKE) Equations were developed. The initial COWPOKE equations described the relative motion of space objects in non- circular orbits using Keplerian elements. Modifications to the equations were made and the equations were used in a relative orbit determination scheme to show the benefits of relative orbit determination for satellites collocated in a single geosynchronous orbit slot. Finally, initial work was done to add Earth oblateness and drag perturbations to the COWPOKE equations.
DTIC
Attitude (Inclination); Perturbation; Synchronous Satellites

20040085023 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Microprocessor-Based Systems Control for the Rigidized Inflatable Get-Away-Special Experiment
Moody, David C.; Mar. 2004; 253 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424363; AFIT/GE/ENG/04-17; No Copyright; Avail: CASI; A12, Hardcopy

As the demand for space based communications and faster data throughput increase, satellites are becoming larger. Larger satellite antennas help to provide the needed gain to increase communications in space. Compounding the performance and size trade-offs are the payload weight and size limit imposed by the launch vehicles. Inflatable structures offer a cost saving opportunity since the structure is significantly lighter and has a reduced storage volume. This allows for smaller launch vehicles and for increased performance capabilities. Inflatable structures offer possibilities for increased satellite lifetimes, increased communications capacity, and reduce launch costs. This thesis develops and implements the computer control system and power system to support the Rigidized Inflatable Get-Away-Experiment. The autonomous computer system controls the flow of the experiment while at the same time collecting and recording temperature, pressure, vibration, and image data. The computer system consists of two processors, one for experiment control and sensor data collection and the second for image data collection. These two systems can work simultaneously to control the flow of the experiment and meet the experiment objectives. Examples of the data collection include heating curves, pressure, tube transfer function plots and images. This thesis also develops the Matlab(Registered) tools required to analyze the data collected by the computers for post-flight data processing. This thesis lays the groundwork for a microprocessor-based architecture for autonomous space experiments. This pioneering effort has been selected for flight testing on-board the U.S. Space Shuttle.
DTIC
Computer Networks; Get Away Specials (Sts); Microprocessors

13
ASTRODYNAMICS

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

20040084271 Physics and Electronics Lab. TNO, The Hague, Netherlands
Fly-out Modelling Version 1.0 of a 127 mm Gun-Launched Novel Munitions Concept
Banning, R.; April 2004; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32729
Report No.(s): FEL-03-A200; TD-2003-0095; Copyright; Avail: Other Sources

This report documents the development of 3 simulation models for a GLNM projectile concept, as well as simulation models for an inertial navigation system and a radio satellite navigation system. The simulation models for the GLNM projectile represent the uncontrolled GLNM projectile, the controlled GLNM projectile and the guided GLNM projectile. The simulations models for the navigation systems have been tested for validity and accuracy against a known projectile trajectory.

These tests have been concluded successfully for both navigation system models
Author
Gun Launchers; Mathematical Models; Computerized Simulation; Satellite Navigation Systems; Incendiary Ammunition

20040084972 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Optimal Constellation Design for Orbital Munitions Delivery System
Anderson, Jason; Mar. 2004; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424273; AFIT/GSS/ENY/04-M01; No Copyright; Avail: CASI; A05, Hardcopy

Rather than delivering conventional munitions through the airspace of uncooperative nations, a constellation of space-stored weapons could potentially target any point on the Earth and arrive within the time it takes to de-orbit and re-enter through the atmosphere. The research involves applying the dynamics of atmospheric re-entry to a Common Aero Vehicle (CAV) and defining a footprint of attainable touchdown points. The footprint is moved forward to create a swath representing all the possible touchdown points in a 90 minute window. A nominal constellation of CAVs is established using a streets of coverage technique, and both analytic studies and numeric genetic algorithm techniques are used to modify the nominal constellation. A minimum number of CAVs is identified which ensures payload delivery to an area of interest within 90 minutes.
DTIC
Ammunition; Atmospheric Entry; Constellations

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*.

20040084872 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Investigation of Atmospheric Reentry for the Space Maneuver Vehicle
McNabb, Dennis J.; Mar. 2004; 95 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424074; AFIT/GA/ENY/04-M03; No Copyright; Avail: CASI; A05, Hardcopy

This study investigated the atmospheric reentry of the Space Maneuver Vehicle from low-earth orbit using an entry guidance concept similar to the Space Shuttle. The Space Maneuver Vehicle was modeled as a point mass with aerodynamic properties as determined using Newtonian impact theory. For the rarefied-flow transition regime bridging formulae are used to capture the effects of both hypersonic continuum flow and free molecular flow. Constraints to the reentry are developed and a reentry corridor is defined in the drag-velocity plane. Bank angle modulation is established as the primary means for controlling drag and range. The guidance concept is applied to both a high inclination orbit and a low inclination orbit with cross-range requirement. Monte Carlo error analysis validates the ability of the control algorithm to guide reentry in the presence of initial state errors, as well as atmospheric variations. (7 tables, 54 figures, 18 refs.)
DTIC
Aerodynamic Forces; Algorithms; Atmospheric Entry; Lifting Reentry Vehicles; Terminal Guidance; Unmanned Spacecraft

20040084908 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Structural Design and Analysis of a Rigidizable Space Shuttle Experiment
Holstein III., Raymond G.; Mar. 2004; 124 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424139; AFIT/GAE/ENY/04-M08; No Copyright; Avail: CASI; A06, Hardcopy

AFIT is in the process of designing a Space Shuttle experiment designated as the Rigidized Inflatable Get- Away-Special Experiment (RIGEX) to study the effects of microgravity on the deployment of rigidizable composite structures. Once in space, the experiment will inflate and rigidize three composite structures and perform a vibration analysis on each by exciting the tubes using piezoelectric patches and collecting data via an accelerometer. This paper presents the structural and vibration analysis of the RIGEX assembly and inflatable composite tubes using ABAQUS Finite Element Analysis (FEA) software. Comparison of the analysis has been carried out with Eigenvalue/Eigenvector experimentation by means of ping testing. This

FEA analysis has been used to verify the natural frequency and structural integrity of the RIGEX support assemblies. The ABAQUS FEA results correlated to within 20% of experimental values.
DTIC
Design Analysis; Finite Element Method; Piezoelectricity; Space Shuttles; Spaceborne Experiments; Structural Analysis; Structural Design; Structural Engineering; Weightlessness

20040084924 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Maneuver Design for Fast Satellite Circumnavigation
Straight, Stanley D.; Mar. 2004; 103 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424170; AFIT/GA/ENY/04-M05; No Copyright; Avail: CASI; A06, Hardcopy

The feasibility of satellite operations in close proximity to a reference satellite is of interest for both civilian and military applications. One such operation is circular circumnavigation in a time period less than the orbital period of the reference satellite. This thesis investigates a guidance scheme for such maneuvers involving impulsive burns at specific points within a specified toroidal region centered on the circular-orbiting reference satellite. Two analytical methods for determining the magnitude and direction of the impulses are demonstrated. These methods are then used as initial estimates in an optimization scheme to produce the minimum total required impulse.
DTIC
Artificial Satellites

20040084937 Army War Coll., Carlisle Barracks, PA
Isomer Energy Source for Space Propulsion Systems
Johnson, Benjamin L.; Mar. 2004; 136 pp.; In English
Report No.(s): AD-A424205; AFIT/GA/ENY/04-M01; No Copyright; Avail: CASI; A07, Hardcopy

Presented in this work are the results of an investigation of alternative means for powering spacecraft and launch vehicles with energy sources other than chemical combustion. Nuclear thermal propulsion and the energy release of a nuclear spin isomer present potential for increased rocket performance with compact, high-energy fuel sources replacing the combustion engines of the Delta IV-H 1st and 2nd stage vehicles. Analysis of historical fission designs along with the isomer hafnium-178-m2 in a particle bed configuration was conducted. Energy storage levels of 1.3 GJ/g are possible with this material, though the successful triggering and maintenance of a chain reaction in this material are still debated topics within the scientific community. The best application for either technology is as an upper stage vehicle with the shielding requirements reduced to that of just a shadow shield between the core and the spacecrafts upper structure. The fission designs are capable of specific impulse values between 800 and 1,000 s leading to mass savings in the range of 7,000 to nearly 10,000 kg once the engine masses and shielding have been included. An isomer core in the configuration of a 19-element PBR may be able to achieve a specific impulse on the order of 880 s with the isomer in metallic form, and specific impulse values as high as 1,090 s if the isomer is in the form of hafnium carbide. This translates to somewhere between a 5,000 and 9,000 kg depending on the material makeup of the core and heat efficiency. Payload mass increases by a factor of two or greater velocity changes are the payoffs of these systems.
DTIC
Aerospace Systems; Isomers; Nuclear Propulsion; Propulsion; Propulsion System Configurations; Propulsion System Performance

20040084986 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Data Sorting and Orbit Determination of Tethered Satellite Systems
Faulstich, Mark J.; Mar. 2004; 120 pp.; In English
Report No.(s): AD-A424295; AFIT/GSS/ENY/04-M03; No Copyright; Avail: CASI; A06, Hardcopy

Tethered satellite system end masses do not obey the normal laws of motion developed for determining their orbits. In addition, tethered satellite systems cause unique problems for satellite tracking because there are potentially two or more objects which may be tracked. This thesis provides insight into these issues by developing a method of sorting out observation data of tethered satellite systems into their appropriate end mass and providing an estimate on the center of mass orbit of the tethered satellite system. The method used to accomplish both of these tasks is optimization of an estimated simulated orbit. This orbit estimate is optimized to provide the minimum difference between the end mass position estimates and the

observations obtained from one or more tracking sites. This methodology also helps provide a baseline for tracking tethered satellite systems more accurately in the future.
DTIC
Artificial Satellites; Orbit Determination; Tethered Satellites; Tethering

20040085008 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Design of a Space-Borne Autonomous Infrared Tracking System
Kimsal, Matthew B.; Mar. 2004; 101 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424335; AFIT/GA/ENY/04-M02; No Copyright; Avail: CASI; A06, Hardcopy

Complete characterization of the space environment in support of the USA goal of space Situational Awareness is not currently achievable. When confronted with recent increases in the deployment and miniaturization of microsatellites by numerous nations, the questions of foreign space capabilities are magnified. This study sought to determine the feasibility of and experimentally demonstrate a microsatellite capability to autonomously loiter about and track a target satellite. Various methods of passive remote sensing were investigated to determine the best means of detecting and tracking a target in space. Microbolometer-based infrared sensors were identified as the best alternative. A representative system was constructed for demonstration in AFIT s SIMSAT laboratory. Software modeling results identified open-loop instability, and therefore the requirement for closed-loop control. A simple PD control algorithm served as the basis for control, and a pseudo-feed-forward term was added to improve results. The feed-forward term was derived form orbital dynamics as the rate at which the chase satellite traverses around an ellipse formed in the target s frame of reference. Reduction in pointing errors of up to 67% were found in simulations. Successful non-optimal tracking results were obtained in the laboratory with a hardware-in-the-loop model for both step and moving inputs.
DTIC
Autonomy; Infrared Tracking; Rendezvous Spacecraft

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; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20040084368 NASA Langley Research Center, Hampton, VA, USA
Computational Aerodynamics of Shuttle Orbiter Damage Scenarios in Support of the Columbia Accident Investigation
Bibb, Karen L.; Prabhu, Ramadas K.; [2004]; 25 pp.; In English; 37th AIAA Thermophysics Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains color illustrations
Contract(s)/Grant(s): 23-372-20-80
Report No.(s): AIAA Paper 2004-2279; No Copyright; Avail: CASI; A03, Hardcopy

In support of the Columbia Accident Investigation, inviscid computations of the aerodynamic characteristics for various Shuttle Orbiter damage scenarios were performed using the FELISA unstructured CFD solver. Computed delta aerodynamics were compared with the reconstructed delta aerodynamics in order to postulate a progression of damage through the flight trajectory. By performing computations at hypervelocity flight and CF4 tunnel conditions, a bridge was provided between wind tunnel testing in Langley's 20-Inch CF4 facility and the flight environment experienced by Columbia during re-entry. The rapid modeling capability of the unstructured methodology allowed the computational effort to keep pace with the wind tunnel and, at times, guide the wind tunnel efforts. These computations provided a detailed view of the flowfield characteristics and the contribution of orbiter components (such as the vertical tail and wing) to aerodynamic forces and moments that were unavailable from wind tunnel testing. The damage scenarios are grouped into three categories. Initially, single and multiple missing full RCC panels were analyzed to determine the effect of damage location and magnitude on the aerodynamics. Next is a series of cases with progressive damage, increasing in severity, in the region of RCC panel 9. The final group is a set of wing leading edge and windward surface deformations that model possible structural deformation of the wing skin due to internal heating of the wing structure. By matching the aerodynamics from selected damage scenarios to the reconstructed flight aerodynamics, a progression of damage that is consistent with the flight data, debris forensics, and wind tunnel data is postulated.
Author
Accident Investigation; Aerodynamic Characteristics; Computational Fluid Dynamics; Damage; Wind Tunnel Tests; Columbia (Orbiter)

20040084410

Lyophilization -Solid Waste Treatment

Litwiller, Eric; Flynn, Michael; Fisher, John; Reinhard, Martin; [2004]; 1 pp.; In English; 34rd International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA

Contract(s)/Grant(s): 131-20-10; No Copyright; Avail: Other Sources; Abstract Only

This paper discusses the development of a solid waste treatment system that has been designed for a Mars transit exploration mission. The technology described is an energy-efficient lyophilization technique that is designed to recover water from spacecraft solid wastes. Candidate wastes include feces, concentrated brines from water processors, and other solid wastes that contain free water. The system is designed to operate as a stand-alone process or to be integrated into the International Space Station Waste Collection System. In the lyophilization process, water in an aqueous waste is frozen and then sublimed, separating the waste into a dried solid material and liquid water. The sublimed water is then condensed in a solid ice phase and then melted to generate a liquid product. In the subject system the waste solids are contained within a 0.2 micron bio-guard bag and after drying are removed from the system and stored in a secondary container. This technology is ideally suited to applications such as the Mars Reference Mission, where water recovery rates approaching 100% are desirable but production of CO2 is not. The system is designed to minimize power consumption through the use of thermoelectric heat pumps. The results of preliminary testing of a prototype system and testing of the final configuration are provided. A mathematical model of the system is also described.

Author

Solid Wastes; Waste Treatment; Mars Missions; Mars Exploration; Freeze Drying

20040084782 NASA Langley Research Center, Hampton, VA, USA

Prediction of STS-107 Hypervelocity Flow Fields about the Shuttle Orbiter with Various Wing Leading Edge Damage

Pulsonetti, Maria V.; Thompson, Richard A.; Alter, Stephen J.; [2004]; 14 pp.; In English; JANNAF 27th Airbreathing Propulsion Subcommittee, 1-5 Dec. 2003, Colorado Springs, CO, USA

Contract(s)/Grant(s): 372-20-80; No Copyright; Avail: CASI; A03, Hardcopy

Computations were performed for damaged configurations of the Shuttle Orbiter in support of the STS-107 Columbia accident investigation. Two configurations with missing wing leading-edge reinforced carbon-carbon (RCC) panels were evaluated at conditions just prior to the peak heating trajectory point. The initial configuration modeled the Orbiter with an approximate missing RCC panel 6 to determine whether this damage could result in anomalous temperatures measured during the STS-107 reentry. This missing RCC panel 6 computation was found to produce heating augmentation factors of 5 times the nominal heating rates on the side fuselage with lesser heat increases on the front of the OMS pod. This is consistent with the thermocouple and resistance temperature detector sensors from the STS-107 re-entry which observed off nominal high early in the re-entry trajectory. A second damaged configuration modeled the Orbiter with missing RCC panel 9 and included ingestion of the flow into the outboard RCC channel. This computation lowered the level (only 2 times nominal) and moved the location of the heating augmentation on the leeside fuselage relative to the missing RCC panel 6 configuration. The lesser heating augmentation for missing RCC panel 9 was confined near the wing fuselage juncture. Near nominal heating was predicted on the remainder of the side fuselage with some lower than nominal heating on the front surface of the OMS pod. These results for missing RCC panel 9 are consistent with data from the STS-107 re-entry where the heating augmentation was observed to move off the side fuselage and OMS pod sensors at later times in the trajectory. As this solution requires supersonic mass ingestion into the RCC channel, it is probably not an appropriate model prior to penetration of the flow through the spar into the wing structure. It may, however, be representative of the conditions at later times and could account for the movement of the heating signature on the side fuselage.

Author

Damage; Flow Distribution; Hypervelocity Flow; Leading Edges; Space Transportation System; Wings; Computational Fluid Dynamics; Uncontrolled Reentry (Spacecraft)

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

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

20040084278 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

High Gain Antenna Gimbal for the 2003-2004 Mars Exploration Rover Program

Sokol, Jeff; Krishnan, Satish; Ayari, Laoucet; 37th Aerospace Mechanisms Symposium; May 2004, pp. 237-250; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The High Gain Antenna Assemblies built for the 2003-2004 Mars Exploration Rover (MER) missions provide the primary communication link for the Rovers once they arrive on Mars. The High Gain Antenna Gimbal (HGAG) portion of the assembly is a two-axis gimbal that provides the structural support, pointing, and tracking for the High Gain Antenna (HGA). The MER mission requirements provided some unique design challenges for the HGAG. This paper describes all the major subsystems of the HGAG that were developed to meet these challenges, and the requirements that drove their design.
Author
Mars Exploration; Antenna Gain; High Gain

20040084374 NASA Marshall Space Flight Center, Huntsville, AL, USA
STARSAT: A Project To Evaluate Ground Tracking of Small Objects in Space (MSFC Center Director's Discretionary Fund)
Campbell, J. W.; Carruth, M. R.; Freestone, T. M.; May 2004; 21 pp.; In English
Contract(s)/Grant(s): Proj. 00-11
Report No.(s): NASA/TM-2004-213174; M-1108; No Copyright; Avail: CASI; A03, Hardcopy

A laser space calibration experiment is considered using the 12-J, 15-Hz high-performance CO2 ladar surveillance sensor (HI-CLASS) system on the 3.67-m aperture advanced electro-optics system (AEOS). The objectives are to provide accurate range and signature measurements of orbiting calibration spheres, demonstrate high-resolution tracking capability of small objects, and precision drag determination for low-Earth orbit (LEO). Ancillary benefits include calibrating radar and optical sites, completing satellite conjunction analyses, supporting orbital perturbation analyses, and comparing radar and optical signatures. A global positioning system (GPS), laser beacon instrumented microsatellite about 25 cm in diameter will be deployed from a Space Shuttle Hitchhiker canister or other suitable launch means. Orbiting in LEO, the microsatellite will pass over AEOS on the average of two times per 24-hr period. An onboard orbit propagator will activate the GPS unit and a visible laser beacon at the appropriate times. The HI-CLASS AEOS will detect the microsatellite as it rises above the horizon, using Space Command-generated acquisition vectors. GPS data will be transmitted to the ground providing independent on-orbit, submeter accuracy location information for the microsatellite.
Author
Ground Tracks; Spaceborne Experiments; Onboard Equipment; Electro-Optics; Microsatellites

20040085009 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Geometric Approach to Orbital Formation Mission Design
Press, Mathew J.; Mar. 2004; 84 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424336; AFIT/GA/ENY/04-M04; No Copyright; Avail: CASI; A05, Hardcopy

For distributed remote sensing architectures to be useful for collecting data, it is essential to have a methodology for relating orbital formation parameters to remote sensing requirements. Utilizing the characteristics of formation parameters, an orbital design approach is developed that establishes a satellite formation from a desired instantaneous spatial distribution as viewed from a target ground site. To maintain a conceptually basic representation, a geometric approach is used to develop the correlating algorithm. This tool will enable mission planning for orbital formations as well as future concept exploration.
DTIC
Geodetic Satellites; Mission Planning; Remote Sensors

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*.

20040084268 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Miniature Loop Heat Pipe (MLHP) Thermal Management System
Ku, Jentung; [2004]; 1 pp.; In English; No Copyright; Avail: CASI; A01, Hardcopy

The MLHP Thermal Management System consists of a loop heat pipe (LHP) with multiple evaporators and condensers, thermal electrical coolers, and deployable radiators coated with variable emittance coatings (VECs). All components are miniaturized. It retains all the performance characteristics of state-of-the-art LHPs and offers additional advantages to enhance

the functionality, versatility, and reliability of the system, including flexible locations of instruments and radiators, a single interface temperature for multiple instruments, cooling the on instruments and warming the off instruments simultaneously, improving. start-up success, maintaining a constant LHP operating temperature over a wide range of instrument powers, effecting automatic thermal switching and thermal diode actions, and reducing supplemental heater powers. It can fully achieve low mass, low power and compactness necessary for future small spacecraft. Potential applications of the MLHP thermal technology for future missions include: 1) Magnetospheric Constellation; 2) Solar Sentinels; 3) Mars Science Laboratory; 4) Mars Scouts; 5) Mars Telecom Orbiter; 6) Space Interferometry Mission; 7) Laser Interferometer Space Antenna; 8) Jupiter Icy Moon Orbiter; 9) Terrestrial Planet Finder; 10) Single Aperture Far-Infrared Observatory, and 11) Exploration Missions. The MLHP Thermal Management System combines the operating features of a variable conductance heat pipe, a thermal switch, a thermal diode, and a state-of-the-art LHP into a single integrated thermal system. It offers many advantages over conventional thermal control techniques, and can be a technology enabler for future space missions. Successful flight validation will bring the benefits of MLHP technology to the small satellite arena and will have cross-cutting applications to both Space Science and Earth Science Enterprises.
Derived from text
Heat Pipes; Miniaturization; Temperature Control; Systems Engineering; Space Missions

20040084274 Moog, Inc., Chatsworth, CA, USA
A Strain Free Lock and Release Mechanism for an Elastically Suspended Two-Axis Gimbal
Asadurian, Armond; Pugh, Richard; Hammond, Jim; 37th Aerospace Mechanisms Symposium; May 2004, pp. 97-106; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

A single-point-actuated, multi degree-of-freedom restraining launch latch mechanism was developed for a two-degree-of-freedom tilt table antenna gimbal. The design of the launch latch protects the gimbal pivots and actuators through launch vibration, and precludes any high forces on sensitive gimbal components as a result of operation of the latch mechanism itself. At the same time, stringent requirements on stiffness for the latched gimbal and payload are met. The launch latch design was carried through to qualification largely as initially conceived; however, detail design changes and improvements were made during development as a result of prototyping and development testing.
Author
Actuators; Launching; Payloads; Latches

20040084275 Oesterreichische Raumfahrt- und Systemtechnik, Vienna, Austria
Lessons Learned on Cryogenic Rocket Engine's Gimbal Bearing Lubrication Selection
Neugebauer, Christian; Falkner, Manfred; 37th Aerospace Mechanisms Symposium; May 2004, pp. 137-141; In English; See also 20040084272; No Copyright; Avail: CASI; A01, Hardcopy

The bearings for a gimbal of a cryogenic upper stage rocket engine are highly loaded, exposed to corrosive environment and have to cope with a wide temperature range down to cryogenic temperatures. ″Cronidur 30″ steel was chosen for the bearing material. To satisfy the demand of low friction moment under these conditions a tribological concept should be found. This paper describes the selection process for the tribological concept suitable for this specific application that resulted in the selection of sputtered lead as lubricant for the gimbal bearings.
Author
Cryogenic Equipment; Gimbals; Bearings; Lubricants

20040084276 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Villaroche, France
SARA(registered trademark)21: A New Rotary Actuator for Space Applications
Secheresse, Olivier; Cadiergues, Laurent; Rabin, Julien; 37th Aerospace Mechanisms Symposium; May 2004, pp. 153-161; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

SNECMA MOTEURS and CNES have recently qualified a new rotary actuator called SARA(R)21, intended for fine orientation of space mechanisms. This SARA(R)21 is a very small, light and compact actuator designed around a new super-flat CSD 20-160 harmonic drive. Its optimized and robust design allows for great performance such as sustaining high loads and rotating into position with an extreme precision of 0.00625 deg. All characteristics, from lifetime functional behavior to strength against mission environments like launch vibrations, were demonstrated with margins during the 2003 qualification test program. The investigation described in this paper confirmed the good behavior of the SARA(R)21 components.
Author
Actuators; Design Analysis; Performance Tests; Technology Utilization

20040084277 Able Engineering Co., Inc., Goleta, CA, USA
Rolamite Joints for Spacecraft Subsystem Vibration Isolation
Compton, Gregory A.; Botke, Matthew M.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 163-169; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

A one-degree of freedom joint with unique performance requirements has been designed and built for use in a passive isolation system for structurally-connected deployable spacecraft subsystems. Using a Rolamite approach, a nearly frictionless and zero spring rate hinged joint can be achieved that is capable of passing significant electrical power and data harnessing. Implementing a Rolamite joint in a system design with requirements typical of spaceflight must be accomplished in a very judicious fashion in order to maintain the expected performance benefits. The following describes the design progression, trades and lessons learned in developing and building this mechanism.
Author
Systems Engineering; Vibration Isolators; Joints (Junctions); Mechanical Drives; Spacecraft Design

20040084285 NASA Johnson Space Center, Houston, TX, USA
The X-38 V-201 Flap Actuator Mechanism
Hagen, Jeff; Moore, Landon; Estes, Jay; Layer, Chris; 37th Aerospace Mechanisms Symposium; May 2004, pp. 377-390; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The X-38 Crew Rescue Vehicle V-201 space flight test article was designed to achieve an aerodynamically controlled re-entry from orbit in part through the use of two body mounted flaps on the lower rear side. These flaps are actuated by an electromechanical system that is partially exposed to the re-entry environment. These actuators are of a novel configuration and are unique in their requirement to function while exposed to re-entry conditions. The authors are not aware of any other vehicle in which a major actuator system was required to function throughout the complete re-entry profile while parts of the actuator were directly exposed to the ambient environment.
Author
X-38 Crew Return Vehicle; Rescue Operations; Reentry

20040084286 Aerospace Corp., El Segundo, CA, USA
Effect of Test Atmosphere on Moving Mechanical Assembly Test Performance
Carre, D. J.; Bertrand, P. A.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 357-361; In English; See also 20040084272
Contract(s)/Grant(s): F04701-00-C-0009; No Copyright; Avail: CASI; A01, Hardcopy

Satellites and many of the moving mechanical assemblies (MMAs) on board operate under the low pressure conditions of the orbital environment. In order to assess the lifetime performance of these devices, it is desirable to test them under the same conditions they will experience during mission operation. However, many times contractors test MMAs in a nitrogen gas environment at approx. 1 atm pressure, assuming the test results will be comparable to those obtained in a vacuum test due to the inertness of the nitrogen gas. We were concerned that impurities in nitrogen gas, such as oxygen even at =1-ppm levels, would lead to different chemistry and rates of reaction compared to vacuum conditions, where the oxygen levels are lower by at least a factor of 1000. In order to test this hypothesis, we performed a set of experiments using our in-house, thrust-bearing wear-test facility with hydrocarbon oils containing an aryl phosphate ester additive mixture. We used a load that resulted in a Hertzian stress of 1.52 GPa, at the high end of typical ball-bearing stresses. We used test time to failure to assess performance differences. The wear tests lasted at least a factor of 5 times longer in nitrogen gas than in vacuum. Since the temperatures of the vacuum and nitrogen tests were matched, this implies that there are chemistry differences occurring at the metal surfaces. We conclude from our test results that nitrogen gas at approx. 1 atm pressure is not a realistic substitute for vacuum conditions for life testing of MMAs that will operate under orbital low-pressure conditions.
Author
Performance Tests; Wear Tests; Vacuum Tests; Atmospheric Effects

20040084288 Ball Aerospace and Technologies Corp., Boulder, CO, USA
Pancam Mast Assembly on Mars Rover
Warden, Robert M.; Cross, Mike; Harvison, Doug; 37th Aerospace Mechanisms Symposium; May 2004, pp. 263-276; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The Pancam Mast Assembly (PMA) for the 2003 Mars Rover is a deployable structure that provides an elevated platform for several cameras. The PMA consists of several mechanisms that enable it to raise the cameras as well as point the cameras

in all directions. This paper describes the function of the various mechanisms as well as a description of the mechanisms and some test parameters. Designing these mechanisms to operate on the surface of Mars presented several challenges. Typical spacecraft mechanisms must operate in zero-gravity and high vacuum. These mechanisms needed to be designed to operate in Martian gravity and atmosphere. Testing conditions were a little easier because the mechanisms are not required to operate in a vacuum. All of the materials are vacuum compatible, but the mechanisms were tested in a dry nitrogen atmosphere at various cold temperatures.
Author
Mars Atmosphere; Roving Vehicles; Space Platforms; Stabilized Platforms

20040084289 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Brake Failure from Residual Magnetism in the Mars Exploration Rover Lander Petal Actuator
Jandura, Louise; 37th Aerospace Mechanisms Symposium; May 2004, pp. 221-229; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

In January 2004, two Mars Exploration Rover spacecraft arrived at Mars. Each safely delivered an identical rover to the Martian surface in a tetrahedral lander encased in airbags. Upon landing, the airbags deflated and three Lander Petal Actuators opened the three deployable Lander side petals enabling the rover to exit the Lander. Approximately nine weeks prior to the scheduled launch of the first spacecraft, one of these mission-critical Lander Petal Actuators exhibited a brake stuck-open failure during its final flight stow at Kennedy Space Center. Residual magnetism was the definitive conclusion from the failure investigation. Although residual magnetism was recognized as an issue in the design, the lack of an appropriately specified lower bound on brake drop-out voltage inhibited the discovery of this problem earlier in the program. In addition, the brakes had more unit-to-unit variation in drop-out voltage than expected, likely due to a larger than expected variation in the magnetic properties of the 15-5 PH stainless steel brake plates. Failure analysis and subsequent rework of two other Lander Petal Actuators with marginal brakes was completed in three weeks, causing no impact to the launch date.
Author
Air Bag Restraint Devices; Actuators; Dropouts; Failure Analysis; Magnetic Properties

20040084291 Moog, Inc., Durham, NC, USA
Establishing Adequate Performance Margin for Space Flight Stepper Motor Mechanisms
Marks, David B.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 119-130; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Adequate Stepper Motor performance margin is critical for mission success. Often, it is not clear from system specifications what the stepper motor performance requirements should be, because the concerns and methods for defining and applying a stepper motor may not be well understood. ″Establishing Adequate Performance Margin for Space Flight Stepper Motor Mechanisms″ presents practical guidelines for the correct specification and application of stepper motors used in space flight mechanisms and provides some basic lessons-learned from flight hardware experiences.
Author
Performance Prediction; Stepping Motors

20040084293 NASA Johnson Space Center, Houston, TX, USA
The Integration of a Load Limiter to an Orbiter Over-Center Mechanism
Gilmore, Adam; Rupp, Tim; 37th Aerospace Mechanisms Symposium; May 2004, pp. 143-146; In English; See also 20040084272; No Copyright; Avail: CASI; A01, Hardcopy

This paper summarizes the design process used to relieve the predicted high loads on a Space Shuttle Orbiter mechanism prior to the STS-112 flight. The overloading of the mechanism was due to a dynamic response between the orbiter and payload that was specific to this payload s mass and attachment scheme. A solution was devised by adding a component that prevented overload of the mechanism. In addition, the introduction of the new component neither interfered with the normal operation nor required extra-vehicular activity from a crewmember. By utilizing rapid prototyping technology, engineers were able to verify clearances and feasibility while preparing to build the flight hardware. This design solution was successfully flown on STS-112 and STS-113.
Author
Design Analysis; Payloads; Dynamic Response

20040084295 Northrop Grumman Space Technology, Redondo Beach, CA, USA
Design and Development of the Primary and Secondary Mirror Deployment Systems for the Cryogenic JWST
Reynolds, Paul; Atkinson, Charlie; Gliman, Larry; 37th Aerospace Mechanisms Symposium; May 2004, pp. 29-44; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

With a 7-meter primary mirror (PM) aperture, the James Webb Space Telescope will require structures that remain stable to levels on the order of 10 nanometers out of plane under dynamic and thermal loading while operating at cryogenic temperatures. Moreover, the JWST will be the first telescope in space to deploy primary and secondary mirrors. The resulting primary mirror (PM) aperture will not only be segmented, but will have hinge-lines and associated latches. The secondary mirror will be deployed with folding booms that latch to support it approximately 7 m away from the PM. This paper describes the design of the JWST Optical Telescope Element (OTE) structures and mechanisms, focusing primarily on the primary and secondary mirror deployment systems. It discusses the driving design requirements, how the resulting designs satisfy those requirements, and how the risk associated with these very large, stable, deployed structures was reduced through development and testing of the Development Optical Telescope Assembly (DOTA).
Author
James Webb Space Telescope; Mirrors; Cryogenic Temperature; Deployment

20040084297 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Deployment Mechanism for the Space Technology 5 Micro Satellite
Rossoni, Peter; Cooperrider, Caner; Durback, Gerard; 37th Aerospace Mechanisms Symposium; May 2004, pp. 59-72; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Space Technology 5 (ST5) is a technology mission that will send three spin-stabilized, 25-kg satellites into a highly elliptical Earth orbit. Each of these satellites must be deployed separately from the same launch vehicle with a spin rate of 3.4 rad/s (32.4 rpm). Because of the satellite's small size and the requirement to achieve its mission spin rate on deploy, typical spin table, pyrotechnic deployment devices or spin up thrusters could not be used. Instead, this new mechanism design employs a 'Frisbee' spin up strategy with a shape memory alloy actuated Pinpuller to deploy each satellite. The mechanism has undergone several design and test iterations and has been successfully qualified for flight.
Author
Deployment; Elliptical Orbits; Microsatellites; Spacecraft Launching

20040084298 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development of a Strain Energy Deployable Boom for the Space Technology 5 Mission
Meyers, Stew; Sturm, James; 37th Aerospace Mechanisms Symposium; May 2004, pp. 73-85; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The Space Technology 5 (ST5) mission is one of a series of technology demonstration missions for the New Millennium Program. This mission will fly three fully functional 25-kilogram micro-class spacecraft in formation through the Earth's magnetosphere; the primary science instrument is a very sensitive magnetometer. The constraints of a 25-kg Micosat resulted in a spin stabilized, octagonal spacecraft that is 30 cm tall by 50 cm diameter and has state-of-the-art solar cells on all eight sides. A non-magnetic boom was needed to place the magnetometer as far from the spacecraft and its residual magnetic fields as possible. The ST-5 spacecraft is designed to be spun up and released from its deployer with the boom and magnetometer stowed for later release. The deployer is the topic of another paper. This paper describes the development efforts and resulting self-deploying magnetometer boom.
Author
Aerospace Engineering; Technology Utilization; Spacecraft Design; Strain Energy Methods; Booms (Equipment); Space Missions

20040084300 Boeing Co., Houston, TX, USA
Review of International Space Station Mechanical System Anomalies
McCann, David S.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 291-299; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

The International Space Station (ISS) when completed will consist of over 32 different mechanical systems utilized in more than 150 applications providing functionality for assembly, rotation and deployment of major components, and maintenance. Currently, a majority of these systems have been launched and either functioned or checked out on orbit, and all have completed preflight testing and flight readiness processing. Within the ISS program the Structures and Mechanisms

(S&M) System Problem Resolution Team (SPRT) is responsible for the resolution of problems associated with all ISS mechanical system during qualification, pre-flight checkout and on-orbit operations. This activity combined with the shear number of complex mechanical systems on ISS has exposed the team to a great number of problems of interest to the Space Mechanism community.
Author
International Space Station; Flight Tests; Complex Systems; Problem Solving; Maintenance; Flight Operations

20040084301 Boeing Co., Houston, TX, USA
Space Station Berthing Mechanisms: Attaching Large Structures On-Orbit that were Never Mated on the Ground
Foster, Robert M.; Cook, John G.; Smudde, Paul R.; Henry, Mark A.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 301-314; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

A significant benefit resulting from the International Space Station (ISS) program has been the development of common mechanisms to attach the various modular components together in orbit. Several different mechanisms were developed to make assembly and growth of the ISS possible. This paper addresses the driving design requirements and verification activities associated with these mechanisms that ensure that all ISS modules, built in different parts of the world and not coming in contact prior to on-orbit assembly, would fit together without problems.
Author
International Space Station; Modules; Orbits

20040084303 Boeing Co., Houston, TX, USA
Mechanism Analysis and Verification Approach for ISS Truss Assembly
Bruner, Wesley; Enriquez, Carlos; Thampi, Sreekumar; 37th Aerospace Mechanisms Symposium; May 2004, pp. 315-331; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Analysis and verification of an International Space Station (ISS) element berthing mechanism is a highly integrated problem, due to its dependency on other systems like robotic manipulators. Yet the mechanism is required to be verified stand-alone with the understanding of all the integrated variables. Failure to do so, can severely constrain the functionality of the mechanism to the point of operational failure during on-orbit operations. This paper explores some of these variables as they are accounted for and imbedded in the analysis and simulations that must be performed to declare the mechanism verified and ready to fly, particularly in the area of contact dynamic simulations. Consideration is specifically given to Modified Rocketdyne Attachment System (RTAS) mating mechanism coarse and fine alignment geometry, friction coefficient, mechanism behavior under load during capture operations, and the ability of the mechanism to achieve soft capture. These and other areas yield the variables that are described, quantified and analyzed in an effort to make sure the mechanism performs without anomalies during the truss assembly operations. This paper discusses these challenges in an effort to state lessons-learned that can lead to advancements in the arena of verification of on-orbit assembly mechanisms.
Author
International Space Station; Trusses; Remote Manipulator System; Aerospace Engineering

20040084304 NASA Johnson Space Center, Houston, TX, USA
The X-38 V-201 Fin Fold Actuation Mechanism
Lupo, Christian; Robertson, Brandan; Gafka, George; 37th Aerospace Mechanisms Symposium; May 2004, pp. 363-376; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The X-38 Vehicle 201 (V-201) is a space flight prototype lifting body vehicle that was designed to launch to orbit in the Space Shuttle orbiter payload bay. Although the project was cancelled in May 2003, many of the systems were nearly complete. This paper will describe the fin folding actuation mechanism flight subsystems and development units as well as lessons learned in the design, assembly, development testing, and qualification testing. The two vertical tail fins must be stowed (folded inboard) to allow the orbiter payload bay doors to close. The fin folding actuation mechanism is a remotely or extravehicular activity (EVA) actuated single fault tolerant system consisting of seven subsystems capable of repeatedly deploying or stowing the fins.
Author
Fins; Folding; X-38 Crew Return Vehicle; Actuators; Space Shuttle Orbiters

20040084363 Boston Univ., Boston, MA, USA
Constellation Pathfinder Technology Development
Spence, Harlan E.; [2004]; 4 pp.; In English
Contract(s)/Grant(s): NAG5-10419; BU-20-325-4573-5; No Copyright; Avail: CASI; A01, Hardcopy

This final report describes the efforts accomplished during the grant s period of performance, covering the period of 15 March 2001 to 14 March 2004, of an unsolicited NASA proposal entitled Constellation Pathfinder Technology Development. We have completed the goals set forth in the proposed research objectives. An overview of these studies is summarized.
Derived from text
Technology Utilization; Fabrication; Pathfinder Nuclear Reactor; Nanosatellites; Satellite Design

20040084370 NASA Ames Research Center, Moffett Field, CA, USA
Characterization of an Integral Thermal Protection and Cryogenic Insulation Material for Advanced Space Transportation Vehicles
Salerno, L. J.; White, S. M.; Helvensteijn, B. P. M.; [2000]; 6 pp.; In English; 30th International Conference on Environmental Systems, 10-13 Jul. 2000, Toulouse, France
Contract(s)/Grant(s): RTOP 242-81-01
Report No.(s): Paper 00ICES-264; No Copyright; Avail: CASI; A02, Hardcopy

NASA's planned advanced space transportation vehicles will benefit from the use of integral/conformal cryogenic propellant tanks which will reduce the launch weight and lower the earth-to-orbit costs considerably. To implement the novel concept of integral/conformal tanks requires developing an equally novel concept in thermal protection materials. Providing insulation against reentry heating and preserving propellant mass can no longer be considered separate problems to be handled by separate materials. A new family of materials, Superthermal Insulation (STI), has been conceiving and investigated by NASA's Ames Research Center to simultaneously provide both thermal protection and cryogenic insulation in a single, integral material.
Author
Insulation; Cryogenics; Thermal Protection

20040084505 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A New Spin
Casani, John; ASK Magazine, No. 18; June 2004, pp. 6-9; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

The trouble was that the shuttle was still under development when that schedule was set. As time went on, the Shuttle had problems with its high pressure turbines, thermal protection tiles, engines, and more. The early launch dates had to be scrapped. NASA Headquarters told us, ″We re going to delay your launch two years to allow more time for the Shuttle development to take place. You can slow your development accordingly.″ Right off the bat, we looked into the celestial mechanics and how they would affect us. The difficulty in launching a spacecraft to Jupiter changes on a year-to- year basis, in a cyclical pattern that repeats about every ten or twelve years. In order to achieve the velocity needed to get from low earth orbit to Jupiter, an upper stage is required in the Shuttle. For the 1982 launch the upper stage was adequate, but it could not provide the velocity we would need in 1984. This meant we would have to separate the Galileo probe from the Galileo orbiter before launch and put each of them on separate Shuttles with separate upper stages. When we told the folks at Headquarters this, they told us, ″Okay we'll give you two Shuttle launches.″
Derived from text
Galileo Spacecraft; Launch Dates; High Pressure

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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 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20040084290 Aerospace Corp., El Segundo, CA, USA
Force and Torque Margins for Complex Mechanical Systems
Postma, Robert W.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 107-118; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Force and torque margins are commonly used within the aerospace community to determine if the actuator for a mechanism has sufficient force or torque to ensure successful operation. Typical mechanism functions include deploying an

antenna, releasing a launch restraint, rotating a solar array, controlling an antenna pointing mechanism, operating a valve, or releasing an interface connector. The definition of force margin relates to the ratio between the driving forces and the resisting loads. For example, if the driving force is twice the resisting load, the force margin is 100 percent. The calculation of force and torque margins is relatively straightforward for a simple mechanism such as a spring-loaded hinge. However, for complex mechanisms employing gear trains, linkages, and jackscrews, the basic arithmetical process becomes more complex. The method described herein references drive forces, and resisting forces and moments, as equivalent forces and moments at a selected point in the mechanism. This is done by multiplying each force or moment by the ratio of its displacement to the displacement at that selected coordinate point. These equivalent forces from the various points of the mechanism are then summed at the selected common point, keeping driving forces separate from resisting forces, for use in the basic force and torque margin formulas. It is shown that force and torque margins can be calculated as energy margins, power margins, or virtual work margins, and that these margins have a simple relationship to mechanical efficiency.
Author
Actuators; Deployment; Hinges; Loads (Forces); Solar Arrays; Torque

20040084292 ISRO Satellite Centre, Peenya, Bangalore, India
Latch-up Anomaly Study for Reflector Deployment of INSAT-2E Satellite
Nagesh, G.; Ravindran, S.; Bhat, N. C.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 87-96; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

INSAT 2E Spacecraft (S/C) has two deployable antenna reflectors of which one of the reflectors showed a non-nominal latching behavior during the ground deployment test with a couple of bounce backs before a final positive latch-up. Similar phenomenon was not observed during the test on the other reflector. Detailed analysis revealed the inherent limitation in the design for the former reflector. This limitation was confirmed by subsequent tests. This paper describes in detail the analysis carried out, the various tests conducted and the optional design modification worked out to correct the same. However, in view of the capability of the present design to latch positively, it was decided to fly this mechanism without any changes in INSAT-2E. The observed on-orbit performance is also reported here.
Author
Deployment; Anomalies; Latch-Up; Antenna Arrays

20040084305 Starsys Research Corp., Boulder, CO, USA
Minimizing Torque Disturbance of Stepper Motors
Sprunck, Jim; 37th Aerospace Mechanisms Symposium; May 2004, pp. 147-152; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

As the resolution of space-borne instruments improves, the stability of the satellite platform becomes more critical. While the attitude control system is paramount in providing this stability it does have finite ability to reject external torques and forces imparted to the spacecraft. This has translated to demanding requirements for low disturbance mechanisms. Starsys has successfully employed microstepping techniques in moving mechanisms to reduce disturbance levels. This allows smooth motion to be achieved using stepper motors and avoids the need for high cost brushless D.C. servo systems. This paper discusses the key aspects of system, component and test design for microstepping systems.
Author
Stepping Motors; Torque Motors; Torque

20040084306 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Hubble Space Telescope Fine Guidance Sensor Post-Flight Bearing Inspection
Pellicciotti, J.; Loewenthal, S.; Jones, W., Jr.; Jumper, M.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 343-356; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Aerospace mechanism engineering success stories often, if not always, consist of overcoming developmental, test and flight anomalies. Many times it is these anomalies that stimulate technology growth and more reliable future systems. However, one must learn from these to achieve an ultimately successful mission. It is not often that a spacecraft engineer is able to inspect hardware that has flown in orbit for several years. However, in February 1997, the Fine Guidance Sensor-1 (FGS-1) was removed from the Hubble Space Telescope (HST) and returned to NASA Goddard Space Flight Center (GSFC) during the second Servicing Mission (SM2). At the time of removal, FGS-1 had nearly 7 years of service and the bearings in the Star Selector Servos (SSS) had accumulated approximately 25 million Coarse Track (CT) cycles. The main reason for its replacement was due to a bearing torque anomaly leading to stalling of the B Star Selector Servo (SSS-B) when reversing

direction during a vehicle offset maneuver, referred to herein as a Reversal Bump (RB). The returned HST FGS SSS bearings were disassembled for post-service condition assessment to better understand the actual cause of the torque spikes, identify potential process/design improvements, and provide information for remedial on-orbit operation modifications. The methods and technology utilized for this inspection are not unique to this system and can be adapted to most investigations at varying stages of the mechanism life from development, through testing, to post flight evaluation. The systematic methods used for the HST Fine Guidance Sensor (FGS) SSS and specific findings are the subjects presented in this paper. The lessons learned include the importance of cleanliness and handling for precision instrument bearings and the potential effects from contamination. The paper describes in detail, the analytical techniques used for the SSS and their importance in this investigation. Inspection analytical data and photographs are included throughout the paper.
Author
Hubble Space Telescope; Guidance Sensors; Cameras; Bearings

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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*.

20040084644 Michigan Univ., Ann Arbor, MI, USA
Development and Characterization of High-Efficiency, High-Specific Impulse Xenon Hall Thrusters
Hofer, Richard R.; Jacobson, David, Technical Monitor; June 2004; 400 pp.; In English
Contract(s)/Grant(s): NAG3-2307; WBS 22-319-20-C2
Report No.(s): NASA/CR-2004-213099; E-14574; Copyright; Avail: CASI; A17, Hardcopy

This dissertation presents research aimed at extending the efficient operation of 1600 s specific impulse Hall thruster technology to the 2000 to 3000 s range. Motivated by previous industry efforts and mission studies, the aim of this research was to develop and characterize xenon Hall thrusters capable of both high-specific impulse and high-efficiency operation. During the development phase, the laboratory-model NASA 173M Hall thrusters were designed and their performance and plasma characteristics were evaluated. Experiments with the NASA-173M version 1 (v1) validated the plasma lens magnetic field design. Experiments with the NASA 173M version 2 (v2) showed there was a minimum current density and optimum magnetic field topography at which efficiency monotonically increased with voltage. Comparison of the thrusters showed that efficiency can be optimized for specific impulse by varying the plasma lens. During the characterization phase, additional plasma properties of the NASA 173Mv2 were measured and a performance model was derived. Results from the model and experimental data showed how efficient operation at high-specific impulse was enabled through regulation of the electron current with the magnetic field. The electron Hall parameter was approximately constant with voltage, which confirmed efficient operation can be realized only over a limited range of Hall parameters.
Derived from text
Hall Thrusters; Xenon; Spacecraft Propulsion; Electromagnetic Propulsion; Plasmas (Physics)

20040084684 Wisconsin Univ., Madison, WI, USA
Wavelength-Agile Optical Sensor for Exhaust Plume and Cryogenic Fluid Interrogation
Sanders, Scott T.; Chiaverini, Martin J.; Gramer, Daniel J.; April 15, 2004; 11 pp.; In English; 52nd JANNAF Propulsion Meeting, 10-13 May 2004, Las Vegas, NV, USA
Contract(s)/Grant(s): NAS13-03019
Report No.(s): SSTI-2200-0002-FLUIDS; No Copyright; Avail: CASI; A03, Hardcopy

Two optical sensors developed in UW-Madison labs were evaluated for their potential to characterize rocket engine exhaust plumes and liquid oxygen (LOX) fluid properties. The plume sensor is based on wavelength-agile absorption spectroscopy A device called a chirped white pulse emitter (CWPE) is used to generate the wavelength agile light, scanning, for example, 1340 - 1560 nm every microsecond. Properties of the gases in the rocket plume (for example temperature and water mole fraction) can be monitored using these wavelength scans. We have performed preliminary tests in static gas cells, a laboratory GOX/GH2 thrust chamber, and a solid-fuel hybrid thrust chamber, and these initial tests demonstrate the potential of the CWPE for monitoring rocket plumes. The LOX sensor uses an alternative to wavelength agile sensing: two independent, fixed-wavelength lasers are combined into a single fiber. One laser is absorbed by LOX and the other not: by monitoring the differential transmission the LOX concentration in cryogenic feed lines can be inferred. The sensor was successful in

interrogating static LOX pools in laboratory tests. Even in ice- and bubble-laden cryogenic fluids, LOX concentrations were measured to better than 1% with a 3 microsec time constant.
Author
Optical Measuring Instruments; Exhaust Gases; Plumes; Cryogenic Fluids; Interrogation; Liquid Oxygen; Rocket Exhaust

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 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20040084269 Institute of Industrial Technology TNO, Eindhoven, Netherlands
Optimisation of Powdery Temporary Camouflage Paints, Phase 1, Replacement of a Raw Material Which was Withdrawn from the Market
Hoeflaak, M.; Meertens, R. M.; September 23, 2003; 27 pp.; In Dutch
Contract(s)/Grant(s): A03/KL/106; TNO Proj. 007.63230
Report No.(s): TD- 2004-0261-Phase-1; Rept-42/04.009912/sec-Phase-1; Copyright; Avail: Other Sources

Temporary camouflage paints in powder form, characterized by excellent storage stability and low storage volume, are developed for the Dutch Army. A new project was started to replace a raw material that was withdrawn from the market and to reduce the so-toxicity of waste water from the removal of the temporary paint. In the first phase of the project the paint stripper component causing the eco-toxicity was identified. Paint formulations with two potential alternatives for the withdrawn raw material are tested for their technological properties and removability. Based on the results of the laboratory tests one of the alternative raw materials appears to be suitable for powdery temporary camouflage coatings. A commercial powdery temporary camouflage coating appears to be very sensitive to water and is unsuitable for the Dutch Army. In the second phase of the project the paint stripper will be further optimized with respect to eco-toxicity and ease of removal of the new paint formulation.
Author
Camouflage; Powder (Particles); Removal

20040084321 Research Inst. of National Defence, Umea, Sweden, Umea Univ., Sweden
Phospholipid Membranes in Biosensor Applications. Stability, Activity and Kinetics of Reconstituted Proteins and Glycolipids in Supported Membranes
Gustafson, I.; Dec. 2003; In English
Report No.(s): PB2004-105075; FOI-R-0987-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Artificial lipid membranes are useful models to gain insight into the processes occurring at the cell membrane, such as molecular recognition and signal transduction. These membranes with incorporated receptors also have a great potential in biosensor applications. In this study the formation of supported membranes onto planar solid supports has been investigated. The stability and activity of incorporated membrane receptors positioned in an appropriate lipid milieu has been studied. A potential use of such preparation for biosensoring is discussed.
NTIS
Lipids; Thin Films

20040084328 Savannah River Ecology Lab., Aiken, SC, USA
Durability of SRP Waste Glass-Effect of Devitrification
Robnett, B. M.; Wicks, G. G.; Jan. 1981; 30 pp.; In English
Report No.(s): DE2004-787804; DPST-81-223; No Copyright; Avail: Department of Energy Information Bridge

This reports summarizes results of a study of devitrification (or crystallization) of three simulated Savannah River Plant waste glass compositions.
NTIS
Crystallization; Durability

20040084330 Helsinki Univ. of Technology, Espoo, Finland
Helsinki University of Technology Laboratory of Materials Processing and Powder Metallurgy
2001; 40 pp.; In English
Report No.(s): PB2004-105299; Copyright; Avail: National Technical Information Service (NTIS)
;Table of Contents: Preface; Personnel; Teaching Activities; Research Activities; Publications; Lectures; Professional Excursions and Other Academic Activities; Theses; Laboratory Facilities; Personnel Contact Information
NTIS
Powder Metallurgy; Research Projects

20040084565 Eloret Corp., Moffett Field, CA, USA
The Bonding of NO2, NH3, and CH2NY to Models of a (10,0) Carbon Nanotube
Walch, Stephen P.; [2004]; 17 pp.; In English
Contract(s)/Grant(s): NAS2-99092; No Copyright; Avail: CASI; A03, Hardcopy
We have studied the bonding of NO2, NH3, and CH2NH to a (10,O) carbon nanotube using the MP2 and ONIOM methods with extended basis sets. We find bond strengths of 3.5, 3.6. and 6.3 kcal/mol for NO2, NH3, and CH2NH, respectively, using the ONIOM method with the high accuracy part treated at the MP2/aug-CC-pVTZ level and the remainder of the CNT approximated at the UFF level and including an estimate of basis set superposition error using the counterpoise method.
Author
Carbon Nanotubes; Bonding; Joints (Junctions); Ammonia

20040084960 Dakota Technologies, Inc., Fargo, ND
Technology Demonstration of Sensor Applications to Direct Push Platforms and Monitoring and Operations
Jarski, Paul; St. Germain, Randy; Mar. 26, 2004; 82 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F41624-00-C-8045
Report No.(s): AD-A424257; No Copyright; Avail: CASI; A05, Hardcopy
Dakota Technologies, Inc. (DTI) demonstrated a real-time, direct push halogen specific detector (hereafter referred to as the Haloprobe) with the US Army Corps of Engineers (USACE), Kansas City District (KCD) Site Characterization and Analyses Penetrometer System (SCAPS) crew. In December 2003, Mr. Jerry Hansen of Air Force Center for Environmental Excellence (AFCEE) coordinated the effort to mobilize equipment and personnel to a site on the former Rickenbacker Air Force Base in Columbus, OH. This site provided an excellent opportunity to train the SCAPS crew on the Haloprobe operations and to provide beneficial subsurface information to Shaw Environmental and the Air Force Real Property Agency for delineating trichloroethene (TCE) contamination near site Building 848. The work occurred in two phases, totaling 5 working days. 36 pushes were advanced, including 27 with the Haloprobe, 5 with laser induced fluorescence (LIF) probe, 3 for collection of soil samples, and 1 to condition a replaceable membrane.
DTIC
Laser Induced Fluorescence; Penetrometers

20040084961 Dakota Technologies, Inc., Fargo, ND
Technology Demonstration of Sensor Applications to Direct Push Platforms and Monitoring and Operations
Jarski, Paul; St. Germain, Randy; Mar. 26, 2004; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F41624-00-C-8045
Report No.(s): AD-A424259; No Copyright; Avail: CASI; A03, Hardcopy
Dakota Technologies, Inc. (DTI) demonstrated an uphole HaloProbe system for water sample analysis of halogenated compounds with the US Army Corps of Engineers (USACE) Kansas City District Site Characterization and Analyses Penetrometer System (SCAPS) crew. In February 2004, the Kansas City District (KCD) and Mr. Jerry Hansen of AFCEE coordinated the mobilization of equipment and personnel to Grissom Air Reserve Base (ARB) near Peru, IN and Rickenbacker International Airport (IAP), Columbus, OH. Both sites are former Air Force Bases. These sites provided excellent opportunities to test the uphole HaloProbe system and provide beneficial subsurface information to the Air Force Real Property Agency. The work occurred over 5 days. A total of 12 well points were installed at Grissom and 9 well points at Rickenbacker. Water level and HaloProbe measurements were recorded for each well.
DTIC
Laser Induced Fluorescence; Penetrometers

20040085452 Karpinsky Geological Research Inst., Saint Petersburg, USSR
Thermodynamic Study of Dissociation Processes of Molecular Oxygen in Vapor over Oxide Compounds
Shornikov, S. I.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 59; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The study of evaporation and condensation processes of substance has attracted considerable interest for undending of the problems relating to the chemical evolution of protoplanet substance in the process of successive condensation of incandescent gases at forming space objects as physico-chemical systems. Recently we observed the linear dependence of logarithm of vapor total pressure over the CaO- MgO-AI2O3-SiO2 compounds vs. the molecular oxygen content in vapor (or the degree of its dissociation). It points to the fact that there is a relationship between the red-ox reactions in the gaseous substance and the condensation processes. In this connection it seems to be useful to consider the observed regularities on example of another oxide compounds.
Derived from text
Thermodynamics; Oxygen; Molecular Excitation; Vapor Pressure; Condensing

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COMPOSITE MATERIALS

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

20040084807 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Warpage of Large Curved Composite Panels due to Manufacturing Anomalies
Starnes, James H., Jr., Technical Monitor; Ambur, Damadar, Technical Monitor; Ochinero, T. T.; Hyer, M. W.; [2002]; 12 pp.; In English
Contract(s)/Grant(s): NAG1-1895; NAG1-2298; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses the influences of a misaligned layer, a resin-rich slightly thicker layer, and a small thermal gradient on the thermally-induced deformations of large curved composite panels during cooldown from their cure temperature. The deformations represent warpage of the panels due to anomalies that occur during layup, consolidation, and cure. Two-dimensional finite element analyses are used The deformations are categorized as to their impact on circumferential and twist warpage metrics. The results are intended to highlight the sensitivity of manufactured panel shape to the various unwanted effects that can occur during manufacturing.
Author
Composite Structures; Temperature Effects; Misalignment; Finite Element Method; Curved Panels; Deformation; Resins

20040084808 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA
Manufacturing Distortions of Curved Composite Panels
Starnes, James H., Jr., Technical Monitor; Ochinero, T. T.; Hyer, M. W.; Journal of Thermoplastic Composite Materials; March 2002; ISSN 0892-7057; Volume 15, pp. 79-87; In English
Contract(s)/Grant(s): NAG1-1895; Copyright; Avail: Other Sources

This papa briefly discusses the influences of through-thickness thermal expansion, a misaligned ply, and a resin-rich slightly thicker ply on the deformations of a curved composite laminate during cool down from tbc cure temperature. Both two-dimensional and three-dimensional level finite-element analyses are used. The deformations are categorized as to radial and tangential deformations and twist, and for each of the three influences, these deformations are quantified. An additional outcome of the study is an indication of the level of analysis needed to study each of these three influences.
Author
Curved Panels; Composite Structures; Deformation; Distortion; Thermal Expansion; Misalignment

20040085022 South Dakota School of Mines and Technology, Rapid City, SD
A Fiber-Optic Sensor System for Total Lifetime Monitoring of Polymer Matrix Composites
Kellar, Jon J.; May 2004; 33 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0287
Report No.(s): AD-A424362; AFRL-SR-AR-TR-04-0357; No Copyright; Avail: CASI; A03, Hardcopy

The most important progress has been made in the following two areas: strain sensitivity measurement and test geometry. The research on strain sensitivity measurement was focused on finding a system that did not have rapid stress relaxation. The transverse test geometry was shown to concentrate the transverse stress at the center of the sample. But the axial stress

generated at the fiber-matrix interface was found to be greater than the transverse stress. Representative volume element analysis of the test geometry was also performed to investigate the effect of multiple fibers.
DTIC
Fiber Optics; Matrix Materials; Polymer Matrix Composites; Strain Gages

20040085031 Military Academy, West Point, NY
Development of a Nonperiodic Homogenization Method for One-Dimensional Continua
Leany, Michael J.; Chung, Peter W.; Namburu, Raju; May 2004; 19 pp.; In English
Report No.(s): AD-A424375; ARL-TR-3197; No Copyright; Avail: CASI; A03, Hardcopy

This work describes a one-dimensional? homogenization method that relaxes the usual assumption of periodicity of microscale displacements. As such this method is appropriate for studying materials with periodic as well as nonperiodic microstructure. Expected applications for the new method include composite rods with manufacturing variability (where material periodicity is destroyed) and rods composed of functionally graded materials. The method is validated through direct comparison with a known exact solution that being a rod with linearly varying axial rigidity. The method for this case is shown to be exact. Further application of the developed method to two different periodic materials is used to validate the usual periodic assumption employed in traditional homogenization methods.
DTIC
Composite Materials; Homogeneity; Homogenizing; Rods

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

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

20040084248
Acquisition of a Gas Chromatograph/Mass Spectrometer System for Laboratory Study of Prebiotic Organic Geochemical Processes on the Early Earth, Mars, and Meteorites
McCollom, Thomas; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NAGC-13424; No Copyright; Avail: CASI; A01, Hardcopy

This was a major equipment grant that provided funds ($72K) for purchase of a benchtop gas chromatograph-mass spectrometer (GC-MS) for use in experimental studies of prebiotic organic compounds. An Agilent model 689015973 GC-MS was purchased and installed in the PI's lab in August of 2003. The instrument is now being used for a variety of research projects. The primary use of the instrument is to analyze and quantify organic products of laboratory experiments conducted by the PI. One example is shown, which shows organic products (predominantly n-alkanes) formed during Fischer-Tropsch-type abiotic synthesis under hydrothermal conditions. The analytical capabilities of the GC- MS allowed identification of the numerous organic products of this as well as other laboratory experiments. A key use of the instrument in this research is that the mass spectrometer capabilities allow use of isotopically labeled reactants to trace the progress of reactions and evaluate background contaminants. collaborative projects with other scientists involved in exobiology & astrobiology research (e.g., Mitch Schulte, NASA Ames; Katrina Edwards, Woods Hole Oceanographic Institution). For instance, an analysis of membrane lipids of an lithoautotrophic iron-oxidizing bacteria being grown on basalt as a source of metabolic energy, a project where the instrument is being used to evaluate possible biomarker compounds from these organisms is shown. These iron oxidizers are thought to be similar to those living within the ocean crust, and are being investigated as possible analog organisms to those on the early Earth or crust of Mars. The instrument has also been used by an outside investigator (graduate student Brandon Canfeld, Arizona State University) for identification and isotopic characterization of experimental products of abiotic organic synthesis experiments he is conducting with Dr. John Holloway. analysis of quality control samples for other NASA-funded projects. For instance, an analysis of residual hydrocarbon contaminants on the internal surface of the shell of an atmospheric sounding rocket is shown. This analysis was used to help determine the source of the contaminating compounds. In the future, the instrument will continue to be used for quality control analysis in clean rooms and instrument construction facilities within the Laboratory for Atmospheric and Space Physics, where the GC-MS is housed.
Author
Gas Chromatography; Mass Spectrometers; Organic Compounds

20040084355 Brookhaven National Lab., Upton, NY
Ultraviolet Raman Spectral Signature Acquisition: UV Raman Spectral Fingerprints
Sedlacek, A. J.; Finfrock, C.; Sep. 2001; In English
Report No.(s): DE2004-15006636; No Copyright; Avail: National Technical Information Service (NTIS)

As a member of the science-support part of the ITT-lead LISA development program, BNL is tasked with the acquisition of UV Raman spectral fingerprints and associated scattering cross-sections for those chemicals-of-interest to the program's sponsor. In support of this role, the present report contains the first installment of UV Raman spectral fingerprint data on the initial subset of chemicals. Because of the unique nature associated with the acquisition of spectral fingerprints for use in spectral pattern matching algorithms (i.e., CLS, PLS, ANN) great care has been undertaken to maximize the signal-to-noise and to minimize unnecessary spectral subtractions, in an effort to provide the highest quality spectral fingerprints. This report is divided into 4 sections. The first is an Experimental section that outlines how the Raman spectra are performed. This is then followed by a section on Sample Handling. Following this, the spectral fingerprints are presented in the Results section where the data reduction process is outlined. Finally, a Photographs section is included.
NTIS
Raman Spectra; Pattern Recognition

20040084734 Fluent, Inc., Lebanon, NH, USA, Foster Wheeler Corp., Livingston, NJ, USA, SRI International Corp., Menlo Park, CA, USA
High Pressure coal Combustion Kinetics Project Quarterly Report for October-December, 2002
Guenther, C.; Jan. 28, 2003; In English
Report No.(s): DE2003-814716; No Copyright; Avail: National Technical Information Service (NTIS)

SRI has completed the NBFZ test program, made modification to the experimental furnace for the HPBO test. The NBFZ datasets provide the information NEA needs to simulate the combustion and fuel-N conversion with detailed chemical reaction mechanisms. BU has determined a linear swell of 1.55 corresponding to a volumetric increase of a factor of 3.7 and a decrease in char density by the same factor. These results are highly significant, and indicate significantly faster burnout at elevated pressure due to the low char density and large diameter.
NTIS
Chemical Reactions; Coal; Combustion Physics

20040084857 Cambridge Univ., Cambridge
Liquid Crystalline Elastomers as Functional Damping Materials
Terentjev, Eugene M.; Jul. 21, 2003; 5 pp.; In English
Contract(s)/Grant(s): FA8655-02-M4088
Report No.(s): AD-A424018; SPC-02-4088; No Copyright; Avail: CASI; A01, Hardcopy

This report results from a contract tasking the University of Cambridge as follows: The research program shall address two issues critical to the development of damping materials based on liquid crystalline elastomers (LCE). An increase in temperature of liquid crystal transition, required for broadening the range of high-dissipation regime, will be achieved by adding new high-Tc terphenyl nematic components as side-groups to siloxane copolymer constituting the LCE network. A reduction of glass transition will be achieved by applying the micro-emulsion principle, combining the mainstream LCE with silicone liquids. This idea, emanating from some biological examples of high damping, has not yet been tried in LCE technology. (2 figures, 6 refs.)
DTIC
Crystallinity; Damping; Elastomers; Liquid Crystals; Vibration

20040084858 Wisconsin Univ., Madison, WI
Energy Transfer and Vibrationally Mediated Photodissociation in Liquids
Crim, F. F.; Mar. 2004; 11 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0081
Report No.(s): AD-A424020; AFRL-SR-AR-TR-04-0300; No Copyright; Avail: CASI; A03, Hardcopy

Vibrational energy is a central aspect of chemical reactivity. Because a few vibrationally energized molecules are the ones that actually overcome the barriers to reaction to form products, the means by which molecules acquire and lose energy is at the heart of chemistry. Thus, vibrationally excited molecules are important in an enormous variety of environments, ranging from the conventional, such as solutions, to the exotic, such as plasmas. The authors have extended their previous studies of

the energy transfer and photodissociation dynamics of isolated molecules into the more complex environment of liquids with the goal of understanding the role that solvents play in the behavior of vibrationally excited molecules. In these experiments, a 100-fs pulse of near or mid-infrared light excites a high frequency stretching vibration of a solute molecule and another short pulse of ultraviolet light monitors the energy content of a subset of the vibrations by transient absorption. The measurements have revealed the influence that vibrational state structure and solvent interactions have on the flow of energy within the vibrationally excited molecule and into the surrounding solvent. (4 figures, 28 refs.)
DTIC
Chemical Reactions; Coupling; Energy Transfer; Liquids; Photodissociation; Solvents; Vibration

20040084878 Georgia Inst. of Tech., Atlanta, GA
Genetically-Engineered Microdevices
Sandhage, Ken H.; Feb. 2004; 16 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0296
Report No.(s): AD-A424087; AFRL-SR-AR-TR-04-0328; No Copyright; Avail: CASI; A03, Hardcopy
Gas/solid displacement reactions have been examined as a means of altering the chemistry of bioclastic silica structures (e.g., the self-assembled microshells of diatoms, a type of aquatic algae) into other ceramic compositions. Complex-shaped silica microshells with nanoscale features were exposed to Mg(g) at \h9OO deg C. The silica microshells underwent the following net displacement reaction: 2Mg(g) + SiO2(s) yields 2MgO(s) + ?Si) (1) where ?Si! refers to silicon dissolved within a Mg-Si liquid. The Mg-Si liquid, which formed by the continued reaction of excess Mg(g) with reduced Si, was observed to sweat away from the solid MgO product of this reaction at 900 deg C to yield Si-free micro/nanostructures. The resulting MgO structures retained the 3-D shapes and fine features of the starting diatom microshells. This demonstration of shape-preserving chemical conversion opens the door to a wide variety of other chemical conversion reactions that we have begun to examine.
DTIC
Genetic Engineering; Silicon Dioxide

20040084907 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Monotonic, Creep-Rupture, and Fatigue Behavior of Carbon Fiber Reinforced Silicon Carbide (C/SiC) at an Elevated Temperature
Engesser, John M.; Mar. 2004; 127 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424138; AFIT/GMS/ENY/04-M01; No Copyright; Avail: CASI; A07, Hardcopy
The main objective of this research effort was to examine the impact that cyclic loading frequency has on the life of a C/SiC composite at an elevated temperature of 550 C. Cyclic loading of C/SiC was investigated at frequencies of 375 Hz, 10 Hz, 1 Hz, and 0.1 Hz. Creep-Rupture tests and tests that were combinations of creep-rupture and fatigue were also accomplished. A monotonic tensile test was performed at 550 C and compared to a room temperature monotonic test. This study showed that an elevated temperature of 550 C has very little effect on the Ultimate Tensile Strength (UTS) of C/SiC. The UTS of C/SiC at 550 C was 487 MPa, while the room temperature UTS is 493 MPa. The three creep-rupture tests in this study performed at 350 MPa, 175 MPa and 105 MPa had lives of less than 11 hours despite the fact that the UTS of C/SiC is 487 MPa at 550 C. The short life of the specimens is due to the oxidation of the carbon fibers within the C/SiC composite. S-N curves developed from the fatigue tests indicate that there is an increase in cycles to failure as the frequency is increased. Another important discovery in this study was the fact that oxidation of the carbon fibers within C/SiC is reduced when frequency of fatigue is increased. At high frequency fatigue (10Hz to 375 Hz), C/SiC composites have longer cycle lives and time lives than at low cycle fatigue. Microscopic and SEM analysis verified that oxidation of carbon within C/SiC is slowed as frequency of fatigue is increased.
DTIC
Carbon Fibers; Creep Rupture Strength; Creep Tests; Fiber Composites; High Temperature; Room Temperature; Silicon Carbides

20040084915 Air Force Research Lab., Wright-Patterson AFB, OH
Properties of Carbon Nitride Films Deposited With and Without Electron Cyclotron Resonance Plasma Assistance
Chen, Ming Y.; Kramer, Daniel J.; Feb. 2001; 11 pp.; In English
Report No.(s): AD-A424152; AFRL-ML-WP-TP-2003-422; No Copyright; Avail: CASI; A03, Hardcopy
Research on carbon nitride has received considerable attention since BETA-C3N4 offers high technological potential for

protective, wear, and optical applications. Deposition of carbon nitride by various techniques has mostly resulted in nitrogen deficient amorphous CNx; films. In this research, reactive magnetron sputtering with and without the assistance of an electron cyclotron resonance (ECR) source was used to deposit CNx thin films at ambient temperature. The process variables include power level, nitrogen partial pressure, and substrate bias. X-ray photoelectron spectroscopy and Auger analysis were used to determine the composition and chemical bonding of the films. Ball-on-disc experiments were performed between 440C stainless steel balls and CNx -coated 440C substrates at 0.1 m/s sliding velocity and 1 N load. The effects of process variables and interface modification on friction and wear rate were examined. Mechanical properties including hardness, modulus, and elastic response were obtained form nanoindentation. CNx films with hardness in the range of 12-16 GPa demonstrated better wear performance than the hardest diamond-like carbon (24 GPa) deposited by the same technique. ECR assisted magnetron sputtering provided films with the lowest wear rates.
DTIC
Carbon Nitrides; Electron Cyclotron Resonance; Electron Paramagnetic Resonance; Friction; Photoelectron Spectroscopy; Plasmas (Physics); X Ray Spectroscopy

20040084922 North Carolina Univ., Chapel Hill, NC
The Growth and Characterization of Metastable Free Radical Nanoclusters
Miller, Roger E.; Jun. 2004; 7 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0044; 5-35877/5-36993
Report No.(s): AD-A424162; AFRL-SR-AR-TR-04-0337; No Copyright; Avail: CASI; A02, Hardcopy

In the first three years of this grant we have made considerable progress towards the goals stated in the original proposal. To date we have made clean sources for propargyl radical, CH3, F, Cl, Br and I. A total of 11 papers have been published during this grant period.
DTIC
Free Radicals; Metastable State; Radicals

20040084925 Stanford Univ., Stanford, CA
Laser Diagnostics for Reacting Flows
Hanson, Ronald K.; Jun. 25, 2004; 79 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0145; Proj-2308
Report No.(s): AD-A424171; AFRL-SR-AR-TR-04-0350; No Copyright; Avail: CASI; A05, Hardcopy

Advanced optical diagnostic techniques relevant to propulsion were investigated. The techniques studied were based on laser spectroscopy, with emphasis on spectrally- resolved absorption and laser-induced fluorescence (LIF) . Spectrally narrow, continuous wave (cw) lasers allowed innovative diagnostics based on spectral line shapes, while pulsed lasers provided intense bursts of photons needed for techniques based on LIF. Accomplishments of note included: studies of fundamental ketone in Support of PLIF imaging diagnostics for fuel vapor and temperature; fabrication of a high-pressure flat-flame burner and its use to develop quantitative strategies for PLIF imaging of NO and temperature in high-pressure combustion systems; the first observation of ultraviolet (UV) LIF of CO2; continued development of a new imaging diagnostic based on infrared planar laser-induced fluorescence (IR PLIF); discovery of strong IN absorption by CO2 at high temperatures and measurements of the absorption cross sections; investigations of the impact of UV CO2 absorption on existing diagnostic strategies for NO; initial demonstrations of a new wavelength-multiplexed laser extinction diagnostic allowing measurements in multiphase fuel flows; and continued development of wavelength-multiplexed tunable diode laser absorption sensors and their application to measure temperature and species concentration in practical combustion environments, including scramjet and gas turbine combustion test rigs at the Air Force Research Laboratory Propulsion Directorate.
DTIC
Diagnosis; Laser Spectroscopy; Lasers; Multiphase Flow; Planar Structures; Reacting Flow

20040084929 ManTech Environmental Technology, Inc., Dayton, OH
A Novel in Vitro System for Exposures of Cell Cultures to Volatile Chemicals
Geiss, Kevin; Feb. 2004; 31 pp.; In English
Contract(s)/Grant(s): F41624-96-C-9010; Proj-2312
Report No.(s): AD-A424193; AFRL-HE-WP-TR-2004-0007; No Copyright; Avail: CASI; A03, Hardcopy

The potential toxic effects of chromophore powder in primary hepatocytes were investigated. Initially, a solubility assessment was conducted in aqueous and organic solutions. The solubility test showed that the chromophore powder is

soluble in DMSO at 0.001 mg/ml. while not in water or ethyl alcohol. Therefore, DMSO was selected as the solvent for the dose range funding study. For initial toxicity evaluations mitochondrial function (MTT assay). lactate dehydrogenase release (LDH assay) and the morphology of cells were assessed for primary hepatocytes under control or exposed conditions (2 hour treatment followed by 24 h of incubation in fresh media). The microscopic studies demonstrated that chromophore-exposed cells at the doses of 0.5 and 1 mg/ml became abnormal in size displaying shrinkage and irregular shape. The results showed that chromophore powder had no measurable effect on mitochondrial function. However, LDH assay showed a significant increase in LDH release at O.1mg/ml. while there was no change at 0.5 and 1.0 mg/ml. The dose range funding study indicates that chromophore powder displayed limited toxicity in vitro at increasing dose.
DTIC
Aqueous Solutions; Exposure; In Vitro Methods and Tests

20040084951 Air Force Research Lab., Wright-Patterson AFB, OH
Characterization Of Annealed Pulsed Laser Deposited (PLD) Thin Films of Cesium Oxythiomolybdate (Cs2MoOS3)
Storng, Karla L.; Zabinski, Jeffrey S.; Mar. 2002; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424236; AFRL-ML-WP-TP-2003-421; No Copyright; Avail: CASI; A03, Hardcopy

Cesium oxythiomolybdate (Cs2MoOS3) is under consideration as a high temperature solid lubricant for silicon nitride bearings. However, Cs2MoOS3oxidizes below the proposed maximum use temperature of 800 ˚C, and the oxidation process is complex. In the presence of silicon nitride, the oxidation reactions change. The purpose of the present research was to determine the chemistry of Cs2MoOS3 coatings grown by pulsed laser deposition (PLD) on several substrates (Si3N4, SiC, Inconel, Al2O3 and ZrO2), and to determine the changes in chemistry and crystal structure after annealing in air to temperatures up to 800 ˚C. Many of the oxidation products identified are expected to be lubricious at elevated temperatures.
DTIC
Annealing; Cesium; Pulsed Lasers; Silicon Nitrides; Thin Films

20040084983 Purdue Univ., West Lafayette, IN
A Model for Thermal Decomposition of Hydrogen Peroxide
Heister, S. D.; Anderson, W. E.; Corpening, J. H.; Austin, B. L.; Jul. 2004; 19 pp.; In English
Contract(s)/Grant(s): F04611-03-M-3207; Proj-BMSB
Report No.(s): AD-A424289; No Copyright; Avail: CASI; A03, Hardcopy

A one-dimensional model has been developed to investigate the thermal decomposition of rocket grade hydrogen peroxide (HP) in a stream of previously decomposed HP products. The model developed assumes steady, one-dimensional adiabatic flow and includes basic mass balances, droplet evaporation, gas-phase decomposition kinetics, droplet dynamics, and control volume conservation laws. The code is adjustable for HP percent concentration for both main and secondary flows, massflow rates for both flows, and initial temperature of each. Results are shown to be consistent with prior experimental measurements. Parametric studies are presented to assess the effects of initial droplet size, secondary injectant flow, mass velocity in the primary stream, peroxide concentration, and initial liquid temperature on the decomposition process. In general, results indicate unacceptably-long decomposition distances assuming 90% HP decomposition products in the primary stream. Using 98% HP showed some improvement due to the enhanced decomposition temperature of this fluid as compared to 90% HP.
DTIC
Decomposition; Hydrogen Peroxide; Temperature Control; Thermal Decomposition

20040084993 Air Force Research Lab., Bolling Air Force Base, Washington, DC
Army Research Office and Air Force Office of Scientific Research: 2004 Contractors' Meeting in Chemical Propulsion
Mann, David M.; Tishkoff, Julian M.; Jan. 2004; 187 pp.; In English
Report No.(s): AD-A424305; AFRL-SR-AR-TR-04-0330; No Copyright; Avail: CASI; A09, Hardcopy

Abstracts are given for 6.1 basic research in chemical propulsion sponsored by the Army Research Office and the Air Force Office of Scientific Research.
DTIC
Chemical Propulsion; Contractors; Propulsion System Configurations; Propulsion System Performance

20040084998 Army Research Lab., Adelphi, MD
Design and Analysis of a 15-kV Package for Wide Bandgap Semiconductor
Ibitayo, Dimeji; Tipton, C. W.; May 2004; 18 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424317; ARL-TR-3225; No Copyright; Avail: CASI; A03, Hardcopy

The development of wide bandgap semiconductor materials such as silicon carbide (SiC) has made possible devices that exceed the voltage ratings of conventional component packaging schemes. As such a new class of high voltage packages must be developed to realize the full potential of these technologies. We report on the electrostatic analysis and design of a t5-kV ceramic package using the ANSYS Multiphysics software. To baseline our work. a standard ceramic package was characterized and modeled for high voltage operation. With this information. a new package geometry was designed, and additional SiC die requirements were identified via finite element simulations.
DTIC
Ceramics; Design Analysis; Energy Gaps (Solid State); High Voltages; Semiconductors (Materials); Silicon Carbides

20040085011 Massachusetts Inst. of Tech., Cambridge, MA
Thermomechanical Properties of Poly(methyl methacrylates) Containing Tethered and Untethered Polyhedral Oligomeric Silsesquioxanes (POSS)
Kopesky, Edward; Haddad, Timothy; Cohen, Robert; McKinley, Gareth; May 27, 2004; 44 pp.; In English
Contract(s)/Grant(s): F04611-99-C-0025; F49620-01-1-0447; Proj-2303
Report No.(s): AD-A424340; No Copyright; Avail: CASI; A03, Hardcopy

Poly(methyl methacrylates) (PMMA) containing both tethered and untethered polyhedral oligomeric silsesquioxanes (POSS) were investigated using wide angle X-ray diffraction (WAXD), differential scanning calorimetry (DSC), and rheological characterization. Unfilled, entangled polymers were synthesized and tested in small amplitude oscillatory shear. The addition of tethered-POSS to the PMMA chain leads to a decrease in the plateau modulus (GN0) as expected from previous results on POSS-polymer rheology. Cyclohexyl-POSS and isobutyl-POSS were blended with PMMA homopolymer, and isobutyl- POSS was also blended with a POSS-PMMA copolymer containing 25 wt% tethered isobutyl-POSS distributed randomly along the chain. Both DSC and rheological results suggest a regime at low untethered-POSS loadings (5 vol%) in PMMA in which much of the POSS filler resides in the matrix in a nanoscopically- dispersed state. This well-dispersed POSS acts as a plasticizer and leads to a decrease in the zero-shear-rate viscosity (0) at low loadings. Above this regime, an apparent solubility limit is reached at which point additional untethered-POSS aggregates into crystallites in the PMMA matrix and both the viscosity and the plateau modulus increase in a way consistent with classical predicitions for hard- sphere-filled suspensions. The principles of time-temperature superposition are followed by these nanocomposites; however, fits to the WLF equation show no strong trend with increasing POSS loading and therefore could not explain the decrease in viscosity in light of an increase in free volume. Blends of untethered-POSS with copolymer show a significant increase in 0 for all loadings, greater than that expected for traditional hard-sphere fillers. This is a result of associations between untethered-POSS and tethered-POSS cages in the blend, which retard chain relaxation processes i
DTIC
Acrylates; Tethering; Thermodynamics

20040085017 Engineering Research and Consulting, Inc., Huntsville, AL
Solid State Structural Studies of Some New Derivatives of HN(SO2CF3)2 and HOTeF5
Viji, Vandana; Vij, Ashwani; Boatz, Jerry; Jun. 7, 2004; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F04611-99-C-0025; Proj-DARP
Report No.(s): AD-A424351; No Copyright; Avail: CASI; A03, Hardcopy

The cisoid form is less common. In the CCDC, only 6 structures show this conformation whereas the transiod form occurs in 15 remaining structures The cisoid conformation results from stronger cation-anion interaction Cisoid observed exclusively when anion is chelated to the metal center The transoid form dominates in structures containing a free anion NO structure known containing both cisoid AND transoid geometry
DTIC
Derivation; Solid State

20040085021 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Detonation Branching in a PDE with Liquid Hydrocarbon Fuel
Panzenhagen, Kristin L.; Mar. 2004; 90 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424361; AFIT/GAE/ENY/04-M13; No Copyright; Avail: CASI; A05, Hardcopy

A pulse detonation engine (PDE) capitalizes on the large mass flux and pressure rise associated with detonations to create thrust, which is proportional to PDE cycle frequency. This research showed that using a branched detonation as an ignition source, as opposed to standard spark ignition, deposits more energy into the thrust tube head. The increase in energy decreases

ignition delay and detonation to deflagration transition (DDT) time. This allows a theoretical 85% cycle frequency increase that is accompanied by an 85% increase in thrust. The increase in energy also reduces the need for a DDT enhancement device, thereby increasing thrust as much as 30%. While detonation branching has been accomplished using gaseous hydrogen, this was the first instance of detonation branching using liquid hydrocarbon fuel.
DTIC
Detonation; Hydrocarbon Fuels; Hydrocarbons; Liquid Fuels; Liquid Hydrogen

26
METALS AND METALLIC MATERIALS

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

20040084623 Defence Science and Technology Organisation, Fishermans Bend, Australia
Fatigue Crack Growth in Several 7050T7451 Aluminium Alloy Thick Section Plates with Aircraft Manufacturer's and Laboratory Surface Finishes Representing Some Regions of the F/A-18 Structure
Barter, S. A.; December 2003; 82 pp.; In English
Report No.(s): DSTO-TR-1539; DODA-AR-013-004; Copyright; Avail: Other Sources

DSTO research into material factors likely to affect F/A-18 fatigue life has highlighted a number of concerns about the fatigue variability of the 7050 thick section plate and the effect that the surface condition has on service fatigue crack initiation. This report presents the results of a fatigue coupon test program, which tested samples cut from three different 7050 plates. The test coupons were drawn from two previously tested Y488 bulkheads that had the original aircraft manufacturer's surface finish intact, and from one plate that had been purchased for coupon testing by DSTO. The surfaces of the coupons made from the DSTO plate were etched to simulate the surface on the two Y488 bulkheads, which was preserved on the coupons cut from these bulkheads. All specimens were loaded with a representative wing root-bending spectrum derived from the F/A-18 FT488/2 bulkhead fatigue test. Several peak stress levels were used to test the low Kt coupons cut from the Y488 bulkheads, and a single stress level was tested with specimens from another DSTO plate. The spectrum used had additional marker loads added to aid quantitative fractography. These marker loads are briefly discussed. Following the tests, quantitative fractography was used to produce crack growth curves for each of the fatigued specimens. This allowed a detailed interpretation of the crack growth to be made, including a measure of the severity of the flaws from which the fatigue cracks initiated. Comparisons between a previously tested 7050 plate, the plate purchased for the coupon testing for this report, and the coupons cut from the two Y488 bulkheads were made. It was found that the crack growth rates and the discontinuities from which the cracking initiated were very similar and they could be characterized by the way that cracking grew from them.
Author
Crack Propagation; Fatigue Tests; Fatigue (Materials); Aluminum Alloys

20040084876 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Fretting Fatigue Behavior of the Titanium Alloy Ti- 6AL-4V Under Seawater Conditions
Lietch, Lewis C.; Mar. 2004; 129 pp.; In English
Report No.(s): AD-A424082; AFIT/GMS/ENY/04-M02; No Copyright; Avail: CASI; A07, Hardcopy

The fretting fatigue behavior of Ti-6A1-4V was investigated in laboratory air and under a controlled environment consisting of synthetic seawater. Fretting fatigue tests were performed for both low and high cycle fatigue regimes. Finite element analysis was utilized to model and analyze the experimental data. The applied stress range and the Modified Shear Stress Range were evaluated as potential fatigue parameters. The results found from this study can be summarized as: (1) seawater had a deleterious effect on fretting fatigue life in the low cycle fatigue regime but improved life in the high cycle fatigue regime, (2) although the Q/P ratio for both conditions increased with an increasing applied stress, the difference between the two conditions was negligible, (3) debris from dry samples contained titanium and oxides while the debris from seawater samples contained titanium, oxides, and seawater contaminants, (4) fretting scar volume was larger under seawater conditions than dry conditions, (5) there were more, closely spaced striations on the fracture surface of the dry samples than of the seawater samples, and (6) both the applied (far field) stress range and the Modified Shear Stress Range can potentially be used as conservative fretting fatigue parameters under high cycle fatigue conditions.
DTIC
Aluminum Alloys; Fracture Mechanics; Fretting; Metal Fatigue; Sea Water; Titanium; Titanium Alloys; Vanadium Alloys

20040084950 Wayne State Univ., Detroit, MI

Nonlinear Optical and Time-Resolved Properties of Novel Organic Dendrimers and Dendrimer Metal

Goodson, T., III; Mar. 16, 2004; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-00-1-0450

Report No.(s): AD-A424234; ARO-41319.7-MS; No Copyright; Avail: CASI; A03, Hardcopy

During the course of a Young Investigator Award from the Army Research Office (Materials Program) the research in the PI's group has developed into three different but related areas of scientific discovery. The first of these areas concerns the optical properties of novel transition metal nanoparticle topology which we call %"Dendnmerr Metal Nanocomposites%%. This novel metal nanoparticle system was investigated under support by the ARO for novel optical limiting and enhanced metal emission properties. We found in particular that gold-metal dendrimer nanocomposites have very strong optical limiting properties that may be useful for eye and sensor protection devices in the visible and near Infrared spectral regions. The emission properties of both and silver dendrimer metal nanocomposites were also investigated by time- resolved upconversion spectroscopy. From these measurements the PI's group found that the efficiency at emission was enhanced in comparison to other related metal topologies and this enhancement is related to the encapsulated metal's morphology (aspect-ratio). Applications of this particular metal topology in to biological systems are currently under investigation in the PI's laboratory. DTIC

Dendrimers; Infrared Spectra; Metals; Nonlinear Systems; Nonlinearity; Optical Properties

20040085024 City Coll. Research Foundation, New York, NY

Detection of Incipient Metal Corrosion and Cracking Beneath Paints Using Near Infrared Ultrafast Photonic Techniques

Alfano, Robert R.; Mar. 2004; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-00-1-0378

Report No.(s): AD-A424364; AFRL-SR-AR-TR-04-0358; No Copyright; Avail: CASI; A02, Hardcopy

During the grant period 9/15/00 - 3/14/04, our group has achieved significant progress in the corrosion and crack detection area using NIR and mid-IR imaging techniques 1- Sunder the support of an AFOSR grant of F49620-OO-1-0378 (CUNY RF 47435-00-01). The program results in a leverage grant supported by NYSTAR, under which a working prototype mid-IR imaging unit was developed and is being commercialized by Lockheed Martin Corporation (LMC) - see the attached LMC data sheet. p11/0

DTIC

Corrosion; Corrosion Resistance; Cracks; Infrared Spectra; Near Infrared Radiation; Paints; Photonics

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*.

