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Langley Research Center

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NASA STI Program ... in Profile

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  NASA Center for AeroSpace Information
  7115 Standard Drive
  Hanover, MD 21076-1320

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STAR includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
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- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

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NASA Center for AeroSpace Information (CASI)

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

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

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Subject Term Index

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01
AERONAUTICS (GENERAL)

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

20090025419 NASA Langley Research Center, Hampton, VA, USA
Mars Entry Atmospheric Data System Modelling and Algorithm Development
Karlgaard, Christopher D.; Beck, Roger E.; OKeefe, Stephen A.; Siemers, Paul; White, Brady; Engelund, Walter C.; Munk, Michelle M.; June 22, 2009; 21 pp.; In English; 41st AIAA Thermophysics Conference, 22-25 Jun. 2009, San Antonio, TX, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2009-3916; LF99-8954; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025419

The Mars Entry Atmospheric Data System (MEADS) is being developed as part of the Mars Science Laboratory (MSL), Entry, Descent, and Landing Instrumentation (MEDLI) project. The MEADS project involves installing an array of seven pressure transducers linked to ports on the MSL forebody to record the surface pressure distribution during atmospheric entry. These measured surface pressures are used to generate estimates of atmospheric quantities based on modeled surface pressure distributions. In particular, the quantities to be estimated from the MEADS pressure measurements include the total pressure, dynamic pressure, Mach number, angle of attack, and angle of sideslip. Secondary objectives are to estimate atmospheric winds by coupling the pressure measurements with the on-board Inertial Measurement Unit (IMU) data. This paper provides details of the algorithm development, MEADS system performance based on calibration, and uncertainty analysis for the aerodynamic and atmospheric quantities of interest. The work presented here is part of the MEDLI performance pre-flight validation and will culminate with processing flight data after Mars entry in 2012.
Author
Atmospheric Circulation; Atmospheric Entry; Wind (Meteorology); Pressure Distribution; Mars Atmosphere; Pressure Measurement; Forebodies

20090026112 Coast Artillery Training Center, Fort Monroe, VA USA
The Antiaircraft Journal. Volume 94, Number 4, July-August 1953
Harris, Charles S, Editor; Baker, Fred A; Moore, James E; Plumly, Paul M; Antiaircraft Journal; Aug 1953; Volume 94, No. 4, pp. 2-55; In English
Report No.(s): AD-A499788; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499788

The journal prints articles on subjects of professional and general interest to personnel of the Antiaircraft Artillery in order to stimulate thought and provoke discussions. However, opinions expressed and conclusions drawn in articles are in no sense official. They do not reflect the opinions or conclusions of official or branch of the Department of the Army. Published bi-monthly by the US Antiaircraft Association.
DTIC
Air Defense; Artillery

20090026195 NASA Langley Research Center, Hampton, VA, USA
Inflow Measurements made with a Laser Velocimeter on a Helicopter Model in Forward Flight. Volume 7: Rectangular Planform Blades at an Advance Ratio Of 0.40, Supplement
[Data Set]
Althoff, Susan L.; Elliott, Joe W.; Hoad, Danny R.; Sailey, Richard H.; April 1989; 3 pp.; In English; See also 19930015349; See also 1993115349
Contract(s)/Grant(s): 505-61-51-10
Report No.(s): NASA-TM-101599-SUPPL; NAS 1.15:101599; AVSCOM-TM-89-B-002-Vol-7-SUPPL; NONP-NASA-SUPPL-DK-93-159783; No Copyright; Avail.: CASI: C01, CD-ROM; A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026195

The disk contains a README.doc file, a copy of Table 3, and 24 data files that support an experimental investigation conducted in the 14- by 22-Foot Subsonic Tunnel at the NASA Langley Research Center to measure the inflow into a scale model helicopter rotor in forward flight (mu = 0.40). The measurements were made with a two-component Laser Velocimeter (LV) one chord above the plane formed by the path of the rotor tips (tip-path-plane). A conditional sampling technique was used to determine the position of the rotor at the time that each velocity measurement was made so that the azimuthal fluctuations in velocity could be determined. Measurements were made at a total of 178 separate locations in order to clearly define the inflow character.
Author (revised)
Aircraft Models; Helicopters; Horizontal Flight; Laser Doppler Velocimeters; Rotary Wings; Scale Models; Velocity Measurement; Wind Tunnel Models; Wind Tunnel Tests

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.

20090025421 Royal Aircraft Establishment, Farnborough, UK
Tables for Use in the Investigation of Supersonic Fields of Flow by the Method of Characteristics
Herbert, P J; Older, S J; Nov 1946; 28 pp.; In English
Report No.(s): AD-A800629; RAE-TN-CW-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA800629

No abstract available
Flow Characteristics; Method of Characteristics; Supersonic Flow

20090025438 NASA Langley Research Center, Hampton, VA, USA
Stability of Supersonic Boundary Layers on a Cone at an Angle of Attack
Balakumar, Ponnampalam; June 22, 2009; 16 pp.; In English; 39th AIAA Fluid Dynamics Conference, 22-25 Jun. 2009, San Antonio, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.07.14.04
Report No.(s): LF99-8151; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025438

The stability and receptivity of three-dimensional supersonic boundary layers over a 7deg sharp tipped straight cone at an angle of attack of 4.2deg is numerically investigated at a free stream Mach number of 3.5 and at two high Reynolds numbers, 0.25 and 0.50x10(exp 6)/inch. The generation and evolution of stationary crossflow vortices are also investigated by performing simulations with three-dimensional roughness elements located on the surface of the cone. The flow fields with and without the roughness elements are obtained by solving the full Navier-Stokes equations in cylindrical coordinates using the fifth-order accurate weighted essentially non-oscillatory (WENO) scheme for spatial discretization and using the third-order total-variation-diminishing (TVD) Runge-Kutta scheme for temporal integration. Stability computations reveal that the azimuthal wavenumbers are in the range of m approx. 25-50 for the most amplified traveling disturbances and in the range of m approx. 40-70 for the stationary disturbances. The N-Factor computations predicted that transition would occur further forward in the middle of the cone compared to the transition fronts near the windward and the leeward planes. The

simulations revealed that the crossflow vortices originating from the nose region propagate towards the leeward plane. No perturbations were observed in the lower part of the cone.
Author
Aerodynamic Stability; Supersonic Boundary Layers; Angle of Attack; Three Dimensional Boundary Layer; Supersonic Speed; Perturbation; Flow Distribution; High Reynolds Number; Stability

20090026006 NASA Johnson Space Center, Houston, TX, USA
Roles of Engineering Correlations in Hypersonic Entry Boundary Layer Transition Prediction
Campbell, Charles H.; Anderson, Brian P.; King, Rudolph A.; Kegerise, Michael A.; Berry, Scott A.; Horvath, Thomas J.; [2010]; 1 pp.; In English; 48th AIAA Aerospace Sciences Meeting, 4-7 Jan. 2010, Orlando, FL, USA
Contract(s)/Grant(s): WBS 377816.06.02.05.03.05.04
Report No.(s): JSC-CN-18482; No Copyright; Avail.: Other Sources; Abstract Only

Efforts to design and operate hypersonic entry vehicles are constrained by many considerations that involve all aspects of an entry vehicle system. One of the more significant physical phenomenon that affect entry trajectory and thermal protection system design is the occurrence of boundary layer transition from a laminar to turbulent state. During the Space Shuttle Return To Flight activity following the loss of Columbia and her crew of seven, NASA's entry aerothermodynamics community implemented an engineering correlation based framework for the prediction of boundary layer transition on the Orbiter. The methodology for this implementation relies upon similar correlation techniques that have been is use for several decades. What makes the Orbiter boundary layer transition correlation implementation unique is that a statistically significant data set was acquired in multiple ground test facilities, flight data exists to assist in establishing a better correlation and the framework was founded upon state of the art chemical nonequilibrium Navier Stokes flow field simulations. Recent entry flight testing performed with the Orbiter Discovery now provides a means to validate this engineering correlation approach to higher confidence. These results only serve to reinforce the essential role that engineering correlations currently exercise in the design and operation of entry vehicles. The framework of information related to the Orbiter empirical boundary layer transition prediction capability will be utilized to establish a fresh perspective on this role, and to discuss the characteristics which are desirable in a next generation advancement. The details of the paper will review the experimental facilities and techniques that were utilized to perform the implementation of the Orbiter RTF BLT Vsn 2 prediction capability. Statistically significant results for multiple engineering correlations from a ground testing campaign will be reviewed in order to describe why only certain correlations were selected for complete implementation to support the Shuttle Program. Historical Orbiter flight data on early boundary layer transition due to protruding gap fillers will be described in relation to the selected empirical correlations. In addition, Orbiter entry flight testing results from the BLT Flight Experiment will be discussed in relation to these correlations. Applicability of such correlations to the entry design problem will be reviewed, and finally a perspective on the desirable characteristics for a next generation capability based on high fidelity physical models will be provided.
Author
Boundary Layer Transition; Hypersonic Boundary Layer; Aerothermodynamics; Hypersonic Reentry; Spacecraft Reentry

20090026079 NASA Ames Research Center, Moffett Field, CA, USA
Fuel Savings and Aerodynamic Drag Reduction from Rail Car Covers
Storms, Bruce; Salari, Kambiz; Babb, Alex; June 02, 2008; 2 pp.; In English; AfricaRail 2008, 2-6 Jun. 2008, Johannesburg, South Africa; Original contains color illustrations
Report No.(s): ARC-E-DAA-TN112; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026079

The potential for energy savings by reducing the aerodynamic drag of rail cars is significant. A previous study of aerodynamic drag of coal cars suggests that a 25% reduction in drag of empty cars would correspond to a 5% fuel savings for a round trip [1]. Rail statistics for the USA [2] report that approximately 5.7 billion liters of diesel fuel were consumed for coal transportation in 2002, so a 5% fuel savings would total 284 million liters. This corresponds to 2% of Class I railroad fuel consumption nationwide. As part of a DOE-sponsored study, the aerodynamic drag of scale rail cars was measured in a wind tunnel. The goal of the study was to measure the drag reduction of various rail-car cover designs. The cover designs tested yielded an average drag reduction of 43% relative to empty cars corresponding to an estimated round-trip fuel savings of 9%.
Author
Rail Transportation; Aerodynamic Drag; Energy Conservation; Drag Reduction; Fuel Consumption; Estimating

20090026192 NASA Langley Research Center, Hampton, VA, USA

Inflow Measurements Made with a Laser Velocimeter on a Helicopter Model in Forward Flight, Volume 8, Rectangular Planform Blades at an Advance Ratio of 0.23, 0.50 Chord above the Tip Path Plane, Supplement

[Data Set]

Althoff, Susan L.; Elliott, Joe W.; Hoad, Danny R.; Sailey, Richard H.; May 1990; 3 pp.; In English; See also 19930015335; See also 1993115335

Contract(s)/Grant(s): 505-61-51-10

Report No.(s): NASA-TM-102642-SUPPL; NAS 1.15:102642; AVSCOM-TM-90-B-007-VOL-8-SUPPL; NONP-NASA-SUPPL-DK-93-159787; No Copyright; Avail.: CASI: C01, CD-ROM; A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026192

The disk contains a README.DOC file, data for Table 3 and 28 data files to support investigations conducted in the 14- by 22-foot Subsonic Tunnel at the NASA Langley Research Center to measure hte inflow into a scale model helicopter rotor in forward flight (mu = 0.23). The measurements were made with a two-component Laser Velocimeter (LV) 0.50 chord above the plane formed by the path of the rotor tips (tip-path-plane). A conditional sampling technique was employed to determine the position of the rotor at the time that each velocity measurement was made so that the azimuthal fluctuations in velocity could be determined. Measurements were made at a total of 178 separate locations in order to clearly define the inflow character. The mean and standard deviation of the induced inflow ratios and the azimuthally dependent induced inflow ratios

Author (revised)

Aircraft Models; Flow Measurement; Helicopters; Horizontal Flight; Laser Doppler Velocimeters; Rotary Wings; Rotor Aerodynamics; Scale Models; Velocity Measurement; Wind Tunnel Models; Wind Tunnel Tests

20090026193 NASA Langley Research Center, Hampton, VA, USA

Inflow Measurements made with a Laser Velocimeter on a Helicopter Model in Forward Flight. Volume 9: Rectangular Planform Blades at an Advance Ratio of 0.23, 0.75 Chord Above the Tip Path Plane, Supplement

[Data Set]

Althoff, Susan L.; Elliott, Joe W.; Hoad, Danny R.; Sailey, Richard H.; May 1990; 3 pp.; In English; See also 19930015336; See also 1993115336

Contract(s)/Grant(s): 505-61-51-10

Report No.(s): NASA-TM-102643-SUPPL; NAS 1.15:102643; AVSCOM-TM-90-B-008-VOL-9-SUPPL; NONP-NASA-SUPPL-DK-93-159788; No Copyright; Avail.: CASI: C01, CD-ROM; A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026193

The disk contains a README.doc, copy of Table 3, and 24 data files to support an experimental investigation conducted in the 14- by 22-Foot Subsonic Tunnel at the NASA Langley Research Center to measure the inflow into a scale model helicopter rotor in forward flight (mu = 0.23). The measurements were made with a two-component Laser Velocimeter (LV) 0.75 chord above the plane formed by the path of the rotor tips (tip-path-plane). A conditional sampling technique was employed to determine the position of the rotor at the time that each velocity measurement was made so that the azimuthal fluctuations in velocity could be determined. Measurements were made at a total of 180 separate locations in order to clearly define the inflow character. The mean and standard deviation of the induced ratios and the azimuthally dependent induced inflow ratios are included on 5.25 flexible disk in the pocket on the inside of the rear cover of this report. These data are presented without analysis.

Author (revised)

Aircraft Models; Flow Measurement; Helicopters; Horizontal Flight; Laser Doppler Velocimeters; Rotary Wings; Scale Models; Velocity Measurement; Wind Tunnel Tests

20090026194 NASA Langley Research Center, Hampton, VA, USA

Inflow Measurements made with Laser Velocimeter on a Helicopter Model in Forward Flight. Volume 11: Rectangular Planform Blades at an Advance Ratio of 0.30, 0.75 Chord Above the Tip Path Plane, Supplement

[Data Set]

Althoff, Susan L.; Elliott, Joe W.; Hoad, Danny R.; Sailey, Richard H.; May 1990; 3 pp.; In English; See also 19930015338; See also 1993115338

Contract(s)/Grant(s): 505-51-51-10

Report No.(s): NASA-TM-102645-SUPPL; NAS 1.15:102645; AVSCOM-TM-90-B-010-VOL-11-SUPPL; NONP-NASA-SUPPL-DK-93-159793; No Copyright; Avail.: CASI: C01, CD-ROM; A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026194

The disk contains a README.doc file, a copy of Table 3, and 24 data files to support an experimental investigation

conducted in the 14- by 22-Foot Supersonic Tunnel at the NASA Langley Research Center to measure the inflow into a scale model helicopter rotor in forward flight (mu = 0.30). The measurements were made with a two-component Laser Velocimeter (LV) 0.75 chord above the plane formed by the path of the rotor tips (tip-path-plane). A conditional sampling technique was employed to determine the position of the rotor at the time that each velocity measurement was made so that the azimuthal fluctuations in velocity could be determined. Measurements were made at a total of 180 separate locations in order to clearly define the inflow character. The mean and standard deviation of the induced inflow ratios and the azimuthally dependent induced inflow ratio are included.
Author (revised)
Aircraft Models; Flow Measurement; Helicopters; Horizontal Flight; Laser Doppler Velocimeters; Rotary Wings; Rotor Aerodynamics; Scale Models; Velocity Measurement; Wind Tunnel Models; Wind Tunnel Tests

20090026206 Texas A&M Univ., College Station, TX, USA
Dual-Pump Coherent Anti-Stokes Raman Scattering Temperature and CO2 Concentration Measurements
Lucht, Robert P.; Velur-Natarajan, Viswanathan; Carter, Campbell D.; Grinstead, Keith D., Jr.; Gord, James R.; Danehy, Paul M.; Fiechtner, G. J.; Farrow, Roger L.; AIAA Journal; April 2003; Volume 41, No. 4, pp. 679-686; In English; Original contains black and white illustrations
Contract(s)/Grant(s): F33615-99-C-2964; 922-20-08-71; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026206

Measurements of temperature and CO2 concentration using dual-pump coherent anti-Stokes Raman scattering, (CARS) are described. The measurements were performed in laboratory flames,in a room-temperature gas cell, and on an engine test stand at the U.S. Air Force Research Laboratory, Wright-Patterson Air Force Base. A modeless dye laser, a single-mode Nd:YAG laser, and an unintensified back-illuminated charge-coupled device digital camera were used for these measurements. The CARS measurements were performed on a single-laser-shot basis. The standard deviations of the temperatures and CO2 mole fractions determined from single-shot dual-pump CARS spectra in steady laminar propane/air flames were approximately 2 and 10% of the mean values of approximately 2000 K and 0.10, respectively. The precision and accuracy of single-shot temperature measurements obtained from the nitrogen part of the dual-pump CARS system were investigated in detail in near-adiabatic hydrogen/air/CO2 flames. The precision of the CARS temperature measurements was found to be comparable to the best results reported in the literature for conventional two-laser, single-pump CARS. The application of dual-pump CARS for single-shot measurements in a swirl-stabilized combustor fueled with JP-8 was also demonstrated.
Author
Carbon Dioxide; Carbon Dioxide Concentration; Coherent Scattering; Laminar Flow; Raman Spectra; Temperature Measurement

20090026305 NASA Langley Research Center, Hampton, VA, USA
Successes and Challenges for Flow Control Simulations
Rumsey, Christopher L.; [2008]; 38 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 599489
Report No.(s): LF99-7374; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026305

A survey is made of recent computations published for synthetic jet flow control cases from a CFD workshop held in 2004. The three workshop cases were originally chosen to represent different aspects of flow control physics: nominally 2-D synthetic jet into quiescent air, 3-D circular synthetic jet into turbulent boundary-layer crossflow, and nominally 2-D flow-control (both steady suction and oscillatory zero-net-mass-flow) for separation control on a simple wall-mounted aerodynamic hump shape. The purpose of this survey is to summarize the progress as related to these workshop cases, particularly noting successes and remaining challenges for computational methods. It is hoped that this summary will also by extension serve as an overview of the state-of-the-art of CFD for these types of flow-controlled flow fields in general.
Author
Jet Flow; Simulation; Separated Flow; Boundary Layer Separation; Computational Fluid Dynamics; Air Jets; Aerodynamic Configurations; Mass Flow; Cross Flow

20090026318 NASA Johnson Space Center, Houston, TX, USA

Hypersonic Navier Stokes Comparisons to Orbiter Flight Data

Campbell, Charles H.; Nompelis, Ioannis; Candler, Graham; Barnhart, Michael; Yoon, Seokkwan; [2009]; 1 pp.; In English; 48th AIAA Aerospace Sciences Meeting, 4-7 Jan. 2010, Orlando, FL, USA

Contract(s)/Grant(s): 377816.06.02.05.03.05.04

Report No.(s): JSC-CN-18483; Copyright; Avail.: Other Sources; Abstract Only

Hypersonic chemical nonequilibrium simulations of low earth orbit entry flow fields are becoming increasingly commonplace as software and computational capabilities become more capable. However, development of robust and accurate software to model these environments will always encounter a significant barrier in developing a suite of high quality calibration cases. The US3D hypersonic nonequilibrium Navier Stokes analysis capability has been favorably compared to a number of wind tunnel test cases. Extension of the calibration basis for this software to Orbiter flight conditions will provide an incremental increase in confidence. As part of the Orbiter Boundary Layer Transition Flight Experiment and the Hypersonic Thermodynamic Infrared Measurements project, NASA is performing entry flight testing on the Orbiter to provide valuable aerothermodynamic heating data. An increase in interest related to orbiter entry environments is resulting from this activity. With the advent of this new data, comparisons of the US3D software to the new flight testing data is warranted. This paper will provide information regarding the framework of analyses that will be applied with the US3D analysis tool. In addition, comparisons will be made to entry flight testing data provided by the Orbiter BLT Flight Experiment and HYTHIRM projects. If data from digital scans of the Orbiter windward surface become available, simulations will also be performed to characterize the difference in surface heating between the CAD reference OML and the digitized surface provided by the surface scans. Author

Low Earth Orbits; Flow Distribution; Hypersonics; Calibrating; Computer Programs; Flight Tests; Infrared Radiation; Thermodynamics; Aerothermodynamics; Boundary Layer Transition

20090026339 NASA Johnson Space Center, Houston, TX, USA

Orbiter Boundary Layer Transition Stability Modeling at Flight Entry Conditions

Bartkowicz, Matt; Johnson, Heath; Candler, Graham; Campbell, Charles H.; [2009]; 1 pp.; In English; 48th AIAA Aerospace Sciences Meeting, 4-7 Jan. 2010, Orlando, FL, USA

Contract(s)/Grant(s): 377816.06.02.05.03.05.04

Report No.(s): JSC-CN-18484; Copyright; Avail.: Other Sources; Abstract Only

State of the art boundary layer stability modeling capabilities are increasingly seeing application to entry flight vehicles. With the advent of user friendly and robust implementations of two-dimensional chemical nonequilibrium stability modeling with the STABL/PSE-CHEM software, the need for flight data to calibrate such analyses capabilities becomes more critical. Recent efforts to perform entry flight testing with the Orbiter geometry related to entry aerothermodynamics and boundary layer transition is allowing for a heightened focus on the Orbiter configuration. A significant advancement in the state of the art can likely be achieved by establishing a basis of understanding for the occurrence of boundary layer transition on the Orbiter due to discrete protruding gap fillers and the nominal distributed roughness of the actual thermal protection system. Recent success in demonstrating centerline two-dimensional stability modeling on the centerline of the Orbiter at flight entry conditions provides a starting point for additional investigations. The more detailed paper will include smooth Orbiter configuration boundary layer stability results for several typical orbiter entry conditions. In addition, the numerical modeling approach for establishing the mean laminar flow will be reviewed and the method for determining boundary layer disturbance growth will be overviewed. In addition, if actual Orbiter TPS surface data obtained via digital surface scans become available, it may be possible to investigate the effects of an as-flown flight configuration on boundary layer transition compared to a smooth CAD reference.

Author

Aerodynamic Stability; Boundary Layer Stability; Boundary Layer Transition; Flight Conditions; Flight Tests; Two Dimensional Models; Space Shuttle Orbiters; Laminar Flow; Aerothermodynamics

20090026340 NASA Johnson Space Center, Houston, TX, USA

Boundary Layer Transition Protuberance Tests at NASA JSC Arc-Jet Facility

Larin, M. E.; Marichalar, J. J.; Kinder, G. R.; Campbell, C. H.; Riccio, J. R.; Nquyen, T. Q.; DelPapa, S. V.; Pulsonetti, M. V.; [2009]; 1 pp.; In English; 48th AIAA Aerospace Sciences Meeting, 4-7 Jan. 2010, Orlando, FL, USA

Contract(s)/Grant(s): 377816.06.02.05.03.05.04

Report No.(s): JSC-CN-18498; Copyright; Avail.: Other Sources; Abstract Only

A series of arc-jet tests in support of the Shuttle Orbiter Boundary Layer Transition flight experiment was conducted in

the Channel Nozzle of the NASA Johnson Space Center Atmospheric Reentry Materials and Structures Facility. The boundary layer trip was a protrusion of a certain height and geometry fabricated as part of a 6‘x6’ tile insert, a special test article made of the Boeing Rigid Insulation tile material and coated with the Reaction Cured Glass used for the bottom fuselage tiles of the Space Shuttle Orbiter. A total of five such tile inserts were manufactured: four with the 0.25-in. trip height, and one with the 0.35-in. trip height. The tile inserts were interchangeably installed in the center of the 24‘x24’ variable configuration tile array mounted in the 24‘x24’ test section of the channel nozzle. The objectives of the test series were to demonstrate that the boundary layer trip can safely withstand the Space Shuttle Orbiter flight-like re-entry environments and provide temperature data on the protrusion surface, surfaces of the nearby tiles upstream and downstream of the trip, as well as the bond line between the tiles and the structure. The targeted test environments were defined for the tip of the protrusion, away from the nominal surface of the tile array. The arc jet test conditions were approximated in order to produce the levels of the free stream total enthalpy at the protrusion height similar to those expected in flight. The test articles were instrumented with surface, sidewall and bond line thermocouples. Additionally, Tempilaq temperature-indicating paint was applied to the nominal tiles of the tile array in locations not interfering with the protrusion trip. Five different grades of paint were used that disintegrate at different temperatures between 1500 and 2000 deg F. The intent of using the paint was to gauge the RCG-coated tile surface temperature, as well as determine its usefulness for a flight experiment. This paper provides an overview of the channel nozzle arc jet, test articles and test conditions, as well as the results of the arc-jet tests including the measured temperature response of the test articles, their pre- and post-test surface scans, condition of the thermal paint, and continents on the protrusion tip heating achieved in tests compared to the computational fluid dynamics predictions.
Author
Atmospheric Entry; Boundary Layer Transition; Computational Fluid Dynamics; Joints (Junctions); Fuselages; Space Shuttle Orbiters

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.

20090025481 NASA Langley Research Center, Hampton, VA, USA
A Mathematical Basis for the Safety Analysis of Conflict Prevention Algorithms
Maddalon, Jeffrey M.; Butler, Ricky W.; Munoz, Cesar A.; Dowek, Gilles; June 2009; 67 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 411931.02.51.07.01
Report No.(s): NASA/TM-2009-215768; L-19699; LF99-8985; Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025481

In air traffic management systems, a conflict prevention system examines the traffic and provides ranges of guidance maneuvers that avoid conflicts. This guidance takes the form of ranges of track angles, vertical speeds, or ground speeds. These ranges may be assembled into prevention bands: maneuvers that should not be taken. Unlike conflict resolution systems, which presume that the aircraft already has a conflict, conflict prevention systems show conflicts for all maneuvers. Without conflict prevention information, a pilot might perform a maneuver that causes a near-term conflict. Because near-term conflicts can lead to safety concerns, strong verification of correct operation is required. This paper presents a mathematical framework to analyze the correctness of algorithms that produce conflict prevention information. This paper examines multiple mathematical approaches: iterative, vector algebraic, and trigonometric. The correctness theories are structured first to analyze conflict prevention information for all aircraft. Next, these theories are augmented to consider aircraft which will create a conflict within a given lookahead time. Certain key functions for a candidate algorithm, which satisfy this mathematical basis are presented; however, the proof that a full algorithm using these functions completely satisfies the definition of safety is not provided.
Author
Algorithms; Aircraft Safety; Iteration; Mathematical Models; Air Traffic Control

20090025483 NASA Langley Research Center, Hampton, VA, USA

A Methodology for Determining Statistical Performance Compliance for Airborne Doppler Radar with Forward-Looking Turbulence Detection Capability

Bowles, Roland L.; Buck, Bill K.; June 2009; 48 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL06AA03B; NNL08AC16T; NNL07AE19T

Report No.(s): NASA/CR-2009-215769; ATR-2009-12038; LF99-8937; Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025483

The objective of the research developed and presented in this document was to statistically assess turbulence hazard detection performance employing airborne pulse Doppler radar systems. The FAA certification methodology for forward looking airborne turbulence radars will require estimating the probabilities of missed and false hazard indications under operational conditions. Analytical approaches must be used due to the near impossibility of obtaining sufficient statistics experimentally. This report describes an end-to-end analytical technique for estimating these probabilities for Enhanced Turbulence (E-Turb) Radar systems under noise-limited conditions, for a variety of aircraft types, as defined in FAA TSO-C134. This technique provides for one means, but not the only means, by which an applicant can demonstrate compliance to the FAA directed ATDS Working Group performance requirements. Turbulence hazard algorithms were developed that derived predictive estimates of aircraft hazards from basic radar observables. These algorithms were designed to prevent false turbulence indications while accurately predicting areas of elevated turbulence risks to aircraft, passengers, and crew; and were successfully flight tested on a NASA B757-200 and a Delta Air Lines B737-800. Application of this defined methodology for calculating the probability of missed and false hazard indications taking into account the effect of the various algorithms used, is demonstrated for representative transport aircraft and radar performance characteristics.

Author

Airborne Radar; Doppler Radar; Atmospheric Turbulence; Aviation Meteorology; Turbulence Effects

20090025485 NASA Langley Research Center, Hampton, VA, USA

A Test Generation Framework for Distributed Fault-Tolerant Algorithms

Goodloe, Alwyn; Bushnell, David; Miner, Paul; Pasareanu, Corina S.; June 27, 2009; 8 pp.; In English; AFM09 (Automated Formal Methods), 27 Jun. 2009, Grenoble, France; Original contains color and black and white illustrations

Contract(s)/Grant(s): NCC1-02043; WBS 640337.01.04

Report No.(s): LF99-9052; Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025485

Heavyweight formal methods such as theorem proving have been successfully applied to the analysis of safety critical fault-tolerant systems. Typically, the models and proofs performed during such analysis do not inform the testing process of actual implementations. We propose a framework for generating test vectors from specifications written in the Prototype Verification System (PVS). The methodology uses a translator to produce a Java prototype from a PVS specification. Symbolic (Java) PathFinder is then employed to generate a collection of test cases. A small example is employed to illustrate how the framework can be used in practice.

Author

Algorithms; Fault Tolerance; Mathematical Models; Space Shuttles; Distributed Processing

20090025965 NASA Langley Research Center, Hampton, VA, USA

Evaluation of an Airborne Spacing Concept to Support Continuous Descent Arrival Operations

Murdoch, Jennifer L.; Barmore, Bryan E.; Baxley, Brian T.; Capron, William R.; Abbott, Terence S.; June 29, 2009; 9 pp.; In English; 8th USA-Europe Research and Development Seminar - ATM 2009, 29 Jun. - 2 Jul. 2009, Napa, CA, USA; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 411931.02.61.07.01

Report No.(s): LF99-8290; Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025965

This paper describes a human-in-the-loop experiment of an airborne spacing concept designed to support Continuous Descent Arrival (CDA) operations. The use of CDAs with traditional air traffic control (ATC) techniques may actually reduce an airport's arrival throughput since ATC must provide more airspace around aircraft on CDAs due to the variances in the aircraft trajectories. The intent of airborne self-spacing, where ATC delegates the speed control to the aircraft, is to maintain or even enhance an airport s landing rate during CDA operations by precisely achieving the desired time interval between aircraft at the runway threshold. This paper describes the operational concept along with the supporting airborne spacing tool

and the results of a piloted evaluation of this concept, with the focus of the evaluation on pilot acceptability of the concept during off-nominal events. The results of this evaluation show a pilot acceptance of this airborne spacing concept with little negative performance impact over conventional CDAs.
Author
Descent; Air Traffic Control; Control Systems Design; Trajectories; Speed Control; Spacing; Airspace

20090025971 NASA Langley Research Center, Hampton, VA, USA
Evaluating the Environmental Performance of the U.S. Next Generation Air Transportation System
Graham, Michael; Augustine, Stephen; Ermatinger, Christopher; Difelici, John; Thompson, Terence R.; Marcolini, Michael A.; Creedon, Jeremiah F.; June 29, 2009; 10 pp.; In English; 8th USA-Europe Research and Development Seminar - ATM 2009, 29 Jun. - 2 Jul. 2009, Napa, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.02.07.01
Report No.(s): LF99-8333; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025971

The environmental impacts of several possible U.S. Next Generation Air Transportation scenarios have been quantitatively evaluated for noise, air-quality, fuel-efficiency, and CO2 impacts. Three principal findings have emerged. (1) 2025 traffic levels about 30% higher than 2006 are obtained by increasing traffic according to FAA projections while also limiting traffic at each airport using reasonable ratios of demand to capacity. NextGen operational capabilities alone enable attainment of an additional 10-15% more flights beyond that 2025 baseline level with negligible additional noise, air-quality, and fuel-efficiency impacts. (2) The addition of advanced engine and airframe technologies provides substantial additional reductions in noise and air-quality impacts, and further improves fuel efficiency. 2025 environmental goals based on projected system-wide improvement rates of about 1% per year for noise and fuel-efficiency (an air-quality goal is not yet formulated) are achieved using this new vehicle technology. (3) Overall air-transport 'product', as measured by total flown distance or total payload distance, increases by about 50% relative to 2006, but total fuel consumption and CO2 production increase by only about 40% using NextGen operational capabilities. With the addition of advanced engine/airframe technologies, the increase in total fuel consumption and CO2 production can be reduced to about 30%.
Author
Air Transportation; Engine Airframe Integration; Fuel Consumption; Air Quality; Carbon Dioxide