20040084318 Lockheed Martin Corp., Syracuse, NY, USA

Failure Analysis of Ceramic Components

Morris, B. W.; Jun. 2000; In English

Report No.(s): DE2004-821943; LM-00K047; No Copyright; Avail: National Technical Information Service (NTIS)

Ceramics are being considered for a wide range of structural applications due to their low density and their ability to retain strength at high temperatures. The inherent brittleness of monolithic ceramics requires a departure from the deterministic design philosophy utilized to analyze metallic structural components. The design program 'Ceramic Analysis and Reliability Evaluation of Structures Life' (CARES/LIFE) developed by NASA Lewis Research Center uses a probabilistic approach to predict the reliability of monolithic components under operational loading. The objective of this study was to develop an understanding of the theories used by CARES/LIFE to predict the reliability of ceramic components and to assess the ability of CARES/LIFE to accurately predict the fast fracture behavior of monolithic ceramic components.

NTIS

Ceramics; Fracture Mechanics

20040084350 Building and Construction Research TNO, Rijswijk, Netherlands, Technische Physische Dienst TNO-TH, Delft, Netherlands
HERON Volume 48, No. 2, 2003
Sluys, L. J.; 2003; 74 pp.; In English
Report No.(s): PB2004-105561; No Copyright; Avail: CASI; A04, Hardcopy

Contents include the following: Preliminary Design of High-Rise Outrigger Braced Shear Wall Structures on Flexible Foundations; Load Sharing in Insulated Double Glass Units; Lateral Resistance of Plybamboo Wall-Panels.
NTIS
Lateral Stability; Walls

20040084352 Lawrence Livermore National Lab., Livermore, CA
D(2) and CD(4) Purity Effects on CD Ablators
Cook, R. C.; Nikroo, A.; Jan. 12, 2004; In English
Report No.(s): DE2004-15006535; UCRL-TR-155861; No Copyright; Avail: National Technical Information Service (NTIS)

The question of how the isotopic purity of the feed gases D(sub 2) and CD(sub 4) used to make CD ablators at GA effects the extinction coefficient in the region of wavenumber 2900/cm ((lambda)= 3.45(micro)m) is addressed below. The answer is at best incomplete; this is only an interim evaluation. What is clear is that using ultra-pure D(sub 2) is required to lower the 'CH' impurity peak at 2900/ cm. Perhaps using ultra-pure CD(sub 4) also helps, though the evidence for this is mixed. A closer look at the results raises other questions, however, and these are discussed below. Though solving these questions is unlikely to reduce the extinction coefficient in the region of 2900/cm below about 10/cm, this work will lead to a better understanding of the deposition of CH/CD GDP, and that is certainly worthwhile.
NTIS
Ablative Materials; Impurities; Isotopes

20040084360 Savannah River Ecology Lab., Aiken, SC, USA
Chemical Durability of SRP Waste Glass-Time/Temperature Dependence and Activation Energies for Leaching in Various Leachants
Gore, S. L.; Wicks, G. G.; Wallace, R. M.; Oct. 1982; 16 pp.; In English
Report No.(s): DE2004-786668; No Copyright; Avail: Department of Energy Information Bridge

This study examines the effects of time and temperature on the leaching of Savannah River Plant waste glass. The effects of pH, SA/V ratio, surface finish, protective layers formed, time and temperature are being studied in detail, and the model is being extended by applying it to other waste glass system.
NTIS
Temperature Dependence; Durability; Chemical Analysis

20040084786 NASA Langley Research Center, Hampton, VA, USA
Coarse-Grained and Atomistic Modeling of Polyimides
Clancy, Thomas C.; Hinkley, Jeffrey A.; July 2004; 30 pp.; In English
Contract(s)/Grant(s): WU 23-762-55-LC
Report No.(s): NASA/TM-2004-213030; L-19026; No Copyright; Avail: CASI; A03, Hardcopy

A coarse-grained model for a set of three polyimide isomers is developed. Each polyimide is comprised of BPDA (3,3,4,4' - biphenyltetracarboxylic dianhydride) and one of three APB isomers: 1,3-bis(4-aminophenoxy)benzene, 1,4-bis(4-aminophenoxy)benzene or 1,3-bis(3-aminophenoxy)benzene. The coarse-grained model is constructed as a series of linked vectors following the contour of the polymer backbone. Beads located at the midpoint of each vector define centers for long range interaction energy between monomer subunits. A bulk simulation of each coarse-grained polyimide model is performed with a dynamic Monte Carlo procedure. These coarsegrained models are then reverse-mapped to fully atomistic models. The coarse-grained models show the expected trends in decreasing chain dimensions with increasing meta linkage in the APB section of the repeat unit, although these differences were minor due to the relatively short chains simulated here. Considerable differences are seen among the dynamic Monte Carlo properties of the three polyimide isomers. Decreasing relaxation times are seen with increasing meta linkage in the APB section of the repeat unit.
Author
Grain Size; Isomers; Polyimides; Benzene; Coarseness; Nanotechnology; Multiscale Models; Atomic Theory

20040084799 NASA Langley Research Center, Hampton, VA, USA
Assessment of Technologies for the Space Shuttle External Tank Thermal Protection System and Recommendations for Technology Improvement, Part 1, Materials Characterization and Analysis
Weiser, Erik S.; SaintClair, Terry L.; Nemeth, Michael P.; June 14, 2004; 23 pp.; In English
Contract(s)/Grant(s): WU 23-794-40-4M
Report No.(s): NASA/TM-2004-213238/PT1; L-19034/PT1; No Copyright; Avail: CASI; A03, Hardcopy

The use of foam insulation on the External Tank (ET) was necessitated by the potentially hazardous build up of ice on the vehicle prior to and during launch. This use of foam was initiated on the Saturn V rocket, which, like the Space Shuttle, used cryogenic fuel. Two major types of foam have been used on the ET. The first type is NCFI 24-124, an acreage material that is automatically sprayed on in a controlled environment. It replaced CPR 488 in 1998 and has been used since that time. The other major foams, BX-250 or BX-265, are handsprayed foams that are used to close out regions where the various sections of the ET are attached. The objectives of the present report are to study the chemistries of the various foam materials and to determine how physical and mechanical anomalies might occur during the spray and curing process. To accomplish these objectives, the report is organized as follows. First, the chemistries of the raw materials will be discussed. This will be followed by a discussion of how chemistry relates to void formation. Finally, a TGA-MS will be used to help understand the various foams and how they degrade with the evolution of chemical by-products.
Author
External Tanks; Space Shuttles; Technology Assessment; Thermal Protection; Cryogenics; Insulation

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*.

20040084586 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Safe Field Storage of Ammunition and Explosives, Part 1, Management Report
vanDongen, P.; December 2003; 34 pp.; In English
Contract(s)/Grant(s): A01/KL/402; TNO Proj. 014.13224
Report No.(s): TD-2002-0224-Pt-1; PML-2003-A50-Pt-1; Copyright; Avail: Other Sources

A research programme was started with the aim to validate and optimize Quantity-Distances to prevent for sympathetic detonations between stacks of ammunition and to protect personnel and material in case of an accidental explosion in field storage conditions. Theoretical research was conducted to develop prediction tools. The new tools were validated with data from a full-scale 5 ton explosion trial that was conducted in Woomera, South-Australia. The new prediction tools have resulted in shorter Quantity-Distances for field storage of ammunition and explosives.
Author
Safety; Storage; Ammunition; Explosives

20040084589 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Safe Field Storage of Ammunition and Explosives, Part 5, Measured Explosion Effects and Structural Response
vandeKasteele, R. M.; vanDongen, P.; December 2003; 52 pp.; In English
Contract(s)/Grant(s): A01/KL/402; TNO Proj. 014.13224
Report No.(s): TD-2002-0228-Pt-5; PML-2003-A54-Pt 5; Copyright; Avail: CASI; A04, Hardcopy

This report describes the measurement set-up and obtained signals of the 5 ton full-scale explosion trial. In this measurement report the measurement method and details like used tranducers, their locations and calibration methods are described. The measurements were set-up to record the pressure load on and response of thirteen Exposed Sites. To achieve this, a total of 66 tranducers were placed. Beside that, 25 normal video and 3 high-speed film cameras were placed to film the structural response of the Exposed Sites. Because to a fault in the control system and trigger setting, 40 of the 66 signals were not recorded. However, the blast loading on the structures can be derived from the measured free field blast propagation. The video recordings give a good impression of the blast loading and structural response of the tested Exposed Sites.
Author
Storage; Explosives; Full Scale Tests; Detonation

31
ENGINEERING (GENERAL)

Includes general research topics related 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*.

20040084357

Engineering and Organizational Issues Related to the World Trade Center Terrorist Attack, Volume 4, From the WTC Tragedy to the Development of Disaster Engineering for landmark Buildings: An Extension of the Performance-Based Earthquake Engineering

Lee, G. C.; Rzhevsky, V.; Tong, M.; Chen, S.; Sep. 2003; 110 pp.; In English

Report No.(s): PB2004-105717; MCEER-03-SP04-Vol-4; No Copyright; Avail: CASI; A06, Hardcopy

The September 11, 2001 (9/11) terrorist attack on the World Trade Center (WTC) complex produced an unprecedented disaster in New York City and the USA. Many technical studies and investigations are continuing to pursue various detailed aspects of the disasters impact. From a strictly structural mechanics point of view, the collapse of the WTC towers was mainly the result of extreme multi-hazard loadings (collision, fire and explosion) that subjected the buildings to forces that were beyond the hazard capacity that they were designed to withstand. In this report, the authors first review the various hazard loadings that were applied to the WTC towers (impact of airplanes, fire and explosion), mainly reported by others, to identify potential multi-hazard design improvements for structural members and their connections, as well as for entire building systems.

NTIS

Terrorism; Damage Assessment; Landmarks; Structural Analysis

20040084597 NASA Marshall Space Flight Center, Huntsville, AL, USA

Evaluation of Training Samples Manually Welded With the Universal Handtool in a Space Simulation Chamber

Russell, C. K.; Malone, T. W.; Cato, S. N.; May 2004; 47 pp.; In English

Report No.(s): NASA/TM-2004-213172; M-1106; No Copyright; Avail: CASI; A03, Hardcopy

The international space welding experiment was designed to evaluate the universal handtool (UHT) functions as a welding, brazing, coating, and cutting tool for in-space operations. The UHT is an electron beam welding system developed by the Paton Welding Institute (PWI), Kiev, Ukraine, and operated a 8 kV with up to 1 kW of power. In preparation for conducting the space welding experiment, cosmonauts were trained to properly operate the UHT and correctly process samples. This Technical Memorandum presents the results of the destructive and nondestructive evaluation of the training samples made in Russia in 1998. It was concluded that acceptable welds can be made with the UHT despite the constraints imposed by a space suit. The lap joint fillet weld configuration was more suitable than the butt joint configuration for operators with limited welding experience. The tube braze joint configuration designed by the PWI was easily brazed in a repeatable manner.

Author

Tools; International Space Station; Electron Beam Welding; Computerized Simulation; Vacuum Chambers

32
COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and *17 Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see *03 Air Transportation and Safety*; and *16 Space Transportation and Safety*.

20040084267 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The use of NASA GEOS Global Analysis in MM5/WRF Initialization: Current Studies and Future Applications

Pu, Zhao-Xia; Tao, Wei-Kuo; [2004]; 1 pp.; In English; WRF/MM5 Workshop, 22-25 Jun. 2004, Boulder, CO, USA; No Copyright; Avail: CASI; A01, Hardcopy

An effort has been made at NASA/GSFC to use the Goddard Earth Observing system (GEOS) global analysis in generating the initial and boundary conditions for MM5/WRF simulation. This linkage between GEOS global analysis and MM5/WRF models has made possible for a few useful applications. As one of the sample studies, a series of MM5 simulations were conducted to test the sensitivity of initial and boundary conditions to MM5 simulated precipitation over the eastern; USA. Global analyses horn different operational centers (e.g., NCEP, ECMWF, I U ASA/GSFCj were used to provide first

guess field and boundary conditions for MM5. Numerical simulations were performed for one- week period over the eastern coast areas of USA. the distribution and quantities of MM5 simulated precipitation were compared. Results will be presented in the workshop. In addition,other applications from recent and future studies will also be addressed.
Derived from text
Earth Observing System (Eos); Systems Analysis; Simulation

20040084324 Commerce Dept., Washington, DC, USA, National Telecommunications and Information Administration, Washington, DC
Improving Rights-of-Way Management Across Federal Lands: A Roadmap for Greater Broadband Deployment
Apr. 2004; 98 pp.; In English
Report No.(s): PB2004-105265; No Copyright; Avail: CASI; A05, Hardcopy

Broadband, also known as high-speed Internet access, has the potential to bring new services and products to American consumers and businesses, fostering innovation, investment, and job-producing economic growth. The President has recognized the economic vitality that can result from broadband deployment and has called on our Nation to be aggressive about the expansion of broadband. On March 26, 2004, the President called for a national goal of universal, affordable access to broadband by 2007. A key to widespread broadband deployment is ensuring that broadband providers have timely and cost-effective access to rights-of-way-the legal right to pass through property controlled by another-so that they can build out their networks across the Nation. In the broadband context, rights-of-way include access to the conduits, corridors, trenches, tower sites, undersea routes and other locations that broadband networks occupy. These passageways often cross large areas of land owned or controlled by the Federal Government. Thus, effective and efficient federal rights-of-way policies and practices are critical for promoting broadband deployment.
NTIS
Broadband; Cost Effectiveness; Commerce

20040084327 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Institute of Digital Communications (IDC) Annual Report 2002
2003; 26 pp.; In English
Report No.(s): PB2004-105297; Copyright; Avail: National Technical Information Service (NTIS)

The Institute of Digital Communications (IDC) is an inter-department research institute in the Helsinki University of Technology (HUT), offering a single efficient and fluent interface towards telecommunications industry, operators, authorities and other research organizations for its member laboratories. The institute was founded in the beginning of year 2000.
NTIS
Pulse Communication; Telecommunication

20040084345 Helsinki Univ. of Technology, Espoo, Finland
Proceedings of the Research Seminar on Telecommunications Software Ad Hoc Mobile Wireless Networks 28.11.2002
Yiae-Kaeaeslo, A.; Hasu, T.; 2002; 138 pp.; In English
Report No.(s): PB2004-105306; Copyright; Avail: National Technical Information Service (NTIS)

;Table of Contents: Wireless LAN Technology: Current State and Future Trends; Ultra Wide Band Technologies; Ad-Hoc Routing Taxonomy and Resource Discovery; On-Demand Multi-Path HIP NAT (OMHN) Routing; Delay-Tolerant Routing in Ad Hoc Networks; Authentication and Authorization in Universal Plug and Play Home Networks; Implementing Jini Servers without Object Serialization Support; JAIN SIP Approach in Ad-Hoc Networks Mobility Management; Requirements for Modeling Trust in Ubiquitous Computing and Ad Hoc Networks; Trust Evaluation Based Security Solution in Ad Hoc Networks.
NTIS
Telecommunication; Mobility; Wireless Communication; Local Area Networks

20040084440 Physics and Electronics Lab. TNO, The Hague, Netherlands
TMS 3.0 Versus MMHS en Stanag 4406
Lachman, R.; Ramdhiansing, A. M.; Veugen, P. J. M.; September 2003; 43 pp.; In English
Contract(s)/Grant(s): V909; TNO Proj. 015.31952/01.01
Report No.(s): FEL-03-A138; TD-2003-0079; Copyright; Avail: Other Sources

The Command & Control Support Centre (C2SC) of the Dutch Royal Army is developing a system to send military

messages between staff units in a tactical mobile environment. There is a need to connect this Tactical Messaging System (TMS) to NATO Military Message Handling Systems (MMHSs) based on the standard STANAG 4406. This TNO study investigates the security problems that could arise and how a secure connection could be realized. Since TMS and STANAG 4406 are developed for use in different domains, their connection must be carefully designed to establish a minimum loss of information during transmission. When within NATO, MIME based solutions continue to take over X.400 based systems, little problems are expected at the level of communication. Tuning of the message content still remains, as well as safe adjustment of the national and NATO filters in boundary protection devices.To get sufficient insight in the connectivity problems a couple of necessary research subjects are suggested.
Author
Message Processing; Standards; Security

20040084532 Physics and Electronics Lab. TNO, The Hague, Netherlands
The On-Air Performance of HF STANAG 4538 'ARCS', Phase 1 and 2
Ponsioen, C.; Hoefsloot, P.; December 2003; 48 pp.; In English
Contract(s)/Grant(s): 015.31164; TNO Proj. A01/KL/654
Report No.(s): TD-2003-0109-Phase-1-2; FEL-03-A224-Phase-1-2; Copyright; Avail: Other Sources
STANAG 4538 describes the Automatic Radio Control System (ARCS), a combination of waveforms and protocols. This NATO standard has been developed to make HF radio communications more robust and efficient. This report describes the on-air performance of the data link and link set-up protocol. For the tests an HF network between the UK, Norway and the Netherlands has been created. The results show that STANAG 4538 significantly increases the throughput and decreases the link set-up time compared to the existing older protocols (e.g. FED-STD-1052, MIL-STD-188-110).
Author
Radio Communication; High Frequencies; Data Links; Protocol (Computers)

20040084601 Defence Science and Technology Organisation, Edinburgh, Australia
The State-of-the-Art in Ship Detection in Synthetic Aperture Radar Imagery
Crisp, D. J.; May 2004; 133 pp.; In English
Report No.(s): DSTO-RR-0272; DODA-AR-013-053; Copyright; Avail: Other Sources
This report is a review of the publicly available literature on algorithms for detecting ships in Synthetic Aperture Radar (SAR) imagery, with the aim of recommending algorithms for inclusion in the Analysts Detection Support System (ADSS). The ADSS is a software system being developed at DSTO for the automatic detection of targets in SAR imagery. We outline the motivations, theory and justifications of the various approaches so that educated comparisons and evaluations can be made. Most current research on ship detection is based on detecting the ship itself rather than its wake. Detection of ship wakes is not addressed in any depth. Ship detection systems generally consist of several stages: land masking; preprocessing; pre-screening; and discrimination. We consider each of these stages in turn and discuss the various algorithms which have been used. A basic system for low to medium resolution single channel SAR imagery is recommended and suggestions for improvements and alternatives are made.
Author
Synthetic Aperture Radar; Radar Detection; Ships; Radar Imagery; Target Acquisition

20040084695 Swedish Defence Research Establishment, Linkoeping, Sweden
Analysis of Capacity in Ad Hoc Networks with Variable Data Rates
Farman, L.; Sterner, U.; Tronarp, O.; Sep. 2003; In English
Report No.(s): PB2004-105074; FOI-R-0928-SE; No Copyright; Avail: National Technical Information Service (NTIS)
We investigate how to use variable data rate in ad hoc TDMA networks and the possible gain in throughput. The use of variable data rate enables the network to adapt to changes in the environment, which is crucial for the ability to guarantee Quality of Service (QoS) in a mobile network. We study the impact that the routing metric and traffic adaptivity have on the network's ability to utilize variable data rate. Furthermore, we study how the number of data rates to chose from improves the throughput. We also investigate the relative gain in throughput for a system with variable data rate compared to a system with fixed data rate.
NTIS
Communication Networks; Time Division Multiple Access

20040084713 Lawrence Livermore National Lab., Livermore, CA
Large Scale Parallel Structured AMR Calculations Using the SAMRAI Framework
Wissink, A. M.; Hornung, R. D.; Kohn, S. R.; Smith, S. S.; Elliott, N.; Aug. 2001; In English
Report No.(s): DE2004-15006199; UCRL-JC-144755; No Copyright; Avail: National Technical Information Service (NTIS)

This paper discusses the design and performance of the parallel data communication infrastructure in SAMRAI, a software framework for structured adaptive mesh refinement (SAMR) multi-physics applications. We describe requirements of such applications and how SAMRAI abstractions manage complex data communication operations found in them. Parallel performance is characterized for two adaptive problems solving hyperbolic conservation laws on up to 512 processors of the IBM ASCI Blue Pacific system. Results reveal good scaling for numerical and data communication operations but poorer scaling in adaptive meshing and communication schedule construction phases of the calculations. We analyze the costs of these different operations, addressing key concerns for scaling SAMR computations to large numbers of processors, and discuss potential changes to improve our current implementation.
NTIS
Grid Refinement (Mathematics); Structured Grids (Mathematics)

20040084772 Physics and Electronics Lab. TNO, The Hague, Netherlands
EOV-aspects Mobile Network Radio Improvement of Detection, Analysis and Transmission
Punt, J. B.; January 2004; 33 pp.; In Dutch
Contract(s)/Grant(s): KL-EOV; V009
Report No.(s): FEL-03-A274; TD-2003-0218; Copyright; Avail: Other Sources

Modern battlefield radios pose problems for current EW equipment. Development of those radios will only increase the difficulties. Following earlier research, this report builds on scenario examples to investigate which improvements are needed for EW. It can be seen that the distance to targets needs to be as small as possible. Mobility will therefore be an important factor for manned sensors. Unmanned sensors offering less functionality than manned sensors, can be closer, and smaller. For both, techniques using antenna arrays and signal processing should offer enhanced sensitivity and resolution. Operational use of EW sensors will change. Using many unmanned sensors for specific tasks requires a different approach from using a manned sensor that can perform every EW task conceivable. On a case by case basis the appropriate mix will have to be found to use EW equipment to its fullest potential. Furthermore, because of the growing dependence on communication, the blocking of radio links is becoming increasingly important.
Author
Radio Equipment; Electronic Warfare; Mobile Communication Systems

20040084779 Physics and Electronics Lab. TNO, The Hague, Netherlands
COTS-Technology and Information Protection
Martis, E. R.; Degen, A. J. G.; Verhaar, P. J. A.; September 2003; 46 pp.; In Dutch
Contract(s)/Grant(s): A01/d/632
Report No.(s): FEL-03-A065; TD-2003-0081; Copyright; Avail: Other Sources

This study gives an overview of available Commercial-of-the-Shelf (COTS) products and services and the information security aspects that arise when using these COTS products and services.
Author
Commercial Off-the-Shelf Products; Security

20040084911 Florida State Univ., Tallahassee, FL
The Romanian Media in Transition
Georgiadis, Basil D.; Mar. 2004; 173 pp.; In English
Report No.(s): AD-A424143; CI04-356; No Copyright; Avail: CASI; A08, Hardcopy

The Romanian media has progressed in only a decade and a half since the fall of Communism. Reporters discuss themes about political reform, the elections, corruption, and even political protest. They critically analyze stories asking the basic questions while frequently providing follow-up. The press has liberalized, reflecting pluralistic domestic and international information sources as opposed to the State- controlled media before 1990. The media, along with free elections, transparency of law and government, and a civil society, are important benchmarks for a society that strives to compare favorably with the West, and for that reason deserves examination. Serious problems exist however. A weak economy makes the media susceptible to government manipulation. Legal challenges by the government and businessmen against journalists as

defendants, impose hefty fines over libel and slander challenges. Control of state broadcast media by ex- Communist ruling Social Democrats prevents the mass media from contributing to the public dialogue. Social attitudes developed in the twentieth century, negatively shape the reporting of national minority groups which are substantial in Romania and the Balkans. Finally, an authoritarian tradition based on imperial, fascist, and communist rule, has manifested itself in violence towards journalists. The dissertation examines the media within the Communist tradition from 1945- 1989 and followed with a survey of the post-Communist media. A brief history of the national minorities question provides perspective on present day attitudes in the media towards these groups. A survey of NGO's and other institutions examined progress towards a civil society. In the international context, a comparison of the situation in Romania with countries in Eastern Europe and Latin America revealed similar problems. The media has diversified greatly considering the short time frame of this study in post- Communist Romania.
DTIC
News Media; Romania

20040084926 Army War Coll., Carlisle Barracks, PA
Combat Search and Rescue: Building a Joint Capability to Meet the Combatant Commander's Requirements
Nelson, Eric M.; Mar. 19, 2004; 34 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424185; No Copyright; Avail: CASI; A03, Hardcopy

This paper examines the combat search and rescue (OSAR) mission sub-set of personnel recovery from both a Service and joint perspective and analyzes its effectiveness in meeting the combatant commander's operational requirements. It reviews the historical significance OSAR has had in past combat operations and the resulting political impacts to campaign strategic objectives. As a framework for analysis the paper describes joint doctrine and procedures for OSAR command and control organization execution and special mission equipment and considers how each Service is organized to meet these challenging requirements. It argues that OSAR is a complex operation that requires multiservice capabilities and dedicated forces. Finally it proposes that the current approach of unilateral Service OSAR leads to redundancy of effort creates competition for high priority resources and limits interoperability of rescue forces within the joint operational environment. It concludes with recommendations for organizing joint dedicated OSAR forces for the future.
DTIC
Combat; Command and Control; Rescue Operations

20040084941 Army War Coll., Carlisle Barracks, PA
U.S. Policy on Weaponizing Space and the Army's Role in Space Control Operations
Netherland, Scott F.; Feb. 18, 2004; 27 pp.; In English
Report No.(s): AD-A424220; No Copyright; Avail: CASI; A03, Hardcopy

The Army has a history of leading the services in the space control mission area. The technology development for anti-ballistic missile (AEM) systems served as a logical precursor to the USA first operational anti- satellite (ASAT) capability called the Nike-Zeus. Today the Army is pushing two new space control programs through the Total Army Analysis (TAA) process. One unit is the Space Counter Surveillance and Reconnaissance (SCRS) system and the other is the Space Electronic Warfare System (SEWS). This Strategy Research Paper will investigate USA policy on the use of space control negation systems and it will review Joint and Army Doctrine on the Command and Control of Space Forces. It will conclude with recommendations for a clarification of U.S. Space policy actions to clarify roles and missions for each service in space operations and improvements to command and control of joint theater space forces.
DTIC
Antimissile Defense; Command and Control; Policies; Warfare

20040085032 Army War Coll., Carlisle Barracks, PA
Command and Control of the Second Infantry Division - Route to a Stronger Alliance
Stackpole, Patrick T.; Mar. 23, 2004; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424377; No Copyright; Avail: CASI; A03, Hardcopy

The argument addresses the question of why the largest ground force in the Republic of Korea the 2d Infantry Division is currently under the command of the Eighth USA Army (EUSA) rather than under operational control (OPCON) of one of the ROK Corps with whom it lives everyday. From the standpoint of peacetime maneuver and training in the increasingly restricted terrain command and control links and procedures the all-important personal ties necessary to function in Korean culture and maintenance of unity of command it appears more advantageous to work everyday with the unit you will fight

beside. Especially as ground forces are redeployed south from their current locations or reorganized on the peninsula and with the ongoing nuclear crisis with North Korea it is time to revisit this command and control relationship.
DTIC
Command and Control; Organizations; Routes

20040085376 Physics and Electronics Lab. TNO, The Hague, Netherlands
Protection Aspects of Mobile and ad hoc Networks
Schotanus, H. A.; Verkoelen, C. A. A.; Geers, J. M. E.; Olk, J. G. E.; April 2004; 30 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.30853
Report No.(s): FEL-03-A280; TD-2004-0112; Copyright; Avail: Other Sources

The use of open standards for mobile and ad hoc networks provide an opportunity for flexibility and cost- efficiency in military networks. This research focused at the security aspects of the available open standards. It can be concluded that the security is currently insufficient for the use in military networks. The use of IPsec can fix some of these problems but by far not all. Therefore, more research is needed to address the security deficiencies in open standards.
Author
Security; Networks; Mobile Communication Systems

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

20040084325 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Laboratory of Electromechanics
Schroder, M.; Jokinen, T.; 2001; 28 pp.; In English
Report No.(s): PB2004-105295; Copyright; Avail: National Technical Information Service (NTIS)

The Laboratory of Electromechanics was founded in 1908. At that time, the Laboratory staff taught the basics of electrical engineering, including electrical machines. Nowadays the research and teaching area of the Laboratory is concentrated on rotating electrical machines, transformers, and other equipment converting energy by means of magnetic fields. In 2000, the main research projects were Noise and Vibration of AC Machines, large Ship Propulsion Motors, Losses in Electrical Machines, Combination of Circuit Simulator and Finite Element Program, High-speed Electrical Machines and Low-Speed Permanent Magnet Wind Generators. Most of the research projects are carried out with external funding from the National Technology Agency of Finland (TEKES) and Finnish Industry.
NTIS
Electrical Engineering; Electromechanics

20040084326 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Laboratory of Electromechanics Annual Report 2001
2002; 28 pp.; In English
Report No.(s): PB2004-105296; Copyright; Avail: National Technical Information Service (NTIS)

The Laboratory of Electro mechanics was founded in 1908. At that time, the Laboratory staff taught the basics of electrical engineering, including electrical machines. Nowadays, the research and teaching area of the Laboratory is concentrated on rotating electrical machines, transformers, and other equipment converting energy by means of magnetic fields.
NTIS
Electrical Engineering; Electromechanics

20040084332 National Renewable Energy Lab., Golden, CO
12th Workshop on Crystalline Silicon Solar Cell Materials and Processes
Sopori, B.; Swanson, D.; Sinton, R.; Tan, T.; Feb. 2003; In English
Report No.(s): DE2003-15004588; NREL/CP-520-33435; No Copyright; Avail: National Technical Information Service (NTIS)

The 12th Workshop on Crystalline Silicon Solar Cell Materials and Processes was held in Breckenridge, Colorado, on Aug. 11-14, 2002. The workshop was attended by 106 scientists and engineers from 25 international photovoltaic (PV) and semiconductor companies, 28 research institutions, and 3 government agencies from different countries. In addition to the review and the poster presentations, there were discussion sessions to address recent progress, critical issues in implementing new technologies, and the role of fundamental R&D in the growing PV Industry. A proceedings of the papers presented at the workshop was published and provided to the attendees at the workshop registration. The theme of the workshop was 'Fundamental R&D in c-Si: Enabling Progress in Solar-Electric Technology.'
NTIS
Semiconductors (Materials); Crystallinity; Solar Cells; Silicon

20040084351 Sandia National Labs., Albuquerque, NM, Science Univ. of Tokyo, Japan
Comparison of Linear Synchronous and Induction Motors
Masada, E.; Kaye, R. J.; Jun. 2004; 30 pp.; In English
Report No.(s): PB2004-105934; SAND-2004-2734-P; No Copyright; Avail: CASI; A03, Hardcopy

A Propulsion Trade Study was conducted as part of the Colorado Maglev Project of FTA's Urban Maglev Technology Development Program to identify and evaluate prospective linear motor designs that could potentially meet the system performance requirements of the Colorado Dept. of Transportation (CDOT) Project, and be applicable to other urban maglev transit corridors. The study focused primarily on the performance of the linear induction motor (LIM) propulsion system of the Chubu HSST (CHSST) that had been selected as the baseline technology for that project. Potential near-term improvements and modifications to that propulsion system have been considered and appear feasible. This report compares the relative advantages and disadvantages of that linear induction motor and mature linear synchronous motor options for urban and suburban maglev transit systems.
NTIS
Magnetic Suspension; Induction Motors; Propulsion

20040084633 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Progress in Low-Power Digital Microwave Radiometer Technologies
Piepmeier, Jeffrey R.; Kim, Edward J.; May 10, 2004; 6 pp.; In English; NASA Earth Science Technology Conference
Contract(s)/Grant(s): UPN 258-70-20; UPN 258-70-03; No Copyright; Avail: CASI; A02, Hardcopy

Three component technologies were combined into a digital correlation microwave radiometer. The radiometer comprises a dual-channel X-band superheterodyne receiver, low-power high-speed cross-correlator (HSCC), three-level ADCs, and a correlated noise source (CNS). The HSCC dissipates 10 mW and operates at 500 MHz clock speed. The ADCs are implemented using ECL components and dissipate more power than desired. Thus, a low-power ADC development is underway. The new ADCs arc predicted to dissipated less than 200 mW and operate at 1 GSps with 1.5 GHz of input bandwidth. The CNS provides different input correlation values for calibration of the radiometer. The correlation channel had a null offset of 0.0008. Test results indicate that the correlation channel can be calibrated with 0.09% error in gain.
Author
Microwave Radiometers; Technology Utilization; Energy Dissipation; Digital Electronics

20040084668 MRJ, Inc., Moffett Field, CA, USA
Analysis of Carbon Nanotube Field-Effect-Transistors (FETs)
Yamada, Toshishige; [1999]; 5 pp.; In English; 46th American Vacuum Society Meeting, 25-29 Oct. 1999, Seattle, WA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A01, Hardcopy

This five page presentation is grouped into 11 numbered viewgraphs, most of which contain one or more diagrams. Some of the diagrams are accompanied by captions, including: 2) Nanotube FET by Delft, IBM; 3) Nanotube FET/Standard MOSFET; 5) Saturation with carrier-carrier; 7) Electronic properties of carbon nanotube; 8) Theoretical nanotube FET characteristics; 11) Summary: Delft and IBM nanotube FET analysis.
CASI
Carbon Nanotubes; Field Effect Transistors

20040084706 Lawrence Livermore National Lab., Livermore, CA
Empirical Confirmation of Critic Level Determination for Zero and Near Zero Backgrounds
Hickman, D. P.; Simpson, T.; Jun. 01, 2001; In English
Report No.(s): DE2004-15006258; UCRL-ID-145114; No Copyright; Avail: National Technical Information Service (NTIS)

The alpha spectroscopy system of the Lawrence Livermore National Laboratory, Hazards Control Department evaluates electroplated samples, typically urine and feces, for alpha emitting radionuclides. Most of the samples processed by the alpha spectroscopy system are evaluated for Plutonium-239 (Pu-239), an important radionuclide used in research. This paper evaluates the Pu-239 background response of the Lawrence Livermore National Laboratory Hazards Control Department's alpha spectroscopy system. Background measurements of the alpha spectroscopy system have been studied to determine an appropriate method for establishing the a postori critical level for detection of plutonium alpha activity. Several methods of establishing the 95% confidence interval for over 4,900 background measurements were evaluated. Two methods appear to provide reasonable results so as to assure an appropriate 95% confidence interval. This report provides the results of this evaluation and the comparison of the various methods tested to establish an empirical evaluation of the critical level using a commercially available analysis program.
NTIS
Numerical Analysis; Radioactive Isotopes; Electroplating

20040084731 Department of Energy, Washington, DC
Die-Cast Copper Motor Rotors: Die Materials and Process Considerations for Economical Copper Rotor Production
Peters, D. T.; Cowie, J. G.; 2003; In English
Report No.(s): DE2003-811913; No Copyright; Avail: National Technical Information Service (NTIS)

For a high melting temperature metal such as copper (Tm = 1083 C) to be economically pressure die cast, one or more suitable high temperature die materials must be identified and adapted to the process. This is a meaningful objective in terms of the rotor of the induction motor where aluminum has been the material of choice for the squirrel cage structure because this lower melting metal is readily die cast. A fabrication process other than pressure die casting is difficult to imagine. Because of copper's higher electrical conductivity, substitution of copper for the aluminum would increase the electrical energy efficiency of the induction motor and potentially provide benefits in manufacturing economics and weight savings, depending on design objective. Copper rotor casting experience and performance of motors equipped with copper rotors are detailed in another paper in this conference. At the 1999 EEMODS conference, a progress report on the die material investigation was presented. This paper updates the results presented in 1999 and elaborates on the die failure mechanism and how die life can be substantially extended.
NTIS
Copper; Rotors; Refractory Materials

20040084777 Physics and Electronics Lab. TNO, The Hague, Netherlands
Detection Performances of the Schiebel AN-19/2 and the Vallon ML 1620B w Metal Auscultators
Oostinga, J. B.; November 2003; 135 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): 879.02.2866.02; TNO Proj. 015.31852
Report No.(s): FEL-03-A057; TD03-0058; Copyright; Avail: Other Sources

The Royal Netherlands Army (RNLA) has about 350 metal detectors of two different types: the Schiebel AN- 19/2 (mod.4) metal detector (93%) and the Vallon ML 1620BW metal detector (7%). Goal of the reported research project is comparison of the detection capabilities of both detector types. The detector properties considered are (1) the influence of sweepspeed, (2) calibration reproducibility, (3) drift effects, (4) hysteresis effects, (5) sensitivity for different ITOP test objects, (6) influence of moisture, (7) interference with another metal detector and (8) battery power consumption. A measurement plan has been written that describes the test procedures. After performance of the tests, it could be concluded that the detection capabilities of the Vallon detector are better than those of the Schiebel detector.
Author
Netherlands; Detection; Metals; Mines (Ordnance); Electronics

20040084870 California Univ., San Diego, La Jolla, CA
Applications of High Tc Planar Josephson Technology
Dynes, Robert C.; Feb. 29, 2004; 12 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0174
Report No.(s): AD-A424063; AFRL-SR-AR-TR-04-0335; No Copyright; Avail: CASI; A03, Hardcopy

During this grant period we have taken our established single junction process to the next step in realizing a very large scale Josephson integrated circuit technology. We have made many process level improvements to address nonuniformity issues. We have fabricated identical junction pairs to study the mutual interactions between junctions. We have also fabricated

arrays of 10, 50, and 100 junctions and have demonstrated a giant Shapiro step in the 10 junction case. Lastly we have updated and improved our measurement system and capabilities.
DTIC
Electrical Measurement

20040084901 California Univ., Berkeley, CA
Macromolecular Antennas and Photovotaics
Frechet, Jean M.; May 7, 2004; 10 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0167
Report No.(s): AD-A424130; AFRL-SR-AR-TR-04-0266; No Copyright; Avail: CASI; A02, Hardcopy

This report explores the preparation of photovoltaic devices with enhanced light harvesting characteristics. In particular plastic hybrid photovoltaic devices based on electroactive polymer/inorganic components are studied. Significant advances were made in polymer- nanocrystal as well as polymer-titania photovoltaic devices through the development of novel polythiophenes that enhance both the interface and electronic communications between the polymer and the inorganic.
DTIC
Photoelectric Cells; Photovoltaic Effect; Semiconductors (Materials)

20040084904 Massachusetts Inst. of Tech., Cambridge, MA
All Sky Imaging System for Atmospheric Plasma Diagnostics
Lee, Min-Chang; May 16, 2004; 11 pp.; In English
Contract(s)/Grant(s): F49620-02-1-0222
Report No.(s): AD-A424134; AFRL-SR-AR-TR-04-0310; No Copyright; Avail: CASI; A03, Hardcopy

A mobile optical observatory was established at the Plasma Science and Fusion Center on campus at MIT. It consists of an All Sky Imaging System (ASIS) and a pick-up truck with a camper-like-box. The major components of ASIS includes: (1) all-sky lenses with different fields of view (FoV) i.e., 24mm/F4.O fish-eye -180 deg. FoV, 45mm/F2.8 - 76 deg. FoV, and 210mm I F4.O - 19 deg. FoV, (2) narrow-band interference spectral filters, (3) 2- and 3-log neutral density filters, (4) image intensifier unit, (5) cooled CCD camera, and (6) data acquisition and remote controlling systems. ASIS is a powerful instruments for atmospheric plasma diagnostics. For example, in radio wave injection and chemical release experiments, rich information can be deduced from the measured airglow. The images of highly structured plasma clouds in chemical release experiments will help identify the source mechanisms, producing plasma density irregularities. Measured intensity of airglow emissions (at 630.0 nm) in radio wave injection experiments will show plasma density depletion. Emissions may also be based on estimating the fluxes of generated energetic particles (at 427. 8 rim in E region and at 630.0 rim in F region), neutral wind (at 557.7 rim), and plasma drifts (at 777.4 rim).
DTIC
Image Intensifiers; Imaging Techniques; Plasma Diagnostics; Plasmas (Physics); Radio Waves

20040084994 Army Research Lab., Adelphi, MD
Design and Test Evaluation of SiC Diode Modules
Griffin, Timothy E.; Koebke, M. G.; May 2004; 44 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424306; ARL-TR-3222; No Copyright; Avail: CASI; A03, Hardcopy

Two high-temperature modules. one of p-i-n SiC diodes and one ofjunction barrier Schottky SiC diodes. were fabricated on AtN. Material choice, thermal conductivity, compatibility, design, and performance are discussed. A curve tracer measured each diode on a module for forward and reverse current versus voltage. Diodes in parallel were measured for reverse recovery charge and time, at different currents and to 150 deg C substrate, including operation in a DC-to-DC converter.
DTIC
Diodes; Modules; Schottky Diodes

20040085002 Michigan Univ., Ann Arbor, MI
Quantum Dot Intersubband Long-Wavelength Detector Arrays
Bhattacharya, P.; Jun. 18, 2004; 13 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0394
Report No.(s): AD-A424327; ARO-41474.9-EL; No Copyright; Avail: CASI; A03, Hardcopy

In(Ga,Al)As/(Ga,Al)As QDIPs are positioned to become an important technology in the field of IR detection, particularly

for the type of high-temperature, low-cost, high- yield detector arrays required for the military and other highly sophisticated applications. This research has advanced the state-of-the-art in QDIP performance, demonstrating that it is reasonable to incorporate these devices into a FPA operating at 150 K for MWIR detection. For example, at this temperature of operation, J(sub dark)^10(exp -5) A/sq cm, R(sub peak) ^0.2 - 0.3 A/W and D* ^10 (exp 10) cm.Hz(exp 1/2/W. These improvements have been achieved by investigating several significant areas of QDIP operation to obtain a complete picture of the many different factors that affect detector performance: i) MBE growth of QDs for increased absorption of IR light, ii) design, fabrication, and characterization of state-of-the-art, discrete QDIPs operating at elevated temperatures, and iii) the characterization of small QDIP array properties.
DTIC
Antenna Arrays; Quantum Dots

20040085013
Search for Plasma Instability Driven THz Radiation Source
Gornik, E.; Strasser, G.; Kast, M.; Pacher, C.; Coquelin, M.; Zobl, R.; May 2004; 74 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD; 19-00-1-0121
Report No.(s): AD-A424347; ARO-41118.2-PH; No Copyright; Avail: CASI; A04, Hardcopy

A novel concept for the generation of Terahertz generation based on current driven plasma instabilities in low-dimensional semiconductor quantum structures was investigated. The design principle is the combination of a step potential quantum well with a resonant tunneling diode, grown by MBE in the AlGaAs/GaAs material system. The interplay of heavy vertical current injection into the step well region with fast carrier extraction by the RTD is intended to create a partial population inversion in the electron distribution leading to the energetic resonance of two plasmon modes in the stepwell i. e. plasma instability. Intersubband emission around 100 cm1 was first observed on a single step quantum well structure. Modifications on the doping, injector region, barrier thickness, well shape and material system were then extensively studied to optimize the radiation output. A direct proof of the proposed plasmon generation process was the observation of an additional current peak mediated by resonant plasmon emission in resonant tunneling diodes with long emitter drift regions. A cascading of the active cells ranging from a fivefold repetition up to 30 stages was finally implemented to maximize the emission. Finally plasma instability mediated emission was identified in samples consisting of 10 and 30 cascades.
DTIC
Magnetohydrodynamic Stability; Radiation Sources; Semiconductor Diodes

20040085028 Colorado Univ., Boulder, CO
RF Photonics for Array Processing MURI
Wagner, Kelvin H.; Anderson, Dana; Popovic, Zoya; Babbitt, Randall W.; Knoesen, Andre; Jan. 1997; 86 pp.; In English
Contract(s)/Grant(s): MURI 1997; N00014-97-1-1006
Report No.(s): AD-A424368; 153-6702; No Copyright; Avail: CASI; A05, Hardcopy

This final report covers 6 years of progress of the 1997 MRI on RF photonics for Antenna Arrays at the University of Colorado, Montana State University, George Mason University, and the University of California Davis. Novel techniques for optical control and processing of the wideband RF and microwave signals encountered in phased array antennas have been developed, guided by research in spatio-temporal adaptive processing algorithms and active quasi-optical RF antenna arrays. The primary goal of this research is to develop enabling optical techniques that provide dramatic improvements in antenna array performance over conventional RF, optical, and digital techniques, allowing the efficient processing of large broadband antenna arrays. Coherent modulation and detection is made robust and practical by the use of dynamic holography in photorefractive and optical coherent transient media. This report summarizes the teams management, educational, and outreach activities, as well as technical progress summarized in 3 attached PhD thesis on broadband adaptive optical array processing spatio-temporal holographic - processing algorithms, coherent-transient true- time-delay, photorefractive signal extraction, optical antenna control, and polymer in line fiber modulators.
DTIC
Electromagnetic Pulses; Photonics; Radio Frequencies

20040085404 Arizona State Univ., Tempe, AZ, USA
Electrical Conductivity, Oxygen Fugacity, and Mantle Materials
Tyburczy, James A.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 64; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

From oxygen isotopic analysis of secondary minerals from SNC meteorites, the interaction between the atmosphere and regolith has been resolved at a much higher degree of specificity. This work has shown that the record of the planetary processes may be captured in the isotopic record and maintained on billion year time scales. In sum, the use of mass independent isotopic measurements has provided new details regarding a wide range of natural processes in the atmosphere, hydrosphere, and geosphere. In the future, such measurements will amplify understanding of planetary bodies, their interactions and evolution. Future return sample missions will additionally benefit from these measurements.
Derived from text
Electrical Resistivity; Oxygen; Isotopes; Minerals

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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*.

20040084338 Lawrence Livermore National Lab., Livermore, CA
Shock Scattering in a Multiphase Flow Model
Klem, D. E.; Apr. 08, 2003; In English
Report No.(s): DE2003-15005082; UCRL-ID-153203; No Copyright; Avail: National Technical Information Service (NTIS)

Multiphase flow models have been proposed for use in situations which have combined Rayleigh-Taylor (RTI) and Richtmyer-Meshkov (RMI) instabilities. Such an approach work poorly for the case of a heavy to light shock incidence on a developed interface. The physical original of this difficulty is traced to an inadequate model of the interfacial pressure term as it appears in the momentum and turbulence kinetic energy equations. Constraints on the form of a better model from a variety of sources are considered. In this context it is observed that a new constraint on closures arises. This occurs because of the discontinuity within the shock responsible for the RMI. The proposed model (Shock Scattering) is shown to give useful results.
NTIS
Turbulence; Mathematical Models; Mechanical Shock; Kinetic Energy

20040084361 Massachusetts Inst. of Tech., MA, USA
Automated Extraction of Flow Features
Dorney, Suzanne, Technical Monitor; Haimes, Robert; July 1, 2004; 8 pp.; In English
Contract(s)/Grant(s): NAG8-1872; No Copyright; Avail: CASI; A02, Hardcopy

Computational Fluid Dynamics (CFD) simulations are routinely performed as part of the design process of most fluid handling devices. In order to efficiently and effectively use the results of a CFD simulation, visualization tools are often used. These tools are used in all stages of the CFD simulation including pre-processing, interim-processing, and post-processing, to interpret the results. Each of these stages requires visualization tools that allow one to examine the geometry of the device, as well as the partial or final results of the simulation. An engineer will typically generate a series of contour and vector plots to better understand the physics of how the fluid is interacting with the physical device. Of particular interest are detecting features such as shocks, recirculation zones, and vortices (which will highlight areas of stress and loss). As the demand for CFD analyses continues to increase the need for automated feature extraction capabilities has become vital. In the past, feature extraction and identification were interesting concepts, but not required in understanding the physics of a steady flow field. This is because the results of the more traditional tools like; iso-surface, cuts and streamlines, were more interactive and easily abstracted so they could be represented to the investigator. These tools worked and properly conveyed the collected information at the expense of a great deal of interaction. For unsteady flow-fields, the investigator does not have the luxury of spending time scanning only one ″snapshot″ of the simulation. Automated assistance is required in pointing out areas of potential interest contained within the flow. This must not require a heavy compute burden (the visualization should not significantly slow down the solution procedure for (co-processing environments). Methods must be developed to abstract the feature of interest and display it in a manner that physically makes sense.
Author
Computational Fluid Dynamics; Computerized Simulation; Fluid Dynamics

20040084362 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Thermal Control Technologies for Complex Spacecraft

Swanson, Theodore D.; [2004]; 12 pp.; In English; 13th International Heat Pipe Conference, 21-25 Sep. 2004, Shanghai, China; Original contains black and white illustrations; No Copyright; Avail: CASI; A03, Hardcopy

Thermal control is a generic need for all spacecraft. In response to ever more demanding science and exploration requirements, spacecraft are becoming ever more complex, and hence their thermal control systems must evolve. This paper briefly discusses the process of technology development, the state-of-the-art in thermal control, recent experiences with on-orbit two-phase systems, and the emerging thermal control technologies to meet these evolving needs. Some ″lessons learned″ based on experience with on-orbit systems are also presented.

Author

Temperature Control; Spacecraft Environments; Capillary Pumped Loops; Cryogenics; Heat Pumps; Thermal Protection

20040084399 NASA Langley Research Center, Hampton, VA, USA

Comparison of Engine/Inlet Distortion Measurements with MEMS and ESP Pressure Sensors

Soto, Hector L.; Hernandez, Corey D.; [2004]; 7 pp.; In English; 24th AIAA Aerodynamic Measurement Technology and Ground Testing Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains color illustrations

Contract(s)/Grant(s): 23-714-00-00

Report No.(s): AIAA Paper 2004-2398; No Copyright; Avail: CASI; A02, Hardcopy

A study of active-flow control in a small-scale boundary layer ingestion inlet was conducted at the NASA Langley Basic Aerodynamic Research Tunnel (BART). Forty MEMS pressure sensors, in a rake style configuration, were used to examine both the mean (DC) and high frequency (AC) components of the total pressure across the inlet/engine interface plane. The mean component was acquired and used to calculate pressure distortion. The AC component was acquired separately, at a high sampling rate, and is used to study the unsteady effects of the active-flow control. An identical total pressure rake, utilizing an Electronically Scanned Pressure (ESP) system, was also used to calculate distortion; a comparison of the results obtained using the two rakes is presented.

Author

Active Control; Distortion; Engine Inlets; Ingestion (Engines); Microelectromechanical Systems; Pressure Sensors; Scanners; Flow Distribution

20040084465 NASA Ames Research Center, Moffett Field, CA, USA, Advanced Management Technology, Inc., Moffett Field, CA, USA

Interactive Terascale Particle Visualization

Ellsworth, David; Green, Bryan; Moran, Patrick; April 15, 2004; 8 pp.; In English; IEEE Visualization 2004, 10-15 Oct. 2004, Austin, TX, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A02, Hardcopy

This paper describes the methods used to produce an interactive visualization of a 2 TB computational fluid dynamics (CFD) data set using particle tracing (streaklines). We use the method introduced by Bruckschen et al. [2001] that pre-computes a large number of particles, stores them on disk using a space-filling curve ordering that minimizes seeks, and then retrieves and displays the particles according to the user's command. We describe how the particle computation can be performed using a PC cluster, how the algorithm can be adapted to work with a multi-block curvilinear mesh, and how the out-of-core visualization can be scaled to 296 billion particles while still achieving interactive performance on PG hardware. Compared to the earlier work, our data set size and total number of particles are an order of magnitude larger. We also describe a new compression technique that allows the lossless compression of the particles by 41% and speeds the particle retrieval by about 30%.

Author

Flow Visualization; Computational Fluid Dynamics; Algorithms; Computation

20040084467 NASA Ames Research Center, Moffett Field, CA, USA

The Rotational Excitation Temperature of the 6614 DIB Carrier

Cami, J.; Salama, F.; Jimenez-Vicente, J.; Galazutdinov, G.; Krelowski, J.; [2004]; 13 pp.; In English

Contract(s)/Grant(s): 2-P03D-019-23; RTOP 188-01-03-01; Copyright; Avail: CASI; A03, Hardcopy

Analysis of high spectral resolution observations of the lambda6614 DIB line profile show systematic variations in the positions of the peaks in the substructure of the profile. These variations can only be understood in the framework of rotational

contours of large molecules, where the variations are caused by changes in the rotational excitation temperature. We show that the rotational excitation temperature for the DIB carrier is of the order 10-40 K - much lower than the gas kinetic temperature - indicating that for this particular DIB carrier angular momentum buildup is not very efficient. The rotational constant indicates that the carrier of this DIB is smaller than previously assumed:7-22 C atoms, depending on the geometry.
Author
High Resolution; Spectral Resolution; Excitation; Angular Momentum; Gas Temperature

20040084562 NASA Ames Research Center, Moffett Field, CA, USA
Parallel 3D Mortar Element Method for Adaptive Nonconforming Meshes
Feng, Huiyu; Mavriplis, Catherine; VanderWijngaart, Rob; Biswas, Rupak; January 29, 2004; 1 pp.; In English; International Conference on Spectral and High Order Methods, 21-25 Jun. 2004, RI, USA
Contract(s)/Grant(s): DTTDTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: Other Sources; Abstract Only

High order methods are frequently used in computational simulation for their high accuracy. An efficient way to avoid unnecessary computation in smooth regions of the solution is to use adaptive meshes which employ fine grids only in areas where they are needed. Nonconforming spectral elements allow the grid to be flexibly adjusted to satisfy the computational accuracy requirements. The method is suitable for computational simulations of unsteady problems with very disparate length scales or unsteady moving features, such as heat transfer, fluid dynamics or flame combustion. In this work, we select the Mark Element Method (MEM) to handle the non-conforming interfaces between elements. A new technique is introduced to efficiently implement MEM in 3-D nonconforming meshes. By introducing an ″intermediate mortar″, the proposed method decomposes the projection between 3-D elements and mortars into two steps. In each step, projection matrices derived in 2-D are used. The two-step method avoids explicitly forming/deriving large projection matrices for 3-D meshes, and also helps to simplify the implementation. This new technique can be used for both h- and p-type adaptation. This method is applied to an unsteady 3-D moving heat source problem. With our new MEM implementation, mesh adaptation is able to efficiently refine the grid near the heat source and coarsen the grid once the heat source passes. The savings in computational work resulting from the dynamic mesh adaptation is demonstrated by the reduction of the the number of elements used and CPU time spent. MEM and mesh adaptation, respectively, bring irregularity and dynamics to the computer memory access pattern. Hence, they provide a good way to gauge the performance of computer systems when running scientific applications whose memory access patterns are irregular and unpredictable. We select a 3-D moving heat source problem as the Unstructured Adaptive (UA) grid benchmark, a new component of the NAS Parallel Benchmarks (NPB). In this paper, we present some interesting performance results of ow OpenMP parallel implementation on different architectures such as the SGI Origin2000, SGI Altix, and Cray MTA-2.
Author
Parallel Processing (Computers); Three Dimensional Models; Computational Grids; Computerized Simulation; Grid Generation (Mathematics); Adaptation

20040084569 NASA Ames Research Center, Moffett Field, CA, USA
Computational Challenges of Viscous Incompressible Flows
Kwak, Dochan; Kiris, Cetin; Kim, Chang Sung; March 11, 2004; 13 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

Over the past thirty years, numerical methods and simulation tools for incompressible flows have been advanced as a subset of the computational fluid dynamics (CFD) discipline. Although incompressible flows are encountered in many areas of engineering, simulation of compressible flow has been the major driver for developing computational algorithms and tools. This is probably due to the rather stringent requirements for predicting aerodynamic performance characteristics of flight vehicles, while flow devices involving low-speed or incompressible flow could be reasonably well designed without resorting to accurate numerical simulations. As flow devices are required to be more sophisticated and highly efficient CFD took become increasingly important in fluid engineering for incompressible and low-speed flow. This paper reviews some of the successes made possible by advances in computational technologies during the same period, and discusses some of the current challenges faced in computing incompressible flows.
Author
Computational Fluid Dynamics; Incompressible Flow; Viscous Flow; Mathematical Models

20040084582 NASA Ames Research Center, Moffett Field, CA, USA

Numerical Solution of Incompressible Navier-Stokes Equations Using a Fractional-Step Approach

Kiris, Cetin; Kwak, Dochan; [1999]; 15 pp.; In English; 27th AIAA Fluid Dynamics Conference, 17-20 Jun. 1996, New Orleans, LA, USA

Report No.(s): AIAA Paper 96-2089; Copyright; Avail: CASI; A03, Hardcopy

A fractional step method for the solution of steady and unsteady incompressible Navier-Stokes equations is outlined. The method is based on a finite volume formulation and uses the pressure in the cell center and the mass fluxes across the faces of each cell as dependent variables. Implicit treatment of convective and viscous terms in the momentum equations enables the numerical stability restrictions to be relaxed. The linearization error in the implicit solution of momentum equations is reduced by using three subiterations in order to achieve second order temporal accuracy for time-accurate calculations. In spatial discretizations of the momentum equations, a high-order (3rd and 5th) flux-difference splitting for the convective terms and a second-order central difference for the viscous terms are used. The resulting algebraic equations are solved with a line-relaxation scheme which allows the use of large time step. A four color ZEBRA scheme is employed after the line-relaxation procedure in the solution of the Poisson equation for pressure. This procedure is applied to a Couette flow problem using a distorted computational grid to show that the method minimizes grid effects. Additional benchmark cases include the unsteady laminar flow over a circular cylinder for Reynolds Numbers of 200, and a 3-D, steady, turbulent wingtip vortex wake propagation study. The solution algorithm does a very good job in resolving the vortex core when 5th-order upwind differencing and a modified production term in the Baldwin-Barth one-equation turbulence model are used with adequate grid resolution.

Author

Incompressible Flow; Navier-Stokes Equation; Numerical Stability; Mathematical Models; Algorithms

20040084595 Combustion Research and Flow Technology, Inc., Pipersville, PA, USA

Multi-Element Unstructured Analyses of Complex Valve Systems

Sulyma, Peter, Technical Monitor; Ahuja, Vineet; Hosangadi, Ashvin; Shipman, Jeremy; May 1, 2004; 14 pp.; In English; 52 JANNAF Propulsion Meeting, 10-13 May 2004, Las Vegas, NV, USA

Contract(s)/Grant(s): NAS13-03009

Report No.(s): SSTI-3000-0001-FLUIDS; No Copyright; Avail: CASI; A03, Hardcopy

The safe and reliable operation of high pressure test stands for rocket engine and component testing places an increased emphasis on the performance of control valves and flow metering devices. In this paper, we will present a series of high fidelity computational analyses of systems ranging from cryogenic control valves and pressure regulator systems to cavitating venturis that are used to support rocket engine and component testing at NASA Stennis Space Center. A generalized multi-element framework with sub-models for grid adaption, grid movement and multi-phase flow dynamics has been used to carry out the simulations. Such a framework provides the flexibility of resolving the structural and functional complexities that are typically associated with valve-based high pressure feed systems and have been difficult to deal with traditional CFD methods. Our simulations revealed a rich variety of flow phenomena such as secondary flow patterns, hydrodynamic instabilities, fluctuating vapor pockets etc. In the paper, we will discuss performance losses related to cryogenic control valves, and provide insight into the physics of the dominant multi-phase fluid transport phenomena that are responsible for the choking like behavior in cryogenic control elements. Additionally, we will provide detailed analyses of the modal instability that is observed in the operation of the dome pressure regulator valve. Such instabilities are usually not localized and manifest themselves as a system wide phenomena leading to an undesirable chatter at high flow conditions.

Author

Computerized Simulation; Computational Fluid Dynamics; Rocket Engines; Control Valves; Cryogenics; Multiphase Flow; Unstructured Grids (Mathematics)

20040084605 Texas A&M Univ., College Station, TX, USA, Tennessee Univ., Knoxville, TN, USA

Microscale Investigation of Thermo-Fluid Transport in the Transition Film, Region of an Evaporating Capillary Meniscus using a Microgravity Environment

Kihm, K. D.; Allen, J. S.; Hallinan, K. P.; Pratt, D. M.; [2004]; 7 pp.; In English

Contract(s)/Grant(s): NAG3-2712; No Copyright; Avail: CASI; A02, Hardcopy

In order to enhance the fundamental understanding of thin film evaporation and thereby improve the critical design concept for two-phase heat transfer devices, microscale heat and mass transport is to be investigated for the transition film region using state-of-the-art optical diagnostic techniques. By utilizing a microgravity environment, the length scales of the transition film region can be extended sufficiently, from submicron to micron, to probe and measure the microscale transport

fields which are affected by intermolecular forces. Extension of the thin film dimensions under microgravity will be achieved by using a conical evaporator made of a thin silicon substrate under which concentric and individually controlled micro-heaters are vapor-deposited to maintain either a constant surface temperature or a controlled temperature variation. Local heat transfer rates, required to maintain the desired wall temperature boundary condition, will be measured and recorded by the concentric thermoresistance heaters controlled by a Wheatstone bridge circuit, The proposed experiment employs a novel technique to maintain a constant liquid volume and liquid pressure in the capillary region of the evaporating meniscus so as to maintain quasi-stationary conditions during measurements on the transition film region. Alternating use of Fizeau interferometry via white and monochromatic light sources will measure the thin film slope and thickness variation, respectively. Molecular Fluorescence Tracking Velocimetry (MFTV), utilizing caged fluorophores of approximately 10-nm in size as seeding particles, will be used to measure the velocity profiles in the thin film region. An optical sectioning technique using confocal microscopy will allow submicron depthwise resolution for the velocity measurements within the film for thicknesses on the order of a few microns. Digital analysis of the fluorescence image-displacement PDFs, as described in the main proposal, can further enhance the depthwise resolution.
Author
Microgravity; Thin Films; Vapor Deposition; Velocity Distribution; Two Phase Flow; Heat Transfer; Evaporation

20040084607 Defence Science and Technology Organisation, Fishermans Bend, Australia
Steady-State Evaluation of 'Two-Equation' RANS (Reynolds-averaged Navier-Stokes) Turbulence Models for High-Reynolds Number Hydrodynamic Flow Simulations
Mulvany, Nicholas J.; Chen, Li; Tu, Ji-Yuan Y.; Anderson, Brendon; March 2004; 66 pp.; In English
Report No.(s): DSTO-TR-1564; DODA-AR-013-055; Copyright; Avail: Other Sources
This report presents an evaluation of the steady-state capability of the turbulence models available in the commercial CFD code FLUENT 6.0, for their application to the simulation of hydrofoil turbulent boundary layer separation at high-Reynolds numbers. Four widely applied two-equation RANS turbulence models were qualitatively and quantitatively assessed through comparison with high quality experimental data at Reynolds numbers of 8.284' 106 and 1.657' 107. The turbulence models evaluated were the Standard k-e model, the Realisable k-e model, the Standard k-w model and the Shear-Stress-Transport (SST) k-w model. It was concluded that the Realisable k-e turbulence model used with enhanced wall functions and near-wall modelling techniques, consistently provided superior performance in predicting the hydrofoil s performance parameters and flow characteristics.
Author
Shear Stress; High Reynolds Number; Performance Prediction; Hydrofoils; Flow Characteristics; Boundary Layer Separation; Computational Fluid Dynamics

20040084619 Defence Science and Technology Organisation, Fishermans Bend, Australia
Gas Sample Preparation and Calibration of Thermal Conductivity Gas Analysers
Burch, Ian; February 2004; 41 pp.; In English
Report No.(s): DSTO-TN-0541; DODA-AR-013-044; Copyright; Avail: Other Sources
This report describes the sample gas preparation technique and calibration procedure for thermal conductivity gas analysers operated by the Platform Sciences Laboratory. The analysers are used to measure gaseous fire suppressant concentrations of extinguishing systems installed in Royal Australian Navy ships. These measurements are undertaken to ensure the systems meet the minimum standards for acceptance into service.
Author
Thermal Conductivity; Calibrating; Gases

20040084638 Defence Science and Technology Organisation, Fishermans Bend, Australia
An Evaluation of the FIDAP Computational Fluid Dynamics Code for the Calculation of Hydrodynamic Forces on Underwater Platforms
Jones, D. A.; Clarke, D. B.; August 2003; 48 pp.; In English
Report No.(s): DSTO-TR-1494; DODA-AR-012-893; Copyright; Avail: Other Sources
Maritime Platforms Division within DSTO is currently studying the science and technology of autonomous underwater vehicles for defence applications. Part of this work involves a study of the hydrodynamics and maneuverability of these vehicles and the development of methods to determine the hydrodynamic coefficients of submerged bodies as a function of their shape. This report describes the application of the FIDAP Computational Fluid Dynamics package to the calculation of

lift and drag forces on relatively simple underwater vehicle shapes including cylinders, spheres, flat plates and wing profiles. The degree to which FIDAP accurately reproduces known experimental data on these shapes is described and the applicability of other Computational Fluid Dynamics packages is discussed.
Author
Computational Fluid Dynamics; Aerodynamic Drag; Hydrodynamic Coefficients; Underwater Vehicles; Submerged Bodies

20040084659 NASA Glenn Research Center, Cleveland, OH, USA
Effect of Heating on Turbulent Density Fluctuations and Noise Generation From High Speed Jets
Panda, Jayanta; Seasholtz, Richard G.; Elam, Kristie A.; Mielke, Amy F.; Eck, Dennis G.; June 2004; 24 pp.; In English; Tenth Aeroacoustics Conference, 10-12 May 2004, Manchester, UK
Contract(s)/Grant(s): WBS 714-09-24
Report No.(s): NASA/TM-2004-213126; AIAA Paper 2004-3016; E-14620; Copyright; Avail: Other Sources

Heated jets in a wide range of temperature ratios (TR), and acoustic Mach numbers (Ma) were investigated experimentally using far field microphones and a molecular Rayleigh scattering technique. The latter provided density fluctuations measurements. Two sets of operating conditions were considered: (1) TR was varied between 0.84 and 2.7 while Ma was fixed at 0.9; (2) Ma was varied between 0.6 and 1.48, while TR was fixed at 2.27. The implementation of the molecular Rayleigh scattering technique required dust removal and usage of a hydrogen combustor to avoid soot particles. Time averaged density measurements in the first set of data showed differences in the peripheral density shear layers between the unheated and heated jets. The nozzle exit shear layer showed increased turbulence level with increased plume temperature. Nevertheless, further downstream the density fluctuations spectra are found to be nearly identical for all Mach number and temperature ratio conditions. To determine noise sources a correlation study between plume density fluctuations and far field sound pressure fluctuations was conducted. For all jets the core region beyond the end of the potential flow was found to be the strongest noise source. Except for an isothermal jet, the correlations did not differ significantly with increasing temperature ratio. The isothermal jet created little density fluctuations. Although the far field noise from this jet did not show any exceptional trend, the flow-sound correlations were very low. This indicated that the density fluctuations only acted as a ″tracer parameter″ for the noise sources.
Author
Turbulent Flow; Noise Generators; High Speed; Jet Flow

20040084674 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
Comparison of Origin 2000 and Origin 3000 Using NAS Parallel Benchmarks
Turney, Raymond D.; May 16, 2001; 9 pp.; In English
Contract(s)/Grant(s): DTT559-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A02, Hardcopy

This report describes results of benchmark tests on the Origin 3000 system currently being installed at the NASA Ames National Advanced Supercomputing facility. This machine will ultimately contain 1024 R14K processors. The first part of the system, installed in November, 2000 and named mendel, is an Origin 3000 with 128 R12K processors. For comparison purposes, the tests were also run on lomax, an Origin 2000 with R12K processors. The BT, LU, and SP application benchmarks in the NAS Parallel Benchmark Suite and the kernel benchmark FT were chosen to determine system performance and measure the impact of changes on the machine as it evolves. Having been written to measure performance on Computational Fluid Dynamics applications, these benchmarks are assumed appropriate to represent the NAS workload. Since the NAS runs both message passing (MPI) and shared-memory, compiler directive type codes, both MPI and OpenMP versions of the benchmarks were used. The MPI versions used were the latest official release of the NAS Parallel Benchmarks, version 2.3. The OpenMP versiqns used were PBN3b2, a beta version that is in the process of being released. NPB 2.3 and PBN 3b2 are technically different benchmarks, and NPB results are not directly comparable to PBN results.
Author
Workloads (Psychophysiology); Computational Fluid Dynamics

20040084676 NASA Langley Research Center, Hampton, VA, USA
Synthetic Jet Flow Field Database for CFD Validation
Yao, Chung-Sheng; Chen, Fang Jenq; Neuhart, Dan; Harris, Jerome; [2004]; 11 pp.; In English; 2nd AIAA Flow Control Conference, 28 Jun. - 1 Jul. 2004, Portland, OR, USA; Original contains black and white illustrations
Contract(s)/Grant(s): 23-719-55-MG
Report No.(s): AIAA Paper 2004-2218; No Copyright; Avail: CASI; A03, Hardcopy

An oscillatory zero net mass flow jet was generated by a cavity-pumping device, namely a synthetic jet actuator. This basic oscillating jet flow field was selected as the first of the three test cases for the Langley workshop on CFD Validation of Synthetic Jets and Turbulent Separation Control. The purpose of this workshop was to assess the current CFD capabilities to predict unsteady flow fields of synthetic jets and separation control. This paper describes the characteristics and flow field database of a synthetic jet in a quiescent fluid. In this experiment, Particle Image Velocimetry (PIV), Laser Doppler Velocimetry (LDV), and hot-wire anemometry were used to measure the jet velocity field. In addition, the actuator operating parameters including diaphragm displacement, internal cavity pressure, and internal cavity temperature were also documented to provide boundary conditions for CFD modeling.
Author
Jet Flow; Data Bases; Computational Fluid Dynamics

20040084984 Utah Univ., Salt Lake City, UT
Boundary Layer Turbulence Measurements - at Submarine-Scale Reynolds Numbers - to Support RANS Model Validation and Development
Klewicki, Joseph C.; Jul. 8, 2004; 175 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0753
Report No.(s): AD-A424292; PFD-01-2004; No Copyright; Avail: CASI; A08, Hardcopy

Existing laboratory facilities cannot simultaneously create boundary layers at submarine scale Reynolds numbers and measure the small-scale turbulent motions. Because of this, the detailed mechanisms for momentum transport in these flows remains poorly understood. To overcome these challenges, the present project made novel use of the atmospheric surface layer that flows over the salt playa of Utah's west desert to obtain well resolved turbulence measurements in boundary layers at submarine scale Reynolds numbers. A particular emphasis was the exploration of scale separation effects on the momentum transport. The project obtained well resolved measurements of velocity and vorticity fluctuations for a range of positions normal to the surface, as well as over a limited range of equivalent sand-grain roughness. The Reynolds number scaling behaviors of a number of statistics have been established. An important overarching result is that the motions contributing to both the Reynolds stress and its wall normal gradient shift from large to intermediate scales at high Reynolds numbers. An unanticipated outcome related to this finding was the development of a new theoretical framework for turbulent wall-flows based directly on the relative magnitudes of the stress gradients that appear in the mean momentum balance equation.
DTIC
Flow Measurement; Reynolds Number; Submarines; Turbulent Boundary Layer; Turbulent Flow

20040085340 NASA Langley Research Center, Hampton, VA, USA
DSMC Simulations of Hypersonic Flows and Comparison With Experiments
Moss, James N.; Bird, Graeme A.; Markelov, Gennady N.; July 06, 2004; 6 pp.; In English; 24th International Symposium on Rarefied Gas Dynamics, 10-16 Jul. 2004, Bari, Italy; Copyright; Avail: CASI; A02, Hardcopy

This paper presents computational results obtained with the direct simulation Monte Carlo (DSMC) method for several biconic test cases in which shock interactions and flow separation-reattachment are key features of the flow. Recent ground-based experiments have been performed for several biconic configurations, and surface heating rate and pressure measurements have been proposed for code validation studies. The present focus is to expand on the current validating activities for a relatively new DSMC code called DS2V that Bird (second author) has developed. Comparisons with experiments and other computations help clarify the agreement currently being achieved between computations and experiments and to identify the range of measurement variability of the proposed validation data when benchmarked with respect to the current computations. For the test cases with significant vibrational nonequilibrium, the effect of the vibrational energy surface accommodation on heating and other quantities is demonstrated.
Author
Hypersonic Flow; Monte Carlo Method; Conical Bodies

20040085350 California Univ., Santa Barbara, CA, USA
Interactions Forces and the Flow-Induced Coalescence of Drops and Bubbles
Leal, L. Gary; Israelachvili, J.; [2004]; 11 pp.; In English
Contract(s)/Grant(s): NAG3-2115; No Copyright; Avail: CASI; A03, Hardcopy

In order to accomplish the proposed macroscale experimental goals, we designed and built a pair of miniaturized computer-controlled four-roll mills, similar but much smaller than the 4-roll mill that had been develop earlier in Prof. Leal's

group for studies of drop deformation and breakup. This unique experimental facility allows for controlled experiments on the breakup and coalescence of very small drops in the size range of 20-200 micrometers in diameter for a wide variety of flows and under a wide range of flow conditions including time-dependent flows, etc. The small size of this device is necessary for coalescence studies, since coalescence occurs in viscous fluids at capillary numbers that are large enough to be experimentally accessible only for drops that are smaller than approximately 100_m in diameter. Using these miniaturized 4-roll mills, we have obtained the first quantitative data (so far as we are aware) on the flow-induced coalescence process.
Author
Bubbles; Coalescing; Drops (Liquids); Miniaturization; Viscous Fluids

20040085373 BAE Systems, Huntsville, AL, USA, NASA Marshall Space Flight Center, Huntsville, AL, USA
Challenges in Physics of Biocrystals and Biocrystallization
Chernov, Alexander A.; [2004]; 1 pp.; In English; International Conference on the Crystallization of Biological Macromolecules 10, 5-9 Jun. 2004, Beijing, China
Contract(s)/Grant(s): NAS8-02096; No Copyright; Avail: Other Sources; Abstract Only

Selected problems in biocrystal mechanics(1), nucleation(2) and growth(3) will be addressed. (1) Elastic moduli of protein crystals found from triple bonding, rod vibrations, ultrasound speed and Brillion light scattering vary in a wide range of 0.3 - 3 GPa. This diversity comes from behaviour of intracrystalline liquid. Namely, liquid flow through the narrow intermolecular channels between compressed and expanded regions within an inhomogeneously deformed crystal was considered. The deformation comes from bending or ultrasound wave propagation. (2) Wide scattering in the number of crystals nucleated in the batch technique may come from liquid flow turbulence associated with pipetting; the Reynolds number these injections reaches 10(exp 3). (3) Poor reproducibility in crystal size and, probably, perfection is supposed to come from a variety of growth conditions in the same batch. Growth in a kinetic growth mode in laminar flow, e.g., in a microfluidic device, would allow to better understand growth kinetics and defect formation.
Author
Crystals; Deformation; Laminar Flow; Liquid Flow; Modulus of Elasticity; Bending

20040085403 Bayreuth Univ., Germany
Solubility of Oxygen in Liquid Iron at High Pressure and Consequences for the Early Differentiation of Earth and Mars
Rubie, D. C.; Gessmann, C. K.; Frost, D. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 56; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Knowledge of the solubility of oxygen in liquid iron alloy at high pressure is necessary for determining if oxygen is present as a major light element in planetary cores. In addition, solubility measurements enable the partitioning of oxygen between metal and silicates to be determined which can then be used to constrain oxygen fugacity during core formation, based on a given bulk composition.
Derived from text
Liquid Alloys; High Pressure; Solubility; Planetary Cores; Oxygen; Metal-Gas Systems

20040085408 Southern Methodist Univ., Dallas, TX, USA
Hydrothermal Systems on Terrestrial Planets: Lessons from Earth
Gregory, R. T.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 30; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Stable isotopic measurements have been instrumental in elucidating the role of fluid-rock interaction in the lithosphere of the Earth; e.g. [l]. Analyses of geothermal fluids [2] and subsurface formation waters [3] provide direct evidence of penetration of surface waters into the crust. Oxygen isotope determinations of whole rocks and their coexisting minerals, e.g. [4,5], provided evidence for the depth of penetration of hydrothermal fluids and mechanisms of isotopic exchange necessary to explain the variations of observed in the water studies. Earth, with water near its triple point at the surface and with silicates near their solidus in the mantle at the base of the lithosphere, provides tremendous opportunities for generating oxygen isotopic heterogeneities in the lithosphere.
Derived from text
Hydrothermal Systems; Lithosphere; Rocks; Surface Water; Oxygen Isotopes; Minerals

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; 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 and Astrionics*.