20090025972 NASA Langley Research Center, Hampton, VA, USA
Distributed Trajectory Flexibility Preservation for Traffic Complexity Mitigation
Idris, Husni; Wing, David; Delahaye, Daniel; June 29, 2009; 10 pp.; In English; 8th USA-Europe Research and Development Seminar - ATM 2009, 29 Jun. - 2 Jul. 2009, Napa, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): NNA07BA86C; WBS 411931.02.51.07.01
Report No.(s): LF99-8303; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025972

The growing demand for air travel is increasing the need for mitigation of air traffic congestion and complexity problems, which are already at high levels. At the same time new information and automation technologies are enabling the distribution of tasks and decisions from the service providers to the users of the air traffic system, with potential capacity and cost benefits. This distribution of tasks and decisions raises the concern that independent user actions will decrease the predictability and increase the complexity of the traffic system, hence inhibiting and possibly reversing any potential benefits. In answer to this concern, the authors propose the introduction of decision-making metrics for preserving user trajectory flexibility. The hypothesis is that such metrics will make user actions naturally mitigate traffic complexity. In this paper, the impact of using these metrics on traffic complexity is investigated. The scenarios analyzed include aircraft in en route airspace with each aircraft meeting a required time of arrival in a one-hour time horizon while mitigating the risk of loss of separation with the other aircraft, thus preserving its trajectory flexibility. The experiments showed promising results in that the individual trajectory flexibility preservation induced self-separation and self-organization effects in the overall traffic situation. The effects were quantified using traffic complexity metrics based on Lyapunov exponents and traffic proximity.
Author
Air Traffic Control; Airspace; Congestion; Trajectories; Routes; Air Traffic

20090026008 NASA Langley Research Center, Hampton, VA, USA
Estimation of Separation Buffers for Wind-Prediction Error in an Airborne Separation Assistance System
Consiglio, Maria C.; Hoadley, Sherwood T.; Allen, B. Danette; June 29, 2009; 9 pp.; In English; 8th USA-Europe Research and Development Seminar - ATM 2009, 29 Jun. - 2 Jul. 2009, Napa, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 411931.02.51.07.01
Report No.(s): Lf99-8317; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026008

Wind prediction errors are known to affect the performance of automated air traffic management tools that rely on aircraft trajectory predictions. In particular, automated separation assurance tools, planned as part of the NextGen concept of operations, must be designed to account and compensate for the impact of wind prediction errors and other system uncertainties. In this paper we describe a high fidelity batch simulation study designed to estimate the separation distance required to compensate for the effects of wind-prediction errors throughout increasing traffic density on an airborne separation assistance system. These experimental runs are part of the Safety Performance of Airborne Separation experiment suite that examines the safety implications of prediction errors and system uncertainties on airborne separation assurance systems. In this experiment, wind-prediction errors were varied between zero and forty knots while traffic density was increased several times current traffic levels. In order to accurately measure the full unmitigated impact of wind-prediction errors, no uncertainty buffers were added to the separation minima. The goal of the study was to measure the impact of wind-prediction errors in order to estimate the additional separation buffers necessary to preserve separation and to provide a baseline for future analyses. Buffer estimations from this study will be used and verified in upcoming safety evaluation experiments under similar simulation conditions. Results suggest that the strategic airborne separation functions exercised in this experiment can sustain wind prediction errors up to 40kts at current day air traffic density with no additional separation distance buffer and at eight times the current day with no more than a 60% increase in separation distance buffer.
Author
Air Traffic Control; Prediction Analysis Techniques; Trajectories; Errors; Safety; Air Traffic

20090026264 Government Accountability Office, Washington, DC, USA
Aviation Safety: Better Data and Targeted FAA Efforts Needed to Identify and Address Safety Issues of Small Air Cargo Carriers
June 2009; 60 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-09-614; No Copyright; Avail.: CASI: A04, Hardcopy

The air cargo industry contributed over $37 billion to the U.S. economy in 2008 and provides government, businesses, and individuals with quick delivery of goods. Although part of an aviation system with an extraordinary safety record, there have been over 400 air cargo accidents and over 900 incidents since 1997, raising concerns about cargo safety. GAO's congressionally requested study addresses (1) recent trends in air cargo safety, (2) factors that have contributed to air cargo accidents, (3) federal government and industry efforts to improve air cargo safety and experts views on the effectiveness of these efforts, and (4) experts views on further improving air cargo safety. To perform the study, GAO analyzed agency data, surveyed a panel of experts, reviewed industry and government documents, and interviewed industry and government officials. GAO also conducted site visits to Alaska, Ohio, and Texas. GAO is recommending efforts to enhance small air cargo carrier safety, including data collection of carrier operations, targeted safety programs, and flight risk assessment. FAA and NTSB provided technical comments, which were included as appropriate.
Derived from text
Risk Assessment; Cargo Aircraft; Air Cargo; Aircraft Safety; Flight Safety; Safety Management

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.

20090025385 Army Research Lab., White Sands Missile Range, NM USA
A Fuel Consumption Algorithm for Unmanned Aircraft Systems
Jameson, Terry; May 2009; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A500380; ARL-TR-4803; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army Research Laboratory, Battlefield Environment Division has been developing an Aviation Weather Routing Tool

(AWRT) to address the issue of weather impacts upon various Unmanned Aircraft System (UAS) missions. The AWRT depicts regions of adverse weather impacts and then searches for alternate routes that minimize those impacts. A related factor that has yet to be included in AWRT involves UAS fuel consumption. Fuel consumption rates, remaining fuel quantity, and therefore allowable times' on-target are vital issues that must be considered to safely and most effectively employ UAS in their various mission roles. In particular, as AWRT proposes alternate routes that minimize adverse weather effects, additional fuel requirements to fly those routes must be taken into account. We have developed a prototype Fuel Consumption Algorithm (FCA) that addresses some of these issues. The prototype FCA has been designed such that minimal operator input is required, while a maximum amount of pertinent flight information is produced. UAS flight performance characteristics, prevailing winds, and mission route definitions are incorporated into the FCA. Using these data, the algorithm computes ground speeds along the various mission segments (and therefore flying times), fuel consumed, and then fuel and time available to be expended at a target area.
DTIC
Algorithms; Conditions; Drone Vehicles; Fuel Consumption; Hazards; Unmanned Aircraft Systems; Weather

20090025398 Defense Inst. of Security Assistance Management, Wright-Patterson AFB, OH USA
US Arms Transfer Policy and the F-X: Can Tigershark Survive
Blose, John N; DISAM Journal; Jan 1984; Volume 6, No. 3, pp. 9-24; In English
Report No.(s): AD-A500232; No Copyright; Avail.: Defense Technical Information Center (DTIC)
On 4 January 1980, the Carter Administration announced a revision of its policy on the development of fighter aircraft specifically for export. This exception opened the way formally for submission of industry proposals for development and production of a new intermediate export fighter which was to be designated the F-X. Until this point, Carter's arms transfer policy had explicitly prohibited development or significant modification of advanced weapons systems solely for export, however, late in his term he was to realize that the sale of the F-X would be in the national interest and, thus, compatible with US arms transfer policy. Carter guidelines for the new export fighter called for an aircraft having cost and performance characteristics which lie generally between the F-5E and F-16A fighters then in production. The aircraft was to be capable of defending recipients from projected air threats into the 1990s; have a secondary air-to-ground capability in close air support of ground forces but yet be sufficiently limited in offensive range-payload capability so as to be clearly out of the class of US advanced, fighter aircraft; and was to have lower cost and easier maintainability than current first-line US fighters. Unlike its predecessors in the export fighter arena, the F-X would receive no government funding for its development. Manufacturers were to assume all financial and marketing risks; however, the aircraft was to be sold on a strict government-to-government basis, in accordance with the provisions of the 1976 Arms Export Control Act. (11:17) The purpose of this paper is to examine the rationale for developing a new generation intermediate export fighter, assess the impact that contemporary US arms transfer policies have had on its development and sale, and attempt to define the degree of US government support required to make the F-X a viable contender in today's export fighter market.
DTIC
Fighter Aircraft; International Trade; Policies

20090025458 NASA Dryden Flight Research Center, Edwards, CA, USA
Flight Test Results from the Rake Airflow Gage Experiment on the F-15B Aircraft
Flynn, Darin C.; Frederick, Michael; Ratnayake, Nalin A.; June 22, 2009; 1 pp.; In English; 27th AIAA Applied Aerodynamics Conference, 22-25 Jun. 2009, San Antonio, TX, USA
Report No.(s): DFRC-928; No Copyright; Avail.: Other Sources; Abstract Only
The Rake Airflow Gage Experiment was flown on the Propulsion Flight Test Fixture at NASA Dryden Flight Research Center using one of Dryden s F-15B research testbed aircraft. Propulsion Flight Test Fixture is a modular, pylon-based platform for flight testing propulsion system components, such as the Channeled Centerbody Inlet Experiment, an innovative, variable-geometry, mixed compression supersonic inlet under development at NASA Dryden. The objective of this flight test was to ascertain the flowfield angularity and local Mach number profile of the aerodynamic interface plane that is defined by the planned location of the tip of the inlet centerbody. Knowledge of the flowfield characteristics at this location underneath will be essential to computational modeling of the new inlet as well as future propulsion systems flight testing using the test fixture. This paper describes the preparation for and execution of the flight test, as well as results and validation of the algorithm used to calculate local Mach number and angularity from the rake's pressure measurements.
Author
Air Flow; Flight Tests; Measuring Instruments; Modularity; Algorithms; Centerbodies

20090025497 Congressional Budget Office, Washington, DC, USA
Alternatives for Modernizing U.S. Fighter Forces
May 2009; 13 pp.; In English
Report No.(s): PB2009-110823; No Copyright; Avail.: National Technical Information Service (NTIS)

This Congressional Budget Office (CBO) study looks at the composition of today's fighter fleets and at how the Department of Defense's (DoD's) plans for modernizing fighter forces as set forth in the Bush Administration's 2009 Future Year's Defense Program (FYDP) and other DoD documents--would affect inventories and warfighting capability over the next several decades. (Just prior to the publication of this report, the Obama Administration released its budget request for fiscal year 2010. Summary Box 1 describes the proposed program changes that are relevant to this study.) As part of its analysis, CBO assessed the overall cost of executing DoD's fiscal year 2009 procurement plans. In addition, CBO explored seven alternative approaches to modernization that, in comparison with DoD's fiscal year 2009 projections, would offer varying levels of war-fighting capability and require varying levels of financial commitment. The study makes no judgments about the affordability or sufficiency of DoD's fiscal year 2009 plans or the seven alternatives.
NTIS
Alternatives; Fighter Aircraft; Federal Budgets; Transportation

20090025887 NASA Langley Research Center, Hampton, VA, USA; National Inst. of Aerospace, Hampton, VA, USA
A Consideration of Constraints on Aircraft Departure Operations
Darr, Stephen T.; Morello, Samuel A.; Shay, Richard F.; Lemos, Katherine A.; Jacobsen, Robert; June 2009; 45 pp.; In English
Contract(s)/Grant(s): NNL08AA00B; WBS 305295.02.07.07.30
Report No.(s): NASA/CR-2009-215763; LF99-8900; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025887

This paper presents a system-level perspective on the operational issues and constraints that limit departure capacity at large metropolitan airports in today's air transportation system. It examines the influence of constraints evident in en route airspace, in metroplex operations, and at individual airports from today's perspective and with a view toward future gate-to-cruise operations. Cross cutting organizational and technological challenges are discussed in relation to their importance in addressing the constraints.
Author
Takeoff; Air Transportation; Airports; Constraints; Airline Operations

20090026322 NASA Dryden Flight Research Center, Edwards, CA, USA
Subspace Iteration Method for Complex Eigenvalue Problems with Nonsymmetric Matrices in Aeroelastic System
Pak, Chan-gi; Lung, Shu; June 21, 2009; 1 pp.; In English; International Forum on Aeroelasticity and Structural Dynamics (IFASD) 2009, 21-25 Jun. 2009, Seattle, WA, USA
Report No.(s): DFRC-933; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026322

Modern airplane design is a multidisciplinary task which combines several disciplines such as structures, aerodynamics, flight controls, and sometimes heat transfer. Historically, analytical and experimental investigations concerning the interaction of the elastic airframe with aerodynamic and in retia loads have been conducted during the design phase to determine the existence of aeroelastic instabilities, so called flutter .With the advent and increased usage of flight control systems, there is also a likelihood of instabilities caused by the interaction of the flight control system and the aeroelastic response of the airplane, known as aeroservoelastic instabilities. An in -house code MPASES (Ref. 1), modified from PASES (Ref. 2), is a general purpose digital computer program for the analysis of the closed-loop stability problem. This program used subroutines given in the International Mathematical and Statistical Library (IMSL) (Ref. 3) to compute all of the real and/or complex conjugate pairs of eigenvalues of the Hessenberg matrix. For high fidelity configuration, these aeroelastic system matrices are large and compute all eigenvalues will be time consuming. A subspace iteration method (Ref. 4) for complex eigenvalues problems with nonsymmetric matrices has been formulated and incorporated into the modified program for aeroservoelastic stability (MPASES code). Subspace iteration method only solve for the lowest p eigenvalues and corresponding eigenvectors for aeroelastic and aeroservoelastic analysis. In general, the selection of p is ranging from 10 for wing flutter analysis to 50 for an entire aircraft flutter analysis. The application of this newly incorporated code is an experiment known as the Aerostructures Test Wing (ATW) which was designed by the National Aeronautic and Space Administration (NASA) Dryden Flight Research Center, Edwards, California to research aeroelastic instabilities. Specifically, this experiment was used to study an instability known as flutter. ATW was a small-scale airplane wing comprised of an airfoil and wing tip boom. This wing was formulated based on a NACA-65A004 airfoil shape with a 3.28 aspect ratio. The wing had a span of 18 inch with

root chord length of 13.2 inch and tip chord length of 8.7 inch. The total area of this wing was 197 square inch. The wing tip boom was a 1 inch diameter hollow tube of length 21.5 inch. The total weight of the wing was 2.66 lbs.
Author
Iteration; Eigenvalues; Matrices (Mathematics); Aeroelasticity; Aircraft Design; Symmetry

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.