20040084272 NASA Johnson Space Center, Houston, TX, USA
37th Aerospace Mechanisms Symposium
Boesiger, Edward A., Compiler; May 2004; 408 pp.; In English; 37th Aerospace Mechanisms Symposium, 19-21 May 2004, Galveston, TX, USA; See also 20040084273 - 20040084306; Original contains color and black and white illustrations
Report No.(s): NASA/CP-2004-212073; S-930; No Copyright; Avail: CASI; A18, Hardcopy

The Aerospace Mechanisms Symposium (AMS) provides a unique forum for those active in the design, production and use of aerospace mechanisms. A major focus is reporting problems and solutions associated with the development and flight certification of new mechanisms. Organized by the Mechanisms Education Association, NASA and Lockheed Martin Space Systems Company (LMSSC) share the responsibility for hosting the AMS. Now in its 37th symposium, the AMS continues to be well attended, attracting participants from both the U.S. and abroad. The 37th AMS, hosted by the Johnson Space Center (JSC) in Galveston, Texas, was held May 19, 20 and 21, 2004. During these three days, 34 papers were presented. Topics included deployment mechanisms, tribology, actuators, pointing and optical mechanisms, Space Station and Mars Rover mechanisms, release mechanisms, and test equipment. Hardware displays during the supplier exhibit gave attendees an opportunity to meet with developers of current and future mechanism components.
Author
Aerospace Systems; Conferences; Mechanical Engineering; Technology Utilization

20040084273 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Boresight Adjustment Mechanism for use on Laser Altimeters
Hakun, Claef; Budinoff, Jason; Brown, Gary; Parong, Fil; Morell, Armando; 37th Aerospace Mechanisms Symposium; May 2004, pp. 45-58; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes the development of the Boresight Adjustment Mechanism (BAM) for the Geoscience Laser Altimeter System (GLAS) Instrument. The BAM was developed late in the integration and test phase of the GLAS instrument flight program. Thermal vacuum tests of the GLAS instrument indicated that the instrument boresight alignment stability over temperature may be marginal. To reduce the risk that GLAS may not be able to meet the boresight alignment requirements, an intensive effort was started to develop a BAM. Observatory-level testing and further evaluation of the boresight alignment data indicated that sufficient margin could be obtained utilizing existing instrument resources and therefore the BAM was never integrated onto the GLAS Instrument. However, the BAM was designed fabricated and fully qualified over a 4 month timeframe to be capable of precisely steering (\h 1 arcsec over 300 arcsec) the output of three independent lasers to ensure the alignment between the transmit and receive paths of the GLAS instrument. The short timeline for the development of the mechanism resulted in several interesting design solutions. This paper discusses the requirement definition, design, and testing processes of the BAM development effort, how the design was affected by the extremely tight development schedule, and the lessons learned throughout the process.
Author
Boresights; Laser Altimeters

20040084287 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Low Mass Translation Mechanism for Planetary FTIR Spectrometry using an Ultrasonic Piezo Linear Motor
Heverly, Matthew; Dougherty, Sean; Toon, Geoffrey; Soto, Alejandro; Blavier, Jean-Francois; 37th Aerospace Mechanisms Symposium; May 2004, pp. 251-262; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

One of the key components of a Fourier Transform Infrared Spectrometer (FTIR) is the linear translation stage used to vary the optical path length between the two arms of the interferometer. This translation mechanism must produce extremely constant velocity motion across its entire range of travel to allow the instrument to attain high signal-to-noise ratio and spectral resolving power. A new spectrometer is being developed at the Jet Propulsion Laboratory under NASA s Planetary Instrument Definition and Development Program (PIDDP). The goal of this project is to build upon existing spaceborne FTIR spectrometer technology to produce a new instrument prototype that has drastically superior spectral resolution and substantially lower mass, making it feasible for planetary exploration. In order to achieve these goals, Alliance Spacesystems, Inc. (ASI) has developed a linear translation mechanism using a novel ultrasonic piezo linear motor in conjunction with a fully

kinematic, fault tolerant linear rail system. The piezo motor provides extremely smooth motion, is inherently redundant, and is capable of producing unlimited travel. The kinematic rail uses spherical Vespel(R). rollers and bushings, which eliminates the need for wet lubrication, while providing a fault tolerant platform for smooth linear motion that will not bind under misalignment or structural deformation. This system can produce velocities from 10 - 100 mm/s with less than 1% velocity error over the entire 100-mm length of travel for a total mechanism mass of less than 850 grams. This system has performed over half a million strokes under vacuum without excessive wear or degradation in performance. This paper covers the design, development, and testing of this linear translation mechanism as part of the Planetary Atmosphere Occultation Spectrometer (PAOS) instrument prototype development program.
Author
Infrared Spectrometers; Fourier Transformation; Linear Systems; Optical Paths; Interferometers

20040084296 Praxis, Inc., Alexandria, VA, USA
A Description of Mechanisms Used in the Low Resolution Airglow and Aurora Spectrograph
Kalmanson, Philip; Starks, Russell; Thonnard, Stefan; Dymond, Kenneth; 37th Aerospace Mechanisms Symposium; May 2004, pp. 1-13; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The Low Resolution Airglow & Aurora Spectrograph (LORAAS) was an aeronomy Instrument designed by the Naval Research Laboratory (NRL). LORAAS was launched into polar orbit on February 23, 1999 aboard the ARGOS spacecraft and operated successfully until the shutdown of the spacecraft in April of 2002. Data gained from the on-orbit performance of the LORAAS mechanisms will be presented along with the performance data taken during ground testing. There were three mechanisms used in LORASS design and are as follows; a guillotine style dust cover door assembly (DCDA), a one-axis scan mirror assembly (SMA), and a detector door mechanism (DDM). These mechanisms are unique in that they must all adhere to the stringent requirements of contamination control due to the sensitivity of the optics used. In addition to supporting instrument operation while in space, some of these mechanisms, such as the DDM and DCDA, were essential for instrument operation while on the ground to aid in instrument construction, calibration and storage. This paper will present a description of the aforementioned mechanisms including an overview of the requirements driving their design, analysis performed on the mechanisms and their components, and final costs.
Author
Aeronomy; Airglow; Auroras; Resolution; Mechanical Engineering; Ultraviolet Spectrometers

20040084680 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Passive Measurement of CO2 Column from an Airborne Platform
Heaps, William S.; Kawa, S. R.; Wilson, Emily; Georgleva, Elena; [2004]; 3 pp.; In English; The 2004 Earth Science Technology Conference, 22-24 Jun. 2004, Palo Alto, CA, USA; No Copyright; Avail: CASI; A01, Hardcopy

We are in the third and final year of our IIP funding to develop a sensor for very precise determination of the CO2 Column. Global measurements of this sort from a satellite platform are needed to improve our understanding of the global carbon budget. In previous reports to this meeting we have described the method by which this system operates and presented data taken during ground based tests of the instrument. Work in the final year has concentrated on building the flight hardened version of the instrument that will be used in our field trials on the Dryden DC-8. The flight unit represents an integration of three channels into a single instrument. These three channels are the CO2 channel, the oxygen pressure sensing channel, and the oxygen temperature sensing channel. Integration of the three channels into a single unit significantly decreases the size of the instrument. The flight unit also employs more rugged optical mounts and integrated optical shielding. Light enters the instrument from below first striking the right angled mirror shown extending over the edge of the platform. The light is then focused through a pinhole to define the instrument field of view, chopped and recollimated. Dichroic mirrors are used to separate the CO2 wavelength from the O2 wavelength and that light is further divided by a 50-50 beamsplitter between the 2 oxygen channels - the pressure channel and the temperature channel. The six white boxes contain the detectors for each of the three channels. The detectors on the left in the photo serve the reference channels and the detectors on the right are for the Fabry-Perots. CO2 is measured by the pair of detectors farthest from the viewer. Pressure via O2 is detected by the central pair of detectors. The closest pair is used to determine temperature via O2.
Author (revised)
Carbon Dioxide; Airborne Equipment; Fabry-Perot Interferometers; Chemical Analysis

20040084776 Physics and Electronics Lab. TNO, The Hague, Netherlands
Scenarios for the Simulation of Infrared Signature Models
Lensen, H. A.; Koole, J.; June 2004; 76 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): 879.03.2882.01; MIWO-6149; TNO Proj. 015.33338
Report No.(s): FEL-04-A049; TD-2004-0118; Copyright; Avail: Other Sources

The Royal Netherlands Army is in the process of acquiring an Infantry Fighting Vehicle (IFV). For the purpose of this process a Program of Requirements has been written, including among other requirements regarding the susceptibility of the IFV to infrared systems. During the acquisition process the compliance of candidate vehicles to the requirements will be verified. One of the methods to support this process is based on simulations with infrared signature models of the vehicle. In order to carry out such model simulations well defined scenarios are required. Therefore, within the framework of this project, 10 generic scenarios have been defined. Next, these scenarios were translated into model parameters which is needed to run the actual simulation. In this way the infrared signature of the (candidate) IFV can be predicted for each scenario. In addition a test description has been formulated for the verification tests of the vehicle. This enables us to better evaluate the verification results. Moreover, in this way test data can be used in the validation process of the infrared signature model of the vehicle. The generic scenarios also can be used during the verification of, or tests with, other observation systems or e.g. anti-tank weapons.
Author
Infrared Signatures; Computerized Simulation; Tanks (Combat Vehicles)

20040084894 Dakota Technologies, Inc., Fargo, ND
Technology Demonstration of Sensor Applications to Direct Push Platforms and Monitoring and Operations
Jarski, Paul; St. Germain, Randy; Dec. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F41624-00-C8045
Report No.(s): AD-A424120; No Copyright; Avail: CASI; A03, Hardcopy

Dakota Technologies, Inc. (DTI) demonstrated the REMPI system's applicability to measure soil gas concentrations from vapor sampling points installed by the AFCEE owned Geoprobe 66DT. In August 2003, Mr. Jerry Hansen of AFCEE coordinated the effort to mobilize equipment and personnel to Shaw Air Force Base in South Carolina. This site provided an excellent opportunity to gather field data and provide beneficial subsurface information to Parsons Environmental for delineating a jet fuel plume at Shaw AFB, SC. The work occurred in one phase, totaling 3 working days. A total of 24 points were implanted with subsequent measurements recorded for each point.
DTIC
Soils

20040084895 Naval Facilities Engineering Service Center, Port Hueneme, CA
Assessment of Environmental Effects of Ordnance Compounds and their Transformation Products in Coastal Ecosystems
Carr, R. S.; Nipper, Marion; Dec. 2003; 165 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424122; NFESC-TR-2234-ENV; TAMU-CC-0303-CCS; No Copyright; Avail: CASI; A08, Hardcopy

This study was undertaken to help understand the fate and effects of two munitions and explosives of concern 2, 6-dinitrotoluene (2,6-DNT) and 2,4,6-trinitrophenol (picric acid) in marine environments Specifically biotransformation and degradation in marine sediments and photo-transformation in seawater were assessed. Studies were conducted with sediments spiked in the laboratory with the two chemicals of concern for the biotransformation assessments and by spiking filtered seawater with these chemicals for the photo- transformation assessments.
DTIC
Acids; Ammunition; Coasts; Ecosystems; Environment Effects; Environmental Surveys; Explosives; Marine Environments; Ordnance; Picrates

20040084913 California Inst. of Tech., Pasadena, CA
Three-Dimensional Structure of Turbulent Scalar Fields With Applications in Aerooptics
Dimotakis, Paul E.; Martin, Christopher; May 15, 2003; 17 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0036
Report No.(s): AD-A424146; AFRL-SR-AR-TR-04-0343; No Copyright; Avail: CASI; A03, Hardcopy

This is the final report for AFOSR Grant F49620-OO- l-0036, which ended 31 Jan 2003. This program aimed to develop

an interferometric technique for mitigating the effects of turbulence on visible-light imaging, complementary to techniques such as Adaptive Optics (AO) or speckle imaging. This technique employs a rotation shearing interferometer and high-speed, low-noise digital imaging system. Where an AO system would employ a complex high-bandwidth electro- mechanical system to mitigate the effects of turbulence, this interferometric technique relies on a novel (low-cost) optical design, high-speed detector electronics, and digital post- processing to obtain images. One significant advantage of this technique is the use of a large-format detector, which enables correction of aberrating fields with power at far higher wavenumbers than AO systems can accommodate. This technique has undergone a number of successful laboratory tests under weakly aberrating conditions, and data obtained at an astronomical observatory, currently under analysis, has passed several operational tests.
DTIC
Adaptive Optics; Scalars; Turbulence

20040084970 Defence Science and Technology Organisation, Salisbury
Clutter Spatial Distribution and New Approaches of Parameter Estimation for Weibull and K-Distributions
Dong, Yunhan; Apr. 2004; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424271; DSTO-RR-0274; DODA-AR-013-086; No Copyright; Avail: CASI; A04, Hardcopy

The spatial distribution of surface clutter in general depends on radar resolution, grazing angle and scatterers on the surface. The Weibull, K- and lognormal distributions are commonly used to approximate the clutter spatial distribution. Comparisons among all three distributions are reviewed and extended. Statistical properties of the Weibull and K- distributions in the log domain are derived and then used in new approaches, named as unbiased estimation schemes, for faster parameter estimation for the Weibull and K- distributions. The maximum likelihood estimates for the K-distribution are also derived without the need of the derivative of the Bessel function. The proposed unbiased estimation schemes provide nearly as identical estimates as the maximum likelihood scheme does, according to real aperture radar data and synthetic aperture radar data analysed.
DTIC
Clutter; Estimating; Spatial Distribution; Weibull Density Functions

20040084991 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Ion Based Pressure Sensor for Pulse Detonation Engines
Zdenek, Jeffrey S.; Mar. 2004; 113 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424303; AFIT/GAE/ENY/04-M17; No Copyright; Avail: CASI; A06, Hardcopy

A high speed, durable, ion probe based pressure sensor is being investigated for use in pulse detonation engines. Traditional pressure sensors are ill suited for the high temperature and vibratory environment encountered in such engines. An alternative transient pressure sensing method is investigated for pressures behind a hydrocarbon flame. These flames generate ions that are quenched by collisions as a function of pressure. An experiment was devised to correlate the ion decay rate with the pressure using an ion probe well suited for the flow. A correlation has been established showing the ion decay rate is a function of pressure. Additional investigation is required even though the ion probe remains a viable alternative method for measuring pressure.
DTIC
Ions; Pressure Sensors; Pulse Detonation Engines

20040085001 California Univ., Los Angeles, CA
Fermi Electronics: A Means of Correlating and Canceling Shot Noise From Solid State Devices
Brown, Elliot R.; Jun. 8, 2004; 48 pp.; In English
Contract(s)/Grant(s): DAAD19-99-1-0295
Report No.(s): AD-A424326; ARO-40145.1-EL; No Copyright; Avail: CASI; A03, Hardcopy

This project has developed a formalism for computing the shot noise in resonant- tunneling structures having an arbitrary number of quantum wells. It is based on the electrostatic feedback effect in quantum-well structures and is the first known shot noise formalism that treats the electrostatic and quantum effects in a self-consistent fashion. Simulation results are analyzed and compared to experimental results for an InGaAs/AlAs double-barrier structure, which is the fastest resonant tunneling diode ever characterized for its noise properties. Shot noise reduction and enhancement are predicted in the positive and negative differential resistance region, respectively, in satisfactory agreement with experiment. The shot noise reduction effect

is then studied for multiple-well resonant tunneling diodes. It is found that in properly designed structures the shot noise factor DTIC

Cancellation; Correlation; Quantum Theory; Quantum Wells; Shot Noise; Solid State; Solid State Devices

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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*.

20040084245 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

The Effects of Laser Illumination on Operational and Visual Performance of Pilots During Final Approach

Nakagawara, Van B.; Montgomery, Ronald W.; Dillard, Archie E.; McLin, Leon N.; Connor, C. William; June 2004; 16 pp.; In English

Contract(s)/Grant(s): FAA-AMB-03-PRS-94

Report No.(s): DOT/FAA/AM-04/9; No Copyright; Avail: CASI; A03, Hardcopy

Several hundred incidents involving the illumination of aircrew members by laser light have been reported in recent years, including several that could have had serious consequences. The purpose of this report is to evaluate the performance of pilots exposed to visible laser radiation during final approach maneuvers at 100 feet above the runway in the Laser-Free Zone (LFZ). Thirty-four pilots served as test subjects for this study. Pilot performance was assessed in a Boeing 727-200 Level C flight simulator using four eye-safe levels of visible laser light (0, 0.5, 5, and 50 microwatts per square centimeter) during four final approach maneuvers (three 30 degree left and one 30 degree right turn to final approach). Subjective responses were solicited after each trial and during an exit interview. The pilots were asked to rate on a scale from 1 to 5 (1 = none, 2 = slight, 3 = moderate, 4 = great, and 5 = very great) the affect each laser exposure had on their ability to operate the aircraft and on their visual performance. The average subjective ratings were calculated for each exposure level and flight maneuver, and an analysis of variance (ANOVA) was performed. Average subjective ratings for operational and visual performance were 2.93 (Range = 2.35 - 3.29; SD = 1.37) and 3.16 (Range = 2.56 - 3.62; SD = 1.30), respectively. ANOVA found statistically significant differences (p less than 0.05) between the 0.5 microwatt per square centimeter operational and visual performance ratings and those for the 5 and 50 microwatt per square centimeter exposures. Approximately 75% of the survey responses indicated that subjects experienced adverse visual effects resulting in some degree of operational difficulty when illuminated by low-level laser radiation. This study confirmed that the illumination of flight crewmembers with laser radiation greater than or equal to 0.5 microwatts per square centimeter is unacceptable in the LFZ. Provided the exposure limit established for the LFZ (i.e., 50n watts per square centimeter) is not exceeded, a sufficient margin of safety appears to exist for protecting pilots from accidental laser exposure during final approach.

Author

Illuminating; Laser Outputs; Pilot Performance; Aircraft Pilots; Visual Perception; Approach

20040084429 Ohio Aerospace Inst., Cleveland, OH, USA

Development of In-Situ Erosion Measurement Techniques for Application to Real-Time Determination of Plasma Thruster Component Lifetimes

[2004]; 17 pp.; In English

Contract(s)/Grant(s): NCC3-739; No Copyright; Avail: CASI; A03, Hardcopy

This research has resulted in advancing the laser-based diagnostic capability and the ion optics development in the ion propulsion program at NASA GRC. Laser-based plasma diagnostics have been demonstrated in tabletop experiments and, in the case of LDI, on laboratory hollow cathodes. Assessment by GRC of its resources and priorities two years into the grant lead to a refocusing of the research effort away from the development of a real-time erosion rate measurement technique. The extension of the diagnostic techniques to diagnostic tools has been transferred to graduate students under the technical direction of the PI. These diagnostics may facilitate the development of ion thruster with significantly improved throughput capability for lower-power (10 kW) missions High-Isp, Long-lived ion optics development has proceeded from simple extensions of state-of-the-art geometries to radically different geometries and materials. Full-scale testing of these ion optics has demonstrated a significant advance in the throughput capability of ion thrusters enabling significantly more demanding missions. The capability to predict the throughput was developed and will continue to be upgraded. The performance models

have been validated via full-scale testing. Partial validation of the throughput prediction will be completed via an upcoming wear test of the ion optics.
Derived from text
Erosion; In Situ Measurement; Real Time Operation; Ion Propulsion; Plasma Diagnostics; Thrust; Plasma Lifetime; Components

20040084617 Defence Science and Technology Organisation, Edinburgh, Australia
Models of Land Clutter Versus Grazing Angle, Spatial Distribution and Temporal Distribution: L-Band VV Polarisation Perspective
Dong, Yunhan; March 2004; 76 pp.; In English
Report No.(s): DSTO-RR-0273; DODA-AR-013-074; Copyright; Avail: Other Sources

Land clutter issues and modelling from a perspective of L-band VV polarisation are addressed. In particular, clutter distributions in three different dimensions are discussed in detail. First a three-term model for the dependence of land clutter on grazing angle is proposed. The model is site-specific and landcover-dependent. Parameters for dominant types of landcover in the Northern Territory region are regressed using AirSAR and MCARM measurements as well as others available in literature. Clutter spatial distribution is also investigated. Aimed at real-time implementation, a simple and fast parameter estimation scheme for the Weibull and K-distributions is given. The estimates are found to be nearly identical to the maximum likelihood estimates. Discussed finally in the report is the clutter temporal distribution (Doppler spectrum) due to motion of moving parts of scatterers. Billingsley's exponential decay model is summarized.
Author
Models; Clutter; Spatial Distribution; Temporal Distribution; Synthetic Aperture Radar

20040084800 NASA Langley Research Center, Hampton, VA, USA
Wind Measurements with High Energy 2 Micron Coherent Doppler Lidar
Barnes, Bruce W.; Koch, Grady J.; Petros, Mulugeta; Beyon, Jeffrey Y.; Amzajerdian, Farzin; Yu, Ji-Rong; Kavaya, Michael J.; Singh, Upendra N.; [2004]; 4 pp.; In English; 22nd International Laser Radar Conference, 12-16 Jul. 2004, Matera, Italy
Contract(s)/Grant(s): 23-319-02-02; Copyright; Avail: CASI; A01, Hardcopy

A coherent Doppler lidar based on an injection seeded Ho:Tm:YLF pulsed laser was developed for wind measurements. A transmitted pulse energy over 75 mJ at 5 Hz repetition rate has been demonstrated. Designs are presented on the laser, injection seeding, receiver, and signal processing subsystems. Sample data of atmospheric measurements are presented including a wind profile extending from the atmospheric boundary layer (ABL) to the free troposphere.
Author
Doppler Radar; Coherent Radiation; Optical Radar; Wind Velocity Measurement; Solid State Lasers; Wind Measurement; Energy Distribution

20040084985 Rochester Univ., NY
Instrumentation for Quantum and Nonlinear Optical Imaging
Boyd, Robert W.; Nov. 9, 2003; 7 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0169
Report No.(s): AD-A424294; ARO-41891.16-PH; No Copyright; Avail: CASI; A02, Hardcopy

The funding obtained from this grant was used to purchase a tunable femtosecond laser system for use in the investigator's research in quantum and nonlinear optical imaging. The finding arrived during the first year of the investigator's ARO project on this topic, and the availability of this new facility has contributed greatly to this research project. During the past year, we made the final selection of the laser system, placed the order for the laser, and installed it in our laboratory. The facility is now fully operational. The laser system was selected both because of its immediate relevance to our ARO-sponsored research program and because it is a very versatile laser system that can be tailored to a wide range of immediate and future applications. The short pulse duration produced by this system allows us to study high-intensity effects through use of only modest pulse energies. In this manner, we can avoid problems associated with laser damage and thereby be able to make use of the weaker but more versatile third-order nonlinear optical response for the generation of entangled and other quantum-correlated beams of light. The wavelength tunability of this laser system will allow us to make use of structural resonances in various material systems (such as PBG materials) to allow the large nonlinear response of such materials to be used for the

generation of quantum states of light. This equipment will be useful for the education of a diverse group of students.
DTIC
Images; Imaging Techniques; Nonlinearity; Tunable Lasers

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*.

20040084367 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Hardware Photos: Image Showing JWST Engineering Demonstration Mirror, Mounted Ready for Machining at AXYS and Image Showing HIP Can Containing Light Mirrors 1 and 2 Ready for Mirror Fabrication
OKeefe, Sean; [2004]; 6 pp.; In English; AAS Meeting, Jun. 2004, Denver, CO, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy

The images in this viewgraph presentation have the following captions: 1) EDU mirror after being sawed in half; 2) EDU Delivered to Axsys; 3) Be EDU Blank Received and Machining Started; 4) Loaded HIP can for flight PM segments 1 and 2; 5) Flight Blanks 1 and 2 Loaded into HIP Can at Brush-Wellman; 6) EDU in Machining at Axsys.
CASI
Machining; Segmented Mirrors

20040084413 NASA Ames Research Center, Moffett Field, CA, USA, Eloret Corp., Moffett Field, CA, USA
Impregnation of Catalytic Metals in Single-Walled Carbon Nanotubes for Toxic Gas Conversion in Life Support System
Li, Jing; Wignarajah, Kanapathipillai; Cinke, Marty; Partridge, Harry; Fisher, John; [2004]; 1 pp.; In English; 34th International Conference on Environmental Systems, 19-22 Jul. 2004, Colorado Springs, CO, USA
Contract(s)/Grant(s): 131-20-10; Copyright; Avail: Other Sources; Abstract Only

Carbon nanotubes (CNTs) possess extraordinary properties such as high surface area, ordered chemical structure that allows functionalization, larger pore volume, and very narrow pore size distribution that have attracted considerable research attention from around the world since their discovery in 1991. The development and characterization of an original and innovative approach for the control and elimination of gaseous toxins using single walled carbon nanotubes (SWNTs) promise superior performance over conventional approaches due to the ability to direct the selective uptake of gaseous species based on their controlled pore size, increased adsorptive capacity due to their increased surface area and the effectiveness of carbon nanotubes as catalyst supports for gaseous conversion. We present our recent investigation of using SWNTs as catalytic supporting materials to impregnate metals, such as rhodium (Rh), palladium (Pd) and other catalysts. A protocol has been developed to oxidize the SWNTs first and then impregnate the Rh in aqueous rhodium chloride solution, according to unique surface properties of SWNTs. The Rh has been successfully impregnated in SWNTs. The Rh-SWNTs have been characterized by various techniques, such as TGA, XPS, TEM, and FTIR. The project is funded by a NASA Research Announcement Grant to find applications of single walled nanocarbons in eliminating toxic gas Contaminant in life support system. This knowledge will be utilized in the development of a prototype SWNT KO, gas purification system that would represent a significant step in the development of high efficiency systems capable of selectively removing specific gaseous for use in regenerative life support system for human exploration missions.
Author
Impregnating; Catalysts; Carbon Nanotubes

20040084581 NASA Ames Research Center, Moffett Field, CA, USA, Eloret Corp., Moffett Field, CA, USA, California Univ., Santa Cruz, CA, USA
Integrating Carbon Nanotubes For Atomic Force Microscopy Imaging Applications
Ye, Qi; Cassell, Alan M.; Liu, Hongbing; Han, Jie; Meyyappan, Meyya; [2004]; 6 pp.; In English; Materials Research Society 2004 Spring Meeting, 12-16 Apr. 2004, San Francisco, CA, USA
Contract(s)/Grant(s): NAS2-99092; NAS2-03144; NSF 03-20512; No Copyright; Avail: CASI; A02, Hardcopy

Carbon nanotube (CNT) related nanostructures possess remarkable electrical, mechanical, and thermal properties. To produce these nanostructures for real world applications, a large-scale controlled growth of carbon nanotubes is crucial for the

integration and fabrication of nanodevices and nanosensors. We have taken the approach of integrating nanopatterning and nanomaterials synthesis with traditional silicon micro fabrication techniques. This integration requires a catalyst or nanomaterial protection scheme. In this paper, we report our recent work on fabricating wafer-scale carbon nanotube AFM cantilever probe tips. We will address the design and fabrication considerations in detail, and present the preliminary scanning probe test results. This work may serve as an example of rational design, fabrication, and integration of nanomaterials for advanced nanodevice and nanosensor applications.
Author
Carbon Nanotubes; Nanofabrication

20040084592 California Univ., Santa Cruz, CA, USA, Eloret Corp., Moffett Field, CA, USA
Large-Scale Fabrication of Carbon Nanotube Probe Tips For Atomic Force Microscopy Critical Dimension Imaging Applications
Ye, Qi Laura; Cassell, Alan M.; Stevens, Ramsey M.; Meyyappan, Meyya; Li, Jun; Han, Jie; Liu, Hongbing; Chao, Gordon; [2004]; 24 pp.; In English; Materials Research Society 2004 Spring Meeting, 12-16 Apr. 2004, San Francisco, CA, USA
Contract(s)/Grant(s): NAS2-99092; NAS2-03144; NSF 03-20512; No Copyright; Avail: CASI; A03, Hardcopy

Carbon nanotube (CNT) probe tips for atomic force microscopy (AFM) offer several advantages over Si/Si3N4 probe tips, including improved resolution, shape, and mechanical properties. This viewgraph presentation discusses these advantages, and the drawbacks of existing methods for fabricating CNT probe tips for AFM. The presentation introduces a bottom up wafer scale fabrication method for CNT probe tips which integrates catalyst nanopatterning and nanomaterials synthesis with traditional silicon cantilever microfabrication technology. This method makes mass production of CNT AFM probe tips feasible, and can be applied to the fabrication of other nanodevices with CNT elements.
CASI
Nanofabrication; Carbon Nanotubes; Nanostructures (Devices); Atomic Force Microscopy

20040084725 Office of Air Quality Planning and Standards, Research Triangle Park, NC
Regulatory Impact Analysis for the Stationary Reciprocating Internal Combustion Engine (RICE) NESHAP
Feb. 2004; 258 pp.; In English
Report No.(s): PB2004-105927; EPA/452/R-04/003; No Copyright; Avail: CASI; A12, Hardcopy

This report summarizes the benefits and costs associated with the National Emissions Standard for Hazardous Air Pollutants (NESHAP) for the Reciprocating Internal Combustion Engines (RICE) source category. This source category includes spark ignition engines that operate generally with natural gas and compression ignition engines that operate with diesel fuel, and can be classified as two-stroke, or four-stroke engines. They are also classified by the richness of the fuel mix: rich burn or lean burn. The affected RICE units operate in a variety of markets and service industries. For instance, some are typically used along natural gas pipelines to provide adequate pressure to transmit fuel through the pipeline. Others are also used to provide power in a remote area of an operation in industries such as health services, energy generation, oil and gas extraction, and quarrying of non-metallic minerals. The NESHAP for RICE will impact existing and new sources of RICE units and is expected to reduce HAP emissions by 5, 600 tons per year by the year 2005 due to controls required to achieve the MACT floorthe minimum level of control mandated by the Clean Air Act. The controls applied to RICE units will also achieve annual reductions of criteria pollutants, including: 234,400 tons of carbon monoxide (CO) per year by 2005, and 167, 900 tons of nitrogen oxides (NOx) per year, and 3,700 tons of particulate matter (PM (sub 10)).
NTIS
Internal Combustion Engines; Air Pollution; Carbon Monoxide; Contaminants

38
QUALITY ASSURANCE AND RELIABILITY

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

20040084257 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Delft, Netherlands
Shock Testing of a Personal Work Station (PWS) Console, Manufacturer Thales
Rink, M. R.; October 22, 2003; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A03/KM/155/13937; TNO Proj. 006.3817/01.01
Report No.(s): Rept-2003-CMC-R072; TD-2003-0204; Copyright; Avail: Other Sources

Shock tests have been carried out to assess the resistance of the PWS against under water shocks. The tests were

performed on the heavy weight shock machine at TNO's shock laboratory. After the tests visible damage was found. A functional inspection, performed by Sewaco, proved that no damage was done to the computer itself.
Author
Shock Tests; Workstations; Consoles

20040084372 NASA Ames Research Center, Moffett Field, CA, USA
Bounding the Resource Availability of Partially Ordered Events with Constant Resource Impact
Frank, Jeremy; April 13, 2004; 15 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We compare existing techniques to bound the resource availability of partially ordered events. We first show that, contrary to intuition, two existing techniques, one due to Laborie and one due to Muscettola, are not strictly comparable in terms of the size of the search trees generated under chronological search with a fixed heuristic. We describe a generalization of these techniques called the Flow Balance Constraint to tightly bound the amount of available resource for a set of partially ordered events with piecewise constant resource impact We prove that the new technique generates smaller proof trees under chronological search with a fixed heuristic, at little increase in computational expense. We then show how to construct tighter resource bounds but at increased computational cost.
Derived from text
Boundaries; Proving; Constraints; Balance

20040084611 NASA Ames Research Center, Moffett Field, CA, USA
Towards Risk Based Design for NASA's Missions
Tumer, Irem Y.; Barrientos, Francesca; Meshkat, Leila; September 23, 2004; 19 pp.; In English; 2004 ASME International Mechanical Engineering Congress Expo, 13-19 Nov. 2004, Anaheim, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

This paper describes the concept of Risk Based Design in the context of NASA s low volume, high cost missions. The concept of accounting for risk in the design lifecycle has been discussed and proposed under several research topics, including reliability, risk analysis, optimization, uncertainty, decision-based design, and robust design. This work aims to identify and develop methods to enable and automate a means to characterize and optimize risk, and use risk as a tradeable resource to make robust and reliable decisions, in the context of the uncertain and ambiguous stage of early conceptual design. This paper first presents a survey of the related topics explored in the design research community as they relate to risk based design. Then, a summary of the topics from the NASA-led Risk Colloquium is presented, followed by current efforts within NASA to account for risk in early design. Finally, a list of ″risk elements″, identified for early-phase conceptual design at NASA, is presented. The purpose is to lay the foundation and develop a roadmap for future work and collaborations for research to eliminate and mitigate these risk elements in early phase design.
Author
Reliability Analysis; Risk

20040084699 Texas A&M Univ., College Station, TX, USA
Error Correction, Control Systems and Fuzzy Logic
Smith, Earl B.; July 19, 2004; 12 pp.; In English
Contract(s)/Grant(s): NAG4-210; No Copyright; Avail: CASI; A03, Hardcopy

This paper will be a discussion on dealing with errors. While error correction and communication is important when dealing with spacecraft vehicles, the issue of control system design is also important. There will be certain commands that one wants a motion device to execute. An adequate control system will be necessary to make sure that the instruments and devices will receive the necessary commands. As it will be discussed later, the actual value will not always be equal to the intended or desired value. Hence, an adequate controller will be necessary so that the gap between the two values will be closed.
Author
Control Systems Design; Error Analysis; Fuzzy Systems; Errors

39
STRUCTURAL MECHANICS

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

20040084593 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Development of a New Test Set-Up for Dynamic Tensile Tests on Concrete Under High Loading Rates, Part 2, Results and Evaluation of Test Series B and C on Concrete
Weerheijm, J.; vanDoormaal, J. C. A. M.; vandeKasteele, R. M.; November 2003; 60 pp.; In English
Contract(s)/Grant(s): A01/D/434; TNO Proj. 014.11905
Report No.(s): TD-2002-0261-Pt-2; PML-2003-A87-Pt-2; Copyright; Avail: CASI; A04, Hardcopy

For the numerical prediction of the response of concrete structures under extreme dynamic loading, like impact and explosions, reliable material data and material models are crucial. The ministry of Defence tasked TNO Prins Maurits Laboratory (TNO-PML) to develop a test method for testing concrete material at high loading rates. An alternative of the Split Hopkinson Bar test methodology was selected and developed successfully. It is based on the old principle of spalling, but equipped with up to date diagnostics and to be combined with advanced numerical simulations. Data on dynamic tensile strength and, most important, on fracture energy at loading rates up to 1000 GPa/s are obtained. The current report, Part 2, describes the instrumentation, the two test series on concrete specimen and the analyses of the test results. The test method offers the opportunity to determine the material properties in direct tension at high loading rates and can be applied at large scale specimen also. The rate effects at the loading rate of 1000 GPa/s for the concrete tested are: tensile strength, factor 5.3; Young's modulus, factor 1.2 and fracture energy, upper bound limit of 2.5.
Author
Tensile Tests; Concretes; Dynamic Loads

20040084596 NASA Marshall Space Flight Center, Huntsville, AL, USA
Design Development Analyses in Support of a Heat Pipe-Brayton Cycle Heat Exchanger
Steeve, B. E.; Kapernick, R. J.; May 2004; 31 pp.; In English
Report No.(s): NASA/TM-2004-213170; M-1104; No Copyright; Avail: CASI; A03, Hardcopy

A heat pipe-cooled reactor coupled to a Brayton cycle is currently under consideration for nuclear electric propulsion or as a planetary surface power source. In this system, power is transferred from the heat pipes to the Brayton gas via a heat exchanger attached to the heat pipes. This Technical Memorandum (TM) discusses the fluid, thermal, and structural analyses that were performed in support of the design of the heat exchanger to be tested in the Safe, Affordable Fission Engine experimental program at Marshall Space Flight Center. A companion paper, Mechanical Design and Fabrication of a SAFE 100 Heat Exchanger for use in NASA's Advanced Propulsion Thermal-Hydraulic Simulator, presents the fabrication issues and prototyping studies that, together with these analyses, led to the development of this heat exchanger. An important consideration throughout the design development of the heat exchanger was its capability to be used for higher power and temperature applications. This TM also discusses this aspect of the design and presents designs for specific applications under consideration.
Author
Brayton Cycle; Fabrication; Heat Exchangers; Heat Pipes; Mechanical Engineering; Thermal Analysis

20040084679 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Research on Explosion-Resistant Ship Panels, Phase 3, Failure Criterion for a Plate with Fragment Holes
vanWees, R. M. M.; January 2004; 27 pp.; In English
Contract(s)/Grant(s): A00/KM/460; TNO Proj. 014.13047
Report No.(s): PML-2003-A73-Phase 3; TD-2002-0247-Phase 3; Copyright; Avail: Other Sources

An experimental study was done to develop a failure criterion for the allowable membrane strain in a steel bulkhead perforated by fragment holes.
Author
Ships; Bulkheads; Steels; Explosions; Holes (Mechanics); Damage

20040084711 Lawrence Livermore National Lab., Livermore, CA
Damage Prediction and Estimation in Structural Mechanics Based on Data Mining
Sandhu, S. S.; Kanapady, R.; Tamma, K. K.; Kamath, C.; Kumar, V.; Jul. 23, 2001; In English
Report No.(s): DE2004-15006200; UCRL-JC-144764; No Copyright; Avail: National Technical Information Service (NTIS)
No abstract available
Structural Analysis; Damage

20040084809 NASA Langley Research Center, Hampton, VA, USA
Measurements of Acoustic Properties of Porous and Granular Materials and Application to Vibration Control
Park, Junhong; Palumbo, Daniel L.; [2004]; 10 pp.; In English; Noise-Con 2004, 12-14 Jul. 2004, Baltimore, MD, USA
Contract(s)/Grant(s): 23-781-10-13; No Copyright; Avail: CASI; A02, Hardcopy
For application of porous and granular materials to vibro-acoustic controls, a finite dynamic strength of the solid component (frame) is an important design factor. The primary goal of this study was to investigate structural vibration damping through this frame wave propagation for various poroelastic materials. A measurement method to investigate the vibration characteristics of the frame was proposed. The measured properties were found to follow closely the characteristics of the viscoelastic materials - the dynamic modulus increased with frequency and the degree of the frequency dependence was determined by its loss factor. The dynamic stiffness of hollow cylindrical beams containing porous and granular materials as damping treatment was measured also. The data were used to extract the damping materials characteristics using the Rayleigh-Ritz method. The results suggested that the acoustic structure interaction between the frame and the structure enhances the dissipation of the vibration energy significantly.
Author
Structural Vibration; Granular Materials; Acoustic Properties; Porous Materials; Energy Dissipation

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20040084571 NASA Ames Research Center, Moffett Field, CA, USA
Visualizing Distributions from Multi-Return Lidar Data to Understand Forest Structure
Kao, David L.; Kramer, Marc; Luo, Alison; Dungan, Jennifer; Pang, Alex; February 17, 2004; 8 pp.; In English; 12th International Conference on Geoinformatics, 7-9 Jun. 2004, Gavle, Sweden
Contract(s)/Grant(s): NCC2-1260; NSF ACI-99-08881; RTOP 704-40-42; No Copyright; Avail: CASI; A02, Hardcopy
Spatially distributed probability density functions (PDFs) are becoming relevant to the Earth scientists and ecologists because of stochastic models and new sensors that provide numerous realizations or data points per unit area. One source of these data is from multi-return airborne lidar, a type of laser that records multiple returns for each pulse of light sent towards the ground. Data from multi-return lidar is a vital tool in helping us understand the structure of forest canopies over large extents. This paper presents several new visualization tools that allow scientists to rapidly explore, interpret and discover characteristic distributions within the entire spatial field. The major contribution from-this work is a paradigm shift which allows ecologists to think of and analyze their data in terms of the distribution. This provides a way to reveal information on the modality and shape of the distribution previously not possible. The tools allow the scientists to depart from traditional parametric statistical analyses and to associate multimodal distribution characteristics to forest structures. Examples are given using data from High Island, southeast Alaska.
Author
Canopies (Vegetation); Forests; Probability Density Functions; Spatial Distribution; Data Acquisition; Optical Radar

20040084632 NASA Ames Research Center, Moffett Field, CA, USA, California State Univ., Monterey Bay, CA, USA
Canopy Cover Predictions using Ground Observations and Remotely Sensed Data
Dungan, Jennifer L.; June 1, 1999; 1 pp.; In English; Ecological Society of America Annual Meeting, 8-12 Aug. 1999, Spokane, WA, USA
Contract(s)/Grant(s): RTOP 622-93-30-10; No Copyright; Avail: Other Sources; Abstract Only
Maps of vegetation status are needed at many scales, from the field level to monitor ecosystem condition to the global level to understand the carbon cycle. Status is quantified by such variables as leaf area index, biomass, and fraction of canopy

cover. Current methods of predicting vegetation variables use remote sensing data to provide a spatially exhaustive data source. In a study in western Montana, several hundred ground observations made by the US Forest Service on tenth-acre conifer plots were used to develop aspatial regression and geostatistical prediction models. Normalized Difference Vegetation Index (NDVI) values from Landsat Thematic Mapper images were used as ancillary data. These models were then used to predict canopy cover at unsampled locations in a 97 square kilometer region on the boundary of the Flathead National Forest and the Bob Marshall Wilderness. Independent data from two dates six years apart were used for validation. Given the assumption that actual canopy cover remained relatively unchanged within this time period, partial validation can be achieved by measuring the correspondence of the two maps. This criterion results in ranking the aspatial regression maps as less accurate than the geostatistically generated maps. The geostatistical approach emphasizes ground measurements more heavily than does aspatid regression. Geostatistical simulations of canopy cover also provide a means of describing uncertainty about the patterns of canopy cover.
Author
Vegetation; Thematic Mappers (Landsat); Normalized Difference Vegetation Index; Leaf Area Index; Biomass; Remote Sensing; Carbon Cycle

20040085417 Cincinnati Univ., OH, USA
Variation of Kd for Fe-Mg Exchange Between Olivine and Melt for Compositions Ranging from Alkaline Basalt to Rhyolite
Kilinc, Attila I.; Tammie, Gerke; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 37; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Analysis of more than 200 olivine-melt pairs in terms of Fe-Mg exchange between olivine and coexisting melt indicates that Kd varies with bulk composition and oxygen fugacity. For tholeiitic basalts Kd value is 0.3 +/- 0.03; however, as the composition changes from tholeiitic to alkaline the Kd decreases to as low as 0.18. On the other end of the compositional spectrum as the silica content of melts increase to rhyolitic composition Kd increases up to 0.68. Our calculations of Rd using Sack et al., Kilinc et al. and Kress and Carmichael equations relating Fe(+3)/Fe(+2) to temperature, oxygen fugacity and compositional parameters shows that Kd is a function of composition. Using S/SCAM as the differentiation index a third degree polynomial equation value of Kd can be calculated for any bulk composition. InK(sub D)=24.937*(S/SCAM)(exp 3)-27.769*(S/SCAM)(exp 2)+9.9783*(S/SCAM)-2.4363
Author
Iron; Magnesium; Olivine; Melts (Crystal Growth)

20040085430 Vermont Univ., Burlington, VT, USA
Metallic Liquid Segregation in Planetesimals
Rushmer, T.; Petford, N.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 57; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Segregation of Fe-Ni-S-O liquids during partial melting of chondritic parent material imparts a distinct geochemical signature on the composition of residual metal and helps determine siderophile partitioning behavior. Chemical signatures will vary according to initial parent body composition, physical segregation mechanisms and at what degree of partial melting core-forming liquids are extracted. In this study, geochemical data from deformation experiments performed on partially molten ordinary chondrite (Kernouve) have been collected on Fe-S-Ni-O quench and associated Fe-Ni residual metal by electron probe and LA-ICPMS. Siderophile concentrations in the quench liquid and associated metal, dynamically segregated at different degrees of partial melting, were used to calculate partition coefficients for different solid metal/liquid metal compositions and are reported in. Deformation in segregating liquid metal from silicate most likely plays a more important role in core formation than previously thought and here we present experimental results and a model which drives segregation by pressure gradients developed in the silicate matrix undergoing porous flow and pure shear. The model also provides estimates of segregation rates. Combined with the geochemical data, possible links between liquid fraction chemistry and rate of transport may be made.
Derived from text
Liquid Metals; Chondrites; Signatures; Inductively Coupled Plasma Mass Spectrometry; Pressure Gradients; Protoplanets; Geochemistry

20040085449 NASA Johnson Space Center, Houston, TX, USA
Micro-XANES Measurements on Experimental Spinels and the Oxidation State of Vanadium in Spinel-Melt Pairs
Righter, K.; Sutton, S.R.; Newville, M.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 54; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Spinel can be a significant host phase for V as well as other transition metals such as Ni and Co. However, vanadium has multiple oxidation states V(2+), V(3+), V(4+) or V(5+) at oxygen fugacities relevant to natural systems. We do know that D(V) spinel/melt is correlated with V and TiO2 content and fO2, but the uncertainty of the oxidation state under the range of natural conditions has made elusive a thorough understanding of D(V) spinel/melt. For example, V(3+) is likely to be stable in spinels, based on exchange with Al in experiments in the CaO-MgO-Al2O3-SiO2 system. On the other hand, it has been argued that V(4+) will be stable across the range of natural oxygen fugacities in nature. In order to gain a better understanding of D(V) spinel/melt we have equilibrated spinel-melt pairs at controlled oxygen fugacities, between HM to NNO, where V is present in the spinel at natural levels (approx. 300 ppm V). These spinel-melt pairs were analyzed using micro-XANES at the Advanced Photon Source at Argonne National Laboratory. The new results will be used together with spinel compositional data (Ti, V content) and oxygen fugacity, to unravel the effects of these variables on D(V) spinel/melt.
Author
Spinel; Oxidation; Vanadium

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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 of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20040084419 NASA Ames Research Center, Moffett Field, CA, USA
An Agent-Based Interface to Terrestrial Ecological Forecasting
Golden, Keith; Nemani, Ramakrishna; Pang, Wan-Lin; Votava, Petr; Etzioni, Oren; April 20, 2004; 7 pp.; In English; 4th Annual Earth Science Technology Conference, 22-24 Jun. 2004, Palo Alto, CA, USA; Copyright; Avail: CASI; A02, Hardcopy

This paper describes a flexible agent-based ecological forecasting system that combines multiple distributed data sources and models to provide near-real-time answers to questions about the state of the Earth system We build on novel techniques in automated constraint-based planning and natural language interfaces to automatically generate data products based on descriptions of the desired data products.
Author
Ecosystems; Forecasting; Real Time Operation; Interfaces

20040084439 Alcorn State Univ., Lorman, MS, USA
Overview, Analysis and Research Results of a CERCLA Site: A Model Study? and the NAFT Experience
Hunt, Clinton, Jr.; April 20, 2004; 31 pp.; In English
Contract(s)/Grant(s): NAG5-10153
Report No.(s): SPPT-1000-0001; No Copyright; Avail: CASI; A03, Hardcopy

THe paper discusses the following: What do we want to accomplish? How do we want to accomplish it? When do we expect to complete each task? CERCLA stands for: Comprehensive, Environmental, Response, Compensation, Liability, and Act.
CASI
Liabilities; Research Facilities; Environments

20040084441 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multisensor Fire Observations
Boquist, C.; February 2004; 3 pp.; In English; Original contains color illustrations
Report No.(s): NASA/EC-2004-2-013-GSFC; No Copyright; Avail: CASI; C01, CD-ROM; A01, Hardcopy

This DVD includes animations of multisensor fire observations from the following satellite sources: Landsat, GOES, TOMS, Terra, QuikSCAT, and TRMM. Some of the animations are included in multiple versions of a short video presentation on the DVD which focuses on the Hayman, Rodeo-Chediski, and Biscuit fires during the 2002 North American fire season. In one version of the presentation, MODIS, TRMM, GOES, and QuikSCAT data are incorporated into the animations of these wildfires. These data products provided rain, wind, cloud, and aerosol data on the fires, and monitored the smoke and destruction created by them. Another presentation on the DVD consists of a panel discussion, in which experts from academia, NASA, and the U.S. Forest Service answer questions on the role of NASA in fighting forest fires, the role of the Terra satellite and its instruments, including the Moderate Resolution Imaging Spectroradiometer (MODIS), in fire fighting decision making,

and the role of fire in the Earth's climate. The third section of the DVD features several animations of fires over the years 2001-2003, including animations of global and North American fires, and specific fires from 2003 in California, Washington, Montana, and Arizona.
CASI
Satellite Observation; Forest Fires; Scientific Visualization; MODIS (Radiometry); Satellite-Borne Instruments; Fire Fighting; Environmental Monitoring

20040084787 Washington Univ., Seattle, WA, USA
Changes in Seasonal Cloud Cover over the Arctic Seas from Satellite and Surface Observations
Schweiger, Axel J.; Geophysical Research Letters; June 19, 2004; ISSN 0094-8276; Volume 31, pp. L12207-L12207; In English
Contract(s)/Grant(s): NAG5-11585; NAG5-11800; NNG04GH52G; NOAA-NA-17RJ1232; Copyright; Avail: Other Sources

Winter and spring changes in cloudiness are compared over the arctic seas (ocean areas north of 60 degrees N) from the TOVS (TIROS Operational Vertical Sounder) Polar Pathfinder retrievals and two separate datasets derived from the Advanced Very High Resolution Radiometer (AVHRR). All satellite products exhibit significant decreases in cloud fraction over the arctic seas during winter (December, January, February) on the order of 5 %/ decade. An equally striking increase in spring (March, April, May) cloudiness is evident from the TOVS Pathfinder (TPP) and the extended AVHRR Polar Pathfinder (APP-x) projects. In the Central Arctic these positive trends can be as large as 15 %/decade. Surface observations from the Russian drifting meteorological stations are consistent with satellite-observed changes during the 1980s. Negative trends in spring cloudiness reported by Comiso [2003] are in conflict with these findings. Spring changes in cloudiness are associated with changes in the atmospheric circulation. These dramatic, large-scale changes may have substantial impacts on the surface energy balance.
Derived from text
Arctic Ocean; Arctic Regions; Cloud Cover; Satellite Observation; Remote Sensing; Annual Variations

20040085388 NASA Marshall Space Flight Center, Huntsville, AL, USA, Maine Univ., Orono, ME, USA
Monitoring the Mesoamerican Biological Corridor: A NASA/CCAD Cooperative Research Project
Sever, Thomas; Irwin, Daniel; Sader, Steven A.; Saatchi, Sassan; July 31, 2004; 5 pp.; In English
Contract(s)/Grant(s): NAG5-8712; No Copyright; Avail: CASI; A01, Hardcopy

To foster scientific cooperation under a Memorandum of Understanding between NASA and the Central American countries, the research project developed regional databases to monitor forest condition and environmental change throughout the region. Of particular interest is the Mesoamerican Biological Corridor (MBC), a chain of protected areas and proposed conservation areas that will link segments of natural habitats in Central America from the borders of northern Columbia to southern Mexico. The first and second year of the project focused on the development of regional satellite databases (JERS-IC, MODIS, and Landsat-TM), training of Central American cooperators and forest cover and change analysis. The three regional satellite mosaics were developed and distributed on CD-ROM to cooperators and regional outlets. Four regional remote sensing training courses were conducted in 3 countries including participants from all 7 Central American countries and Mexico. In year 3, regional forest change assessment in reference to Mesoamerican Biological Corridor was completed and land cover maps (from Landsat TM) were developed for 7 Landsat scenes and accuracy assessed. These maps are being used to support validation of MODIS forest/non forest maps and to examine forest fragmentation and forest cover change in selected study sites. A no-cost time extension (2003-2004) allowed the completion of an M.S. thesis by a Costa Rican student and preparation of manuscripts for future submission to peer-reviewed outlets. Proposals initiated at the end of the project have generated external funding from the U.S. Forest Service (to U. Maine), NASA-ESSF (Oregon State U.) and from USAID and EPA (to NASA-MSFC-GHCC) to test MODIS capabilities to detect forest change; conduct literature review on biomass estimation and carbon stocks and develop a regional remote sensing monitoring center in Central America. The success of the project has led to continued cooperation between NASA, other federal agencies, and scientists from all seven Central American Countries (see SERVIR web site for this ongoing work - servir.nsstc.nasa.gov).
Derived from text
Project Management; Training Analysis; MODIS (Radiometry); Imaging Spectrometers; Data Bases; Biomass

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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*.

20040084340 Helsinki Univ. of Technology, Espoo
Advanced Energy Systems Annual Report 2002
Konttinen, P.; Noponen, M.; Apr. 2003; 94 pp.; In English
Report No.(s): PB2004-105302; TKK-F-C195; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction; Research: New and Renewable Energy Systems; Fusion and Plasma Physics; Radiation Physics and Nuclear Engineering; Laser Physics and Applications; Public Relations; Teaching Activities: Academic Degrees and Theses; Course Selection; Publications: New and Renewable Energy Systems; Fusion and Plasma Physics; Radiation Physics; Scientific Visits and Professional Activities: Visitors to the Laboratory; Visits and Activities of the Staff.
NTIS
Energy Storage; Energy Policy

20040084358 First Solar, LLC, Perrysbury, OH, USA
Research Leading to High Throughout Processing of Thin-Film CdTe PV Module. Phase I Annual Report, October 2003
Powell, R. C.; Meyers, P. V.; Feb. 2004; In English
Report No.(s): DE2004-15006751; NREL/SR-520-35348; No Copyright; Avail: National Technical Information Service (NTIS)

Work under this subcontract contributes to the overall manufacturing operation. During Phase I, average module efficiency on the line was improved from 7.1% to 7.9%, due primarily to increased photocurrent resulting from a decrease in CdS thickness. At the same time, production volume for commercial sale increased from 1. 5 to 2.5 MW/yr. First Solar is committed to commercializing CdTe-based thin-film photovoltaics. This commercialization effort includes a major addition of floor space and equipment, as well as process improvements to achieve higher efficiency and greater durability. This report presents the results of Phase I of the subcontract entitled 'Research Leading to High Throughput Processing of Thin-Film CdTe PV Modules.' The subcontract supports several important aspects needed to begin high-volume manufacturing, including further development of the semiconductor deposition reactor, advancement of accelerated life testing methods and understanding, and improvements to th e environmental, health, and safety programs.
NTIS
Cadmium Tellurides; Accelerated Life Tests

20040084359 ITN Energy Systems, Inc., Littleton, CO, USA, Colorado School of Mines, Golden, CO
Plasma-Assisted Coevaporation of S and Se for Wide Band Gap Chalcopyrite Photovoltaics
Repins, I.; Wolden, C.; Jan. 2004; In English
Report No.(s): DE2004-15006755; NREL/SR-520-35515; No Copyright; Avail: National Technical Information Service (NTIS)

In this work, ITN Energy Systems (ITN) and lower-tier subcontractor Colorado School of Mines (CSM) explore the replacement of the molecular chalcogen precursors during deposition (e.g., Se2 or H2Se) with more reactive chalcogen monomers or radicals (e.g., Se). Molecular species are converted to atomic species in a low-pressure inductively coupled plasma (ICP). Tasks of the proposed program center on development and validation of monatomic chalcogen chemistry, tuning of low-pressure monomer chalcogen sources, and evaluation of plasma-assisted co-evaporation (PACE) for CIGS co-evaporation.
NTIS
Solar Energy; Photovoltaic Conversion; Energy Gaps (Solid State); Atmospheric Chemistry

20040084609 Defence Science and Technology Organisation, Edinburgh, Australia
Alternative Fuels and Propulsion Systems: Some Technology Trends and Possible Implications for the Future Army
Dortmans, Peter J.; May 2004; 66 pp.; In English
Report No.(s): DSTO-TN-0551; DODA-AR-013-094; Copyright; Avail: CASI; A04, Hardcopy

Alternative fuels and propulsion systems are key emerging science and technology areas that will impact on defence in the next two decades. This report explores some of the associated issues in order to gauge where and how they might influence the military within the Army-After-Next timeframe. Our analysis is built upon an environmental scan of New Scientist magazine, from which we identified a number of key emerging themes - Strategic Issues, Non-renewable sources, Renewable sources, Recycled energy sources, Novel materials, Miniaturised systems and Novel approaches to propulsion. For each of these, technological developments are captured and considered in terms of their implications, both on military systems directly, and the broader implications for the future context. The impacts on Land Force core skills within the Army-as-a-system framework of these technologies are discussed.
Author
Propulsion System Configurations; Renewable Energy; Technology Assessment; Energy Policy

20040084889 Idaho Univ., Moscow, ID
Protection and Reconfiguration of Zonal Distribution Systems
Johnson, Brian K.; Hess, Herbert L.; Mar. 2003; 5 pp.; In English
Contract(s)/Grant(s): N00014-00-1-0477
Report No.(s): AD-A424111; No Copyright; Avail: CASI; A01, Hardcopy

This research project focused in three areas. The first area developed fault detection and location schemes for ungrounded and high resistance grounded power systems. An evaluation of the impacts of different grounded schemes on system protection and power quality was conducted. The second area concentrated on developing schemes to isolate sensitive loads from voltage sags caused by faults and pulsed loads. One project developed a fault current limiter based on a vector- switching. A second implemented a static series compensator with a flywheel energy storage system to connect between sensitive loads and the system. The third developed an interface for pulsed loads combined with local energy storage. The third area of this project developed an analog model power system for testing protection schemes and power electronic converters.
DTIC
Electric Power Transmission; Protection; Supplying

20040084947 Army Inst. of Surgical Research, Fort Sam Houston, TX
Evaluation of Two Mechanical Ventilators for Use in U.S. Army Combat Support Hospitals
VanPutte, William; Arevalo, Tia; Greydanus, Dominique; Cancio, Leopoldo; Jun. 2004; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424230; No Copyright; Avail: CASI; A03, Hardcopy

Patients who cannot or will not be evacuated to a fixed facility for an extended period of time may require long- term ventilator care. We studied two ventilators to determine which could better fulfill the needs of Army Combat Support Hospitals. VersaMed iVent and Drager Savina ventilators were tested in a 22-day study at the U.S. Army Institute of Surgical Research, Fort Sam Houston, Tx; Brooke Army Medical Center, Fort Sam Houston, TX; and Camp Bullis, TX between 14 April and 5 May 2004. Battery life and charge time, durability of ventilators underfield conditions, physical properties and restrictions, and ease of use were examined. Battery charge time for the iVent was nearly 4 times longer than for the Savina ventilator in our test. The iVent outperformed the Savina ventilator in the other categories. Both ventilators present limitations such as yearly checkup requirements by company-certified technicians, obligatory battery recharge every 6 months, and storage temperature restrictions. The life of the internal batteries for both devices was short (approximately one hour) . Of the two ventilators, our testing and user feedback recommend the VersaMed iVent ventilator. For either ventilator the purchase of optional external batteries should be considered.
DTIC
Combat; Hospitals; Support Systems; Ventilators

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ENVIRONMENT POLLUTION

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

20040084349 West Virginia Univ., Morgantown, WV
Medium Heavy-Duty Truck Test Cycle Evaluation
Clark, N. N.; Gautam, M.; Wayne, W. S.; Lyons, D. W.; Feb. 2004; 50 pp.; In English
Report No.(s): PB2004-105711; No Copyright; Avail: CASI; A03, Hardcopy

A Medium Heavy-Duty Truck (MHDT) schedule, developed by the California Air Resources Board (ARB), was examined experimentally to determine its suitability as a future research tool. The MHDT was developed to aid in emissions characterization of trucks with 14,001 to 33, 000 lb. gross vehicle weight, exercised on a chassis dynamometer. This weight range encompasses a wide variety of vehicles, with varying power to weight ratios and with synchronized manual, unsynchronized manual, and automatic transmissions. A major objective of this program was to examine repeatability of emissions data from MHDT driven through this schedule. The MHDT schedule consisted of three modes; namely, a Lower Speed Transient, a Higher Speed Transient, and a Cruise mode. The maximum speeds of these modes were 28. 9, 58.2 and 66.0 mph, respectively.
NTIS
Air Pollution; Automatic Test Equipment; Automatic Control

20040084564 NASA Ames Research Center, Moffett Field, CA, USA
Analysis of North Atlantic Aircraft Data on Oxygenated Intermediate Species Using an Adapted Regional Chemistry-Transport Model
Chatfield, Robert; Mathur, Rohit; Alapaty, Kiran; Hanna, Adel; Binkowski, Frank; Guan, Hong; Esswein, Robert; [2004]; 2 pp.; In English; American Chemistry Council, 4-6 May 2004, Miami, FL, USA
Report No.(s): ATM0008; No Copyright; Avail: CASI; A01, Hardcopy

Our study is on the interaction of nitrogen oxides with organics as they are exported from their complex sources in Eastern North America. Both urban and specific industrial emissions contribute the nitrogen of the C-H-O-N compounds that affect the global atmosphere, helping determine both ozone and the self-cleaning radical chemistry of the troposphere mediated by the OH radical. Different industrial sources, urban, and natural emissions contribute the organic C. Peroxyacetyl nitrate, CH3C(double bonds O)OONO2 is the most interesting compound for which we can measure the outflow to the full depth of the Atlantic troposphere. As we adapt the 3-d chemical model to describe outflow for specific periods with sufficient accuracy, we are analyzing some valuable information in the NARE-97 complete airborne dataset. (NARE: North Atlantic Regional Experiment). Ames researchers find that there are substantial puzzles in the ratios of PAN/NO2. Peroxy acetyl nitrate provides one of the major long-distance export pathways for active nitrogen from Eastern North America. It should be closely linked with NO, (defined as the sum NO + NO2) by simple thermal association and decomposition reactions, at least when the ambient temperature is substantially above 5 C.
Derived from text
Acetic Acid; Air Pollution; Atmospheric Chemistry; Nitrogen Oxides; Oxygenation

20040084663 NASA Marshall Space Flight Center, Huntsville, AL, USA
Toxic Gas Exposure Risks Associated With Potential Shuttle Catastrophic Failures
Anderson, B. Jeffrey; McCaleb, Rebecca C.; June 2004; 105 pp.; In English
Report No.(s): NASA/TP-2004-213284; M-1116; No Copyright; Avail: CASI; A06, Hardcopy

From early in the Shuttle program, the National Aeronautics and Space Administration has modeled hydrogen chloride (HCl) release by burning solid propellant in the solid rocket boosters. In 1998, the USA Air Force 45th Space Wing instituted more stringent launch commit criteria (LCC) for the Titan and Delta vehicles and proposed that the same LCC be applied to the Shuttle to enhance safety of onsite visitors and offsite public. Two types of health and safety standards were applicable: (1) Expected casualties and risk and (2) air quality emergency response. This study addresses the issues using the U.S. Environmental Protection Agency-recommended model, CALPUFF. Results were compared to those produced by the USAF model, REEDM, developed for projecting air quality from nominal launches. Model performance was also evaluated against results of a Kennedy Space Center-sponsored study at the Los Alamos National Laboratory (LANL) using a computer intensive, wild-fire model. CALPUFF and the LANL model are capable of multipuff modeling of multiple sources. REEDM is a single-source, single-puff model. This study revealed significant deficiencies in REEDM when applied to the catastrophic failure problem. CALPUFF results indicate that, if a Shuttle abort were to occur over land, serious levels of HCl exposure could occur out to distances of at least 10 km, sufficient range to include major onsite visitor viewing areas. A preliminary survey of mitigation alternatives indicates cost-effective measures could be implemented that are sufficiently protective. Recent safety initiatives in response to the Columbia Accident Investigation Board report are not reflected here.
Derived from text
Toxicity; Space Shuttle Boosters; Casualties; Combustion; Atmospheric Models; Exposure

20040084692 Environmental Protection Agency, Las Vegas, NV, USA
Regional Vulnerability Assessment for the Mid-Atlantic Region: Evaluation of Integration Methods and Assessments Results
2003; In English
Report No.(s): PB2004-104952; EPA/600/R-03/082; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes methods for quantitative regional assessment developed by the Regional Vulnerability Assessment (ReVA) program. The goal of ReVA is to develop regional-scale assessments of the magnitude, extent, distribution, and uncertainty of current and anticipated environmental vulnerabilities. ReVA: provides regional data on stressors and sensitive resources; develops techniques to integrate information on exposure and effects; evaluates potential environmental changes under alternative future scenarios; evaluates alternative environmental policies; develops techniques to prioritize areas for ecological restoration; and identifies information gaps. These integrated assessments and comparisons provide a framework for assessing relative risk and prioritizing management actions. For example, areas may be identified and prioritized for ecological restoration. This framework also facilitates communication and dialogue regarding economic and quality of life trade-offs associated with alternative environmental policies. To achieve these goals, ReVA has developed a number of integration methods. This report will describe each of the integration methods, their advantages and disadvantages for integrated assessment, and make recommendations for development and application.
NTIS
Vulnerability; Measure and Integration

20040084715 Automotive Testing Labs., Inc., Mesa, AZ, USA
Collection of Evaporative Emissions Data from Off-Road Equipment
McClement, D.; Nov. 2003; 112 pp.; In English
Report No.(s): PB2004-105583; No Copyright; Avail: CASI; A06, Hardcopy

The purpose of this study was to collect evaporative emissions data on a variety of in-use gasoline-powered off-road equipment. Significant changes in evaporative emissions measurement procedures were implemented for on-road mobile sources in the 1990's. Before this study, only limited data had been gathered on off-road equipment using the new superior methods. The off-road gasoline powered equipment category encompasses a wide variety of different types. The categories included in this study were Lawn and Garden, Marine Recreational, Off-Road Recreational, and Light Commercial. The primary test fuel was summer grade commercial California Phase II reformulated gasoline purchased in early summer of 2001. Testing included Hot Soak, Diurnal, Running Loss, and Refueling emission measurements. Data was collected continuously throughout each test. The continuous data was provided to ARB staff in electronic format. The results of this program are to be used by ARB to validate and improve the emissions factor model OFFROAD, which includes this class of equipment.
NTIS
Data Processing Equipment; Data Acquisition

20040084722 Cincinnati Univ., OH, USA
Estimation of Highest Task Silica Exposures
Grimsley, L. F.; Jun. 28, 2001; 42 pp.; In English
Report No.(s): PB2004-105622; No Copyright; Avail: CASI; A03, Hardcopy

More than 1 million workers in the USA are exposed to silica and approximately 100,000 will develop lung diseases. Despite efforts to decrease silica exposure in the workplace, overexposures and deaths from silicosis continue in certain operations and industries. According to the National Institute for Occupational Safety and Health (NIOSH), each year more than 250 workers die from silicosis. The objectives of the study were to investigate ways to estimate silica exposure in unsampled tasks and to evaluate the relationship between highest task silica exposure and the development of silicosis. Data from the North Carolina Dusty Trades, a unique resource for exposure-response studies of the effects of silica exposure is the basis for the study. Three methods of imputation were used. The methods included estimating exposures based on the geometric mean exposure at sampled commodity-specific tasks, the median exposure of commodity-specific tasks, and a maximum likelihood estimation statistical model. A case-control study design was used to evaluate the effect that estimated silica exposure from the highest task had on the development of silicosis.
NTIS
Indoor Air Pollution; Exposure; Silicon Dioxide

20040084730 National Inst. for Occupational Safety and Health, Washington, DC, USA
Relationship of Coal Seam Parameters and Airborne Respirable Dust at Longwalls
Organiscak, J. A.; Page, S. J.; Jankowski, R. A.; 1992; 28 pp.; In English
Report No.(s): PB2004-106170; NIOSH/RI-9425; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Bureau of Mines investigated the relationship of bituminous coal seam parameters and the amount of airborne respirable dust generated at longwalls. Dust and coal samples were obtained from 20 longwalls operating in geographically representative coalfields throughout the U.S. Statistical analyses of coal seam parameters and airborne respirable dust measurements indicate a likely causal relationship between seam type and respirable dust. The report describes a recent underground study to determine if type of bituminous coal seam is an influential factor in airborne dust generation. This work is part of the Bureau's program to improve the health of the Nation's miners by reducing their exposure to respirable dust.
NTIS
Coal; Exposure; Seams (Joints)

20040084733 National Inst. for Occupational Safety and Health, Washington, DC, USA
Final Progress Report: Industrial Hygiene Training Program, Colorado State University, Project Period July 1, 1997 to June 30, 2002
Sep. 2002; 22 pp.; In English
Report No.(s): PB2004-106173; No Copyright; Avail: CASI; A03, Hardcopy

The original inception of this program was in 1973 with the first NIOSH funding in 1975. This progress report covers the period of July, 1997 through June, 2002. During this period there were 44 graduates of the program - at the MS and PhD levels. An additional 32 students graduated at the BS level and are currently practicing in an aspect of industrial hygiene. Even though the BS program is not part of this funding, the affilation of this NIOSH TPG in a comprehensive department offering degrees at all levels allows synergies to exist between the faculty and students leading to internships research projects and employment in the field at the BS level. We have also recruited particularly bright and motivated BS students into the graduate program. Over 90% of all program graduates at all levels are currently practicing comprehensive industrial hygiene or in aspects of industrial hygiene. Over the reporting period there were 122 applicants to the graduate program; 67 were extended admission and 35 students enrolled; resulting in a demand of slightly less than 2:1 for desired admission, and resulting in 56% of admitted students actually enrolling. The most often cited reason for not accepting admission was choice of a school in a geographically desirable (near family, for example) area followed closely by financial constraints. The difference in numbers enrolled and graduated were due to students in the program at time that this reporting period began. Program graduates produced forty-four theses or dissertations, and program graduates in combination with program faculty generated 28 refereed publications, three book chapters, four full proceedings, four abstracted proceedings, and three government publications. An additional seven papers are in stag.es of review or revision. In total the grant period was an extremely productive one with high quality students being graduated and preferentially employed; and with very good contributions to the scientific body of knowledge as a result of the programs of study.
NTIS
Industrial Safety; Hygiene

20040084738 RTI International, Rsearch Triangle Park, NC, USA
California Portable Classrooms Study Phase II: Main Study
May 2003; 162 pp.; In English
Report No.(s): PB2004-106117; No Copyright; Avail: CASI; A08, Hardcopy

The purpose of the California Portable Classrooms study was to assess environmental conditions in Californias portable classrooms. This report documents results from Phase II of the study. Phase II was an in-person monitoring study of a probability sample of all public California K-12 schools with at least one portable classroom. The Phase II field study was conducted in the fall and winter of 2001-02. Three classrooms were monitored in each of 67 schools, usually two portable classrooms and one traditional classroom. In addition to direct environmental monitoring, the study used several data collection forms, including a Facilities Questionnaire, a Teacher Questionnaire, and classroom and Heating, Ventilation, and Air Conditioning (HVAC) check lists, to assess environmental conditions in the sample classrooms. This report describes the sample design, the survey instruments, the monitoring methodology, the data collection process, the data analysis procedures, and the results that show and compare the major characteristics of the populations of eligible public schools as well as the population of portable and traditional classrooms in these schools.
NTIS
Data Acquisition; Data Processing; Environmental Monitoring; Ventilation

20040084739 RTI International, Rsearch Triangle Park, NC, USA
California Portable Classrooms Study Phase I: Mailed Survey
Whitmore, R.; Clayton, A.; Phillips, M.; Akland, G.; May 2003; 126 pp.; In English
Report No.(s): PB2004-106116; No Copyright; Avail: CASI; A07, Hardcopy

The purpose of this California Portable Classrooms Study was to assess environmental conditions in California's portable classrooms. This report documents results from a mailed survey to a probability sample of all public California K-12 schools with at least one portable classroom. Two questionnaires, a Facilities Questionnaire and a Teacher Questionnaire, and passive formaldehyde samplers were mailed to the sample of schools selected to participate in the survey. This report describes the sample design, the survey instruments, the data collection process, the data analysis procedures, and the results that show and compare the major characteristics of the populations of eligible public schools as well as portable and traditional classrooms. Response rates were between 40 and 45% for school-level responses. However, for schools that responded, response rates at the classroom-level were about 95% for teacher questionnaires and for formaldehyde monitoring. The population of schools with one or more portable classrooms is estimated to consist of about 6,900 schools, with a total of about 145,000 traditional classrooms and about 85,000 portable classrooms.
NTIS
Data Acquisition; Estimating; Formaldehyde; Surveys; Environmental Quality

20040084740 RTI International, Rsearch Triangle Park, NC, USA
California Portable Classrooms Study Project. Executive Summary
May 2003; 32 pp.; In English
Report No.(s): PB2004-106118; No Copyright; Avail: CASI; A03, Hardcopy

The California Portable Classrooms Study (PCS) was conducted to address concerns raised regarding environmental conditions in Californias portable classrooms. The objective of the study was to examine environmental health conditions, especially those related to indoor air quality and health risks, in K-12 portable classrooms in California. These environmental conditions included levels of airborne chemicals; the presence of potential pollutant sources; the performance of heating, ventilating, and air-conditioning systems; factors such as light, noise, temperature, and relative humidity; the presence of mold and other biological contaminants; and pollutant and allergen levels in floor dust. Concerns over indoor environmental quality in Californias schools have been raised by scientists, government agencies, school administrators, and environmental health groups, as the demand for classrooms resulted in increased reliance on portable classrooms. Population growth, class-size reduction programs, and fiscal limitations have driven this increase. Schools have primarily met the increased demand for classrooms by using portable classrooms because, relative to traditional classrooms, they are more economical and can be obtained more quickly. Additionally, until 1998 new schools were required to be designed to include 30% portable classrooms.
NTIS
Air Quality; Biological Effects; Contaminants; Environmental Quality

20040084743 Pennsylvania State Univ., State College, PA, USA
Measurement and Analysis of Blank Tire Tread Vibration and Radiated Noise
Burroughs, C. B.; Dugan, E. L.; Jul. 01, 2003; In English
Report No.(s): PB2004-106149; SQDH-2003-3; No Copyright; Avail: National Technical Information Service (NTIS)

Traffic noise is a major concern in many communities. Although there are many measures being taken to reduce exposure to traffic noise, the most efficient method is to reduce the noise at its source. Tire noise has been shown to exceed the noise levels produced by the power at highway speeds. Nearfield acoustical holography measurements indicate that most of the acoustic radiation generated by tire/pavement interaction is localized to the entrance and exit to the contact patch. Accelerometers were embedded into the tread of blank tires to measure the vibration response of the tire as it rotates through the contact patch.
NTIS
Acoustical Holography; Exposure; Noise Reduction; Tires; Vibration

20040084744 Purdue Univ., West Lafayette, IN, USA
Investigation of Novel Acoustic Barrier Concepts Phase I: Concept Development and Preliminary Evaluation
Mongeau, L.; Bolton, J. S.; Suh, S.; Jun. 2003; 120 pp.; In English
Report No.(s): PB2004-106150; SQDH-2003-2; No Copyright; Avail: CASI; A06, Hardcopy

In a previous research project (SPR 2418; ″Study of the performance of acoustic barriers for Indiana toll roads,″) the

influence of environmental factors, and of advanced sound barrier concepts was investigated. The presence of temperature gradients over pavements was found to have a strong influence on sound propagation. Refraction of sound waves emitted by tire-road interactions in the vicinity of the ground also affects sound barrier performance. Modified ray tracing model suggested that prevailing winds have an influence on barrier performance at large distances. Randomized edge configurations were found not to improve barrier performance for traffic noise. Random edges simply scatter sound energy without any net noise reduction. Although the edge can be optimized for specific frequency components and locations, it appears that optimization for broadband noise control is difficult. The study also suggested that adding sound absorptive material along the barrier edge could enhance barrier performance.
NTIS
Frequencies; Noise Reduction; Sound Propagation

20040084745 Purdue Univ., West Lafayette, IN, USA
Concrete Mixtures that Incorporate Inclusions to Reduce the Sound Generated in Portland Cement Concrete Pavements
Olek, J.; Weiss, W. J.; Neithalath, N.; Jan. 2004; In English
Report No.(s): PB2004-106151; SQDH-2004-2; No Copyright; Avail: National Technical Information Service (NTIS)

Tire-pavement interaction noise is one of the significant environmental problem in highly populated urban areas situated near busy highways. Traditionally, this problem was reduced through the use of sound barriers; but this method has limitations. The understanding that methodologies to reduce the sound at the source itself is necessary, has led to the development of modified cement concrete materials. This report outlines the systematic research effort conducted in order to develop and characterize two different cement based materials incorporating inclusions. Morphologically altered cellulose fibers were used in the first part of this study as inclusion materials in a plain cement mortar matrix. Flexible polypropylene fibers were used as inclusions in a porous concrete (gap-graded aggregate concrete) matrix in the second part.
NTIS
Noise Reduction; Concretes; Highways

20040084746 Purdue Univ., West Lafayette, IN, USA
Development of Quiet and Durable Porous Portland Cement Concrete Paving Materials
Olek, J.; Weiss, W. J.; Neithalath, N.; Marolf, A.; Sell, E.; Sep. 2003; In English
Report No.(s): PB2004-106152; SQDH-2003-5; No Copyright; Avail: National Technical Information Service (NTIS)

This report outlines the systematic research effort conducted in order to develop and characterize Enhanced Porosity Concrete (EPC) to mitigate the problem of tire-road interaction noise. The basic tenet of this research is that carefully introduced porosity of about 15% - 25% in the material structure of concrete will allow sound waves to pass through and dissipate its energy. EPC mixtures were proportioned with three different aggregate sizes, and the binary blends of these sizes. The physical and mechanical properties of these mixtures were studied in detail. Methods to determine the porosity of EPC were developed. Flexural strengths of EPC specimens were studied in detail, and the influence of sand content, and silica fume were ascertained. The acoustic absorption coefficients of EPC were determined using an impedance tube. It was found that the pore volume and pore sizes have a significant influence on acoustic absorption. The tortuosity of the pore network, which forces the waves to travel longer, and the frictional losses in the pore walls are the main mechanisms that are responsible for energy loss. The influence of specimen thickness on the acoustic absorption coefficient is also brought out.
NTIS
Concrete Structures; Mechanical Properties; Energy Dissipation

20040084805 NASA Langley Research Center, Hampton, VA, USA
The GLOBE Contrail Protocol: Initial Analysis of Results
Chambers, Lin; Duda, David; [2004]; 4 pp.; In English; 8th Annual GLOBE Conference, 25-30 Jul. 2004, Boulder, CO, USA
Contract(s)/Grant(s): 23R-622-96-9H-02-02; No Copyright; Avail: CASI; A01, Hardcopy

The GLOBE contrail protocol was launched in March 2003 to obtain surface observer reports of contrail occurrence to complement satellite and model studies underway at NASA Langley, among others. During the first year, more than 30,000 ground observations of contrails were submitted to GLOBE. An initial analysis comparing the GLOBE observations to weather prediction model results for relative humidity at flight altitudes is in progress. This paper reports on the findings to date from this effort.
Author
Contrails; Pollution Monitoring; Weather Forecasting

20040084855 NASA Langley Research Center, Hampton, VA, USA
The GLOBE Earth Day 2004 Contrail Count-a-Thon
Chambers, Lin H.; Cole, Julia; [2004]; 5 pp.; In English; 8th Annual GLOBE Conference, 25-30 Jul. 2004, Boulder, CO, USA
Contract(s)/Grant(s): 23R-622-96-9H-02-02; No Copyright; Avail: CASI; A01, Hardcopy

Early in 2004 the GLOBE Science team suggested a contrail count activity to celebrate Earth Day 2004, which was held this year on April 22nd in the USA and some other countries around the world. The GLOBE contrail team embraced this idea and developed a simplified data collection sheet for this special project. Information about the event was shared through the GLOBE site, UCAR and NASA press releases, the NASA portal (http://www.nasa.gov) and the CERES S'COOL Project (http://scool.larc.nasa.gov). On Earth Day, about 120 observations were received through the GLOBE Contrail Count-a-Thon website, about 70 contrail observations were received through regular GLOBE data reporting, and 19 contrail observations were received through regular S'COOL data reporting. Only observations between 11:00 and 13:00 local time were included in the Count-a-Thon. The event was reported in the Boulder Daily Camera beforehand and in the Oregon Register-Guard after the fact. It was also reported on National Public Radio s Day-to-Day show; whose host even submitted an observation. This poster discusses the Count-a-Thon experience and reports the results.
Author
Contrails; Cloud Cover

20040084944 Geological Survey, Washington, DC
Aeroradioactivity Survey and Related Surface Geology of Parts of the San Francisco Region, California (ARMS- I)
Books, Kenneth G.; May 1968; 42 pp.; In English
Report No.(s): AD-A424224; CEX-58.4.5; No Copyright; Avail: CASI; A03, Hardcopy

A recent aeroradioactivity survey in the San Francisco region, Calif., shows a moderate range of 0 to 1000 counts per second in the levels of natural radioactivity. The lower levels can be related to unconsolidated sediments with a high water content and the higher levels can be related to igneous rocks or alluvium and soils derived from igneous rocks. The survey is approximately l4, 000 square miles in area and was made by the U. S. Geological Survey on behalf of the D)ivision of Biology and Medicine, U. S. Atomic Energy Commission. Continuous radioactivity profiles were obtained with scintillation counting equipment at approximately 500 ft above the ground on parallel northeast-southwest flight lines spaced 1 mile apart. A map of aeroradioactivity levels was prepared from the profiles.
DTIC
Geological Surveys; Geology; Radioactivity; San Francisco (Ca); Surveys

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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*.

20040084266 Geophysical Observatory, Sodankyla, Finland
Magnetic Results: Sodankyla 2003
Kultima, Johannes, Editor; 2004; ISSN 1456-3673; 40 pp.; In English
Report No.(s): Rept-95; Copyright; Avail: Other Sources

Magnetic results from the SODANKYLA Geophysical Observatory are presented. The contents include: 1) Coordinates; 2) Variometers; 3) Absolute and base-line measurements; 4) Treatment of recordings; 5) Measured and adopted baselines 2003(graph); 6) Annual means 1914 - 2003 (graph); 7) Annual means 1914 - 2003 (tables); 8) Monthly and annual means 2003; 9) Activity figures K and Ak; 10) Hourly mean values: - North component (X) - East component (Y) - Vertical component (Z); 11) Daily variation; and 12) Bartels diagram.
CASI
Geophysical Observatories; Magnetic Measurement; Finland

20040084299 Honeybee Robotics Ltd., New York, NY, USA
Rock Abrasion Tool
Myrick, Thomas M.; Davis, Kiel; Wilson, Jack; 37th Aerospace Mechanisms Symposium; May 2004, pp. 277-290; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

The Rock Abrasion Tool (RAT) is designed to expose the interior of Martian rocks for identification and analysis. The

RAT, contained within a cylinder 128-mm long and 85-mm in diameter, has a mass of 687 grams. Using three small DC brushed motors, the RAT grinds a 5-mm deep, 45-mm diameter hole into a targeted rock. During grinding, the grinding wheel, shaped as a paddle with a synthetic diamond-impregnated resin, engages a target rock when the Z-axis is extended. Unrealized during testing, under Mars conditions the grinding wheel wear rate decreases five fold when compared to operation under Earth conditions. In total, four Rock Abrasion Tools were manufactured, two flight units, and two engineering test units. After delivering the flight units, the motor current measured by the RAT s electronic interface did not provide a true reading. Follow-on testing permitted correlating the erroneous data with proper data. The flight units were installed on two separate spacecrafts for delivery to Mars in 2004.
Author
Abrasion; Diamonds; Rocks; Planetary Geology; Mars Environment

20040084634 NASA Ames Research Center, Moffett Field, CA, USA
Turbulent Concentration of Chondrules: Size Distribution and Multifractal Scaling
Cuzzi, Jeffrey N.; Hogan, Robert C.; Paque, Julie M.; Dobrovolskis, Anthony R.; [1999]; 18 pp.; In English
Contract(s)/Grant(s): RTOP 344-30-51-03; Copyright; Avail: CASI; A03, Hardcopy

Size-selective concentration of particles in 3D turbulence may be related to collection of chondrules and other constituents into primitive bodies in a weakly turbulent protoplanetary nebula. In the terrestrial planet region, both the characteristic size and narrow size distribution of chondrules are explained, whereas ″fluffier″ particles would be concentrated in lower density, or more intensely turbulent, regions of the nebula. The spatial distribution of concentrated particle density obeys multifractal scaling, suggesting a dose tie to the turbulent cascade process. This scaling behavior allows predictions of the concentration probabilities to be made in the protoplanetary nebula, which are so large (\g 10(exp 3) - 10(exp 4)) that further studies must be made of the role of mass loading.
Author
Chondrule; Size Distribution; Turbulence; Nebulae; Spatial Distribution

20040084953 Innovative Scientific Solutions, Inc., Dayton, OH
The Application of Advanced Diagnostics to the Study of Non-Equilibrium Air Plasmas
Williamson, James M.; Bletzinger, Peter; Sep. 2002; 60 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-C-2806; Proj-2301
Report No.(s): AD-A424238; AFRL-PR-WP-TR-2003-2022; No Copyright; Avail: CASI; A04, Hardcopy

Low-Mach-number shock waves propagating through a low-pressure, non-equilibrium, positive-column gas discharge have been observed to experience dispersion and velocity changes. These effects are shown to depend on discharge polarity. Optical and electrical measurements are described which demonstrate further polarity-dependent effects in discharge light emission and changes in electrical properties. The axial-population-density profile of 2 3S1 metastable He has also been measured by diode-laser absorption spectroscopy in the double layer formed at an abrupt transition of the tube diameter in a positive column. The diode-laser absorption profiles show enhanced production of triplet metastable He 2 3S1 in the double-layer region, as compared to that of the unperturbed positive column (small diameter), with the magnitude of being strongly dependent on the discharge polarity. The absolute concentration of H-atoms has been measured in the positive column of a pulsed dc discharge by two-photon-absorption laser-induced fluorescence (TALIF) in H2 N2 gas mixtures at constant pressure and current for discharge- pulse durations of 10 μs to 1 ms. The change in H-atom production from the direct-electron-impact dissociation of H2 at short times compared to that from multi-quantum vibrational energy-transfer-induced dissociation of H2 at long times is determined from temporally resolved H-atom-concentration measurements.
DTIC
Atmospheric Chemistry; Diagnosis; Plasma Equilibrium; Plasmas (Physics)

20040085349 Battelle-Edgewood Operations, Edgewood Arsenal, MD
Corrosion of Buried Mines
Ostazeski, Stan; Saubier, Leo F.; Dec. 2002; 22 pp.; In English
Contract(s)/Grant(s): SPO700-D-3180
Report No.(s): AD-A424106; SFIM-AEC-PC-CR-2003012; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses how observations of corrosion in buried mines can improve our ability to predict corrosion in steel munitions buried in the US (i. e., unexploded ordnance (UXO)). It proceeds from the hypothesis that the corrosion that takes place in metals, joints, dissimilar metal interfaces, etc., that are present in mines, may be correlated with corrosion in UXO.

Listings of buried landmines having steel casings are presented, along with country of origin and limited design information. DTIC
Ammunition; Corrosion

20040085411 Chicago Univ., Chicago, IL, USA
Oxygen Barometry Using Synchrotron MicroXANES of Vanadium
Sutton, S. R.; Karner, J. M.; Papike, J. J.; Delaney, J. S.; Shearer, C. K.; Newville, M.; Eng, P.; Rivers, M.; Dyar, M. D.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 61; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

A promising proxy for oxygen fugacity is the valence of vanadium because it has a large number of possible valence states in nature (2(+), 3(+), 4(+) and 5(+)) and is ubiquitous in earth and planetary materials. A new, non-destructive method for valence determinations of vanadium and oxygen fugacity estimates with spatial resolution of a few micrometers is synchrotron x-ray absorption near edge structure (XANES) spectroscopy.
Derived from text
Oxygen; Vanadium; Valence; X Ray Absorption; Synchrotrons; Planetary Composition

20040085413 Columbia Univ., Palisades, NY, USA
Ultra-High Temperature Effects in Earth's Magma Ocean: Pt and W Partitioning
Cottrell, E.; Walker, D.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 19; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

New experiments to 2600'C demonstrate a very strong negative dependence of D sub pt sup met/yil and a weak negative dependence of D sub w 0n T.The Pt results reconcile mantle Pt abundances with the magma ocean model and also resolve the ″nugget problem.″ The W results allow hotter magma oceans to be compatible with mantle W abundance than if D sub w had a positive T dependence.
Author
Magma; Earth Mantle

20040085416 Pennsylvania State Univ., University Park, PA, USA
Mantle Redox Evolution and the Rise of Atmospheric O2
Kasting, J. F.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 36; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Why did atmospheric O2 rise around 2.3 Ga when photosynthetic cyanobacteria appear to have arisen at least 400 m.y. earlier? Either cyanobacterial productivity was lower for some reason during the Archean, or else the volcanic sink for O2 must have been larger. The relative constancy of the delta (13)C values of carbonates at approx. 0% both before and after the initial rise of O2 implies that organic carbon burial rates did not change and, hence, that the volcanic sink for O2 must have decreased with time. Kasting et al. suggested that this happened because the upper mantle became progressively oxidized during the Archean as hydrogen escaped to space. The hydrogen came from water originally, so this process would have oxidized the Earth. In their model, it was Earth's upper mantle that was oxidized by subduction of water and carbonates, followed by outgassing of H2 and CO. Subduction of ferric iron may also have been important. As the upper mantle became more oxidized, the volcanic gases would have become less reduced, until eventually they were overwhelmed by photosynthetically produced O2. This hypothesis, while attractive in many respects, is in apparent disagreement with observations. Data on the Cr and V content of ancient basalts and komatiites indicate that upper mantle fO2 has changed very little since at least 3.5 Ga. A recent reanalysis of volcanic gas oxidation states by Holland shows that only a small change (\h1 log unit) in fO2 may be required in order to get the atmospheric oxidation state to flip, but even this small change may be ruled out. Thus, the question of why atmospheric O2 rose when it did remains a mystery.
Author
Earth Atmosphere; Precambrian Period; Earth Mantle; Oxygen

20040085420 Australian National Univ., Canberra, Australia
Non-Linear Fractionation of Oxygen Isotopes Implanted in Lunar Metal Grains: Solar, Lunar or Terrestrial Origin?
Ireland, T. R.; Holden, P.; Norman, M.; Clarke, J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 32; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The imminent return of the Genesis experiment motivated us to look for natural analogs. The occurrence of metal grains

in lunar soil offers such a possibility. The metal, probably splash droplets from meteorite impacts, offer a robust medium with low intrinsic concentrations of oxygen. These grains have been exposed to surface conditions and effects, most notably to the solar wind for a much longer time than the Genesis materials and hence signals should be larger, making for easier analytical conditions.
Derived from text
Meteorite Collisions; Oxygen Isotopes; Lunar Soil; Surface Properties; Solar Wind

20040085428 Minnesota Univ., Minneapolis, MN, USA
The Influence of Oxygen Environment on Kinetic Properties of Silicate Rocks and Minerals
Kohlstedt, D. L.; Hier-Majumder, S.; Mackwell, S. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 39; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The oxygen content in a geologic environment, expressed as oxygen partial pressure or oxygen fugacity, has a direct effect on the kinetic properties of rocks composed of minerals that contain a significant concentration of transition metal cations. In this context, the most extensively studied mineral is Fe-Mg olivine. Experimental investigations demonstrated that the rates of cation diffusion, electrical conductivity, and creep all increase systematically with increasing oxygen partial pressure. The measured dependencies of such physical properties on oxygen partial pressure provide insight into the mechanisms by which ionic and electronic transport proceed as well as constraints on the variation of these properties from one environment to the next.
Derived from text
Silicates; Rocks; Minerals; Olivine; Iron; Magnesium; Transition Metals; Oxygen

20040085431 Bayreuth Univ., Germany
Redox Exchanges in Hydrous Magma
Gaillard, F.; Schmidt, B. C.; MacCammon, C. A.; Pichavant, M.; Scaillet, B.; Mackwell, S. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 29; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Contrasts in redox conditions prevailing in magma within the Earth have been and are still responsible for extensive large-scale chemical differentiation during the past 4.6 billion years. The formation of the core is likely attributable to a primary magma ocean in equilibrium with Fe-metal in the early age of the Earth; the oceanic crust is constructed by accretion of mid-ocean-ridge-basalt containing dominantly ferrous iron; and the continental crust probably derives from subduction-related arc-magmas that contain approx.20-60% of iron in the ferric form. These redox controls on the magma-derived stratification of the Earth underline the need for a fundamental understanding of mechanisms and rate of redox exchanges in natural silicate melts.
Derived from text
Magma; Melts (Crystal Growth); Oxidation-Reduction Reactions; Earth Crust; Subduction (Geology)

20040085432 Wisconsin Univ., Madison, WI, USA
Crustal Evolution and Maturation on Earth: Oxygen Isotope Evidence
Valley, J. W.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 65; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Zircon is a common accessory mineral in intermediate to felsic igneous rocks and also occurs in some mafic rocks. Zircons provide the most reliable record of magmatic oxygen isotope ratio as well as U-Pb age if significant radiation damage is avoided. No other mineral permits O-18(magma) to be confidently determined and coupled to age of crystallization. Zoned magmatic zircons serve as time capsules, preserving isotopic, trace element and mineral/melt inclusion evidence of evoking magmatic conditions.
Derived from text
Igneous Rocks; Planetary Crusts; Planetary Evolution; Mineralogy; Oxygen Isotopes; Crystallization

20040085439 Colorado Univ., Boulder, CO, USA
How Well do Sulfur Isotopes Constrain Oxygen Abundance in the Ancient Atmospheres?
Pavlov, A. A.; Mills, M. J.; Toon, O. B.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 52; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Oxygen abundance in the ancient terrestrial atmospheres is a fundamental and poorly resolved problem. Without samples of the ancient atmospheres scientists had to rely on the indirect constraints from the incomplete and heavily altered geological

record. Fortunately, discovery of mass-independent fractionation (MIF) in sulfur isotopes in the Archean sediments and lack of MIF in sulfur in the younger rocks placed a strict upper constraint on the amount of oxidants and oxygen in the ancient Earth's atmosphere prior to 2.3 Gyr ago. MIF in sulfur isotopes can be produced only in the atmosphere and subsequent isotopic fractionation in the sediments can only destroy MIF but not create it. Preservation of MIF in the Archean sediments requires sulfur deposition from the Archean atmosphere in the variety of oxidation states (SO2, H2S, S8, H2SO4 etc.) so that sulfur-bearing species would not completely rehomogenize sulfur isotopes before incorporation into the ancient rocks. Pavlov & Kasting showed that it would be only possible if the ancient pO2 level were less than 10(exp -5) PAL (present atmospheric level). However recent measurements in the Antarctic ice core showed a small but non-zero MIF in sulfate correlated with the large volcanic eruptions, raising questions about the sulfur MIF sensitivity to oxygen levels. We put sulfur isotopes into a 2-D photochemical/microphysical model and looked at how strong the initial atmospheric fractionation had to be in order to be preserved in the Antarctic ice-cores. We will discuss two possibilities to preserve small sulfur MLF in the present atmosphere: (1) Preservation through polar sulfate mesopause aerosols; (2) Preservation through the alternative pathway of SO2 oxidation. Author

Sulfur Isotopes; Oxygen; Abundance; Atmospheric Composition; Earth Atmosphere; Precambrian Period

20040085444 New Mexico Univ., Albuquerque, NM, USA

Experimental Constraints on Oxygen and Other Light Element Partitioning During Planetary Core Formation

Agee, C. B.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 11; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The nature of the light element content of the Earth's molten outer core has been actively debated since Birch first proposed that some mix of light elements such as O, S, and Si could account for the apparent 10% density deficit there. Over the past several years numerous high-pressure experimental studies have placed important constraints on the physics and chemistry of planetary core formation. Based on siderophile element partitioning studies core formation for the Earth appears to have occurred within a deep magma ocean. Thus the effects of pressure and temperature are important factors to consider in modelling the fate of light elements during core-mantle segregation. Here I review our current knowledge of oxygen, sulfur, and silicon partitioning between Fe-metal and silicate at extreme conditions, and the constraints these data place on light element behavior during planetary core formation.

Derived from text

Planetary Cores; Light Elements; Oxygen; Pressure Effects; Magma; High Pressure

20040085445 Case Western Reserve Univ., Cleveland, OH, USA

Core Formation in the Earth: Constraints from Ni and Co

Chabot, N. L.; Draper, D. S.; Agee, C. B.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 15; In English; See also 20040085398

Contract(s)/Grant(s): NAG5-12831; 344-31-20-25; Copyright; Avail: CASI; A01, Hardcopy

Due to their metal-loving nature, Ni and Co were strongly partitioned into the metallic core and were left depleted in the silicate mantle during core formation in the Earth. Based on experimental liquid metal- liquid silicate partition coefficients (D), studies have suggested that core formation in an early magma Ocean can explain the observed mantle depletions of Ni and Co [l-51. However, the conditions proposed by the magma ocean models have ranged from pressures of 24 to 59 GPa and temperatures of 2200 to \h 4000 K. Furthermore, the proposed magma Ocean oxygen fugacities have differed by nearly two orders of magnitude.Chabot and Agee noted that the different models predicted contradictory behaviors for D(Ni) and D(Co) as a function of temperature. With the hope of resolving the discrepancies between the magma ocean models, we conducted a systematic experimental study to constrain the effects of temperature on D(Ni) and D(Co).

Derived from text

Earth Core; Magma; Earth Mantle

20040085448 Centre de Recherches Petrographiques et Geochimiques, Nancy, France

Nitrogen Solubility in Basaltic Melt. Effects of Oxygen Fugacity, Melt Composition and Gas Speciation

Libourel, G.; Marty, B.; Humbert, F.; Gayer, E.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 42; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Nitrogen is a major forming element of the Earth's atmosphere and one of the key elements of the biological evolution. Knowledge of its (elemental or isotopic) behavior is therefore of prime importance to understand and quantify processes which might have controlled the exchange of nitrogen between the mantle and the atmosphere through time. However in contrast to

rare gases, mechanisms governing the incorporation of nitrogen in basaltic melts are not well documented. In order to provide much needed constraints, we have developed a combined experimental and analytical approach to measure nitrogen solubility in silicate melts. Equilibration were performed at one atmosphere and at 1425 C over a large range of oxygen fugacity controlled by mixtures of gases belonging to either [C-N-0] or [C-N-0-HI vapor systems. Nitrogen contents in equilibrated samples were measured using a technique based on CO2 laser extraction in high vacuum line and static vacuum mass spectrometry and N speciation by FTIR measurements on selected N-bearing glass samples.
Derived from text
Basalt; Earth Mantle; Outgassing

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20040084307 NASA Ames Research Center, Moffett Field, CA, USA
Formation of a Tropopause Cirrus Layer Observed over Florida during CRYSTAL-FACE
Jensen, Eric; Pfister, Leonhard; Bui, Thaopaul; Weinheimer, Andrew; Weinstock, Elliot; Smith, Jessica; Pittman, Jasna; Baumgardner, Darrel; McGill, Mathew J.; 2004; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

On July 13, 2002, a widespread, thin tropopause cirrus layer occurred over the Florida region. This cloud was observed in great detail with the CRYSTAL-FACE instrumentation, including in-situ measurements with the WB-57 aircraft. We use this cloud case study to evaluate the physical processes controlling the formation and evolution of tropopause cirrus layers. Microphysics indicate ice crystal diameters in the cloud layer ranged from about 7 to 40 um, and the peak number mode was about 10-25 um. In-situ water vapor and temperature measurements in the cloud indicated supersaturation with respect to ice throughout, with ice saturation ratios as large as 1.8. TRajectory analysis shows that the air sampled near the tropopause on this day generally came from the north and cooled considerable during the previous days.Examination of visible satellite imagery indicates that the cloud layer formation was, in general, not simply left over ice from convectively generated anvil cirrus.
Author
Clouds (Meteorology); Tropopause; Temperature Measurement; Ice

20040084310 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Highlights of the Version 8 SBUV and TOMS Datasets Released at this Symposium
Bhartia, Pawan K.; McPeters, Richard D.; Flynn, Lawrence E.; Wellemeyer, Charles G.; [2004]; 1 pp.; In English; International Quadrennial Ozone Symposium, 1-8 Jun. 2004, Kos, Greece; No Copyright; Avail: Other Sources; Abstract Only

Last October was the 25th anniversary of the launch of the SBUV and TOMS instruments on NASA's Nimbus-7 satellite. Total Ozone and ozone profile datasets produced by these and following instruments have produced a quarter century long record. Over time we have released several versions of these datasets to incorporate advances in UV radiative transfer, inverse modeling, and instrument characterization. In this meeting we are releasing datasets produced from the version 8 algorithms. They replace the previous versions (V6 SBUV, and V7 TOMS) released about a decade ago. About a dozen companion papers in this meeting provide details of the new algorithms and intercomparison of the new data with external data. In this paper we present key features of the new algorithm, and discuss how the new results differ from those released previously. We show that the new datasets have better internal consistency and also agree better with external datasets. A key feature of the V8 SBUV algorithm is that the climatology has no influence on inter-annual variability and trends; it only affects the mean values and, to a limited extent, the seasonal dependence. By contrast, climatology does have some influence on TOMS total O3 trends, particularly at large solar zenith angles. For this reason, and also because TOMS record has gaps, md EP/TOMS is suffering from data quality problems, we recommend using SBUV total ozone data for applications where the high spatial resolution of TOMS is not essential.
Author
Total Ozone Mapping Spectrometer; Solar Backscatter UV Spectrometer; Nimbus 7 Satellite; Radiative Transfer; Ozone

20040084319 Commerce Dept., Washington, DC, USA
Weather Information for Surface Transportation. National Needs Assessment Report
Dec. 2002; In English
Report No.(s): PB2004-104232; FCM-R18-2002; No Copyright; Avail: National Technical Information Service (NTIS)

In 1998, a federal interagency committee identified the weather information needs of surface transportation sectors as a priority for coordinated action. In response, the Office of the Federal Coordinator for Meteorological Services and Supporting Research undertook a study of existing and potential needs for weather information for surface transportation (WIST). This report covers six transportation sectors: Roadway-state and federal highways, roads, and streets Long-Haul Railway-rail lines providing intercity freight and passenger service, with their yards, stations, and depots Marine Transportation System-coastal and inland waterways, ports and harbors, and the intermodal terminals serving them Rural and Urban Transit-bus and van service on streets and roadways, rail lines for metropolitan subway and surface 'light rail' systems Pipeline Systems-Above and below ground pipelines for commodities such as crude oil, refined petroleum products, and natural gas, plus the storage, transfer, and pumping facilities for pipelines Airport Ground Operations-All ground movement of vehicles, work crews, and passengers.
NTIS
Weather; Meteorological Services; Surface Vehicles; Transportation

20040084320 Burgess and Niple Ltd., Columbus, OH, USA
Destructive Waters (DESWAT) Project, Romania Ministry of Waters and Environmental Protection. Feasibility Study Report, Part 1
Apr. 2003; In English
Report No.(s): PB2004-104980; No Copyright; Avail: National Technical Information Service (NTIS)

The DESWAT program was initiated in order to improve the flood forecasting capabilities of the Romanian Ministry of Water and Environmental Protection, through the National Institute of Meteorology and Hydrology (INMH). Burgess and Niple, Limited was selected in May of 2002 to carry out the project, assisted by sub consultants Bluegrass GIS, Inc., and the Technical University of Civil Engineering, Bucharest. As the project moved into the final phase of pilot demonstration and training, Vieux and Associates, Inc. were added as a model demonstration and training sub consultant. The feasibility assessment involves investigation of a number of options for improving flood forecasting in Romania, with the primary goals of more rapid and more accurate forecasts. A significant improvement is feasible at this time because of the SIMIN weather radar project currently under construction in Romania, which will generate better Meteorological data for rapid and automatic input to flood modeling programs or systems.
NTIS
Floods; Forecasting

20040084322 National Oceanic and Atmospheric Administration, Ann Arbor, MI, USA
Lake Erie Ice Cover Climatology Basin Averaged Ice Cover: Winters 1898-2002
Assel, R. A.; May 2004; 20 pp.; In English
Report No.(s): PB2004-105251; NOAA/TM/GLERL-128; No Copyright; Avail: CASI; A03, Hardcopy

Spatial averages of ice concentrations for the west, center, and eastern basins of Lake Erie are presented for a 105- winter base period (1898-2002) for daily, monthly, and annual time periods. Dates of first ice, last ice, and ice duration were also examined. The daily and monthly data for the contemporary 1973-2002 winter period were used to calculate statistics and to define and compare the seasonal progression of ice cover for each lake basin. Century trends included later first ice dates, earlier last ice dates, and shorter duration of the ice cover. These trends were also observed during the contemporary (1973-2002) period.
NTIS
Ice; Lake Erie

20040084390 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Aura Brochure
Hilsenrath, Ernest; Schoeberl, Mark R.; Douglass, Anne; [2004]; 36 pp.; In English
Report No.(s): NASA/NP-2004-4-626-GSFC; No Copyright; Avail: CASI; A03, Hardcopy

Aura is designed to answer questions about changes in our life-sustaining atmosphere. Aura's four instruments will study the atmosphere's chemistry and dynamics. Aura's measurements will enable us to investigate questions about ozone trends, air quality changes and their linkage to climate change. Aura's measurements will provide accurate data for predictive models and provide useful information for local and national agency decision support systems. Aura is the third in a series of large Earth observing platforms to be flown by the National Aeronautics and Space Administration (NASA) with international

contributions. Aura along with EOS Terra (launched December, 1999) and Aqua (launched May, 2002) will provide an unprecedented view of the global Earth system.
Derived from text
Meteorological Satellites; Climate Change; Earth Observing System (Eos)

20040084464 NASA Ames Research Center, Moffett Field, CA, USA
Sensitivity of Simulated Warm Rain Formation to Collision and Coalescence Efficiencies, Breakup, and Turbulence: Comparison of Two Bin-Resolved Numerical Models
Fridlind, Ann; Seifert, Axel; Ackerman, Andrew; Jensen, Eric; [2004]; 3 pp.; In English; 14th International Conference on Clouds and Precipitation, 17-24 Jul. 2004, Bologna, Italy; No Copyright; Avail: CASI

Numerical models that resolve cloud particles into discrete mass size distributions on an Eulerian grid provide a uniquely powerful means of studying the closely coupled interaction of aerosols, cloud microphysics, and transport that determine cloud properties and evolution. However, such models require many experimentally derived paramaterizations in order to properly represent the complex interactions of droplets within turbulent flow. Many of these parameterizations remain poorly quantified, and the numerical methods of solving the equations for temporal evolution of the mass size distribution can also vary considerably in terms of efficiency and accuracy. In this work, we compare results from two size-resolved microphysics models that employ various widely-used parameterizations and numerical solution methods for several aspects of stochastic collection.
Author
Aerosols; Cloud Physics; Parameterization; Coalescing; Sensitivity; Atmospheric Turbulence; Raindrops

20040084629 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Impact of Aerosols on Cloud and Precipitation Processes: Cloud-Resolving Model Simulations
Tao, Wei-Kuo; Li, X.; Khain, A.; Simpson, S.; Johnson, D.; Remer, L.; [2004]; 1 pp.; In English; 2nd International Workshop on NWP Model, 17-20 May 2004, Seoul, Korea, Republic of; No Copyright; Avail: Other Sources; Abstract Only

Cloud microphysics is inevitably affected by the smoke particle (CCN, cloud condensation nuclei) size distributions below the clouds. Therefore, size distributions parameterized as spectral bin microphysics are needed to explicitly study the effects of atmospheric aerosol concentration on cloud development, rainfall production, and rainfall rates for convective clouds. Recently, two detailed spectral-bin microphysical schemes were implemented into the Goddard Cumulus Ensembel (GCE) model. The formulation for the explicit spectral-bin microphysical processes is based on solving stochastic kinetic equations for the size distribution functions of water droplets (i.e., cloud droplets and raindrops), and several types of ice particles [i.e. pristine ice crystals (columnar and plate-like), snow (dendrites and aggregates), graupel and frozen drops/hail]. Each type is described by a special size distribution function containing many categories (i.e. 33 bins). Atmospheric aerosols are also described using number density size distribution functions. A spectral-bin microphysical model is very expensive from a computational point of view and has only been implemented into the 2D version of the GCE at the present time. The model is tested by studying the evolution of deep tropical clouds in the west Pacific warm pool region and in the mid-latitude continent with different concentrations of CCN: a low ″c1ean″concentration and a high ″dirty″ concentration. In addition, differences and similarities between bulk microphysics and spectral-bin microphysical schemes will be examined and discussed.
Author
Aerosols; Clouds (Meteorology); Precipitation (Meteorology); Cloud Physics; Atmospheric Models; Computerized Simulation

20040084631 Defence Science and Technology Organisation, Edinburgh, Australia
Application of Numerical Weather Prediction to Rapid Environmental Assessment
Anstee, Stuart; April 2004; 36 pp.; In English
Report No.(s): DSTO-GD-0403; DODA-AR-013-082; Copyright; Avail: Other Sources

This report summarizes numerical weather prediction capability available in Australia, its likely near-term development and its application to Rapid Environmental Assessment. Research at the Commonwealth Bureau of Meteorology and the Commonwealth Scientific and Industrial Research Organization into meteorological and to some extent, oceanic forecasting, is examined.
Author
Numerical Weather Forecasting; Meteorology

20040084637 Scripps Institution of Oceanography, La Jolla, CA, USA
Antarctic Ultraviolet Radiation Climatology from Total Ozone Mapping Spectrometer Data
Lubin, Dan; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8252; No Copyright; Avail: CASI; A01, Hardcopy

This project has successfully produced a climatology of local noon spectral surface irradiance covering the Antarctic continent and the Southern Ocean, the spectral interval 290-700 nm (UV-A, UV-B, and photosynthetically active radiation, PAR), and the entire sunlit part of the year for November 1979-December 1999. Total Ozone Mapping Spectrometer (TOMS) data were used to specify column ozone abundance and UV-A (360- or 380-nm) reflectivity, and passive microwave (MW) sea ice concentrations were used to specify the surface albedo over the Southern Ocean. For this latter task, sea ice concentration retrievals from the Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR) and its successor, the Defense Meteorological Satellite Program (DMSP) Special Sensor Microwave Imager (SSM/I) were identified with ultraviolet/visible-wavelength albedos based on an empirical TOMS/MW parameterization developed for this purpose (Lubin and Morrow, 2001). The satellite retrievals of surface albedo and UV-A reflectivity were used in a delta-Eddington radiative transfer model to estimate cloud effective optical depth. These optical depth estimates were then used along with the total ozone and surface albedo to calculate the downwelling spectral UV and PAR irradiance at the surface. These spectral irradiance maps were produced for every usable day of TOMS data between 1979-1999 (every other day early in the TOMS program, daily later on).
Author
Total Ozone Mapping Spectrometer; Ultraviolet Radiation; Climatology; Antarctic Regions; Microwave Imagery

20040084667 Northeast Radio Observatory Corp., Westford, MA, USA
Advancing Solid Earth Science through Improved Atmosphere Modeling
Niell, A. E.; July 27, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-13744; No Copyright; Avail: CASI; A01, Hardcopy

We proposed to investigate and develop better models for the effect of the hydrostatic and water vapor components of the neutral atmosphere on delay for VLBI and GPS by using a Numerical Weather Model to better simulate realistic atmosphere conditions. By using a raytrace calculation through the model atmosphere at the times of actual VLBI observations, the potential improvement in geodetic results can be evaluated. Also, by calculating the actual variation of delays with elevation and azimuth, the errors in current mapping function models can be assessed. The VLBI data to be initially analyzed are the fifteen days of the CONT02 sessions of 2002 October which included eight stations. There are three segments to the research. 1) The PSU/NCAR fifth generation mesoscale numerical weather model (MM5) will be used to provide the state of the atmosphere with highest horizontal resolution of 3 km. 2) A three-dimensional raytrace program will be developed to determine the delays through the model atmosphere at the times and in the directions of the VLBI observations for each of the sites. 3) The VLBI data will be analyzed using both standard models for the atmosphere mapping functions and the mapping functions derived from the NWM raytracing.
Author
Hydrostatics; Water Vapor; Very Long Base Interferometry; Global Positioning System; Atmospheric Models; Mesometeorology

20040084681
A Polar Specific 20-year Data Set of Cloud Fraction and Height Derived from Satellite Radiances
Francis, Jennifer; Schweiger, Axel; 2004; 4 pp.; In English
Contract(s)/Grant(s): NAG5-11800; NAG5-11585; No Copyright; Avail: CASI; A01, Hardcopy

This is a final report to fulfill reporting requirements on NASA grant NASA NAG5-11800. Jennifer Francis, PI at Rutgers University is currently continuing work on this project under a no-cost extension. Work at the University of Washington portion of the project is completed and reported here. Major accomplishments and results from this portion of the project include: 1) Extension and reprocessing of TOVS Polar Pathfinder (Path-P) data set; 2) Analysis of Arctic cloud variability; 3) Validation of Southern Hemisphere ocean cloud retrievals; 4) Intercompared cloud height information from AVHRR retrievals and surface-based cloud radar information.
Author (revised)
Arctic Regions; Antarctic Regions; Marine Meteorology; Clouds (Meteorology)

20040084735 California State Air Resources Board, Sacramento, CA
Evaluation of a Gas-Phase Atmospheric Reaction Mechanism for Low NOx Conditions
Carter, W. L.; May 2004; In English
Report No.(s): PB2004-106114; No Copyright; Avail: National Technical Information Service (NTIS)

The ability SAPRC-99 atmospheric chemical mechanism to predict photochemical smog formation under low NOx conditions was evaluated by comparing model predictions to results experiments from three different environmental chamber facilities. These included new experiments from our UCR EPA environmental chamber, and previous experiments at from the Tennessee Valley Authority (TVA) and the Australian Commonwealth Scientific and Industrial Research Organization (CSIRO) chambers. The facility and procedures for the new UCR EPA experiments, and the procedures for modeling data from all three chambers, are discussed.
NTIS
Air Pollution; Nitrous Oxides; Reaction Kinetics

20040084900 Utah Univ., Salt Lake City, UT
Diagnosis of Medium-Range Predictability Enhancement During Anomalous Winter Zonal Flows Over Western North America
Byerle, Lee A.; Jan. 2003; 57 pp.; In English
Report No.(s): AD-A424127; AFIT-CI04-385; No Copyright; Avail: CASI; A04, Hardcopy

This investigation analyzes medium range predictability enhancement during winter cases of anomalous, upper troposphere zonal flows over western North America. Time correlations based upon a 50 year record of reanalyses suggest that winters with anomalously strong zonal winds are wetter over the region, while years with anomalously weak zonal winds are relatively drier. Forecasts are selected based upon anomalously weak and strong zonal flows during January. Results from 15 day simulations using a variety of operational and research global model configurations are presented to diagnose the predictability of precipitation and large scale features. Model forecasts of precipitation accumulation delineate qualitatively between wet and dry events at both 5 and 10 days. Anomaly correlations of the geopotential height field reveal useful predictability for some ensembles extending to 9.5 days. Uniform resolution forecasts are compared with two model configurations which employ rotated variable resolution. Uniform and variable resolution forecasts maintain representative precipitation into the second week over the western U.S.
DTIC
Augmentation; Diagnosis; North America; Predictions; Troposphere; Weather Forecasting; Winter

20040084969 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Intercomparison of Global Research and Operational Forecasts
Roman, Jennifer C.; Aug. 2004; 118 pp.; In English
Report No.(s): AD-A424270; CI04-400; No Copyright; Avail: CASI; A06, Hardcopy

Current limitations of atmospheric predictive skill are investigated through comparison of correlation and error statistics of operational and research global models for two boreal winter seasons. In 1993, bias-corrected models produced anomaly correlations of 0.6 after 7 days, with relatively little forecast skill beyond that point. In 2003, the forecast skill of a more developed, higher-resolution operational model has been extended 36-48 h, while the skill of the unchanged, low-resolution research model has been extended 6-16 h. This implies more predictable patterns in 2003 or model and initial state improvements made since 1993. The relative importance of improved model resolution/physics and initial state to the lengthening of forecast skill is diagnosed through the evaluation of root mean square (rms) evolution of analyzed and forecast differences of 500-mb height and meridional wind. Results indicate that forecast sensitivity to initial data is less important than is the sensitivity to the model used. However, the sensitivity to model used (rms of model forecast differences) is comparable or smaller than the rms forecast error of the model, indicating model forecasts are more similar to each other than to reality. Correlations of model errors to each other quantify this similarity, with correlations exceeding the asymptotic value of 0.5 through the 14-day forecasts. Investigations of initial state error evolution by wavenumber show long waves generally account for more of the total uncertainty growth in 14-day research model integrations than do short waves, with the relative importance of each determined by initial state uncertainty and model resolution. Results indicate current predictive skill may be impacted by model sophistication, but error pattern similarities suggest a common deficiency of models, perhaps in the initial state uncertainty.
DTIC
Forecasting; Radio Waves

20040084971 Stevens Inst. of Tech., Hoboken, NJ

Assessing Transport in the Ocean and Atmosphere: Computational Tools for Predictability and Experimental Design

Miller, Patrick D.; Jul. 6, 2004; 8 pp.; In English

Contract(s)/Grant(s): N00014-99-1-0029

Report No.(s): AD-A424272; No Copyright; Avail: CASI; A02, Hardcopy

This effort addressed applications of dynamical systems to aperiodic, two-dimensional velocity fields, and improvements in the numerical tools available to perform such analysis. Invariant manifold techniques were used to estimate the extent of mixing in a barotropic meandering jet (Gulf Stream), showing that transport is on the same order as cross- jet transport due to ring detachment. Manifold calculations verified theoretical predictions of separatrix splitting in a viscous perturbation of the barotropic pv equation. In a simulation of an island recirculation, lobe analysis shed light on the importance of chaotic transport relative to Ekman transport. A pv budget was calculated for the gyre using a Lagrangian definition of the recirculation. The results imply that the budget for a time-averaged fixed boundary may typically overestimate the importance of chaotic advection in the overall vorticity budget. The vftool software package went through a major rewrite, including a better ODE solver, improved command-line interface and model input, a greatly expanded and improved Matlab toolbox, and compatibility with several variants of Unix.

DTIC

Atmospheric Pressure; Computer Programs; Experiment Design; Oceans; Predictions

20040084979 Academy of Sciences of the Armenian SSR, Ashtarack

Investigating the Effect of Natural and Technogenic Atmospheric Disturbances of the Northern Hemisphere on the Electromagnetic Environment in the Antarctic (P-072)

Yampolski, Yuri; Jul. 2003; 138 pp.; In English

Report No.(s): AD-A424281; EOARD-STCU-01-8003; No Copyright; Avail: CASI; A07, Hardcopy

This report results from a contract tasking National Academy of Sciences of the Ukraine as follows: The Project is aimed at studying the effect of high-energy natural and/or technogenic processes in the Northern hemisphere in the electromagnetic conditions of the Antarctic region. The observations are to be held at the Ukrainian 'Antarctic base (UAB) Academician Vemadsky' at 65 S, 64 W. The Antarctic is known to be the only continent where industrial production is prohibited and sizable electric power sources and consumers are absent. As a result. the electromagnetic 'climate' in the region is controlled mostly by processes in the lithosphere, atmosphere and magnetosphere. Besides, the Antarctic region is characterized by little, if any thunderstorm activity, that being the principal source of radio interference at low and middle latitudes at frequencies of fractions of one hertz to tens of megahertz. Hence, the natural conditions in the region are favorable for investigating the electromagnetic processes occurring in different parts of the world, such as the global thunderstorm activity, large-scale geomagnetic disturbances, the low frequency radiation from the lithosphere on the earthquake eve, and so forth.

DTIC

Antarctic Regions; Northern Hemisphere

20040084987 Secretary of the Air Force, Washington, DC

Weather For Aircrews - Air Force Handbook 11-203, Volume 2

May 16, 2002; 86 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424298; No Copyright; Avail: CASI; A05, Hardcopy

This handbook familiarizes the aircrew member with weather services, charts and codes. Serves as a text for undergraduate pilot and navigator training, all USAF instrument refresher training and flight instruction programs and various individual flying training programs. It is issued to each flying unit and to each instructor and student involved in Undergraduate Pilot Training and other aircrew training courses.

DTIC

Flight Crews; Handbooks; Weather

20040084996 Colorado Univ., Boulder, CO

Internal Consistency of Meteorological Data Obtained with a Volume-Imaging, Multi-Receiver Radar Wind Profiler

Muschinski, Andreas; May 26, 2004; 6 pp.; In English

Contract(s)/Grant(s): DAAD; 19-00-1-0527

Report No.(s): AD-A424315; ARO-40136.6-EV; No Copyright; Avail: CASI; A02, Hardcopy

The main goals of this project (″Internal consistency of meteorological data obtained with a volume- imaging,

multi-receiver radar wind profiler) were (1) to identify as clearly as possible the mathematical relationships between radar wind profiler (RWP) signals and the turbulent atmospheric field in the radar resolution volume; and (2) to develop dynamical and other conservation equations for those properties of the turbulence field that we identify in Part (1). The mathematical relationships between the radar observables and the atmospheric fields have now been formulated in a very general manner. In contrast to all earlier RWP theories, the new theory allows not only the zeroth moment (backscattered power) but also all higher moments (Doppler shift, spectral width, etc.) of the Doppler spectrum to be rigorously expressed in terms of statistics of the velocity and refractive-index fields in the RWP's resolution volume. The theoretical results have been illustrated and enhanced by the analysis of RWP measurements and fine-wire, in-situ turbulence measurements.
DTIC
Consistency; Doppler Effect; Imaging Techniques; Meteorological Parameters; Meteorological Radar; Radar Targets; Receivers; Wind (Meteorology); Wind Profiles

20040085014 Army Research Lab., White Sands Missile Range, NM
Effectiveness of Two Forecast Models for Stratiform Precipitation
Passner, Jeffrey E.; Apr. 2004; 38 pp.; In English
Report No.(s): AD-A424348; ARL-TR-3188; No Copyright; Avail: CASI; A03, Hardcopy

The U.S. Army Research Laboratory has developed a mesoscale weather model called the Battlescale Forecast Model (BFM). After model initialization, the BFM produces forecast variables for a 24-h period. Since the Army required a longer-term prediction, the Mesoscale Model Version 5 (MM5) gridded data are received from the U.S. Air Force Weather Agency to provide forecast information for up to a 48-h period. Due to the importance of precipitation on the tactical decision aids, as well as military operations in general, both models forecast stratiform and convective precipitation, which are made available to the user in a database and graphically. This report describes the basic meteorological theory applied to the precipitation processes and forecasts for both the BFM and MM5. The effectiveness of the BFM and MM5 precipitation output are analyzed as well. Precipitation forecasts are derived from numerical model data, such as the BFM and MM5. These data provide the forecaster and users with a detailed overview of the atmospheric conditions that might produce precipitation along with the general precipitation rates, amounts, and types. These precipitation parameters are later placed into other programs, such as the Integrated Weather Effects Decision Aid, can attain this information.
DTIC
Forecasting; Meteorology; Military Operations; Weather Forecasting

20040085351 NorthWest Research Associates, Inc., Bellevue, WA, USA
Mesosphere-Stratosphere Coupling: Implications for Climate Variability and Trends
Baldwin, Mark P.; July 27, 2004; 6 pp.; In English
Contract(s)/Grant(s): NASW-03015
Report No.(s): NASA-3015-QPR3; Rept-1; No Copyright; Avail: CASI; A02, Hardcopy

A key aspect of this project is the establishment of a causal link from circulation anomalies in the lower mesosphere and stratopause region downward through the stratosphere to the troposphere. The observational link for stratospheric sudden warmings and surface climate is fairly clear. However, our understanding of the dynamics is incomplete. We have been making significant progress in the area of dynamical mechanisms by which circulation anomalies in the stratosphere affect the troposphere. We are trying to understand the details and sequence of events that occur when a middle atmosphere (wind) anomaly propagates downward to near the tropopause. The wind anomaly could be caused by a warming or solar variations in the low-latitude stratopause region, or could have other causes. The observations show a picture that is consistent with a circulation anomaly that descends to the tropopause region, and can be detected as low as the mid-troposphere. Processes near the stratopause in the tropics appear to be important precursors to the wintertime development of the northern polar vortex. This may affect significantly our understanding of the process by which low-latitude wind anomalies in the low mesosphere and upper stratosphere evolve through the winter and affect the polar vortex.
Author
Climate; Mesosphere; Stratosphere

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*.

20040084640 Defence Science and Technology Organisation, Edinburgh, Australia
Environmental Mitigation Ranges Around Australia
Clarke, Paul; February 2004; 45 pp.; In English
Report No.(s): DSTO-GD-0395; DODA-AR-013-045; Copyright; Avail: Other Sources

URS Australia is currently writing a document ″Environmental Management Plan for Australian Maritime Exercise Areas″ for the ADF. To help URS, MOD has modelled the expected sound pressure levels for a number of different environments and sonar frequencies around Australia. This was used to calculate the mitigation range that could be used when operating different sonars in Australian waters.
Author
Australia; Environment Management; Marine Environments; Environment Protection; Underwater Acoustics

20040084683 NASA Stennis Space Center, Bay Saint Louis, MS, USA
Using MODIS Terra 250 m Imagery to Map Concentrations of Total Suspended Matter in Coastal Waters
Miller, Richard L.; McKee, Brent A.; April 11, 2004; 19 pp.; In English
Report No.(s): SSTI-2200-0001; No Copyright; Avail: CASI; A03, Hardcopy

High concentrations of suspended particulate matter in coastal waters directly effect or govern numerous water column and benthic processes. The concentration of suspended sediments derived from bottom sediment resuspension or discharge of sediment-laden rivers is highly variable over a wide range of time and space scales. Although there has been considerable effort to use remotely sensed images to provide synoptic maps of suspended particulate matter, there are limited routine applications of this technology due in-part to the low spatial resolution, long revisit period, or cost of most remotely sensed data. In contrast, near daily coverage of medium-resolution data is available from the MODIS Terra instrument without charge from several data distribution gateways. Equally important, several display and processing programs are available that operate on low cost computers.
Author
MODIS (Radiometry); Remote Sensing; Coastal Water; Imaging Spectrometers; Particulates; Sediments

20040085442 Toronto Univ., Ontario, Canada
Testing the Magma Ocean Hypothesis Using Metal-Silicate Partitioning of Te, Se and S
Rose, L. A.; Brenan, J. M.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 55; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

It has been observed that Te, Se and S all have similar depletions in the bulk silicate Earth (D(sup core-silicate-Earth)). If the core formed as a result of high P-T equilibrium at the base of a magma ocean, this equivalent depletion signature would require similar metal-silicate partitioning. The partitioning behavior of these elements is most certainly controlled by oxygen fugacity (fO2), but to different extents. A powerful test of the magma ocean theory is to determine if these elements converge to the same D at a set of P-T-fO2 conditions reasonable for core formation.
Derived from text
Magma; Oceans; Earth Core

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*.

20040084385 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Attitude Towards and Actual Consumption of Combat Rations by (Experienced) Military Personal with Varying Backgrounds, Part 2, Pilot Study Modified Food Questionnaire for the Airmobile Brigade
Westenbrink, S.; vanErp-Baart, A. M. J.; vanAken-Schneijder, P.; September 2003; 30 pp.; In Dutch
Contract(s)/Grant(s): A0/oD/105; TNO Proj. 22103/01.01
Report No.(s): TD-2003-0208-Pt-2; V5402-Pt-2; Copyright; Avail: Other Sources

In a pilot study to measure attitude and real consumption of military rations in a large group of military personnel with varying background it was concluded that a structured 24 hour dietary interview is not suitable for those who get their rations distributed for several days in advance. For this group an adapted version of the food consumption questionnaire was developed and tested. Using a self administered questionnaire, soldiers indicated: 1. Which food item (+ amounts) they selected from the combat ration for use during the military operation. 2. The foods consumed on day 1 and day 2. Furthermore they were asked to collect and return the food items that were left over after the operation. In principal, the food items selected at the start minus the food left over should equal the consumption on day 1 and day 2. However the agreement was poor. We expected that measuring the foods selected at the start and the food left over better reflects the real consumption, especially if more supervision is available. Thus for the main study it is recommended to collect only data on foods selected at the start and on foods left over at the end of the operation and to skip measuring food consumption on day 1 + 2.
Author
Food Intake; Diets; Military Personnel; Rations

20040084406 NASA Ames Research Center, Moffett Field, CA, USA
Ionization Cross Sections and Dissociation Channels of DNA Bases by Electron Collisions
Huo, Winifred M.; Dateo, Christopher E.; Fletcher, Graham D.; March 12, 2004; 1 pp.; In English; 8th International Workshop Radiation Damage of DNA, 25-30 May 2004, Banff, Canada; No Copyright; Avail: Other Sources; Abstract Only

Free secondary electrons are the most abundant secondary species in ionizing radiation. Their role in DNA damage, both direct and indirect, is an active area of research. While indirect damage by free radicals, particularly by the hydroxyl radical generated by electron collision with water. is relatively well studied, damage by direct electron collision with DNA is less well understood. Only recently Boudaiffa et al. demonstrated that electrons at energies well below ionization thresholds can induce substantial yields of single- and double-strand breaks in DNA by a resonant, dissociative attachment process. This study attracted renewed interest in electron collisions with DNA, especially in the low energy region. At higher energies ionization becomes important. While Monte Carlo track simulations of radiation damage always include ionization, the probability of dissociative ionization, i.e., simultaneous ionization and dissociation, is ignored. Just like dissociative attachment, dissociative ionization may be an important contributor to double-strand breaks since the radicals and ions produced by dissociative ionization, located in the vicinity of the DNA coil, can readily interact with other parts of the DNA. Using the improved binary-encounter dipole (iBED) formulation, we calculated the ionization cross sections of the four DNA bases, adenine, cytosine, guanine, and thymine, by electrons at energies from threshold to 1 KeV. The present calculation gives cross sections approximately 20% lower than the results by Bemhardt and Paretzke using the Deutsch-Mark and Binary-Encounter-Bethe (BEB) formalisms. The difference is most likely due to the lack of a shielding term in the dipole potential used in the Deutsch-Mark and BEB formalisms. The dissociation channels of ionization for the bases are currently being studied.
Author
Deoxyribonucleic Acid; Ionization Cross Sections; Dissociation; Particle Collisions; Free Electrons

20040084407 NASA Ames Research Center, Moffett Field, CA, USA
Ionization Cross Sections and Dissociation Channels of the DNA Sugar-Phosphate Backbone by Electron Collisions
Dateo, Christopher; Huo, Winifred M.; Fletcher, Graham D.; March 12, 2004; 1 pp.; In English; 3rd International Workshop on Space Radiation Research
Contract(s)/Grant(s): NAS2-00062; No Copyright; Avail: Other Sources; Abstract Only

It has been suggested that the genotoxic effects of ionizing radiation in living cells are not caused by the highly energetic incident radiation, but rather are induced by less energetic secondary species generated, the most abundant of which are free electrons.' The secondary electrons will further react to cause DNA damage via indirect and direct mechanisms. Detailed knowledge of these mechanisms is ultimately important for the development of global models of cellular radiation damage. We are studying one possible mechanism for the formation cf DNA strand breaks involving dissociative ionization of the DNA sugar-phosphate backbone induced by secondary electron co!lisions. We will present ionization cross sections at electron collision energies between threshold and 10 KeV using the improved binary encounter dipole (iBED) formulation' Preliminary results of the possible dissociative ionization pathways will be presented. It is speculated that radical fragments produced from the dissociative ionization can further react, providing a possible mechanism for double strand breaks and base damage.
Author
Deoxyribonucleic Acid; Ionization Cross Sections; Free Electrons; Radiation Effects; Ionizing Radiation; Cells (Biology); Sugars

20040084459 NASA Ames Research Center, Moffett Field, CA, USA
A Decade of Life Sciences Experiment Unique Equipment Development for Spacelab and Space Station, 1990-1999
Savage, Paul D.; Connolly, J. P.; Navarro, B. J.; [1999]; 6 pp.; In English; 29th International Conference on Environmental Systems, 12-15 Jul. 1999
Report No.(s): Paper 1999-01-2175; No Copyright; Avail: CASI; A02, Hardcopy

Ames Research Center's Life Sciences Division has developed and flown an extensive array of spaceflight experiment unique equipment (EUE) during the last decade of the twentieth century. Over this ten year span, the EUE developed at ARC supported a vital gravitational biology flight research program executed on several different platforms, including the Space Shuttle, Spacelab, and Space Station Mir. This paper highlights some of the key EUE elements developed at ARC and flown during the period 1990-1999. Resulting lessons learned will be presented that can be applied to the development of similar equipment for the International Space Station.
Author
International Space Station; Gravitational Physiology; Mir Space Station

20040084594 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Biochemical Effects of Low Level Exposure to Soman Vapour
Bajgar, J.; vanderSchans, M. J.; Fusek, J.; Degenhardt, C. E. A. M.; Sevelova, L.; deJong, L. P. A.; Benschop, H. P.; November 2003; 43 pp.; In English
Contract(s)/Grant(s): A00/D/448; TNO Proj. 014.12572
Report No.(s): TD-2002-0254; PML-2003-A80; Copyright; Avail: Other Sources

A cooperative project of TNO-PML and PMMA was performed dealing with effects of respiratory intoxication of guinea pigs by soman after whole body exposure to a sublethal dose (0.3, 0.4 and 0.7 LCt50). An apparatus was developed at PMMA which is suitable for exposure of guinea pigs, rats and mice to G agents. Intoxication by the 3 doses decreased plasma BuChE activity 1 day after exposure, whereas only the middle and/or the highest dose affected AChE activity in erythrocytes, diaphragm and 4 brain parts, neuroexcitability, some characteristics of spontaneous behaviour and liver tyro-sine aminotransferase activity, but did not affect the plasma corticosterone concentration (2 parameters for stressogenic effects). Only activities of AChE and BuChE and the scores for some behavioral characteristics were still different from those of non-treated animals 4 weeks after exposure. The method developed by TNO-PML for retrospective detection of exposure to a nerve agent was introduced into the methodical spectrum of PMMA. The sensitivity of this method was improved by using Nexus cartridges for solid phase extraction and thermodesorption/cold trap injection into the gas chromatographic system combined with MS detection. No conclusions could be drawn for the internal doses of soman caused by respiratory exposure to sublethal doses of the agent due to inconsistency of the results obtained.
Author
Biochemistry; Vapors; Respiratory Physiology; Intoxication; Guinea Pigs

20040084635 Defence Science and Technology Organisation, Edinburgh, Australia
Determining the Acceptable Limits of Head Mounted Loads
Ivancevic, V.; Beagley, N.; March 2004; 42 pp.; In English
Report No.(s): DSTO-TR-1577; DODA-AR-013-092; Copyright; Avail: Other Sources

This report reviews ergonomic and biodynamic factors related to the introduction of head mounted loads for military land environments. It presents an overview of current knowledge pertaining to the assessment of head mounted load limits. Limitations in the predictive ability of existing modelling and measurement techniques are discussed. The report introduces a novel biodynamic model, currently under development by DSTO, designed to overcome these limitations. LOD's Human Biodynamics Engine is a realistic model of the human body motion within a dynamic environment. The model is unprecedented in its representation of the full, distributed, three-dimensional neck and spine dynamics and in its incorporation of reflexive and cerebellar-like control of spinal motion. The model is used to investigate specific considerations of head mounted load design and their use in an operational context.
Author
Human Body; Loads (Forces); Biodynamics; Cerebellum

20040084682 Defence Science and Technology Organisation, Edinburgh, Australia
Side Effects of Virtual Environments: A Review of the Literature
Barrett, Judy; May 2004; 58 pp.; In English
Report No.(s): DSTO-TR-1419; DODA-AR-012-747; Copyright; Avail: Other Sources

Cybersickness symptoms are the unintended psychophysiological side effects of participation in virtual environments. Symptoms can occur both during and after participation, thus having implications for health and safety, user acceptance, and overall system effectiveness. Just as for other visually induced motion sickness, cybersickness is believed to result from sensory and perceptual mismatches between the visual and vestibular systems, and can be considered as a problem of adaptation to altered environments. Symptoms can be grouped into three dimensions: nausea, disorientation or postural instability, and visual symptoms. Numerous factors relating to the individual participants, the virtual reality system and virtual environment used, and the task carried out, can affect either incidence or severity of cybersickness. Taking account of these factors may avoid or minimise symptoms. This report reviews the literature on cybersickness, simulator sickness, and the relevant research on motion sickness, considers measures that have been proposed to manage and treat cybersickness, and identifies areas where more research is needed.
Author
Virtual Reality; Motion Sickness; Flight Simulators; System Effectiveness; Psychophysiology; Disorientation

20040084859 Colorado State Univ., Fort Collins, CO
Role of Melatonin in the Prevention of Breast Cancer in Patients With Cystic Breast Disease
Wells, Robert L.; Sep. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9143
Report No.(s): AD-A424033; No Copyright; Avail: CASI; A03, Hardcopy

The primary objectives of this study are to establish a clinical breast cyst fluid (BCF) sample bank among patients with gross cystic breast disease (GCBD) in order to study the relationship between GCBD, melatonin and related growth agents in BCF, and breast cancer risk. BCF samples form participating patients will be used to elucidate the contribution of melatonin and related growth agents (EGF, TGF- beta, DHEA-S) to the oncostatic effects of BCF on MCF-7 human breast cancer cells. This project is currently in its final year, which was added as a no-cost extension to the original study. Progress through year 3 included continued patient enrollment and completion of biochemical as says and growth experiments for incoming BCF samples. Patient recruitment is scheduled for completion in the near future and statistical data analyses will proceed in this final grant year. Preliminary results obtained form interim statistical analyses are consistent with previously reported findings. In summary, cell culture growth experiments using BCF samples and corresponding biochemical composition assays continued in year 3. This project is scheduled for completion in the upcoming grant year.
DTIC
Cancer; Cysts; Diseases; Hormones; Mammary Glands; Patients; Prevention

20040084860 Tulane Univ., New Orleans, LA
Retroelements and Genetic Instability in Breast Cancer
Perepelitsa, Victoria P.; Apr. 2003; 38 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0597
Report No.(s): AD-A424037; No Copyright; Avail: CASI; A03, Hardcopy

LINEl is the most prevalent human retroelement and it contributes to genomic instability. The full extent of LINE- 1 mobility in somatic tissues and tumors is not known. L1 expression is extremely low in differentiated cells except for testis but it is significantly elevated in some breast cancer cells. Full-length LINE-1 RNA is not detected even when transiently expressed from the CMV promoter. These observations suggest that posttranscriptional mechanisms are involved in limitation of L1 expression. By using a polyadq program we identified 20 putative polyadenylation (polyA) sites located only in the sense strand of the L1.3 genome. We hypothesize that the use of the putative polyA sites located within the L1 .3 genome limit the amount of full-length L1 .3 NIRNAs present in mammalian cells. We developed a system that allows detection of the full-length L1 mRNA and any RNA species produced through internal polyadenylation. We determined that numerous putative polyadenylation sites found in L1 elements are functional and they attenuate full-length L1 RNA formation by about 50 fold. There is tremendous redundancy in these internal polyadenylation sites. This unique attenuation mechanism helps to minimize the rate of L1 retrotransposition but may also increase the negative impact of these insertion events on the genome.
DTIC
Cancer; Genetics; Genome; Mammary Glands

20040084861 Chicago Univ., Chicago, IL
The Role of Capase-8 in Breast Carcinoma Cells
Barnhart, Bryan C.; Peter, Marcus E.; Apr. 2004; 77 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0200
Report No.(s): AD-A424040; No Copyright; Avail: CASI; A05, Hardcopy

CD95 mediated apoptosis is important for numerous processes, and often tumor cells develop a resistance to CD95 mediated apoptosis. NCF7-Fas-Bcl-xl cells, which are a model of a breast carcinoma cell, are protected from CD95 mediated apoptosis by binding and inactivating active caspase-8 generated at the DISC on mitochondria. The mechanism of this binding and its functional relevance is the subject of the study. The binding properties and mechanism of the subsequent degradation is addressed. Additionally, CD95 signaling in these apoptosis resistant tumor cells was determined to activate numerous signaling pathways, resulting in the activation of multiple genes including anti-apoptotic, pro- proliferative, and pro-tumorigenic genes, and ultimately an increase in motility and invasiveness. This increase was determined to be dependent on the activation of the NF-KB pathway, as well as the Erkl/2 pathway, and interestingly, caspase-8 activity. These observations are profound and relevant to the study of numerous breast cancers, and my redefine the way in which CD95 signaling is viewed. It also addresses the role of caspase-8 in breast carcinoma cells, which may induce tumor progression in certain circumstances rather than the death of the cell.
DTIC
Apoptosis; Cancer; Mammary Glands

20040084862 Cold Spring Harbor Lab., New York, NY
Analysis of the ARF/p53 Pathway During Oncogenic Stimulation
Nahle, Zaher A.; Lowe, Scott; Jul. 2003; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0682
Report No.(s): AD-A424043; No Copyright; Avail: CASI; A03, Hardcopy

This report describes the research accomplishments/findings covering the above indicated period and outlined in the approved statement of work. In short, we have locally manufactured, tested and successfully used the spotted cDNA microarray chips to analyze gene expression profiles of E1A induced primary mouse fibroblasts either wild- type or deficient for the ARF and/or p53 genes. We found that the ElA oncoprotein regulates the expression of a myriad of targets involved in a diversity of functions such as apoptosis, cell cycle progression, checkpoint control, DNA replication, angiogenesis, biosynthesis, as well as structural and cytoskeletal elements. Our results revealed the pleiotropic role of El A and produced a databank of potential apoptotic targets that can be studied and characterized. Following up on some targets, we demonstrated that ElA can coordinately up- regulate caspase expression through E2F via a direct transcriptional mechanism, providing therefore an example of how apoptosis can be hardwired' to cell-cycle progression. Importantly, we also showed that, p53-generated signals resulting in caspase activation (for example, cytochrome C release from mitochondria) cooperate with p53-independent increases in caspase expression to induce apoptosis, implying that oncogene-induced apoptosis proceeds through a highly coordinated series of events.
DTIC
Apoptosis; Cancer; Carcinogens; Stimulation; Tumors

20040084863 New York Univ., New York, NY
Breast Cancer Susceptibility and DNA Damage/Repair
Shore, Roy E.; Jun. 2003; 14 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0578
Report No.(s): AD-A424044; No Copyright; Avail: CASI; A03, Hardcopy

The specific hypothesis was that women who have selected polymorphic variants in genes that predispose them to poorer repair of DNA damage will have greater breast cancer risk. Polymorphisms in base excision repair (xRCCl), nucleotide excision repair (XPD, XPC), double-strand break repair (XRCC3, Rad5l, LIG4) and checkpoint-control (CDKN2A) genes were investigated. A secondary hypothesis was that risk may be further accentuated by lifestyle-related exposures to carcinogens or oxidants. A nested case control study of 612 matched pairs was conducted within the NYU Women's Health Study, a prospective study of over 14,000 healthy women aged 35-65 who were enrolled in the study during 1985-91. Genotyping was performed using RFLP. Statistical analyses were controlled for ethnicity, age, and various risk factors for breast cancer. There was a statistically significant increase in breast cancer risk for women who had the homozygous variant genotype for the XPC-PAT+ polymorphism (OR=l.41, 95% CI: 1. 04- 1.91). Further analyses suggested that women with the variant allele had an 80% greater (p=O.09) breast cancer risk associated with smoking and 70% greater (p=O.06) for alcohol consumption than those who were wild type. The XRCC3 Thr24l- Met substitution also showed a suggestive association with breast cancer risk.
DTIC
Cancer; Damage; Deoxyribonucleic Acid; Genes; Maintenance; Mammary Glands

20040084864 California Univ., Los Angeles, CA

Characterization of the Role of the Cytoplasmic Tail of Prostate Specific Membrane Antigen in its Intracellular Localization and Function

Rajasekaran, Ayyappan K.; Feb. 2004; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-00-1-0009

Report No.(s): AD-A424045; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this award was to identify cytoplasmic proteins that associate with the cytoplasmic tail of PSMA. Using yeast tow-hybrid screening, we identified that PSMA associates with an actin cross-linking proteins called filamin. We have demonstrated this interaction both in vitro and in vivo. We also established that PSMA is localized to he recycling endosome and that PSMA association with filamin is necessary for PSMA targeting to the recycling endosome. Finally, we also showed that the cytoplasmic tail of PSMA through its association with the act in cross-linking protein modulae the NAALADase activity of this protein. We suggest that the cytoplasmic tail of PSMA plays an important role in the function/s of PSMA.

DTIC

Antigens; Cancer; Cytoplasm; Membranes; Position (Location); Prostate Gland

20040084865 Colorado Univ., Denver, CO

Mechanisms of Growth Factor Attenuation of Cell Death in Chemotherapy Treated Breast Cancer Cells

Van Den Berg, Carla; Aug. 2003; 31 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9142

Report No.(s): AD-A424046; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this research project was study the mechanisms for insulin-like growth factor-I (IGF-I) mediated survival responses in breast cancer cells treated with chemotherapy or radiation. To this end, we have focused on the survival kinase, Akt and also the kinase which conveys cell death messages induced by chemotherapy or radiation treatment, JNK (c-Jun N-terminal kinase). Interestingly, IGF-I treatment of breast cancer cells induces the activity of both kinases Akt and JNK. Our recent work with Akt confirm that its activity protects cells form chemotherapy. The MCF-7 breast cancer cell line that we use for our studies is protected from ICF-I activation of Akt but not through pathways that have been described thus far. In fact, these cells are resistant to the cell death pathway that is typically activated with chemotherapy and radiation treatment. Therefore, we are currently studying new mechanisms for Akt mediated cell survival. Our work to identify how JNK conveys cell death signals in response to UV or chemotherapy treatment indicates that JNK can also down-regulates growth factor mediated signaling. Inhibition of JNK, in the absence of chemotherapy or radiation, also causes cell cycle arrest and inhibits breast cancer cell proliferation.

DTIC

Cancer; Cells (Biology); Chemotherapy; Death; Mammary Glands

20040084866 Burnham Inst., La Jolla, CA

Cloning and Characteristics of Active Egr-1 Target Genes by in Vivo Crosslinking

DE Belle, Ian; Dec. 2003; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-99-1-9092

Report No.(s): AD-A424047; No Copyright; Avail: CASI; A03, Hardcopy

This project is designed toward the identification of a comprehensive set of target genes for the transcription factor Egr1. Since breast cancer cells often do not express Egr1 while normal breast epithelial cells do, it is important to define Egr1 target genes with the hope that critical patterns of Egr1 regulated gene expression active only in normal cells will be revealed. I have chosen to approach this project using an in vivo crosslinking and chromatin immunoprecipitation (ChIP), protocol. Using this approach I have successfully cloned a newly identified Egr1 target gene called TOE1. This gene is currently being characterized, but has the property of an inhibitor of cellular growth when overexpressed. Furthermore, TOE1 may act through interaction and modification of the activity of p53.

DTIC

Cancer; Cloning (Biology); Crosslinking; Genes; In Vivo Methods and Tests; Mammary Glands; Targets

20040084867 Tulane Univ., New Orleans, LA

Potential Therapeutic Use of Glyceollins (I-III), Novel Anti-Estrogenic Flavonoid Phytochemicals Isolated From Soy

Burow, Matthew E.; Jul. 2003; 18 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0596

Report No.(s): AD-A424053; No Copyright; Avail: CASI; A03, Hardcopy

The flavonoid family of phytochemicals, particularly those derived from soy, has received attention regarding their estrogenic activity as well as their effects on human health and disease. The types and amounts of these compounds in soy and other plants are controlled by both constitutive expression and stress-induced biosynthesis. The health benefits of soy may therefore be dependent upon the amounts of the various hormonally active phytochemicals present. We have identified increased biosynthesis of the isoflavonoid phytoalexin compounds, glyceollins I, II and II, in soy plants grown under stressed conditions (elicited soy) which exhibit marked anti- estrogenic effects on ER function. The glyceollin (I-III) compounds may represent an important component of the health effects of soy as well as represent novel anti-estrogens useful in the prevention or treatment of breast carcinoma. in this grant we propose to test the hypothesis that elicited soy extract, which has been shown to be anti-estrogenic in cell culture, is therapeutic in a tumor- transfer model of breast cancer. Using this model, we additionally hypothesize that specific Glyceollins, isolated from elicited soy, will display anti-estrogenic activity in vivo, suppressing the growth of breast tumors. To this end in the first year of this proposal we have, 1) completed preliminary studies establishing the MCF-7 in vivo immunocompromised mouse model of tumorigenesis in this lab; 2) generated and 110 Kg of elicited soybeans to be converted to protein for use in the mouse soy diet studies and confirmed Glyceollin expression in various products; 3) begun separation of individual Glyceollins (I,II,III) from purified Glyceollin (I, II, III) mixture; 4) established the in vitro suppression of colony formation (survival/proliferation) by Glyceollins; and 5) demonstrated suppression of estrogen stimulated VEGF expression by Glyceollins.
DTIC
Cancer; Mammary Glands; Proteins; Therapy

20040084868 Johns Hopkins Univ., Baltimore, MD
Development of Targeted Sindbis Virus Vectors for Potential Application to Breast Cancer Therapy
Dropulic, Lesia K.; Sep. 2003; 14 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9232
Report No.(s): AD-A424055; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of the proposed research is to develop a propagation-competent (PC) aiphavirus vector that is targeted specifically to receptors expressed on breast cancer cells or to receptors expressed on tumor-associated vasculature. This type of targeted vector would provide a very efficient means of specifically killing a large number of malignant cells. Two Sindbis virus (SV) vectors containing the epidermal-like growth factor domain of heregulin in place of a portion of its receptor-binding domains, were impaired in their ability to assemble and bud from transfected cells. However, transfection of cells with the heregulin-containing SV RNAs resulted in preferential killing of breast cancer cells. Using a sequence encoding a 13 amino acid NUR- containing peptide ligand, we were able to produce a replication-competent SV. This recombinant virus did not preferentially replicate and kill cells expressing the target CD 13 receptor. Breast cancer tumors were produced in nude mice using MDA-MB-23 1 cells. Difficulties with production of PC heregulin containing virus and with production of sufficient quantities of viral RNA precluded performance of properly controlled animal studies. Future studies will focus on identifying other ligands, permissive sites of replacement versus insertion in the SV genome, and further development of the animal models.
DTIC
Cancer; Mammary Glands; Neoplasms; Therapy; Viruses

20040084873 Health Research, Inc., Buffalo, NY
Targeted Therapy of Human Breast Cancer by 2-5A- Antisense Directed Against Telomerase RNA
Cowell, John K.; Dec. 2003; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-98-1-8295
Report No.(s): AD-A424078; No Copyright; Avail: CASI; A03, Hardcopy

The telomerase enzyme consists of an RNA template and a reverse transcriptase which ensures replication of the termini of chromosomes. Normal somatic cells do not express telomerase and progressively lose telomeric repeat units at each cell division which ultimately results in celluarl senescence. Rapidly growing tumor cells overcome this handicap by reexpressiong the telomerase enzyme making it a potential target for therapy. We have demonstrated using anti sense oligonuclotides that targeting the RNA component of telomerase (hTR) for degradation commits tumor cells to rapid apoptosis in vitro and in vivo. Normal cells are unaffected a tumor cells treated with oligonucleotides carrying mismatched bases do not illicit this response. The same apoptotic response was induced in breast cancer cells in vitro using small interfering RNA molecules (siRNA) targeting hTR. In these approaches only a single treatment over a seven day period was sufficient to reduce cell viability significantly. This is in contrast to the need for daily administration of the antisense molecules. These observations provide

strong support for the possibility that targeting the telomerase RNA could be developed as a rational therapeutic approach if limitations of delivery and specificity can be overcome.
DTIC
Cancer; Mammary Glands; Ribonucleic Acids; Therapy

20040084874 Johns Hopkins Univ., Baltimore, MD
Development of a Diagnostic Blood Test for Breast Cancer
Gabrielson, Edward W.; Sep. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9236
Report No.(s): AD-A424079; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this study is to develop a diagnostic blood test for breast cancer. The concept is based on the premise that breast cancers shed sufficient quantities of DNA into plasma to be detected using methylation-specific PCR. Initial testing of the method was disappointing because relatively few cancers were detected in serum or plasma from documented breast cancer patients. We modified our methodology to greatly increase the sensitivity of the assay. Concurrently, we tested a larger panel of genes for methylation in breast cancers of various histologic types. The improvement of sensitivity resulted in some loss of specificity, with positive methylation signals detected in white blood cells and normal breast from some individuals. This problem appeared to be somewhat biased toward particular genes, such as BrCAl. Using the modified MSP detection method and a panel of 4 sensitive and relatively specific gene markers, we were then able to detect positive signals in plasma for 21 of 31 cases (62%) with methylation of at least one of the genes in the tumor tissue. Overall, this project has demonstrated potential for using methylation specific PCR to detect breast cancer derived DNA in patients' blood. However, the project has also identified potential issues with regard to sensitivity and specificity that would need to be addressed before application as a clinical assay.
DTIC
Blood; Cancer; Deoxyribonucleic Acid; Diagnosis; Mammary Glands; Methylation

20040084875 Brookhaven National Lab., Upton, NY
PET Imaging of Estrogen Metabolism in Breast Cancer
Ding, Yu-Shin; Jun. 2002; 42 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9089
Report No.(s): AD-A424080; No Copyright; Avail: CASI; A03, Hardcopy

We propose that estrogen metabolism in breast cancer can be imaged with positron emission tomography (PET). It is well known that many breast tumors associate with estrogen and the presence of catecholestrogens in breast tumors cause changes in the DNA which may lead to uncontrolled cell growth. Catecholestrogens are broken down by an enzyme called catechol-O-methyltransferase (COMT). COMT is known to be elevated in malignant breast tumors, and abnormal COMT genetics have recently been found in individuals with breast cancer. We have developed 18Fro4l-096O, the first radiotracer for visualizing COMT with PET. The hypothesis that 18Fro4l- 0960 can map COMT was demonstrated both in vivo and ex vivo in baboon and rodents. We have also adapted our COMT enzyme assay method and performed studies in breast tumor tissue samples from cancer patients undergoing surgery. Preliminary results showed elevated COMT activities in the breast tumor tissues of all patients studied; the difference can be as high as 26 fold increase. We then carried out toxicology tests and submitted an IND application that was finally approved by the FDA on Oct. , 1999 to conduct studies in breast cancer patients. After receiving the IND, we have been working on documents that required to get approvals from the HSRRB at US Army Medical Research and local IRBs at BNL and Stony Brook. This novel approach to an extremely important medical problem goes beyond diagnosis in that it seeks to delineate the fundamental biochemical properties and molecular signatures of tumor cells. PET imaging studies on breast cancer patients are underway.
DTIC
Cancer; Estrogens; Imaging Techniques; Mammary Glands; Metabolism

20040084879 Massachusetts General Hospital, Boston, MA
An MR Contrast Agent for Intra-Prostatic Imaging of Prostatic Cancer
Josephson, Lee; Jan. 2004; 30 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0089
Report No.(s): AD-A424091; No Copyright; Avail: CASI; A03, Hardcopy

The goal of the current research is the development of a magnetic nanoparticle based MR contrast agent that binds the

gastrin releasing peptide receptor, a molecular marker associated with neoplasia. In the first year of this proposed work a series of bombesin derivatives have been synthesized and their binding to the GRP receptor quantitated by displacement of radioiodinated bombesin. Positively charged derivatives have lower LC50s, suggesting that the environment around the binding pocket is negatively charged and hydrophilic. Selected peptides have been conjugated to magnetic nanoparticles with various numbers of peptides per nanoparticle. A non-isotopic, enzyme immunoassay method, based on the ability to quantify fluorescein, has been developed to replace the assay using receptor binding and displacement of radioiodinated peptides.
DTIC
Cancer; Imaging Techniques; Magnetic Properties; Magnetic Resonance; Prostate Gland

20040084880 Baylor Coll. of Medicine, Houston, TX
INT6 is a Potential Tumor Suppressor for Breast Cancer
Chang, Eric C.; Feb. 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0624
Report No.(s): AD-A424092; No Copyright; Avail: CASI; A02, Hardcopy

This project tests the hypothesis that Int6 regulates the 26s proteasome and acts as a tumor suppressor for breast cancer. With the support of this grant, we were able to complete a number of studies in a genetic model system (yeast), thus firmly establishing the fact that Int6 regulates the proteasome. To further our studies in mammalian cells, the key experiment proposed in this project period is to create cell lines in which Int6 can be inactivated. The most direct and powerful way of doing this is to use RNAi to knock-down 11VT6 expression. We have started testing several oligos but so far have not yet successfully knocked down INT6 expression. To properly detect INT6 expression, we have obtained two antibodies against Int6 from colleagues. In the mean time, we have made anti peptide antibody against Int6 and are further improving its specificity for immunoblots. As an alternative approach to inactivate Int6 activities, we are constructing cell lines that express C-terminally truncated Int6, which may be dominant negative. We are performing RT-PCR now to screen a number of clones that may stably express these proteins.
DTIC
Cancer; Genetics; Mammary Glands; Suppressors; Tumors

20040084881 Pennsylvania State Univ., University Park, PA
Discovery of Cyclic Peptide Estrogens and Antiestrogens
Clark, Daniel D.; May 2004; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0536
Report No.(s): AD-A424093; No Copyright; Avail: CASI; A02, Hardcopy

The identification of proteins involved in the initiation of disease and the identification of small molecules that modulate these proteins are of great importance for the discovery of improved therapeutics. For example, compounds that potentiate estrogen receptor-mediated gene expression comprise a large class of currently employed drugs. These compounds can both treat breast cancer and provide hormone replacement therapy. Although initially beneficial, over time current clinically prescribed compounds can exhibit deleterious side-effects that include the development of drug resistance and an increased risk of breast cancer. We initially hypothesized that a recently described genetic system termed split-intein mediated circular ligation of peptides and proteins (SICLOPPS) (PNAS, 1999, 96, 13638- 13643) could enable the identification of small cyclic peptides that exhibit estrogenic and antiestrogenic activity in recombinant yeast systems. However, preliminary data suggests that SICLOPPS does not function or express well in yeast. Current efforts are directed at using related systems to investigate oncogenic protein tyrosine kinases and to identify proteins involved in estrogen-responsive pathways. These studies may identify new drug targets involved in the proliferation of breast cancer.
DTIC
Cancer; Estrogens; Genes; Hormones; Mammary Glands; Peptides

20040084882 Maryland Univ., Baltimore, MD
Novel Growth Factor as Prognostic Marker for Estrogen-Independence in Breast Cancer
Serrero, Ginette; Aug. 2003; 58 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0551
Report No.(s): AD-A424094; No Copyright; Avail: CASI; A04, Hardcopy

The Concept Award focused on investigating the expression on the biomarker PCDGF/GP88 in breast cancer and its effect on the acquisition of estrogen independence and tamoxifen resistance, a hallmark of breast cancer with poor prognosis.

Specific aims set for this application were achieved. PCDGF expression was examined by immunohistochemistry in paraffin embedded breast cancer biopsies. A study with 206 samples showed that PCDGF was mostly negative in benign lesions. In contrast 67% of ductal carcinoma in situ (ICIS) and 80% of invasive ductal carcinoma (IDC) stained positive for PCDGF/GP88. In IDcs, PCDGF expression correlated with tumor grade, p53 and Ki67. In contrast, no correlation was found with ER/PR and Her-2 expression. Based on these results, we examined the effect of increased expression of PCDGF in ER+MCF-7 cell line as model system. We showed that increased of PCDGF expression in these cells led to estrogen independence and to resistance to the antiestrogen tamoxifen both in vitro and in vivo in mouse xenografts. Molecular studies demonstrated that PCDGF exerts its effect by blocking the apoptotic effect of tamoxifen. These data demonstrate the importance of PCDGF/GP88 as a novel target for the development of therapy for tamoxifen resistant breast cancer.
DTIC
Cancer; Estrogens; Mammary Glands; Markers

20040084883 Colorado Univ., Aurora, CO
Effects of Androgen Blockade on Cognitive Function and Quality of Life in Men with Prostate Cancer
Grigsby, James P.; Feb. 2004; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0040
Report No.(s): AD-A424095; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this project is to examine the nature and severity of cognitive impairments experienced by men undergoing continuous androgen deprivation or intermittent androgen deprivation treatment. The cognitive abilities of androgen deprivation patients will be compared with those of a sample of healthy men. We are undertaking collection of data from three groups: 35 men on intermittent androgen deprivation therapy, 35 men on continuous androgen deprivation therapy, and an age- and education-matched sample of 35 healthy (cancer- free) men. Our major hypothesis is the patients undergoing androgen deprivation therapy will experience impairments in those cognitive abilities reported in the research literature to be related to androgen levels (e.g., spatial ability, working memory for visual information). There are as yet no results to report. During this second project year, we have begun data collection with androgen-deprivation subjects, but have continued to spend an inordinate amount of time in obtaining necessary institutional approvals.
DTIC
Cancer; Cognition; Hormones; Human Beings; Males; Mental Performance; Prostate Gland; Social Factors

20040084884 Medical Univ. of South Carolina, Charleston, SC
Real-Time PCR Analysis of Peripheral Blood: A Non- Invasive Technology That Can Be Used to Assess Tumor Burden in Breast Cancer Patients
Mitas, Michael; Oct. 2003; 9 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0554
Report No.(s): AD-A424096; No Copyright; Avail: CASI; A02, Hardcopy

The molecular detection of circulating tumor cells (CTC) in breast cancer patients has been limited by two factors: 1) low concentration of CTC in peripheral blood, and 2) normal lymphocytes express some cancer-associated genes at detectable levels. In this study, we investigated the ability of a novel buoyant density gradient centrifugation (BDGC) medium (Oncoouick, HEXAL Gentech) to enrich CTC prior to real- time RT-PCR analysis.
DTIC
Blood Circulation; Cancer; Erythrocytes; Lymphocytes; Mammary Glands; Patients; Real Time Operation; Tumors

20040084885 Duke Univ., Durham, NC
Toxic Interactions of Prophylactic Drugs and Pesticides
Abou-Donia, Mohamed B.; Jul. 2003; 230 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-99-1-9020
Report No.(s): AD-A424099; No Copyright; Avail: CASI; A11, Hardcopy

The goal of this project is to evaluate the mechanisms of interactive effects of exposure to the insect repellant, DEET, the insecticide, permethrin, and anti-nerve agent, pyridostigmine bromide (PB) and the biological and pathological consequences of such interactions. The hypothesis to be tested is that combined exposure to a mixture of chemicals would have enhanced, and in some cases detrimental toxicological effects than exposure with single chemical as result of diminished ability of the body to detoxify these chemicals, and as a consequence, an increased effective concentration of the parent compound(s) in the

circulation. The resultant toxic response is probably due to enhanced delivery and availability of individual chemicals to the target organ, and to specific molecules.
DTIC
Bromides; Drugs; Pesticides; Toxicity

20040084886 Johns Hopkins Univ., Baltimore, MD
Pathobiology of pp32 in Breast Cancer
Pasternack, Gary R.; Sep. 2003; 8 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9240
Report No.(s): AD-A424101; No Copyright; Avail: CASI; A02, Hardcopy

Breast cancers differ from benign breast epithelium through the prominent expression of pp32rl and pp32r2, oncogenic members of the pp32 gene family, in contrast to benign epithelium, which predominantly expresses pp32. 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. In the course of pursuing this work, we recognized that improved assay methods would yield better results for Task 1. To complete these tasks, it was ultimately necessary to raise, affinity- purify, and characterize antibodies to peptides derived from pp32, pp32rl, and pp32r2. Characterization of these antibodies by Western blot shows that they are sufficiently specific to be employed in panels to distinguish the pp32 forms in breast samples; this work will continue beyond the project period.
DTIC
Cancer; Clinical Medicine; Epithelium; Mammary Glands; Pathology

20040084896 University Health Network, Toronto, Ontario
Development of COMET-FISH Method for Rapid Identification of Persons at Risk for Breast Cancer Development. Addendum
Bristow, Robert; Jan. 2004; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-01-1-0526
Report No.(s): AD-A424123; No Copyright; Avail: CASI; A03, Hardcopy

A proportion of breast cancers have genetic alterations at 17q11.2-q12 (HER-2/neu), 20q13.2 (ZNF217 gene) and 17p13.1 (p53). We have documented global genetic instability within malignant breast cancer cell lines (MCF-7; MDA-MB-468 and CRL-2336) by coupling the DNA-damage Comet assay to fluorescence in situ hybridization (Comet-FISH). Gene- specific instability at p53 and HER-2 loci was also observed. Following genotoxic insult (IR and H2O2), we found that p53 locus was capable of rapid and preferential repair when compared to the HER-2 locus. Comet-FISH is a rapid and easy assay which is amenable for the study of gene-specific instability or DNA repair in tissues relating to cancer risk or progression.
DTIC
Cancer; Comets; Fishes; Genetics; Mammary Glands; Risk

20040084899 Lawrence Livermore National Lab., Livermore, CA
Quantifying the Effects of Preventive Foods on the Metabolism of a Prostate Carcinogen in Humans and in Prostate Cells Grown in Culture
Felton, James S.; Apr. 2003; 49 pp.; In English
Contract(s)/Grant(s): DAMD17-00-1-0011
Report No.(s): AD-A424126; No Copyright; Avail: CASI; A03, Hardcopy

We are investigating the effects of foods associated with reduced prostate cancer risk on a dietary carcinogen known to be associated with cooked meat and elevated cancer risk. Cooked muscle meats contain potent mutagens and carcinogens belonging to the heterocyclic amine class of compounds. One of these, PhIP, is a genotoxic carcinogen that has been shown to cause DNA damage in prostate tissue and prostate tumor formation in rats. We have developed a method to quantify urinary metabolites of PhIP in human volunteers that have been fed a meal of cooked chicken. Using this method, we have shown that PhIP metabolism may be affected by diet and lifestyle factors and that broccoli, soy, and tomatoes may influence the relative amounts of PhIP metabolite excretion. At the cellular level we are investigating the metabolism of PhIP in human prostate cancer cells and are investigating the relationship between DNA damage and gene expression. This research uses

state-of-the- art analytical measurement methods to support conclusions about the role of diet and prostate cancer in humans. Although still preliminary, our results indicate that other components of the diet may have an effect on the metabolism of a commonly- occurring food carcinogen.
DTIC
Carcinogens; Cells (Biology); Metabolism; Prostate Gland

20040084903 Northeastern Ohio Univ. Coll. of Medicine, Rootstown, OH
Prevalence and Outcomes of Restless Legs Syndrome Among Veterans
Bourguet, Claire C.; Feb. 2004; 43 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0082
Report No.(s): AD-A424133; No Copyright; Avail: CASI; A03, Hardcopy

Restless Legs Syndrome (RLS) is a commonly under or misdiagnosed organic cause of insomnia. Prevalence estimates range form 4 to 16%, with 29% reported among Veterans. Thirty-five percent of US adults report insomnia annually. There is evidence that insomnia leads to psychic distress which impacts health care utilization. To examine components of a proposed model linking RLS to insomnia, and insomnia to physic distress and increased utilization. To estimate the prevalence of RLS, insomnia, mood disorders, and substance abuse; quantify the proportion of mood disorders and substance abuse which are attributes to RLS and insomnia; document the diagnosis of RLS and insomnia; and estimate the association of RLS and insomnia to health care utilization and health related quality of life. A cross-sectional survey of a representative sample of Ohio VA clients using telephone interviews and data extracted from medical records. One year follow-up of health care utilization using postal questionnaire and medical records. In the first research year, interviews were completed with 958 veterans. Methods for abstracting utilization data from electronic medical records were developed, as were methods to adjust study outcomes for health status of study members. Data collection is ongoing.
DTIC
Data Acquisition; Insomnia; Military Personnel; Signs and Symptoms

20040084909 Chicago Univ., Chicago, IL
Improved MR Images of Breast Lesions with Fast Spectroscopic Imaging
Karczmar, Gregory S.; Oct. 2003; 38 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9121
Report No.(s): AD-A424140; No Copyright; Avail: CASI; A03, Hardcopy

The goal of this research is to use high spectral and spatial resolution (HiSS) MR imaging to improve images of human breast. Our work on the application of HiSS to improve anatomic and functional imaging was first described in a paper in Academic Radiology. Related work from this laboratory is presented in a number of other publications. Work from other laboratories shows that closely related methods also provide advantages for anatomic and functional MRI. Our funding from the Army has supported implementation of HiSS on clinical scanners and preliminary tests of the method in women with normal breasts and women with breast lesions. The results demonstrate that HiSS provides improved fat-suppression, contrast and edge delineation compared to conventional imaging. The funded work resulted in several publications listed in this report We are continuing to optimize this method and are applying for additional funding so that it can be tested in a larger group of women.
DTIC
Cancer; Clinical Medicine; High Resolution; Imaging Techniques; Lesions; Magnetic Resonance; Mammary Glands; Spectroscopy

20040084916 Long Island Jewish Medical Center, New Hyde Park, NY
Breast Cancer Prevention by Hormonally Induced Mammary Gland Differentiation: The Role of a Novel Mammary Growth Inhibitor and Differentiation Factor MRG (Addendum)
Shi, Yuenian E.; Oct. 2003; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9255
Report No.(s): AD-A424154; No Copyright; Avail: CASI; A03, Hardcopy

A mammary derived growth inhibitor related gene and a fatty acid binding protein MRG was previously identified and characterized. The present study is to test the hypothesis that MRG is a candidate mediator of the differentiating effect of pregnancy and lactation on breast epithelial cells and up- regulation of MRG expression in young mulliparous females can mimic pregnancy- and lactation-induced mammary gland differentiation and prevent breast cancer incidence. Overexpression

of MRC in human breast cancer cells induced differentiation with changes in cellular morphology and significant increase in the production of lipid droplets. Treatment of mouse mammary gland in organ culture with MRG protein resulted in a differentiated morphology and stimulation of beta-casein expression. While there was no lobulo-alveolar structure in control virgin mice, expression of MRG transgene in the mammary gland of MRG transgenic mice resulted in the formation of alveolar-like structure. Consistent with the morphological change, expression of MRG also increased milk protein b-casein expression in the gland. Our results suggest that MRG is a candidate mediator of the differentiating effect of pregnancy on breast epithelial cells.
DTIC
Cancer; Inhibitors; Mammary Glands; Prevention

20040084917 Johns Hopkins Univ., Baltimore, MD
Rational Inhibitors of DNA Base Excision (BER) Enzymes: New Tools for Elucidating the Role of BER in Cancer Chemotherapy
Krosky, Daniel J.; Stivers, James T.; May 2004; 32 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0251
Report No.(s): AD-A424155; No Copyright; Avail: CASI; A03, Hardcopy
In this funding period we have completed Task 1 of the approved Statement of Work which seeks to develop useful inhibitor scaffolds for the DNA repair enzyme uracil DNA glycosylase (UDG). In addition, we have performed groundbreaking studies that shed light on the molecular basis of substrate recognition by UDG. These new studies provide exciting avenues for rational inhibitor development with potential for anticancer therapy. Major findings in this period include the synthesis and screening of new bipartite transition state-based inhibitors for UDG, and the exploration of the roles of hydrogen bonding and molecular flexibility in specific recognition by the enzyme. This work has resulted in two publications during this period.
DTIC
Bit Error Rate; Cancer; Chemotherapy; Deoxyribonucleic Acid; Inhibitors; Mammary Glands

20040084918 Mount Sinai Hospital, Toronto, Ontario
Are p53 Mutations Associated With Increased Risk of Developing Breast Cancer? A Molecular Epidermiological Study
Kandel, Rita A.; Oct. 2003; 42 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9301
Report No.(s): AD-A424156; No Copyright; Avail: CASI; A03, Hardcopy
In a case-control study, nested within a cohort of 4,888 women with BBD, we demonstrated that p53 protein accumulation detected by immunohistochemistry was associated with a 2.5- fold increase in the risk of subsequent breast. However, by using immunohistochemistry alone, we may have underestimated the true risk of developing breast cancer. We hypothesized that p53 mutations in benign breast tissue are associated with increased risk of subsequent breast cancer. We are testing our hypothesis by: (1) analyzing benign breast tissue from 138 cases and 556 controls for the presence of p53 mutations using PCR-SSCP and PCR-direct DNA sequencing; and (2) estimating the risk of breast cancer in relation to: (a) the presence of p53 mutations in BBD; and (b) the presence of both p53 mutations and p53 protein accumulation in BBD. DNA was extracted fro the paraffin -embedded breast tissue and exons 2 to 11 of p53 were screened by PCR-SSCP followed by manual sequencing if an abnormality was detected. Manual sequencing was used as we found it detects more gene alterations than GeneChipR array. Women with an alteration in intron that is not a polymorphism and positive immunostaining for p53 have a 2.9 fold increased risk to develop breast cancer.
DTIC
Cancer; Epidemiology; Mammary Glands; Mutations; Risk

20040084927 Massachusetts Univ. Medical Center, Worcester, MA
A Holistic Quality of Life Intervention for Patients with Secondary Prostate Cancer
Carmody, James F.; Feb. 2004; 315 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-02-1-0091
Report No.(s): AD-A424187; No Copyright; Avail: CASI; A14, Hardcopy
The second annual report of progress in the study entitled A holistic quality of life intervention for patients with secondary prostate cancer' is contained. Each of the tasks listed in the approved statement of work' that were applicable to the second year of the study is contained. In particular: Task 1: Patient identification and referral. Task 2: Patient contact, intake of patients

into study, patient tracking. Task 3 Review of intervention group meetings and materials. The successful completion of two intervention cycles and the subsequent three-month follow-up data collection procedures is described. Special attention is given to the adapted recruitment strategies that have been developed to remedy the shortfall of study accrual numbers for recruitment into the third intervention cycle that begins in March 2004. Also included are the completed participant intervention manual and accompanying CD. The featuring of this study on the ABC national evening network news broadcast as an example of an innovative approach to cancer treatment is also discussed. Because the intervention period of this study is not yet complete no outcomes are reported.
DTIC
Cancer; Patients; Prostate Gland; Stress (Psychology)

20040084930 Operational Technologies Corp., Beavercreek, OH
Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) Field Demonstration Report: Elmendorf Air Force Base, Alaska
Reed, D. A.; Sterner, T. R.; Merrill, E. A.; Jun. 2001; 94 pp.; In English
Contract(s)/Grant(s): DAHA90-06-D-0014; Proj-1710
Report No.(s): AD-A424194; AFRL-HE-WP-TR-2001-0118; No Copyright; Avail: CASI; A05, Hardcopy

A demonstration of the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) approach for assessing human health risk at weathered petroleum release sites was performed at a former underground storage tank (UST) release site at Elmendorf Air Force Base (EAFB), Alaska. The site, ST702/8, Military Airlift Command (MAC) Chalet (Building 31562), a recreational cabin, is impacted by diesel fuel. A total of ten soil samples were obtained at depths to 12 feet below the ground surface (bgs). The soil samples were analyzed for total petroleum hydrocarbons (TPH) as TPH gasoline range organics (GRO) and TPH diesel range organics (DRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), and petroleum fractions. Six of the ten primary soil samples contained TPH DRO concentrations above the Alaska Method Two cleanup standard for petroleum migration to groundwater (250 mg/kg). RBSLs were calculated for a recreational and a commercial exposure scenario. For the recreational scenario, only one soil sample exceeded the Tier 1 total TPH RBSL (955 mg/kg). For the commercial exposure scenario four of the site soil samples contained TPH in concentrations that exceeded the Tier 1 total TPH RBSL for the subsurface soil indoor vapor inhalation pathway. Higher tier (Tier 2) risk evaluations are recommended for select data before any remedial actions are imposed.
DTIC
Crude Oil; Hydrocarbons; Petroleum Products; Storage Tanks

20040084931 Pittsburgh Univ., Pittsburgh, PA
Determination of a Unique Pattern of Gene Expression in Node Positive Breast Cancer Using Serial Analysis of Gene Expression (SAGE)
Brufsky, Adam M.; Jul. 2003; 5 pp.; In English
Contract(s)/Grant(s): DAMD17-01-1-0608
Report No.(s): AD-A424196; No Copyright; Avail: CASI; A01, Hardcopy

The main hypothesis of this project is that a specific genetic expression pattern for lymphogeneous spread exists in a small fraction of cells in primary breast cancer. The Principal Investigator (PI) believes that this expression pattern will be the same in primary tumors from different women. These patterns could then be exploited to determine the lymph mode status of a primary breast cancer. This DOD concept award extension investigated whether a genetic signature in the primary tumor could be developed for lymph node positive breast cancer. Using a combination of serial analysis of gene expression (SAGE) and microarray techniques, a preliminary genetic signature has been developed. Further experiments are in progress to refine the genetic signature and confirm the overexpression of certain genes that predict for lymph node positive breast cancer.
DTIC
Cancer; Gene Expression; Genetics; Lymphatic System; Mammary Glands

20040084932 Duke Univ., Durham, NC
The Role of Estrogen Related Receptor in Modulating Estrogen Receptor Mediated Transcription in Breast Cancer Cells
Gaillard, Stephanie; McDonnell, Donald P.; Apr. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0174
Report No.(s): AD-A424198; No Copyright; Avail: CASI; A03, Hardcopy

Estrogen-related receptors (ERRs) are orphan members of the nuclear receptor super family of ligand- dependent transcription factors. Unlike estrogen receptors (ERs), ERRs are unresponsive to natural estrogens and activate transcription constitutively, interacting with required coactivators and DNA-binding elements in the absence of ligand. ERR-alpha has been shown to 1) activate the transcription of pS2, a breast cancer marker; 2) be unresponsive to hormonal therapies, i.e. Tamoxifen; and 3) correlate with unfavorable prognosis in breast tumors. Thus ERR-alpha could be a predictive marker of breast tumor hormone responsiveness and may be a suitable therapeutic target for hormone resistant breast cancers. Therefore, understanding the convergence of the ER and ERR signaling pathways is critical to clarifying the role of ERRs in modulating hormone response. Without specific ligands to modulate ERRs, studies of the physiological contributions of these receptors has been limited. We proposed to develop peptide antagonists to specifically inhibit the transcriptional activity of ERRs by blocking receptor-cofactor interactions. Peptides were identified by phage display screening that are capable of inhibiting ERR-mediated transcription without disrupting the transcriptional activity of other nuclear receptors, e.g. ER- alpha and ER-beta, validating the use of these peptides as specific ERR antagonists. In addition, using these peptides we have identified key regulatory surfaces on the ERR protein that permit the interaction of the receptor with previously validated ERR-coactivators.
DTIC
Cancer; Cells (Biology); Estrogens; Mammary Glands; Modulation; Transcription (Genetics)

20040084933 ManTech Environmental Technology, Inc., Dayton, OH
Metabolism of Perchloroethylene and 1,1,1,2- Tetrachloroethane After Carbon Tetrachloride Pretreatment in B6C3F1 Mice
Mahle, Deirdre A.; Godfrey, Richard J.; Buttler, Gerry W.; Fisher, Jeffrey W.; Aug. 2000; 23 pp.; In English
Contract(s)/Grant(s): F33615-00-C-6060; Proj-4223
Report No.(s): AD-A424200; AFRL-HE-WP-TR-2001-0133; No Copyright; Avail: CASI; A03, Hardcopy
Risk assessments for chlorinated solvents are typically only done for single chemicals, and clean up costs are based on these assessments. However, groundwater and drinking water supplies are usually contaminated with multiple compounds. The most commonly used approach for assessing risks to multiple chemical exposures assumes additivity of response. This study investigates the effect of exposure to mixtures of carbon tetrachloride and 2 other chlorinated solvents, perchloroethylene and 1,1,1 ,2-tetrachloroethane. Metabolite formation, which is the process thought to be responsible for toxicity is affect carbon tetrachloride. By understanding the alteration in metabolic outcome for perchlorethylene and 1,1,1 ,2-tetrachloroethane the assessment of risk associated with exposures to these types of mixtures may be more science-based.
DTIC
Carbon Tetrachloride; Chlorination; Metabolism; Metabolites; Mice; Pretreatment; Toxicity

20040084935 California Univ., Los Angeles, CA
Endothelial Genes
Brooks, Mai N.; Jun. 2004; 13 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0330
Report No.(s): AD-A424202; No Copyright; Avail: CASI; A03, Hardcopy
Breast cancer growth and metastasis are dependent on angiogenesis. Multiple angiogenic peptides have been identified and sequenced. These include basic and acidic fibroblast growth factor (bFCF and aFGF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), transforming growth factor-alpha and beta (TGF-alpha and TGF- beta), hepatocyte growth factor (HGF), tumor necrosis factor- alpha (TNF-alpha), interleukin-8 (IL-8), granulocyte colony stimulating factor (G-CSF), E-selectin, angiogenin, platelet- derived endothelial cell growth factor (PD-ECGF), placental growth factor and pleiotrophin. Furthermore, several endogenous angiogenic inhibitors have recently been identified. These include thrombospondin, TMP-1 (tissue inhibitor of metalloproteinase), angiostatin, endostatin, METH-I and METH-2. Recently, our laboratory has utilized a subtraction hybridization technique to identify two novel genes: endomucin and EG-1 (endothelial-derived gene-1).
DTIC
Cancer; Endothelium; Genes; Mammary Glands

20040084936 ManTech Environmental Technology, Inc., Dayton, OH

Cytotoxicity of the Murine Keratinocyte Line HEL30 Exposed to the JP-8 Jet Fuel Components M-xylene 1-Methylnaphthalene and N-nonane

Rogers, James V.; Pollard, Dan L.; McDougal, James N.; Siegel, Gary L.; Oct. 2002; 28 pp.; In English

Contract(s)/Grant(s): Proj-2312

Report No.(s): AD-A424203; AFRL-HE-WP-TR-2003-0003; No Copyright; Avail: CASI; A03, Hardcopy

In vitro models are being used to evaluate the toxic and irritating effects of JP-8, a kerosene-based jet fuel. JP-8 components are volatile, which makes in vitro studies difficult to evaluate dose-response relationships due to changes in chemical dosimetry caused by evaporation from the exposure medium. An in vitro approach testing volatile chemical toxicity that we have recently developed was used to evaluate the toxicity of the JP-8 components m-xylene, 1- methylnaphthalene (1-MN), and n-nonane in keratinocytes. Partition coefficients were measured and used to estimate the chemical concentration in the keratinocytes. The EC50 for m- xylene and 1-MN decreased significantly (P\h0.05) at 1 2, and 4 hi. For n nonane, no significant decreases in the EC50 values were observed over time; marginal cytotoxicity of n nonane in keratinocytes was observed at 1 hi. Within 4 hi, about 75-90% of each volatile chemical was observed to be lost from the exposure medium when tissues were exposed in unsealed 24-well plates. This decrease resulted in significantly higher medium chemical concentrations needed to obtain EC50 values when compared to tissues exposed in sealed%vials. This study demonstrates that chemical evaporation during in vitro exposures can significantly affect toxicological endpoint measurements. Ultimately, relating target cell chemical concentration to cellular responses in vitro could be used in determining an equivalent external dose using a biologically- based mathematical model.