20090025440 NASA Langley Research Center, Hampton, VA, USA
Computational Analysis for Roughness-Based Transition Control
Li, Fei; Choudhari, Meelan M.; Chang, Chau-Lyan; Edwards, Jack R., Jr.; June 23, 2009; 6 pp.; In English; IUTAM 2009 Symposium on Laminar-Turbulent Transition, 23-26 Jun. 2009, Stockholm, Sweden; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 599489
Report No.(s): LF99-8181; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025440

Suitably placed discrete roughness elements are known to delay or hasten the onset of transition, depending on requirements. In this paper, 2D eigenvalue analysis is used to study the effects of surface roughness in the context of transition delay over subsonic and supersonic swept wing configurations, as well as boundarylayer tripping on the forebody of a hypersonic air breathing vehicle.
Author
Surface Roughness Effects; Aerodynamic Configurations; Analysis (Mathematics); Eigenvalues; Surface Roughness; Forebodies

20090025969 NASA Langley Research Center, Hampton, VA, USA
Experimental Performance of a Genetic Algorithm for Airborne Strategic Conflict Resolution
Karr, David A.; Vivona, Robert A.; Roscoe, David A.; DePascale, Stephen M.; Consiglio, Maria; June 29, 2009; 10 pp.; In English; 8th USA-Europe Research and Development Seminar - ATM 2009, 29 Jun. - 2 Jul. 2009, Napa, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 411931.02.51.07.01
Report No.(s): LF99-8301; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025969

The Autonomous Operations Planner, a research prototype flight-deck decision support tool to enable airborne self-separation, uses a pattern-based genetic algorithm to resolve predicted conflicts between the ownship and traffic aircraft. Conflicts are resolved by modifying the active route within the ownship's flight management system according to a predefined set of maneuver pattern templates. The performance of this pattern-based genetic algorithm was evaluated in the context of batch-mode Monte Carlo simulations running over 3600 flight hours of autonomous aircraft in en-route airspace under conditions ranging from typical current traffic densities to several times that level. Encountering over 8900 conflicts during two simulation experiments, the genetic algorithm was able to resolve all but three conflicts, while maintaining a required time of arrival constraint for most aircraft. Actual elapsed running time for the algorithm was consistent with conflict resolution in real time. The paper presents details of the genetic algorithm's design, along with mathematical models of the algorithm's performance and observations regarding the effectiveness of using complimentary maneuver patterns when multiple resolutions by the same aircraft were required.
Author
Flight Management Systems; Real Time Operation; Genetic Algorithms; Monte Carlo Method; Operations Research; Airspace

20090026191 NASA Dryden Flight Research Center, Edwards, CA, USA
Implementation of an Adaptive Controller System from Concept to Flight Test
Larson, Richard R.; Burken, John J.; Butler, Bradley S.; Yokum, Steve; April 06, 2009; In English; AIAA Infotech\@Aerospace Conference and Exhibit, 6-9 Apr. 2009, Seattle, WA, USA; Original contains color and black and white illustrations
Report No.(s): DFRC-970; Copyright; Avail.: CASI: C01, CD-ROM

The National Aeronautics and Space Administration (NASA) at the Dryden Flight Research Center (DFRC) has been conducting flight-test research using an F-15 aircraft (figure 1). This aircraft has been specially modified to interface a neural net (NN) controller as part of a single-string Airborne Research Test System (ARTS) computer with the existing quad-redundant flight control system (FCC) shown in figure 2. The NN commands are passed to FCC channels 2 and 4 and are cross channel data linked (CCDL) to the other computers as shown. Numerous types of fault-detection monitors exist in the FCC when the NN mode is engaged; these monitors would cause an automatic disengagement of the NN in the event of a triggering fault. Unfortunately, these monitors still may not prevent a possible NN hard-over command from coming through to the control laws. Therefore, an additional and unique safety monitor was designed for a single-string source that allows authority at maximum actuator rates but protects the pilot and structural loads against excessive g-limits in the case of a NN hard-over command input. This additional monitor resides in the FCCs and is executed before the control laws are computed. This presentation describes a 'floating limiter' (FL) concept that was developed and successfully test-flown for this program (figure 3). The FL computes the rate of change of the NN commands that are input to the FCC from the ARTS. A window is created with upper and lower boundaries, which is constantly 'floating' and trying to stay centered as the NN command rates are changing. The limiter works by only allowing the window to move at a much slower rate than those of the NN commands. Anywhere within the window, however, full rates are allowed. If a rate persists in one direction, it will eventually 'hit' the boundary and be rate-limited to the floating limiter rate. When this happens, a persistent counter begins and after a limit is reached, a NN disengage command is generated. The tunable metrics for the FL are (1) window size, (2) drift rate, and (3) persistence counter. Ultimate range limits are also included in case the NN command should drift slowly to a limit value that would cause the FL to be defeated. The FL has proven to work as intended. Both high-g transients and excessive structural loads are controlled with NN hard-over commands. This presentation discusses the FL design features and presents test cases. Simulation runs are included to illustrate the dramatic improvement made to the control of NN hard-over effects. A mission control room display from a flight playback is presented to illustrate the neural net fault display representation. The FL is very adaptable to various requirements and is independent of flight condition. It should be considered as a cost-effective safety monitor to control single-string inputs in general.
Author
F-15 Aircraft; Neural Nets; Controllers; Flight Control; Safety Devices; Adaptive Control; Loads (Forces)

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)*.

20090025492 Smith (Wilbur) and Associates, Columbia, SC, USA
Airport System Planning Practices. A Synthesis of Airport Practice
Fritsche, B.; January 2009; 79 pp.; In English
Report No.(s): PB2009-111670; ACRP-SYN-14; No Copyright; Avail.: CASI: A05, Hardcopy

This synthesis study is intended to inform state aviation agencies, airport operators, stakeholders, and policy makers about Airport System Planning Practices. The report reviews literature and provides results of surveys of state aviation agencies and regional planning organizations to determine the extent to which they are involved in airport system planning, the type of studies they perform, and how successful their efforts have been in meeting the process objectives. Barbara Fritsche, Wilbur Smith Associates, Cincinnati, Ohio, collected and synthesized the information and wrote the report. The members of the topic panel are acknowledged on the preceding page. This synthesis is an immediately useful document that records the practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As progress in research and practice continues, new knowledge will be added to that now at hand.
NTIS
Airport Planning; Airports; Procedures

20090026202 Australian National Univ., Canberra, Australia
Fluorescence Imaging of Rotational and Vibrational Temperature in a Shock Tunnel Nozzle Flow
Palma, Philip C.; Danehy, Paul M.; Houwing, A. F. P.; AIAA Journal; September 2003; Volume 41, No. 9, pp. 1722-1732; In English; 20th AIAA Advanced Measurement and Ground Testing Technology Conference, 15-18 Jun. 2001, Albuquerque, NM, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): 713-80-13-01
Report No.(s): AIAA Paper 98-2703; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026202

Two-dimensional rotational and vibrational temperature measurements were made at the nozzle exit of a free-piston shock tunnel using planar laser-induced fluorescence. The Mach 7 flow consisted predominantly of nitrogen with a trace quantity of nitric oxide. Nitric oxide was employed as the probe species and was excited at 225 nm. Nonuniformities in the distribution of nitric oxide in the test gas were observed and were concluded to be due to contamination of the test gas by driver gas or cold test gas.The nozzle-exit rotational temperature was measured and is in reasonable agreement with computational modeling. Nonlinearities in the detection system were responsible for systematic errors in the measurements. The vibrational temperature was measured to be constant with distance from the nozzle exit, indicating it had frozen during the nozzle expansion.
Author
Nitric Oxide; Nozzle Flow; Shock Tunnels; Temperature Measurement; Convergent-Divergent Nozzles

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*.

20090026033 Los Alamos National Lab., NM USA
Targeted and Comprehensive Space-Environment Sensors: Description and Recommendations
Reeves, G.; O'Brien, P.; Mazur, J.; Ginet, G.; Jan. 2009; 16 pp.; In English
Contract(s)/Grant(s): DE-AC52-03NA99205
Report No.(s): DE2009-948578; LA-14381; No Copyright; Avail.: Department of Energy Information Bridge

We discuss the roles of the two classes of space-environment sensors on operational space systems: (1) Targeted sensors capable of measuring the environment and effects at a level sufficient for providing situational awareness for the host spacecraft and (2) Comprehensive sensors capable of providing detailed environment measurements that can be mapped to a broad region of near-Earth space, providing global situational awareness and quantitative characterization of the environment. Our purpose is to show the usefulness of a heterogeneous architecture with both classes of sensors for the near-term and long-term needs of National Security Space.
NTIS
Aerospace Environments; Aerospace Systems; Hazards; Security; Targets

13
ASTRODYNAMICS

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

20090025457 NASA Dryden Flight Research Center, Edwards, CA, USA
Application of Reduced Order Transonic Aerodynamic Influence Coefficient Matrix for Design Optimization
Pak, Chan-gi; Li, Wesley W.; June 21, 2009; 1 pp.; In English; International Forum on Aeroelasticity and Structural Dynamics (IFASD) 2009, 21-25 Jun. 2009, Seattle, WA, USA
Report No.(s): DFRC-932; No Copyright; Avail.: Other Sources; Abstract Only

Supporting the Aeronautics Research Mission Directorate guidelines, the National Aeronautics and Space Administration [NASA] Dryden Flight Research Center is developing a multidisciplinary design, analysis, and optimization [MDAO] tool. This tool will leverage existing tools and practices, and allow the easy integration and adoption of new state-of-the-art software. Today s modern aircraft designs in transonic speed are a challenging task due to the computation time required for

the unsteady aeroelastic analysis using a Computational Fluid Dynamics [CFD] code. Design approaches in this speed regime are mainly based on the manual trial and error. Because of the time required for unsteady CFD computations in time-domain, this will considerably slow down the whole design process. These analyses are usually performed repeatedly to optimize the final design. As a result, there is considerable motivation to be able to perform aeroelastic calculations more quickly and inexpensively. This paper will describe the development of unsteady transonic aeroelastic design methodology for design optimization using reduced modeling method and unsteady aerodynamic approximation. The method requires the unsteady transonic aerodynamics be represented in the frequency or Laplace domain. Dynamically linear assumption is used for creating Aerodynamic Influence Coefficient [AIC] matrices in transonic speed regime. Unsteady CFD computations are needed for the important columns of an AIC matrix which corresponded to the primary modes for the flutter. Order reduction techniques, such as Guyan reduction and improved reduction system, are used to reduce the size of problem transonic flutter can be found by the classic methods, such as Rational function approximation, p-k, p, root-locus etc. Such a methodology could be incorporated into MDAO tool for design optimization at a reasonable computational cost. The proposed technique is verified using the Aerostructures Test Wing 2 actually designed, built, and tested at NASA Dryden Flight Research Center. The results from the full order model and the approximate reduced order model are analyzed and compared.
Author

Aerodynamic Coefficients; Computational Fluid Dynamics; Influence Coefficient; Transonic Flow; Transonic Flutter; Unsteady Aerodynamics

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

20090026268 NASA Ames Research Center, Moffett Field, CA, USA

A Flexible Evolvable Architecture for Constellation Mission Systems User Applications

Trimble, Jay P.; Crocker, Alan R.; May 12, 2008; 8 pp.; In English; SpaceOps 2008 Conference, 12-16 May 2008, Heidelberg, Germany; Original contains color illustrations

Contract(s)/Grant(s): WBS 282938.02.09.20.99

Report No.(s): ARC-E-DAA-TN-120; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026268

While simulating a complex set of repair tasks to be performed by EVA crewmembers on an upcoming mission, flight controllers and astronauts determine that the repair will take much longer than originally anticipated. All equipment in the vicinity of the worksite must be powered off to maintain a safe environment for the astronauts. Because heater power will be unavailable, several critical components will now be at risk of freezing and permanent damage. If an impending thermal violation is detected, Mission Control will have very limited time to react. Therefore, flight controllers must not only modify their procedures to account for these risks, they must also incorporate into their displays outputs from thermal models, alternate temperature measurements, new alarm limits, and emergency power-on commands to enable the detection and response to freezing conditions. Current software for mission control systems makes scenarios like this difficult to address. Given the time frame for modifying software, operations teams are left with labor-intensive operational workarounds as their only options. NASA Ames Research Center (ARC) and NASA Johnson Space Center (JSC) are collaborating on the development of a flexible software system for mission operations that will enable greater user flexibility than has been available to date. Using composable software, end users in the scenario described above could recompose procedures and command and control displays to allow flight controllers to monitor temperature measurements, identify time-critical conditions, and execute the procedures required to respond to these conditions before flight hardware is permanently damaged.
Author

Warning Systems; Flight Control; Software Engineering; Extravehicular Activity; Flexibility; Display Devices; Prevention; Damage; Command and Control; Constellation Program

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*.

20090025418 NASA Marshall Space Flight Center, Huntsville, AL, USA
Operational Considerations and Comparisons of the Saturn, Space Shuttle and Ares Launch Vehicles
Cruzen, Craig; Chavers, Greg; Wittenstein, Jerry; March 07, 2009; 15 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, Mt, USA; Original contains color illustrations
Report No.(s): IEEEAC Paper 1389; M09-0269; MO9-0350; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025418

The USA (U.S.) space exploration policy has directed the National Aeronautics and Space Administration (NASA) to retire the Space Shuttle and to replace it with a new generation of space transportation systems for crew and cargo travel to the International Space Station, the Moon, Mars, and beyond. As part of the Constellation Program, engineers at NASA's Marshall Space Flight Center in Huntsville, Alabama are working to design and build the Ares I, the first of two large launch vehicles to return humans to the Moon. A deliberate effort is being made to ensure a high level of operability in order to significantly increase safety and availability as well as reduce recurring costs of this new launch vehicle. It is the Ares Project's goal to instill operability as part of the requirements development, design and operations of the vehicle. This paper will identify important factors in launch vehicle design that affect the operability and availability of the system. Similarities and differences in operational constraints will also be compared between the Saturn V, Space Shuttle and current Ares I design. Finally, potential improvements in operations and operability for large launch vehicles will be addressed. From the examples presented, the paper will discuss potential improvements for operability for future launch vehicles.
Author
Constellation Program; Launch Vehicles; Space Transportation System; Space Exploration; NASA Programs; Launch Vehicle Configurations; Systems Engineering

20090025422 NASA Marshall Space Flight Center, Huntsville, AL, USA
Infusing Training into the Documentation and Culture of Ares I Upper Stage Design and Manufacturing
Scott, David W.; March 07, 2009; 6 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, MT, USA; Original contains color illustrations
Report No.(s): IEEEAC Paper 1550, Version 4; M09-0222; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025422

In roughly two years time, Marshall Space Flight Center's (MSFC) Mission Operations Laboratory (MOL) has incubated a personnel training and certification program for about 1000 learners and multiple phases of the Ares I Upper Stage (US) project. Previous MOL-developed training programs focused on about 100 learners with a focus on operations, and had enough full-time training staff to develop courseware and provide training administration. This paper discusses 1) how creation of a broad, structured training program unfolded as feedback from more narrowly defined tasks, 2) how training philosophy, development methods, and administration are being simplified and tailored so that many Upper Stage organizations can grow their own training yet maintain consistency, accountability, and traceability across the project, and 3) possibilities for interfacing with the production contractor's training system and staff.
Author
Ares 1 Upper Stage; Manufacturing; Launch Vehicle Configurations; International Space Station; General Overviews; Education

20090025424 NASA Marshall Space Flight Center, Huntsville, AL, USA
Flight and Integrated Vehicle Testing: Laying the Groundwork for the Next Generation of Space Exploration Launch Vehicles
Taylor, Jim; April 14, 2009; 2 pp.; In English
Report No.(s): M09-0104; No Copyright; Avail.: Other Sources; Abstract Only

Integrated vehicle testing will be critical to ensuring proper vehicle integration of the Ares I crew launch vehicle and Ares V cargo launch vehicle. The Ares Projects, based at Marshall Space Flight Center in Alabama, created the Flight and Integrated Test Office (FITO) as a separate team to ensure that testing is an integral part of the vehicle development process. As its name indicates, FITO is responsible for managing flight testing for the Ares vehicles. FITO personnel are well on the way toward assembling and flying the first flight test vehicle of Ares I, th Ares I-X. This suborbital development flight will evaluate the

performance of Ares I from liftoff to first stage separation, testing flight control algorithms, vehicle roll control, separation and recovery systems, and ground operations. Ares I-X is now scheduled to fly in summer 2009. The follow-on flight, Ares I-Y, will test a full five-segment first stage booster and will include cryogenic propellants in the upper stage, an upper stage engine simulator, and an active launch abort system. The following flight, Orion 1, will be the first flight of an active upper stage and upper stage engine, as well as the first uncrewed flight of an Orion spacecraft into orbit. The Ares Projects are using an incremental buildup of flight capabilities prior to the first operational crewed flight of Ares I and the Orion crew exploration vehicle in 2015. In addition to flight testing, the FITO team will be responsible for conducting hardware, software, and ground vibration tests of the integrated launch vehicle. These efforts will include verifying hardware, software, and grou handling interfaces. Through flight and integrated testing, the Ares Projects will identify and mitigate risks early the USA prepares to take its next giant leaps to the Moon and beyond.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Flight Test Vehicles; Space Exploration; Manned Space Flight

20090025484 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares I-X: On the Threshold of Exploration
Davis, Stephan R.; Askins, Bruce; April 14, 2009; 13 pp.; In English; JANNAF Conference, 14-17 Apr. 2008, Las Vegas, NV, USA; Original contains color illustrations
Report No.(s): M09-0344; M09-0098; M09-0401; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025484

Ares I-X, the first flight of the Ares I crew launch vehicle, is less than a year from launch. Ares I-X will test the flight characteristics of Ares I from liftoff to first stage separation and recovery. The flight also will demonstrate the computer hardware and software (avionics) needed to control the vehicle; deploy the parachutes that allow the first stage booster to land in the ocean safely; measure and control how much the rocket rolls during flight; test and measure the effects of first stage separation; and develop and try out new ground handling and rocket stacking procedures in the Vehicle Assembly Building (VAB) and first stage recovery procedures at Kennedy Space Center (KSC) in Florida. All Ares I-X major elements have completed their critical design reviews, and are nearing final fabrication. The first stage--four-segment solid rocket booster from the Space Shuttle inventory--incorporates new simulated forward structures to match the Ares I five-segment booster. The upper stage, Orion crew module, and launch abort system will comprise simulator hardware that incorporates developmental flight instrumentation for essential data collection during the mission. The upper stage simulator consists of smaller cylindrical segments, which were transported to KSC in fall 2008. The crew module and launch abort system simulator were shipped in December 2008. The first stage hardware, active roll control system (RoCS), and avionics components will be delivered to KSC in 2009. This paper will provide detailed statuses of the Ares I-X hardware elements as NASA's Constellation Program prepares for this first flight of a new exploration era in the summer of 2009.
Author
Ares 1 Launch Vehicle; Rocket Launching; Constellation Program; Flight Tests; Spacecraft Components