DTIC

Chemical Composition; Concentration (Composition); In Vitro Methods and Tests; Jet Engine Fuels; Jp-8 Jet Fuel; Nonanes; Rodents; Toxicity; Xylene

20040084938 Cold Spring Harbor Lab., New York, NY

Characterization of Molecular Factors Critical to the S100A4 (A Metastasis-Associated Protein) - Dependent Increase in Motility of Breast Cancer Cells

Kim, Edward J.; Helfman, David; Apr. 2004; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0194

Report No.(s): AD-A424207; No Copyright; Avail: CASI; A03, Hardcopy

Our studies show that S100A4 localizes to lamellipodia structures in a migrating breast cancer-derived cell line and colocalizes with a known S100A4-interacting protein, heavy chain IIA (MHC-IIA) at the leading edge. We also demonstrate that S100A4 mutants that are either defective in their ability to dimerize or calcium-binding are unable to interact with MHC-IIA. An S100A4 mutant that is deficient for calcium-binding retains the ability to form homodimers, suggesting that S100A4 can exist as calcium-free or calcium- bound dimmers in vivo. Interestingly, despite the calcium- dependence for interaction with known protein partners, calcium-binding is not necessary for localization to lamellipodia. Both wild type and a mutant that is deficient for calcium-binding colocalize with known markers of actively forming leading edges of lamellipodia, Arp3, and N-WASP. These data suggest that S100A4 localizes to the leading edge in a calcium-independent manner and identification of the proteins that are involved in localizing S100A4 to the lamellipodial structures will provide novel insight into the mechanism by which S100A4 participates in metastasis.

DTIC

Cancer; Locomotion; Mammary Glands; Metastasis; Proteins

20040084940 California Univ., Irvine, CA

Physiological Stress Reactivity and Breast Cancer

Wadhwa, Pathik; Oct. 2003; 7 pp.; In English

Contract(s)/Grant(s): DAMD17-99-1-9248

Report No.(s): AD-A424210; No Copyright; Avail: CASI; A02, Hardcopy

The objective of the present program of research is to study physiological processes that may mediate the links between psychological states and cancer. Specifically, the present study is designed to conduct an investigation of the cross-sectional associations between indices of stress reactivity and psychological coping styles in women with breast cancer and matched healthy controls. The aims of the project are: (1) to quantify parameters of biological reactivity to a behavioral stress paradigm in women with and without breast cancer; (2) To examine (a) group differences between women with and without breast cancer biological stress reactivity, and (b) the effects of menopause and familial risk on biological stress reactivity and emotional expression; and (3) To develop the methodology and obtain preliminary data which could justify subsequent, prospective

research with high- risk populations. During the current reporting period, a new recruitment site has been added; 59 new subjects have been recruited in to the study; 51 assessments of research subjects have been completed; and preliminary (descriptive) analyses have been conducted on 35 subjects. The study relational database has been continuously updated, and biosamples have been stored at - 70 degrees C for assays.
DTIC
Cancer; Mammary Glands; Physiology; Reactivity

20040084946 East Carolina Univ., Greenville, NC
Oral Administration of a N-Acetyl-D-Glucosamine Polymer Particles Down-Regulates Airway Allergic Responses
Shibata, Yoshimi; Mar. 2004; 104 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0004
Report No.(s): AD-A424227; No Copyright; Avail: CASI; A06, Hardcopy

This is an annual report of the 1st grant year. Since PI and Research Associates moved to the new Institute September 2003, the transfer of grantee institute is under processing. We established chitin particle preparations from 4 different sources and selected one preparation that expresses the highest Th1 adjuvant activity. We completed the preparation at amounts necessary for this entire project. Mycobacterial components, Th1 adjuvants, have been proposed to use for the down-regulation of allergic responses. However, our studies (Task 2) indicate that, unlike chitin Th1 adjuvant, mycobacterial components induce PGE2-releasing macrophages in the spleen and a Th1-to-Th2 shift of immune responses. Our results suggest that mycobacterial components are unreliable for long-term uses as a Th1 adjuvant.
DTIC
Acetic Acid; Allergic Diseases; Asthma; Chitin

20040084948 Clemson Univ., SC
Finite Element Based Photon Migration Imaging
Jiang, Huabei; May 2004; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-99-1-9130
Report No.(s): AD-A424231; No Copyright; Avail: CASI; A02, Hardcopy

This research is aimed at developing a new optical approach, called ″Photon Migration Imaging″, for breast cancer detection and diagnosis. The project will develop computer software and conduct phantom experiments to achieve the proposed goals. At the conclusion of this project, we are pleased to report that we have completed the proposed goals. In this final report, we summarize our accomplishments in the proposed research areas.
DTIC
Cancer; Finite Element Method; Images; Imaging Techniques; Mammary Glands; Migration; Photons

20040084949 Kentucky Univ., Lexington, KY
Targeted Ablation of CML Stem Cells
Jordan, Craig T.; May 2004; 6 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0263
Report No.(s): AD-A424233; No Copyright; Avail: CASI; A02, Hardcopy

The purpose of this grant project is to identify and characterize methods for ablation of CML stem cells. Numerous studies have shown that malignant stem cells lie at the heart of CML disease; therefore, specific targeting of these cells is essential for more durable remission and cure. Consequently, we are employing both mouse and human model systems to study the nature of CML stem cells and to identify effective drug combinations that will preferentially destroy malignant stem cells while sparing normal cells. Studies to date in our mouse model system indicate that PS-341 may be a drug that effectively targets primitive CML cells.
DTIC
Ablation; Genes; Leukemias

20040084954 North Carolina Agricultural and Technical State Univ., Greensboro, NC
Assessing the Feasibility of an In Vitro Cytotoxicity Method to Detect Harmful Ubiquitous Chemicals
Cook, Robert S.; Channel, Stephen R.; Meyer, Gary D.; Miller, Thomas E.; Curran, Michelle A.; Jun. 2002; 36 pp.; In English
Contract(s)/Grant(s): F33601-01-F-9064; Proj-1710
Report No.(s): AD-A424242; AFRL-HE-WP-TR-2002-0098; No Copyright; Avail: CASI; A03, Hardcopy

The objective of this work was to assess the feasibility of accomplishing aqueous extracts of soil samples and determining if the extracted solution induced adverse effects in the human myelomonocytic cell line, HL60. Dosing of HL60 cells was accomplished over a 24hour period using 100% of extracted media from standard soil samples containing known contaminants. Assessments of viability, apoptosis, reduced thiols, and mitochondrial membrane integrity were accomplished by argon-ion laser flow cytometric analysis, using chemical labels specific for each endpoint. The in vitro cytotoxicity data was compared with the results of Microtox and Mutatox tests was well as earthworm and plant toxicity tests. In vitro cytotoxicity tests results exhibited good correlation with other tests results.
DTIC
In Vitro Methods and Tests; Mitochondria

20040084956 Minnesota Univ., Duluth, MN
Regulation of Genes Controlling Carbohydrate Metabolism in the Heart of a Hibernating Mammal
Andrews, Matthew T.; May 18, 2004; 10 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0014
Report No.(s): AD-A424253; ARO-41650.7-LS; No Copyright; Avail: CASI; A02, Hardcopy

The project funded by this ARO grant is to characterize genes that are responsible for the physiological changes that occur during hibernation in the heart of the thirteen-lined ground squirrel (Spermophilus tridecemlineatus). We focused on the heart because it is a contractile organ that must continue to work despite physiological conditions that would be lethal to most mammals. We used a PCR-based gene expression screen to isolate cDNAs of genes showing increased levels of expression in the heart during hibernation. In the process we learned a considerable amount about the function of various gene products during hibernation. Specifically, we learned about the genes responsible for the switch from a carbohydrate-based metabolism to a fat-based metabolism and their regulation We examined novel genomic structures, analyzed the evolution of genes required for hibernation and showed high homology to human orthologs. Finally we demonstrated how fat in the form of triacylglycerols can be hydrolyzed at temperatures as low as O C.
DTIC
Carbohydrate Metabolism; Genes; Heart; Hibernation; Mammals; Squirrels

20040084957 California Univ., Berkeley, CA
Effects of Chlorine Dioxide on Spore Structural and Fuctional Properties
Leighton, Terrance; Dec. 29, 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0561
Report No.(s): AD-A424254; ARO-41874.1-CH; No Copyright; Avail: CASI; A03, Hardcopy

One major barrier to the development of new spore decon technologies is that killing assays take 36-48 hours to perform and require a tedious culture-based assessment of spore viability. Spore sterilization assays can require from seven to twenty one days of incubation in growth medium. We proposed that near-real time optical spore germination assays could be developed into a new type of spore killing assay. The experimental results described in this report were designed to test this hypothesis. Dormant bacterial endospores are highly birefringent due to the anhydrous nature of the spore cytoplasm. Once spores are triggered to germinate by small molecules such as sugars, nucleosides or amino acids, a series of very rapid enzymic reactions occur that leads to the hydrolysis of spore integuments and the rehydration of the spore cytoplasm. The germination process is accompanied by a concomitant 30 - 50% decrease in visible wavelength optical absorbance. Real-time spore germination kinetics can be acquired spectrophotometrically. We report here a comparative analysis of spore killing by several sporicides using established viability assays, live/dead fluorescent microscopy, rapid spectrophotometric and automated scanning microscopic methods.
DTIC
Bacteria; Bactericides; Chlorine; Dioxides; Spores

20040084958 Emory Univ., Atlanta, GA
New Catalytic Molecules and Materials for Decontamination
Hill, Craig L.; May 14, 2004; 9 pp.; In English
Contract(s)/Grant(s): DAAD19-01-1-0593
Report No.(s): AD-A424255; ARO-41943.6-CH; No Copyright; Avail: CASI; A02, Hardcopy

This grant has been quite successful in that many of the targeted issues (basic reactivity, mechanistic and structure-reactivity features) for catalyzed O2-based oxidations, and in particular O2-based decontamination reactions, were established.

In addition, several new and effective catalysts for oxidative decontamination were discovered and/or developed. The new catalytic systems include Au(III)-based homogeneous systems, coinage metal salts of polyoxometalates (POMs), POMs electrostatically bound to cationic silica nanoparticles, POMs catenated with redox active counterions, and multi-iron-containing POMs. Nearly all the publications address the relationships between the physical and electronic structures of the catalysts in varying environments and their reactivity and mechanisms of oxidative decontamination. The most reactive catalysts developed under this program, including some multi-iron-containing POMs, are forming the basis of intellectual property and collaborative efforts with companies (Gentex Corporation and TDA Research).
DTIC
Catalysis; Decontamination; Molecules; Oxidation

20040084959 Air Force Inst. of Tech., Wright-Patterson AFB, OH
A Retrospective Study of the Incidence of Missed Opportunities in Identifying, Managing and Referring At-Risk of Overweight and Overweight Children and Adolescents in an Outpatient Primary Care Setting
Quirke, Amy S.; Jun. 30, 2004; 112 pp.; In English
Report No.(s): AD-A424256; CIO4-399; No Copyright; Avail: CASI; A06, Hardcopy

A descriptive study of the incidence of missed opportunities in identifying, managing and referring children and adolescents at-risk of overweight and overweight were conducted using a retrospective chart review of two Midwest, suburban, private outpatient primary care clinics. Of the 208 medical records reviewed, the incidence of at- risk of overweight (BMI-for-age less than or equal 85% \h 95%) in children and adolescents was 8.8% and 9.4%, respectively. The overweight (BMI-for-age greater than or equal 95%) prevalence rate for each group was 14.7% and 17.9%, respectively. None of the 19 children or adolescents with a calculated BMI-for-age as at-risk for overweight was identified by the HCP with an ICD 9-CM code for obesity or abnormal weight gain in the medical record. Of the 34 subjects with a calculated BMI-for- age as overweight, 40% of children (n = 6) and 42% of adolescents (n = 8) were identified by the HCP as overweight as evidenced by a diagnosis of obesity or abnormal weight in the medical record. None of the children or adolescents at- risk of overweight received a referral for nutrition or psychological counseling or specialty care. Twenty-three of the 53 children and adolescents identified as being at-risk of overweight or overweight also had a chronic medical condition. Of these 23, only two children with Reactive Airway Disease were given referrals to nutritional medicine.
DTIC
Children; Human Beings; Identifying; Obesity; Risk

20040084964 Pittsburgh Univ., Pittsburgh, PA
Peptide-Mediated Transduction of Proteins and Nucleic Acids to Prevent and Treat Experimental Prostate Cancer
Whalen, Janey D.; Jan. 2003; 10 pp.; In English
Report No.(s): AD-A424262; No Copyright; Avail: CASI; A02, Hardcopy

Our goal in this project is to prevent the occurrence of bone metastasis in early experimental prostate cancer using protein transduction: the ability of small peptides to facilitate the entry of large biologically active fusion protein cargos into cells. The hypothesis to be tested is that protein transduction can deliver therapeutic proteins to skeletal tissues and bone marrow in such a manner that they may facilitate the apoptotic, or programmed cell death of cancerous cells and tissues of the bone. Prostate cancer is lethal and incurable once it has metastasized to the bone. We and others have previously shown that protein transduction can allow many proteins into organs previously unaccessible to other delivery methods (drugs, viral vectors etc). We have constructed unique protein-transduction domains (PTD5 and Lys8) which we have demonstrated efficiently facilitate the entry and activity of the pro-apoptotic peptide Smac34 into prostate cancer cell lines. Protein transduction may prove to be a useful drug delivery method of biologically active proteins in cancer.
DTIC
Cancer; Genetics; Nucleic Acids; Peptides; Prostate Gland; Proteins; Transferring

20040084966 Federal Aviation Administration, Washington, DC
Personality Characteristics of Air Traffic Control Specialists as Predictors of Disability Retirement
Dollar, Carolyn; Broach, Dana; Schroeder, David J.; Oct. 2003; 10 pp.; In English
Report No.(s): AD-A424266; DOT/FAA/AM-03/14; No Copyright; Avail: CASI; A02, Hardcopy

Previous research has demonstrated that psychological factors may play a role in disability retirements. The purpose of

this study was to investigate whether psychological factors such as personality were related to disability retirements from the air traffic control specialist (ATCS) occupation.
DTIC
Air Traffic Control; Air Traffic Controllers (Personnel); Disabilities; Personality; Predictions; Retirement

20040084967 Hutchinson (Fred) Cancer Research Center, Seattle, WA
Genome Wide Examination of Allelic Loss in Lobular and Ductal Breast Cancer
Porter, Peggy; Jul. 2003; 17 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0386
Report No.(s): AD-A424268; No Copyright; Avail: CASI; A03, Hardcopy

The purpose of this study is to compare allelic loss throughout the genome in lobular and ductal type breast cancers using the commercially available HuSNP assay. We will evaluate the rate of allelic loss on individual chromosome arms in 60 each of lobular and ductal breast cancers obtained from a population-based study (NCI RO1 CA85913,- P.I. Janet Daling). We have validated the prototype HuSNP platform for use in fixed tissue samplesSchubert, 2002 #1827, 2) enrolled and identified subjects for the study, 3) flow cytometry cell sorted breast tumors for the study, and 4) established the new array platform for collection of data from 10,000 SNPs in the Porter lab and the array facility at the FHCRC. Information about morphology-specific traits gained from this study of a large number of lobular cancers will lead to an increased understanding of the biology. of distinct subsets of breast cancer. It will provide a basis for future studies designed to stratify patients into prognostic and treatment groups and/or inform the development of targeted therapies for specific tumor types.
DTIC
Cancer; Diseases; Genetics; Genome; Losses; Mammary Glands

20040085016 North Carolina Univ., Chapel Hill, NC
Modeling and Prediction of Space/Time Natural Processes Using A Bayesian Maximum Entropy
Christakos, George; Serre, Marc; May 5, 2003; 4 pp.; In English
Contract(s)/Grant(s): DAAG55-98-1-0289
Report No.(s): AD-A424350; ARO-37541.16-EV; No Copyright; Avail: CASI; A01, Hardcopy

This report covers the year 2003. The major results from this work were as follows: (1) New improvements of the Bayesian Maximum Entropy (BME) theory of space/time mapping, (2) new technology leading to considerable revision/ improvement of the widely used BMElib library (currently used by researchers and practitioners in over 20 countries worldwide. The work has resulted in several publications in journals and books, as well as presentations at national and international meetings.
DTIC
Bayes Theorem; Entropy; Maximum Entropy Method; Probability Theory; Spatial Distribution

20040085348 Georgia Inst. of Tech., Atlanta, GA
Complex-Shaped Microcomponents by the Reactive Conversion of Biological Templates
Sandhage, Kenneth H.; Naik, Rajesh; Stone, Morley; May 27, 2004; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-01-1-0507
Report No.(s): AD-A424129; AFRL-SR-AR-TR-04-0295; No Copyright; Avail: CASI; A03, Hardcopy

This project has been aimed at: 1) identifying gas/solid reaction conditions for converting biologically- derived micro/nanotemplates into other oxides without a loss of the starting 3-D shape and fine features, and 2) evaluating the nanochemical/nanostructural evolution during such reactive conversion. The most significant accomplishments have been: 1) Development of an oxidation-reduction reaction process for converting biosilica-based micro/ nanoassemblies into MgO nanoparticle structures with a preservation of the starting 3- D shape and fine features at temperatures as low as 700 deg C; 2) Development of a two-Step oxidation-reduction reaction process for converting biosilica-based micro/nanoassemblies into CaO nanoparticle structures with a preservation of the starting 3-D shape and fine features at temperatures as low as 1000 deg C; 3) Development of a two-step metathetic reaction process for converting biosilica-based micro/nanoassemblies into TiO2 nanoparticle structures with a preservation of the starting 3-D shape and fine features at temperatures as low as 350 deg C; 4) Identification of novel reaction paths accessed during conversion of biosilica structures into magnesia (via formation of forsterite as an intermediate product) and titania (via formation of the intermediate compound, titanium oxyfluoride); 5)

Identification of peptides that promote room- temperature formation of germania nanoparticle networks.
DTIC
Biomimetics; Chemical Reactions; Displacement; Nanostructures (Devices); Reactivity; Silicon Dioxide; Templates

20040085355 Stanford Univ., Stanford, CA, USA
Functionality and Evolutionary History of the Chaperonins in Thermophilic Archaea. A Bioinformatical Perspective
Karlin, Samuel; [2004]; 3 pp.; In English
Contract(s)/Grant(s): NCC2-5497; No Copyright; Avail: CASI; A01, Hardcopy

We used bioinformatics methods to study phylogenetic relations and differentiation patterns of the archaeal chaperonin 60 kDa heat-shock protein (HSP60) genes in support of the study of differential expression patterns of the three chaperonin genes encoded in Sulfolobus shibatae.
Author
Thermophiles; Thermal Shock; Proteins; Genes; Microorganisms

20040085443 NASA Ames Research Center, Moffett Field, CA, USA
Oxygen Profile of a Thermo-Haliophilic Community in the Badwater Salt Flat
Smith, H. D.; McKay, C. P.; Rainey, F.; Bebout, B.; Carpenter, S.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 60; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Badwater is the lowest, saltiest, and hottest, place in North America. This extreme environment is 86 meters (282 feet) below sea level surrounded by four mountain ranges. Due to the geographical location Badwater does not receive moisture from the prevailing winds, this intern results in a hot, arid, and salty environment. Despite these extreme living conditions, microbes manage to flourish within the salt flat. The salt acts as an insulator making life just beneath the surface more comfortable In this paper, we compare the microbial population versus oxygen concentration; and the importance of and the role of oxygen in metabolic functions by these thermo-haliophiles. Furthermore a model of the oxygen profile will also provide an insight to the oxygen cycle in salty environments. This research has implications for the limits of life on Earth and Mars. Recent results from the MER rovers show that water on Mars was very salty. Measuring the oxygen profile in these salty environments on Earth provides a framework within which potential life on Mars can be evaluated. The use of an oxygen profile could also be used as a search criteria for life.
Derived from text
Arid Lands; Flats (Landforms); High Temperature Environments; Oxygen; Microorganisms

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 Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20040084888 Army War Coll., Carlisle Barracks, PA
The Culture of Fitness and Nutrition in the U.S. Army - Can We Do Better
Sherwood, Timothy M.; Apr. 15, 2004; 25 pp.; In English
Report No.(s): AD-A424107; No Copyright; Avail: CASI; A03, Hardcopy

This paper discusses the current culture of physical fitness and nutrition maintenance in the USA Army. It advocates the need to improve that culture due to the current operational tempo of the force and to meet the Army's aggressive transformation plans. The demands placed on the Army today and for the foreseeable future are far different than the demands on the force for the past twenty years. This necessitates a different approach and different standards of physical fitness in the Army. In addition the Army transformation plan and the vision set by the new Chief of Staff of the Army General Schoomaker necessitate changes to ensure the Army culture adapts with the ongoing transformation initiatives. The paper recommends numerous changes to the way the Army develops and promotes its physical fitness and nutrition culture and identifies how these changes will affect both its Active and Reserve Component Soldiers its family members and it%s retiree communities.
DTIC
Military Personnel; Nutrition; Physical Fitness

20040084919 Air Force Research Lab., Brooks AFB, TX

Do Teams Adapt to Fatigue in a Synthetic C2 Task

Chaiken, Scott; Barnes, Christopher; Harville, Donald; Miller, James C.; Elliot, Linda; May 2004; 27 pp.; In English

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A424158; AFRL-HE-BR-TR-2004-0041; No Copyright; Avail: CASI; A03, Hardcopy

There has been little systematic research on fatigue for teams when compared to individuals. We investigated how team performance degrades with sustained operations on a PC-based moderate fidelity air battle management synthetic task. Teams of ISR, Strike, and Sweep battle managers conducted 8 one-hour missions from 1830 to 1030 the following day, along with performance assessment batteries (during alternate hours of testing). This modest fatigue protocol allowed us to explore team fatigue assessment for both mission outcome and team process, complementing past analyses (Elliott, Coovert, Barnes, Miller, 2003; Harville, Elliott, Coovert, Barnes, Miller, 2003). In addition, one of the team roles had lower workload, allowing us to assess whether the lighter role would receive greater workload in fatigued vs. non-fatigued conditions, as a team-adaptive fatigue countermeasure. Our results showed participants performing more poorly while fatigued both on cognitive tests and on one dimension of mission outcome (number of enemy kills) but not on others (friendly losses to fuel outs and hostile actions). General activity level for the team roles declined with fatigue (number of orders issued, information seeking). Finally, while roles recognized the value of offloading work onto the lighter role, this tendency did not significantly increase with fatigue.

DTIC

Personnel

20040084934 Cincinnati Univ., OH

Oxygen and Carbon Dioxide Levels During Qualitative Respirator Fit Testing

Laferty, Edward A.; Jun. 30, 2004; 59 pp.; In English

Report No.(s): AD-A424201; AFIT-CI-04-398; No Copyright; Avail: CASI; A04, Hardcopy

Approved Occupational Safety and Health Administration qualitative respirator fit test methods require the use of a test hood about the subject's head and shoulders. Workers fit tested by this method have commented on the discomfort of being inside the test enclosure. This study was designed to quantify some parameters that might lead to these types of comments. For this study, subjects performed a series of four respirator fit tests. A quantitative and a qualitative fit test were performed with a full facepiece respirator. Then a quantitative and a qualitative fit test were performed with an N95 filtering facepiece respirator. Parameters measured include: subjects height, weight, and age, oxygen and carbon dioxide levels, air temperature, heart rate, arterial oxygen saturation, and Borg Ratio Scale value on breathing exertion. Carbon dioxide levels are significantly higher and oxygen levels are significantly lower in the respirator when the test hood is used during the qualitative fit test. The temperature inside the test hood rose an average 7.5 deg F in the course of the qualitative fit test of the N95 filtering facepiece device. These stressors are not present during a quantitative respirator fit test. Professionals conducting respirator fit tests should be aware of the physiological burdens that may occur during the qualitative respirator fit test. Some groups may be especially sensitive to this test such as the elderly, pregnant women, persons with pulmonary and/or cardiac disease, or persons with psychological disorders such as anxiety, panic disorders, or claustrophobia.

DTIC

Carbon Dioxide; Masks; Oxygen; Respirators; Stress (Physiology)

20040085003 Air Force Research Lab., Brooks AFB, TX

Functional Magnetic Resonance Imaging Shows Potential for Predicting Individual Differences in Fatigue Vulnerability

Caldwell, John A.; Smith, Jennifer K.; Caldwell, J. L.; Mu, Qiwen; George, Mark; Jun. 2004; 36 pp.; In English

Contract(s)/Grant(s): Proj-7757

Report No.(s): AD-A424328; AFRL-HE-BR-TR-2004-0066; No Copyright; Avail: CASI; A03, Hardcopy

Fatigue from sleep loss exerts deleterious effects on group performance, and some individuals are more affected than others. Underlying pattern of cortical activation may partially account for such individual differences. The present research utilized fMRI procedures to examine the non-sleep- deprived cortical activation of a group of active-duty military pilots on whom the effects of sleep loss had previously been quantified& The pilots completed a Sternberg Working Memory Task (SWMT) alternately with a control task during 13-minute scans. Examination of the number of activated voxels in response to SWMT indicated that, as a group, the pilots were more similar to a group of fatigue-resistant non- pilots than to a group of fatigue vulnerable non-pilots. In addition, within the pilot group, the number of activated voxels was significantly related

to the level of fatigue vulnerability on a simulator flight-performance task. Thus, it appears that baseline fMRI scans may be useful for predicting fatigue susceptibility.
DTIC
Human Performance; Imaging Techniques; Magnetic Resonance; Predictions; Vulnerability

54
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

20040084380 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
A Historical Review of Color Vision Standards for Air Traffic Control Specialists at Automated Flight Service Stations
Milburn, Nelda J.; June 2004; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FAA-HRR-522
Report No.(s): DOT/FAA/AM-04/10; No Copyright; Avail: CASI; A03, Hardcopy

This report chronicles several experiments the Civil Aerospace Medical Institute has conducted to assess the effects that advances in technology have had on automated flight service station air traffic control specialists color identification tasks and the ensuing revisions to the color vision standard and verification testing.
Author
Aerospace Medicine; Air Traffic Controllers (Personnel); Automatic Control; Color Vision; Histories; Civil Aviation

20040084466 NASA Ames Research Center, Moffett Field, CA, USA
Inner Space and Outer Space: Pressure Suits & Life Support Systems for Space Workers
Webbon, Bruce; January 2004; 17 pp.; In English; Speech at Naval Undersea Museum, 21 Apr. 2004, Silverdale, WA, USA; No Copyright; Avail: CASI; A03, Hardcopy

This slide presentation presents an overview of work system requirements, extravehicular activity system evolution, key issues, future needs, and a summary. Key issues include pressure suits, life support systems, system integration, biomedical requirements, and work and mobility aids.
CASI
Extravehicular Activity; Life Support Systems; Space Suits

20040084723 North Carolina State Univ., Raleigh, NC, USA
Ergonomic Solutions for Furniture Manufacturers
Mirka, G. A.; Cormier, D.; Taylor, J.; Dec. 2003; 122 pp.; In English
Report No.(s): PB2004-105624; No Copyright; Avail: CASI; A06, Hardcopy

The specific aims of this project were to study the effectiveness and the efficacy of ergonomic interventions for the reduction of musculoskeletal injuries/illnesses in the furniture manufacturing industry and, more globally, to explore ways that ergonomic interventions can be introduced/promoted to increase the likelihood of their acceptance by the users. This research effort can be broken down into seven research projects that were completed during the period of this grant. The aim of Project No. 1 was to identify those jobs and work tasks that were most problematic from the perspective of musculoskeletal injury/illness. The aim of Project No. 2 was to identify the specific physical risk factors posed by these prioritized jobs. The aim of Project No. 3 was to design, engineer and prototype engineering and work practice controls that were developed with the expressed goal of eliminating or reducing exposure to the identified risk factors. The aim of Project No. 4 was to perform a formal laboratory analysis of the prototypes developed through Project No. 3. The aim of Project No. 5 was to perform a formal field analysis of the prototypes developed through Project No. 3 and assessed in project No. 4. Project No. 6 was an evaluation of the effects of the participatory ergonomics technique in the acceptance of the ergonomic interventions. Project No. 7 was also a study that considered ways that interventions could be developed and presented to increase the likelihood of their acceptance.
NTIS
Human Factors Engineering; Performance Prediction; Industries

20040084758 Physics and Electronics Lab. TNO, The Hague, Netherlands
Survey of the Infrastructure for Evaluation of Command and Control Concepts
Arciszewski, H. F. R.; Houttuin, K.; April 2004; 34 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): 726.2.00342; TNO Proj. 015.32024/2-2
Report No.(s): FEL-03-A264; TM-03-A043; TD-2003-0214; Copyright; Avail: Other Sources

This report describes the infrastructure (hardware and software) that has been built for the study for command and control concepts ('Studie Toekomstige Commandovoering'). The infrastructure has been used during a number of man-in-the-loop runs by several air and surface warfare officers of the RNLN in order to evaluate the automation and support concepts that were developed in the course of the overall study.
Author
Command and Control; Computerized Simulation; Man Machine Systems

20040084921 Space and Naval Warfare Systems Center, San Diego, CA
Improved Mobility in a Multi Degree of Freedom Unmanned Ground Vehicle
Blackburn, Michael R.; Bailey, Richard; Lytle, Brent; Apr. 2004; 12 pp.; In English
Report No.(s): AD-A424161; No Copyright; Avail: CASI; A03, Hardcopy

Mandelbrot through his analysis of Fractals (Mandelbrot 1977) has shown that the complexity of the physical geometry of nature is similar at all scales. This implies that a robot of fixed dimension will always be too big to get though some passageways and too small to get over some other obstacles However as others have demonstrated Increasing the number of the vehicle's motion degrees of freedom (dof) may permit it to change its conformation and dimensions, affording to it a greater range of environmental dimensionality through which it may move. This paper contains a description of our multi dof unmanned ground vehicle (UGV), including the variety of basic behaviors of which it is capable Our UGV is a six-dof sensor-rich small mobile robot composed of three segments - a central core and two tracked pods. The rotations of the pod tracks are the primary mobility mode (2-dof) of the vehicle. The pods are attached to the core at opposite ends, each by a single ″L″ axle that rotates through l80 degrees (2-dof), serving to improve balance and leverage. The pods can rotate 360 degrees about their end of the axle (2-dof) providing increased mobility over obstacles The UGV in compact form is 17,6″ long 16,2″ wide, and 4, 6″ tall, but can extend to 49″ long to climb over obstacles or cross chasms, or rise to 16″ high to straddle low obstacles, In its extended mode its maximum width is 9,5″ permitting it to squeeze through an opening of that size, The UGV can independently draw in its two outer pods to grasp and longitudinally traverse horizontal pipes or logs or travel within a narrow culvert.
DTIC
Degrees of Freedom; Mobility; Robots; Unmanned Ground Vehicles

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 Sciences*.

20040084428 NASA Ames Research Center, Moffett Field, CA, USA
Computer Modeling of the Earliest Cellular Structures and Functions
Pohorille, Andrew; Chipot, Christophe; Schweighofer, Karl; March 1, 2000; 1 pp.; In English; American Physical Society Meeting, 19-21 Mar. 2000, Minneapolis, MN, USA
Contract(s)/Grant(s): RTOP 344-50-92-02; No Copyright; Avail: Other Sources; Abstract Only

In the absence of extinct or extant record of protocells (the earliest ancestors of contemporary cells). the most direct way to test our understanding of the origin of cellular life is to construct laboratory models of protocells. Such efforts are currently underway in the NASA Astrobiology Program. They are accompanied by computational studies aimed at explaining self-organization of simple molecules into ordered structures and developing designs for molecules that perform proto-cellular functions. Many of these functions, such as import of nutrients, capture and storage of energy. and response to changes in the environment are carried out by proteins bound to membrane\h We will discuss a series of large-scale, molecular-level computer simulations which demonstrate (a) how small proteins (peptides) organize themselves into ordered structures at water-membrane interfaces and insert into membranes, (b) how these peptides aggregate to form membrane-spanning structures (eg. channels), and (c) by what mechanisms such aggregates perform essential proto-cellular functions, such as

proton transport of protons across cell walls, a key step in cellular bioenergetics. The simulations were performed using the molecular dynamics method, in which Newton's equations of motion for each item in the system are solved iteratively. The problems of interest required simulations on multi-nanosecond time scales, which corresponded to 10(exp 6)-10(exp 8) time steps.
Author
Cells (Biology); Biological Evolution; Molecular Dynamics; Energy Transfer; Membrane Structures; Proteins; Protobiology

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*.

20040084329 Pacific Northwest National Lab., Richland, WA, USA
Combining Distributed and Shared Memory Models: Approach and Evolution of the Global Arrays Toolkit
Nieplocha, J.; Harrison, R. J.; Kumar, M. K.; Palmer, B.; Tipparaju, V.; 2003; In English
Report No.(s): DE2003-15004344; No Copyright; Avail: National Technical Information Service (NTIS)

Both shared memory and distributed memory models have advantages and shortcomings. Shared memory model is much easier to use but it ignores data locality/placement. Given the hierarchical nature of the memory subsystems in the modern computers this characteristic might have a negative impact on performance and scalability. Various techniques, such as code restructuring to increase data reuse and introducing blocking in data accesses, can address the problem and yield performance competitive with message passing, however at the cost of compromising the ease of use feature. Distributed memory models such as message passing or onesided communication offer performance and scalability but they compromise the ease-of-use. In this context, the message-passing model is sometimes referred to as 'assembly programming for the scientific computing'. The Global Arrays toolkit attempts to offer the best features of both models. This paper describes the characteristics of the Global Arrays programming model, capabilities of the toolkit, and discusses its evolution.
NTIS
Distributed Memory; Messages

20040084331 Lawrence Livermore National Lab., Livermore, CA
Issues of Precision for Hardware-Based Volume Visualization
LaMar, E.; Apr. 11, 2003; In English
Report No.(s): DE2003-15004384; UCRL-JC-152962; No Copyright; Avail: National Technical Information Service (NTIS)

This paper discusses issues with the limited precision of hardware-based volume visualization. We will describe the compositing OVER operator and how fixed-point arithmetic affects it. We propose two techniques to improve the precision of fixed-point compositing and the accuracy of hardware-based volume visualization. The first technique is to perform dithering of color and alpha values. The second technique we call exponent-factoring, and captures significantly more numeric resolution than dithering, but can only produce monochromatic images.
NTIS
Fixed Point Arithmetic; Precision; Hardware

20040084344 Helsinki Univ. of Technology, Espoo
IT at HUTCC
Mar. 30, 2001; 66 pp.; In English
Report No.(s): PB2004-105305; Copyright; Avail: National Technical Information Service (NTIS)

This guide tells you about the services of the Helsinki University of Technology (HUT) Computing Centre (HUTCC), the equipment and how to use the UNIX and Windows computers. It is especially intended for foreigners studying or doing research at HUT. That is why we have included some important phone numbers in chapter Important Addresses and Telephone Numbers. With this guide you will learn where to find everything, where to get help, how to send E-mail, how to read network news etc. With this guide we are trying to give general information of the computer environment in HUT, to teach the basics of UNIX and to get people started with UNIX.
NTIS
Unix (Operating System); Computer Systems Programs

20040084353 Lawrence Livermore National Lab., Livermore, CA
Comparison of TracePro and Micromega Models for Infrared Heated Ice Layers Inside of Hohlraums
Kozioziemski, B. J.; Jan. 15, 2004; In English
Report No.(s): DE2004-15006536; UCRL-TR-155868; No Copyright; Avail: National Technical Information Service (NTIS)

A reference calculation for the infrared absorption profile was settled upon to compare results using TracePro commercial raytracing software and the Micromega codes. I have rerun the TracePro model with updated parameters to better match those used in Micromega. While the general shape of the absorption curves are consistent, the fine details still differ considerably between the two software packages.

NTIS
Infrared Radiation; Ice; Infrared Absorption

20040084409
Unstructured Adaptive (UA) NAS Parallel Benchmark, Version 1.0
Feng, Huiyu; VanderWijngaart, Rob; Biswas, Rupak; Mavriplis, Catherine; April 09, 2004; 17 pp.; In English
Contract(s)/Grant(s): RTOP 704-40-24; Copyright; Avail: CASI; A03, Hardcopy

We present a complete specification of a new benchmark for measuring the performance of modern computer systems when solving scientific problems featuring irregular, dynamic memory accesses. It complements the existing NAS Parallel Benchmark suite. The benchmark involves the solution of a stylized heat transfer problem in a cubic domain, discretized on an adaptively refined, unstructured mesh.

Author
Unstructured Grids (Mathematics); Parallel Processing (Computers); Computer Systems Programs; Specifications; Mathematical Models

20040084417 NASA Ames Research Center, Moffett Field, CA, USA
Kernel PLS Estimation of Single-trial Event-related Potentials
Rosipal, Roman; Trejo, Leonard J.; [2004]; 1 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Nonlinear kernel partial least squaes (KPLS) regressior, is a novel smoothing approach to nonparametric regression curve fitting. We have developed a KPLS approach to the estimation of single-trial event related potentials (ERPs). For improved accuracy of estimation, we also developed a local KPLS method for situations in which there exists prior knowledge about the approximate latency of individual ERP components. To assess the utility of the KPLS approach, we compared non-local KPLS and local KPLS smoothing with other nonparametric signal processing and smoothing methods. In particular, we examined wavelet denoising, smoothing splines, and localized smoothing splines. We applied these methods to the estimation of simulated mixtures of human ERPs and ongoing electroencephalogram (EEG) activity using a dipole simulator (BESA). In this scenario we considered ongoing EEG to represent spatially and temporally correlated noise added to the ERPs. This simulation provided a reasonable but simplified model of real-world ERP measurements. For estimation of the simulated single-trial ERPs, local KPLS provided a level of accuracy that was comparable with or better than the other methods. We also applied the local KPLS method to the estimation of human ERPs recorded in an experiment on co,onitive fatigue. For these data, the local KPLS method provided a clear improvement in visualization of single-trial ERPs as well as their averages. The local KPLS method may serve as a new alternative to the estimation of single-trial ERPs and improvement of ERP averages.

Author
Kernel Functions; Nonlinearity; Least Squares Method; Regression Analysis; Estimators

20040084603 NASA Ames Research Center, Moffett Field, CA, USA
Random Matrix Approach to Quantum Adiabatic Evolution Algorithms
Boulatov, Alexei; Smelyanskiy, Vadier N.; May 12, 2004; 31 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

We analyze the power of quantum adiabatic evolution algorithms (Q-QA) for solving random NP-hard optimization problems within a theoretical framework based on the random matrix theory (RMT). We present two types of the driven RMT models. In the first model, the driving Hamiltonian is represented by Brownian motion in the matrix space. We use the Brownian motion model to obtain a description of multiple avoided crossing phenomena. We show that the failure mechanism of the QAA is due to the interaction of the ground state with the ″cloud″ formed by all the excited states, confirming that in the driven RMT models. the Landau-Zener mechanism of dissipation is not important. We show that the QAEA has a finite probability of success in a certain range of parameters. implying the polynomial complexity of the algorithm. The second model corresponds to the standard QAEA with the problem Hamiltonian taken from the Gaussian Unitary RMT ensemble

(GUE). We show that the level dynamics in this model can be mapped onto the dynamics in the Brownian motion model. However, the driven RMT model always leads to the exponential complexity of the algorithm due to the presence of the long-range intertemporal correlations of the eigenvalues. Our results indicate that the weakness of effective transitions is the leading effect that can make the Markovian type QAEA successful.
Author
Algorithms; Hamiltonian Functions; Matrix Theory

20040084606 NASA Ames Research Center, Moffett Field, CA, USA
Balanced Central Schemes for the Shallow Water Equations on Unstructured Grids
Bryson, Steve; Levy, Doron; March 23, 2004; 24 pp.; In English
Contract(s)/Grant(s): 704-40-42; No Copyright; Avail: CASI; A03, Hardcopy

We present a two-dimensional, well-balanced, central-upwind scheme for approximating solutions of the shallow water equations in the presence of a stationary bottom topography on triangular meshes. Our starting point is the recent central scheme of Kurganov and Petrova (KP) for approximating solutions of conservation laws on triangular meshes. In order to extend this scheme from systems of conservation laws to systems of balance laws one has to find an appropriate discretization of the source terms. We first show that for general triangulations there is no discretization of the source terms that corresponds to a well-balanced form of the KP scheme. We then derive a new variant of a central scheme that can be balanced on triangular meshes. We note in passing that it is straightforward to extend the KP scheme to general unstructured conformal meshes. This extension allows us to recover our previous well-balanced scheme on Cartesian grids. We conclude with several simulations, verifying the second-order accuracy of our scheme as well as its well-balanced properties.
Author
Unstructured Grids (Mathematics); Shallow Water; Topography; Upwind Schemes (Mathematics); Linear Equations

20040084608 NASA Ames Research Center, Moffett Field, CA, USA
Job Scheduling in a Heterogeneous Grid Environment
Shan, Hong-Zhang; Smith, Warren; Oliker, Leonid; Biswas, Rupak; [2004]; 12 pp.; In English; 2004 HPDC Conference, 2004
Contract(s)/Grant(s): RTOP 725-10-31; No Copyright; Avail: CASI; A03, Hardcopy

Computational grids have the potential for solving large-scale scientific problems using heterogeneous and geographically distributed resources. However, a number of major technical hurdles must be overcome before this potential can be realized. One problem that is critical to effective utilization of computational grids is the efficient scheduling of jobs. This work addresses this problem by describing and evaluating a grid scheduling architecture and three job migration algorithms. The architecture is scalable and does not assume control of local site resources. The job migration policies use the availability and performance of computer systems, the network bandwidth available between systems, and the volume of input and output data associated with each job. An extensive performance comparison is presented using real workloads from leading computational centers. The results, based on several key metrics, demonstrate that the performance of our distributed migration algorithms is significantly greater than that of a local scheduling framework and comparable to a non-scalable global scheduling approach.
Author
Computational Grids; Algorithms; Heterogeneity; Bandwidth

20040084620 Defence Science and Technology Organisation, Edinburgh, Australia
Implementation of the Radon Transform Using Non-equispaced Discrete Fourier Transforms
Jones, Ronald; Cooke, Tristrom; Redding,k Nicholas J.; April 2004; 34 pp.; In English
Report No.(s): DSTO-TR-1576; DODA-AR-013-091; Copyright; Avail: Other Sources

This report discusses the implementation of the Radon transform in the Analysts Detection Support System (ADSS) environment using non-equispaced Discrete Fourier Transforms (DFTs). It provides an analysis and experimental results for discretisation error and the use of matched filtering to enhance peaks in the transform.
Author
Discrete Functions; Fourier Transformation; Image Analysis; Synthetic Aperture Radar

20040084690 Lawrence Livermore National Lab., Livermore, CA
Magnification Lens for Interactive Volume Visualization
LaMar, E. C.; Hamann, B.; Joy, K. I.; Jul. 19, 2001; In English
Report No.(s): DE2004-15006302; UCRL-JC-144766; No Copyright; Avail: National Technical Information Service (NTIS)

Volume visualization of large data sets suffers from the same problem that many other visualization modalities suffer from: either one can visualize the entire data set and lose small details or visualize a small region and lose the context. In this paper, they present a magnification lens technique for volume visualization. While the notion of a magnification-lens is not new, and other techniques attempt to simulate the physical properties of a magnifying lens, their contribution is in developing a magnification lens that is fast, can be implemented using a fairly small software overhead, and has a natural, intuitive appearance. The issue with magnification lens is the border, or transition, region. The lens center and exterior have a constant zoom factor, and are simple to render. It is the border region that blends between the external and interior magnification, and has a non-constant magnification. They use the perspective-correct textures capability, available in most current graphics systems, to produce a lens with a tessellated border region that approximates linear compression with respect to the radius of the magnification lens. They discuss how a cubic border can mitigate the discontinuities resulting from the use of a linear function, without significant performance loss. They discuss various issues concerning development of a three-dimensional magnification lens.
NTIS
Magnification; Lenses

20040084705 Lawrence Livermore National Lab., Livermore, CA
Detecting Translation Errors in CAD Surfaces and Preparing Geometries for Mesh Generation
Anders Petersson, N.; Chand, K. K.; Aug. 27, 2001; In English
Report No.(s): DE2004-15006269; UCRL-JC-144019; No Copyright; Avail: National Technical Information Service (NTIS)
The authors have developed tools for the efficient preparation of CAD geometries for mesh generation. Geometries are read from IGES files and then maintained in a boundary-representation consisting of a patchwork of trimmed and untrimmed surfaces. Gross errors in the geometry can be identified and removed automatically while a user interface is provided for manipulating the geometry (such as correcting invalid trimming curves or removing unwanted details). Modifying the geometry by adding or deleting surfaces and/or sectioning it by arbitrary planes (e.g. symmetry planes) is also supported. These tools are used for robust and accurate geometry models for initial mesh generation and will be applied to in situ mesh generation requirements of moving and adaptive grid simulations
NTIS
Computational Grids; Grid Generation (Mathematics); Computer Aided Design

20040084707 Budapest Univ. of Technology and Economics, Budapest, Hungary
Periodica Polytechnica Electrical Engineering, Volume 46, Nos. 3-4
Jun. 2003; 94 pp.; In English
Report No.(s): PB2004-105564; No Copyright; Avail: CASI; A05, Hardcopy
Contents include the following: High-Level Synthesis Using Predefined IP-5; Performance Modeling of Cooperating Tasks in PC Clusters; Software Problems of an Experimental Robot Controller Based on QNX Real-time Operating Systems; Model Reference Adaptive Control of Ripple Reduced SRM Drives; Routing with Minimum Wire Length in the Manhattan Model is NP-Complete; and Switching Robust Adaptive Control Based on RBF Neural Networks.
NTIS
Electrical Engineering; Adaptive Control

20040084710 Lawrence Livermore National Lab., Livermore, CA
Global Static Indexing for Real-Time Exploration of Very Large Regular Grids
Pascucci, V.; Frank, R. J.; 2004; In English
Report No.(s): DE2004-15006198; UCRL-JC-144754; No Copyright; Avail: National Technical Information Service (NTIS)
In this paper we introduce a new indexing scheme for progressive traversal and visualization of large regular grids. We demonstrate the potential of our approach by providing a tool that displays at interactive rates planar slices of scalar field data with very modest computing resources. We obtain unprecedented results both in terms of absolute performance and, more importantly, in terms of scalability. On a laptop computer we provide real time interaction with a 20483 grid (8 Giga-nodes) using only 20MB of memory. On an SGI Onyx we slice interactively an 81923 grid (1/2 tera-nodes) using only 60MB of memory. The scheme relies simply on the determination of an appropriate reordering of the rectilinear grid data and a progressive construction of the output slice. The reordering minimizes the amount of I/O performed during the out-of-core

computation. The progressive and asynchronous computation of the output provides flexible quality/speed tradeoffs and a time-critical and interruptible user interface.
NTIS
Computation; Display Devices; Real Time Operation

20040084794 NASA Langley Research Center, Hampton, VA, USA, National Inst. of Aerospace, Hampton, VA, USA
Parameter Transient Behavior Analysis on Fault Tolerant Control System
Belcastro, Christine, Technical Monitor; Shin, Jong-Yeob; December 2003; 24 pp.; In English
Contract(s)/Grant(s): NAS1-02117; NCC1-02043; WU 762-60-31-02
Report No.(s): NASA/CR-2003-212682; NIA-2003-05; No Copyright; Avail: CASI; A03, Hardcopy

In a fault tolerant control (FTC) system, a parameter varying FTC law is reconfigured based on fault parameters estimated by fault detection and isolation (FDI) modules. FDI modules require some time to detect fault occurrences in aero-vehicle dynamics. This paper illustrates analysis of a FTC system based on estimated fault parameter transient behavior which may include false fault detections during a short time interval. Using Lyapunov function analysis, the upper bound of an induced-L2 norm of the FTC system performance is calculated as a function of a fault detection time and the exponential decay rate of the Lyapunov function.
Author
Fault Tolerance; Control Systems Design; Modules; Fault Detection; Systems Analysis; Transient Response

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COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

20040084780 Prairie View Agricultural and Mechanical Coll., TX, USA
Mitigation of High Altitude and Low Earth Orbit Radiation Effects on Microelectronics via Shielding or Error Detection and Correction Systems
Gupta, Kajal, Technical Monitor; Kirby, Kelvin; July 19, 2004; 55 pp.; In English
Contract(s)/Grant(s): NAG4-210; No Copyright; Avail: CASI; A04, Hardcopy

The NASA Cooperative Agreement NAG4-210 was granted under the FY2000 Faculty Awards for Research (FAR) Program. The project was proposed to examine the effects of charged particles and neutrons on selected random access memory (RAM) technologies. The concept of the project was to add to the current knowledge of Single Event Effects (SEE) concerning RAM and explore the impact of selected forms of radiation on Error Detection and Correction Systems. The project was established as an extension of a previous FAR awarded to Prairie View A&M University (PVAMU), under the direction of Dr. Richard Wilkins as principal investigator. The NASA sponsored Center for Applied Radiation Research (CARR) at PVAMU developed an electronic test-bed to explore and quantify SEE on RAM from charged particles and neutrons. The test-bed was developed using 486DX microprocessor technology (PC-104) and a custom test board to mount RAM integrated circuits or other electronic devices. The test-bed had two configurations - a bench test version for laboratory experiments and a 400 Hz powered rack version for flight experiments. The objectives of this project were to: 1) Upgrade the Electronic Test-bed (ETB) to a Pentium configuration; 2) Accommodate more than only 8 Mbytes of RAM; 3) Explore Error Detection and Correction Systems for radiation effects; 4) Test modern RAM technologies in radiation environments.
Author
Single Event Upsets; Random Access Memory; Test Stands; Radiation Effects

20040084997 State Univ. of New York, Utica, NY
Secure Architecture for Extensible Mobile Internet Transport System
Das, Digen; Fitzgibbons, Patrick; Hash, Larry; Jun. 2004; 85 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-01-1-0518; Proj-OIAG
Report No.(s): AD-A424316; AFRL-IF-RS-TR-2004-139; No Copyright; Avail: CASI; A05, Hardcopy

This document is the final report for the State University of New York Institute of Technology Secure Architecture For Extensible Mobile Internet Transport System project. In this paper, we will summarize our accomplishments, discuss high and low points of the project, and suggest future work that might be done to further mobile/wireless security research. We will also present a final overview discussion of Mobile Security Policy. Although our initial AFRL funding period is over we intend

to pursue more secure wireless research, and will use this site to post any future results in software or technical reports. We would like to thank AFRL for giving us the opportunity to get started in this research arena.
DTIC
Architecture (Computers); Internets

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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.

20040084375 NASA Ames Research Center, Moffett Field, CA, USA
An Empirical Evaluation of Automated Theorem Provers in Software Certification
Denney, Ewen; Fischer, Bernd; Schumann, Johann; [2004]; 20 pp.; In English; Empirically Successful First Order Reasoning (ESFOR 2004), 4-8 Jul. 2004, Cork, Ireland; No Copyright; Avail: CASI; A03, Hardcopy

We describe a system for the automated certification of safety properties of NASA software. The system uses Hoare-style program verification technology to generate proof obligations which are then processed by an automated first-order theorem prover (ATP). We discuss the unique requirements this application places on the ATPs, focusing on automation, proof checking, and usability. For full automation, however, the obligations must be aggressively preprocessed and simplified, and we demonstrate how the individual simplification stages, which are implemented by rewriting, influence the ability of the ATPs to solve the proof tasks. Our results are based on 13 certification experiments that lead to more than 25,000 proof tasks which have each been attempted by Vampire, Spass, e-setheo, and Otter. The proofs found by Otter have been proof-checked by IVY.
Derived from text
Proving; Program Verification (Computers); Systems Engineering; Safety Factors

20040084431 Computer Sciences Corp., Moffett Field, CA, USA
Evaluating the Information Power Grid using the NAS Grid Benchmarks
VanderWijngaartm Rob F.; Frumkin, Michael A.; March 03, 2004; 7 pp.; In English; International Parallel and Distributed Processing Symposium, 26-30 Apr. 2004, Santa Fe, New Mexico, USA
Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A02, Hardcopy

The NAS Grid Benchmarks (NGB) are a collection of synthetic distributed applications designed to rate the performance and functionality of computational grids. We compare several implementations of the NGB to determine programmability and efficiency of NASA's Information Power Grid (IPG), whose services are mostly based on the Globus Toolkit. We report on the overheads involved in porting existing NGB reference implementations to the IPG. No changes were made to the component tasks of the NGB can still be improved.
Author
Grid Generation (Mathematics); Computational Grids; Grid Computing (Computer Networks)

20040084436 Building and Construction Research TNO, Delft, Netherlands
CAEFEM as Numerical Tool for Submarine Strength Analysis
Gielen, A. W. J.; October 2003; 27 pp.; In English
Contract(s)/Grant(s): A03/KM/116; V051; TNO Proj. 006.38145
Report No.(s): TD-2003-009; Rept-2003-CMC-R047; Copyright; Avail: Other Sources

This document describes usability of FEMAP and CAEFEM for strength analyses of submarines. To this end CAEFEM was benchmarked against results of a model problem executed in the past. The reason for this is to have a good tool to assess the effect of corrosion damage to the pressure hull. The conclusion is that CAEFEM is sufficiently accurate to serve as a tool for corrosion damage for existing submarine designs, but not sufficiently accurate to evaluate a new design.
Author
Hulls (Structures); Submarines; Corrosion; Damage Assessment; Computer Programs

20040084461 NASA Ames Research Center, Moffett Field, CA, USA
Generative Representations for Computer-Automated Design Systems
Hornby, Gregory S.; [2004]; 15 pp.; In English; No Copyright; Avail: CASI; A03, Hardcopy

With the increasing computational power of Computers, software design systems are progressing from being tools for

architects and designers to express their ideas to tools capable of creating designs under human guidance. One of the main limitations for these computer-automated design programs is the representation with which they encode designs. If the representation cannot encode a certain design, then the design program cannot produce it. Similarly, a poor representation makes some types of designs extremely unlikely to be created. Here we define generative representations as those representations which can create and reuse organizational units within a design and argue that reuse is necessary for design systems to scale to more complex and interesting designs. To support our argument we describe GENRE, an evolutionary design program that uses both a generative and a non-generative representation, and compare the results of evolving designs with both types of representations.
Author
Computer Aided Design; Software Engineering; Software Development Tools; Computer Programs

20040084561 NASA Ames Research Center, Moffett Field, CA, USA
A Unified Framework for Periodic, On-Demand, and User-Specified Software Information
Kolano, Paul Z.; [2004]; 9 pp.; In English; IEEE International Symposium on High-Performance Distributed Computing, 4-6 Jan. 2004, HI, USA; No Copyright; Avail: CASI; A02, Hardcopy

Although grid computing can increase the number of resources available to a user; not all resources on the grid may have a software environment suitable for running a given application. To provide users with the necessary assistance for selecting resources with compatible software environments and/or for automatically establishing such environments, it is necessary to have an accurate source of information about the software installed across the grid. This paper presents a new OGSI-compliant software information service that has been implemented as part of NASA's Information Power Grid project. This service is built on top of a general framework for reconciling information from periodic, on-demand, and user-specified sources. Information is retrieved using standard XPath queries over a single unified namespace independent of the information's source. Two consumers of the provided software information, the IPG Resource Broker and the IPG Neutralization Service, are briefly described.
Author
Grid Computing (Computer Networks); Software Engineering; Human-Computer Interface; Information Retrieval

20040084563 NASA Ames Research Center, Moffett Field, CA, USA
The Design of Collectives of Agents to Control Non-Markovian Systems
Lawson, John W.; Wolpert, David H.; [2004]; 6 pp.; In English; Copyright; Avail: CASI; A02, Hardcopy

The Collective Intelligence (COIN) framework concerns the design of collectives of reinforcement-learning agents such that their interaction causes a provided ″world″ utility function concerning the entire collective to be maximized. Previously, we applied that framework to scenarios involving Markovian dynamics where no re-evolution of the system from counter-factual initial conditions (an often expensive calculation) is permitted. This approach sets the individual utility function of each agent to be both aligned with the world utility, and at the same time, easy for the associated agents to optimize. Here we extend that approach to systems involving non-Markovian dynamics. In computer simulations, we compare our techniques with each other and with conventional ″team games″. We show whereas in team games performance often degrades badly with time, it steadily improves when our techniques are used. We also investigate situations where the system's dimensionality is effectively reduced. We show that this leads to difficulties in the agents ability to learn. The implication is that learning is a property only of high-enough dimensional systems.
Author
Computerized Simulation; Markov Processes; Artificial Intelligence

20040084570 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
ScyFlow: An Environment for the Visual Specification and Execution of Scientific Workflows
McCann, Karen M.; Yarrow, Maurice; DeVivo, Adrian; Mehrotra, Piyush; February 23, 2004; 11 pp.; In English; GGF #10 Workflo Workshop, 9-13 Mar. 2004, Berlin, Germany
Contract(s)/Grant(s): RTOP 302-15-41; No Copyright; Avail: CASI; A03, Hardcopy

With the advent of grid technologies, scientists and engineers are building more and more complex applications to utilize distributed grid resources. The core grid services provide a path for accessing and utilizing these resources in a secure and seamless fashion. However what the scientists need is an environment that will allow them to specify their application runs at a high organizational level, and then support efficient execution across any given set or sets of resources. We have been designing and implementing ScyFlow, a dual-interface architecture (both GUT and APT) that addresses this problem. The

scientist/user specifies the application tasks along with the necessary control and data flow, and monitors and manages the execution of the resulting workflow across the distributed resources. In this paper, we utilize two scenarios to provide the details of the two modules of the project, the visual editor and the runtime workflow engine.
Author
Information Flow; Scientific Visualization; Complex Systems; Computational Fluid Dynamics; Specifications

20040084583 NASA Ames Research Center, Moffett Field, CA, USA
A Closed-Loop Optimal Neural-Network Controller to Optimize Rotorcraft Aeromechanical Behaviour, Volume 1, Theory and Methodology
Leyland, Jane Anne; March 2001; 267 pp.; In English
Contract(s)/Grant(s): 712-10-12
Report No.(s): NASA/TM-2001-209623/VOL1; A-00V0033/VOL1; No Copyright; Avail: CASI

Given the predicted growth in air transportation, the potential exists for significant market niches for rotary wing subsonic vehicles. Technological advances which optimise rotorcraft aeromechanical behaviour can contribute significantly to both their commercial and military development, acceptance, and sales. Examples of the optimisation of rotorcraft aeromechanical behaviour which are of interest include the minimisation of vibration and/or loads. The reduction of rotorcraft vibration and loads is an important means to extend the useful life of the vehicle and to improve its ride quality. Although vibration reduction can be accomplished by using passive dampers and/or tuned masses, active closed-loop control has the potential to reduce vibration and loads throughout a.wider flight regime whilst requiring less additional weight to the aircraft man that obtained by using passive methads. It is ernphasised that the analysis described herein is applicable to all those rotorcraft aeromechanical behaviour optimisation problems for which the relationship between the harmonic control vector and the measurement vector can be adequately described by a neural-network model.
Derived from text
Rotary Wings; Neural Nets; Vectors (Mathematics)

20040084584 NASA Ames Research Center, Moffett Field, CA, USA, Computer Sciences Corp., Moffett Field, CA, USA
What Multilevel Parallel Programs do when you are not Watching: A Performance Analysis Case Study Comparing MPI/OpenMP, MLP, and Nested OpenMP
Jost, Gabriele; Labarta, Jesus; Gimenez, Judit; May 17, 2004; 6 pp.; In English; Workshop on OpenMP Applications and Tools, 17-18 May 2004, Houston, TX, USA
Contract(s)/Grant(s): DTTS59-9-D-00437; NASA Order A-61812-D; TIC2001-0995-C02-01; Copyright; Avail: CASI; A02, Hardcopy

With the current trend in parallel computer architectures towards clusters of shared memory symmetric multi-processors, parallel programming techniques have evolved that support parallelism beyond a single level. When comparing the performance of applications based on different programming paradigms, it is important to differentiate between the influence of the programming model itself and other factors, such as implementation specific behavior of the operating system (OS) or architectural issues. Rewriting-a large scientific application in order to employ a new programming paradigms is usually a time consuming and error prone task. Before embarking on such an endeavor it is important to determine that there is really a gain that would not be possible with the current implementation. A detailed performance analysis is crucial to clarify these issues. The multilevel programming paradigms considered in this study are hybrid MPI/OpenMP, MLP, and nested OpenMP. The hybrid MPI/OpenMP approach is based on using MPI [7] for the coarse grained parallelization and OpenMP [9] for fine grained loop level parallelism. The MPI programming paradigm assumes a private address space for each process. Data is transferred by explicitly exchanging messages via calls to the MPI library. This model was originally designed for distributed memory architectures but is also suitable for shared memory systems. The second paradigm under consideration is MLP which was developed by Taft. The approach is similar to MPi/OpenMP, using a mix of coarse grain process level parallelization and loop level OpenMP parallelization. As it is the case with MPI, a private address space is assumed for each process. The MLP approach was developed for ccNUMA architectures and explicitly takes advantage of the availability of shared memory. A shared memory arena which is accessible by all processes is required. Communication is done by reading from and writing to the shared memory.
Author
Parallel Programming; Architecture (Computers); Distributed Memory; Memory (Computers); Reliability Analysis; Time Measurement

20040084602 NASA Ames Research Center, Moffett Field, CA, USA

Realtime Absolute Orientation with Outlier Rejection for Visual Odometry and Mesh Merging

Bandari, Esfandiar; Goldstein, Norman; Nesnas, Issa; Bajracharya, Max; January 09, 2004; 2 pp.; In English; Copyright; Avail: CASI; A01, Hardcopy

This paper addresses a high level spatio-temporal problem, namely ″absolute orientation″, which arises in visual-odometry (using stereo), or registering two models created by different Structure from Motion (SFM) reconstructions. We compare the very popular method due to Horn using quaternions and our own independently derive method using the orthonormal rotation matrix R. We also introduce a novel approach for outlier rejection using spectral clustering.

Author

Real Time Operation; Computerized Simulation; Outliers (Statistics)

20040084627 Defence Science and Technology Organisation, Edinburgh, Australia

What Distributed Interactive Simulation (DIS) Protocol Data Units (PDU) Should My Australian Defence Force Simulator Have?

Zalcman, Lucien; March 2004; 67 pp.; In English

Report No.(s): DSTO-TR-1565; DODA-AR-013-058; Copyright; Avail: Other Sources

In 2003 the author attended the AEW&C Operational Mission System (OMS) simulator preliminary design review. The design for the Distributed Interactive Simulation (DE) interface on this simulator was not well developed and a significant amount of work was required to bring the AEWK OMS simulator's D E interface up to a suitable standard to provide a useful level of interoperability. This report documents the processes used to develop a minimum, basic set of DE message packets (Protocol Data Units (PDUs)) that should provide sufficient interoperability to enable the (or any other ADF) simulator to participate in a DE, Wide Area Network, training exercise at the time the simulator is accepted by the ADF without expensive after acceptance modification. Although used for the AEWK OMS simulator the recommended, base, minimum set of DE PDUs is not directed at any particular platform or project and is meant to be the generic starting point for any ADF simulator DE interface. An analysis of platform specific functionality would also be required to provide additional platform specific DIS PDUs.

Author

Distributed Interactive Simulation; Interoperability; Data Structures; Design Analysis

20040084686 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Design of MiPS 2.0

Halswijk, W. H. C.; vanderHorst, R. M.; Moerel, J. L. P. A.; February 2004; 71 pp.; In English

Contract(s)/Grant(s): B01/KL/458; TNO Proj. 014.13076

Report No.(s): TD-2004-0001; PML-2004-A1; Copyright; Avail: Other Sources

A simulation framework for trajectory simulation of unguided and guided weapons is implemented using the Matlab/Simulink environment. Subcomponents (e.g. sensor, autopilot) are implemented using configurable libraries, which enables re-usable modelled components. The implemented quations of motions are based on body-fixed reference fi-ame using six degrees of freedom. The attitude of a modelled weapon is modelled using Euler angles or Quaternions. Trajectory simulations based in both attitude models show very good agreement. Plane-fixed and Aero-ballistic equations of motions are added for the simulation of fast spinning projectiles. Again results form these methods show very good agreement with the body-fixed equations. Atmosphere and gravitational models are added.

Author

Computer Programs; Computerized Simulation; Trajectory Analysis

20040084891 Military Academy, West Point, NY

Transforming the Department: 1999-2004

McGinnis, Mike; May 2004; 21 pp.; In English

Report No.(s): AD-A424113; DSE-TR-04-29; No Copyright; Avail: CASI; A03, Hardcopy

Established in 1989, the Department of Systems Engineering at the USA Military Academy, West Point, New York offers pedagogically sound, ABET accredited undergraduate degrees in systems engineering and engineering management. However, from the start, course development, teaching, student summer internships, faculty research, and faculty development were essentially managed as separate, individual-centric, stove-piped programs. In the summer of 1999, an internal Department review and assessment' by senior faculty identified this as a major hindrance to the Department's pursuit of excellence and

higher performance. In an effort to improve performance and efficiency across all programs, the Department leadership developed a plan to transform the department by better aligning and enhancing the synergy between programs. This paper discusses the challenges of this undertaking and highlights the success of our continuing transformation process.
DTIC
Systems Engineering

20040084893 University of Southern California, Marina del Rey, CA
Capturing and Exploiting Semantic Relationships for Information Management
Gill, Yolanda; May 26, 2004; 55 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0337
Report No.(s): AD-A424119; AFRL-SR-AR-TR-04-0290; No Copyright; Avail: CASI; A04, Hardcopy

TRELLIS provides an interactive environment that allows users to add their observations, opinions, and conclusions as they analyze information by making semantic annotations to documents and other on-line resources. Our work concentrated on four major areas: 1) designing a vocabulary to annotate information analysis, 2) creating semantic markup representations for this vocabulary and annotating analysis products, 3) deriving trust ratings for sources used in collections of analyses, and 4) developing the TRELLIS interface and tools.
DTIC
Data Management; Information Management; Information Systems; Knowledge Based Systems; Semantics

20040084905 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Geographically Locating an Internet Node Using Network Latency Measurement
Turnbaugh, Eugene D.; Mar. 2004; 110 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424136; AFIT/GCS/ENG/04-21; No Copyright; Avail: CASI; A06, Hardcopy

Discovering the geographic location of a node using only its Internet Protocol (IP) address and latency measurements is a big challenge. The difficulties include accurate latency measure, network address translation (NAT) masking, service blocking, disparate physical configuration, dissimilar network hardware, and inaccurate and limited measuring tools. Using only latency measurements from the Internet, this research successfully geolocated the nearest city to a destination node 100 percent of the time to 5 of 6 destinations regardless of the time of day the measurements were taken. Additionally, there was 67 percent success in identifying the two closest geographical cities to each of the six destinations. These results were accomplished using publicly available high-speed servers that gathered latency data from six geographically dispersed destinations connected to the Internet at markedly different speeds, to include a dial-up client, three cable modem users, a digital subscriber link (DSL) user, and a high-speed Internet router. This study builds upon existing research in this area and develops a heuristic, called the Time-to-Location Heuristic (TTLH). TTLH uses well-connected Internet routers, called polling stations, to collect baseline latencies to known locations, called endpoints. Using the Euclidean distance algorithm, the latencies from a destination node (at an unknown location) are compared to the baseline latencies. The lowest Euclidean distances help determine the closest endpoint cities to a destination node.
DTIC
Computer Networks; Internets; Modems; Position (Location)

20040084912 Carnegie-Mellon Univ., Pittsburgh, PA
Scalable Redundancy for Infrastructure Services
Reiter, Michael; May 2004; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-02-1-0139; Proj-N402
Report No.(s): AD-A424144; AFRL-IF-RS-TR-2004-138; No Copyright; Avail: CASI; A03, Hardcopy

Redundancy is a core tenet of robust system design, and has been employed as a defense against system failure and/or compromise for decades. One goal of this effort is to explore directions toward achieving redundancy that scales to large systems. Another goal of this research is to explore the application of scalable redundancy technologies to the implementation of infrastructure services of a variety of types.
DTIC
Command and Control; Computer Programs; Redundancy

20040084939 Army War Coll., Carlisle Barracks, PA

Geographic Location of a Computer Node Examining a Time-to-Location Algorithm and Multiple Autonomous System Networks

Sorgaard, Duane C.; Mar. 2004; 111 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424208; AFIT/GCS/ENG/04-17; No Copyright; Avail: CASI; A06, Hardcopy

To determine the location of a computer on the Internet without resorting to outside information or databases would greatly increase the security abilities of the US Air Force and the Department of Defense. The geographic location of a computer node has been demonstrated on an autonomous system (AS) network, or a network with one system administration focal point. The work shows that a similar technique will work on networks comprised of a multiple AS network. A time-to-location algorithm can successfully resolve a geographic location of a computer node using only latency information from known sites and mathematically calculating the Euclidean distance to those sites from an unknown location on a single AS network. The time-to-location algorithm on a multiple AS network successfully resolves a geographic location 71.4% of the time. Packets are subject to arbitrary delays in the network; and inconsistencies in latency measurements are discovered when attempting to use a time-to location algorithm on a multiple AS network. To improve accuracy in a multiple AS network, a time-to-location algorithm needs to calculate the link bandwidth when attempting to geographically locate a computer node on a multiple AS network.

DTIC

Algorithms; Autonomy; Computers; Position (Location)

20040084952 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Comparative Analysis of Active and Passive Mapping Techniques in an Internet-Based Local Area Network

Kuntzelman, James B.; Mar. 2004; 103 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424237; AFIT/GCS/ENG/04-09; No Copyright; Avail: CASI; A06, Hardcopy

Network mapping technologies allow quick and easy discovery of computer systems throughout a network. Active mapping methods, such as using nmap, capitalize on the standard stimulus-response of network systems to probe target systems. In doing so, they create extra traffic on the network, both for the initial probe and for the target system's response. Passive mapping methods work opportunistically, listening for network traffic as it transits the system. As such, passive methods generate minimal network traffic overhead. Active methods are still standard methods for network information gathering; passive techniques are not normally used due to the possibility of missing important information as it passes by the sensor. Configuring the network for passive network mapping also involves more network management. This research explores the implementation of a prototype passive network mapping system, lanmap, designed for use within an Internet Protocol-based local area network. Network traffic is generated by a synthetic traffic generation suite using honeyd and syntraf, a custom Java program to interact with honeyd. lanmap is tested against nmap to compare the two techniques. Experimental results show that lanmap is quite effective, discovering an average of 76.1% of all configured services (server- and client-side) whereas nmap only found 27.6% of all configured services. Conversely, lanmap discovered 19.9% of the server services while nmap discovered 92.7% of the configured server-side services. lanmap discovered 100% of all client-side service consumers while nmap found none. lanmap generated an average of 200 packets of network overhead while nmap generated a minimum of minimum 8,600 packets on average?up to 155,000 packets at its maximum average value. The results show that given the constraints of the test bed, passive network mapping is a viable alternative to action network mapping, unless the mapper is looking for server-side services.

DTIC

Computer Networks; Computer Programs; Internets; Local Area Networks

20040084962 Defence Science and Technology Organisation, Salisbury

Automation Information Sharing and Shared Situation Awareness

Kardos, Monique; Mar. 2004; 37 pp.; In English

Report No.(s): AD-A424260; DSTO-GD-0400; DODA-AR-013-069; No Copyright; Avail: CASI; A03, Hardcopy

Increasingly, the trend for military and other organisations is an increase in automation to improve the efficiency and effectiveness of staff in the workplace. In the military context, automated tools assisting in battlefield visualisation and mission planning may be implemented for these very purposes. Automation may, however, impact on the performance of military teams and affect the situation awareness (SA) necessary for good team functioning. This review examines the potential impacts and benefits of automation on information sharing, SA, planning, and team performance, as well as the concept of measuring SA. Several potential methods for measuring both shared and individual SA in various military contexts (ie. during field exercises, Command Post Exercises and in laboratory-based experiments) are then briefly outlined. It concludes with a brief

discussion of the need for further examination of the impact of automation, the need for training of staff, and the reality of the benefits imparted by the tools themselves.
DTIC
Computerized Simulation

20040084965 Naval Surface Warfare Center, Bethesda, MD
Program Documentation for the Channel Analysis and Design Evaluation Tool (CADET)
Kopp, Paul J.; Silver, Andrew L.; May 2004; 73 pp.; In English
Report No.(s): AD-A424264; NSWCCD-50-TR-2004/004; No Copyright; Avail: CASI; A04, Hardcopy

The Naval Surface Warfare Center, Carderock Division has developed a software tool, the Channel Analysis and Design Evaluation Tool (CADET), to aid in determining the operational depth of an entrance channel to commercial ports. CADET is a set of computer programs that use probabilistic risk analysis techniques to evaluate the accessibility of a series of channel depths for multiple vessel geometries and loading conditions. The operational depth is governed by many factors, including the geometry of the channel, local environmental conditions, and the hydrodynamic characteristics of the types of vessels that transit the channel. Shallow water vertical motions and the underway squat and trim are included. The wave environment is described using a climatology of local waves. The climatology includes the percent occurrence of combinations of significant wave height, modal period, and peak direction. These values are then converted into directional wave spectra and used to generate the ship motions for that wave condition. The accessibility of the channel for each project depth is then determined through calculating the risk of the ship impacting each project depth and the persistence of that wave condition at the channel. The CADET software distribution includes a MS Windows based program that provides a graphical user interface to the ship and project databases, the analysis software tools, and the results of project studies supporting design alternative analysis. This document provides a short summary of the theory upon which CADET is based, and instructions on how to use CADET.
DTIC
Computer Programs; Keels; Ships; Waterways

20040084989 Army Aviation and Missile Command, Redstone Arsenal, AL
RDE Command First Application (1st APP) Simulation Experiment for Future Combat Systems (FCS) Networked Fires
Tackett, Gregory B.; McKelvy, Timothy; Jun. 2004; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424301; AMSAM-RD-SS-TR-AMR-SS-04-14; No Copyright; Avail: CASI; A03, Hardcopy

The Virtual Distributed Laboratory for Modeling and Simulation (VDLMS) science and Technology Ob(jective (STO) initiated a First Application (1ST App) effort in 2003, to baseline the use of legacy distributed simulations within the U. S. Army Research, Development, and Engineering Command (RDECOM) to support Future Combat Systems (FCS) and Objective Force (OF) experimentation. This baseline provides a threshold in performance and process against which the emerging Modeling Architeettire for Technology, Research, and EXperimentation (MATREX), a combined simulation architecture between VDLMS and the Joint Virtual Battlespace (JVB), can be compared. This baseline was defined in terms of the cost, schedule, and performance of the conduct of a full-blown distributed real- time event representing a major portion of an FCS Unit of Action (UA), with sufficient data to conduct meaningful analysis in the context of an exploratory experiment. Networked Fires was the analysis context chosen for this event, due to the critical need for an understanding of realistic Networked Fires performance in FCS, in support of acquisition and design. This report discusses the 1st App cost, schedule, and performance baselines, the lessons learned from conduct of a distributed simulation of this magnitude, and some insights into the issues, questions, parameters, and results of the event.
DTIC
Combat; Data Acquisition; Fires; Simulation

20040085010 California Univ., Riverside, CA
Automatic Design and Synthesis of Automatic Target Recognition (ATR) systems Using Learning Paradigms
Bhanu, Bir; Lin, Yingqiang; Krawiec, Krzysztof; Oct. 2003; 148 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-99-C-1440; Proj-6095
Report No.(s): AD-A424338; CRIS-1003; AFRL-SN-WP-TR-2004-1019; No Copyright; Avail: CASI; A07, Hardcopy

This report investigates evolutionary computational techniques such as genetic programming (GP), coevolutionary genetic programming (CGP), linear genetic programming (LGP) and genetic algorithms (GA) to automate the synthesis and analysis of object detection and recognition systems. It shows the efficacy of evolutionary computation in synthesizing

effective composite operators and composite features from domain-independent primitive image processing operations and primitive features for object detection and recognition. Smart crossover, smart mutation and a new fitness function based on minimum description length (MDL) principle are designed to improve the efficiency of genetic programming. A new MDL-based fitness function is proposed to improve the genetic algorithm s performance on feature selection for object detection and recognition. Results are shown using MSTAR SAR imagery.
DTIC
Target Recognition

62
COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20040084376 NASA Ames Research Center, Moffett Field, CA, USA
A Hybrid Constraint Representation and Reasoning Framework
Golden, Keith; Pang, Wanlin; April 20, 2004; 15 pp.; In English; 10th International Conference on Principles and Practice of Constraint Programming (CP-2004), 27 Sep. - 1 Oct. 2004, Toronto, Canada; No Copyright; Avail: CASI; A03, Hardcopy

In this paper, we introduce JNET, a novel constraint representation and reasoning framework that supports procedural constraints and constraint attachments, providing a flexible way of integrating the constraint system with a runtime software environment and improving its applicability. We describe how JNET is applied to a real-world problem - NASA's Earth-science data processing domain, and demonstrate how JNET can be extended, without any knowledge of how it is implemented, to meet the growing demands of real-world applications.
Author
Earth Sciences; Constraints; Data Processing; Computer Systems Programs; Representations

20040084388 Physics and Electronics Lab. TNO, The Hague, Netherlands
Security Aspects of Mobile and ad hoc Networks
Schotanus, H. A.; Verkoelen, C. A. A.; Hansson, E.; Genik, L.; Salmanian, M.; Mason, P.; April 2004; 346 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.30853
Report No.(s): FEL-03-A242; TD-2003-0216; Copyright; Avail: Other Sources

The use of open standards for mobile and ad hoc networks provide an opportunity for flexibility and cost-efficiency in military networks. This research focused at the security aspects of the available open standards. It can be concluded that the security is currently insufficient for the use in military networks. The use of IPsec can fix some of these problems but by far not all. Therefore, more research is needed to address the security deficiencies in open standards.
Author
Mobile Communication Systems; Wireless Communication; Military Technology; Computer Information Security; Computer Networks; Protocol (Computers)

20040084418 NASA Ames Research Center, Moffett Field, CA, USA
Benchmarking Memory Performance with the Data Cube Operator
Frumkin, Michael A.; Shabanov, Leonid V.; March 26, 2004; 18 pp.; In English; 17th International Conference on Parallel and Distributed Computing Systems, 15-17 Sep. 2004, San Francisco, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy

Data movement across a computer memory hierarchy and across computational grids is known to be a limiting factor for applications processing large data sets. We use the Data Cube Operator on an Arithmetic Data Set, called ADC, to benchmark capabilities of computers and of computational grids to handle large distributed data sets. We present a prototype implementation of a parallel algorithm for computation of the operatol: The algorithm follows a known approach for computing views from the smallest parent. The ADC stresses all levels of grid memory and storage by producing some of 2d views of an Arithmetic Data Set of d-tuples described by a small number of integers. We control data intensity of the ADC by selecting the tuple parameters, the sizes of the views, and the number of realized views. Benchmarking results of memory performance of a number of computer architectures and of a small computational grid are presented.
Author
Memory (Computers); Computational Grids; Architecture (Computers); Algorithms

20040084610 Computer Sciences Corp., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
An Expert Assistant for Computer Aided Parallelization
Jost, Gabriele; Chun, Robert; Jin, Haoqiang; Labarta, Jesus; Gimenez, Judit; June 20, 2004; 7 pp.; In English; PARA'04 Workshop on State-of-the-Art in Scientific Computing, 20-24 Jun. 2004, Kopenhagen, Denmark
Contract(s)/Grant(s): DTTS59-99-D00437; NASA Order A-61812-D; TIC2001-0995-C02-01; No Copyright; Avail: CASI; A02, Hardcopy

The prototype implementation of an expert system was developed to assist the user in the computer aided parallelization process. The system interfaces to tools for automatic parallelization and performance analysis. By fusing static program structure information and dynamic performance analysis data the expert system can help the user to filter, correlate, and interpret the data gathered by the existing tools. Sections of the code that show poor performance and require further attention are rapidly identified and suggestions for improvements are presented to the user. In this paper we describe the components of the expert system and discuss its interface to the existing tools. We present a case study to demonstrate the successful use in full scale scientific applications.
Author
Computer Techniques; Information Analysis; Reliability Analysis; Expert Systems

20040084612 NASA Ames Research Center, Moffett Field, CA, USA
Shortcomings with Tree-Structured Edge Encodings for Neural Networks
Hornby, Gregory S.; [2004]; 12 pp.; In English; Genetic and Evolutionary Computation Conference, 26-30 Jun. 2004, Seattle, WA, USA; No Copyright; Avail: CASI; A03, Hardcopy

In evolutionary algorithms a common method for encoding neural networks is to use a tree structured assembly procedure for constructing them. Since node operators have difficulties in specifying edge weights and these operators are execution-order dependent, an alternative is to use edge operators. Here we identify three problems with edge operators: in the initialization phase most randomly created genotypes produce an incorrect number of inputs and outputs; variation operators can easily change the number of input/output (I/O) units; and units have a connectivity bias based on their order of creation. Instead of creating I/O nodes as part of the construction process we propose using parameterized operators to connect to preexisting I/O units. Results from experiments show that these parameterized operators greatly improve the probability of creating and maintaining networks with the correct number of I/O units, remove the connectivity bias with I/O units and produce better controllers for a goal-scoring task.
Author
Algorithms; Coding; Controllers; Neural Nets; Trees (Mathematics)

20040084784
Updated Electronic Testbed System
Brewer, Kevin L.; 2001; 21 pp.; In English
Contract(s)/Grant(s): NAG4-210; No Copyright; Avail: CASI; A03, Hardcopy

As we continue to advance in exploring space frontiers, technology must also advance. The need for faster data recovery and data processing is crucial. In this, the less equipment used, and lighter that equipment is, the better. Because integrated circuits become more sensitive in high altitude, experimental verification and quantification is required. The Center for Applied Radiation Research (CARR) at Prairie View A&M University was awarded a grant by NASA to participate in the NASA ER-2 Flight Program, the APEX balloon flight program, and the Student Launch Program. These programs are to test anomalous errors in integrated circuits due to single event effects (SEE). CARR had already begun experiments characterizing the SEE behavior of high speed and high density SRAM's. The research center built a error testing system using a PC-104 computer unit, an Iomega Zip drive for storage, a test board with the components under test, and a latchup detection and reset unit. A test program was written to continuously monitor a stored data pattern in the SRAM chip and record errors. The devices under test were eight 4Mbit memory chips totaling 4Mbytes of memory. CARR was successful at obtaining data using the Electronic TestBed System (EBS) in various NASA ER-2 test flights. These series of high altitude flights of up to 70,000 feet, were effective at yielding the conditions which single event effects usually occur. However, the data received from the series of flights indicated one error per twenty-four hours. Because flight test time is very expensive, the initial design proved not to be cost effective. The need for orders of magnitude with more memory became essential. Therefore, a project which could test more memory within a given time was created. The goal of this project was not only to test more memory within a given time, but also to have a system with a faster processing speed, and which used less peripherals. This paper will describe procedures used to build an updated Electronic Testbed System.
Derived from text
Microelectronics; Performance Tests; Computer Design; Computer Systems Programs; Aerospace Engineering

20040084877 Army War Coll., Carlisle Barracks, PA
The Human Dimension of Network Security
O'Brien, Dennis A.; Mar. 18, 2004; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424086; No Copyright; Avail: CASI; A03, Hardcopy

The transformation of the U.S. military relies heavily on new technology to wage standoff wars with limited casualties. However network centric warfare is susceptible to numerous risks and may not be safe enough to win wars alone. This paper will examine the safety of DOD networks and the implications it has on our military forces. Specifically it will address the human dimension of network security and vulnerabilities resulting from human error insider threats and deliberate hacking. DTIC

Computer Information Security; Computer Networks; Network Analysis; Security

20040084955 Army War Coll., Carlisle Barracks, PA
Securing American Cyberspace: A Strategic Necessity
Barrineau, James E.; Mar. 19, 2004; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424249; No Copyright; Avail: CASI; A03, Hardcopy

USA (U.S.) cyberspace is not secure and this lack of security leaves the nation vulnerable to cyberattack from a variety of sources. Successful cyberattacks have had and may continue to have negative results with strategic implications. Until now cyberspace has existed with relatively unregulated access. However as the reliance on cyberspace grows the subsequent requirement for security also grows with it and we must now take at least the minimum necessary measures to better secure it or continue to suffer the consequences of computer attacks from a variety of threats. The U.S. Government must first set the example by securing itself and then move to bring industry into compliance preferably through consensus but if necessary through regulation or legislation. While government should display the necessary leadership in this arena industry has the great majority of the nation's infrastructure and therefore will bear the largest burden. Finally individual users must take a more active role in securing their small part of cyberspace. All three have a key role in securing American cyberspace in order to prevent a potential ″digital Pearl Harbor″ or ″electronic September 11″ from ever occurring.
DTIC

Computer Information Security; Security

20040084973 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Packet Analysis of Unmodified Bluetooth Communication Devices
Watts, Neal A.; Mar. 2004; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424274; AFIT/GCS/ENG/04-22; No Copyright; Avail: CASI; A05, Hardcopy

Bluetooth technology has potential for widespread use within the Department of Defense and the Air Force. An office environment using Bluetooth technology can wirelessly connect computers, printers, and other office equipment in order to share information over short distances. The clutter and annoyance of cables connecting equipment can be eliminated. Bluetooth provides a standard interface for connection, as opposed to many different proprietary cables. The research is conducted indoors in a climate controlled environment, with minimal obstructions, to closely follow free-space signal propagation. Four different antenna orientations are used. The factors varied are the distance between devices, and the antenna orientation. This research determined that two of the four cards tested have a specific distance where a change from Data High rate packets and Data Medium rate are used. The change occurs at 2 meters for one and 3 meters for the other. This research also shows that manufacturers transmit identical data in identical formats. Also, this research shows that antenna orientation, and receiver signal strength indicator values have no predictive value in determining packet type used for transmission..
DTIC

Communication Equipment; Local Area Networks; Radiotelephones; Telecommunication

20040084980 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Automating Security Protocol Analysis
Mancini, Stephen W.; Mar. 2004; 103 pp.; In English
Report No.(s): AD-A424282; AFIT/GCS/ENG/04-12; No Copyright; Avail: CASI; A06, Hardcopy

When Roger Needham and Michael Schroeder first introduced a seemingly secure protocol 24, it took over 18 years to discover that even with the most secure encryption, the conversations using this protocol were still subject to penetration. To date, there is still no one protocol that is accepted for universal use. Because of this, analysis of the protocol outside the encryption is becoming more important. Recent work by Joshua Guttman and others 9 have identified several properties that

good protocols often exhibit. Termed Authentication Tests , these properties have been very useful in examining protocols. The purpose of this research is to automate these tests and thus help expedite the analysis of both existing and future protocols. The success of this research is shown through rapid analysis of numerous protocols for the existence of authentication tests. The result of this is that an analyst is now able to ascertain in near real-time whether or not a proposed protocol is of a sound design or whether an existing protocol may contain previously unknown weaknesses. The other achievement of this research is the generality of the input process involved. Although there exist other protocol analyzers, their use is limited primarily due to their complexity of use. With the tool generated here, an analyst needs only to enter their protocol into a standard text file; and almost immediately, the analyzer determines the existence of the authentication tests.
DTIC
Cryptography; Protocol (Computers); Security

20040084995 Army War Coll., Carlisle Barracks, PA
Cyber Warfare/Cyber Terrorism
O'Hara, Timothy F.; Mar. 19, 2004; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424310; No Copyright; Avail: CASI; A03, Hardcopy

Section 1 of this paper provides an overview of cyber warfare as an element of information warfare, starting with the general background of the current strategic environment the USA is operating in. This section also examines why information warfare has become such an attractive alternative form of conflict, reviews the traditional principles of warfare and why they may or may not apply to cyber warfare, and proposes new principles of warfare that may be needed to conduct cyber warfare. Section 1 concludes with a review of offensive and defensive cyber warfare concepts. Section 2 presents a general overview of cyber terrorism, including definitions of cyber terrorism and cyber terrorism support. This section examines three possible levels of cyber terrorist attack and concludes with an analysis of the factors that may or may not encourage terrorists to engage in cyber terrorist operations. The third and final section of the paper attempts to answer the following question: ″Is cyber terrorism a legitimate threat?″ This section examines factors that should be considered when evaluating cyber terrorism as a potential threat. (4 tables, 5 figures, 25 refs.)
DTIC
Security; Terrorism; Threat Evaluation; Warfare

20040085007 Army Research Lab., Adelphi, MD
Strategic Information Plan 2001-2005
Nov. 2000; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424333; No Copyright; Avail: CASI; A03, Hardcopy

The goal of the Army Research Laboratories (ARL) is to produce ″one, united Army Research Laboratory with standard business practices, concentrated teamwork, and less bureaucracy supported by a corporate information management environment where personnel, financial, accounting, acquisition, and material functions operate uniformly throughout ARL.″ The purposes of the Strategic Information Plan are as follows: enable the execution of the Research & Development mission, provide world class support to all of ARL's customers, ensure constant process improvement, protect information, provide appropriate access to information, share information, and ensure wise investment of financial and human resources. As these objectives are met, a vision of ″One ARL″ will emerge in which business process enhancement tools, such as workflow management, knowledge management, portals, and eBusiness solutions will provide direct and measurable benefits to the ARL user. There will be immediate and effective electronic access to the information warehouse that constitutes ARL's intellectual property along with emerging capabilities that allow integrated voice, data, and video over the same network medium. The ARL Strategic Information Plan applies to all ARL organizations, ARL contractors, and ARL tenants on other installations. A world-class infrastructure encompasses two complementary factors, State-of-the-Art Technologies and Best of Breed Information Technology Practices. Thirteen components constitute the infrastructure: (1) voice communications; (2) video communications; (3) radio, wireless and satellite communications; (4) data communications; (5) desktop computer support; (6) management and business applications; (7) library and knowledge management; (8) visual production (graphics and publications); (9) records and document management; (10) information technology management; (11) information plans and policies; (12) facilities and space; and (13) people -trained and productive7
DTIC
Computer Information Security; Information Management; Organizations; Standardization

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*.

20040084373 NASA Ames Research Center, Moffett Field, CA, USA
Distributed Control by Lagrangian Steepest Descent
Wolpert, David H.; Bieniawski, Stefan; [2004]; 8 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

Often adaptive, distributed control can be viewed as an iterated game between independent players. The coupling between the players mixed strategies, arising as the system evolves from one instant to the next, is determined by the system designer. Information theory tells us that the most likely joint strategy of the players, given a value of the expectation of the overall control objective function, is the minimizer of a function o the joint strategy. So the goal of the system designer is to speed evolution of the joint strategy to that Lagrangian mhimbhgpoint,lowerthe expectated value of the control objective function, and repeat Here we elaborate the theory of algorithms that do this using local descent procedures, and that thereby achieve efficient, adaptive, distributed control.
Derived from text
Euler-Lagrange Equation; Adaptive Control; Distributed Parameter Systems

20040084411 NASA Ames Research Center, Moffett Field, CA, USA
Designing Agent Collectives For Systems With Markovian Dynamics
Wolpert, David H.; Lawson, John W.; [2004]; 9 pp.; In English
Report No.(s): Paper 546; No Copyright; Avail: CASI; A02, Hardcopy

The Collective Intelligence (COIN) framework concerns the design of collectives of agents so that as those agents strive to maximize their individual utility functions, their interaction causes a provided world utility function concerning the entire collective to be also maximized. Here we show how to extend that framework to scenarios having Markovian dynamics when no re-evolution of the system from counter-factual initial conditions (an often expensive calculation) is permitted. Our approach transforms the (time-extended) argument of each agent's utility function before evaluating that function. This transformation has benefits in scenarios not involving Markovian dynamics of an agent's utility function are observable. We investigate this transformation in simulations involving both hear and quadratic (nonlinear) dynamics. In addition, we find that a certain subset of these transformations, which result in utilities that have low opacity (analogous to having high signal to noise) but are not factored (analogous to not being incentive compatible), reliably improve performance over that arising with factored utilities. We also present a Taylor Series method for the fully general nonlinear case.
Author
Markov Chains; Mathematical Models; Algorithms; Functions (Mathematics); Artificial Intelligence

20040084578 NASA Ames Research Center, Moffett Field, CA, USA
Improving Search Algorithms by Using Intelligent Coordinates
Wolpert, David H.; Tumer, Kagan; Bandari, Esfandiar; Physical Review E; [2004]; Volume 69, pp. 017791-1 - 017791-4; In English; Copyright; Avail: CASI; A01, Hardcopy

We consider algorithms that maximize a global function G in a distributed manner, using a different adaptive computational agent to set each variable of the underlying space. Each agent eta is self-interested; it sets its variable to maximize its own function g (sub eta). Three factors govern such a distributed algorithm's performance, related to exploration/exploitation, game theory, and machine learning. We demonstrate how to exploit alI three factors by modifying a search algorithm's exploration stage: rather than random exploration, each coordinate of the search space is now controlled by a separate machine-learning-based player engaged in a noncooperative game. Experiments demonstrate that this modification improves simulated annealing (SA) by up to an order of magnitude for bin packing and for a model of an economic process run over an underlying network. These experiments also reveal interesting small-world phenomena.
Author
Algorithms; Coordinates; Artificial Intelligence; Functions (Mathematics)

20040084585 NASA Ames Research Center, Moffett Field, CA, USA
Synthesizing 3D Surfaces from Parameterized Strip Charts
Robinson, Peter I.; Gomez, Julian; Morehouse, Michael; Gawdiak, Yuri; [2004]; 15 pp.; In English; Workshop ECS; Copyright; Avail: CASI; A03, Hardcopy

We believe 3D information visualization has the power to unlock new levels of productivity in the monitoring and control of complex processes. Our goal is to provide visual methods to allow for rapid human insight into systems consisting of thousands to millions of parameters. We explore this hypothesis in two complex domains: NASA program management and NASA International Space Station (ISS) spacecraft computer operations. We seek to extend a common form of visualization called the strip chart from 2D to 3D. A strip chart can display the time series progression of a parameter and allows for trends and events to be identified. Strip charts can be overlayed when multiple parameters need to visualized in order to correlate their events. When many parameters are involved, the direct overlaying of strip charts can become confusing and may not fully utilize the graphing area to convey the relationships between the parameters. We provide a solution to this problem by generating 3D surfaces from parameterized strip charts. The 3D surface utilizes significantly more screen area to illustrate the differences in the parameters and the overlayed strip charts, and it can rapidly be scanned by humans to gain insight. The selection of the third dimension must be a parallel or parameterized homogenous resource in the target domain, defined using a finite, ordered, enumerated type, and not a heterogeneous type. We demonstrate our concepts with examples from the NASA program management domain (assessing the state of many plans) and the computers of the ISS (assessing the state of many computers). We identify 2D strip charts in each domain and show how to construct the corresponding 3D surfaces. The user can navigate the surface, zooming in on regions of interest, setting a mark and drilling down to source documents from which the data points have been derived. We close by discussing design issues, related work, and implementation challenges.
Derived from text
Three Dimensional Models; Parameterization; Complex Systems; Scientific Visualization; Information Flow; Charts; NASA Programs

20040084630 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Developing Software for NASA Missions in the New Millennia
Truszkowski, Walt; Rash, James; Rouff, Christopher; Hinchey, Mike; [2004]; 9 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

NASA is working on new mission concepts for exploration of the solar system. The concepts for these missions include swarms of hundreds of cooperating intelligent spacecraft which will be able to work in teams and gather more data than current single spacecraft missions. These spacecraft will not only have to operate independently for long periods of time on their own and in teams, but will also need to have autonomic properties of self healing, self configuring, self optimizing and self protecting for them to survive in the harsh space environment. Software for these types of missions has never been developed before and represents some of the challenges of software development in the new millennia. The Autonomous Nano Technology Swarm (ANTS) mission is an example of one of the swarm missions NASA is considering. The ANTS mission will use a swarm of one thousand pico-spacecraft that weigh less than five pounds. Using an insect colony analog, ANTS will explore the asteroid belt and catalog the mass, density, morphology, and chemical composition of the asteroids. Due to the size of the spacecraft, each will only carry a single miniaturized science instrument which will require them to cooperate in searching for asteroids that are of scientific interest. This article also discusses the ANTS mission, the properties the spacecraft will need and how that will effect future software development.
Derived from text
Solar System; NASA Space Programs; Software Engineering; Autonomy; Nanotechnology

20040084988 Space and Naval Warfare Systems Center, San Diego, CA
Foundations for Learning and Adaptation in a Multi Degree of Freedom Unmanned Ground Vehicle
Blackburn, Michael R.; Bailey, Richard; Apr. 2004; 11 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424299; No Copyright; Avail: CASI; A03, Hardcopy

The real-time coordination and control of a many motion degrees of freedom (dof) unmanned ground vehicle under dynamic conditions in a complex environment is nearly impossible for a human operator to accomplish. Needed are adaptive on-board mechanisms to quickly complete sensor- effector loops to maintain balance and leverage. This paper contains a description of our approach to the control problem for a small unmanned ground vehicle with six dof in the three spatial dimensions. Vehicle control is based upon five fixed action patterns that exercise all of the motion dof of which the vehicle is capable. and five basic reactive behaviors that protect the vehicle during operation. The reactive behaviors demonstrate short-term adaptations. requirement for basic behavioral motivation.
DTIC
Degrees of Freedom; Unmanned Ground Vehicles

20040084990 Space and Naval Warfare Systems Center, San Diego, CA
Unmanned Ground Vehicles for Integrated Force Protection
Carroll, Daniel M.; Mikell, Kenneth; Denewiler, Thomas; Apr. 2004; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424302; No Copyright; Avail: CASI; A03, Hardcopy

The collaboration of Command and Control (C2) systems with Unmanned Ground Vehicles (UGVs) provides Integrated Force Protection from the Robotic Operation Command Center. Autonomous UGVs are directed as Force Projection units. UGV payloads and fixed sensors provide situational awareness while unattended munitions provide a less-than-lethal response capability. Remote resources serve as automated interfaces to legacy physical devices such as manned response vehicles. barrier gates. fence openings. garage doors. and remote power on/off capability for unmanned systems. The Robotic Operations Command Center executes the Multiple Resource Host Architecture (MRHA) to simu1taneously control heterogeneous unmanned systems. The MRHA graphically displays video map and status for each resource using wireless digital communications for integrated data video and audio. Events are prioritized and the user is prompted with audio alerts and text instntctions for alarmss and warnings. A control hierarchy of missions and duty rosters support autonomous operations.
DTIC
Command and Control; Protection; Robotics; Unmanned Ground Vehicles

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NUMERICAL ANALYSIS

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

20040084408 NASA Ames Research Center, Moffett Field, CA, USA
Theory of Collective Intelligence
Wolpert, David H.; June 21, 2003; 64 pp.; In English; No Copyright; Avail: CASI; A04, Hardcopy

In this chapter an analysis of the behavior of an arbitrary (perhaps massive) collective of computational processes in terms of an associated ″world″ utility function is presented We concentrate on the situation where each process in the collective can be viewed as though it were striving to maximize its own private utility function. For such situations the central design issue is how to initialize/update the collective's structure, and in particular the private utility functions, so as to induce the overall collective to behave in a way that has large values of the world utility. Traditional ″team game″ approaches to this problem simply set each private utility function equal to the world utility function. The ″Collective Intelligence″ (COIN) framework is a semi-formal set of heuristics that recently have been used to construct private utility. functions that in many experiments have resulted in world utility values up to orders of magnitude superior to that ensuing from use of the team game utility. In this paper we introduce a formal mathematics for analyzing and designing collectives. We also use this mathematics to suggest new private utilities that should outperform the COIN heuristics in certain kinds of domains. In accompanying work we use that mathematics to explain previous experimental results concerning the superiority of COIN heuristics. In that accompanying work we also use the mathematics to make numerical predictions, some of which we then test. In this way these two papers establish the study of collectives as a proper science, involving theory, explanation of old experiments, prediction concerning new experiments, and engineering insights.
Author
Intelligence; Numerical Analysis; Predictions; Domains

20040084438 NASA Langley Research Center, Hampton, VA, USA
Nonlinear Analysis of Bonded Composite Single-LAP Joints
Oterkus, E.; Barut, A.; Madenci, E.; Smeltzer, S. S.; Ambur, D. R.; [2004]; 18 pp.; In English
Report No.(s): AIAA Paper 2004-1560; Copyright; Avail: CASI; A03, Hardcopy

This study presents a semi-analytical solution method to analyze the geometrically nonlinear response of bonded composite single-lap joints with tapered adherend edges under uniaxial tension. The solution method provides the transverse shear and normal stresses in the adhesive and in-plane stress resultants and bending moments in the adherends. The method utilizes the principle of virtual work in conjunction with von Karman s nonlinear plate theory to model the adherends and the shear lag model to represent the kinematics of the thin adhesive layer between the adherends. Furthermore, the method accounts for the bilinear elastic material behavior of the adhesive while maintaining a linear stress-strain relationship in the adherends. In order to account for the stiffness changes due to thickness variation of the adherends along the tapered edges, their in-plane and bending stiffness matrices are varied as a function of thickness along the tapered region. The combination

of these complexities results in a system of nonlinear governing equilibrium equations. This approach represents a computationally efficient alternative to finite element method. Comparisons are made with corresponding results obtained from finite-element analysis. The results confirm the validity of the solution method. The numerical results present the effects of taper angle, adherend overlap length, and the bilinear adhesive material on the stress fields in the adherends, as well as the adhesive, of a single-lap joint
Author
Nonlinear Equations; Lap Joints; Analytic Functions; Geometric Accuracy

20040084588 NASA Ames Research Center, Moffett Field, CA, USA
A Well-Balanced Central-Upwind Scheme for the 2D Shallow Water Equations on Triangular Meshes
Bryson, Steve; Levy, Doron; [2004]; 1 pp.; In English; Tenth International Conference on Hyperbolic Problems, Theory, Numerics and Applications, 13-17 Sep. 2004, Osaka, Japan
Contract(s)/Grant(s): 704-40-42; No Copyright; Avail: CASI; A01, Hardcopy

We are interested in approximating solutions of the two-dimensional shallow water equations with a bottom topography on triangular meshes. We show that there is a certain flexibility in choosing the numerical fluxes in the design of semi-discrete Godunov-type central schemes. We take advantage of this fact to generate a new second-order, central-upwind method for the two-dimensional shallow water equations that is well-balanced. We demonstrate the accuracy of our method as well as its balance properties in a variety of examples.
Derived from text
Shallow Water; Two Dimensional Models; Flow Equations

20040084591 Building and Construction Research TNO, Delft, Netherlands
Interaction Calculations using LS-DYNA
vandenEikhoff, J.; December 5, 2003; 71 pp.; In English
Contract(s)/Grant(s): A01/KM/117/13759; TNO Proj. 006.38107/01.02
Report No.(s): TD-2003-0201; Rept-2003-CMC-R077; Copyright; Avail: Other Sources

TNO-CMC has the disposal of two complementary tools for interaction calculations: Simplified Interaction Tool (SIT) based on LS-DYNA and 2(%)DCAV based on the public domain Finite Element code DYNA3D. Because of internal standardisation and support of the supplier it would be desirable when interaction analyses can be performed with LS-DYNA. The object of this project is to investigate the possibility to perform 2DCAV like analyses with LS-DYNA. A preprocessor for the shock loading in LS-DYNA was developed. Test calculations with fluid meshes and with an old example were performed. It was not possible to use gravity stress initiation in LS-DYNA. The use of the acoustic FLUID material type of LS-DYNA did not produce reliable results. The gravity stress in the liquid can be applied with gravity loading on the fluid, combined with the equivalent loading at the boundaries. There is no need to do this in a stress relaxation step. A damping value mu of 6000 Pa s has to be used for the water to reproduce the 2DCAV results. Bulk cavitation at non reflecting boundaries gives deviations which are confined to a small region near the boundaries. During the shock phase the acceleration, velocity and pressure results agree well with the 2DCAV results. The construction keeps sinking at the end of the calculation, which is not correct.
Derived from text
Computation; Finite Element Method; Phase Velocity; Gravitation; Stress Relaxation; Cavitation Flow

20040084599 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Safe Field Storage of Ammunition and Explosives: Part II: Prevention of sympathetic detonation, Part 2, Prevention of Sympathetic Detonation
Bouma, R. H. B.; Verbeek, H. J.; vanWees, R. M. M.; vanDongen, P.; December 2003; 118 pp.; In English
Contract(s)/Grant(s): A01/KL/402; TNO Proj. 014.13224
Report No.(s): TD-2002-0225-Pt-2; PML-2003-A51-Pt-2; Copyright; Avail: Other Sources

A program was performed for the Dutch MOD to derive safe quantity-distances for field storage of ammunition and explosives, in particular for storage in compounds out-of-area. The program consisted of theoretical analyses, design of a test set-up, a trial with 5 tonne NEQ in Woomera, South Australia, analysis of the test results and derivation of quantity-distances. This part of the series of reports on this program focuses on the intermagazine distances and barricades required to prevent sympathetic detonation. A mechanistic model was built that predicts the movement of the barricade due to the blast and fragment load and predicts the load of the impact of the barricade debris on the acceptor munitions. At first the criteria used

for the U.S. Navy's High Performance Magazine were used to specify the maximum acceptable load. Later criteria were derived that are better suited for soil or water-filled barricades. The quantity-distances derived with the new method and criteria lie significantly below the Q-Ds specified in NATO AC/258(ST)WP/213.
Author
Numerical Analysis; Prevention; Detonation; Storage

20040084887 California Univ., Berkeley, CA
Grid Discretization Based Method for Anisotropic Shortest Path Problem Over Continuous Regions
Jia, Zhanfeng; Varaija, Pravin; Apr. 2004; 10 pp.; In English
Contract(s)/Grant(s): N66001-00-1-8062; F33615-01-C-3150; Proj-ARPF
Report No.(s): AD-A424102; AFRL-VA-WP-TP-2004-313; No Copyright; Avail: CASI; A02, Hardcopy

The paper presents a method to find the shortest path between two points over a continuous region. The length of a path Is the integral of the cost along the path. The cost can be anisotropic, meaning that it depends on both the position on the path and its direction. The method uses a simple rectangular grid to discretize the region, independent of the cost. Because the cost Is anisotropic, rectlinear paths connecting adjacent grid points may not approximate the optimal path. To overcome this ″limit-on-direction″ problem, the method searches over shifted versions of the rectilinear paths A Bellman. Ford style algorithm finds the best shifted path. Theoretical analysis and numerical experiments ensure efficiency of the algorithm.
DTIC
Anisotropy; Costs; Numerical Analysis

20040084892 Florida Univ., Gainesville, FL
The Theoretical Analysis of Self-Deployable Tensegrity Structures
Crane Ill, Carl D.; Feb. 25, 2004; 4 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0021
Report No.(s): AD-A424114; No Copyright; Avail: CASI; A01, Hardcopy

A new technology has been discovered. Elastic ties have been introduced into a class of tensegrity structures. Each structure can be stowed or packaged into a cylindrical form with the struts lying side by side. When the structure is release from its stowed position it self-deploys and reaches a position of minimum potential energy. It is considered that one major application of this new technology is the development of novel self-deploying structures for the deployment of antennas in space. This proposal addresses the key theoretical issues which provide a proper basis for the understanding of: (i) the geometrical stability of the structures; (ii) the kinematics and statics of self-deployment from the stowed position to the fully deployed position; (iii) the elastic stability of the structures via application of Catastrophe Theory; (iv) the kinematics and statics of the structures for position control and actuation of the antenna surface using screw theory. The investigators firmly believe that an analysis based properly on the geometry, statics, and kinematics of the structures will lead to optimal designs and performance. This will further lead to reduced costs and a high degree of reliability.
DTIC
Finite Element Method; Structural Analysis; Tensegrity Structures

20040084914 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Effect of a Variable Contact Load on Fretting Fatigue Behavior of Ti-6Al-4V
Jutte, Andrew J.; Mar. 2004; 174 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424151; AFIT/GAE/ENY/04-M09; No Copyright; Avail: CASI; A08, Hardcopy

Effects of a variable contact load on the high cycle fretting fatigue behavior of Ti-6AL-4V were investigated. Experimental tests were performed using a new test setup capable of applying a contact load varying in amplitude, frequency, and phase and independently measuring shear forces on opposite sides of a specimen. Finite element analysis (FEA) of experimental and idealized loading conditions was performed and local mechanistic parameters and the Modified Shear Stress Range (MSSR) fatigue parameter were determined. Correlations between contact width, slip amplitude, fatigue life and a variable contact load were established with variable contact loading shown to have a damaging effect. Predicted values of crack location and orientation using the MSSR parameter were verified experimentally. The MSSR parameter unsuccessfully predicted fatigue life for variable contact loads. A new formulation of the MSSR parameter is proposed.
DTIC
Aluminum Alloys; Contact Loads; Fatigue Life; Finite Element Method; Fracture Mechanics; Fretting; Titanium Alloys; Vanadium Alloys

20040084992 Black River Systems Co., Inc., Utica, NY
Detector and Extractor of Fileprints (DEF) Prototype
Henry, Richard; May 2004; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F30602-03-C-0068; Proj-STG3
Report No.(s): AD-A424304; AFRL-IF-RS-TR-2004-136; No Copyright; Avail: CASI; A03, Hardcopy

The Detector and Extractor of Fileprints (DEF) algorithm is a technique for representing data sequences in the form of fileprints. It combines a periodogram-based process with the Adjustable Bandwidth Concept (ABC) detector algorithm to generate these outputs. DEF at this time has two primary applications. The first application protects the payload of a file from unauthorized tampering or distribution. The second identifies an arbitrary segment of data by comparing results to the fileprints generated by running the algorithm on truth files of known types. A demonstration application was written in the Java programming language, which consists of graphical and textual modes of operation both of which are capable of producing fileprints on one or more target files. A general report is created for each file that is processed. A visualization of the prints created is presented to the user and processed statistically. The tamper detection capabilities of the system are strong, and it is able to detect very small differences in data segments. Further precision would make this feature more useful and open it up to more applications of the technology.
DTIC
Algorithms; Prototypes

20040085006 Washington State Univ., Pullman, WA
Telemetry Frame Generation
Hudelson, Matthew; Webb, William; Nov. 30, 2003; 33 pp.; In English
Contract(s)/Grant(s): F49620-00-1-0001
Report No.(s): AD-A424331; AFRL-SR-AR-TR-04-0302; No Copyright; Avail: CASI; A03, Hardcopy

When testing an aircraft, or other vehicle, it is normal to monitor the test on the ground through the use of telemetry. In its raw form, the telemetered data can he thought of as a stream of bits. The mapping of these bits is usually done by defining repeating and periodic telemetry frames. The design of telemetry frames is mathematically difficult (more formally, this problem is known to be NP-Hard). This difficulty can lead to the design of inefficient frames. When that happens, there are many bits being sent that carry no information. Further, there is increasing demand on the spectrum and many ongoing efforts to use this spectrum more efficiently. The algorithm developed during this research project and described in detail in this report will generally produce frames in which more than 80% (and often more than 90%) of the bits transmitted contain information. (3 tables, 5 figures)
DTIC
Algorithms; Data Transmission; Telemetry

20040085027 University of South Florida, Tampa, FL
Investigation of Jet Impingement Cooling Using High Prandtl Number Fluids and Ammonia for Military Applications
Rahman, Muhammad M.; Mar. 2004; 253 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F33615-98-1-2923; Proj-3145
Report No.(s): AD-A424367; AFRL-PR-WP-TR-2004-2047; No Copyright; Avail: CASI; A12, Hardcopy

The objective of this project was to perform a comprehensive numerical study for the prediction of conjugate heat transfer during jet impingement cooling. Calculations were done primarily for two working fluids: MIL-7808 and ammonia. A number of substrate materials were studied. The investigation considered both free and confined jet configurations using circular and slot nozzles. Fifteen different disk or plate thicknesses ranging from 0 to 12 mm and eleven different nozzle heights from 0.4 mm to 12.5 mm were used. A number of heat source patterns were considered to explore the effects of magnitude and location of heat generation. Both steady state heat transfer and the transient start-up of power were investigated. It was found that the magnitude of local heat transfer coefficient or Nusselt number decreased with time at all locations on the disk. A higher heat transfer coefficient at the impingement location was seen at a smaller thickness, whereas a thicker plate provided a more uniform distribution of heat transfer coefficient. Materials with a higher thermal conductivity provided more uniform distribution of interface temperature as well as the heat transfer coefficient. Both local and average heat transfer coefficient increased with Reynolds number. For a given flow rate, a higher heat transfer coefficient was obtained with smaller nozzle diameter. Compared to MIL-7808 and FC-77, ammonia provided smaller solid-fluid interface temperature and higher heat transfer coefficient.
DTIC
Ammonia; Cooling; Heat Transfer Coefficients; Jet Impingement; Military Technology; Prandtl Number

65
STATISTICS AND PROBABILITY

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

20040084604 NASA Ames Research Center, Moffett Field, CA, USA, Research Inst. for Advanced Computer Science, Moffett Field, CA, USA

Automatic Generation of Algorithms for the Statistical Analysis of Planetary Nebulae Images

Fischer, Bernd; [2004]; 2 pp.; In English; No Copyright; Avail: Other Sources; Abstract Only

Analyzing data sets collected in experiments or by observations is a Core scientific activity. Typically, experimentd and observational data are &aught with uncertainty, and the analysis is based on a statistical model of the conjectured underlying processes, The large data volumes collected by modern instruments make computer support indispensible for this. Consequently, scientists spend significant amounts of their time with the development and refinement of the data analysis programs. AutoBayes [GF+02, FS03] is a fully automatic synthesis system for generating statistical data analysis programs. Externally, it looks like a compiler: it takes an abstract problem specification and translates it into executable code. Its input is a concise description of a data analysis problem in the form of a statistical model as shown in Figure 1; its output is optimized and fully documented C/C++ code which can be linked dynamically into the Matlab and Octave environments. Internally, however, it is quite different: AutoBayes derives a customized algorithm implementing the given model using a schema-based process, and then further refines and optimizes the algorithm into code. A schema is a parameterized code template with associated semantic constraints which define and restrict the template s applicability. The schema parameters are instantiated in a problem-specific way during synthesis as AutoBayes checks the constraints against the original model or, recursively, against emerging sub-problems. AutoBayes schema library contains problem decomposition operators (which are justified by theorems in a formal logic in the domain of Bayesian networks) as well as machine learning algorithms (e.g., EM, k-Means) and nu- meric optimization methods (e.g., Nelder-Mead simplex, conjugate gradient). AutoBayes augments this schema-based approach by symbolic computation to derive closed-form solutions whenever possible. This is a major advantage over other statistical data analysis systems which use numerical approximations even in cases where closed-form solutions exist. AutoBayes is implemented in Prolog and comprises approximately 75.000 lines of code. In this paper, we take one typical scientific data analysis problem-analyzing planetary nebulae images taken by the Hubble Space Telescope-and show how AutoBayes can be used to automate the implementation of the necessary anal- ysis programs. We initially follow the analysis described by Knuth and Hajian [KHO2] and use AutoBayes to derive code for the published models. We show the details of the code derivation process, including the symbolic computations and automatic integration of library procedures, and compare the results of the automatically generated and manually implemented code. We then go beyond the original analysis and use AutoBayes to derive code for a simple image segmentation procedure based on a mixture model which can be used to automate a manual preproceesing step. Finally, we combine the original approach with the simple segmentation which yields a more detailed analysis. This also demonstrates that AutoBayes makes it easy to combine different aspects of data analysis.

Author

Algorithms; Imaging Techniques; Planetary Nebulae; Statistical Analysis; Automatic Control

20040084902 United Technologies Research Center, East Hartford, CT

Analytical Systems Engineering Advanced Mathematics

Banaszuk, Andrzej; LaBarre, Robert E.; May 29, 2004; 67 pp.; In English

Contract(s)/Grant(s): F49620-03-C-0035

Report No.(s): AD-A424132; AFRL-SR-AR-TR-04-0291; No Copyright; Avail: CASI; A04, Hardcopy

This effort was concerned with identifying and assessing the primary technical barriers and risks that must be overcome to establish fast computational methods for uncertainty analysis in large models of interconnected components in which the shape of system-level dynamics is important. The results of this study show tremendous promise for computationally efficient methods for propagating uncertainty. Numerous approaches were investigated on problems ranging from the control of afterburner combustion instabilities to modeling organic molecules and DNA. This contract also resulted in a highly successful workshop on the Design of Dynamical Systems Robust to Uncertainty, engaging experts from international communities. The following papers are appended to this report: ″Propagation of Uncertain Inputs through Networks of Nonlinear Components;″ ″Graph Decomposition Methods for Uncertainty Propagation in Complex, Nonlinear Interconnected Dynamical Systems;″ ″Spectral Balance: A frequency Domain Framework for Analysis of Nonlinear Dynamical Systems;″ ″An Iterative Method for Propagation of Probability Distributions in Feedback Systems;″ ″Uncertainty in the Dynamics of Conservative Maps;″

″Dynamics in Molecular Modelling and the Scope for Uncertainty Analysis by Dellnitz- Preis and Polynomial Chaos Methods;″ and ″Symmetry-Breaking and Uncertainty Propagation in a Reduced Order Thermo-acoustic Model.″ (51 refs. following main report)
DTIC
Mathematical Models; Nonlinear Systems; Systems Analysis; Systems Engineering

20040084978 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Concurrent Cognitive Mapping and Localization Using Expectation Maximization
Laviers, Kennard R.; Mar. 2004; 98 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424280; AFIT/GCS/ENG/04-10; No Copyright; Avail: CASI; A05, Hardcopy

Robot mapping remains one of the most challenging problems in robot programming. Most successful methods use some form of occupancy grid for representing a mapped region. An occupancy grid is a two dimensional array in which the array cells represents (x,y) coordinates of a cartesian map. This approach becomes problematic in mapping large environments as the map quickly becomes too large for processing and storage. Rather than storing the map as an occupancy grid, our robot (equipped with ultrasonic sonars) views the world as a series of connected spaces. These spaces are initially mapped as an occupancy grid in a room-by-room fashion using a modified version of the Histogram In Motion Mapping (HIMM) algorithm extended in this thesis. As the robot leaves a space, denoted by passing through a doorway, it converts the grid to a polygonal representation using a novel edge detection technique. Then, it stores the polygonal representation as rooms and hallways in a set of Absolute Space Representations (ASRs) representing the space connections. Using this representation makes navigation and localization easier for the robot to process. The system also performs localization on the simplified cognitive version of the map using an iterative method of estimating the maximum likelihood of the robot's correct position. This is accomplished using the Expectation Maximization algorithm. Treating vector directions from the polygonal map as a Gaussian distribution, the Expectation Maximization algorithm is applied, for the first time, to find the most probable correct pose while using a cognitive mapping approach.
DTIC
Coordinates; Expectation; Position (Location); Robots

20040085354 NASA Langley Research Center, Hampton, VA, USA
Employing Sensitivity Derivatives for Robust Optimization under Uncertainty in CFD
Newman, Perry A.; Putko, Michele M.; Taylor, Arthur C., III; May 07, 2004; 6 pp.; In English; 9th ASCE Engrg. Mechanics Div., Structural Engrg. Inst, Geotechnical Inst. Aerospace Div. and the Sandia National Labs. Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability, 26-28 Jul. 2004, Albuquerque, NM, USA
Contract(s)/Grant(s): 762-45-G1
Report No.(s): PMC2004; No Copyright; Avail: CASI; A02, Hardcopy

A robust optimization is demonstrated on a two-dimensional inviscid airfoil problem in subsonic flow. Given uncertainties in statistically independent, random, normally distributed flow parameters (input variables), an approximate first-order statistical moment method is employed to represent the Computational Fluid Dynamics (CFD) code outputs as expected values with variances. These output quantities are used to form the objective function and constraints. The constraints are cast in probabilistic terms; that is, the probability that a constraint is satisfied is greater than or equal to some desired target probability. Gradient-based robust optimization of this stochastic problem is accomplished through use of both first and second-order sensitivity derivatives. For each robust optimization, the effect of increasing both input standard deviations and target probability of constraint satisfaction are demonstrated. This method provides a means for incorporating uncertainty when considering small deviations from input mean values.
Author
Stochastic Processes; Computational Fluid Dynamics; Optimization; Uncertain Systems

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20040084281 Southwest Research Inst., San Antonio, TX, USA
Space Applications of MEMS: Initial Vacuum Test Results from the SwRI(registered trademark) Vacuum Microprobe Facility
Valek, P. W.; McComas, D. J.; Miller, G. P.; Mitchell, J. N.; Pope, S. E.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 179-184; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

We have designed and built the first fully functional vacuum microprobe test facility specifically intended to optimize the development of Micro Electro-Mechanical Systems (MEMS) devices for space applications. This facility includes an ion-pumped, ultra-clean vacuum system outfitted with four three-axis precision microprobe stages. The testing is monitored with a long focal length microscope through a thin sapphire window. Testing of several initial MEMS designs shows extremely promising results for using such devices in space applications. In particular, we show that significantly reduced voltages are adequate to resonantly drive some MEMS devices in vacuum owing to significantly reduced damping and the consequent much higher Qs of the systems (approx.1000x) in the absence of air. We also show the results of a many cycle (\g10(exp 10)) test of a comb-driven, force-distance multiplied sliding aperture door and demonstrate that potential show-stopper issues such as stiction and vacuum welding can be overcome in MEMS devices properly designed for the vacuum environment.
Author
Microelectromechanical Systems; Microanalysis; Vacuum Tests; Electric Potential

20040084323 Helsinki Univ. of Technology, Espoo
Modeling the Joint Dynamics of Instantaneous and Exponentially Averaged Queue Lengths
Kuumola, E.; 2002; 60 pp.; In English
Report No.(s): PB2004-105292; TKT-4/2002; Copyright; Avail: National Technical Information Service (NTIS)

Differentiated Services architecture is proposed to provide a variety of quality of service levels over the packet switched Internet network. In the DiffServ network complex flow measuring and classification functions are implemented at the network boundary nodes. At the interior nodes the distinctive forwarding behavior between flow aggregates is obtained with simple Per-Hop Behavior (PHB) packet scheduling mechanisms. The effects of the suggested PHB mechanisms and their parameterization on the traffic quality issues have still remained an open question. The focus of the thesis is on constructing a modeling methodology for the Assured Forwarding scheme that is one of the suggested PHB mechanisms for the DiffServ architecture. The framework for the AF model is adapted from the previous approaches of modeling DiffServ PHB mechanisms. The model aims at capturing the packet level dynamics of the AF buffer in order to evaluate the effect of the AF parameterization on the traffic QoS measures.
NTIS
Classifications; Queueing Theory; Parameterization

20040084560 Research Inst. for Advanced Computer Science, Moffett Field, CA, USA
Toward Synthesis, Analysis, and Certification of Security Protocols
Schumann, Johann; [2004]; 6 pp.; In English; IJCAR 2004: Second International Joint Conference on Automated Reasoning for Security Protocols, 4-8 Jul. 2004, Cork, Ireland; No Copyright; Avail: CASI; A02, Hardcopy

Implemented security protocols are basically pieces of software which are used to (a) authenticate the other communication partners, (b) establish a secure communication channel between them (using insecure communication media), and (c) transfer data between the communication partners in such a way that these data only available to the desired receiver, but not to anyone else. Such an implementation usually consists of the following components: the protocol-engine, which controls in which sequence the messages of the protocol are sent over the network, and which controls the assembly/disassembly and processing (e.g., decryption) of the data. the cryptographic routines to actually encrypt or decrypt the data (using given keys), and t,he interface to the operating system and to the application. For a correct working of such a security protocol, all of these components must work flawlessly. Many formal-methods based techniques for the analysis of a security protocols have been developed. They range from using specific logics (e.g.: BAN-logic [4], or higher order logics [12] to model checking [2] approaches. In each approach, the analysis tries to prove that no (or at least not a modeled intruder) can get access to secret data. Otherwise, a scenario illustrating the &tack may be produced. Despite the seeming simplicity of security protocols (″only″ a few messages are sent between the protocol partners in order to ensure a secure communication), many flaws have been detected. Unfortunately, even a perfect protocol engine does not guarantee flawless working of a security protocol, as incidents show. Many break-ins and security vulnerabilities are caused by exploiting errors in the implementation of the protocol engine or the underlying operating system. Attacks using buffer-overflows are a very common class of such attacks. Errors in the implementation of exception or error handling can open up additional vulnerabilities. For example, on a website with a log-in screen: multiple tries with invalid passwords caused the expected error message (too many retries). but let the user nevertheless pass. Finally, security can be compromised by silly implementation bugs or design decisions. In a commercial VPN software, all calls to the encryption routines were incidentally replaced by stubs, probably during factory testing. The product worked nicely. and the error (an open VPN) would have gone undetected, if a team member had not inspected the low-level traffic out of curiosity. Also, the use secret proprietary encryption routines can backfire, because such algorithms often exhibit weaknesses which can be exploited easily (see e.g., DVD encoding). Summarizing,

there is large number of possibilities to make errors which can compromise the security of a protocol. In today s world with short time-to-market and the use of security protocols in open and hostile networks for safety-critical applications (e.g., power or air-traffic control), such slips could lead to catastrophic situations. Thus, formal methods and automatic reasoning techniques should not be used just for the formal proof of absence of an attack, but they ought to be used to provide an end-to-end tool-supported framework for security software. With such an approach all required artifacts (code, documentation, test cases) , formal analyses, and reliable certification will be generated automatically, given a single, high level specification. By a combination of program synthesis, formal protocol analysis, certification; and proof-carrying code, this goal is within practical reach, since all the important technologies for such an approach actually exist and only need to be assembled in the right way.
Derived from text
Protocol (Computers); Communication Networks; Computer Information Security; Certification; Computer Programs; Systems Analysis

20040084572 NASA Ames Research Center, Moffett Field, CA, USA
Structure Constraints in a Constraint-Based Planner
Pang, Wan-Lin; Golden, Keith; April 20, 2004; 15 pp.; In English; 10th International Conference on Principles and Practice of Constraint Programming, 27 Sep. - 1 Oct. 2004, Toronto, Canada; No Copyright; Avail: CASI; A03, Hardcopy

In this paper we report our work on a new constraint domain, where variables can take structured values. Earth-science data processing (ESDP) is a planning domain that requires the ability to represent and reason about complex constraints over structured data, such as satellite images. This paper reports on a constraint-based planner for ESDP and similar domains. We discuss our approach for translating a planning problem into a constraint satisfaction problem (CSP) and for representing and reasoning about structured objects and constraints over structures.
Author
Earth Sciences; Data Processing; Planning

20040084759 Physics and Electronics Lab. TNO, The Hague, Netherlands
Evaluation of Damage Control Concepts, Part 2
Keijer, W.; Gillis, M. P. W.; May 2004; 83 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): TNO Proj. 015.32952
Report No.(s): FEL-03-A210-Pt-2; TD-2003-0094-Pt-2; Copyright; Avail: Other Sources

The Royal Netherlands Navy in need of damage control concepts which are capable of fighting calamities on board ships more effectively and with fewer crew. To evaluate new concepts, the ACDC simulation framework has been developed. In this project, ACDC had been used to achieve two goals: (1) to evaluate the effect (on the damage) of restructuring the crew and (2) to obtain operational guidelines for the damage control process. To achieve the first goal, a previously developed scenario of a missile hit during readiness state 1 was converted to readiness state 3. The damage control process during readiness state 3 proved to be faster, but that did not result in less damage to the ship. To meet goal 2, a series of missile hit scenarios was simulated while varying the start time of the fire attacks. Thus a profile of the damage was created. In order to significantly reduce the damage, very fast (automatic) response is needed. Several suggestions include installing sprinklers and boundary cooling in the forward part of the ship.
Author
Damage; Ships; Personnel Management; Computerized Simulation

20040084974 Washington Univ., Saint Louis, MO
Nonlinear Control Systems
Byrnes, Christopher I.; Isidori, Alberto; Jun. 21, 2004; 53 pp.; In English
Contract(s)/Grant(s): F49620-01-1-0039
Report No.(s): AD-A424276; TR-22-1345-59436; AFRL-SR-AR-TR-04-0323; No Copyright; Avail: CASI; A04, Hardcopy

This project researched the development of a systematic feedback design methodology for shaping the steady- state response of complex systems. The design issues comprising this task include the stabilization of unstable systems and the design of feedback laws enabling a system to asymptotically track a signal and to asymptotically reject unwanted disturbances. The model used for complex systems are lumped nonlinear systems as well as linear and nonlinear distributed parameter systems
DTIC
Nonlinear Systems

20040085025 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Systems-Level Feasibility Analysis of a Microsatellite Rendezvous with Non-Cooperative Targets

Toso, Allen R.; Mar. 2004; 115 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424365; AFIT/GSS/ENY/04-M06; No Copyright; Avail: CASI; A06, Hardcopy

The feasibility of using a microsatellite to accomplish an orbital rendezvous with a noncooperative target was evaluated. This study focused on identifying and further exploring the technical challenges involved in achieving a noncooperative rendezvous. A system engineering analysis and review of past research quickly led to a concentration on the guidance, navigation, and control elements of the microsatellite operation. The integration of control and orbit determination algorithms was investigated. A simple yet robust solution could not be found to meet reasonable rendezvous criteria, using essentially off-the-shelf technology and algorithms. System feasibility has been assessed to have a low probability in the very near term. DTIC

Feasibility Analysis; Microsatellites; Systems Engineering; Targets

20040085029 Domaine Univ., Grenoble

International Conference Organized by ″AFA - SMAI″ on Curves and Surfaces (5th), Held at Saint-Malo, France on June 27 - July 3, 2002. Programme

Jul. 3, 2002; 29 pp.; In English

Contract(s)/Grant(s): F61775-02-WE051

Report No.(s): AD-A424373; CSP 02-5051; No Copyright; Avail: CASI; A03, Hardcopy

The Final Proceedings for Fifth International Conference on Curves and Surfaces, 27 June 2002 - 3 July 2002 This conference will cover topics related to approximation theory including interpolation, smoothing techniques, splines, radial basis functions, wavelets as well as practical aspects of geometric modeling, computer-aided design and mechanics. DTIC

Computer Aided Design; Conferences; France; Mathematical Models

67
THEORETICAL MATHEMATICS

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

20040084897 Texas A&M Univ., College Station, TX

Theoretical and Experimental Investigations of Internal Resonances, and Related Behavior, in Nonlinear Aeroelastic Systems

Strganac, Thomas W.; Jun. 2004; 7 pp.; In English

Contract(s)/Grant(s): F49620-00-1-0051

Report No.(s): AD-A424124; AFRL-SR-AR-TR-04-0303; No Copyright; Avail: CASI; A02, Hardcopy

Adverse aeroelastic responses and related instabilities may affect the performance of many advanced air vehicle configurations. These responses are linked to nonlinearities within the aeroelastic system and have resulted in responses such as store-induced limit cycle oscillations (LCOs) and residual pitch oscillations (RPOs). As concepts for future aircraft designs are pursued, the source of these instabilities must be characterized. The primary objectives of this research are to investigate the presence of nonlinear pathologies such as LCOs and system resonances in aeroelastic systems; characterize the signature of such responses in the coupled nonlinear aerodynamic, structure, structural dynamic system; and, and examine passive suppression concepts. These research activities have been directed toward an explanation of nonlinear behavior found in aircraft systems. In particular, interest has been focused on store-induced limit cycle oscillations (″wing-with-store flutter″) that exist, but not predicted with current approaches. We considered an aeroelastic system that was coupled by nonlinearities, possessed an external forcing, and satisfied conditions in which the frequencies were commensurate. Also, we examined LCO's induced by continuous hardening-type nonlinearities in structural stiffness. DTIC

Aeroelasticity; Nonlinear Systems

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*.

20040084333 Lawrence Livermore National Lab., Livermore, CA
Time-Resolved Emittance Characterization of an Induction Linac Beam Using Optical Transition Radiation
Le Sage, G. P.; Nov. 05, 2002; In English
Report No.(s): DE2003-15004929; UCRL-ID-153254; No Copyright; Avail: National Technical Information Service (NTIS)

An induction linac is used by Lawrence Livermore National Laboratory to perform radiographic testing at the Flash X-ray Radiography facility. Emittance characterization is important since x-ray spot size impacts the resolution of shadow-graphs. Due to the long pulse length, high current, and beam energy, emittance measurement using Optical Transition Radiation is an attractive alternative for reasons that will be described in the text. The utility of OTR-based emittance measurement has been well demonstrated for both RF and induction linacs. We describe the time-resolved emittance characterization of an induction linac electron beam. We have refined the optical collection system for the induction linac application, and have demonstrated a new technique for probing the divergence of a subset of the beam profile. The experimental apparatus, data reduction, and conclusions will be presented. Additionally, a new scheme for characterizing the correlation between beam divergence and spatial coordinates within the beam profile will be described.
NTIS
Linear Accelerators; Radio Frequencies; Radiography; Characterization; Electron Beams

20040084334 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Low Temperature Laboratory Annual Report 2001
2002; 74 pp.; In English
Report No.(s): PB2004-105300; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Low Temperature Laboratory (LTL); Scientific Advisory Board; Personalia; Low Temperature Physics Research; Brain Research Unit; Teaching Activities; Technical Services; Activities of the Personnel; Publications
NTIS
Low Temperature; Low Temperature Physics

20040084335 Helsinki Univ. of Technology, Espoo
Helsinki University of Technology Low Temperature Laboratory Annual Report 2002
2003; 92 pp.; In English
Report No.(s): PB2004-105301; Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Preface; In Memoriam; Scientific Advisory Board; Personalia; International Collaborations; Low Temperature Physics Research; Brain Research Unit; Teaching Activities; Technical Services; Appendix I; Appendix II
NTIS
Low Temperature; Low Temperature Physics

20040084336 Lawrence Livermore National Lab., Livermore, CA
Performance and Operational Modeling of the National Ignition Facility
Shaw, M. J.; Williams, W. H.; Jancaitis, K. S.; Widmayer, C. C.; House, R. K.; Jul. 01, 2003; In English
Report No.(s): DE2003-15005174; UCRL-JC-154117; No Copyright; Avail: National Technical Information Service (NTIS)

The National Ignition Facility (NIF), currently under construction at the University of Californias Lawrence Livermore National Laboratory (LLNL) is a stadium-sized facility containing a 192-beam, 1.8 Megajoule, 500-Terrawatt, 351-nm laser system together with a 10-meter diameter target chamber with room for nearly 100 experimental diagnostics. NIF is being built by the National Nuclear Security Administration and when completed will be the worlds largest laser experimental system, providing a national center to study inertial confinement fusion and the physics of matter at extreme energy densities and pressures. NIFs 192 energetic laser beams will compress fusion targets to conditions where they will ignite and burn, liberating more energy than required to initiate the fusion reaction. The first four beamlines (a quad) are currently being commissioned, with increasingly energetic laser pulses being propagated throughout the laser system. Success on many of the NIF lasers

missions depends on obtaining precisely specified energy waveforms from each of the 192 beams over a wide variety of pulse lengths and temporal shapes. A computational system, the Laser Performance Operations Model (LPOM) has been developed and deployed during NIF commissioning to automate the laser setup process, and accurately predict laser energetics. For each shot on NIF, the LPOM determines the characteristics of the injection laser system required to achieve the desired main laser output, provides parameter checking for equipment protection, determines the required diagnostic setup, and supplies post-shot data analysis and reporting.
NTIS
Ignition; Research Facilities; Pulsed Lasers; Performance Prediction; Laser Outputs; Laser Beams

20040084348 Rutherford Appleton Lab., Oxford, UK
LaNSA Users Manual
Habara, H.; May 2004; 66 pp.; In English
Report No.(s): PB2004-105319; RAL-TR-2003-025; Copyright; Avail: National Technical Information Service (NTIS)

LaNSA (Large Area Neutron Scintillator Array) detector is one of the largest neutron spectrometer for measuring laser-plasma neutrons in the world. The detector consists of 960 channels of BC505 liquid scintillator, each coupled with Thorn-EMI9902KB05 photo-multiplier-tube (PMT). The data acquisition system consists of CAMAC and fastbus modules that are controlled through IBM-PC base computer. The obtained signals from the detector are delivered to LeCroy 1879 Time-Digital-Converter (TDC), which records the arrival time of the signal via LeCroy 4413 discriminator. These timings are collected and then converted into a neutron spectrum through the time-of-flight (TOF) method. At the same time, the signals are also detected with LeCroy 1885F Analog-to-Digital-Converter (ADC) to obtain accumulated current charge of the signal. This manual instructs you how to operate the LaNSA control system. In section 2, the basic operation processes on how to obtain the neutron data are described. In the next three sections, the important processes are examined and explained in detail: 'Set up the software, ' 'Initializing and Acquisition.' Section 6 explains the functions of menu items in the main window. The last three sections are description for other utility windows: 'Setup,' 'CAMAC test' and 'Fastbus test' windows.
NTIS
User Manuals (Computer Programs); Analog to Digital Converters; Neutron Spectrometers

20040084354 Brookhaven National Lab., Upton, NY, USA
SUSY Signatures in ATLAS at LHC
Paige, F. E.; 2003; 20 pp.; In English
Report No.(s): DE2004-15006612; BNL-71580-2003-CP; No Copyright; Avail: Department of Energy Information Bridge

This talk summarizes work by the ATLAS Collaboration at the CERN Large Hadron Collider on the search SUSY particles and Higgs bosons and on possible measurements of their properties.
NTIS
Higgs Bosons; Signatures

20040084537 Arizona State Univ., Tempe, AZ, USA
Penetration of High Intensity Radiated Fields (HIRF) Into General Aviation Aircraft
Balanis, Constantine A.; Birtcher, Craig R.; Georgakopoulos, Stavros V.; Panaretos, Anastasios H.; [2004]; 417 pp.; In English
Contract(s)/Grant(s): NCC1-01051; No Copyright; Avail: CASI; A18, Hardcopy

The ability to design and achieve electromagnetic compatibility is becoming more challenging with the rapid development of new electronic products and technologies. The importance of electromagnetic interference (EMI) and electromagnetic compatibility (EMC) issues stems from the fact that the ambient electromagnetic environment has become very hostile; that is, it increases both in density and intensity, while the current trend in technology suggests the number of electronic devices increases in homes, businesses, factories, and transportation vehicles. Furthermore, the operating frequency of products coming into the market continuously increases. While cell phone technology has exceeded 1 GHz and Bluetooth operates at 2.4 GHz, products involving satellite communications operate near 10 GHz and automobile radar systems involve frequencies above 40 GHz. The concern about higher frequencies is that they correspond to smaller wavelengths, therefore electromagnetic waves are able to penetrate equipment enclosure through apertures or even small cracks more easily. In addition, electronic circuits have become small in size, and they are usually placed on motherboards or housed in boxes in very close proximity. Cosite interference and coupling in all electrical and electronic circuit assemblies are two essential issues that have to be examined in every design.
Author
Electromagnetic Compatibility; Electromagnetic Fields; Electromagnetic Interference; Electromagnetic Radiation; Satellite Communication

20040084580 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Self-Organized Criticality, Multifractals, and Intermittent Turbulence in Earth's Magnetotail
Chang, Tom; May 25, 2004; 47 pp.; In English
Contract(s)/Grant(s): NAG5-9117; No Copyright; Avail: CASI; A03, Hardcopy

We have achieved all the goals stated in our grant proposal in collaboration with Dr. C.C. Wu of the University of California at Los Angeles. Specifically, these include: The understanding of the complexity induced nonlinear spatiotemporal structures and the coexisting propagating modes. The development of plasma resonances and coherent structures in space plasmas. The study of fluctuation-induced nonlinear instabilities and their role in the reconfiguration of magnetic topologies in the magnetotail. The development of ″anisotropic three-dimensional complexity″ in the plasma sheet due to localized merging and interactions of the magnetic coherent structures and associated topological phase transitions. The understanding of the intermittent turbulence and energization process of the observed Bursty Bulk Flows (BBF's) in the Earth s magnetotail. The acceleration of ions due to the intermittent turbulence of propagating arid nonpropagating fluctuations In the following, we include lists of our published papers, invited talks, and professional activities. A detailed description of our accomplished research results is given in Section IV.
Author
Magnetic Field Configurations; Nonlinearity; Plasma Resonance; Stability

20040084698 Stanford Linear Accelerator Center, Stanford, CA, USA, Nationaal Inst. voor Kernfysica en Hoge Energiefysica, Amsterdam, Netherlands, Vrije Univ., Amsterdam, Netherlands
Sin(2Beta): Status and Prospects
Raven, G.; Apr. 2003; In English
Report No.(s): DE2003-815231; SLAC-PUB-10075; No Copyright; Avail: National Technical Information Service (NTIS)

An overview of the observation of CP violation in the neutral B system, and the measurements of the CP-violating asymmetry sin2(beta) with B(yields) charmonium K(sub S,L)(sup 0) events, performed by the BABAR and Belle experiments at the SLAC and KEK B factories is given. In addition, the measurements of sin2(beta) with several other modes are described, including B(yields)(psi)K(sub S)(sup 0), which, as the leading contribution is from a loop diagram, could be sensitive to physics beyond the Standard Model.
NTIS
Asymmetry; Charm (Particle Physics); CP Violation

20040084701 Stanford Linear Accelerator Center, Stanford, CA, USA
Yukawa Hierarchies from Extra Dimensions with Small FCNC
Lillie, B.; Aug. 2003; In English
Report No.(s): DE2003-815242; SLAC-PUB-10094; No Copyright; Avail: National Technical Information Service (NTIS)

We investigate a class of extra dimensional models where all of the Standard Model fermions are localized to a single fixed point in an S(sub 1)/Z(sub 2) orbifold, and each species is localized with an exponential wavefunction with a different width. We show that this naturally generates Yukawa hierarchies of the size present in the Standard Model, and we find a set of model parameters that reproduces the observed masses and mixings to experimental accuracy. In addition, the dominant constraints, arising from flavor changing neutral currents, are shown to restrict the compactification scale to be 1/R (greater than) 2 - 5TeV, which is a much less stringent constraint than in similar extra dimensional models of the Yukawa hierarchy.
NTIS
Yukawa Potential; Wave Functions; Fermions

20040084703 Stanford Linear Accelerator Center, Stanford, CA, USA
Measurement of the Total Width, the Electronic Width and the Mass of the Gamma (10580) Resonance
Aug. 08, 2003; In English
Report No.(s): DE2003-815249; SLAC-PUB-10102; No Copyright; Avail: National Technical Information Service (NTIS)

We present a preliminary measurement of the resonance parameters of the (Upsilon)(10580) resonance with the BABAR detector at the SLAC PEP-II asymmetric B factory. We measure the total width (Lambda)(sub tot) to be (20.7(+/-) 1.6(+/-) 2.5)MeV, the partial electronic width (Lambda)(sub ee) = (0.321(+/-) 0.017(+/-) 0.029) keV and the mass M = (10.5793(+/-) 0.0004(+/-) 0.0012) GeV/c(sub 2).
NTIS
Asymmetry; Resonance Testing

20040084712 Lawrence Livermore National Lab., Livermore, CA
Selective Refinement Approach for Computing the Distance Functions of Curves
Laney, D. A.; Duchaineau, M. A.; Max, N. L.; Dec. 01, 2000; In English
Report No.(s): DE2004-15006152; UCRL-JC-142632; No Copyright; Avail: National Technical Information Service (NTIS)

We present an adaptive signed distance transform algorithm for curves in the plane. A hierarchy of bounding boxes is required for the input curves. We demonstrate the algorithm on the isocontours of a turbulence simulation. The algorithm provides guaranteed error bounds with a selective refinement approach. The domain over which the signed distance function is desired is adaptively triangulated and piecewise discontinuous linear approximations are constructed within each triangle. The resulting transform performs work only were requested and does not rely on a preset sampling rate or other constraints.
NTIS
Algorithms; Triangulation; Curvature; Distance

20040084718 Lawrence Livermore National Lab., Livermore, CA
Surface Figure Metrology for CELT Primary Mirror Segments
Sommargren, G. E.; Phillion, D. W.; Seppala, L. G.; Lerner, S. A.; Feb. 27, 2001; In English
Report No.(s): DE2004-15006207; UCRL-ID-145935; No Copyright; Avail: National Technical Information Service (NTIS)

The University of California and California Institute of Technology are currently studying the feasibility of building a 30-m segmented ground based optical telescope called the California Extremely Large Telescope (CELT). The early ideas for this telescope were first described by Nelson and Mast and more recently refined by Nelson. In parallel, concepts for the fabrication of the primary segments were proposed by Mast, Nelson and Sommargren where high risk technologies were identified. One of these was the surface figure metrology needed for fabricating the aspheric mirror segments. This report addresses the advanced interferometry that will be needed to achieve 15nm rms accuracy for mirror segments with aspheric departures as large as 35 m peak-to-valley. For reasons of cost, size, measurement consistency and ease of operation we believe it is desirable to have a single interferometer that can be universally applied to each and every mirror segment. Such an instrument is described in this report.
NTIS
Fabrication; Segments; Telescopes; Feasibility Analysis; Mirrors; Optical Equipment

20040084719 Lawrence Livermore National Lab., Livermore, CA
One-Dimensional Heat Transfer Analysis for Thin Films with Applications in Inertial Fusion Energy
Durbin, S. G.; Moir, R. W.; Sep. 21, 2001; In English
Report No.(s): DE2004-15006205; UCRL-ID-145435; No Copyright; Avail: National Technical Information Service (NTIS)

The X-rays from inertial fusion energy micro explosions deposited in a thin film will lead to a temperature rise dependent on penetration depth and time duration. This temperature rise is important to the study of surface tension driven flows and the surface quality of films for optics. A one-dimensional heat transfer analysis is used to estimate the film temperature rise for several different cases applicable to both final optical surfaces and renewable liquid first walls. Attenuating gas mixtures of xenon and krypton are considered to mitigate the deposition of X-ray energy.
NTIS
Heat Transfer; Thin Films; Fusion Propulsion; X Rays

20040084720 Stanford Linear Accelerator Center, Stanford, CA, USA, Harvard Univ., Cambridge, MA, USA
SU (N) Geometries and Topological String Amplitudes
Iqbal, A.; Kashani-Poor, A. K.; 2003; In English
Report No.(s): DE2003-815287; SLAC-PUB-9924; No Copyright; Avail: National Technical Information Service (NTIS)

It has been conjectured recently that the field theory limit of the topological string partition functions, including all higher genus contributions, for the family of CY3-folds giving rise to N=2 4D SU(N) gauge theory via geometric engineering can be obtained from gauge instanton calculus. We verify this surprising conjecture by calculating the partition functions for such local CYs using diagrammatic techniques inspired by geometric transitions. Determining the Gopakumar-Vafa invariants for these geometries to all orders in the fiber wrappings allows us to take the field theory limit.
NTIS
Calculus; Gauge Theory; Measuring Instruments

20040084727 Delaware River Basin Commission, Trenton, NJ, USA
DYNHYD5 Hydrodynamic Model (Version 2.0) and Chloride Water Quality Model for the Delaware Estuary
Dec. 2003; In English
Report No.(s): PB2004-106343; No Copyright; Avail: National Technical Information Service (NTIS)

A new hydrodynamic model was needed as a part of the development of Stage 1 TMDLs for polychlorinated biphenyls (PCBs) for the Delaware River Estuary. The downstream boundary of the existing DYNHYD5 hydrodynamic model (Version 1.0) was updated to establish a hydrodynamic and mass transport link to the ocean boundary. High resolution of Zone 6 would require a more comprehensive data collection effort and result in unacceptable increases in simulation time. Alternatively, introducing nine junctions to represent Zone 6 allowed for improved simulations, resulting from this linkage to the ocean boundary, while minimizing impacts to simulation time and model stability. Furthermore, since PCBs TMDLs to be derived using this hydrodynamic model applies only to Zones 2 through 5, a more coarse representation in Zone 6 was acceptable. The newer version of the hydrodynamic model (Version 2. 0) extends the downstream boundary to the mouth of the Delaware Bay (Zone 6), and consists of 105 junctions and 111 channels. The concept of a rolling calibration was used. In rolling calibration, as more data becomes available, the simulation period of the model is sequentially extended, and the model is re-calibrated to the expanded data set for each extension. The final calibration covers the period from September 1, 2001 to March 31, 2003, which is19 months or 577 days.
NTIS
Hydrodynamics; Mass Transfer; Polychlorinated Biphenyls

20040084728 Lawrence Livermore National Lab., Livermore, CA
FY 03 OMEGA Summary for LLE Annual Report
Turner, R. E.; Oct. 24, 2003; In English
Report No.(s): DE2004-15006277; UCRL-TR-155665; No Copyright; Avail: National Technical Information Service (NTIS)

Lawrence Livermore National Laboratory (LLNL) continued, in FY 03, to be a large user of Omega, using 390 experimental shots. These are roughly broken into 2 groups: those in support of the inertial confinement fusion (ICF) program; and those in support of high energy density sciences (HEDS), which includes materials, equation of state, and physics experiments.
NTIS
Research Facilities; Reports

20040084729 Bettis Atomic Power Lab., West Mifflin, PA, USA
Generalization of Spatial Channel Theory to Three-Dimensional x-y-z Transport Computations
Abu-Shumays, I. K.; Hunter, M. A.; Martz, R. L.; Risner, J. M.; 2003; In English
Report No.(s): DE2003-797087; No Copyright; Avail: National Technical Information Service (NTIS)

Spatial channel theory, initially introduced in 1977 by M. L. Williams and colleagues at ORNL, is a powerful tool for shield design optimization. It focuses on so called 'contributon' flux and current of particles (a fraction of the total of neutrons, photons, etc.) which contribute directly or through their progeny to a pre-specified response, such as a detector reading, dose rate, reaction rate, etc., at certain locations of interest. Particles that do not contribute directly or indirectly to the pre-specified response, such as particles that are absorbed or leak out, are ignored. Contribution fluxes and currents are computed based on combined forward and adjoint transport solutions. The initial concepts were considerably improved by Abu-Shumays, Selva, and Shure by introducing steam functions and response flow functions. Plots of such functions provide both qualitative and quantitative information on dominant particle flow paths and identify locations within a shield configuration that are important in contributing to the response of interest. Previous work was restricted to two dimensional (2-D) x-y rectangular and r-z cylindrical geometries. This paper generalizes previous work to three-dimensional x-y-z geometry, since it is now practical to solve realistic 3-D problems with multidimensional transport programs.
NTIS
Three Dimensional Models; Computation; Transport Theory

20040084742 Stanford Linear Accelerator Center, Stanford, CA, USA, Zurich Univ., Switzerland
Exclusive and Inclusive Rare B Decays: CKM Phenomenology and New Physics Reach
Hurth, T.; Lunghi, E.; 2003; In English
Report No.(s): DE2003-815229; SLAC-PUB-10042; No Copyright; Avail: National Technical Information Service (NTIS)

We report recent results in rare B decays. Our focus will be on b(yields) d(gamma) and b(yields) s(ell)(sup+)(ell)(sup -)

transitions. We discuss their impact on the CKM phenomenology and their role within our search for new physics. In particular, we analyze the impact of a recent lattice QCD estimate of the B(yields) K(star) form factor at zero recoil. We also briefly discuss the presently available optimal theoretical tools for the inclusive and exclusive modes.
NTIS
Quantum Chromodynamics; Phenomenology; Form Factors

20040084778 Physics and Electronics Lab. TNO, The Hague, Netherlands
Change in the Magnetic Signature of Submarines, Chapter 2
Naus, H. W. L.; August 2003; 29 pp.; In Dutch
Contract(s)/Grant(s): A99/KM/810; TNO Proj. 28622
Report No.(s): FEL-03-A143-Ch-2; TD-2003-0105-Ch-2; Copyright; Avail: Other Sources

The study of the change in the magnetic signature of submarines caused by submerging has been continued. Phenomenological theories of ferromagnetism and magnetostriction are identified and implemented in algorithms. Herewith the process of submerging has been simulated and the magnetic induction has been calculated. The variation under the influence of stress turns out to be hysteretic. For a known local magnetization of an object, potential theory yields the external magnetic field. The geometry of the object plays an important role. Taking homogeneously magnetized massive and hollow ellipsoids to model a submarine, the magnetic fields are computed. Finally, a proposal for experiments with a submarine is included.
Author
Submarines; Magnetic Signatures; Ferromagnetism

20040084910 Air Force Research Lab., Wright-Patterson AFB, OH
Methods In Entropic Thermomechanics
Hall, Richard B.; Sep. 2000; 21 pp.; In English
Report No.(s): AD-A424142; AFRL-ML-WP-TP-2003-437; No Copyright; Avail: CASI; A03, Hardcopy

Elements of constitutive model formulation for simple materials within a thermodynamic, finite deformation framework are reviewed. Recent developments in addressing the second law and entropy existence are emphasized for their simplicity and ease of interpretation. An original treatment of finite thermoviscoelasticity is developed in this context. A broadened Caratheodory-based entropy is proposed, and is compared to recent work of Casey (Casey J., On elastic-thermo- plastic materials at finite deformations. Int J Plast, 14, 173- 91). Frame indifference, objective rates, and spins are briefly addressed, introducing application of the broadened framework to (cited work in) finite thermoviscoplasticity. Fundamental references are provided.
DTIC
Entropy; Thermodynamics

20040085018 Purdue Univ., West Lafayette, IN
Synthesis of Irregular Diffractive Optical Elements
Webb, Kevin J.; Jan. 2003; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0387
Report No.(s): AD-A424355; ARO-38781.1-PHFR; No Copyright; Avail: CASI; A03, Hardcopy

The theory of irregular diffractive optical elements is being developed by means of optimization software that allows wavelength-scale geometries to be synthesized. Structures are being designed for mode conversion and filtering demonstrations using the developed software. Example structures will be fabricated using silicon%based materials an hen tested using near-field optical microscopy. This work will lay the foundation for applications such as VCSEL mod control and compact wavelength division multiplexing elements.
DTIC
Diffraction; Diffractive Optics; Near Fields; Optical Equipment

20040085418 Tokyo Univ., Hongo, Japan
Mass-Independent Isotopic Fractionation of Sulfur from Sulfides in the Huronian Supergroup, Canada
Tachibana, S.; Hirai, T.; Goto, K.; Yamamoto, S.; Kirschvink, J. L.; Kopp, R. E.; Ohkouchi, N.; Isozaki, Y.; Tada, R.; Tajika, E., et al.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 62; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Mass-independent isotopic fractionation (MIF) in sulfur isotopes from sedimentary rocks older than 2.47 Gyr has been attributed to the low oxygen content of the atmosphere. The recent finding of near-zero MIF of sulfur in pyrites from approx. 2.32 Ga shales of the Rooihoogte and Timeball Hill formations, South Africa, suggests that atmospheric oxygen may have reached approx. 10(exp 5) PAL by 2.32 Ga. The Huronian Supergroup of Canada was deposited between 2.45 - 2.22 Ga, possibly overlapping with deposition of the Rooihoogte and Timeball Hill Formations, and preserves a record of three glaciations. Small MIF of sulfur (delta(sup 33)S less than 0.5%) has been reported for sulfides from the Huronian Supergroup (McKim, Ramsay Lake, and Pecors Formations). We have started in-situ analyses of the sulfur isotopic compositions of sulfides for formations overlying was reported. including the second and third glacial diamictites (Bruce and Gowganda Formations), using the Cameca ims-1270 ion microprobe at the Geological Society of Japan. Some sulfides are rounded, and some are aligned parallel to lamination, which implies that they are of detrital origin.
Derived from text
Sulfur Isotopes; Sulfides; Oxygen; Isotopic Labeling; Fractionation

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 and Power*.

20040084253 Maritime Research Inst. Netherlands, Wageningen, Netherlands
Bow Wave Observations of a Frigate Model
Bosschers, J.; deJong, J.; March 2004; 46 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A02/KM/172; MARIN Proj. 15354
Report No.(s): TD-2002-0232; Rept-15354-5-DT; Copyright; Avail: CASI; A03, Hardcopy

Due to the continuous decrease of machinery related ship noise it is expected that in the future hydrodynamic noise sources may become important for the underwater signature of ships sailing at speeds below cavitation inception. One of the hydrodynamic noise sources is the noise due to bubbles which are generated by breaking waves in general en by the breaking bow wave in particular. Although the noise associated with bubbles has been investigated since 1933 by Minnaert and the relation between noise of bubbles generated by wind generated waves has been investigated since Knudsen published his deep water ambient noise spectra curves in 1944, relative little is known about the bubble behaviour and bubble noise due to breaking ship waves as shown in a literature review on the noise of breaking ship waves by Bosschers. Because bow wave breaking and bubble generation hardly affect the wave resistance of ship hulls, very little attention has been paid to this phenomenon for traditional ship design. There is therefore a strong need for detailed observations on both model scale and full scale. The present report describes some detailed bow wave observations of a frigate model which was being tested in the Deep Water Towing Tank of MARIN. The observations were made using two regular speed cameras and one high speed camera. The work has been carried out by Mr. J. de Jong, an MSc student of Twente University of Technology, during a three month traineeship period. The present report is partly based upon his traineeship report.
Derived from text
Air Water Interactions; Bow Waves; Cavitation Flow; Water Waves; Noise Spectra

20040084404 Institute TNO of Applied Physics, Delft, Netherlands
SEA Models for Underwater Sound Radiation from Ship Hulls and the Effect of Decoupling Coatings
deJong, C. A. F.; Termeer, M. K.; December 11, 2003; 38 pp.; In English
Contract(s)/Grant(s): A02/KM/167; TNO Proj. 008.03457; TNO Proj. 04411
Report No.(s): TD-0236; DGT-RPT-020150; Copyright; Avail: Other Sources

The underwater sound radiation from vibrating ship hulls has proven to be difficult to predict. This report describes updated Statistical Energy Analysis (SEA) models for the radiation efficiency of ship hulls, with and without acoustic decoupling coatings. The results are compared with experimental results on a laboratory scale model and an a full scale frigate. The agreement between the modelled and predicted hull vibration levels is good. The predicted underwater radiated sound power does show a fair agreement with the measurements, with errors up to 10 dB.
Author
Coatings; Decoupling; Ship Hulls; Statistical Analysis; Underwater Acoustics; Radiation; Mathematical Models

20040084437 Technische Physische Dienst TNO-TH, Delft, Netherlands

Energy Dissipation by Fuzzy Structural Appendages in Particular Vibration Damping of Cable Bundles Attached to a Plate

Petersson, B. A. T.; Buessow, R.; December 1, 2003; 23 pp.; In English

Contract(s)/Grant(s): A02/KM/124; TNO Proj. 008.04410/01.01

Report No.(s): TD-0244; DGT-RPT-030096; Copyright; Avail: Other Sources

In prediction models for structure-borne noise transmission from machinery to underwater it is necessary to provide an estimate of the internal losses in the ship structure. These losses are due to material relaxation effects, acoustic radiation but also to losses to 'fuzzy' structural appendages that are of secondary importance for the sound transmission and hence omitted from the models. The latter losses include a wide variety of loss mechanisms, the knowledge of which is limited. An introductory study reveals that appendages such as cables and pipes can realize significant damping. The present report proposes an approach for further theoretical developments and experimental corroboration for a suitable generic configuration consisting of a cable or cable bundle attached to a plate.