20090025970 NASA Marshall Space Flight Center, Huntsville, AL, USA
Main Propulsion for the Ares Projects
Sumrall, Phil; April 21, 2009; 14 pp.; In English; Baylor University Engineering Class, 21 Apr. 2009, Waco, TX, USA; Original contains color illustrations
Report No.(s): M09-0443; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025970

The goal of this slide presentation is to provide an update on the status of the Ares propulsion systems. The Ares I is the vehicle to launch the crew and the Ares V is a heavy lift vehicle that is being designed to launch cargo into Low Earth Orbit (LEO) and transfer cargo and crews to the moon. The Ares propulsion systems are based on the heritage hardware and experiences from the Apollo project to the Space Shuttle and also to current expendable launch vehicles (ELVs). The presentation compares the various launch vehicles from the Saturn V to the space shuttle, including the planned details of the Ares I and V. There are slides detailing the elements of the Ares I and the Ares V, including views of the J2X upper stage engine that is to serve both the Ares I and V. The extent of the progress is reviewed.
CASI
Propulsion; Propulsion System Configurations; Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; J-2 Engine

20090025977 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares I Operability Overview
Shaughnessy, Raymond W.; April 29, 2009; 67 pp.; In English; AIAA Space Operations and Support Technical Committee, 29-30 Apr. 2009, Honolulu, HI, USA; Original contains color illustrations
Report No.(s): M09-0445; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025977

A general overview of Ares I Operability is presented. The contents include: 1) Vehicle and Ops Concept Overviews; 2) What does operability mean to the Ares I Project?; 3) What is the Ares Project doing to influence operability into the flight hardware designs?; and 4) How do we measure Ares I Project success in infusing operability?
CASI
General Overviews; Ares 1 Launch Vehicle; Operations Research; Technology Assessment; Systems Integration

20090026016 NASA Marshall Space Flight Center, Huntsville, AL, USA
Integrated Vehicle Ground Vibration Testing in Support of Launch Vehicle Loads and Controls Analysis
Tuma, Margaret L.; Chenevert, Donald J.; April 14, 2009; 15 pp.; In English; 56th JANNAF Propulsion Meeting, 14-17 Apr. 2009, Nevada, USA; Original contains color and black and white illustrations
Report No.(s): M09-0402; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026016

NASA has conducted dynamic tests on each major launch vehicle during the past 45 years. Each test provided invaluable data to correlate and correct analytical models. GVTs result in hardware changes to Saturn and Space Shuttle, ensuring crew and vehicle safety. Ares I IVGT will provide test data such as natural frequencies, mode shapes, and damping to support successful Ares I flights. Testing will support controls analysis by providing data to reduce model uncertainty. Value of testing proven by past launch vehicle successes and failures. Performing dynamic testing on Ares vehicles will provide confidence that the launch vehicles will be safe and successful in their missions.
Derived from text
Dynamic Tests; Loads (Forces); Mathematical Models; Space Shuttle Orbiters; Vibration Mode; Vibration Tests; Ares 1 Launch Vehicle

20090026017 NASA Marshall Space Flight Center, Huntsville, AL, USA
Area V: A National Launch Asset for the 21st Century
Sumrall, Phil; April 14, 2009; 18 pp.; In English; 56th Joint Army Navy NASA Air Force Propulsion Meeting, 14-17 Apr. 2009, Nevada, USA; Original contains color illustrations
Report No.(s): M09-0406; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026017

The goal of this presentation is to present an update on status and development of the Ares V launch vehicle. The Ares V is a heavy lift vehicle that is being designed to launch cargo into Low Earth Orbit and transfer Cargo and crews to the Moon. Slides show the commonalities between the Ares V, and the Ares I, and the Delta IV. The launch profile for a typical Lunar mission is reviewed. A timeline showing the progress from the Exploration Systems Architecture Study (ESAS) to the Lunar Capability Concept Review (LCCR) is presented. Other slides review the payload shroud, the payload vs altitude and inclination, the payload mass vs C3 Energy, projections of the performance for selected trajectories, and the planning calendar.
CASI
Ares 5 Cargo Launch Vehicle; Constellation Program; Planning

20090026018 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares V: New Opportunities for Scientific Payloads
Creech, Steve; March 26, 2009; 11 pp.; In English; Original contains color illustrations
Report No.(s): M09-0407; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026018

What if scientists and payload planners had access to three to five times the volume and five to nine times the mass provided by today's launch vehicles? This simple question can lead to numerous exciting possibilities, all involving NASA's new Ares V cargo launch vehicle now on the drawing board. Multiple scientific fields and payload designers have that opportunity with the Ares V cargo launch vehicle, being developed at NASA as the heavy-lift component of the U.S. Space Exploration Policy. When the Ares V begins flying late next decade, its capabilities will significantly exceed the 1960s-era

Saturn V or the current Space Shuttle, while it benefits from their engineering, manufacturing, and infrastructure heritage. It will send more crew and cargo to more places on the lunar surface than Apollo and provide ongoing support to a permanent lunar outpost. Moreover, it will restore a strategic heavy-lift U.S. asset, which can support human and robotic exploration and scientific ventures for decades to come. Assessment of astronomy payload requirements since Spring 2008 has indicated that Ares V has the potential to support a range of payloads and missions. Some of these missions were impossible in the absence of Ares V's capabilities. Collaborative design/architecture inputs, exchanges, and analyses have already begun between scientists and payload developers. A 2008 study by a National Research Council (NRC) panel, as well as analyses presented by astronomers and planetary scientists at two weekend conferences in 2008, support the position that Ares V has benefit to a broad range of planetary and astronomy missions. This early dialogue with Ares V engineers is permitting the greatest opportunity for payload/transportation/mission synergy and the least financial impact to Ares V development. In addition, independent analyses suggest that Ares V has the opportunity to enable more cost-effective mission design.
Derived from text
Ares 5 Cargo Launch Vehicle; Payloads; Space Shuttles; Robotics; General Overviews; Systems Integration; Astronomy

20090026309 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ensuring Safe Exploration: Ares Launch Vehicle Integrated Vehicle Ground Vibration Testing
Tuma, M. L.; Chenevert, D. J.; April 14, 2009; 19 pp.; In English; JANNAF Conference, 14-17 Apr. 2009, Las Vegas, NV, USA; Original contains color and black and white illustrations
Report No.(s): M09-0345; M09-0099; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026309

Ground vibration testing has been an integral tool for developing new launch vehicles throughout the space age. Several launch vehicles have been lost due to problems that would have been detected by early vibration testing, including Ariane 5, Delta III, and Falcon 1. NASA will leverage experience and testing hardware developed during the Saturn and Shuttle programs to perform ground vibration testing (GVT) on the Ares I crew launch vehicle and Ares V cargo launch vehicle stacks. NASA performed dynamic vehicle testing (DVT) for Saturn and mated vehicle ground vibration testing (MVGVT) for Shuttle at the Dynamic Test Stand (Test Stand 4550) at Marshall Space Flight Center (MSFC) in Huntsville, Alabama, and is now modifying that facility to support Ares I integrated vehicle ground vibration testing (IVGVT) beginning in 2012. The Ares IVGVT schedule shows most of its work being completed between 2010 and 2014. Integrated 2nd Stage Ares IVGVT will begin in 2012 and IVGVT of the entire Ares launch stack will begin in 2013. The IVGVT data is needed for the human-rated Orion launch vehicle's Design Certification Review (DCR) in early 2015. During the Apollo program, GVT detected several serious design concerns, which NASA was able to address before Saturn V flew, eliminating costly failures and potential losses of mission or crew. During the late 1970s, Test Stand 4550 was modified to support the four-body structure of the Space Shuttle. Vibration testing confirmed that the vehicle's mode shapes and frequencies were better than analytical models suggested, however, the testing also identified challenges with the rate gyro assemblies, which could have created flight instability and possibly resulted in loss of the vehicle. Today, NASA has begun modifying Test Stand 4550 to accommodate Ares I, including removing platforms needed for Shuttle testing and upgrading the dynamic test facilities to characterize the mode shapes and resonant frequencies of the vehicle. The IVGVT team expects to collect important information about the new launch vehicles, greatly increasing astronaut safety as NASA prepares to explore the Moon and beyond.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Ground Tests; Vibration; Test Stands; Test Facilities

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*.

20090025466 NASA Glenn Research Center, Cleveland, OH, USA
Ka-Band Waveguide Hybrid Combiner for MMIC Amplifiers With Unequal and Arbitrary Power Output Ratio
Simons, Rainee N.; Chevalier, Christine T.; Wintucky, Edwin G.; Freeman, Jon C.; June 2009; 12 pp.; In English; 2009 International Microwave Symposium, 7-12 Jun. 2009, Boston, MA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 806866.02.03.0645.01
Report No.(s): NASA/TM-2009-215639; E-16925-1; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025466

The design, simulation and characterization of a novel Ka-band (32.05 +/- 0.25 GHz) rectangular waveguide branch-line

hybrid unequal power combiner is presented. The manufactured combiner was designed to combine input signals, which are in phase and with an amplitude ratio of two. The measured return loss and isolation of the branch-line hybrid are better than 22 and 27 dB, respectively. The application of the branch-line hybrid for combining two MMIC power amplifiers with output power ratio of two is demonstrated. The measured combining efficiency is approximately 93 percent over the above frequency band.
Author
Extremely High Frequencies; Integrated Circuits; Microwave Circuits; Power Amplifiers; Rectangular Waveguides

20090026172 Observatoire de la Cote d'Azur, Grasse, France
T2L2 Time Transfer by Laser Link
Veillet, Christian; Fridelance, Patricia; Dec 1994; 12 pp.; In English
Report No.(s): AD-A500253; No Copyright; Avail.: Defense Technical Information Center (DTIC)
T2L2 (Time Transfer by Laser Link) is a new generation time transfer experiment based on the principles of LASSO (Laser Synchronization from Synchronous Orbit) and used with an operational procedure developed at OCA (Observatoire de la Cote d'Azur) during the active intercontinental phase of LASSO. The hardware improvements could lead to a precision better than 10 ps for time transfer (flying clock monitoring or ground based clock comparison). Such a package could fly on any spacecraft with a stable clock. It is developed in France in the frame of the PHARAO project (cooled atom clock in orbit) involving CNES and different laboratories. But TZL2 could fly on any spacecraft carrying a stable oscillator. A GPS satellite would be a good candidate, as T2L2 could allow to link the flying clock directly to ground clocks using light, aiming to important accuracy checks, both for time and for geodesy. Radiostron (a flying VLBI antenna with an H-maser) is also envisioned, waiting for a PHARAO flight. The ultimate goal of T2L2 is to be part of more ambitious missions, as SORT (Solar Orbit Relativity Test), aiming to examine aspects of the gravitation in the vicinity of the Sun.
DTIC
Artificial Satellites; Evaluation; Gas Lasers; Global Positioning System; Information Transfer; Optical Communication; Synchronous Satellites; System Effectiveness; Synchronism; Clocks; Very Long Baseline Array (VLBA)

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*.

20090025479 NASA Marshall Space Flight Center, Huntsville, AL, USA
Xenia Spacecraft Study
Hopkins, Randy; March 02, 2009; 83 pp.; In English; Original contains color and black and white illustrations
Report No.(s): M09-0347; No Copyright; Avail.: CASI: A05, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025479
This slide presentation reviews the proposed design for the Xenia mission spacecraft. The goal of this study is to perform a mission concept study for the mission. Included in this study are: the overall ground rules and assumptions (GR&A), a mission analysis, the configuration, the mass properties, the guidance, Navigation and control, the proposed avionics, the power system, the thermal protection system, the propulsion system, and the proposed structures. Conclusions from the study indicate that the observatory fits within the Falcon 9 mass and volume envelope for launching from Omelek, the pointing, slow slewing, and fast slewing requirements and the thermal requirements are met.
CASI
Mission Planning; Astronomical Satellites; Spaceborne Astronomy

20090025480 NASA Marshall Space Flight Center, Huntsville, AL, USA
Flight and Integrated Vehicle Testing: Laying the Groundwork for the Next Generation of Space Exploration Launch Vehicles
Taylor, J. L.; Cockrell, C. E.; April 14, 2009; 30 pp.; In English; JANNAF Conference, 14-17 Apr., Las Vegas, NV, USA; Original contains color illustrations
Report No.(s): M09-0352; M09-0400; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025480
Integrated vehicle testing will be critical to ensuring proper vehicle integration of the Ares I crew launch vehicle and Ares

V cargo launch vehicle. The Ares Projects, based at Marshall Space Flight Center in Alabama, created the Flight and Integrated Test Office (FITO) as a separate team to ensure that testing is an integral part of the vehicle development process. As its name indicates, FITO is responsible for managing flight testing for the Ares vehicles. FITO personnel are well on the way toward assembling and flying the first flight test vehicle of Ares I, the Ares I-X. This suborbital development flight will evaluate the performance of Ares I from liftoff to first stage separation, testing flight control algorithms, vehicle roll control, separation and recovery systems, and ground operations. Ares I-X is now scheduled to fly in summer 2009. The follow-on flight, Ares I-Y, will test a full five-segment first stage booster and will include cryogenic propellants in the upper stage, an upper stage engine simulator, and an active launch abort system. The following flight, Orion 1, will be the first flight of an active upper stage and upper stage engine, as well as the first uncrewed flight of an Orion spacecraft into orbit. The Ares Projects are using an incremental buildup of flight capabilities prior to the first operational crewed flight of Ares I and the Orion crew exploration vehicle in 2015. In addition to flight testing, the FITO team will be responsible for conducting hardware, software, and ground vibration tests of the integrated launch vehicle. These efforts will include verifying hardware, software, and ground handling interfaces. Through flight and integrated testing, the Ares Projects will identify and mitigate risks early as the USA prepares to take its next giant leaps to the Moon and beyond.
Author
Ares 1 Launch Vehicle; Ares 5 Cargo Launch Vehicle; Flight Characteristics; Flight Tests; Launching; Planning

20090025985 NASA Marshall Space Flight Center, Huntsville, AL, USA
Infusing Training into the Documentation and Culture of Ares I Upper Stage Development, Manufacturing, Testing, and Operations
Scott, David W.; March 03, 2009; 1 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, MT, USA
Report No.(s): MSFC-2214; No Copyright; Avail.: Other Sources

During the Preliminary Design Review (PDR) for the Ares I rocket's Upper Stage element, Marshall Space Flight Center's (MSFC) Training and Crew Support Branch (EO20) identified a need for comprehensive personnel training and certification in multiple phases of the project not just for ground and flight operations, which is traditional, but during design, manufacture, and test as well. MSFC's successful training program for International Space Station (ISS) payload operations over a ten-year time span and had funding for a full-time branch to develop, deliver, and manage training to an initial learner population of about 100 flight operations personnel, most of whom were in the same organization as the training team and/or had been involved in the Spacelab program of the 1980s and 1990s. The Upper Stage effort has required a much faster buildup, involves almost 1000 learners from a wider array of disciplines, and does not have funding for enough full-time training personnel to develop large percentages of the course material. This paper discusses how training philosophy, development methods, and administration are being simplified and tailored so that many Upper Stage organizations can grow their own training yet maintain consistency, accountability, and traceability across the project.
Author
Ares 1 Upper Stage; International Space Station; Manufacturing; Flight Training

20090026009 NASA Langley Research Center, Hampton, VA, USA
NESC Independent Review of the Mars Reconnaissance Orbiter (MRO) Contamination Thermal/Vacuum (T/V) Anomaly Technical Consultation Report
Sutter, James K.; Leidecker, Henning W.; Panda, Binayak; Piascik, Robert S.; Muirhead, Brian K.; Peeler, Debra; March 2009; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 510505.01.07.01.06
Report No.(s): NASA/TM-2009-215573; NESC-RP-05-122/05-038-E; L-19609; LF99-8400; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026009

The NESC eras requested by the NASA Jet Propulsion Laboratory (JPL) to conduct an independent review of the Mars Reconnaissance Orbiter (MRO) Thermal/Vacuum (T/V) Anomaly Assessment. Because the anomaly resulted in the surface contamination of the MRO, selected members of the Materials Super Problem Resolution Team (SPRT) and the NASA technical community having technical expertise relative to contamination issues were chosen for the independent review. The consultation consisted of a review of the MRO Project's reported response to the assessment findings, a detailed review of JPL technical assessment final report, and detailed discussions with the JPL assessment team relative to their findings.
Author
Mars Reconnaissance Orbiter; Contamination; Anomalies