Author

Bundles; Energy Dissipation; Mathematical Models; Vibration Damping; Cables (Ropes); Pipes (Tubes); Plates (Structural Members)

20040084726 National Renewable Energy Lab., Golden, CO

Acoustic Tests of Small Wind Turbines

Migliore, P.; van Dam, J.; Huskey, A.; Oct. 2003; In English

Report No.(s): DE2003-15005521; NREL/CP-500-34662; No Copyright; Avail: National Technical Information Service (NTIS)

Eight small wind turbines ranging from 400 watts to 100 kW in rated power were tested for acoustic emissions at the U.S. Department of Energy's National Renewable Energy Laboratory. Rigorous test procedures based on international standards were followed for measurements and data analyses. Results are presented in the form of sound pressure level versus wind speed, where the sound was recorded downwind of the turbine at a distance equal to the hub height plus half the rotor diameter. When there was sufficient separation between wind turbine noise and background noise, the apparent sound power level was calculated. In several cases, this was not possible. The implications of this problem are discussed briefly. Some of the configurations tested were specifically developed to reduce the noise level of their predecessors. Test data for these machines demonstrate marked progress toward quieter turbines.

NTIS

Aeroacoustics; Aerodynamic Noise; Data Processing; Noise Reduction; Wind Turbines

20040084999 Colorado State Univ., Fort Collins, CO

Reduced Rank Wiener Filters in Optimized Coordinates for Partially Adaptive Filtering in Passive and Active Sonar Arrays

Scharf, Louis; Jun. 25, 2004; 15 pp.; In English

Contract(s)/Grant(s): N00014-01-1-1019

Report No.(s): AD-A424321; No Copyright; Avail: CASI; A03, Hardcopy

We summarize the results of our most recent ONR Contract, ″Reduced Rank Wiener Filters in Optimized Coordinates for Partially Adaptive Filtering in Passive and Active Sonar Arrays,″ ONR Contract N00014-01-1-1019, by giving a narrative account of what we have found for reduced-rank detection and estimation, conjugate direction Wiener filters, beamforming and diversity combining, and matched and adaptive subspace detection. We offer a discussion of open questions, as these inform our continuing work, under ONR support. The work reported here falls into the category of fundamental research addressed to passive sonar surveillance from large sonar arrays deployed in complex acoustic environments.

DTIC

Adaptive Filters; Coordinates; Sonar; Wiener Filtering

20040085019 Air Force Inst. of Tech., Wright-Patterson AFB, OH

Vibrometric Detection of Beam Damage Due to Inclusions

Reifsnyder, Aron J.; Mar. 2004; 130 pp.; In English; Original contains color illustrations

Report No.(s): AD-A424357; AFIT/GA/ENY/04-J01; No Copyright; Avail: CASI; A07, Hardcopy

The Air Force Institute of Technology, in conjunction with the Structural Health Monitoring branch of the Air Force

Research Laboratory, is researching methods of determining effects of notch location and size on beam structures using modal frequency analysis. This thesis explores the ability to detect included notches of varying magnitudes and locations within the frequency domain of an isotropic cantilever beam. A series of experiments employing centerline-notched 2024 T3 and 2024 0 aluminum beams was used to determine whether natural frequency measurement in beam structures is a valid mechanism for damage detection. Each specimen was excited by a strain actuator and the dynamic beam response measured using a laser Doppler vibrometer, thereby obtaining eigenvalues and eigenvectors for each case. Results are analyzed for frequency degradation trends based on location, notch length, and vibration mode. Correlation is made between experimentally observed varies, ABAQUS modeling, and a series of MATLAB predictions utilizing a finite element solution approach developed by Perel and Palazotto (2002).
DTIC
Damage; Doppler Effect; Inclusions; Structural Analysis; Vibration Meters

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*.

20040084526 NASA Marshall Space Flight Center, Huntsville, AL, USA
Electron Density and Two-Channel Neutron Emission Measurements in Steady-State Spherical Inertial-Electrostatically Confined Plasmas, with Review of the One-Dimensional Kinetic Model
Dobson, Chris C.; Hrbud, Ivana; Journal of Applied Physics; July 1, 2004; ISSN 0021-8979; Volume 96, No. 1, pp. 94-108; In English; Copyright; Avail: Other Sources

Electron density measurements have been made in steady-state plasmas in a spherical inertial electrostatic confinement (IEC) discharge using microwave interferometry. Plasma cores interior to two cathodes, having diameters of 15 and 23 cm, respectively, were probed over a transverse range of 10 cm with a spatial resolution of about 1.4 cm for buffer gas pressures from 0.2 to 6 Pa in argon and deuterium. The transverse profiles are generally flat, in some cases with eccentric symmetric minima, and give mean densities of from approx. = 0.4 to 7 x 10(exp 10)/cu cm, the density generally increasing with the neutral gas pressure. Numerical solutions of the one-dimensional Poisson equation for IEC plasmas are reviewed and energy distribution functions are identified which give flat transverse profiles. These functions are used with the plasma approximation to obtain solutions which also give densities consistent with the measurements, and a double potential well solution is obtained which has minima qualitatively similar to those observed. Explicit consideration is given to the compatibility of the solutions interior and exterior to the cathode, and to grid transparency. Deuterium fusion neutron emission rates were also measured and found to be isotropic, to within the measurement error, over two simultaneous directions. Anisotropy was observed in residual emissions during operation with nonfusing hydrogen- 1. The deuterium rates are consistent with predictions from the model.
Author
Electron Density (Concentration); Neutron Emission; Steady State; Electrostatics; Plasmas (Physics); Density Measurement

20040084714 Georgia Inst. of Tech., Atlanta, GA, USA
Monitoring and Control Research Using a University Research Reactor and SBWR Test-Loop
Ahrens, F. W.; Sep. 2003; In English
Report No.(s): DE2003-816297; No Copyright; Avail: National Technical Information Service (NTIS)

The existing hybrid simulation capability of the Penn State Breazeale nuclear reactor was expanded to conduct research for monitoring, operations and control. Hybrid simulation in this context refers to the use of the physical time response of the research reactor as an input signal to a real-time simulation of power-reactor thermal-hydraulics which in-turn provides a feedback signal to the reactor through positioning of an experimental changeable reactivity device (ECRD). An ECRD is an aluminum tube containing an absorber material that is positioned in the central thimble of the reactor by an external computer-driven algorithm. Simulation of parallel boiling channels and modal reactor kinetics were used to expand the hybrid reactor simulation (HRS) capability to include out-of-phase stability characteristics observed in operating BWRs.
NTIS
Algorithms; Computerized Simulation; Nuclear Reactors; Feedback

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OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20040084280 Ross-Hime Designs, Inc., Minneapolis, MN, USA
Free Space Optical Communications System Pointer
Rosheim, Mark E.; Sauter, Gerald F.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 171-178; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

Free Space Optical (FSO) communications pointing problems will be described and a solution presented. Conventional systems used in sea, land, and space are illustrated. Our integrated approach investigates three major problems areas: kinematics, structure, and dexterity. Their interrelationship will be discussed.
Author
Free-Space Optical Communication; Kinematics

20040084337 Lawrence Livermore National Lab., Livermore, CA
Mesoscale Lasser Processing Using Excimer and Short-Pulse Ti:Sapphire Lasers
Shirk, M. D.; Rubenchik, A. M.; Gilmer, G. H.; Stuart, B. C.; Armstrong, J. P.; Jul. 28, 2003; In English
Report No.(s): DE2003-15005175; UCRL-JC-154591; No Copyright; Avail: National Technical Information Service (NTIS)

No abstract available
Pulsed Lasers; Excimers

20040084342 Lawrence Livermore National Lab., Livermore, CA
Structural Modification in Fused Silica Due to Laser Damage Induced Shock Compression
Kubota, A.; Caturla, M. J.; Davila, L.; Stolken, J.; Dec. 05, 2001; In English
Report No.(s): DE2004-15002012; UCRL-JC-144223; No Copyright; Avail: National Technical Information Service (NTIS)

High power laser pulses can produce damage in high quality fused silica optics that can lead to its eventual obscuration and failure. Current models suggest the initiation of a plasma detonation due to absorbing initiators and defects, leading to the formation of shock waves. Recent experiments have found a densified layer at the bottom of damage sites, as evidence of the laser-damage model. We have studied the propagation of shock waves through fused silica using molecular dynamics. These simulations show drastic modifications in the structure and topology of the network, in agreement with experimental observations.
NTIS
Detonation; Laser Damage; Shock Wave Propagation; Shock Loads; Silica Glass

20040084343 Lawrence Livermore National Lab., Livermore, CA
Performance of Bare and Sol-gel Coated DKDP Crystal Surfaces Exposed to Multiple 351-nm Laser Pulses in Vacuum and Air
Whitman, P.; Norton, M.; Nostrand, M.; Molander, W.; Nelson, A.; Dec. 19, 2001; In English
Report No.(s): DE2004-15002013; UCRL-JC-144220; No Copyright; Avail: National Technical Information Service (NTIS)

We have investigated the surface degradation of bare and sol-gel coated deuterated potassium dihydrogen phosphate (DKDP) crystals when exposed to 351-nm laser pulses in atmospheric air and nitrogen and at pressures ranging from atmospheric down to 10-5 Torr vacuum. Optical microscopy, surface topography, surface chemical analyses, 351-nm pumped photoemission maps, and photometry results have been used to characterize these samples. We report the occurrence of two potentially linked surface degradation phenomena: the development of increased photoemission and the development of unacceptable surface roughening in the region exposed to the beam in vacuum. We note no degradation for surfaces exposed in air or nitrogen at pressures exceeding 1 torr. Diamond-turned DKDP surfaces show a ubiquitous, low-intensity photoemission signature before exposure to any laser fluence. The observed reduction of this emission signal as a function of operating pressure and accumulated laser energy when crystals are exposed to 351-nm laser pulses in air can be correlated with the removal of surface carbon.
NTIS
Sol-Gel Processes; Chemical Analysis; Crystal Surfaces

20040084689 Lawrence Livermore National Lab., Livermore, CA
Development of a Process Model for CO(2) Laser Mitigation of Damage Growth in Fused Silica
Feit, M. D.; Rubenchik, A. M.; Boley, C. D.; Rotter, M. D.; Nov. 01, 2003; In English
Report No.(s): DE2004-15006278; UCRL-CONF-155673; No Copyright; Avail: National Technical Information Service (NTIS)

A numerical model of CO2 laser mitigation of damage growth in fused silica has been constructed that accounts for laser energy absorption, heat conduction, radiation transport, evaporation of fused silica and thermally induced stresses. This model will be used to understand scaling issues and effects of pulse and beam shapes on material removal, temperatures reached and stresses generated. Initial calculations show good agreement of simulated and measured material removal. The model has also been applied to LG-770 glass as a prototype red blocker material.
NTIS
Carbon Dioxide Lasers; Silica Glass; Radiation Transport

20040084736 Missouri Univ., Columbia, MO, USA
Direct Conversion of Radioisotope Energy to Electricity: Year 3 Report
2003; In English
Report No.(s): DE2003-815206; No Copyright; Avail: National Technical Information Service (NTIS)

A new chemical reactor has been tested for Field Enhanced Diffusion by Optical Activation doping and purification of SiC, GaN and AlN films. Different conditions have been used on SiC, GaN and AlN samples including temperature variation, electrical field variation, variations in electrical current and optical activation. A 5mW (630-680) nm laser was used for optical activation. It was observed that optical activation has a major effect on ion drift rates. It was also observed that the magnitude of the electrical current also enhanced ion drift rates by a postulated current drag mechanism. I-V characteristic curves were measured to verify changes in the electrical properties of the samples SIMS was used to analyze the concentrations of impurities in the film samples before and after treatment. It has been demonstrated that the field-enhanced diffusion by optical activation method can dope and purify the films. As a result, the electrical properties of the wafers have been significantly improved during treatment especially in cases where a laser is used.
NTIS
Chemical Reactors; Electric Fields; Electrical Properties; Energy Conversion; Radioisotope Heat Sources

20040084871 Air Force Inst. of Tech., Wright-Patterson AFB, OH
High Resolution, Slant Angle Scene Generation and Validation of Concealed Targets in DIRSIG
Barcomb, Kris E.; Schott, John; Brown, Scott; Hattenberger, Tim; Jun. 28, 2004; 13 pp.; In English
Report No.(s): AD-A424065; AFIT-CI04-397; No Copyright; Avail: CASI; A03, Hardcopy

Traditionally, synthetic imagery has been constructed to simulate images captured with low resolution, nadir- viewing sensors. Advances in sensor design have driven a need to simulate scenes not only at higher resolutions but also from oblique view angles. The primary efforts of this research include: real image capture, scene construction and modeling, and validation of the synthetic imagery in the reflective portion of the spectrum. High resolution imagery was collected of an area named MicroScene at the Rochester Institute of Technology using the Chester F. Carlson Center for Imaging Science's MISI and WASP sensors using an oblique view angle. Three Humvees, the primary targets, were placed in the scene under three different levels of concealment. Following the collection, a synthetic replica of the scene was constructed and then rendered with the Digital Imaging and Remote Sensing Image Generation (DIRSIC) model configured to recreate the scene both spatially and spectrally based on actual sensor characteristics. Finally, a validation of the synthetic imagery against the real images of MicroScene was accomplished using a combination of qualitative analysis, Gaussian maximum likelihood classification, and the RX algorithm. The model was updated following each validation using a cyclical development approach. The purpose of this research is to provide a level of confidence in the synthetic imagery produced in DIRSIG so that it can be used to train and develop algorithms for real world concealed target detection.
DTIC
Digital Systems; High Resolution; Scene Generation; Slopes; Targets

20040085020 Massachusetts Univ., Lowell, MA
Synthesis and Study of Fullerene-Based Photovoltaic and Two-Photon Absorptive Conjugate Materials
Chiang, Long Y.; May 31, 2004; 23 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0334
Report No.(s): AD-A424360; AFRL-SR-AR-TR-04-0333; No Copyright; Avail: CASI; A03, Hardcopy

We have achieved in the synthesis of several modified fluorenated monoadducts of C(exp 60) showing high cross-sections of two-photon absorption (TPA). Conclusively, we substantiated our proposal that multi-adduct chromophore structures in close vicinity of the C(EXP 60) cage may mimicking the extra-dimensionality of chromophores in 3D configuration, and thus contribute to the enhanced two-photon absorption optical properties. Accordingly for this study, several monoadducts and novel multiadduct analogues of C(EXP 60)-diphenylaminofluorene C(EXP 60)(\gDPAF)n derivatives were synthesized and characterized by various spectroscopic methods. In summary, effective molecular TPA cross-sections of one branched alkyl derivative C60(\gDPAF-C(sub 9)) in CS2 was found to be 251 x lO(sub-48) cm4-sec/molecule, which is slightly higher than the TPA cross-sections value (196 x lO(sub-48) cm4- sec/molecule) obtained for our first generation C60(\gDPAF-C2) monoadduct. It is more than double in the cross-sections of its parent linear DPAF analogue and in a comparable value with that of the current TPA benchmark octupolar analogue AF350 with sigma2' =278 XLO(sub-48) cm4-sec/molecule. As the structure of C60-diphenylaminofluorene conjugate is extended from monoadduct to bisadduct analogous, effective molecular TPA cross-sections of C60(\gDPAF-C9)2 was found to be 622 xlO(sub-48) cm4-sec/molecule. This cross-sections value becomes one of the highest obtained for many organicpolyaromatic chromophores to date.
DTIC
Conjugates; Fullerenes; Optical Properties; Photons

75
PLASMA PHYSICS

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

20040084416 NASA Ames Research Center, Moffett Field, CA, USA
The Role of Plasma in Plasma Enhanced Chemical Vapour Deposition of Nanostructure Growth
Hash, David B.; Meyyappan, M.; Teo, Kenneth B. K.; Lacerda, Rodrigo G.; Rupesinghe, Nalin L.; April 23, 2004; 3 pp.; In English; Trends in Nanotechnology 2004, 13-17 Sep. 2004, Segovia, Spain; No Copyright; Avail: CASI; A01, Hardcopy

Chemical vapour deposition (CVD) has become the preferred process for high yield growth of carbon nanotubes and nanofibres because of its ability to pattern growth through lithographic positioning of transition metal catalysts on substrates. Many potential applications of nanotubes such as field emitters [1] require not only patterned growth but also vertical alignment. Some degree of ali,ment in thermal CVD processes can be obtained when carbon nanotubes are grown closely together as a result of van der Waals interactions. The ali,onment however is marginal, and the van der Waals prerequisite makes growth of freestanding nanofibres with thermal CVD unrealizable. The application of electric fields as a means of ali,onment has been shown to overcome this limitation [2-5], and highly aligned nanostructures can be grown if electric fields on the order of 0.5 V/microns are employed. Plasma enhanced CVD in various configurations including dc, rf, microwave, inductive and electron cyclotron resonance has been pursued as a means of enabling alignment in the CVD process. However, the sheath fields for the non-dc sources are in general not sufficient for a high degree of ali,pment and an additional dc bias is usually applied to the growth substrate. This begs the question as to the actual role of the plasma. It is clear that the plasma itself is not required for aligned growth as references [3] and [4] employed fields through small applied voltages (3-20 V) across very small electrode spacings (10-100 microns) and thus avoided striking a discharge.
Author
Vapor Deposition; Carbon Nanotubes; Nanostructure Growth; Transition Metals; Catalysts; Alignment

20040084628 NASA Ames Research Center, Moffett Field, CA, USA
Ion Transport Modeling in Non-Collisional RF Sheaths
Meyyappan, M.; Govindan, T. R.; Bose, Deepak; [1999]; 1 pp.; In English; Presentation at Gaseous Electronics Conference, October 1999, Norfolk, VA, USA
Contract(s)/Grant(s): NAS2-14031; RTOP 632-10-01; No Copyright; Avail: Other Sources; Abstract Only

A reactor scale ICP plasma model does not adequately resolve the submillimeter scale rf sheaths due to severe disparities in length and times scales. These non-collisional sheaths determine the spread in the ion bombardment energy distribution on the wafer. Analytical models based on ″damped potential″ has been used by various authors to simplify sheath modeling. However, inherent in these models are some assumptions that may be invalid. In this work we show that simplifying assumptions such as a uniform ion flux may be in error by as much as 200% at 13.56MHz. This work involves solving ion

transport in non-collisional rf sheaths. A comprehensive study of the dependence of ion flux and energy on uncertainties in the sheath-presheath (i.e. sheath thickness) boundary will also be done.
Author
Radio Frequencies; Ion Irradiation; Sheaths; Wafers; Plasmas (Physics)

20040084669 NASA Ames Research Center, Moffett Field, CA, USA
ICP Reactor Modeling: CF4 Discharge
Bose, Deepak; Govindan, T. R.; Meyyappan, M.; [1999]; 1 pp.; In English; Gaseous Electronics Conference, Oct. 1999, Norfolk, VA, USA
Contract(s)/Grant(s): NAS2-14031; RTOP 632-10-01; No Copyright; Avail: Other Sources; Abstract Only

Inductively coupled plasma (ICP) reactors are widely used now for etching and deposition applications due to their simpler design compared to other high density sources. Plasma reactor modeling has been playing an important role since it can, in principle, reduce the number of trial and error iterations in the design process and provide valuable understanding of mechanisms. Fluorocarbon precursors have been the choice for oxide etching. We have data available on CF4 from our laboratory. These are current voltage characteristics, La.ngmuir probe data, UV-absorption, and mass spectrometry measurements in a GEC-ICP reactor. We have developed a comprehensive model for ICP reactors which couples plasma generation and transport and neutral species dynamics with the gas flow equations. The model has been verified by comparison with experimental results for a nitrogen discharge in an ICP reactor. In the present work, the model has been applied to CF4 discharge and compared to available experimental data.
Author
Fluorocarbons; Plasmas (Physics); Plasma Generators; Iteration; Etching; Electric Potential

20040084732 University of Southern California, Los Angeles, CA, USA
Program for Plasma-Based Concepts for Future High Energy Accelerators
Katsouleas, T.; Muggli, P.; 2003; In English
Report No.(s): DE2003-815207; No Copyright; Avail: National Technical Information Service (NTIS)

OAK B204 Program for Plasma-Based Concepts for Future High Energy Accelerators. The progress made under this program in the period since November 15, 2002 is reflected in this report. The main activities for this period were to conduct the first run of the E-164 high-gradient wakefield experiment at SLAC, to prepare for run 2 and to continue our collaborative effort with CERN to model electron cloud interactions in circular accelerators. Each of these is described. Also attached to this report are papers that were prepared or appeared during this period.
NTIS
Plasma Accelerators; Particle Accelerators

20040085015 Army Research Lab., Aberdeen Proving Ground, MD
The Response of Propellants to Plasma Radiation
Beyer, Richard A.; Pesce-Rodriquez, Rose A.; Jun. 2004; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-622618
Report No.(s): AD-A424349; ARL-TR-3189; No Copyright; Avail: CASI; A03, Hardcopy

Experiments have been done where standard and research propellants were exposed to the visible and infrared (IR) light from a high-energy plasma discharge. Measurements of mass lost by the sample. analysis of the IR spectra of evolved gases. and optical microscopy have been used to characterize the response. In addition. the response for graphite-free JA2 conditioned to hot and cold temperatures has shown that the magnitude of the response for this material is stronger for hot samples. Overall. the samples show strong response when the light can penetrate further into the samples; the response is limited to a thin layer at the surface for composite propellants.
DTIC
Gun Propellants; Ignition; Plasma Jets; Plasma Radiation; Plasmas (Physics); Propellants; Radiation Effects

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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*.

20040084240 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
High Efficiency Thermoelectric Radioisotope Power Systems
El-Genk, Mohamed; Saber, Hamed; Caillat, Thierry; July 2004; 140 pp.; In English
Contract(s)/Grant(s): JPL-80-5516; NAG3-2543
Report No.(s): UNM-ISNPS-1-2004; No Copyright; Avail: CASI; A07, Hardcopy

The work performed and whose results presented in this report is a joint effort between the University of New Mexico s Institute for Space and Nuclear Power Studies (ISNPS) and the Jet Propulsion Laboratory (JPL), California Institute of Technology. In addition to the development, design, and fabrication of skutterudites and skutterudites-based segmented unicouples this effort included conducting performance tests of these unicouples for hundreds of hours to verify theoretical predictions of the conversion efficiency. The performance predictions of these unicouples are obtained using 1-D and 3-D models developed for that purpose and for estimating the actual performance and side heat losses in the tests conducted at ISNPS. In addition to the performance tests, the development of the 1-D and 3-D models and the development of Advanced Radioisotope Power systems for Beginning-Of-Life (BOM) power of 108 We are carried out at ISNPS. The materials synthesis and fabrication of the unicouples are carried out at JPL. The research conducted at ISNPS is documented in chapters 2-5 and that conducted at JP, in documented in chapter 5. An important consideration in the design and optimization of segmented thermoelectric unicouples (STUs) is determining the relative lengths, cross-section areas, and the interfacial temperatures of the segments of the different materials in the n- and p-legs. These variables are determined using a genetic algorithm (GA) in conjunction with one-dimensional analytical model of STUs that is developed in chapter 2. Results indicated that when optimized for maximum conversion efficiency, the interfacial temperatures between various segments in a STU are close to those at the intersections of the Figure-Of-Merit (FOM), ZT, curves of the thermoelectric materials of the adjacent segments. When optimizing the STUs for maximum electrical power density, however, the interfacial temperatures are different from those at the intersections of the ZT curves, but close to those at the intersections the characteristic power, CP, curves of the thermoelectric materials of the adjacent segments (CP = T(sup 2)Zk and has a unit of W/m). Results also showed that the number of the segments in the n- and p-legs of the STUs optimized for maximum power density are generally fewer than when the same unicouples are optimized for maximum efficiency. These results are obtained using the 1-D optimization model of STUs that is detailed in chapter 2. A three-dimensional model of STUs is developed and incorporated into the ANSYS commercial software (chapter 3). The governing equations are solved, subject to the prescribed
Author
Design Analysis; Fabrication; Performance Tests; Segments; Mathematical Models; Three Dimensional Models; Thermoelectric Materials; Cooling

20040084704 Stanford Linear Accelerator Center, Stanford, CA, USA
Method of Measuring the Coupled Lattice Functions at the Interaction Point in e+e- Storage Rings
Cai, Y.; 2003; In English
Report No.(s): DE2003-815269; SLAC-PUB-10126; No Copyright; Avail: National Technical Information Service (NTIS)

We have investigate a method of measuring the complete lattice functions including the coupling parameters at any azimuthal position in a periodic an symplectic system. In particular, the method is applied to measure the lattice functions at the interaction point where the beams collide. It has been demonstrate that a complete set of lattice functions can be accurately measured with two adjacent beam position monitors and the known transformation matrix between them. As a by-product, the method also automatically measures the complete one-turn matrix.
NTIS
Beams (Radiation); By-Products; Transformations (Mathematics)

20040084716
BABAR Explores CP Violation
Karyotakis, Y.; 2003; In English
Report No.(s): DE2003-815303; SLAC-PUB-9830; No Copyright; Avail: National Technical Information Service (NTIS)

The most recent results obtained by the BABAR experiment at the PEP-II asymmetric-energy B Factory at SLAC on CP-violating asymmetries and branching fractions for neutral and charged B decays are presented here. The analysis was

performed on a data sample of (approx) 88 million(Upsilon)(4S)(yields) B(bar B) decays collected between 1999 and 2002. Using b(yields) c(bar c)s decays, we measure sin2(beta)= 0.741(+/-) 0.067(stat)(+/-) 0.034(syst). We also present sin2 (beta) measurements from, b(yields) s(bar s)s and b(yields) c(bar c)d processes. From neutral B meson decays to two-body final states of charged pions and kaons, we derive for the CP violating parameters, S(sub(pi)(pi))/= 0.02(+/-) 0.34(+/-) 0.05(-0.54,+0.58) and C(sub(pi)(pi))/= -0.30(+/-) 0.25(+/-) 0.04(-0.72,+0.12). First results for B(yields)(pi)(sup+)(pi)(sup -)(pi)(sup 0) and K(sup(+/-))(pi)(sup(-+))(pi)(sup 0) final states dominated by the(rho)(sup(+/-)) resonance, are also presented.
NTIS
CP Violation; Particle Decay; Asymmetry

20040084721
Impact of Beam Energy Modulation on rf Zero-Phasing Microbunch Measurements
Huang, Z.; Shaftan, T.; 2003; In English
Report No.(s): DE2003-815284; SLAC-PUB-9788; No Copyright; Avail: National Technical Information Service (NTIS)

Temporal profile of a simple bunch distribution may be obtained by measuring the horizontal density profile of an energy-chirped electron beam at a dispersive region using the rf zero-phasing technique. For an energy-modulated beam, the horizontal profile obtained by this technique is also modulated with an enhanced amplitude. We study the microbunching experiment at the NSLS source development laboratory and show that the horizontal modulation observed by the rf zero-phasing technique can be explained by the space-charge induced energy modulation in the accelerator.
NTIS
Electron Beams; Radio Frequencies

20040084724 Stanford Linear Accelerator Center, Stanford, CA, USA
Future Proof for Physics: Preserving the Record of SLAC
Deken, J. M.; 2003; In English
Report No.(s): DE2003-815282; SLAC-PUB-9686; No Copyright; Avail: National Technical Information Service (NTIS)

The report provides a brief introduction to SLAC, discusses the origins of the SLAC Archives and History Office, its present-day operations, and the present and future challenges it faces in attempting to preserve an accurate historical record of SLAC's activities.
NTIS
Documents; Proving; Research Facilities

20040084737 Fermi National Accelerator Lab., Batavia, IL, USA
Sfermion Precision Measurements at a Linear Collider
Sep. 2003; In English
Report No.(s): DE2003-815213; FERMILAB-CONF-02/384; No Copyright; Avail: National Technical Information Service (NTIS)

At future e(sup+)e(sup -) linear colliders, the event rates and clean signals of scalar fermion production--in particular for the scalar leptons--allow very precise measurements of their masses and couplings and the determination of their quantum numbers. Various methods are proposed for extracting these parameters from the data at the sfermion thresholds and in the continuum. At the same time, NLO radiative corrections and non-zero width effects have been calculated in order to match the experimental accuracy. The substantial mixing expected for the third generation sfermions opens up additional opportunities. Techniques are presented for determining potential CP-violating phases and for extracting tan(beta) from the stau sector, in particular at high values. The consequences of possible large mass differences in the stop and bottom system are explored in dedicated analyses.
NTIS
Linear Accelerators; Scalars; Fermions; Particle Production

20040084968 George Mason Univ., Fairfax, VA
Defects in Ion-Implanted Silicon Carbide
Rao, Mulpuri V.; Jul. 2004; 5 pp.; In English
Contract(s)/Grant(s): DAAD19-00-1-0490
Report No.(s): AD-A424269; ARO-41080.5-MS; No Copyright; Avail: CASI; A01, Hardcopy

Defects that introduce electrically active deep levels in ion-implanted Silicon Carbide (SiC) were studied by performing

capacitance Deep- Level Transient- Spectroscopy (DLTS) and transconductance frequency dispersion measurements on fully implanted MESFETs in bulk semi-insulating 4-H SiC, MISFETs in 6-H SiC and double implanted p-n and n-p junction diodes in 4-H SiC. The junction diodes made with aluminum and phosphoms implantations exhibited higher reverse leakage current compared to those made by nitrogen and boron implantations. In all samples implanted with nitrogen a defect complex involving nitrogen and a point defect (introduced by the ion-implantation process) is observed with a trap level introduced at 0.51 eV above the valence band. Phosphoms implant-native defect related peaks are observed at 0.6 and 0. 7 eV above the valence band. In all boron implanted samples, a prominent electrically active boron related D-center defect is seen at 0.62 eV above the valence band. In aluminum implanted samples an intrinsic vacancy related defect is seen at 0. 78 eV above the valence band. Surface state related defects were observed in the N-implanted channel region at energies 0.18 eV, 0.3 eV and 0.4 eV. Several defects were observed in the gate insulator and insulator/channel interface.
DTIC
Defects; Integrated Circuits; Ion Implantation; Silicon Carbides

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula. For specific topics in these areas see *categories 81 through 85*.

20040084279 Swales Aerospace, Beltsville, MD, USA
HST Solar Array 3 Latches
Garrah, Mike; 37th Aerospace Mechanisms Symposium; May 2004, pp. 131-136; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

The Hubble Space Telescope Servicing Mission 3B, completed successfully in March of 2002, included installation of two new Solar Array (designated SA3) Assemblies. The SA3s are of a completely new design that minimizes on-orbit jitter, and maximizes power generation. The SA3 Latches, developed by Swales Aerospace under contract with NASA Goddard Space Flight Center, were used to carry the SA3s into orbit in the Space Transportation System 109 Cargo Bay. These latches were engineered to meet a wide array of requirements covering almost the entire spectrum of mechanism design. During the course of this presentation, the details of the overall latch system design, as well as the design of each individual latch will be presented. An overview of the latch environmental test program will be presented with emphasis on solution of problems encountered during that process. Because this hardware has been successfully designed, tested, and flown, there is a vast array of practical information available that will be of definite value to mechanisms engineers. A summary of ″lesson learned″ during the development process will be provided at the end of this presentation.
Author
Hubble Space Telescope; Latches; Installing; Solar Arrays; Maintenance

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20040084270 Prins Maurits Lab. TNO, Rijswijk, Netherlands
The Bi-lateral US-NL Collaboration on Dismounted Combatant Operations: Summer of 2003
vanSon-deWaard, E. N.; Kamstra, M.; denHartog, E. A.; December 2003; 43 pp.; In English
Contract(s)/Grant(s): A03/KL/4UH; TNO Proj. 014.15324
Report No.(s): PML- 2003-A93; TD-2002-0267; Copyright; Avail: Other Sources

This report documents the outcome of four bi-lateral meetings in the period of May up to November 2003 between the USA of America and the Netherlands in the research area of close combat modelling & analysis. The parties concerned were the American Natick Soldier Center (NSC) and its contractor Science Technology Incorporation (STI) and TNO Defence Research. The main objectives of these bi-lateral meetings were: 1) Exchange of information; and 2) Negotiations on the proposed Project Arrangement. Since 2001 the USA and the Netherlands are in the process of setting up a Project Arrangement (PA) in the research area of close combat modelling & analysis as a mechanism for bi-lateral collaboration. The exchange of

information shapes the collaboration efforts to be conducted under the PA as well as being a means of keeping abreast of the latest Integrated Unit Simulation System (IUSS) developments.
Author
Combat; Computerized Simulation; Summer; United States; Netherlands; Military Operations

20040084381 Physics and Electronics Lab. TNO, The Hague, Netherlands
Support for the Selection of Evaluation Methods
vandenNieuwenhuyzen, D. J. T. P. M.; Sabel-Pikaar, A. A.; June 2003; 95 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/865; TNO Proj. 015.30780
Report No.(s): FEL-03-A112; TD-2003-0054; Copyright; Avail: Other Sources

The recent developments within the educational field have consequences for the design of education. There is more attention for skills and in the field of knowledge the priority lies on insight and not on facts. These developments ask for different learner activities within the educational setting. The Royal Netherlands &Force (RNLAF) has a need for support for the selection of evaluation methods. For this need we formulated the next researchdefinition: Which guidelines can offer support for the selection of evaluation methods, through which a well-founded decision will take place? The guidelines have the advantage that the design of education will be standardised. This will increase the gap between experienced educational-developers and not-experienced educational-developers. The guidelines offer footing and structure and promote that relevant factors will not be forgotten during the decision-process. The guidelines offer the educational-developers certainty and they guarantee a qualitative good selection of evaluation methods.
Author
Education; Standardization; Priorities

20040084386 Physics and Electronics Lab. TNO, The Hague, Netherlands
The Works of the OA Cell of HQ ISAF III
Toevank, F. J. G.; Gouweleeuw, R. G. W.; November 2003; 41 pp.; In English
Report No.(s): FEL-03-A174; TD-2003-0101; Copyright; Avail: Other Sources

This report summarizes the activities and experiences of the Operational Analysis (OA) Cell that was attached to the (GE/NL) Headquarters (HQ) of the International Security Assistance Force (ISM III) in Kabul Afghanistan from 28th of May to 6th of August 2003.
Author
Operational Problems; Decision Making

20040084501 NASA, Washington, DC, USA
ASK Magazine, No. 18
Laufer, Alexander, Editor; June 2004; 43 pp.; In English; See also 20040084502 - 20040084510
Report No.(s): NASA/NP-2004-06-354-HQ; No Copyright; Avail: CASI; A03, Hardcopy

The following articles from ASK magazine were processed: A New Spin; Fixing What s Broken; A Stormy Situation; Getting the Cows on Their Feet; Tell Me about Your Lemonade Stand; Hanging On by a Thread; Dressing Up the Naked Truth; Engineering Memos; and ASK Talks with A1 Diaz.
Derived from text
Project Management; Decision Making; NASA Programs

20040084502 ITT Aerospace/Communications Div., Fort Wayne, IN, USA
A Stormy Situation
Goshorn, Larry; ASK Magazine, No. 18; June 2004, pp. 14-16; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

At ITT Aerospace, in Fort Wayne, we build many different kinds of specialty payloads, including some of the workhorse instruments on NASA and NOAA's meteorological satellites. These instruments provide many of the pictures that you see on the evening news and the Weather Channel. I like to think we're not only in the aerospace business, but also in the business of protecting lives and property. We take our responsibility seriously, and that means something we have to make tough decisions.
Derived from text
Aerospace Industry; Commerce; Decision Making

20040084504 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Engineering Memos
Casani, John; ASK Magazine, No. 18; June 2004, pp. 26-30; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

I first came to the Jet Propulsion Laboratory (JPL) 48 years ago, and was taught that what's most important for project success is bringing good people on board, getting them to come together as a team, making certain that they're all on the same page, and setting up the mechanisms to keep them communicating. That much is true to all successful projects - but, naturally, it is not as simple as it sounds.
Derived from text
Communicating; Workloads (Psychophysiology); Management Methods

20040084507 Defense Acquisition Univ., VA, USA
Getting the Cows on Their Feet
Patnode, Norman; ASK Magazine, No. 18; June 2004, pp. 17-19; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

A while back, I was working on a team to reengineering the Air Force's logistic process for all the reparable items in the inventory, everything from engines to oxygen regulators to electronic circuit cards. After doing some analysis, some experimenting, and some prototyping, we were ready to implement our changes. IN simple english. we were trying to put a process in place where, like Wal-Mart, every customer purchase provides the tug that causes a replacement to be shipped overnight from the warehouse to fill the hole on the shelf before the store opens the next morning. Then, in response to the hole that's just been created in the warehouse, the depot either buys or repairs a unit and quickly ships it to the warehouse. By implementing this ″Wal-Mart solution″ we were sure we could make the whole system respond quickly to the needs of the war- fighters using the items. Although most people understand this process today, at the time it was revolutionary.
Derived from text
Replacing; Inventories; Experimentation

20040084508 Starsys Research Corp., Boulder, CO, USA
Tell Me about Your Lemonade Stand
Tibbitts, Scott; ASK Magazine, No. 18; June 2004, pp. 20-21; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

At STARSYS, we execute many Firm Fixed Price (FFP) programs for the development of mechanical systems for spacecraft. Contracting this way pre-suppose that we have the ability to establish and hold scope for a system that has yet to be defined. To do FFP, it is critical that we have program managers who are masters at cost control. Fortunately, we have some ″masters″ in our company. They just seem to have a knack for driving to a financial target. Doesn't matter if the program has contingency or not. Doesn't seem to matter if they use MS Project, Excel spread-sheets, or the back of an envelope. Doesn't even seem to matter whether the program is set up as a financial challenge or a winner.
Derived from text
Financial Management; Cost Analysis; Cost Reduction

20040084509 NASA Goddard Space Flight Center, Greenbelt, MD, USA
ASK Talks with Al Diaz
Diaz, Alphonso; OKeefe, Sean; ASK Magazine, No. 18; June 2004, pp. 31-39; In English; See also 20040084501; No Copyright; Avail: CASI; A02, Hardcopy

Following the release of the Columbia Accident Investigation Board (CAIB) Report, Alphonso (Al) Diaz, Goddard Center director, was asked by NASA Administrator Sean O'Keefe to head up the Agency's response. The Diaz team, as it came to be known, was changed with making sure the CAIB Report did not become another dusty volume on a shelf of old Agency reviews.
Derived from text
Accident Investigation; Management Planning; Reports

20040084510 Group Process Consulting, Greensboro, NC, USA
The Power of Story: Dressing Up the Naked Truth
Simmons, Annette; ASK Magazine, No. 18; June 2004, pp. 24-25; In English; See also 20040084501; No Copyright; Avail: CASI; A01, Hardcopy

ASK Magazine is not alone when it comes to using storytelling to capture lessons learned and share knowledge. Several other practitioners have successfully introduced this approach to knowledge management within organizations. This article by Annette Simmons marks the first in a series ty authors whose work on storytelling has been widely recognized. We hope these features illuminate why ASK contributors use the story form to share their knowledge, and how you can do the same. Annette Simmons spoke at the February 2002 APPL Masters Forum.
Derived from text
Organizations; Education

20040084531 Physics and Electronics Lab. TNO, The Hague, Netherlands
Knowledge Management in the OKM-Organization, Part 1, Context, Definition, Need and a Survey of Measures
vanderHulst, A. H.; Verstegen, D. M. L.; January 2004; 42 pp.; In Dutch
Contract(s)/Grant(s): 781.2.0017.01; TNO Proj. 015.32638
Report No.(s): FEL-03-A247-Pt-1; TD-2003-0107-Pt-1; Copyright; Avail: Other Sources

In a rapidly changing environment, knowledge management is one of the means for an organization to cope with internal and external demands. This report targets the question of the nature and scope of the knowledge management policy for the school organization of the RNINavy. In this document, Part I, we describe the context in which the organization operates, define knowledge management and describe a number of possible activities with their area of application.
Author
Environment Management; Policies

20040085353 NASA Glenn Research Center, Cleveland, OH, USA
Lewis' Educational and Research Collaborative Intership Program Grant Closeout Report
August 2003; 267 pp.; In English
Contract(s)/Grant(s): NAG3-2896; No Copyright; Avail: CASI; A12, Hardcopy

The Lewis' Educational and Research Collaborative Internship Program (LERCIP) is a collaborative undertaking by the Office of Educational Programs at NASA Glenn Research Center at Lewis Field (formerly NASA Lewis Research Center) and the Ohio Aerospace Institute. This program provides 10-week internships and 10 or 12-week fellowships for undergraduate/graduate students and secondary school teachers. Approximately 130 interns are selected to participate in this program each year and begin arriving the second week in May. The internships provide students with introductory professional experiences to complement their academic programs. The interns are given assignments on research and development projects under the personal guidance of NASA professional staff members. Each intern is assigned a NASA mentor who facilitates a research assignment. In addition to the research assignment, the summer program includes a strong educational component that enhances the professional stature of the participants. The educational activities include a research symposium and a variety of workshops, lectures and short courses. An important aspect of the program is that it includes students with diverse social, cultural and economic backgrounds.
Author
Education; Students; Lectures; Economics

20040085384 Technische Univ., Delft, Netherlands
An Application of the Methodology for Assessment of the Sustainability of the Air Transport System
Janic, Milan; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 40-82; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

An assessment and operationalization of the concept of a sustainable air transport system is recognized as an important but complex research, operational and policy task. This paper represents an academic effort to properly address the problem of assessing the sustainability of an air transport system. In particular, the paper presents a methodology for assessment of the sustainability of an air transport system. This methodology is based on an indicator system related to particular dimensions of the air transport system s performance considered from the aspects of particular actors involved. Specific cases are selected to illustrate the application of the proposed methodology.
Author
Air Transportation; Policies

20040085386 Universidade Federal do Rio de Janeiro, Brazil
Developing a Fleet Standardization Index for Airline Pricing
deBorgesPan, Alexis George; EspiritoSanto, Respico A., Jr.; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 97-110; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

Quantifying subjective aspects is a difficult task that requires a great dedication of time from researchers and analysts. Nevertheless, one of the main objectives of it is to pave the way for a better understanding of the focused aspects. Fleet standardization is one of the subjective aspects that is extremely difficult to turn into numbers. It is of great importance to understand the benefits that may come from a higher level of standardization for airlines. A more standardized fleet may represent lower costs of operations and maintenance plus a much better planning of routes and flights.
Author
Commercial Aircraft; Cost Reduction; Maintenance; Standardization

82
DOCUMENTATION AND INFORMATION SCIENCE

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

20040084356 Brookhaven National Lab., Upton, NY
IUPAC Statutes and Bylaws (Impact on Commissions, Committees, Membership and Officers)
Holden, N. E.; 2003; 10 pp.; In English
Report No.(s): DE2004-15006609; BNL-71593-2003-CP; No Copyright; Avail: Department of Energy Information Bridge

From the history of the Commission, it began with a large number of members. It was found that it was difficult to gain agreement by correspondence between such a large group. A smaller group was elected to operate by correspondence and make decisions. It operated successfully for a half century in this manner. With funding available, the Commission membership grew larger but they discussed all matters face to face at Commission meetings. Sub-committees were appointed to pursue specialized topics and members reported and discussed their subcommittee results directly to the Commission at the face to face meetings. With the change in the bylaws, future face to face meetings will no longer be an option for the members of the Commission and its sub-committees, unless all members provide their own funds or those of their host institutions. The funding and membership restrictions are all serious topics, which require a thorough discussion.
NTIS
Law (Jurisprudence); Regulations

20040084377 NASA Ames Research Center, Moffett Field, CA, USA
SemanticOrganizer: A Customizable Semantic Repository for Distributed NASA Project Teams
Keller, Richard M.; Berrios, Daniel C.; Carvalho, Robert E.; Hall, David R.; Rich, Stephen J.; Sturken, Ian B.; Swanson, Keith J.; Wolfe, Shawn R.; April 17, 2004; 15 pp.; In English; International Semantic Web Conference 2004, 7-11 Nov. 2004, Hiroshima, Japan; No Copyright; Avail: CASI; A03, Hardcopy

SemanticOrganizer is a collaborative knowledge management system designed to support distributed NASA projects, including diverse teams of scientists, engineers, and accident investigators. The system provides a customizable, semantically structured information repository that stores work products relevant to multiple projects of differing types. SemanticOrganizer is one of the earliest and largest semantic web applications deployed at NASA to date, and has been used in diverse contexts ranging from the investigation of Space Shuttle Columbia's accident to the search for life on other planets. Although the underlying repository employs a single unified ontology, access control and ontology customization mechanisms make the repository contents appear different for each project team. This paper describes SemanticOrganizer, its customization facilities, and a sampling of its applications. The paper also summarizes some key lessons learned from building and fielding a successful semantic web application across a wide-ranging set of domains with diverse users.
Author
Management Systems; Access Control; Rangefinding

20040084378 NASA Ames Research Center, Moffett Field, CA, USA
MAPGEN: Mixed-Initiative Activity Planning for the Mars Exploration Rover Mission
Ai-Chang, Mitchell; Bresina, John; Hsu, Jennifer; Jonsson, Ari; Kanefsky, Bob; McCurdy, Michael; Morris, Paul; Rajan, Kanna; Vera, Alonso; Yglesias, Jeffrey, et al.; [2004]; 2 pp.; In English; 14th International Conference on Automated Planning and Scheduling (ICAPS 04), 3-7 Jun. 2004, Whistler, Canada; No Copyright; Avail: CASI; A01, Hardcopy

This document describes the Mixed initiative Activity Plan Generation system MAPGEN. This system is one of the critical tools in the Mars Exploration Rover mission surface operations, where it is used to build activity plans for each of the rovers, each Martian day. The MAPGEN system combines an existing tool for activity plan editing and resource modeling, with an advanced constraint-based reasoning and planning framework. The constraint-based planning component provides active constraint and rule enforcement, automated planning capabilities, and a variety of tools and functions that are useful for building activity plans in an interactive fashion. In this demonstration, we will show the capabilities of the system and demonstrate how the system has been used in actual Mars rover operations. In contrast to the demonstration given at ICAPS 03, significant improvement have been made to the system. These include various additional capabilities that are based on automated reasoning and planning techniques, as well as a new Constraint Editor support tool. The Constraint Editor (CE) as part of the process for generating these command loads, the MAPGEN tool provides engineers and scientists an intelligent activity planning tool that allows them to more effectively generate complex plans that maximize the science return each day. The key to the effectiveness of the MAPGEN tool is an underlying constraint-based planning and reasoning engine.
Author
Mars Exploration; Planning; Mars Surface

20040084384 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Hybrid Vehicle Rating Standards: Meeting Reports of NATO AVT-106 in 2003
vanderBurgt, J. J. A.; Boeschoten, R.; Groh, Z. J. G.; April 2004; 29 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): A03/KL/4WM; TNO Proj. 014.15516
Report No.(s): PML-2004-A15; TD-2004-0015; Copyright; Avail: Other Sources

This report describes the work of the NATO Technical Team AVT-106 Hybrid Vehicle Rating Standards and the role of TNO-PML therein. AVT-106 is a follow-up of AVT-047 ″All electric vehicle″. The objective of AVT-106 is to develop common rating criteria in appropriate format as a potential basis for a future NATO standard, to assess hybrid electric vehicles, and compare them based on their operational performance. The focus of the technical team will be on those features where electric vehicles differ from conventional ones. Among these features silent watch and silent mobility, power generation and energy storage and recovery are considered significant ones.
Author
Electric Motor Vehicles; Standards; Military Technology

20040084389 Physics and Electronics Lab. TNO, The Hague, Netherlands
Training Support Packages
Sabel-Pikaar, A. A.; May 2004; 48 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): V037; TNO Proj. 015.31289/01.13
Report No.(s): FEL-03-A170; TD-2003-066; Copyright; Avail: Other Sources

The focus of this preliminary investigation is on training of tactical units. The adoption of a standard format Training Support Package has advantages in terms of efficiency and effectiveness.
Author
Education; Training Evaluation; Training Analysis

20040084444 NASA Langley Research Center, Hampton, VA, USA
NASA Video Catalog, Supplement 14
July 2004; 536 pp.; In English
Report No.(s): NASA/SP-2004-7109/SUPPL14; No Copyright; Avail: CASI; A23, Hardcopy

This issue of the NASA Video Catalog cites video productions listed in the NASA STI Database. The videos listed have been developed by the NASA centers, covering Shuttle mission press conferences; fly-bys of planets; aircraft design, testing and performance; environmental pollution; lunar and planetary exploration; and many other categories related to manned and unmanned space exploration. Each entry in the publication consists of a standard bibliographic citation accompanied by an abstract. The Table of Contents shows how the entries are arranged by divisions and categories according to the NASA Scope

and Coverage Category Guide. For users with specific information, a Title Index is available. A Subject Term Index, based on the NASA Thesaurus, is also included. Guidelines for usage of NASA audio/visual material, ordering information, and order forms are also available.
Author
Aircraft Design; Audio Visual Material; Bibliographies; Catalogs (Publications); Space Exploration

20040084534 NASA, Washington, DC, USA
Apollo: A Retrospective Analysis
Launius, Roger D.; July 2004; 117 pp.; In English
Report No.(s): NASA/SP-2004-4503; No Copyright; Avail: CASI; A06, Hardcopy

The program to land an American on the Moon and return safely to Earth in the 1960s has been called by some observers a defining event of the twentieth century. Pulitzer Prize-winning historian Arthur M. Schlesinger, Jr., even suggested that when Americans two centuries hence study the twentieth century, they will view the Apollo lunar landing as the critical event of the century. While that conclusion might be premature, there can be little doubt but that the flight of Apollo 11 in particular and the overall Apollo program in general was a high point in humanity s quest to explore the universe beyond Earth. Since the completion of Project Apollo more than twenty years ago there have been a plethora of books, studies, reports, and articles about its origin, execution, and meaning. At the time of the twenty-fifth anniversary of the first landing, it is appropriate to reflect on the effort and its place in U.S. and NASA history. This monograph has been written as a means to this end. It presents a short narrative account of Apollo from its origin through its assessment. That is followed by a mission by mission summary of the Apollo flights and concluded by a series of key documents relative to the program reproduced in facsimile. The intent of this monograph is to provide a basic history along with primary documents that may be useful to NASA personnel and others desiring information about Apollo.
Derived from text
Apollo Flights; Documents; Moon; Space Programs

20040084536 Physics and Electronics Lab. TNO, The Hague, Netherlands
Towards Staff Requirements for the Infrared Signature of Naval Ships
Neele, F. P.; Heijmans, R.; deRooy, R.; December 2003; 34 pp.; In English
Contract(s)/Grant(s): A01/KM/956; TNO Proj. 015.32031
Report No.(s): TD-2003-0031; FEL-02-A301; Copyright; Avail: Other Sources

The definition of staff requirements for the infrared signature of naval ships is addressed. A central problem is the formulation of concise and verifiable requirements. The ship signature is divided into three parts (ordered in decreasing dependence on atmospheric conditions): exhaust gases, sensor and weapon systems, and outside hull and superstructure surfaces. Signature requirements for exhausts gases and sensor and weapon systems can be stated in terms of maximum radiance contrast or maximum temperature contrast with the background and are easily verifiable. The third part, hull and superstructure, usually generates the largest contribution to a ship s signature and is strongly dependent on atmospheric conditions; a complete description of the variability of its signature would require many environments. It is proposed here to set requirements on the paint system, rather than on the infrared signature (in a number of environments). This requirement is also easily verifiable. The signature variability is illustrated by results for a number of environments. Using recent trial data data, the uncertainty in measurement and modelling of a ship s signature is shown to range up to several degrees in the midwave and longwave bands. These uncertainties must be known when comparing model predictions with signature measurements.
Author
Exhaust Gases; Hulls (Structures); Infrared Signatures; Ships

20040084600 NASA Ames Research Center, Moffett Field, CA, USA
Realtime Knowledge Management (RKM): From an International Space Station (ISS) Point of View
Robinson, Peter I.; McDermott, William; Alena, Richard L.; [2004]; 6 pp.; In English; No Copyright; Avail: CASI; A02, Hardcopy

We are developing automated methods to provide realtime access to spacecraft domain knowledge relevant a spacecraft's current operational state. The method is based upon analyzing state-transition signatures in the telemetry stream. A key insight is that documentation relevant to a specific failure mode or operational state is related to the structure and function of spacecraft systems. This means that diagnostic dependency and state models can provide a roadmap for effective

documentation navigation and presentation. Diagnostic models consume the telemetry and derive a high-level state description of the spacecraft. Each potential spacecraft state description is matched against the predictions of models that were developed from information found in the pages and sections in the relevant International Space Station (ISS) documentation and reference materials. By annotating each model fragment with the domain knowledge sources from which it was derived we can develop a system that automatically selects those documents representing the domain knowledge encapsulated by the models that compute the current spacecraft state. In this manner, when the spacecraft state changes, the relevant documentation context and presentation will also change.
Author
International Space Station; Real Time Operation; Telemetry; Management Systems; Data Systems

20040084693 New Mexico Univ., Albuquerque, NM, USA
Paso Del Norte Watershed Council Coordinated Water Resources Database Project. Technical Completion Report
Brown, C.; Sheng, Z.; Rich, M.; Jan. 2004; In English
Report No.(s): PB2004-104015; No Copyright; Avail: National Technical Information Service (NTIS)

The Paso del Norte Watershed Council (PDNWC) is a quasi-governmental organization that serves in an advisory capacity to the New Mexico-Texas Water Commission regarding the selection, planning, and implementation of environmental enhancements and mitigations associated with the El Paso-Las Cruces Regional Sustainable Water Project. The Council recommends policies for cooperation, coordination, and the sharing of information concerning planning and management activities of projects affecting the Paso del Norte Watershed, this being defined as the Rio Grande Basin between Elephant Butte Dam/Reservoir in southern New Mexico and Fort Quitman, Texas. In the last several years, the Watershed Council has discussed the development of a regional cooperative database project that would provide streamlined access to a range of water resource data in the Paso del Norte region. In August of 2002, the El Paso Water Utilities provided initial funding to the Paso del Norte Watershed Council to develop a pilot cooperative database project, and efforts toward the development of such a project have been ongoing. This document is the final report for this effort.
NTIS
Watersheds; Water Resources; Data Bases

20040084697 Helsinki Univ. of Technology, Espoo, Finland
Student's Guide to HUT Library
2002; 24 pp.; In English
Report No.(s): PB2004-105293; Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this guide is to help you find what you are looking for by using different methods of information retrieval. Since new information is produced constantly throughout the world, learning to use a library effectively is becoming more and more necessary. Perhaps (and most likely) your course(s) require a research project, including a literature search, and a seminar presentation. One of the goals of the professor's is to educate you to become an effective researcher and user of information already available. In other words, since the wheel has already been invented, why waste your time re-inventing it.
NTIS
Information Retrieval; Words (Language)

20040084741 Joint Economic Committee, Washington, DC, USA
Security in the Information Age: New Challenges, New Strategies
May 2002; 138 pp.; In English
Report No.(s): PB2004-106147; No Copyright; Avail: CASI; A07, Hardcopy

Over the years, the Joint Economic Committee has investigated a wide range of threats to the USA and its economy. The committee has consistently identified emerging issues including radio frequency weapons, bioterrorism, information warfare, espionage, technology transfers, transnational crime, and weapons proliferation. We continued that course in June 2001 with a hearing entitled, 'Wired World: Cyber Security and the U.S. Economy.' Following this hearing, it became clear that we needed to better understand an increasingly complicated set of diffuse security threats. Computer networks connect and control everything from pipelines to stock exchanges. The September 11 attacks on the World Trade Center and the Pentagon make it clear that we must be better aware of our vulnerabilities and develop viable strategies to detect, deter, and counter both physical and cyber-based threats to our people and our infrastructures. This compendium represents a range of perspectives

on infrastructure protection, from definitions and strategies to business challenges and policy actions.
NTIS
Information Systems; Security; Computer Networks

20040084773 Physics and Electronics Lab. TNO, The Hague, Netherlands
Support by the Selection of Arts
Sabel-Pikaar, A. A.; vandenNieuwenhuyzen, D. J. T. P. M.; June 2003; 79 pp.; In Dutch; Original contains color illustrations
Contract(s)/Grant(s): A01/KLu/865; TNO Proj. 015.30780/01.01
Report No.(s): FEL-03-A071; TD03-0039; Copyright; Avail: Other Sources

The recent developments within the educational field have consequences for the design of education. There is more attention for skills and in the field of knowledge the priority lies on insight and not on facts. These developments ask for different learner activities within the educational setting. The Royal Netherlands AirForce (RNLAF) has a need for support for the selection of learner activities. For this need we formulated the next research-definition: Which guidelines can offer support for the selection of learner activities, through which a well-founded decision will take place? The guidelines have the advantage that the design of education will be standardized. This will increase the gap between experienced educational-developers and not-experienced educational-developers. The guidelines offer footing and structure and promote that relevant factors will not be forgotten during the decision-process. The guidelines offer the educational-developers certainty and they guarantee a qualitative good selection of learner activities.
Author
Netherlands; Systems Engineering; Education

20040084774 Physics and Electronics Lab. TNO, The Hague, Netherlands
Knowledge Management in the OKM-organization, Part 2, Plan of Knowledge Management Approach Related to Development and Delivery of Instruction
vanderHulst, A. H.; Verstegen, D. M. L.; January 2004; 47 pp.; In Dutch
Contract(s)/Grant(s): 781.2.0017.01; TNO Proj. 015.32638
Report No.(s): FEL-03-A248-Pt-2; TD-2003-0108-Pt-2; Copyright; Avail: Other Sources

In a rapidly changing environment, knowledge management is one of the means for an organization to cope with internal and external demands. This report targets the question of the nature and scope of the knowledge management policy for the school organization of the RNINavy. This document, Part II, describes a needs assessment related to the two primary educational functions of the school organization, being the development and delivery of instruction. On this basis it provides an advice on a knowledge management approach, a combination of HRM-, organizational- and ICT oriented measures.
Author
Knowledge; Information Management; Education

20040084798 NASA Langley Research Center, Hampton, VA, USA
Assessing the Effectiveness of a Mathematics-Focused, Instructional Technology Program for Grades 6-8: A 5-Year Trend Analysis of NASA CONNECT(tm) Evaluation Data
Glassman, Nanci A.; Perry, Jeannine B.; Giersch, Christopher E.; Lambert, Matthew A.; Pinelli, Thomas E.; July 2004; 122 pp.; In English
Contract(s)/Grant(s): WU 23-090-20-09
Report No.(s): NASA/TM-2004-213242; L-18384; No Copyright; Avail: CASI; A06, Hardcopy

NASA CONNECT is a research-, inquiry, and standards-based, integrated mathematics, science, and technology series of 30-minute instructional distance learning (television and web-based) programs for students in grades 6 8. Respondents who evaluated the programs in the series over the first five seasons (1998-99 through 2002-03) reported that (1) they used the programs in the series; (2) the goals and objectives for the series were met; (3) the programs were aligned with the national mathematics, science, and technology standards; (4) the program content was developmentally appropriate for the grade level; and (5) the programs in the series enhanced and enriched the teaching of mathematics, science, and technology.
Author
Mathematics; NASA Programs; Technology Assessment; Education; Computer Programs

20040084869 Army War Coll., Carlisle Barracks, PA
Network Centric Warfare and the Changing Role of the Signal Corps
Thorne, Mike; Mar. 19, 2004; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424057; No Copyright; Avail: CASI; A03, Hardcopy

This research paper will explore the missions and construct for Army future force information and knowledge management organizations as part of a network centric information infrastructure. The Network Centric Information infrastructure will herald in a new paradigm for the Army Signal Corps-it no longer will be just a communications provider. Through the implementation of enhanced technologies and the adoption of a network centric approach we can obviate the need for communications installers and maintainers on the future battlefield. This requires a vision predicated on dramatically changing the Signal Corps as we know it. We must begin with the end in mind and recognize that technology and new doctrine will allow us to move to this new paradigm. We can field a future force with embedded communications capabilities thereby allowing the Signal Corps to move into the arena of joint information and knowledge management. This will require specialized training but not a unique force to implement. We can mold Military Intelligence (MI) Information Operations (IO) and automation officers into a cohesive team of knowledge management professionals that will be the core of the new Signal Corps. Professional Army communicators must embrace new missions and define a new paradigm or find themselves in forced obsolescence. This paper will propose a feasible course of action that will facilitate the development of a network centric information infrastructure in support of the future force. Furthermore the paper will present the benefits of transforming the core mission of the Signal Corps to one of knowledge management in keeping with the overall implementation of a network centric system in an era of joint interdependence.
DTIC
Intelligence; Organizations; Warfare

20040084923 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA
List of US Army Research Institute Research and Technical Publications
May 2004; 50 pp.; In English
Report No.(s): AD-A424163; No Copyright; Avail: CASI; A03, Hardcopy
List of ARI Refereed Journal Articles Books and Book Chapters FY2OO3. Conference Papers FY2OO3.
DTIC
Periodicals

20040084963 Defence Science and Technology Organisation, Salisbury
An Automatic Transcriber of Meetings Utilising Speech Recognition Technology
Graham, Steve; Sladek, Jarrah; Mar. 2004; 60 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424261; DSTO-CR-0355; DODA-AR-013-054; No Copyright; Avail: CASI; A04, Hardcopy
Conducting meetings is an important part of the Australian Defence Organisation (ADO) activities. Meetings span a broad range of knowledge sharing and collaborative activities; examples are interviews, informal discussions, brain-storming sessions, vide-conferences and presentations. Thus, looking at ways to improve the capture of information from these meetings is of interest to the ADO. This report presents progress towards the application of speech recognition technology to automatically produce text transcriptions of collaborative meetings. The report reviews the literature on automatic transcription systems and describes the progress on the research and development of a concept demonstrator named AuTM (Automatic Transcriber of Meetings).
DTIC
Speech Recognition; Utilization

20040084982 Real Time Methods, Inc., Santa Clara, CA
Distributed Streams-Based Data-Mining for Application Intrusion Detection
Yurica, Kevin; Pande, Rahul; Motwani, Rajeev; Jun. 17, 2004; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F49620-03-C-0057
Report No.(s): AD-A424288; AFRL-SR-AR-TR-04-0339; No Copyright; Avail: CASI; A03, Hardcopy
This investigation considered the challenge of real-time, distributed data mining across high-level TCP/IP protocols for application layer intrusion detection. The approach taken was to focus on the fundamental challenges of; a) evaluating similarities between different application-level TCP/IP protocols, b) node-based header evaluation methods for HTTP, c) a communication strategy to support aggregation and coordination. This streams-based approach to real-time data mining appears to be a useful in many areas including; security monitoring, intrusion detection and sensor networks.
DTIC
Data Mining; Detection; Distributed Processing; Information Retrieval; Security; Streams; Warning Systems

20040085000 Naval Postgraduate School, Monterey, CA
Compilation of Theses Abstracts
Dec. 2003; 136 pp.; In English
Report No.(s): AD-A424322; NPS-09-04-002; No Copyright; Avail: CASI; A07, Hardcopy

The Naval Postgraduate School (NPS) was established to serve the advanced educational needs of the Navy. The broad responsibility of the school is reflected in its stated mission: Increase the combat effectiveness of U.S. and allied armed forces and enhance the security of the U.S.A. through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense related challenges of the future. To fulfill its mission, the Naval Postgraduate School strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation in the Navy, and to prepare officers to introduce and utilize future technologies. The research program at NPS exists to support the primary mission of graduate education. Research at NPS: * maintains upper division course content and programs at cutting edge; * challenges students with creative problem solving experiences on DoD relevant issues; * advances DoN/DoD technology; * solves warfare problems; and attracts and retains quality faculty.
DTIC
Abstracts; Theses

20040085030 Domaine Univ., Grenoble
International Conference Organized by ″AFA - SMAI″ on Curves and Surfaces (5th), Held at Saint-Malo, France on June 27 - July 3, 2002. Resumes
Jul. 3, 2002; 118 pp.; In English
Report No.(s): AD-A424374; CSP 02-5051; No Copyright; Avail: CASI; A06, Hardcopy

The Final Proceedings for Fifth International Conference on Curves and Surfaces, 27 June 2002 - 3 July 2002 This conference will cover topics related to approximation theory including interpolation, smoothing techniques, splines, radial basis functions, wavelets as well as practical aspects of geometric modeling, computer-aided design and mechanics.
DTIC
Approximation; Computer Aided Design; Conferences; France; Mathematical Models

20040085033 Army War Coll., Carlisle Barracks, PA
Achieving Information Assurance
Nanton, Ulmont C., Jr; Mar. 19, 2004; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424379; No Copyright; Avail: CASI; A04, Hardcopy

Achieving Information Assurance (IA) is an integral factor in the U.S. efforts to strengthen America's homeland security. Technology enhancements have enabled greater efficiency in our business processes. At the same time we have increased our dependency on technology and thus our vulnerability. While our enemy continues to exploit conventional means to harm us in our homeland the threat of compromised information systems in critical infrastructure poses an even greater threat to our national security. Technology enables attacks against our way of life from abroad. It is no longer necessary to take the fight to your neighbor. Our inability to secure the very systems that we have become wholly dependent on could very well be the catalyst that exploits our weakness. Information assurance is the application of controls to mitigate the risk of exposure of our information systems. Our current method of dealing with information security is one of reaction. This process is in urgent need of replacement with a system of proactive protection and immediate/automated corrective action. This paper will show that near real time information assurance is achievable.
DTIC
Security

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20040085383 Luigi Bocconi Commercial Univ., Milan, Italy
Future Scenarios for the European Airline Industry: A Marketing-Based Perspective
Jarach, David; Journal of Air Transportation, Volume 9, No. 2; 2004, pp. 23-39; In English; See also 20040085380; Copyright; Avail: CASI; A03, Hardcopy; Available from CASI on CD-ROM only as part of the entire parent document

The last couple of years have proven to be very tough for the airline industry. Macroeconomic turmoil, like 9/11,

consequent economic recession, the threat of terrorism and the SARS virus have all had a combined drastic effect on both volumes and values of traffic performed by the industry. Microeconomic and industry-related changes, most definitively the dramatic growth of market power of low-cost carriers (LCCs), are haloing this condition of the airline environment, putting into deep crisis incumbents traditional business models and giving life to liquidity losses, huge deficits and bankrupts. In the U.S. market, LCCs have been a reality since the early 1970s and have been counterattacked many times, with scarce luck, by incumbent network carriers. In the European environment, instead, LCCs attack is fresher and the ultimate answers by national carriers are still to be put into practice. The risks of inaction, however, are probably stronger than in the U.S., due to the higher fragmentation of the European industry and the States ownership of many carriers that still prevent radically invasive market reactions like mergers. After an introductory but compulsory parenthesis on the rise of the low-cost phenomenon in the airline industry, this paper aims to analyze the new market scenario for the airline industry, focusing on the European context. Furthermore, the paper will analyze the main marketing tactics UE carriers might adopt to cope with the huge wave of low-cost entities and survive in the current tough environment.
Author
Airline Operations; Industries; Marketing; Commerce; European Space Programs

88
SPACE SCIENCES (GENERAL)

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

20040084672 MRJ Technology Solutions, Inc., Moffett Field, CA, USA, NASA Ames Research Center, Moffett Field, CA, USA
AsterAnts: A Concept for Large-Scale Meteoroid Return and Processing using the International Space Station
Globus, Al; Biegel, Bryan A.; Traugott, Steve; [2004]; 7 pp.; In English; STAIF 2000 Conference, 30 Jan. 2000, Albuquerque, NM, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: CASI; A02, Hardcopy

AsterAnts is a concept calling for a fleet of solar sail powered spacecraft to retrieve large numbers of small (1/2-1 meter diameter) Near Earth Objects (NEOs) for orbital processing. AsterAnts could use the International Space Station (ISS) for NEO processing, solar sail construction, and to test NEO capture hardware. Solar sails constructed on orbit are expected to have substantially better performance than their ground built counterparts [Wright 1992]. Furthermore, solar sails may be used to hold geosynchronous communication satellites out-of-plane [Forward 1981] increasing the total number of slots by at least a factor of three. potentially generating $2 billion worth of orbital real estate over North America alone. NEOs are believed to contain large quantities of water, carbon, other life-support materials and metals. Thus. with proper processing, NEO materials could in principle be used to resupply the ISS, produce rocket propellant, manufacture tools, and build additional ISS working space. Unlike proposals requiring massive facilities, such as lunar bases, before returning any extraterrestrial larger than a typical inter-planetary mission. Furthermore, AsterAnts could be scaled up to deliver large amounts of material by building many copies of the same spacecraft, thereby achieving manufacturing economies of scale. Because AsterAnts would capture NEOs whole, NEO composition details, which are generally poorly characterized, are relatively unimportant and no complex extraction equipment is necessary. In combination with a materials processing facility at the ISS, AsterAnts might inaugurate an era of large-scale orbital construction using extraterrestrial materials.
Author
Meteoroids; International Space Station; Solar Sails; Space Missions; Near Earth Objects; Communication Satellites

20040085405 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Oxygen Isotope Composition of Eucrites and Implications for the Formation of Crust on the HED Parent Body
Wiechert, U.; Halliday, A. N.; Palme, H.; Rumble, D.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 67; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Oxygen isotopes are a powerful tool for assessing the provenance of early solar system material. This approach can be used to assess the number of parent bodies of differentiated silicate meteorites, or achondrites. The largest group among these meteorites are howardites, eucrites and diogenites, often referred to as HED meteorites. To evaluate whether all HEDs formed on a single or several parent bodies we have determined precise abundances of O-16, O-17 and O-18 for 34 HED meteorites using a CO2 laser fluorination technique. This also allows us to evaluate whether eucrites formed by melting poorly mixed

primitive material or a homogeneous reservoir such as might be produced in a magma ocean.
Derived from text
Oxygen Isotopes; Meteoritic Composition; Achondrites; Magma; Oxygen 17; Oxygen 18; Crusts

20040085409 Alberta Univ., Edmonton, Alberta, Canada
Oxygen in Martian Meteorites: A Review of Results from Mineral Equilibria Oxybarometers
Herd, C. D. K.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 31; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Two oxybarometers based on mineral equilibria have been used to determine oxygen fugacity (fO2) in the martian meteorites: the Fe-Ti oxide and olivine-pyroxene-spinel (Ol-Px-Sp) methods. The details of these methods and a review of their application to martian basalts (i.e., basaltic and olivine-phyric shergottites) is provided. The purpose of this abstract is to summarize results for martian basalts (Table 1) and to provide details that elucidate the advantages and potential pitfalls of these methods.
Derived from text
Mars (Planet); Olivine; Shergottites; Pyroxenes; Basalt; Meteorites

20040085410 California Univ., Los Angeles, CA, USA
The Role of Water in Determining the Oxygen Isotopic Composition of Planets
Young, E. D.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 68; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

It is becoming increasingly likely that reactions between water and rock (and rock melts) were the primary by which planetesimals, and eventually terrestrial planets, obtained their oxygen isotopic signatures. Two processes were responsible. One is photochemistry in the early solar nebula. The other is reactions between liquid water ice melt and rocks within protoasteroid environments.
Derived from text
Planetary Composition; Water; Photochemical Reactions; Protoplanets; Rocks

20040085429 Washington Univ., Seattle, WA, USA
Redox Evolution of Magmatic Systems
Kress, V. C.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 40; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Iron is the most abundant of the elements that exist in multiple redox states under typical terrestrial planetary conditions. Fe can exist in ferric, ferrous and metallic states under planetary conditions in percent to tens of percent concentrations. For this reason, iron-bearing phases will tend to be the principle buffers of redox variation in the terrestrial planets. Because of the relatively low chemical diffusivity of oxygen in solid phases, transfer and modification of relative redox potential in planetary bodies is primarily mediated by a melt or vapor phase.
Derived from text
Terrestrial Planets; Iron; Diffusivity; Oxygen

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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.

20040084369 NASA Ames Research Center, Moffett Field, CA, USA
Hummingbird Comet Nucleus Analysis Mission
Kojiro, Daniel; Carle, Glenn C.; Lasher, Larry E.; February 18, 2000; 1 pp.; In English
Contract(s)/Grant(s): RTOP 344-36-30-28; No Copyright; Avail: Other Sources; Abstract Only

Hummingbird is a highly focused scientific mission, proposed to NASA s Discovery Program, designed to address the highest priority questions in cometary science-that of the chemical composition of the cometary nucleus. After rendezvous with the comet, Hummingbird would first methodically image and map the comet, then collect and analyze dust, ice and gases from the cometary atmosphere to enrich characterization of the comet and support landing site selection. Then, like its namesake, Hummingbird would carefully descend to a pre-selected surface site obtaining a high-resolution image, gather a

surface material sample, acquire surface temperature and then immediately return to orbit for detailed chemical and elemental analyses followed by a high resolution post-sampling image of the site. Hummingbird s analytical laboratory contains instrumentation for a comprehensive molecular and elemental analysis of the cometary nucleus as well as an innovative surface sample acquisition device.
Author
Chemical Analysis; Comet Nuclei; Cometary Atmospheres

20040084383 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Verification of NASA Emergent Systems
Rouff, Christopher; Vanderbilt, Amy K. C. S.; Truszkowski, Walt; Rash, James; Hinchey, Mike; [2004]; 10 pp.; In English; Artificial Intelligence Applications and Innovations-2004, 22-27 Aug. 2004, Toulouse, France; Original contains black and white illustrations; No Copyright; Avail: CASI; A02, Hardcopy

NASA is studying advanced technologies for a future robotic exploration mission to the asteroid belt. This mission, the prospective ANTS (Autonomous Nano Technology Swarm) mission, will comprise of 1,000 autonomous robotic agents designed to cooperate in asteroid exploration. The emergent properties of swarm type missions make them powerful, but at the same time are more difficult to design and assure that the proper behaviors will emerge. We are currently investigating formal methods and techniques for verification and validation of future swarm-based missions. The advantage of using formal methods is their ability to mathematically assure the behavior of a swarm, emergent or otherwise. The ANT mission is being used as an example and case study for swarm-based missions for which to experiment and test current formal methods with intelligent swam. Using the ANTS mission, we have evaluated multiple formal methods to determine their effectiveness in modeling and assuring swarm behavior.
Author
Asteroid Belts; Robotics; Autonomy; Asteroids

20040084387 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Element Abundances in the Galactic Cosmic Rays with Atomic Number (Z) in the Interval 30 is less than or equal to Z is less than or equal to 40
Barbier, Louis; Binns, W. R.; Christian, E.; deNolfo, G.; Geier, S.; Israel, M. H.; Link, J. T.; Mewaldt, R. A.; Mitchell, J.; Rauch, B. F., et al.; [2004]; 1 pp.; In English; APS Conference, 1-4 May 2004, Denver, CO, USA; No Copyright; Avail: Other Sources; Abstract Only

We present new results on the elemental abundances of galactic cosmic rays with atomic number, Z, greater than 30, and comparison of these observations with abundances expected from galactic propagation of various suggested models of the cosmic-ray source. We combine preliminary results from the 2003-04 flight of the Trans-Iron Galactic Element Recorder (TIGER) cosmic-ray detector with previously reported results from the 2001-02 flight. This instrument flew over Antarctica for nearly 32 days at a mean atmospheric depth of 5.2 mb in December 2001 - January 2002. At the time of submission of this abstract, January 8, 2004, TIGER was again in the air over Antarctica having completed 22 days of an expected 30day flight at a mean atmospheric depth of about 4 nb, Data from the first flight demonstrated excellent resolution of individual elements, and we expect similar resolution from the second flight.
Author
Abundance; Galactic Cosmic Rays; Atomic Structure

20040084515 Naval Observatory, Flaggstaff, AZ
Preliminary Parallaxes of 40 L and T Dwarfs from the US Naval Observatory Infrared Astronometry Program
Vrba, F. J.; Henden, A. A.; Liginbuhl, C. B.; Guetter, H. H.; Munn, J. A.; May 2004; 23 pp.; In English
Contract(s)/Grant(s): HST-HF-01137.01; NAS5-26555
Report No.(s): AD-A424036; No Copyright; Avail: CASI; A03, Hardcopy

We present preliminary trigonometric parallaxes and proper motions for 22 L dwarfs and 18 T dwarfs measured using the ASTROCAM infrared imager on the US naval Observatory (USNO) 1.55 m Strand Astrometric Reflector. The results presented here are based on observations obtained between 2000 September and 2002 November; about half of the objects have an observational time baseline of t 1:3 yr and half t 2:0 yr. Despite these short time baselines, the astrometric quality is sufficient to produce significant new results, especially for the nearer T dwarfs. Seven objects are in common with the USNO optical CCD parallax program for quality control and seven in common with the European Southern Observatory 3.5 m New Technology Telescope parallax program. We compare astrometric quality with both of these programs. Relative to absolute

parallax corrections are made by employing Two Micron All Sky Survey and/or Sloan Digital Sky Survey photometry for reference-frame stars. We combine USNO infrared and optical parallaxes with the best available California Institute of Technology (CIT) system photometry to determine MJ , MH, and MK values for 37 L dwarfs between spectral types L0 and L8 and 19 T dwarfs between spectral types T0.5 and T8 and present selected absolute magnitude versus spectral type and color diagrams, based on these results. Luminosities and temperatures are estimated for these objects. Of special interest are the distances of several objects that are at or near the L-T dwarf boundary so that this important transition can be better understood. The previously reported early to mid T dwarf luminosity excess is clearly confirmed and found to be present at J, H, and K. The large number of objects that populate this luminosity-excess region indicate that it cannot be due entirely to selection effects. The T dwarf sequence is extended to MJ 16:9 by 2MASS J041519 0935, which, at d 5:74 pc, is found to be the lluminous LOG (L=L)pa
DTIC
Dwarf Stars; Infrared Photography; Infrared Radiation; Observatories; Parallax; Photometry

20040084781 Space Telescope Science Inst., Baltimore, MD, USA
Supplementing the Digitized Sky Survey for UV-Mission Planning
McLean, Brian; July 26, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-12570; STScI Proj. J1020; No Copyright; Avail: CASI; A01, Hardcopy

The Space Telescope Science Institute worked on a project to augment the Digitized Sky Survey archive by completing the scanning and processing of the POSS-I blue survey. This will provide an additional valuable resource to support UV-mission planning. All of the data will be made available through the NASA optical/UV archive (MAST) at STScI. The activities completed during this project are included.
Derived from text
Mission Planning; Sky Surveys (Astronomy); Spaceborne Telescopes; Ultraviolet Radiation; Digital Systems

20040084801 Space Telescope Science Inst., Baltimore, MD, USA
Standardized Sky Partitioning for the Next Generation Astronomy and Space Science Archives
Lal, Nand, Technical Monitor; McLean, Brian; July 26, 2004; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8511; STScI Proj. J0187; No Copyright; Avail: CASI; A01, Hardcopy

The Johns Hopkins University and Space Telescope Science Institute are working together on this project to develop a library of standard software for data archives that will benefit the wider astronomical community. The ultimate goal was to develop and distribute a software library aimed at providing a common system for partitioning and indexing the sky in manageable sized regions and provide complex queries on the objects stored in this system. Whilst ongoing maintenance work will continue the primary goal has been completed. Most of the next generation sky surveys in the different wavelengths like 2MASS, GALEX, SDSS, GSC-II, DPOSS and FIRST have agreed on this common set of utilities. In this final report, we summarize work on the work elements assigned to the STScI project team.
Author
Computer Programs; Sky Surveys (Astronomy); Data Storage

20040085012 Air Force Inst. of Tech., Wright-Patterson AFB, OH
Axisymmetric Optical Membrane Modeling Based on Experimental Results
Lutz, Brian J.; Mar. 2004; 135 pp.; In English; Original contains color illustrations
Report No.(s): AD-A424343; AFIT/GAE/ENY/04-M11; No Copyright; Avail: CASI; A07, Hardcopy

The USA Air Force, Department of Defense and commercial industry have recognized the great value of near-earth space development, specifically in satellites for use in communications, ground and space surveillance and more active roles. However, resolution, or the primary optic s diameter, has been a limitation, especially for ground surveillance. Deployable optics has been investigated to allow larger optics in space and membrane optics has received increasing attention recently. The membrane's flexible nature requires some passive and possibly active control to reduce optical distortion caused by manufacturing, deployment, or other effects during use. Piezoelectric surface controllers are one option to actively control the membrane on the order of optical measurements (micron displacement or less). Multiple configurations of transverse displacements are feasible depending on the piezo zone locations and activation. The current thrust of industry is reducing the effort, time and cost of manufacturing and testing through use of computerized modeling and simulation; therefore, this was investigated for a membrane mirror and piezoelectric combination. Prior experiments using 6-inch diameter membranes have been conducted with an axisymmetric piezoelectric material layer on the non-optical surface. Various voltage differentials

were applied to the piezo and the transverse displacement was measured. A finite element code, using perturbation techniques, was written in MATLAB and tested to check the feasibility of using computer models for the micro- displacements occurring with the membrane-piezo lay-up. The computer program considered was developed for axisymmetric conditions; however, in many cases, these conditions tended to dominate. Under these conditions, the finite element code produces results that represent the axisymmetrically reduced expe
DTIC
Membranes

90
ASTROPHYSICS

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

20040084239 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The Structure and Evolution of the Universe
Sakimoto, Philip, Technical Monitor; Gould, Roy; June 1, 2004; 4 pp.; In English
Contract(s)/Grant(s): NCC5-706; No Copyright; Avail: CASI; A01, Hardcopy

Overview. The past year for the new SEU Forum has been a highly productive one and has moved us forward on three major objectives: Involving the public in the major scientific discoveries in our SEU theme this past year, especially the exciting discoveries about dark energy, cosmology, and black holes. Implementing the recommendations of the Knappenberger Report in order to strengthen the educational coherence of our collective activities. Developing strategic partnerships with underserved communities and other key customers . Among our activities for the past year are the following: Serving the Informal Science Education Communities: Summary of Goals, Plans and Activities for the Year 9/15/04 - 9/14/05. Interactions with the Space Science Community.
Derived from text
Evolution (Development); Universe; Cosmology

20040084294 Lockheed Martin Space Systems Co., Palo Alto, CA, USA
STEREO/SECCHI Coronagraph Hollow-Core Motor Development and Testing
Moore, Augustus S.; Price, Alexander D.; Akin, David J.; Horber, Ralph; 37th Aerospace Mechanisms Symposium; May 2004, pp. 15-27; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

A hollow-core motor was developed by the Lockheed Martin Solar and Astrophysics Laboratory for use in two coronagraph telescopes in the Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI) instrument suite on the two spacecraft of Solar Terrestrial Relations Observatory (STEREO). The HCM has a 48-mm aperture and rotates a polarizer on the optical axis of the telescopes. Here we describe the development of the mechanism and testing methods as well as the results of testing and life simulation. The HCM was proven to be robust and capable of performing in excess of its prime mission life. In addition, we present the limitations to the design and the lessons learned for future mechanisms.
Author
Astrophysics; Coronagraphs; Heliosphere; Solar Terrestrial Interactions; Telescopes; Motors

20040084308 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Iron K Lines from Accretion Disks: Models for Line Production and Spectroscopic Constraints
Kallman, Timothy; Palmeri, Patrick; [2004]; 2 pp.; In English; COSPAR, 18-25 Jul. 2004, Paris, France; No Copyright; Avail: Other Sources; Abstract Only

Measured profiles of the iron K lines provide important dynamical information about emitting matrial in compact objects. However, much of the modeling work which has been used to infer the location and origin of line observed from AGN and galactic black hole sources is based on highly simplified assumptions about the microphysics of K line emission. In particular, many of the intrinsic line energies, widths and emissivities are based on central-field atomic calculations. We present the results of new calculations of the quantities for the entire iron isonuclear sequence, and demonstrate that the intrinsic K line spectra contain considerably more complexity than has been previously considered. We also present calculations of iron K emission and absorption spectra which include the new data, including the local spectrum radiated from an X-ray illuminated accretion disk. The implications for the interpretation of observed iron K lines from black hole sources will be discussed.
Author
Absorption Spectra; Accretion Disks; Astronomical Models; K Lines

20040084309 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Extreme, Blueshifted Iron Line in the Narrow Line Seyfert 1 PG 1402+261

Reeves, J. N.; Porquet, D.; Turner, T. J.; [2004]; 14 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

We report on a short, XMM-Newton observation of the radio-quiet Narrow Line Seyfert 1 PG 1402+261. The EPIC X-ray spectrum of PG 1402+261 shows a strong excess of counts between 6 - 9 keV in the rest frame. This feature can be modeled by an unusually strong (equivalent width 2 keV) and very broad energy at 7.3 keV appears blue-shifted with respect to the iron Kalpha emission band between 6.4 - 6.97 keV, whilst the blue-wing of the line extends to 9 keV in the quasar rest frame. The line profile can be fitted by reflection from the inner accretion disk, but an inclination angle of greater than 60 degrees is required to model the extreme blue-wing of the line. Furthermore the extreme strength of the line requires a geometry whereby the hard X-ray emission from PG1402+261 above 2 keV is dominated by the pure-reflection component from the disk, whilst little or none of the direct hard power-law is observed. Alternatively the spectrum above 2 keV may instead be explained by an ionized absorber, if the column density is sufficiently high (NH greater than 3 x 10(exp 23) per square centimeter) and if the matter is ionized enough to produce a deep (tau approximately equal to 1) iron K-shell absorption edge at 9 keV. This absorber could originate in a large column density, high velocity outflow, perhaps similar to those which appear to be observed in several other high accretion rate AGN. Further observations, especially at higher spectral resolution, are required to distinguish between the accretion disk reflection or outflow scenarios.