20090026277 Arnold Engineering Development Center, Arnold AFS, TN, USA
Fifth Annual Symposium on Space Environment Simulation
May 21, 1964; 319 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: CASI: A14, Hardcopy

This is the Fifth Annual Symposium on Space Environment Simulation. The Fourth Symposium was held on 22-23 May 1963 at the Thunderbird Motel in El Segundo, California, with the Aerospace Corporation as host and with Mr. Eugene Borson as chairman. The Third Symposium was held 14-15 June 1962 at Valley Forge, Pennsylvania, with the General-Electric Company's Missile and Space Division as host. The Second Symposium was held in Cambridge, Massachusetts, in 1961 with the A. D. Little Company as host and Mr. Alex Pastuhov served as chairman. The First Symposium was held in Los Angeles in 1960 with Dr. Ray Chuan as chairman.
Derived from text
Conferences; Space Environment Simulation; Spacecraft Maintenance; Astronautics

20090026291 NASA Johnson Space Center, Houston, TX, USA
Handbook for Designing MMOD Protection
Christiansen, Eric L.; Arnold, Jim; Davis, Alan; Hyde, James; Lear, Dana; Liou, J.-C.; Lyons, Frankel; Prior, Thomas; Ratliff, Martin; Ryan, Shannon; Giovane, Frank; Corsaro, Bob; Studor, George; June 2009; 152 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2009-214785; S-1038; Copyright; Avail.: CASI: A08, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026291

Spacecraft are subject to micro-meteoroid and orbital debris (MMOD) impact damage which have the potential to degrade performance, shorten the mission, or result in catastrophic loss of the vehicle. Specific MMOD protection requirements are established by NASA for each spacecraft early in the program/project life to ensure the spacecraft meets desired safety and mission success goals. Both the design and operations influences spacecraft survivability in the MMOD environment, and NASA considers both in meeting MMOD protection requirements. The purpose of this handbook is to provide spacecraft designers and operations personnel with knowledge gained by NASA in implementing effective MMOD protection for the International Space Station (ISS), Space Shuttle, and various science spacecraft. It has been drawn from a number of previous publications, as well as new work. This handbook documents design and operational methods to reduce MMOD risk. In addition, this handbook describes tools and equations needed to design proper MMOD protection. It is a living report in that it will be updated and re-released periodically in future with additional information.
Author
Micrometeoroids; Space Debris; Spacecraft Survivability; Spacecraft Defense; Spacecraft Shielding; Meteoroid Protection

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 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*.

20090026267 NASA Ames Research Center, Moffett Field, CA, USA
Adaptive Key Component Control of Nonlinear Evolving Flexible Structures
Balas, Mark; Frost, Susan Alane; October 28, 2008; 3 pp.; In English; ASME Conference on Smart Materials, Adaptive Structures and, 28-30 Oct. 2008, Ellicott City, MD, USA
Contract(s)/Grant(s): WBS 561 581.02.08.01 . I 7.03
Report No.(s): ARC-E-DAA-TN-116; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026267

An optimal alarm system and its approximations may use Kalman filtering for univariate linear dynamic systems driven by Gaussian noise to provide a layer of predictive capability. Predicted Kalman filter future process values and a fixed critical threshold can be used to construct a candidate level-crossing event over a predetermined prediction window. An optimal alarm system can be designed to elicit the fewest false alarms for a fixed detection probability in this particular scenario.
Author
Adaptive Control; Linear Systems; Warning Systems; Random Noise; Dynamic Control; Structural Stability

20
SPACECRAFT PROPULSION AND POWER

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

20090025463 NASA Glenn Research Center, Cleveland, OH, USA
Extended Operation Testing of Stirling Convertors in Support of Stirling Radioisotope Power System Development
Lewandowski, Edward J.; Schreiber, Jeffrey G.; Wilson, Scott D.; Oriti, Salvatore M.; Cornell, Peggy; Schifer, Nicholas; June 2009; 19 pp.; In English; Sixth International Energy Conversion and Engineering Conference (IECEC 2008), 28-30 Jul. 2008, Cleveland, OH, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 138494.04.01.01
Report No.(s): NASA/TM-2009-215481; AIAA Paper 2008-5791; E-16673; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025463

100 We class Stirling convertors began extended operation testing at NASA Glenn Research Center (GRC) in 2003 with a pair of Technology Demonstration Convertors (TDCs) operating in air. Currently, the number of convertors on extended operation test has grown to 12, including both TDCs and Advanced Stirling Convertors (ASCs) operating both in air and in thermal vacuum. Additional convertors and an electrically heated radioisotope generator will be put on test in the near future. This testing has provided data to support life and reliability estimates and the quality improvements and design changes that have been made to the convertor. The convertors operated 24/7 at the nominal amplitude and power levels. Performance data were recorded on an hourly basis. Techniques to monitor the convertors for change in internal operation included gas analysis, vibration measurements, and acoustic emission measurements. This data provided a baseline for future comparison. This paper summarizes the results of over 145,000 hr of TDC testing and 40,000 hr of ASC testing and discusses trends in the data. Data shows the importance of improved materials, hermetic sealing, and quality processes in maintaining convertor performance over long life.
Author
Reliability; Stirling Cycle; Stirling Engines; Reliability Analysis; Performance Prediction; Performance Tests; Thermal Vacuum Tests

20090025465 NASA Glenn Research Center, Cleveland, OH, USA
NASA's Evolutionary Xenon Thruster (NEXT) Component Verification Testing
Herman, Daniel A.; Pinero, Luis R.; Sovey, James S.; May 2009; 19 pp.; In English; 44th AIAA Joint Propulsion Conference and Exhibit, 21-23 Jul. 2008, Hartford, CT, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 346620.04.05.03.13
Report No.(s): NASA/TM-2009-215612; AIAA Paper 2008-4812; E-16928; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025465

Component testing is a critical facet of the comprehensive thruster life validation strategy devised by the NASA s Evolutionary Xenon Thruster (NEXT) program. Component testing to-date has consisted of long-duration high voltage propellant isolator and high-cycle heater life validation testing. The high voltage propellant isolator, a heritage design, will be operated under different environmental condition in the NEXT ion thruster requiring verification testing. The life test of two NEXT isolators was initiated with comparable voltage and pressure conditions with a higher temperature than measured for the NEXT prototype-model thruster. To date the NEXT isolators have accumulated 18,300 h of operation. Measurements indicate a negligible increase in leakage current over the testing duration to date. NEXT 1/2 in. heaters, whose manufacturing and control processes have heritage, were selected for verification testing based upon the change in physical dimensions resulting in a higher operating voltage as well as potential differences in thermal environment. The heater fabrication processes, developed for the International Space Station (ISS) plasma contactor hollow cathode assembly, were utilized with modification of heater dimensions to accommodate a larger cathode. Cyclic testing of five 1/22 in. diameter heaters was initiated to validate these modified fabrication processes while retaining high reliability heaters. To date two of the heaters have been cycled to 10,000 cycles and suspended to preserve hardware. Three of the heaters have been cycled to failure giving a B10 life of 12,615 cycles, approximately 6,000 more cycles than the established qualification B10 life of the ISS plasma contactor heaters.
Author
Heaters; Ion Engines; Isolators; Ion Propulsion; Life (Durability); Leakage; Propulsion System Performance; Solar Electric Propulsion

20090026334 NASA Ames Research Center, Moffett Field, CA, USA

Development of an On-board Failure Diagnostics and Prognostics System for Solid Rocket Booster

Smelyanskiy, Vadim N.; Luchinsky, Dmitry G.; Osipov, Vyatcheslav V.; Timucin, Dogan A.; Uckun, Serdar; July 24, 2009; 14 pp.; In English; 44th AlAA JPC, 24 Jul. 2008, Connecticut, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNA08CG83C; WBS: 136905.01.01.02.99

Report No.(s): ARC-E-DAA-TN-149; Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026334

We develop a case breach model for the on-board fault diagnostics and prognostics system for subscale solid-rocket boosters (SRBs). The model development was motivated by recent ground firing tests, in which a deviation of measured time-traces from the predicted time-series was observed. A modified model takes into account the nozzle ablation, including the effect of roughness of the nozzle surface, the geometry of the fault, and erosion and burning of the walls of the hole in the metal case. The derived low-dimensional performance model (LDPM) of the fault can reproduce the observed time-series data very well. To verify the performance of the LDPM we build a FLUENT model of the case breach fault and demonstrate a good agreement between theoretical predictions based on the analytical solution of the model equations and the results of the FLUENT simulations. We then incorporate the derived LDPM into an inferential Bayesian framework and verify performance of the Bayesian algorithm for the diagnostics and prognostics of the case breach fault. It is shown that the obtained LDPM allows one to track parameters of the SRB during the flight in real time, to diagnose case breach fault, and to predict its values in the future. The application of the method to fault diagnostics and prognostics (FD&P) of other SRB faults modes is discussed.

Author

Booster Rocket Engines; Performance Prediction; Solid Propellant Rocket Engines; Diagnosis; Failure; Ground Tests; Test Firing; Nozzle Geometry; Real Time Operation

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*.

20090025346 Geological Survey, Reston, VA USA

Minerals Yearbook: Lithium, 2006

Ober, J. A.; Jan. 2009; 8 pp.; In English

Report No.(s): PB2009-111617; No Copyright; Avail.: CASI: A02, Hardcopy

In 2006, lithium consumption in the USA was estimated to be 2,500 metric tons (t) of contained lithium, the same as the estimate for 2005 and nearly 32% more than in 2004. The sources for these lithium compounds were a domestic lithium carbonate operation in Nevada and imports from Argentina and Chile. Chile has been the worlds leading producer of lithium carbonate since 1997, the year that it first surpassed the USA in production. Production in Chile was from two lithium brine operations on the Salar de Atacama in the Andes Mountains. Concentrated brines were processed at two lithium carbonate plants in Antofagasta. In the USA, production continued at a lithium brine operation with an associated lithium carbonate plant in Nevada. Lithium carbonate and lithium chloride also were produced from brines from the Salar del Hombre Muerto in the Andes Mountains in Argentina. China also produced lithium carbonate, but details on the source of production were not available. Australia was, by far, the leading producer of lithium concentrates, and Brazil, Canada, Portugal, and Zimbabwe also produced signifi cant quantities. A large percentage of the lithium carbonate produced in South America was exported to the USA for consumption in industrial applications and as feed material for the production of downstream lithium compounds, such as lithium hydroxide monohydrate, lithium metal, and organic lithium compounds.

NTIS

Lithium; Minerals

20090025910 International Trade Commission, Washington, DC USA

Advice Concerning the Addition of Certain Pharmaceutical Products and Chemical Intermediates to the Pharmaceutical Appendix to the Harmonized Tariff Schedule of the USA. Investigation No. 332-476

Sep. 2006; 121 pp.; In English

Report No.(s): PB2009-112438; USITC/PUB-3883; No Copyright; Avail.: CASI: A06, Hardcopy

Under the Pharmaceutical Zero-for-Zero Initiative, which entered into force in 1995, the USA and its major trading

partners eliminated tariffs on many pharmaceuticals, their derivatives, and certain chemical intermediates used to make pharmaceuticals. The U.S. list of pharmaceutical products and chemical intermediates eligible for duty-free treatment under the agreement is given in the Pharmaceutical Appendix to the Harmonized Tariff Schedule of the USA. The Pharmaceutical Appendix is periodically updated to provide duty relief for additional such products, including newly developed pharmaceuticals. This report provides advice on the third update to the agreement, in which approximately 1,300 products are proposed to receive duty-free treatment. In 2005, U.S. imports of products currently included in the pharmaceutical agreement totaled over $58 billion; U.S. exports of such products exceeded $25 billion. U.S. imports of items proposed for addition to the agreement are estimated to be valued at $619 million in 2007 versus about $6 million for exports. However, these values for the products likely underestimate eventual trade because estimates were not available for many of the products.
NTIS
Drugs; International Trade; Pharmacology; Schedules; United States

20090026113 Oakland Univ., Rochester, MI USA
Optimization of a Paint Production Process
Najjar, Pamela; Apr 2009; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A499704; Repot-19823; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499704

The project will be conducted for the U.S. Army TARDEC Survivability Group. The main objective of this project is to integrate a pixilated camouflage paint pattern into the production process for the Future Combat Systems (FCS). Currently, military systems are coated with a single color of Chemical Agent Resistant Coating (CARC) for the entire vehicle. However, when the previous generation of camouflage was applied, it was done by hand, using pattern templates only as a guide (which led to variation and overspray from color to color), and each color could be applied over the previous one(s). The new camouflage pattern requires that a minimal amount of paint be applied (i.e. different colors should not be coated over others). In addition, the paint process will be almost entirely robotic (with the exception a few minor details (i.e. touch ups)).
DTIC
Paints; Coatings

24
COMPOSITE MATERIALS

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

20090025459 NASA Glenn Research Center, Cleveland, OH, USA
Dynamic Probabilistic Instability of Composite Structures
Chamis, Christos C.; May 18, 2009; 14 pp.; In English; SAMPE 2009, 18-21 May 2009, Baltimore, MD, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 659877.02.03.0573.01
Report No.(s): E-16894; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025459

A computationally effective method is described to evaluate the non-deterministic dynamic instability (probabilistic dynamic buckling) of thin composite shells. The method is a judicious combination of available computer codes for finite element, composite mechanics and probabilistic structural analysis. The solution method is incrementally updated Lagrangian. It is illustrated by applying it to thin composite cylindrical shell subjected to dynamic loads. Both deterministic and probabilistic buckling loads are evaluated to demonstrate the effectiveness of the method. A universal plot is obtained for the specific shell that can be used to approximate buckling loads for different load rates and different probability levels. Results from this plot show that the faster the rate, the higher the buckling load and the shorter the time. The lower the probability, the lower is the buckling load for a specific time. Probabilistic sensitivity results show that the ply thickness, the fiber volume ratio and the fiber longitudinal modulus, dynamic load and loading rate are the dominant uncertainties in that order.
Author
Composite Structures; Dynamic Loads; Probability Theory; Mathematical Models

20090025467 NASA Langley Research Center, Hampton, VA, USA
Rapid, Solventless, Bulk Preparation of Metal Nanoparticle-Decorated Carbon Nanotubes
Lint, Yi; Watson, Kent A.; Ghose, Sayata; Smith, Joseph G.; Delozier, Donavon M.; Cao, Wei; Crooks, Roy E.; Connells, John W.; March 11, 2009; 42 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH06CC03B; WBS 092837.04.02.01.04
Report No.(s): LF99-8271; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1021/nn8009097

A rapid, solventless method is described for the decoration of carbon nanotubes with metal nanoparticles. The straightforward two-step process utilizes neither reducing agents nor electric current and involves the dry mixing of a precursor metal salt (e.g. a metal acetate) with carbon nanotubes (single- or multi-walled) followed by heating in an inert atmosphere. The procedure is scalable to multi-gram quantities and generally applicable to various other carbon substrates (e.g. carbon nanofiber, expanded graphite, and carbon black) and many metal salts (e.g. Ag, Au, Co, Ni, and Pd acetates). As a model system, Ag nanoparticle-decorated carbon nanotube samples were prepared under various mixing techniques, metal loading levels, thermal treatment temperatures, and nanotube oxidative acid treatments. These nanohybrids were characterized by a variety of microscopic and spectroscopic techniques. For example, X-ray diffraction and scanning electron microscopy indicate that the average size of the Ag nanoparticles has little to do with the thermal treatment temperature but can be easily controlled by varying the Ag loading. Raman spectroscopy illustrated both the metal-nanotube electronic interactions and the surface enhancement effect from the Ag nanoparticle attachment. High-resolution transmission electron microscopy captured the in situ salt-to-metal conversion events on the nanotube surface. The mechanistic implications from the characterization results are discussed.
Author
Carbon Nanotubes; Characterization; Nanoparticles; Nanofabrication; Nanotechnology; Nanostructure (Characteristics)

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*.