Author

Iron; Seyfert Galaxies; Line Spectra; K Lines; Accretion Disks

20040084382 Smithsonian Astrophysical Observatory, Cambridge, MA, USA

XII Recontres De Blois

Kaluzienski, Louis, Technical Monitor; Forman, William; July 2004; 2 pp.; In English

Contract(s)/Grant(s): NAG5-11172; No Copyright; Avail: CASI; A01, Hardcopy

In the initial awarding of the grant, we had difficulty phasing our proposed support of graduate students, postdoctoral fellows and young US scientists with the meeting schedule and the grant cycle. Initially, the grant arrived too late to support the meeting. The following year, a combination of the renewal process and the meeting announcement prevented us from announcing the support opportunity sufficiently in advance to allow us to make awards and provide support. As described in the initial proposal, the Moriond and Blois meetings are a unique opportunity for younger researchers to make oral presentations of their work at an international venue. As noted above, the phasing of meetings combined with the difficulty of arranging foreign travel for scientists at other institutions precluded the possibility of supporting the proposed meetings and providing young US scientists and post-doctoral fellows support to attend these meetings.

Author

Students; Conferences

20040084430 NASA Ames Research Center, Moffett Field, CA, USA

The Composition of Dust in the Interstellar Medium

Sandford, Scott A.; [2000]; 1 pp.; In English; Galactic Structure, Stars and the Interstellar Medium, 27 May - 2 Jun. 2000, Jackson Lake, WY, USA

Contract(s)/Grant(s): RTOP 344-37-44-01; No Copyright; Avail: Other Sources; Abstract Only

In this talk I will review our current knowledge of the composition, abundance, and distribution of organic and related compounds in the diffuse and dense interstellar media (ISM) of our galaxy. This knowledge is the result of a combined effort of practitioners of telescopic observation, theory, and laboratory studies. We are increasingly coming to understand that the population of organic materials in space is complex and that it contains molecular species that are of direct interest to the fields not only of astrophysics and astrochemistry, but also astrobiology. In this talk I will concentrate my discussion on the various chemical processes that occur in the ISM, the classes of compounds they produce, and the various @-pes of evidence that we have that some of these materials survive incorporation into newly forming stellar/planetary systems. Finally, I will end with some comments on the possible implications of these materials for the origin of life.

Author

Stellar Systems; Organic Materials; Molecular Gases; Exobiology; Chemical Reactions

20040084700 Stanford Linear Accelerator Center, Stanford, CA, USA

Observations of Cluster Substructure Using Weakly Lensed Sextupole Moments

Irwin, J.; Shmakova, M.; Jul. 2003; In English

Report No.(s): DE2003-815232; SLAC-PUB-10076; No Copyright; Avail: National Technical Information Service (NTIS)

Since dark matter clusters and groups may have substructure, we have examined the sextupole content of Hubble images looking for a curvature signature in background galaxies that would arise from galaxy-galaxy lensing. We describe techniques for extracting and analyzing sextupole and higher weakly lensed moments. Indications of substructure, via spatial clumping of curved background galaxies, were observed in the image of CL0024 and then surprisingly in both Hubble deep fields. We estimate the dark cluster masses in the deep field. Alternatives to a lensing hypothesis appear improbable, but better statistics will be required to exclude them conclusively. Observation of sextupole moments would then provide a means to measure dark matter structure on smaller length scales than heretofore.
NTIS
Galaxies; Substructures; Dark Matter

20040084709 Massachusetts Inst. of Tech., Cambridge, MA, USA
Complexity Induced Anisotropic Bimodal Intermittent Turbulence in Space Plasmas
Chang, Tom; Tam, Sunny W. Y.; Wu, Cheng-Chin; [2004]; 41 pp.; In English
Contract(s)/Grant(s): NAG5-9117; No Copyright; Avail: CASI

The ″physics of complexity″ in space plasmas is the central theme of this exposition. It is demonstrated that the sporadic and localized interactions of magnetic coherent structures arising from the plasma resonances can be the source for the coexistence of nonpropagating spatiotemporal fluctuations and propagating modes. Non-Gaussian probability distribution functions of the intermittent fluctuations from direct numerical simulations are obtained and discussed. Power spectra and local intermittency measures using the wavelet analyses are presented to display the spottiness of the small-scale turbulent fluctuations and the non-uniformity of coarse-grained dissipation that can lead to magnetic topological reconfigurations. The technique of the dynamic renormalization group is applied to the study of the scaling properties of such type of multiscale fluctuations. Charged particle interactions with both the propagating and nonpropagating portions of the intermittent turbulence are also described.
Author
Anisotropy; Intermittency; Space Plasmas; Turbulence; Mathematical Models

20040084821 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
Quasar Absorption Studies
Mushotzky, Richard, Technical Monitor; Elvis, Martin; July 2004; 6 pp.; In English
Contract(s)/Grant(s): NAG5-13160; No Copyright; Avail: CASI; A02, Hardcopy

The aim of the proposal is to investigate the absorption properties of a sample of inter-mediate redshift quasars. The main goals of the project are: Measure the redshift and the column density of the X-ray absorbers; test the correlation between absorption and redshift suggested by ROSAT and ASCA data; constrain the absorber ionization status and metallicity; constrain the absorber dust content and composition through the comparison between the amount of X-ray absorption and optical dust extinction. Unanticipated low energy cut-offs where discovered in ROSAT spectra of quasars and confirmed by ASCA, BeppoSAX and Chandra. In most cases it was not possible to constrain adequately the redshift of the absorber from the X-ray data alone. Two possibilities remain open: a) absorption at the quasar redshift; and b) intervening absorption. The evidences in favour of intrinsic absorption are all indirect. Sensitive XMM observations can discriminate between these different scenarios. If the absorption is at the quasar redshift we can study whether the quasar environment evolves with the Cosmic time.
Derived from text
Quasars; X Ray Absorption; Red Shift

20040085399 New Mexico Univ., Albuquerque, NM, USA
In Situ Determination of Fe(+3)/Sigma Fe of Spinels by Electron Microprobe: An Evaluation of the Flank Method
Berlin, J.; Spilde, M.; Brearley, A. J.; Draper, D. S.; Dyar, M. D.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 12; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

In the past decade, progress has been made in the in situ determination of Fe3+/(Sigma)Fe ratios of minerals (which can be used to infer oxygen fugacity, fO2) with techniques such as TEM-EELS, Mossbauer milliprobe, and microXanes. In addition, electron microprobes can measure the intensity change and shift of the L lines with the oxidation state of iron. We are currently investigating potential applications of the Flank method to geologic problems. Our goal is to evaluate whether

the Flank method can be used to detect variation of Fe3+/(Sigma)Fe (and hence fO2) in spinel grains from terrestrial mantle xenoliths.
Derived from text
Iron; Inclusions; Oxidation; In Situ Measurement

20040085412 Eidgenoessische Technische Hochschule, Zurich, Switzerland
The Effect of Oxygen Fugacity on Large-Strain Deformation and Recrystallization of Olivine
Bystricky, M.; Kunze, K.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 13; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The rheological properties of olivine, the most abundant phase in the Earth upper mantle, are likely to govern mantle dynamics. In particular, the development of crystallographic preferred orientations ((CPOs) in olivine during deformation and recrystallization gives rise to seismic anisotropy in the mantle. Recent experimental studies have shown that different CPOs develop at large strains for dry olivine, wet olivine and olivine with melt. In this study, we have focused on the effect of oxygen fugacity on the deformation and recrystallization of dry olivine.
Derived from text
Olivine; Oxygen; Recrystallization; Rheology

20040085419 California Univ., San Diego, La Jolla, CA, USA
Mass Independent Isotopes and Applications to Planetary Atmospheres
Thiemens, M. H.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 63; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

With the discovery of the mass independent isotopic fractionation process by Thiemens and Heidenreich in 1983, a new technique to understand various natural processes became available. Since that time, a quantum mechanical basis for understanding this effect became available. This has strengthened the ability to understand how this unique fractionation process may occur in nature. it has now been demonstrated that for example, in the Earth's atmosphere, every oxygen bearing molecule, with the exception of water, is mass independently fractionated. The molecules include: CO, CO2, O2, O3 , H2O2, N2O and solid aerosol nitrate and sulfate. From ice core studies, the evolution of the oxidative capacity of the Earth has now been tracked and quantified on a less than 100,000 year time scale. The analysis of sulfate and nitrates has provided a unique way to understand and quantify the alterations in the oxidative capacity of the earth. In addition, the measurements have lead to a highly specific quantification of oxidative processes and their chemical reaction mechanisms, e.g. relative roles of homegenous and heterogenous oxidation. From oxygen isotopic analysis of secondary minerals from SNC meteorites, the interaction between the atmosphere and regolith has been resolved at a much higher degree of specificity. This work has shown that the record of the planetary processes may be captured in the isotopic record and maintained on billion year time scales. In sum, the use of mass independent isotopic measurements has provided new details regarding a wide range of natural processes in the atmosphere, hydrosphere, and geosphere. In the future, such measurements will amplify understanding of planetary bodies, their interactions and evolution. Future return sample missions will additionally benefit from these measurements.
Author
Isotopes; Planetary Atmospheres; Fractionation; Nitrogen Oxides; Reaction Kinetics; SNC Meteorites

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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*.

20040084282 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Deployment Process, Mechanization, and Testing for the Mars Exploration Rovers
Iskenderian, Ted; 37th Aerospace Mechanisms Symposium; May 2004, pp. 197-210; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

NASA's Mar Exploration Rover (MER) robotic prospectors were produced in an environment of unusually challenging schedule, volume, and mass restrictions. The technical challenges pushed the system s design towards extensive integration of function, which resulted in complex system engineering issues. One example of the system's integrated complexity can be found in the deployment process for the rover. Part of this process, rover ″standup″, is outlined in this paper. Particular

attention is given to the Rover Lift Mechanism's (RLM) role and its design. Analysis methods are presented and compared to test results. It is shown that because prudent design principles were followed, a robust mechanism was created that minimized the duration of integration and test, and enabled recovery without perturbing related systems when reasonably foreseeable problems did occur. Examples of avoidable, unnecessary difficulty are also presented.
Author
Mars Exploration; Roving Vehicles; Design Analysis; Complex Systems; Robotics

20040084283 Aeroflex, Inc., Hauppauge, NY, USA
Development of Mars Exploration Rover Lander Petal Actuators
Sharif, Boz; Joscelyn, Ed; 37th Aerospace Mechanisms Symposium; May 2004, pp. 211-220; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

The twin robotic missions ″Spirit″ and ″Opportunity″ were launched in the summer of 2003 as part of the MER (Mars Exploration Rover) project for a rendezvous with Mars in early 2004. These identical twin rovers were designed to prospect the surface of Mars for evidence of past geological activity related to presence of liquid water. The mission was modeled after the successful ″Pathfinder″ mission that delivered the ″Sojourner″ rover to the surface of Mars in 1997. The new rovers are much larger and heavier than the ″Sojourner″ and are equipped with a large array of scientific instruments as well as communication gear for direct transmission of data back to Earth. The landing vehicles have also grown in size to accommodate the new rover configuration. After the Lander makes its hard landing protected by a cocoon of air bags, it is the job of any one of the 3 Lander Petal Actuators (LPA s) to right the spacecraft, if necessary, and open the remaining petals to allow deployment of the rover onto the surface of the red planet.
Author
Mars Exploration; Roving Vehicles; Rover Project; Planetary Surfaces; Mars Surface; Actuators

20040084284 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Challenges of Designing the Rocker-Bogie Suspension for the Mars Exploration Rover
Harrington, Brian D.; Voorhees, Chris; 37th Aerospace Mechanisms Symposium; May 2004, pp. 185-195; In English; See also 20040084272; No Copyright; Avail: CASI; A03, Hardcopy

Over the past decade, the rocker-bogie suspension design has become a proven mobility application known for its superior vehicle stability and obstacle-climbing capability. Following several technology and research rover implementations, the system was successfully flown as part of Mars Pathfinder s Sojourner rover. When the Mars Exploration Rover (MER) Project was first proposed, the use of a rocker-bogie suspension was the obvious choice due to its extensive heritage. The challenge posed by MER was to design a lightweight rocker-bogie suspension that would permit the mobility to stow within the limited space available and deploy into a configuration that the rover could then safely use to egress from the lander and explore the Martian surface. This paper will describe how the MER rocker-bogie suspension subsystem was able to meet these conflicting design requirements while highlighting the variety of deployment and latch mechanisms employed in the design.
Author
Mars Exploration; Rover Project; Mars Surface; Mobility

20040084371 NASA Ames Research Center, Moffett Field, CA, USA
Structural Characterization of Crystalline Ice Nanoclusters
Blake, David; [2000]; 2 pp.; In English; Structural Characterization of Crytalline Ice nanoclusters, 26-29 Mar. 2000, MD, USA
Contract(s)/Grant(s): RTOP 344-38-12-06; No Copyright; Avail: Other Sources; Abstract Only

Water ice nanoclusters are useful analogs for studying a variety of processes that occur within icy grains in the extraterrestrial environment. The surface of ice nanoclusters prepared in the laboratory is similar to the surface of interstellar ice grains. In cold molecular clouds, the silicate cores of interstellar grains are typically approx. 100 nm in diameter and have a coating of impure amorphous water ice. Depositional, thermal and radiolytic processes leave the surface and subsurface molecules in a disordered state. In this state, structural defects become mobile and reactions of trapped gases and small molecules can occur. The large surface area of nanocluster deposits relative to their bulk allows for routine observation of such surface-mediated processes. Furthermore, the disordered surface and subsurface layers in nanocluster deposits mimic the structure of amorphous ice rinds found on interstellar dust grains. Transmission Electron Microscopy (TEM has been used tn characterize the crystallinity, growth mechanism, and size distribution of nanoclusters formed from a mixture of water vapor with an inert carrier gas that has been rapidly cooled to 77K. E M imaging reveals a Gaussian size distribution around a modal

diameter that increases from approx. 15 to 30 nm as the percentage of water vapor within the mixture increases from 0.5 to 2.007, respectively . TEM bright and dark field imaging also reveals the crystalline nature of the clusters. h4any of the clusters show a mosaic structure in which crystalline domains originate at the center Other images show mirror planes that are separated by approx. 10 nm. Electron diffraction patterns of these clusters show that the clusters are composed of cubic ice with only a small hexagonal component. Further, the crystalline domain size is approximately the same as the modal diameter suggesting that the clusters are single crystals.
Author
Ice; Extraterrestrial Environments; Clusters; Interstellar Matter

20040084414 Massachusetts Univ., Amherst, MA, USA
Planetary Geology and Geophysics Program
McGill, George E.; [2004]; 2 pp.; In English
Contract(s)/Grant(s): NAG5-8909; No Copyright; Avail: CASI; A01, Hardcopy

Geological mapping and topical studies, primarily in the southern Acidalia Planitia/Cydonia Mensae region of Mars is presented. The overall objective was to understand geologic processes and crustal history in the northern lowland in order to assess the probability that an ocean once existed in this region. The major deliverable is a block of 6 1:500,000 scale geologic maps that will be published in 2004 as a single map at 1:1,000,000 scale along with extensive descriptive and interpretive text. A major issue addressed by the mapping was the relative ages of the extensive plains of Acidalia Planitia and the knobs and mesas of Cydonia Mensae. The mapping results clearly favor a younger age for the plains. Topical studies included a preliminary analysis of the very abundant small domes and cones to assess the possibility that their origins could be determined by detailed mapping and remote-sensing analysis. We also tested the validity of putative shorelines by using GIs to co-register full-resolution MOLA altimetry data and Viking images with these shorelines plotted on them. Of the 3 proposed shorelines in this area, one is probably valid, one is definitely not valid, and the third is apparently 2 shorelines closely spaced in elevation. Publications supported entirely or in part by this grant are included.
Author
Geophysics; Mars Surface; Planetary Geology; Remote Sensing; Thematic Mapping

20040084427, NASA Ames Research Center, Moffett Field, CA, USA
Maghemite Formation via Organics and the Prospect for Maghemite as a Biomarker Mineral on Mars
Bishop, Janice; Mancinelli, R. L.; Madsen, M. B.; Zent, A. P.; March 07, 2000; 1 pp.; In English; Astrobiology Science Conference, 3-5 Apr. 2000, Moffett Field, CA, USA
Contract(s)/Grant(s): NCC2-1100; RTOP 344-34-00-02; Copyright; Avail: Other Sources; Abstract Only

One of the major questions on Mars is the origin of the magnetic component in the surface material. Our work on maghemite formation suggests that alteration of femhydrite in the presence of organics would provide a plausible formation scenario for this magnetic soil component and further suggests that maghemite might be an important biomarker mineral on Mars. Identification of biomarker minerals is an important aspect of Astrobiology . The iron oxide mineral maghemite is thought to be one of the magnetic components in the Martian surface material; however, it is a rare mineral on the Earth and requires a reducing agent for synthesis. Organic material serves as a reductant in maghemite formation during forest fires on Earth and may play an important role in maghemite formation on Mars through low-temperature heating (e.g., volcanism, impacts). This study involves analysis of magnetite, maghemite and hematite formation under Martian environmental conditions from femhydrite in the presence and absence of organics. A dehydrated version of the mineral femhydrite is thought to be present in Martian soil/dust grains and could have formed at an earlier time on Mars when water was present. Our work indicates that low-temperature alteration of femhydrite in the presence of organic material could be an important mechanism on Mars.
Author
Minerals; Mars Environment; Magnetite; Hematite; Biomarkers; Mars Surface

20040084462 NASA Ames Research Center, Moffett Field, CA, USA
Glycine Ablation during Comet/Meteoroid Impact
Huo, Winifred M.; Dateo, Christopher E.; Mckay, Christopher P.; Borucki, William J.; March 11, 2004; 1 pp.; In English; Astrobiology Science Conference 2004, 28 Mar. - 1 Apr. 2004, Moffett Field, CA, USA
Contract(s)/Grant(s): RTOP 344-58-12; No Copyright; Avail: Other Sources; Abstract Only

Amino acids and other organic compounds important to the chemistry of life are thought to have been delivered to early

Earth by asteroids and comets. The survivability of such compounds upon high speed entry is not well understood. If molecular processing occurs during entry, the nature of the new molecules produced by such processing is also an open question. To address this question, we have initiated a study of the ablation of glycine, the simplest amino acid, upon the high speed entry of a comet or meteoroid into an atmosphere. The study assumes glycine is distributed on the surface of the comet/meteoroid. The high speed impact creates electrons, ions, and radicals in the atmosphere that react with the surface and either desorb glycine or break it up. The ablation process is studied as a function of entry speed and atmospheric composition. The AURORA code from the commercially available software package CHEMKIN is used in the study.
Author
Ablation; Comets; Glycine; Hypervelocity Impact; Meteoroids; Abiogenesis

20040084463 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Forward Contamination of the Moon and Mars: Implications for Future Life Detection Missions
Glavin, Daniel P.; Dworkin, Jason P.; Lupisella, Mark; Kminek, Gerhard; Rummel, John D.; [April 28, 2004]; 15 pp.; In English; Copyright; Avail: CASI; A03, Hardcopy

NASA and ESA have outlined new visions for solar system exploration that will include a series of lunar robotic missions to prepare for, and support a human return to the Moon, and future human exploration of Mars and other destinations. One of the guiding principles for exploration is to pursue compelling scientific questions about the origin and evolution of life. The search for life on objects such as Mars will require that all spacecraft and instrumentation be sufficiently cleaned and sterilized prior to launch to ensure that the scientific integrity of extraterrestrial samples is not jeopardized by terrestrial organic contamination. Under COSPAR's current planetary protection policy for the Moon, no sterilization procedures are required for outbound lunar spacecraft. Nonetheless, future in situ investigations of a variety of locations on the Moon by highly sensitive instruments designed to search for biologically derived organic compounds would help assess the contamination of the Moon by lunar spacecraft. These studies could also provide valuable ″ground truth″ data for Mars sample return missions and help define planetary protection requirements for future Mars bound spacecraft carrying life detection experiments. In addition, studies of the impact of terrestrial contamination of the lunar surface by the Apollo astronauts could provide valuable data to help refine future Mars surface exploration plans for a human mission to Mars.
Author
Lunar Spacecraft; Mars Missions; Planetary Protection; Space Exploration; Moon

20040084550 NASA Ames Research Center, Moffett Field, CA, USA
From Interstellar Polycyclic Aromatic Hydrocarbons and Ice to the Origin of Life
Allamandola, Louis; [2004]; 2 pp.; In English; Department Colloquium Series, 21-23 Mar. 2000, Atlanta, Ga, USA
Contract(s)/Grant(s): RTOP 344-50-92-02; No Copyright; Avail: Other Sources; Abstract Only

Tremendous strides have been made in our understanding of interstellar material over the past twenty years thanks to significant, parallel developments in observational astronomy and laboratory astrophysics. Twenty years ago the composition of interstellar dust was largely guessed at, the concept of ices in dense molecular clouds ignored, and the notion of large, abundant, gas phase, carbon rich molecules widespread throughout the interstellar medium (ISM) considered impossible. Today the composition of dust in the diffuse ISM is reasonably well constrained to cold refractory materials comprised of amorphous and crystalline silicates mixed with an amorphous carbonaceous material containing aromatic structural units and short, branched aliphatic chains. In the dense ISM, the birthplace of stars and planets, these cold dust particles are coated with mixed molecular ices whose composition is very well constrained. Lastly, the signature of carbon-rich polycyclic aromatic hydrocarbons (PAHs), shockingly large molecules by early interstellar chemistry standards, is widespread throughout the Universe. The first part of this talk will describe how infrared studies of interstellar space, combined with laboratory simulations, have revealed the composition of interstellar ices (the building blocks of comets) and the high abundance and nature of interstellar PAHs. The laboratory database has now enabled us to gain insight into the identities, abundances, and physical state of many interstellar materials. Within a dense molecular cloud, and especially in the presolar nebula, the materials frozen into the interstellar/precometary ices are photoprocessed by ultraviolet light and produce more complex molecules. The remainder of the presentation will focus on the photochemical evolution of these materials and the possible role of these compounds on the to the carbonaceous components of micrometeorites, they are likely to have been important sources of complex materials on the early Earth and their composition may be related to the origin of life.
Author
Biological Evolution; Ice; Interstellar Matter; Polycyclic Aromatic Hydrocarbons; Laboratory Astrophysics

20040084685 Proxemy Research, Inc., Laytonsville, MD, USA
Quantitative Studies in Planetary Volcanism
Baloga, Stephen M.; July 31, 2004; 9 pp.; In English
Contract(s)/Grant(s): NAGW-10530
Report No.(s): E04-001; No Copyright; Avail: CASI; A02, Hardcopy

Proxemy Research has a research grant to perform scientific investigations of volcanism and volcanic-related process on other planets. Part of this research involves mathematical modeling of specific volcanic transport processes and the use of terrestrial analogs. This report contains a summary of activities conducted over the time period indicated. In addition, a synopsis of science research conducted during the period is given. A complete listing of publications and scientific abstracts that were presented at scientific conferences is contained in the report.
Author
Volcanology; Planetary Geology; Mathematical Models; Conferences

20040084688 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Hot Shot
Covault, Craig; Aviation Week and Space Technology; July 26, 2004; Volume 161, No. 4, pp. 58-59; In English; Copyright; Avail: Other Sources

The NASA Messenger spacecraft is ready for launch to Mercury on a mission researchers hope will unravel why the closest planet to the Sun is so dramatically different from its siblings - Earth, Venus and Mars - all born from the same solar nebula 5 billion years ago. The NASA/Johns Hopkins Applied Physics Laboratory (APL) spacecraft is to lift off here Aug. 2 at 2:16 a.m. EDT on a Boeing Delta II Heavy booster. Development of the $426-million mission has involved 800 people from 50 contractors and organizations spread across 24 U.S. states and six countries. Canadian, Italian and German companies are among the major contractors.
Author
Space Probes; Mercury (Planet)

20040084694 Naval Observatory, Washington, DC
Nautical Almanac for the Year 2005
2004; 364 pp.; In English
Report No.(s): PB2004-105005; Copyright; Avail: National Technical Information Service (NTIS)

This publication locates essential astronomical information for navigation at sea or anyone interested in astronomy. It contains tabulations for the sun, moon, planets, and stars; times of sunrise, sunset, twilights, moonrise and moonset; aids for identifying stars and planets; and standard times of most countries.
NTIS
Astronomical Catalogs; Navigation

20040084702 Stanford Linear Accelerator Center, Stanford, CA, USA
Laboratory Investigations of the Extreme Universe
Chen, P.; 2003; In English
Report No.(s): DE2003-815245; SLAC-PUB-10097; No Copyright; Avail: National Technical Information Service (NTIS)

Recent years have seen tremendous progress in our understanding of the extreme universe, which in turn points to even deeper questions to be further addressed. History has shown that the symbiosis between direct observations and laboratory investigation is instrumental in the progress of astrophysics. Current frontier astrophysical phenomena related to particle astrophysics and cosmology typically involve one or more of the following conditions: (1) extremely high energy events; (2) very high density, high temperature processes; (3) super strong field environments. Laboratory experiments using high intensity lasers and particle beams can calibrate astrophysical observation or detection processes, investigate the underlying dynamics of astrophysical phenomena, and probe into fundamental physics in extreme limits. We give examples of possible laboratory experiments that investigate into the extreme universe.
NTIS
High Power Lasers; Observation; Particle Beams; Universe

20040084708 NASA Ames Research Center, Moffett Field, CA, USA

A Model for Formation of Dust, Soil and Rock Coatings on Mars: Physical and Chemical Processes on the Martian Surface

Bishop, Janice; Murchie, Scott L.; Pieters, Carle M.; Zent, Aaron P.; September 04, 2001; 39 pp.; In English

Contract(s)/Grant(s): NAG5-3871; RTOP 344-34-21-10; Copyright; Avail: CASI; A03, Hardcopy

This model is one of many possible scenarios to explain the generation of the current surface material on Mars using chemical, magnetic and spectroscopic data From Mars and geologic analogs from terrestrial sites. One basic premise of this model is that the dust/soil units are not derived exclusively from local rocks, but are rather a product of global, and possibly remote, weathering processes. Another assumption in this model is that there are physical and chemical interactions of the atmospheric dust particles and that these two processes create distinctly different results on the surface. Physical processes distribute dust particles on rocks and drift units, forming physically-aggregated layers; these are reversible processes. Chemical reactions of the dust/soil particles create alteration rinds on rock surfaces and cohesive, crusted surface units between rocks, both of which are relatively permanent materials. According to this model the dominant components of the dust/soil particles are derived from alteration of volcanic ash and tephra, and contain primarily nanophase and poorly crystalline ferric oxides/oxyhydroxide phases as well as silicates. These phases are the alteration products that formed in a low moisture environment. These dust/soil particles also contain a smaller amount of material that was exposed to more water and contains crystalline ferric oxides/oxyhydroxides, sulfates and clay silicates. These components could have formed through hydrothermal alteration at steam vents or fumeroles, thermal fluids, or through evaporite deposits. Wet/dry cycling experiments are presented here on mixtures containing poorly crystalline and crystalline ferric oxides/oxyhydroxides, sulfates and silicates that range in size from nanophase to 1-2 pm diameter particles. Cemented products of these soil mixtures are formed in these experiments and variation in the surface texture was observed for samples containing smectites, non-hydrated silicates or sulfates. Reflectance spectra were measured of the initial particulate mixtures, the cemented products and ground versions of the cemented material. The spectral contrast in the visible/near-infrared and mid-infrared regions is significantly reduced for the cemented material compared to the initial soil, and somewhat reduced for the ground, cemented soil compared to the initial soil. The results of this study suggest that diurnal and seasonal cycling on Mars will have a profound effect on the texture and spectral properties of the dust/soil particles on the surface. The model developed in this study provides an explanation for the generation of cemented or crusted soil units and rock coatings on Mars and may explain albedo variations on the surface observed near large rocks or crater rims.

Author

Dust; Mars Surface; Planetary Geology; Sedimentary Rocks; Soils; Chemical Composition; Physical Properties; Models

20040084783 Space Telescope Science Inst., Baltimore, MD, USA

Infrared Observations of Cometary Dust and Nuclei

Lisse, Carey; January 2004; 5 pp.; In English

Contract(s)/Grant(s): NAG5-9006; No Copyright; Avail: CASI; A01, Hardcopy

This bibliography lists citations for publications published under the grant. Subjects of the publications include cometary dust, instellar and interplanetary dust, comet nuclei and comae, Comet Hale-Bopp, infrared observations of comets, mass loss, and comet break-up.

Author

Infrared Astronomy; Comets; Comet Nuclei; Cosmic Dust; Bibliographies

20040085378 Atmospheric and Environmental Research, Inc., Lexington, MA, USA

Two-Dimensional Transport Studies for the Composition and Structure of the Io Plasma Torus

Smyth, William H.; July 16, 2004; 9 pp.; In English

Contract(s)/Grant(s): NASW-02036; NASW-02003

Report No.(s): P-1037; No Copyright; Avail: CASI; A02, Hardcopy

Research efforts in the second quarter have been focused upon a preliminary exploration of the likely impact of Europs's local atmospheres and neutral clouds on the plasma torus and the initiation of an assessment of the basic nature of the radial structure of the electron density in the plasma torus during the JO encounter of the Galileo spacecraft with Jupiter.

Author

Io; Toroidal Plasmas; Europa; Planetary Structure; Two Dimensional Models

20040085398 Lunar and Planetary Inst., Houston, TX, USA

Workshop on Oxygen in the Terrestrial Planets

2004; ISSN 0161-5297; 75 pp.; In English; Workshop on Oxygen in the Terrestrial Planets, 20-23 Jul. 2004, Santa Fr, NM, USA; See also 20040085399 - 20040085455

Contract(s)/Grant(s): NCC5-679

Report No.(s): LPI-Contrib-1203; Copyright; Avail: CASI; A04, Hardcopy

This volume contains abstracts that have been accepted for presentation at the Workshop on Oxygen in the Terrestrial Planets, July 20-23,2004, Santa Fe, New Mexico. The contents include: 1) Experimental Constraints on Oxygen and Other Light Element Partitioning During Planetary Core Formation; 2) In Situ Determination of Fe(3+)/SigmaFe of Spinels by Electron Microprobe: An Evaluation of the Flank Method; 3) The Effect of Oxygen Fugacity on Large-Strain Deformation and Recrystallization of Olivine; 4) Plagioclase-Liquid Trace Element Oxygen Barometry and Oxygen Behaviour in Closed and Open System Magmatic Processes; 5) Core Formation in the Earth: Constraints from Ni and Co; 6) Oxygen Isotopic Compositions of the Terrestrial Planets; 7) The Effect of Oxygen Fugacity on Electrical Conduction of Olivine and Implications for Earth s Mantle; 8) Redox Chemical Diffusion in Silicate Melts: The Impact of the Semiconductor Condition; 9) Ultra-High Temperature Effects in Earth s Magma Ocean: Pt and W Partitioning; 10) Terrestrial Oxygen and Hydrogen Isotope Variations: Primordial Values, Systematics, Subsolidus Effects, Planetary Comparisons, and the Role of Water; 11) Redox State of the Moon s Interior; 12) How did the Terrestrial Planets Acquire Their Water?; 13) Molecular Oxygen Mixing Ratio and Its Seasonal Variability in the Martian Atmosphere; 14) Exchange Between the Atmosphere and the Regolith of Mars: Discussion of Oxygen and Sulfur Isotope Evidence; 15) Oxygen and Hydrogen Isotope Systematics of Atmospheric Water Vapor and Meteoric Waters: Evidence from North Texas; 16) Implications of Isotopic and Redox Heterogeneities in Silicate Reservoirs on Mars; 17) Oxygen Isotopic Variation of the Terrestrial Planets; 18) Redox Exchanges in Hydrous Magma; 19) Hydrothermal Systems on Terrestrial Planets: Lessons from Earth; 20) Oxygen in Martian Meteorites: A Review of Results from Mineral Equilibria Oxybarometers; 21) Non-Linear Fractionation of Oxygen Isotopes Implanted in Lunar Metal Grains: Solar, Lunar or Terrestrial Origin? 22) Isotopic Zoning in the Inner Solar System; 23) Redox Conditions on Small Bodies; 24) Determining the Oxygen Fugacity of Lunar Pyroclastic Glasses Using Vanadium Valence - An Update; 25) Mantle Redox Evolution and the Rise of Atmospheric O2; 26) Variation of Kd for Fe-Mg Exchange Between Olivine and Melt for Compositions Ranging from Alkaline Basalt to Rhyolite; 27) Determining the Partial Pressure of Oxygen (PO,) in Solutions on Mars; 28) The Influence of Oxygen Environment on Kinetic Properties of Silicate Rocks and Minerals; 29) Redox Evolution of Magmatic Systems; 30) The Constancy of Upper Mantlefo, Through Time Inferred from V/Sc Ratios in Basalts: Implications for the Rise in Atmospheric 0 2; 31) Nitrogen Solubility in Basaltic Melt. Effects of Oxygen Fugacity, Melt Composition and Gas Speciation; 32) Oxygen Isotope Anomalies in the Atmospheres of Earth and Mars; 33) The Effect of Oxygen Fugacity on Interdiffusion of Iron and Magnesium in Magnesiowiistite 34) The Calibration of the Pyroxene Eu-Oxybarometer for the Martian Meteorites; 35) The Europium Oxybarometer: Power and Pitfalls; 36) Oxygen Fugacity of the Martian Mantle from PigeoniteMelt Partitioning of Samarium, Europium and Gadolinium; 37) Oxidation-Reduction Processes on the Moon: Experimental Verification of Graphite Oxidation in the Apollo 17 Orange Glasses; 38) Oxygen and Core Formation in the Earth; 39) Geologic Record of the Atmospheric Sulfur Chemistry Before the Oxygenation of the Early Earth s Atmosphere; 40) Comparative Planetary Mineralogy: V/(CrCAl) Systematics in Chromite as an Indicator of Relative Oxygen Fugacity; 41) How Well do Sulfur Isotopes Constrain Oxygen Abundance in the Ancient Atmospheres? 42) Experimental Constraints on the Oxygen Isotope (O-18/ O-16) Fractionation in the Ice vapor and Adsorbant vapor Systems of CO2 at Conditions Relevant to the Surface of Mars; 43) Micro-XANES Measurements on Experimental Spinels andhe Oxidation State of Vanadium in Spinel-Melt Pairs; 44) Testing the Magma Ocean Hypothesis Using Metal-Silicate Partitioning of Te, Se and S; 45) Solubility of Oxygen in Liquid Iron at High Pressure and Consequences for the Early Differentiation of Earth and Mars Metallic Liquid Segregation in Planetesimals; 46) Oxygen Fugacity of Lunar Basalts and the Lunar Mantle. Range of fo2 and the Effectiveness of Oxybarometers; 47) Thermodynamic Study of Dissociation Processes of Molecular Oxygen in Vapor over Oxide Compounds; 48) Oxygen Profile of a Thermo-Haliophilic Community in the Badwater Salt Flat; 49) Oxygen Barometry Using Synchrotron MicroXANES of Vanadium; 50) Mass-Independent Isotopic Fractionation of Sulfur from Sulfides in the Huronian Supergroup, Canada; 51) Mass Independent Isotopes and Applications to Planetary Atmospheres; 52) Electrical Conductivity, Oxygen Fugacity, and Mantle Materials; 53) Crustal Evolution and Maturation on Earth: Oxygen Isotope Evidence; 54) The Oxygen Isotope Composition of the Moon: Implications for Planet Formation; 55) Oxygen Isotope Composition of Eucrites and Implications for the Formation of Crust on the HED Parent Body; and 56) The Role of Water in Determining the Oxygen Isotopic Composition of Planets.

CASI

Terrestrial Planets; Planetary Geology; Oxygen Isotopes; Mineralogy

20040085400 Arizona Univ., Tucson, AZ, USA

How did the Terrestrial Planets Acquire Their Water?

Drake, M. J.; Stimpfl, M.; Lauretta, D. S.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 22; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

There is no consensus on the origin of water in the terrestrial planets. Earth demonstrably has water. Odyssey has shown vast water ice sheets buried under a thin layer of dust polewards of about 60 deg. of latitude in both hemispheres of Mars. The D/H ratio of Venus is about 100 times that of Earth's oceans, and is plausibly explained by loss of H2O through UV photodissociation at the top of the Venus atmosphere. Mercury and the Moon appear to be bone dry, possibly due to volatile loss in giant impacts.

Derived from text

Terrestrial Planets; Water; Venus Atmosphere; Oceans; Dust

20040085401 Lunar and Planetary Inst., Houston, TX, USA

The Effect of Oxygen Fugacity on Interdiffusion of Iron and Magnesium in Magnesiowustite

Mackwell, S. J.; Bystricky, M.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 44; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Magnesiowustite is the second most abundant mineral in the lower mantle of Earth and presumably Venus. As such it chemical, physical and mechanical properties will exert a significant influence on this region of the planets' interiors. Like most iron-bearing minerals, magnesiowustite possesses considerable non-stoichiometry, due to the presence of octahedral cation (metal) vacancies that charge compensate for ferric iron, which occupies either nominally 2+ octahedral cation sites, or tetrahedrally coordinated interstitial sites. Past research has demonstrated that the degree of non-stoichiometry increases with increasing iron content and oxygen fugacity, and decreases with increasing temperature and pressure. This non-stoichiometry exerts a tangible effect on a range of chemical and physical properties, ranging from diffusion through elastic behavior, electrical conductivity and deformation. It also provides a natural site for occupancy by water-derived species, which in turn further affect crystal properties. We have performed experiments to measure inter-diffusion between iron and magnesium in magnesiowustite Mg(4)Fe(1-x)O over a range of temperature (1320 - 1400 C), oxygen fugacity (10(exp -1) to 10(exp -4.3 Pa)), and iron content (0.0 less than x less than 0.27) at room pressure.

Derived from text

Diffusion; Iron; Magnesium; Minerals; Oxygen

20040085402 New Mexico Univ., Albuquerque, NM, USA

Comparative Planetary Mineralogy: V/(Cr+Al) Systematics in Chromites as an Indicator of Relative Oxygen Fugacity

Papike, J. J.; Kamer, J. M.; Shearer, C. K.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 51; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

As our contribution to the new ″Oxygen in the Solar System″ initiative of the Lunar and Planetary Institute and the NASA Cosmochemistry Program, we have been developing oxygen barometers based largely on behavior of V which can occur in four valence states V2+, V3+, V4+, and V5+, and record at least 8 orders of magnitude of fO2. Our first efforts in measuring these valence proportions were by XANES techniques in basaltic glasses from Earth, Moon, and Mars. We now address the behavior of V valence states in chromite in basalts from Earth, Moon, and Mars. We have been looking for a ″V in chromite oxybarometer″ that works with data collected by the electron microprobe and thus is readily accessible to a large segment of the planetary materials community. This paper describes very early results that will be refined over the next two years.

Derived from text

Cosmochemistry; Mineralogy; Vanadium; Chromium; Aluminum; Oxygen; Chromites; Planetary Geology

20040085406 Brown Univ., Providence, RI, USA

The Calibration of the Pyroxene Eu-Oxybarometer for the Martian Meteorites

McCanta, M. C.; Rutherford, M. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 45; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Oxygen fugacity (f(sub O2)) is the physical parameter used to describe oxidation state. f(sub O2) influences both the crystallization sequences of magmas and the composition of the resulting minerals. Therefore, by quantifying the crystallization f(sub O2) of a magma, insights can be gained into conditions of the magma storage region (i.e., a planetary interior). One of the first phases on the basaltic shergottite liquidus is the low-Ca pyroxene pigeonite. By measuring the f(sub O2) recorded in the pigeonite cores, the earliest crystallization history of the Martian magmas can be determined. In order to

quantify the f(sub O2) recorded in the pigeonites, a new technique was required. It had been noted that the Eu(sup 2+)/Eu(sup 3+) ratio in pyroxenes was a function of F(sub O2), but this potential oxybarometer had never been calibrated for pigeonite. This study describes the calibration of the pigeonite Eu-oxybarometer.
Derived from text
Calibrating; Crystallization; SNC Meteorites; Oxygen; Mars (Planet)

20040085407 Rice Univ., Houston, TX, USA
The Constancy of Upper Mantle fugacity O2 Through Time Inferred from V/Sc Ratios in Basalts: Implications for the Rise in Atmospheric O2
Li, Zhengxue; Lee, Cin-TyAeolus; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 41; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Understanding how the oxidation state of the Earth's mantle has evolved through time is critical to placing constraints on the timescales and nature of various planetary differentiation processes, such as core-mantle segregation, silicate differentiation, and atmospheric evolution. However, the secular evolution of the fO2 of the Earth's mantle is still not fully constrained because of the difficulties in obtaining direct measurements of the mantle through time. One approach is to use mantle xenoliths, but xenoliths are limited in space and time. Another approach is to measure the fO2 of basaltic lavas. Unfortunately, post-eruptive alteration and magmatic differentiation (e.g., fractional crystallization, degassing, and crustal assimilation) can change the fO2 of the magma during ascent. Approaches that use O2 thermobarometry or use redox-sensitive elements to track fractional crystallization yield only post-emplacement fO2's. An independent approach is to use the coupled systematics of V and Sc in primitive basalts.
Derived from text
Earth Mantle; Magma; Oxidation-Reduction Reactions; Basalt

20040085414 Open Univ., Milton Keynes, UK
Oxygen Isotopic Variation of the Terrestrial Planets
Franchi, I. A.; Greenwood, R. C.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 27; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Since the seminal work of Clayton and co-workers it has been clear that there was oxygen isotopic heterogeneity in the most primitive materials in the solar nebula, with variations of up to 50% in Delta(sup 18)O and over 25% in Delta(sup 17) in materials formed or at least heavily processed within the nebula. In the terrestrial planets (Earth, Moon, Mars and the HED parent body (possibly Vesta)) the range Delta(sup 18)O values can remain very large, especially on geologically active bodies, particularly the Earth where low temperature reactions with water can play important role in developing large isotopic variations. However, the variation that is now seen in Delta(sup 17)O is 4%, with the variation from each body generally much less. This limited range in the Delta(sup 17) values is generally believed to be the result of large volume homogenization during widespread heating/melting events during the history of these planets and large asteroids. However, variation still exists within and between the suites of rocks from each of the terrestrial planets, and this can provide valuable information on their origin, inter-relationship and evolution. In order to extract this information it is necessary to measure the oxygen isotopic composition of clean, well characterized materials to very high precision.
Derived from text
Oxygen Isotopes; Terrestrial Planets; Homogenizing

20040085415 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Molecular Oxygen Mixing Ratio and Its Seasonal Variability in the Martian Atmosphere
England, Christopher; Hrubes, J. Dana; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 23; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The mixing ratio of molecular oxygen and other species that do not condense at martian ambient conditions will vary as the mass of atmosphere oscillates over a martian year due to alternate condensation and vaporization of carbon dioxide at the poles. This variation can be estimated utilizing measurements of mixing ratio made in-situ together with multi-year measurements of atmospheric pressure, both available from the Viking landers starting in 1976. The concentration of non-condensables, on average, will be approximately an inverse function of the atmospheric pressure.
Derived from text
Oxygen; Molecular Gases; Mixing Ratios; Mars Atmosphere

20040085421 Paris VI Univ., France
Isotopic Zoning in the Inner Solar System
Jambon, A.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 33; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The main lines of meteorite classification rest upon chemical criteria. Primitive meteorites or chondrites derive their composition directly from the solar nebula without differentiation processes in their parent body (e.g. no core extraction). Chondrites are distinguished h m differentiated meteorites (achondrites and siderites). More detailed studies of chondrites showed they could be separated into a number of classes, the most effective criterion for that being the oxidation state of iron, which can be either combined as a metal alloy (with Ni) or with sulfur or oxygen. In this latter case it enters the constitution of Fe-Mg silicates, like olivine. The following major groups are distinguished: carbonaceous chondrites wherein Fe is completely oxidized or nearly so, ordinary chondrites which are intermediate and enstatite chondrites in which Fe is not combined to oxygen. These wide groups are further divided into classes using more subtle criteria, specific to each group. The most abundant meteorites by far, are the ordinary chondrites. Enstatite chondrites are least frequent but statistical considerations lead to conflicting views: If one class is poorly populated, one may argue that it is a curiosity, not an important one. Conversely one can say that this results from their great success in forming larger parent bodies and their study is therefore of utmost importance to the understanding of planetary bodies. According to this view, ordinary chondrites are expected to stem from the main asteroid belts. Accretion in this region has been highly perturbated by the vicinity of Jupiter so that no massive planet could emerge. Chondrites from this region can therefore be viewed as leftover from the planetary formation.
Derived from text
Isotopes; Solar System; Meteorites; Chondrites

20040085422 NASA Johnson Space Center, Houston, TX, USA
Redox Conditions on Small Bodies
Jones, J. H.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 34; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The Eucrite Parent Body (4 Vesta). The eucrites are basalts that contain approx. 18 wt% FeO and contain trace metal. The eucrites are very depleted in siderophile elements, so it appears that the source regions of these basalts once equilibrated with Fe-Ni metal. Therefore, it is of interest to ask what fo2 is required to precipitate metal from a liquid of eucrite composition. Or in other words, what f02 did eucrites form under? This fo2 has been determined experimentally by and was found to be IW-1. Therefore, eucrites formed at about IW-1. In addition, it is interesting to note that assuming X(sub feo) = alpha(sub FeO) allows calculation of eucrite fo2 (assuming equilibrium with Fe metal). This calculation yields the same result as the experiments to within approx. 0.25 log units, reinforcing this result.
Derived from text
Basalt; Depletion; Iron Oxides; Vesta Asteroid

20040085423 Australian National Univ., Canberra, Australia
Oxygen and Core Formation in the Earth
ONeill, Hugh St.C.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 49; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Core formation in the Earth is ultimately dependent on the net redox state of the material from which the Earth accreted (i.e., ratio of silicate plus oxide material to metal). This ratio is a direct reflection of the material's oxygen content. A planet formed of fully oxidized material (as in CI chondrites) could not form a metallic core. Oxygen is the third most abundant element in the solar system (after H and He) and the most abundant element in the Earth, comprising 44.3% by weight of the Earth s mantle. The O content of the bulk Earth is thus approximately 30%, and in detail slightly higher depending on how much O comprises the light component in the Earth's core. The Earth's O/Mg ratio is approximately 2.0, which compares with approximately 5 in CI chondrites and 14.6 in the solar composition; thus the Earth has only a small fraction of the O available in the solar composition, hence the metallic core. A discussion about the ratio of silicate to metal is also presented.
Derived from text
Earth Core; Oxygen; Planetary Geology; Terrestrial Planets

20040085424 Carnegie Institution of Washington, Washington, DC, USA
Geologic Record of the Atmospheric Sulfur Chemistry Before the Oxygenation of the Early Earth's Atmosphere
Ono, S.; Wing, B.; Eigenbrode, J.; Rumble, D.; Farquhar, J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 50; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Mass-independent fractionation (MIF) signatures recorded sulfide and sulfate minerals in rocks older than 2.45 Ga suggest a fundamental change in the biogeochemical sulfur cycle took place between 2.45 and 2.0 Ga, most likely reflecting an oxygenation of the Earth's early atmosphere. We will present multi-sulfur isotope records of a late Archean sedimentary sequence in the Hamersley Basin, Australia (approximately 2.7 to 2.4 Ga). These data, placed in a context of modeled isotope systematics and depositional environments, provide new insights into sulfur biogeochemical cycle prior to the oxygenation of the Earth's atmosphere.
Derived from text
Oxygenation; Sulfur; Earth Atmosphere; Planetary Geology; Biogeochemistry; Air Pollution

20040085425 Brown Univ., Providence, RI, USA
Oxidation-Reduction Processes on the Moon: Experimental Verification of Graphite Oxidation in the Apollo 17 Orange Glasses
Nicholis, M. G.; Rutherford, M. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 48; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

It is widely believed that a volatile-driven fire-fountain eruption produced the Apollo 17 orange glass deposit. The picritic composition of these glasses indicate that they maybe the primitive analogs of mare basalts, and hence may be a window into the evolution of the lunar interior. However, to understand the petrogenesis of the picritic glasses it is essential to verify and constrain the volatile generating mechanism driving the eruption as well as the volatile budget during magma ascent in the conduit. Fogel and Rutherford have shown that the oxidation of graphite suspended in the melt and/or present in the source region, was alone capable of fueling a fire-fountain event. Further analysis of metal blebs found in the orange glasses indicated that CO, the main component of the gas phase, was produced in the reduction reactions discussed.
Derived from text
Oxidation-Reduction Reactions; Moon; Graphite; Apollo 17 Flight; Glass; Petrogenesis

20040085426 NASA Johnson Space Center, Houston, TX, USA
The Europium Oxybarometer: Power and Pitfalls
McKay, G.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 46; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

One of the most important characteristics of a planet is the oxidation state of its mantle, as reflected in primitive basalts. Petrologists have devised several methods to estimate the oxygen fugacity under which basalts crystallized. One method that has been the subject of recent interest involves the depth of the Eu anomaly in first-crystallizing minerals. A discussion detailing the experimental calibration of the Europium oxybarometer and the application of this device to Angrites and Martian basaltic meteorites are presented. The strengths and weaknesses of the instrument are also included.
Derived from text
Europium; Barometers; Oxygen; Planetary Mantles; Petrology

20040085427 NASA Johnson Space Center, Houston, TX, USA
Oxygen Fugacity of the Martian Mantle from Pigeonite/Melt Partitioning of Samarium, Europium and Gadolinium
Musselwhite, S.; Jones, J. H.; Shearer, C.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 47; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

This study is part of an ongoing effort to calibrate the pyroxene/melt Eu oxybarometer for conditions relevant to the martian meteorites. There is fairly good agreement between a determinations using equilibria between Fe-Ti oxides and the estimates from Eu anomalies in shergottite augites in tenns of which meteorites are more or less oxidized. The Eu calibration was for angrite composition pyroxenes which are rather extreme. However, application of a calibration for martian composition augites 113 does not significantly reduce the discrepancy between the two methods. One possible reason for this discrepancy is that augites are non-liquidus. The use of pigeonite rather than augite as the oxy-barometer phase is considered. We have conducted experiments on martian composition pigeonite/melt REE partitioning as a function of fO2.
Derived from text
Europium; Gadolinium; Mars Surface; Oxygen; Planetary Mantles; Samarium; Mars (Planet); Melts (Crystal Growth)

20040085433 Chicago Univ., Chicago, IL, USA
Oxygen Isotopic Compositions of the Terrestrial Planets
Clayton, Robert N.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 16; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Mechanisms that may account for oxygen isotope heterogeneity in meteorites on the microscopic scale do not seem adequate for explaining the similarities and differences in isotopic composition on a planetary scale. In chondrites, most of the isotopic variability can be attributed to photochemical enrichment of the two rare heavy isotopes with respect to the O-16 rich solar composition. In the CO, CM, CI, and CR chondrites, an additional low-temperature aqueous alteration leads to mass-dependent further enrichment of the heavy isotopes. If the proposed origin of the isotopic variation in chondrites is correct, then only a small fraction, represented primarily in CAIs, has the solar oxygen isotopic composition, and all other meteoritic components must have undergone photochemical processing. In addition, since the bulk isotopic compositions of the terrestrial planets and of the achondrite parent bodies are similar to those of chondrites, they too must be made of photochemically enriched matter. The photochemical reactions produce a non-equilibrium assemblage of gases, probably leading to a non-equilibrium assemblage of solids, particularly with respect to their oxidation state. These issues emphasize the importance of the measurement of oxygen isotopes in the Genesis solar wind mission. Within the Earth, oxygen isotope variations are due almost entirely to mass-dependent fractionation effects, giving a line of slope 0.52 on the three-isotope plot. The average crustal composition is 3-4%0 higher in DELTA O-18 than the upper mantle. This difference is too large to be due to igneous fractionation effects alone, and reflects the larger, low-temperature isotope fractionation associated with aqueous weathering reactions at the Earth's surface. Similar effects are not observed in the intraplanetary isotopic variations in the Moon or in the parent bodies of the HED and SNC meteorites. The bulk oxygen isotopic compositions of Earth and Mars (assumed to be the SNC parent body) cannot be accounted for by any mixture of two components, such as those proposed by Ringwood and Wanke. In principle, three-component mixtures of ordinary chondrites, CI, and CV chondrites can match the planetary isotopic compositions, but are inconsistent with chemical compositions. An additional unexplained observation is the exact coincidence in oxygen isotopic composition between Earth and Moon. The correspondence of isotopic composition between the Earth and the enstatite chondrites has been taken by some to have direct genetic significance. In all models using primitive chondrites as building blocks for the terrestrial planets, there is a necessity to remove a major fraction of the moderately volatile elements (alkalies, S, etc.), without altering their isotopic compositions.
Derived from text
Isotopic Labeling; Oxygen Isotopes; Terrestrial Planets; Meteorites

20040085434 Scripps Institution of Oceanography, La Jolla, CA, USA
The Effect of Oxygen Fugacity on Electrical Conduction of Olivine and Implications for Earth's Mantle
Constable, S.; Roberts, J. J.; Duba, A.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 17; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Because electrical conductivity is exponentially dependent on temperature and also a function of composition and phase, studies of mantle conductivity have long held the promise of providing information on the thermal and compositional state of Earth's mantle. Two techniques for probing deep conductivity exist; the magnetotelluric (MT) method of recording surface magnetic and electric fields, and the geomagnetic depth sounding (GDS) method of separating externally generated and internally induced magnetic fields from vector magnetometer records. The GDS method has recently gained momentum from the application of magnetic satellite data, which provide a global coverage not possible using land-based observatories alone. The bridge between these field studies and the internal constitution of Earth is provided by laboratory measurements of Earth materials as a function of temperature, composition, and pressure. Oxygen fugacity fa plays many important roles in this enterprise. First and foremost, fp must be controlled sufficiently to keep the sample within its stability field, or irreversible changes in composition and conductivity occur. Secondly, electrical conductivity of olivine, and presumably other mantle materials in which iron influences conductivity and stoichiometry, depends on fs and the oxidation state of the mineral. Thirdly, fO2 can be used as a laboratory tool for probing the behavior of defects in mantle minerals. We have studied the effect of oxygen on the electrical properties of olivine, (Mg(sub 0.9),Fe(sub 0.3))2SiO4, the dominant mineral of Earth's upper mantle, in an effort to quantitatively describe conduction mechanism, charge mobility, and defect concentration. The working model for the relationship between the major defect populations and fO2 is described by the equation given.
Author
Earth Mantle; Electrical Resistivity; Olivine; Electrical Properties; Oxygen

20040085435 Victoria Univ., British Columbia, Canada
Plagioclase-Liquid Trace Element Oxygen Barometry and Oxygen Behaviour in Closed and Open System Magmatic Processes
Canil, Dante; Thom, James; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 14; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

There are several measurements of the oxygen fugacity recorded by magmas, and related concern about the behaviour of

oxygen in magmas. Do magmas exchange oxygen in an open process through homogeneous equilibria, or do they remain closed systems along their liquid line of descent? Evidence for mixing of several magma batches in many magma types suggests truly open systems, and many oxygen barometers record crystallization along or parallel to 'buffers' such that the magma must exchange oxygen or 'breathe' by interaction with a separate redox reservoir, likely sulfur. In this study, we explore the use of trace element signatures in plagioclase as an indicator of the oxygen fugacity recorded by magmas with multiple histories, or by extraterrestrial samples. Plagioclase is a ubiquitous mineral in magmas ranging in composition from basalt to rhyolite, and often shows a detailed record of the magma batches into which it has been mixed and recycled. We experimentally calibrate the partition of redox sensitive elements (V, Mn) into plagioclase with a view to using concentration profiles for these elements to infer conditions of oxygen fugacity during crystallization, mixing, resorption and recycling, or as an empirical oxygen barometer in many terrestrial and extraterrestrial samples for which no other traditional methods can be employed.
Derived from text
Magma; Oxygen; Trace Elements; Liquids; Barometers; Minerals

20040085436 Brown Univ., Providence, RI, USA
Redox Chemical Diffusion in Silicate Melts: The Impact of the ″Semiconductor Condition″
Cooper, Reid F.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 18; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Transition-metal-cation redox experiments designed to characterize the rate of oxygen-species diffusion in silicate melts reveal a startling result: for melts of similar polymerization, chemical diffusion seems to occur some 10(exp 2)-10(exp 3) times faster than that seen for O-18 in tracer diffusion experiments. The primary reason for the discrepancy is that, in many cases, the chemical diffusion producing the valence-state change of transition-metal cations does not involve diffusion of an oxygen species at all, but rather is wrought by the diffusion of network-modifying cations whose motion is decoupled from that of other ions by the high transport coefficient of electronic defects, i.e., electron holes (h(sup dot)) and/or electrons in the conduction band (e')-a situation knows as the ″semiconductor condition″ in chemical kinetics. Cation-diffusion-effected redox reactions, in both melts and minerals, create reaction morphologies with implications, e.g., for the perceived chemistry of planetary surfaces and for the structures of metal-bearing chondrules. Discussions about the oxidation of basaltic magmas and the reduction of iron-oxide-bearing melts are included.
Derived from text
Melts (Crystal Growth); Oxidation-Reduction Reactions; Semiconductors (Materials); Silicates; Diffusion

20040085437 Maryland Univ., College Park, MD, USA
Exchange Between the Atmosphere and the Regolith of Mars: Discussion of Oxygen and Sulfur Isotope Evidence
Farquhar, J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 24; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Mass-independent fractionations for oxygen isotopes and sulfur isotopes between secondary phases and primary igneous phases in SNC meteorites have been interpreted to reflect a difference between surface and deep oxygen and sulfur reservoirs on Mars. Several hypotheses have been proposed to explain this observation such as fractionation by escape processes (in the case of oxygen), addition of a late veneer of anomalous oxygen and sulfur, and mass-independent atmospheric chemistry. The observation of a variable magnitude mass-independent oxygen isotope signature for carbonate and water among different meteorites, and for carbonate and sulfate from the same meteorite (Nakhla) is most consistent with the latter interpretation. Narrowing the source of the sulfur isotope data is less straight forward but bears on the question atmosphere-surface oxygen exchange because it may reflect a similar process. The magnitude of the mass-independent fractionations for sulfate sulfur from Nakhla and for isolated grains in ALH840011 are larger than those seen for all analyses of whole rock sulfide and sulfate from other meteorite groups. This argues against an origin associated with addition of a late veneer of exotic sulfur. Experimental and theoretical evidence allows a gas-phase (atmospheric) origin for these mass-independent sulfur and oxygen isotope signals, and the observation of mass-independent sulfur isotope signatures in atmospheric and atmospheric-derived species on Earth provides a consistency argument in favor of similar processes operating on Mars. Mass-independent oxygen and/or sulfur isotope signatures have been observed in terrestrial sulfate aerosols, ice core sulfate from stratosphere-piercing volcanic eruptions, and terrestrial rock samples older than 2.0-2.5 billion years old. For sulfur, these signatures are larger than the largest that have been identified in the meteoritic record and direct transfer of atmospheric sulfur species such as sulfate to the surface has been suggested as the source for the SNC signature. (Minor components of some carbonaceous chondrites have been shown to possess mass-independent signatures up to a few permil.) The Earth-centered perspective also tells us that the exchange pathways and local reservoir sizes for oxygen and sulfur can play a significant role in the transfer and

preservation of these signals in the rock record leading to the interpretation that the sulfur and oxygen isotope signature in sulfate sulfur may reflect direct transfer of the sulfate from the atmosphere to the surface, but that the oxygen isotope signatures for carbonate and water may reflect the transfer of oxygen from another species that itself acquired a mass-independent oxygen isotopic composition from the atmosphere.
Derived from text
Planetary Geology; Regolith; Sulfur Isotopes; Oxygen Isotopes; Mars Atmosphere

20040085438 Southern Methodist Univ., Dallas, TX, USA
Oxygen and Hydrogen Isotope Systematics of Atmospheric Water Vapor and Meteoric Waters: Evidence from North Texas
Ferguson, K. M.; Gregory, R. T.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 25; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Understanding the relationship between surface temperature and the oxygen and hydrogen isotopic composition of meteoric water is critical for unraveling the climate history of the Earth. The correlation between mean annual temperature and the isotopic composition of precipitation forms the basis of interpretation of temperature fluxations in ice core data and hence some similar relationship may obtain for a planet like Mars. The signal inferred from ice measurements correlates with oxygen isotope ratios determined from marine sediments that documents 450,000 years of glacial-interglacial cycles. years of glacial-interglacial cycles. Dallas, Texas, sits in the pathway of Polar, Pacific, and Gulf of Mexico air masses. Stable isotopes being a conservative tracer provide an opportunity to track the time integrated history of air masses interacting over Dallas. Isotopic concentration data provide hard constraints on storm and air mass evolution currently modeled by weather forecasting program and global circulation models. For the years 2001-2003, we sampled individual precipitation events over periods lasting between minutes to hours to examine intrastorm isotopic ratio variability in the context of satellite and radar images taken over the same time intervals. In order to gain a more continuous record, we began monitoring the isotopic composition of the atmospheric water vapor at approximately 30 m above the ground on a dailey basis. The results of the isotopic composition of the atmospheric water vapor are included.
Derived from text
Hydrogen Isotopes; Oxygen Isotopes; Water Vapor; Texas; Meteorites

20040085440 Los Alamos National Lab., NM, USA
Experimental Constraints on the Oxygen Isotope (O-18/O-16) Fractionation in the Ice/Vapor and Adsorbate/Vapor Systems of CO2 at Conditions Relevant to the Surface of Mars
Rahn, Thom; Eiler, John; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 53; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

A large fraction of the volatile oxygen on Mars is sequestered in carbon dioxide (CO2) that is partitioned between the atmosphere, polar caps and adsorbed in the regolith. The stable isotopic composition of this CO2 can help constrain the origin and evolution of the respective CO2 reservoirs but is interpretable only with knowledge of fractionations relevant to Martian surface conditions. We review here results of previous experimental investigations of isotopic fractinations of CO2 vapor relative to CO2 ice and CO2 vapor relative to CO2 adsorbed on various mineral substrates. These experiments indicate that variations in ice-cap size and the amount of CO2 stored in the regolith, over a range of time scales, could lead to variations in delta (18)O on the order of tens of per mil. In addition, carbon isotopic ((13)C/(12)C) content is nearly invariant in the ice/vapor system and exhibits 'reverse' fractionation in the adsorbate/vapor system, i.e. the heavier (13)C preferentially remains in the vapor phase. Investigations searching for isotopic evidence for the existence of past or present life on Mars must take these unique constraints into account when interpreting records of Martian O and C isotopes.
Author
Oxygen Isotopes; Fractionation; Carbon Dioxide; Mars Surface

20040085441 NASA Johnson Space Center, Houston, TX, USA
Determining the Oxygen Fugacity of Lunar Pyroclastic Glasses Using Vanadium Valence - An Update
Karner, J. M.; Sutton, S. R.; Papike, J. J.; Shearer, C. K.; Jones, J. H.; Newville, M.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 35; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

We have been developing an oxygen barometer based on the valence state of V (V(2+), V(3+), V(4+), and V(5+)) in solar system basaltic glasses. The V valence is determined by synchrotron micro x-ray absorption near edge structure (XANES), which uses x-ray absorption associated with core-electronic transitions (absorption edges) to reveal a pre-edge peak whose

intensity is directly proportional to the valence state of an element. XANES has advantages over other techniques that determine elemental valence because measurements can be made non-destructively in air and in situ on conventional thin sections at a micrometer spatial resolution with elemental sensitivities of approx. 100 ppm. Recent results show that fO2 values derived from the V valence technique are consistent with fO2 estimates determined by other techniques for materials that crystallized above the IW buffer. The fO2's determined by V valence (IW-3.8 to IW-2) for the lunar pyroclastic glasses, however, are on the order of 1 to 2.8 log units below previous estimates. Furthermore, the calculated fO2's decrease with increasing TiO2 contents from the A17 VLT to the A17 Orange glasses. In order to investigate these results further, we have synthesized lunar green and orange glasses and examined them by XANES.
Author
Lunar Composition; Oxygen; Vanadium; Valence; Glass

20040085446 Field Museum of Natural History, Chicago, IL, USA
Implications of Isotopic and Redox Heterogeneities in Silicate Reservoirs on Mars
Foley, C. N.; Wadhwa, M.; Janney, P. E.; Borg, L.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 26; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

New constraints on Nd and W isotopic systematics show that there is no simple linear relationship between epsilonNd-142 and epsilonW-182 values in the Martian meteorites as was suggested based on earlier data. Instead, three distinct end-members are apparent: LREE-enriched shergottites, such as Shergotty and Zagami; which have chondritic epsilonNd-412 and superchondritic epsilonW-182 (approximately 0.9epsilon and approximately 0.5epsilon, respectively, relative to terrestrial); LREE-depleted shergottites, such as DaG 476, with superchondritic epsilonNd-142 and epsilonW-182 (approximately 0.9epsilon and approximately 0.5epsilon, respectively, relative to terrestrial); and the nakhlites-chassignite (NC) with superchondritic epsilonNd-142 and epsilonW-182 (approximately 0.7epsilon and approximately 3epsilon, respectively, relative to terrestrial). These systematics reveal that early differentiation events on Mars resulted in the formation of at least three distinct silicate reservoirs which have subsequently remained unaffected by global convective mixing. In particular, as discussed, core formation occurred early (within approximately 12 Ma from the beginning of the solar system) followed by a silicate differentiation event (approximately 20-25 Ma after solar system formation) which established a mantle reservoir with the unique NC source characteristics; continued silicate differentiation (extending greater than 45 Ma after solar system formation, when Hf-182 was extinct but Sm-146 was extant) resulted in the formation of two end-member silicate reservoirs involved in shergottite petrogenesis, i,e., a depleted mantle reservoir and an enriched (mantle or crustal) reservoir. Here we will discuss the constraints on the redox conditions in these three isotopically distinctive silicate reservoirs and how they may relate to their isotopic characteristics.
Derived from text
Heterogeneity; Oxidation-Reduction Reactions; Silicates; Mars Surface; Neodymium Isotopes; Tungsten Isotopes; Reservoirs

20040085447 Bayreuth Univ., Germany
Redox State of the Moon's Interior
Gaillard, F.; Schmidt, B. C.; MacCammon, C. A.; Pichavant, M.; Scaillet, B.; Mackwell, S. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 29; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Contrasts in redox conditions prevailing in magma within the Earth have been and are still responsible for extensive large-scale chemical differentiation during the past 4.6 billion years. The formation of the core is likely attributable to a primary magma ocean in equilibrium with Fe-metal in the early age of the Earth; the oceanic crust is constructed by accretion of mid-ocean-ridge-basalt containing dominantly ferrous iron; and the continental crust probably derives from subduction-related arc-magmas that contain approximately 20-60% of iron in the ferric form. These re-dox controls on the magma-derived stratification of the Earth underline the need for a fundamental understanding of mechanisms and rate of redox exchanges in natural silicate melts. The redox state of a melt is commonly associated with its iron redox ratio Fe(3+)/Fe(2+), T, and correlated to the intensive parameter oxygen fugacity, fO2. Since the 196Os, numerous experimental studies have contributed to the calibration of the thermodynamic relationship between fO2, Fe(3+)/Fe(2+), T, and chemical composition of the silicate liquid. In contrast, the nature of the rate and mechanisms of acquisition of redox state in anhydrous melts has only been recently elucidated and it has been shown that migration of both monovalent and divalent cations rate-limits the kinetics of iron oxidation-reduction in silicate melts. However, natural silicate melts contain water in the range of hundred of ppm to several wt%, which contribute, in comparison to anhydrous systems, an additional redox couple, H2 / H2O. Due to the great mobility of both H2 and H2O species, the application of the reaction mechanisms identified in dry melt is questionable in the

case of water-bearing melts. We therefore provide a model that allows the prediction of oxidation-reduction rates in the presence of hydrogen for a wide range of melt compositions.
Derived from text
Oxidation-Reduction Reactions; Moon; Lunar Topography; Subduction (Geology)

20040085450 Eidgenoessische Technische Hochschule, Zurich, Switzerland
The Oxygen Isotope Composition of the Moon: Implications for Planet Formation
Wiechert, U.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 66; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The Moon is widely considered to have formed during a collision between the proto- Earth and a Mars-sized planet (named Theia). Assuming this model to be correct the Moon was formed from materials from the proto-Earth, Theia and any additional material added later. Oxygen isotope variations in differentiated planetary bodies like the Earth, Mars or the HED parent body are largely mass-dependent, i.e. the data define a characteristic line with a slope of approx. 0.52 in a graph of O-17 vs. O-18. In general, different parent bodies define distinct parallel trends reflecting different bulk compositions for the parent bodies. The differences are usually expressed as O-17, which is the deviation from the mass-dependent fractionation trend defined by terrestrial samples in per mil O-17. The first oxygen isotope data for lunar samples published by Clayton and Mayeda fell along a linear array overlapping with the terrestrial samples. However, these early oxygen isotope data for the Moon have a large range of approx. 0.3% which may reflect some isotopic heterogeneity of the Moon. Therefore, lunar samples have been re-investigated with a high precision CO2 laser fluorination method.
Derived from text
Oxygen Isotopes; Moon; Planetary Evolution; Mars (Planet)

20040085451 New Mexico Univ., Albuquerque, NM, USA
Oxygen Fugacity of Lunar Basalts and the Lunar Mantle. Range of Fugaicty of fO2 and the Effectiveness of Oxybarometers
Shearer, C. K.; Papike, J. J.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 58; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

Estimates of fO2 for mare basalts and the lunar mantle have been made using a variety of approaches: intrinsic fO2, mineral assemblages, melt and mineral compositions and the oxidation state of multiple valence cations. Although each approach has its limitations, most indicate that mare basalts crystallized at fO2 between the iron-wustite buffer (IW) and the ilmenite breakdown reaction. It has also been inferred from these estimates that the lunar mantle is also highly reduced lying at conditions below IW. Here, we illustrate some of the recorders of fO2, in lunar basalts and the implications for the lunar mantle.
Derived from text
Basalt; Moon; Oxygen; Mineral Deposits

20040085453 Washington Univ., Saint Louis, MO, USA
Terrestrial Oxygen and Hydrogen Isotope Variations: Primordial Values, Systematics, Subsolidus Effects, Planetary Comparisons, and the Role of Water
Criss, Robert E.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 20; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

O and H isotopic variations provide key information on planetary formation and the evolution and interactions of their lithospheres, atmospheres and hydrospheres. Earth is best understood. The delta O-18 values of Earth's major lithospheric reservoirs such as MORB closely approximate those of lunar igneous rocks (+5.7plus or minus0.3%o). This similarity suggests that Earth and Moon have a common primordial affinity and that +5.7 %o is the bulk O-18 composition in the Earth-Moon system, but only Earth's outermost layers have been sampled. Also, large total O-18 ranges are observed for terrestrial magmas (-2 to +16%o), igneous rocks (-10.5 to +16 %o), and sedimentary rocks (at least -4 to +39 %o). Only small effects (less than 2%0) can be attributed to pure fractional crystallization as isotopic fractionations are small at high temperatures; this partly explains why felsic rocks are systematically higher in O-18 by 1-4 per mil than mafic and ultramafic rocks, but cannot explain the total ranges in terrestrial rocks. Earth's great ranges therefore require interaction or exchange of rocks and magmas with oxygen reservoirs at or near Earth's surface, where large enrichments or depletions in O-18 are possible because fractionation factors are large at low temperatures. Key identified processes include aqueous deposition,

subsolidus exchange with infiltrating hydrothermal fluids, and exchange with or assimilation of wallrocks having disparate compositions.
Derived from text
Hydrogen Isotopes; Oxygen Isotopes; Water; Solidus; Planetary Evolution; Earth-Moon System

20040085454 California Univ., Los Angeles, CA, USA
Oxygen Isotope Anomalies in the Atmospheres of Earth and Mars
Lyons, J. R.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 43; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The discovery of large enrichments of O-18 in stratospheric ozone, and the demonstration of mass-independent fractionation (MIF) of oxygen isotopes (O-16, O-17, O-18) in both laboratory-produced ozone and atmospheric ozone have opened up a new field of isotope atmospheric chemistry. Observations of MIF have been made in a wide variety of oxygen-containing atmospheric species, in effect, making MIF a tracer of ozone chemistry. The signature of MIF has also been observed in sulfate and nitrate aerosols, and is preserved after aerosol deposition in dry environments such as the Antarctic dry valleys and the Atacama desert. Anomalies in O-17 allow us to trace atmospheric ozone chemistry into the surficial lithosphere. Determination of isotopomer-specific rate coefficients for the ozone formation reaction proved that the MIF occurs during the formation step. In addition, having isotopomer-specific rate coefficients for ozone formation makes it possible to quantitatively model the photochemistry and distribution of isotopologues of atmospheric species. Model results for delta O-17 of several atmospheric species versus altitude are presented. Also, the ranges of measured values for several aerosol and surface deposited sulfates and nitrates, and perchlorate surface deposits are shown.
Derived from text
Anomalies; Earth Atmosphere; Mars Atmosphere; Oxygen Isotopes

20040085455 University of Western Ontario, London, Ontario, Canada
Determining the Partial Pressure of Oxygen (PO2) in Solutions on Mars
King, P. L.; Workshop on Oxygen in the Terrestrial Planets; 2004, pp. 38; In English; See also 20040085398; Copyright; Avail: CASI; A01, Hardcopy

The current martian atmosphere has log (P(sub O2)) = -5, but martian mantle estimates are below the quartz-fayalite-magnetite (QFM) buffer; recalculated as log (P(sub O2)) less than -79 at 25 C. Also, it is likely that early Mars had relatively low P(sub O2) conditions, analogous with those proposed for the early Earth. Here, I examine the martian P(sub O2), evolution using phase equilibria, S(sup 2-)/S(sup 6+) and Fe(sup 3+)/Fe(sup 2+) minerals or species in surface solutions on Mars.
Derived from text
Oxygen Tension; Mars Atmosphere; Planetary Mantles

92
SOLAR PHYSICS

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

20040084234 Smithsonian Astrophysical Observatory, Cambridge, MA, USA
The Tunable XUV Imager (TXI) Sounding Rocket Payload
Brinton, John, Technical Monitor; Golub, Leon; July 2004; 24 pp.; In English
Contract(s)/Grant(s): NAG5-5075; No Copyright; Avail: CASI; A03, Hardcopy

The TXI was flown successfully on 21 June 2001 (36.199 US). All systems functioned as planned and image data were acquired and sent to the ground. Unfortunately, due to a parachute failure the payload was destroyed. In this report we summarize results from the flight and provide detailed information on the high resolution X-ray imaging detector which was developed as part of the program.
Author
Extreme Ultraviolet Radiation; Payloads; Sounding Rockets; X Ray Imagery; Tunable Lasers

20040084379 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The BESS-Polar Experiment Program
Streitmatter, R. E.; [2004]; 1 pp.; In English; COSPAR 2004, 18-25 Jul. 2004, Paris, France; No Copyright; Avail: Other Sources; Abstract Only

BESS-Polar, new, ultra-thin, superconducting spectrometer optimized for long-duration balloon flights, is presently under construction, with the goals of extending current BESS measurements of antiprotons to lower energies, extending the search for antinuclei to greater sensitivities and improving the ability to measure light isotopes in the cosmic radiation. A first flight from Antarctica in December 2004 is planned, with a later flight to be made at Solar minimum. The design, operating parameters and scientific prospects of BESS-Polar will be presented.
Author
Solar Activity Effects; Balloon Flight; Antiprotons; Spectrometers; Cosmic Rays

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20040084717
CRAnE: A JAS-based Data Acquisition System for Cosmic Rays
Docktor, J.; Reyes, M.; Glanzman, T.; Langeveld, W.; 2003; In English
Report No.(s): DE2003-815300; SLAC-TN-03-004; No Copyright; Avail: National Technical Information Service (NTIS)

Cosmic Ray Analysis Environment (CRAnE) is a software tool designed to collect and plot data from a cosmic ray telescope (CRT) connected to a computer serial port. As a plugin to Java Analysis Studio (JAS), CRAnE provides visual displays of incoming cosmic ray rates as they are detected. In an effort to make the program user-friendly, it operates through a graphical user interface. This paper describes the features of CRAnE and includes installation and operation instructions in the appended users manual.
NTIS
Cosmic Rays; Data Acquisition; Display Devices

20040084820 California Inst. of Tech., Pasadena, CA, USA, Air Force Research Lab., Hanscom AFB, MA, USA
Mining CRRES IDM Pulse Data and CRRES Environmental Data to Improve Spacecraft Charging/Discharging Models and Guidelines
Brautigam, D. H.; Frederickson, A. R.; June 2004; 55 pp.; In English
Contract(s)/Grant(s): NASA Order H-34774-D
Report No.(s): NASA/CR-2004-213228; M-1111; No Copyright; Avail: CASI; A04, Hardcopy

One can truly predict the charging and pulsing in space over a year's time using only the physics that worked for periods of an hour and less in prior publications. All portions of the task were achieved, including the optional portion of determining a value for conductivity that best .t the data. Fortran statements were developed that are required for the NUMIT runs to work with this kind of data from space. In addition to developing the Fortran for NUMIT, simple correlations between the IDM pulsing history and the space radiation were observed because we now have a better characterization of the space radiation. The study showed that: (1) the new methods for measurement of charge storage and conduction in insulators provide the correct values to use for prediction of charging and pulsing in space; (2) the methods in NUMIT that worked well for time durations less than hours now work well for durations of months; (3) an average spectrum such as AE8 is probably not a good guide for predicting pulsing in space one must take time dependence into account in order to understand insulator pulsing; and (4) the old method for predicting pulse rates in space that was based on the CRRES data could be improved to include dependencies on material parameters.
Author
Crres (Satellite); Spacecraft Charging; Monitors; Mathematical Models; Pulse Rate; Data Acquisition; Electric Discharges

20040085393 California Inst. of Tech., Pasadena, CA, USA
Atmospheric Trace Gas Abundances and Stable Isotope Ratios via IR-LIF
Blake, Geoffrey A.; [2004]; 6 pp.; In English
Contract(s)/Grant(s): NAG5-9471; No Copyright; Avail: CASI; A02, Hardcopy

We propose to develop new technologies with support provided by PIDDP that will enable the in situ measurements of abundances and stable isotope ratios in important radiatively and biogenically active gases such as carbon dioxide, carbon monoxide, water, methane, nitrous oxide, and hydrogen sulfide to very high precision (0.1 per mil or better for the isotopic ratios, for example). Such measurements, impossible at present, could provide pivotal new constraints on the global (bio)geochemical budgets of these critical species, and could also be used to examine the dynamics of atmospheric transport on Mars, Titan, and other solar system bodies. We believe the combination of solid state light sources with imaging of the IR laser induced fluorescence (IR-LIF) via newly available detector arrays will make such in situ measurements possible for the first time. Even under ambient terrestrial conditions, the LIF yield from vibrational excitation of species such as water and carbon dioxide should produce emission measures well in excess of ten billion photons/sec from samples volumes of order 1 c.c. These count rates can, in principle, yield detection limits into the sub-ppt range that are required for the in situ isotopic study of atmospheric trace gases. While promising, such technologies are relatively immature, but developing rapidly, and there are a great many uncertainties regarding their applicability to in situ IR-LIF planetary studies. We therefore feel PIDDP support will be critical to developing these new tools, and propose a three-year program to combine microchip near-IR lasers with low background detection axes and state-of-the-art HgCdTe detectors developed for astronomical spectroscopy to investigate the sensitivity of IR-LIF under realistic planetary conditions, to optimize the optical pumping and filtering schemes for important species, and to apply the spectrometer to the non-destructive measurement of stable isotopes in a variety of test samples. These studies form the necessary precursors to the development of compact, lightweight stable isotope/trace gas sensors for future planetary missions.
Derived from text
Atmospheric Composition; Trace Contaminants; Isotope Ratios; Abundance; Carbon Dioxide; Carbon Monoxide; Methane; Nitrous Oxides; Hydrogen Sulfide; Water; In Situ Measurement

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GENERAL

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

20040084255 NASA, Washington, DC, USA
Remembering Apollo 11: The 35th Anniversary Data Archive CD-ROM, 1969-2004
July 2004; In English
Report No.(s): NASA/SP-2004-4601; NASA/NC-2004-06-HQ; No Copyright; Avail: CASI; C01, CD-ROM

This CD-ROM is intended as a collection of hard-to-find technical data and other interesting information about the Apollo 11 mission as well as the Apollo program in general. Information such as mission operations reports, press kits, and news references for all of the Apollo missions, spacecraft, and the Saturn V launch vehicle is included. Histories of the Lunar Orbiter program, biographies of the Apollo astronauts and other key individuals, and audio-video materials such as video and audio clips, photo galleries and blue-print like diagrams of the Apollo spacecraft are included.
Derived from text
Apollo Spacecraft; Astronauts; Lunar Orbiter; Saturn 5 Launch Vehicles

20040084302 Lockheed Martin Space Systems Co., Sunnyvale, CA, USA
Life of Scanner Bearings with Four Space Liquid Lubricants
Bazinet, Dean G.; Espinosa, Mark A.; Loewenthal, Stuart H.; Gschwender, Lois; Jones, William R., Jr.; Predmore, Roamer E.; 37th Aerospace Mechanisms Symposium; May 2004, pp. 333-341; In English; See also 20040084272; No Copyright; Avail: CASI; A02, Hardcopy

The results of a life test program to evaluate bearing life with different space lubricants and cleaning solvents is presented. Thirty pairs of flight-like scanner bearings were tested over a period of seven years. Lubricants included two well known perfluorinated space oils (Brayco 815Z(TradeMark) and Krytox 143AB(TradeMark), a more recent synthetic hydrocarbon oil (Pennzane 2001(TradeMark), and one yet to be in space service (silahydrocarbon oil). Bearings lubricated with Pennzane 2001 oil were found to have the longest lives. Life improvements up to 18X relative to perfluorinated oils and 3X relative to the silahydrocarbon oil were measured. No statistically significant life improvement was found with TiC-coated balls relative to standard plain steel balls for Penzanne 2001 bearings. Bearing life was generally longer when the bearings were cleaned with

ozone-safe aqueous or hydrofluorocarbon (HFC) solvents as alternates to the discontinued CFC-113.
Author
Lubricants; Bearings; Solvents; Hydrocarbons; Coatings

20040084621 Defence Science and Technology Organisation, Edinburgh, Australia
Evaluation of a Silent Killer, the PMN Anti-Personnel Blast Mine
Swinton, R. J.; Bergeron, D. M.; May 2004; 42 pp.; In English
Report No.(s): DSTO-TR-1582; DODA-AR-013-112; Copyright; Avail: Other Sources

The destructive output of the PMN mine was assessed experimentally by detonating actual mines in air and then in soil. The fragmentation pattern was recorded using a combination of flash X-rays, fragmentation packs, and gelatine cylinders. This made it possible to measure the velocity as well as the mass of the fragments, so that their injury potential could be estimated. This report describes the test set-ups and methodology used for the tests, and presents the results that were obtained.
Author
Destruction; Detonation; Fragments; Mines (Ordnance)

20040084670 NASA Ames Research Center, Moffett Field, CA, USA
The Effect of the Weight Scheme on DFT Vibrational Frequencies
Bauschlicher, Charles; Ricca, Alessandra; [1999]; 1 pp.; In English
Contract(s)/Grant(s): 519-40-12; No Copyright; Avail: Other Sources; Abstract Only

All-electron B3LYP harmonic frequencies of Ge2H5 and Ge2H6 are computed for several choices of grid and using both the Becke and the Stratmann, Scuseria, and Frisch atomic partition functions (weight scheme). For large grids, the results are independent of the weighting scheme. The lowest frequency mode is much more stable with respect to the number of grid points when the Stratmann, Scuseria, and Frisch weights are used.
Author
Atomic Weights; Computational Grids; Frequencies

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