20090025345 Florida Atlantic Univ., Dania Beach, FL, USA; Florida State Dept. of Transportation, Gainesville, FL, USA
Corrosion Resistant Alloys for Reinforced Concrete, April 2009
Hartt, W. H.; Powers, R. G.; Marino, F. P.; Paredes, M.; Simmons, R.; Apr. 2009; 150 pp.; In English
Report No.(s): PB2009-111422; FHWA-HRT-09-020; No Copyright; Avail.: CASI: A07, Hardcopy

Deterioration of concrete bridges because of reinforcing steel corrosion has been recognized for 4-plus decades as a major technical and economic challenge for the USA. As an option for addressing this problem, renewed interest has focused on corrosion resistant reinforcements, stainless steels in particular. The present research study was performed jointly by Florida Atlantic University and the Florida Department of Transportation to evaluate reinforcements of this type. These included solid stainless steels 3Cr12 (UNS-S41003), 2101LDX (ASTM A955-98), 2304 (UNS-S31803), 2205 (UNS 31803), two 316L (UNS S31603) alloys, two 316 stainless steel clad black bar products, and ASTM A1035 commonly known as MMFX 2. Black bar (ASTM A615) reinforcement provided a baseline for comparison purposes. Results from short-term tests and preliminary results from long-term exposure of reinforced concrete slabs were presented in the first interim report for this project. This second interim report provides longer-term data and analyses of chloride exposures that involved four different types of reinforced concrete specimens, two of which were intended to simulate northern bridge decks exposed to deicing salts and the remaining two to marine substructure elements. Three different concrete mix designs were employed, and specimen types included combinations with a (1) simulated concrete crack, (2) bent top bar, (3) corrosion resistant upper bar(s) and black steel lower bars, and (4) intentional clad defects such that the carbon steel substrate was exposed. Cyclic wet-dry ponding with a sodium chloride (NaCl) solution was employed in the case of specimens intended to simulate northern bridge decks, and continuous partial submergence in either a NaCl solution or at a coastal marine site in Florida was used for specimens intended to represent a coastal bridge substructure. The exposures were for periods in excess of 4 years. The candidate alloys were ranked according to performance, and an analysis is reported that projects performance in actual concrete structures.
NTIS
Composite Materials; Concretes; Corrosion Resistance; Steels

20090025349 Geological Survey, Reston, VA USA

Total Selenium and Selenium Species in Irrigation Drain Inflows to the Salton Sea, California, April and July 2008

May, T. W.; Walther, M. J.; Saiki, M. K.; Brumbaugh, W. G.; Jan. 2009; 26 pp.; In English

Report No.(s): PB2009-111820; USGS/OFR-2009-1011; No Copyright; Avail.: CASI: A03, Hardcopy

This report presents the results for two sampling periods (April 2008 and July 2008) during a 4-year monitoring program to characterize selenium concentrations in selected irrigation drains flowing into the Salton Sea, California. Total selenium, selenium species (dissolved selenite, selenate, organoselenium), and total suspended solids were determined in water samples and total selenium was determined in water column particulates and in sediment, detritus, and biota that included algae, plankton, midge larvae (family, Chironomidae), and two fish specieswestern mosquitofish (Gambusia affinis) and sailfin molly (Poecilia latipinna). In addition, sediments were analyzed for percent total organic carbon and particle size. Mean total selenium concentrations in water for both sampling periods ranged from 1.93 to 44.2 micrograms per liter, predominately as selenate, which is typical of waters where selenium is leached out of selenium-containing marine shales and associated soils under alkaline and oxidizing conditions. Total selenium concentrations (micrograms per gram dry weight) ranged as follows: algae, 0.75 to 3.39; plankton, 0.88 to 4.03; midges, 2.52 to 44.3; fish, 3.37 to 18.9; detritus, 1.11 to 13.6; sediment, 0.11 to 8.93.

NTIS

Drainage; Irrigation; Salton Sea (CA); Selenium

20090025386 Applied Research Associates, Inc., Tyndall AFB, FL USA

Temperature Programmable Injection Techniques for Explosives (Postprint)

Mayfield, Howard T; Burr, Eila M; Lombardi, Kimberly R; Mar 2006; 17 pp.; In English; Anaytical Chemistry and Applied Spectroscopy, 12-17 Mar. 2006, Orlando, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): F08637-03-C-6006; Proj-OAFT

Report No.(s): AD-A500371; AFRL-RX-TY-TP-2008-4629; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Temperature programmable injection ports promise great versatility, capable of normal split/splitless injections and offering options to inject thermally labile materials with gentle heating profiles. Nitroaromatic and nitramine compounds useful in explosive formulations tend to be thermally labile and limited in volatility. Although LC/MS techniques have been proposed for analysis of these chemicals, GC and GC/MS techniques remain more convenient and more cost effective than LC/MS, and more sensitive than conventional LC analyses for nitroaromatics and nitramine explosives. ECD and other specialized GC detectors have also been described for the detection and analysis of nitroaromatics and nitramines, and these techniques offer additional options for the inexpensive analysis of explosives. All GC based techniques share the common challenges of vaporizing these compounds without excessive losses due to sorption and thermal reactivity. This report will describe results of an investigation to develop GC/MS analyses for nitroaromatics and nitramines, such as TNT and RDX, using a commercially available single-quadrupole GC/MS system with provision for positive and negative ion detection, EI and CI ionization conditions, and a programmable temperature vaporization (PTV) injection port. Conditions investigated include simple split/splitless injections, temperature programmed injections, and injections onto wide-bore pre-columns. GC/MS conditions investigated included electron impact and chemical ionization, using methane as reagent gas. Positive and negative CI conditions were investigated.

DTIC

Explosives; Explosives Detection; Gas Chromatography; Injection; Ionization; Mass Spectroscopy; Sensitivity; Thermodynamic Properties; Volatility

20090025905 Geological Survey, Reston, VA USA

Resistivity Profiling for Mapping Gravel Layers that May Control Contaminant Migration at the Amargosa Desert Research Site, Nevada

Lucius, J. E.; Abraham, J. D.; Burton, B. L.; January 2008; 36 pp.; In English

Report No.(s): PB2009-112546; USGS-SIR-2008-5091; No Copyright; Avail.: National Technical Information Service (NTIS)

Gaseous contaminants, including CFC 113, chloroform, and tritiated compounds, move preferentially in unsaturated subsurface gravel layers away from disposal trenches at a closed low-level radioactive waste-disposal facility in the Amargosa Desert about 17 kilometers south of Beatty, Nevada. Two distinct gravel layers are involved in contaminant transport: a thin, shallow layer between about 0.5 and 2.2 meters below the surface and a layer of variable thickness between about 15 and 30 meters below land surface. From 2003 to 2005, the U.S. Geological Survey used multielectrode DC and AC resistivity surveys

to map these gravel layers. Previous core sampling indicates the fine-grained sediments generally have higher water content than the gravel layers or the sediments near the surface. The relatively higher electrical resistivity of the dry gravel layers, compared to that of the surrounding finer sediments, makes the gravel readily mappable using electrical resistivity profiling. The upper gravel layer is not easily distinguished from the very dry, fine-grained deposits at the surface. Two-dimensional resistivity models, however, clearly identify the resistive lower gravel layer, which is continuous near the facility except to the southeast. Multielectrode resistivity surveys provide a practical noninvasive method to image hydrogeologic features in the arid environment of the Amargosa Desert.
NTIS
Contaminants; Deserts; Electrical Resistivity; Gravels; Migration

20090025989 Lawrence Livermore National Lab., Livermore, CA USA
Assessment of UF(6) Equation of State
Brady, P.; Chand, K.; Warren, D.; Vandersall, J.; Feb. 16, 2009; 20 pp.; In English
Contract(s)/Grant(s): DE-AC52-07NA27344
Report No.(s): DE2009-948653; LLNL-TR-410694; No Copyright; Avail.: National Technical Information Service (NTIS)

A common assumption in the mathematical analysis of flows of compressible fluids is to treat the fluid as a perfect gas. This is an approximation, as no real fluid obeys the perfect gas relationships over all temperature and pressure conditions. An assessment of the validity of treating the UF6 gas flow field within a gas centrifuge with perfect gas relationships has been conducted. The definition of a perfect gas is commonly stated in two parts: 1) the gas obeys the thermal equation of state, p = nRT (thermally perfect), and, 2) the gas specific heats are constant (calorically perfect). Analysis indicates the thermally perfect assumption is valid for all flow conditions within the gas centrifuge, including shock fields. The low operating gas pressure is the primary factor in the suitability of the thermally perfect equation of state for gas centrifuge computations. UF6 is not calorically perfect, as the specific heats vary as a function of temperature. This effect is insignificant within the bulk of the centrifuge gas field, as gas temperatures vary over a narrow range. The exception is in the vicinity of shock fields, where temperature, pressure, and density gradients are large, and the variation of specific heats with temperature should be included in the technically detailed analyses. Results from a normal shock analysis incorporating variable specific heats is included herein, presented in the conventional form of shock parameters as a function of inlet Mach Number. The error introduced by assuming constant specific heats is small for a nominal UF6 shock field, such that calorically perfect shock relationships can be used for scaling and initial analyses. The more rigorous imperfect gas analysis should be used for detailed analyses.
NTIS
Centrifuges; Equations of State; Fluorides; Gas Analysis; Gas Flow; Uranium

20090026028 Massachusetts Univ., Amherst, MA USA
Evaluation of Rigid-Rod Polymeric Fibers by Post-Treatment in scC02
Lesser, Alan J; Dec 30, 2008; 37 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0478
Report No.(s): AD-A499976; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499976

Poly-p-phenelenebenzobisoxazole (PBO, commercial name ZylonTM, Toyobo Co.)is one of the rigid-rod polymers which produces fiber with excellent mechanical properties. This polymer, originally developed by the U.S. Air Force to replace metals in space and aviation applications, is currently one of the more promising materials for fibers used in personnel ballistic armors. In this study we evaluate the degradation mechanisms of PBO fibers and investigate strategies to stabilize them using supercritical CO2 as an extraction medium, a transport medium, and a polymerization medium. Various treatments and their effects are reported herein.
DTIC
Rods; Reinforcing Fibers; Polymers

20090026047 Centre National de la Recherche Scientifique, Vandoeure, France
Hot Scatterers and Tracers for the Transfer of Heat in Collisional Dynamics
Lefevere, R.; Zambotti, L.; Mar. 31, 2009; 28 pp.; In English
Report No.(s): PB2009-111436; No Copyright; Avail.: CASI: A03, Hardcopy

We introduce stochastic models for the transport of heat in systems described by local collisional dynamics. The dynamics consists of tracer particles moving through an array of hot scatterers describing the effect of heat baths at fixed temperatures.

Those models have the structure of Markov renewal processes. We study their ergodic properties in details and provide a useful formula for the cumulant generating function of the time integrated energy current. We observe that out of thermal equilibrium, the generating function is not analytic. When the set of temperatures of the scatterers is fixed by the condition that in average no energy is exchanged between the scatterers and the system, different behaviours may arise. When the tracer particles are allowed to travel freely through the whole array of scatterers, the temperature profile is linear. If the particles are locked in between scatterers, the temperature profile becomes nonlinear. In both cases, the thermal conductivity is interpreted as a frequency of collision between tracers and scatterers.
NTIS
Heat Transfer; Scattering

20090026114 Washington River Protection Solutions, Richland, WA, USA
Caustic Cleaning for Waste Heel Removal
May 2009; 28 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Report No.(s): DE2009-952599; WRPS-41324-VA; No Copyright; Avail.: Department of Energy Information Bridge
No abstract available
Alkalies; Cleaners; Cleaning; Radioactive Wastes

20090026134 Savannah River National Lab., Aiken, SC, USA
Statistical Evaluation of Processing Data form the RH RU HG Matrix Study
Koopman, D.; Apr. 17, 2009; 39 pp.; In English
Contract(s)/Grant(s): DE-AC09-08SR22470
Report No.(s): DE2009-952445; SRNL-STI-2009-00084; No Copyright; Avail.: Department of Energy Information Bridge
An evaluation of the statistical significance of Rh, Ru, and Hg on DWPF Sludge Receipt and Adjustment Tank (SRAT) cycle catalytic hydrogen generation and process chemistry was conducted by the Savannah River National Laboratory (SRNL) using a full-factorial experimental design. This test design can identify significant interactions between these three species in addition to individual effects. Statistical modeling of data from the Rh-Ru-Hg matrix study has been completed. Preliminary data and conclusions were given in an earlier report.
NTIS
Radioactive Wastes; Statistical Analysis

20090026142 Brookhaven National Lab., Upton, NY USA
Dynamic Aperture Evaluation for the RHIC 2009 Polarized Proton Runs
Luo, Y.; Bai, M.; Beebe-Wang, J.; Fischer, W.; Montag, C.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952550; BNL-81830-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
In this article we numerically evaluate the dynamic apertures of the proposed lattices for the coming Relativistic Heavy Ion Collider (RHIC) 2009 polarized proton (pp) 100 GeV and 250 GeV runs. One goal of this study is to find out the appropriate Beta(star) for the coming 2009 pp runs. Another goal is to check the effect of second order chromaticity correction in the RHIC pp runs.
NTIS
Apertures; Heavy Ions; Protons

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METALS AND METALLIC MATERIALS

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

20090025337 Virginia Univ., Charlottesville, VA USA
Impact Response of Sandwich Plates with a Pyramidal Lattice Core
Yungwirth, Christian J; Wadley, Haydn N; O'Connor, John H; Zakraysek, Alan J; Deshpande, Vikram S; Jul 20, 2007; 18 pp.; In English
Contract(s)/Grant(s): N00014-01-1-1051; N00014-04-1-02990
Report No.(s): AD-A500483; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The ballistic performance edge clamped 304 stainless-steel sandwich panels has been measured by impacting the plates

at mid-span with a spherical steel projectile whose impact velocity ranged from 250 to 1300 ms(-1). The sandwich plates comprised two identical face sheets and a pyramidal truss core: the diameter of the impacting spherical projectile was approximately half the 25 mm truss core cell size. The ballistic behavior has been compared with monolithic 304 stainless-steel plates of approximately equal areal mass and with high strength aluminum alloy (6061-T6) sandwich panels of identical geometry. The ballistic performance is quantified in terms of the entry and exit projectile velocities while high-speed photography is used to investigate the dynamic deformation and failure mechanisms. The stainless-steel sandwich panels were found to have a much higher ballistic resistance than the 6061-T6 aluminum alloy panels on a per volume basis but the ballistic energy absorption of the aluminum structures was slightly higher on a per unit mass basis. The ballistic performance of the monolithic and sandwich panels is almost identical though the failure mechanics of these two types of structures are rather different. At high impact velocities, the monolithic plates fail by ductile hole enlargement. By contrast, only the proximal face sheet of the sandwich plate undergoes this type of failure. The distal face sheet fails by a petalling mode over the entire velocity range investigated here. Given the substantially higher blast resistance of sandwich plates compared to monolithic plates of equal mass, we conclude that sandwich plates display a potential to outperform monolithic plates in multi-functional applications that combine blast resistance and ballistic performance.
DTIC
Sandwich Structures; Stainless Steels; Terminal Ballistics

20090025414 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Optical Microscopy Techniques to Inspect for Metallic Whiskers
Brusse, Jay A.; [2006]; In English; Original contains color illustrations; Copyright; Avail.: CASI: C01, DVD

Metal surface finishes of tin, zinc and cadmium are often applied to electronic components, mechanical hardware and other structures. These finishes sometimes unpredictably may form metal whiskers over periods that can take from hours to months or even many years. The metal whiskers are crystalline structures commonly having uniform cross sectional area along their entire length. Typical whisker dimensions are nominally on the order of only a few microns (um) across while their lengths can extend from a few microns to several millimeters. Metal whiskers pose a reliability hazard to electronic systems primarily as an electrical shorting hazard. The extremely narrow dimensions of metal whiskers can make observation with optical techniques very challenging. The videos herein were compiled to demonstrate the complexities associated with optical microscope inspection of electronic and mechanical components and assemblies for the presence or absence of metal whiskers. The importance of magnification, light source and angle of illumination play critical roles in being able to detect metal whiskers when present. Furthermore, it is demonstrated how improper techniques can easily obscure detection. It is hoped that these videos will improve the probability of detecting metal whiskers with optical inspection techniques.
Author
Inspection; Metal Surfaces; Microscopy; Optical Microscopes; Whisker Composites

20090025864 Honeywwell Federal Manufacturing and Technologies, Kansas City, MO, USA
Spin-forming Project Report
Switzner, N.; Henry, D.; Mar. 2009; 53 pp.; In English
Contract(s)/Grant(s): DE-ACO4-01AL66850
Report No.(s): DE2009-952564; KCP-613-8550; No Copyright; Avail.: Department of Energy Information Bridge

In a second development order, spin-forming equipment was again evaluated using the test shape, a hemispherical shell. In this second development order, pure vanadium and alloy titanium (Ti-6Al-4V) were spin-formed, as well as additional copper and 21-6-9 stainless. In the first development order the following materials had been spin-formed: copper (alloy C11000 ETP), 6061 aluminum, 304L stainless steel, 21-6-9 stainless steel, and tantalum-2.5% tungsten. Significant challenges included properly adjusting the rotations-per-minute (RPM), cracking at un-beveled edges and laser marks, redressing of notches, surface cracking, non-uniform temperature evolution in the titanium, and cracking of the tailstock. Lessons learned were that 300 RPM worked better than 600 RPM for most materials (at the feed rate of 800 mm/min); beveling the edges to lower the stress reduces edge cracking; notches, laser marks, or edge defects in the preform doom the process to cracking and failure; coolant is required for vanadium spin-forming; increasing the number of passes to nine or more eliminates surface cracking for vanadium; titanium develops a hot zone in front of the rollers; and the tailstock should be redesigned to eliminate the cylindrical stress concentrator in the center.
NTIS
Vanadium; Titanium Alloys; Metal Spinning; Aluminum Alloys; Copper Alloys

20090025911 International Trade Commission, Washington, DC USA
Circular Welded Non-Alloy Steel Pipe from China. Investigation No. TA-421-6
Oct. 2005; 232 pp.; In English
Report No.(s): PB2009-112436; USITC/PUB-3807; No Copyright; Avail.: CASI: A11, Hardcopy

Following receipt of a petition, on August 2, 2005, on behalf of Allied Tube and Conduit Corp., Harvey, IL; IPSCO Tubulars, Inc., Camanche, IA; Maruichi American Corp., Santa Fe Springs, CA; Maverick Tube Corp., Chesterfield, MO; Sharon Tube Co., Sharon, PA; Western Tube Conduit Corp., Long Beach, CA; Wheatland Tube Co., Wheatland, PA.; and the United Steelworkers of America, AFL-CIO, Pittsburgh, PA; the Commission instituted investigation No. TA-421-06, Circular Welded Non-Alloy Steel Pipe from China, under section 421(b) of the Act to determine whether circular welded non-alloy steel pipe from China is being imported into the USA in such increased quantities or under such conditions as to cause or threaten to cause market disruption to the domestic producers of like or directly competitive products.
NTIS
China; International Trade; Pipes (Tubes); Steels

20090025912 International Trade Commission, Washington, DC USA
Certain Circular Welded Carbon Quality Line Pipe: Evaluation of the Effectiveness of Import Relief. Investigation No. TA-204-10
Aug. 2003; 77 pp.; In English
Report No.(s): PB2009-112435; USITC/PUB-3628; No Copyright; Avail.: CASI: A05, Hardcopy

On March 1, 2003, the safeguard action imposed by the President on imports of circular welded carbon quality line pipe (welded line pipe) terminated. The action which the President took under section 203 of the Trade Act of 1974 (the Act), was in the form of imposing an additional tariff on imports of welded line pipe effective March 1, 2000, for a period of 3 years and 1 day. Section 204(d) ofthe Act requires the Commission, after termination of any action taken under section 203, to 'evaluate the effectiveness of the actions in facilitating positive adjustment by the domestic industry to import competition, consistent with the reasons set out by the President in the report submitted to the Congress under section 203(b)'. Accordingly, effective April 11, 2003, the Commission instituted investigation No. TA-204-10, Certain Circular Welded Carbon Quality Line Pipe: Evaluation of the Effectiveness of Import Relief. The evaluation must be completed no later than 180 days after the termination of the relief, which in this case is August 28, 2003.
NTIS
Carbon; Carbon Steels; International Trade; Pipes (Tubes)

20090025938 NASA Marshall Space Flight Center, Huntsville, AL, USA
Initial Transient in Zn-doped InSb Grown in Microgravity
Ostrogorsky, A G.; Marin, C.; Volz, M.; Duffar, T.; Journal of Crystal Growth; June 2009; Volume 311, Issue 12, pp. 3243-3248; In English; Original contains color and black and white illustrations
Report No.(s): M09-0371; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025938; http://dx.doi.org/10.1016/j.jcrysgro.2009.03.036

Three Zn-doped InSb crystals were directionally solidified under microgravity conditions at the International Space Station (ISS) Alpha. The distribution of the Zn was measured using SIMS. A short diffusion-controlled transient, typical for systems with k greater than 1 was demonstrated. Static pressure of approximately 4000 N/m2 was imposed on the melt, to prevent bubble formation and dewetting. Still, partial de-wetting has occurred in one experiment, and apparently has disturbed the diffusive transport of Zn in the melt.
Author
Microgravity; Zinc; Metal Crystals; International Space Station; Mathematical Models; Doped Crystals; Indium Antimonides

20090026023 Lawrence Livermore National Lab., Livermore, CA USA
Characterization of Defocused Electron Beams and Welds in Stainless Steel and Refractory Metals using the Enhanced Modified Faraday Cup Diagnostic (February 23, 2009)
Elmer, J.; Feb. 23, 2009; 31 pp.; In English
Contract(s)/Grant(s): DE-AC52-07NA27344
Report No.(s): DE2009-948652; LLNL-TR-410752; No Copyright; Avail.: National Technical Information Service (NTIS)

As the first part of a project to compare new generation, continuous wave, laser welding technology to traditional electron beam welding technology, electron beam welds were made on commercially pure vanadium refractory metal and 21-6-9

austenitic stainless steel. The electron beam welds were made while employing EB diagnostics to fully characterize the beams so that direct comparisons could be made between electron beam and laser beams and the welds that each process produces. NTIS

Defocusing; Electron Beam Welding; Electron Beams; Refractory Metals; Stainless Steels; Welded Joints

20090026122 Cincinnati Univ., OH, USA

Processing, Microstructure and Creep Behavior of Mo-Si-B-Based Intermetallic Alloys for Very High Temperature Structural Applications

Vasudevan, V.; Mar. 31, 2008; 39 pp.; In English

Contract(s)/Grant(s): DE-FG26-03NT41793

Report No.(s): DE2009-951265; No Copyright; Avail.: National Technical Information Service (NTIS)

This research project is concerned with developing a fundamental understanding of the effects of processing and microstructure on the creep behavior of refractory intermetallic alloys based on the Mo-Si-B system. In the first part of this project, the compression creep behavior of a Mo-8.9Si-7.71B (in at.%) alloy, at 1100 and 1200 degrees C was studied, whereas in the second part of the project, the constant strain rate compression behavior at 1200, 1300 and 1400 degrees C of a nominally Mo-20Si-10B (in at.%) alloy, processed such as to yield five different alpha-Mo volume fractions ranging from 5 to 46%, was studied. In order to determine the deformation and damage mechanisms and rationalize the creep/high temperature deformation data and parameters, the microstructure of both undeformed and deformed samples was characterized in detail using x-ray diffraction, scanning electron microscopy (SEM) with back scattered electron imaging (BSE) and energy dispersive x-ray spectroscopy (EDS), electron back scattered diffraction (EBSD)/orientation electron microscopy in the SEM and transmission electron microscopy (TEM). The microstructure of both alloys was three-phase, being composed of alpha-Mo, Mo3Si and T2-Mo5SiB2 phases. The values of stress exponents and activation energies, and their dependence on microstructure were determined. The data suggested the operation of both dislocation as well as diffusional mechanisms, depending on alloy, test temperature, stress level and microstructure. Microstructural observations of post-crept/deformed samples indicated the presence of many voids in the alpha-Mo grains and few cracks in the intermetallic particles and along their interfaces with the alpha-Mo matrix. TEM observations revealed the presence of recrystallized alpha-Mo grains and sub-grain boundaries composed of dislocation arrays within the grains (in Mo-8.9Si-7.71B) or fine sub-grains with a high density of b = 1/2<111> dislocations (in Mo-20Si-10B), which are consistent with the values of the respective stress exponents and activation energies that were obtained and provide confirmatory evidence for the operation of diffusional (former alloy) or dislocation (latter alloy) creep mechanisms. In contrast, the intermetallic phases contained very few dislocations, but many cracks. The relative contributions of the -Mo and the intermetallic particles to the overall deformation process, including their individual and collective dependence on temperature and strain rate are discussed in light of the present results and those from previous reports.

NTIS

Creep Properties; High Temperature; Intermetallics; Microstructure; Refractory Metal Alloys; Structural Design

20090026131 Oak Ridge National Lab., TN USA

Manufacture of Alumina-Forming Austenitic Stainless Steel Alloys by Conventional Casting and Hot-Working Methods

Jan. 2009; 8 pp.; In English

Report No.(s): DE2009-949987; No Copyright; Avail.: Department of Energy Information Bridge

Oak Ridge National Laboratory (ORNL) and Carpenter Technology Corporation (CarTech) participated in an in-kind cost share cooperative research and development agreement (CRADA) effort under the auspices of the Energy Efficiency and Renewable Energy (EERE) Technology Maturation program to explore the feasibility for scale up of developmental ORNL alumina-forming austenitic (AFA) stainless steels by conventional casting and rolling techniques. CarTech successfully vacuum melted 30lb heats of four AFA alloy compositions in the range of Fe-(20-25)Ni-(12- 14)Cr-(3-4)Al-(1-2.5)Nb wt.% base. Conventional hot/cold rolling was used to produce 0.5-inch thick plate and 0.1-inch thick sheet product. ORNL subsequently successfully rolled the 0.1-inch sheet to 4 mil thick foil. Long-term oxidation studies of the plate formmaterial were initiated at 650, 700, and 800 C in air with 10 volume percent water vapor. Preliminary results indicated that the alloys exhibit comparable (good) oxidation resistance to ORNL laboratory scale AFA alloy arc casting previously evaluated. The sheet and foil material will be used in ongoing evaluation efforts for oxidation and creep resistance under related CRADAs

with two gas turbine engine manufacturers. This work will be directed to evaluation of AFA alloys for use in gas turbine recuperators to permit higher-temperature operating conditions for improved efficiencies and reduced environmentalemissions. NTIS

Aluminum Oxides; Austenitic Stainless Steels; Casting; Hot Working; Stainless Steels

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*.

20090026031 Massachusetts Univ., Amherst, MA USA

Responsive Polymer Interfaces

Crosby, Alfred J; Dec 2, 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-05-1-0559

Report No.(s): AD-A499873; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA499873

This project focused on the fabrication and characterization of responsive polymer interfaces to be used as smart coatings that dynamically alter surface properties, advanced optical devices, and/or sensors. Transition speed, magnitude of change, and sensitivity are primary challenges in the development of responsive surfaces. To meet these challenges, we developed polymer surfaces with controlled shell structures that transition via snap-through or crumpling elastic instabilities upon the application of a trigger. During this final reporting period, we have focused on three primary aspects of these responsive surface-attached shells: 1) the dynamics of snap; 2) the adhesion of crumpling surface structures; and 3) the crumpling of ultrathin polymer films for the fabrication of sub-micron surface patterns. In addition to the three papers related to this project published in significant peer-review journals, we are currently preparing three manuscripts to publish the results of each of the three focused initiatives of this past funding period. Several presentations on this research also have been delivered at national and international symposia, a full patent for the developed technology has been filed, companies and private investors have expressed interest in this technology, and the research has received numerous highlights in the national and local media. DTIC

Polymeric Films; Optical Measuring Instruments; Mechanical Properties; Adhesion

20090026072 NASA Langley Research Center, Hampton, VA, USA

Recent Advances in Thermoplastic Puncture-Healing Polymers

Gordon, K. L.; Working, D. C.; Wise, K. E.; Bogert, P. B.; Britton, S. M.; Topping, C.C.; Smith, J. Y.; Siochi, E. J.; June 28, 2009; 2 pp.; In English; 2nd International Conference on Self-Healing Materials, 28 Jun. - 1 Jul. 2009, Illinois, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS: 645846.02.07.07.14.03

Report No.(s): LF99-8232; Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026072

Self-healing materials provide a route for enhanced damage tolerance in materials for aerospace applications. In particular, puncture-healing upon impact has the potential to mitigate significant damage caused by high velocity micrometeoroid impacts. This type of material also has the potential to improve damage tolerance in load bearing structures to enhance vehicle health and aircraft durability. The materials being studied are those capable of instantaneous puncture healing, providing a mechanism for mechanical property retention in lightweight structures. These systems have demonstrated healing capability following penetration of fast moving projectiles -- velocities that range from 9 mm bullets shot from a gun (approx.330 m/sec) to close to micrometeoroid debris velocities of 4800 m/sec. In this presentation, we report on a suite of polymeric materials possessing this characteristic. Figure 1 illustrates the puncture healing concept. Puncture healing in these materials is dependent upon how the combination of a polymer's viscoelastic properties responds to the energy input resulting from the puncture event. Projectile penetration increases the temperature in the vicinity of the impact. Self-healing behavior occurs following puncture, whereby energy must be transferred to the material during impact both elastically and inelastically, thus establishing two requirements for puncture healing to occur: a.) The need for the puncture event to produce a local melt state in the polymer material and b.) The molten material has to have sufficient melt elasticity to snap back and close the hole. 1,2 Previous ballistic testing studies revealed that Surlyn materials warmed up to a temperature approx.98 C during projectile puncture (3 C higher than it s melting temperature). 1,2 The temperature increase produces a localized flow state and the melt

elasticity to snap back thus sealing the hole. Table 1 lists the commercially polymers studied here, together with their physical properties. The polymers were selected based on chemical structure, tensile strengths, tensile moduli, glass transition temperature, melting temperatures, and impact strength. The thermal properties of the polymers were characterized by Differential Scanning Calorimetry (DSC) and Dynamic Mechanical Analysis (DMA). Mechanical properties were assessed by a Sintech 2W instron according to ASTM D1708 or D638 at crosshead speeds of 5.08 cm/min. 7.6 cm x 7.6 cm panels of the different materials were prepared and ballistic testing was performed at various temperatures. The panels were shot with a .223 caliber semiautomatic rifle from a distance of 23 meters at various temperatures. Chronographs were used to measure initial and final bullet velocity. Temperatures at the site of impact were measured using a FLIR ThermaCAM S60 thermal camera. A Vision Research model Phantom 9 high speed video camera was used to capture high speed video footage of ballistics testing.
Author
Aerospace Engineering; Thermoplasticity; Sealing; Impact Strength; Ballistics; Elastic Properties; Durability; Thermodynamic Properties; Mechanical Properties

20090026129 Johns Hopkins Univ., Baltimore, MD, USA
Silicon Carbide Ceramics for Compact Heat Exchangers
Nagle, D. C.; Zhang, D.; Mar. 26, 2009; 185 pp.; In English
Report No.(s): DE2009-950101; No Copyright; Avail.: National Technical Information Service (NTIS)

Silicon carbide (SiC) materials are prime candidates for high temperature heat exchangers for next generation nuclear reactors due to their refractory nature and high thermal conductivity at elevated temperatures. This research has focused on demonstrating the potential of liquid silicon infiltration (LSI) for making SiC to achieve this goal. The major advantage of this method over other ceramic processing techniques is the enhanced capability of making high dense, high purity SiC materials in complex net shapes.
NTIS
Ceramics; Heat Exchangers; Silicon Carbides

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*.

20090025461 NASA Glenn Research Center, Cleveland, OH, USA
Halophytes, Algae, and Bacteria Food and Fuel Feedstocks
Hendricks, R. C.; Bushnell, D. M.; May 2009; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.16.03
Report No.(s): NASA/TM-2009-215294; E-16577-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025461

The constant, increasing demand for energy, freshwater, and food stresses our ability to meet these demands within reasonable cost and impact on climate while sustaining quality of life. This environmental Triangle of Conflicts between energy, food, and water--while provoked by anthropogenic monetary and power struggles--can be resolved through an anthropogenic paradigm shift in how we produce and use energy, water, and food. With world population (6.6 billion) projected to increase 40 percent in 40 to 60 yr, proper development of saline agriculture and aquaculture is required, as 43 percent of the Earth's landmass is arid or semi-arid and 97 percent of the Earth's water is seawater. In light of this, we seek fuel alternatives in plants that thrive in brackish and saltwater with the ability to survive in arid lands. The development and application of these plants (halophytes) become the primary focus. Herein we introduce some not-so-familiar halophytes and present a few of their benefits, cite a few research projects (including some on the alternatives algae and bacteria), and then set theoretical limits on biomass production followed by projections in terms of world energy demands. Based on diverse arid lands with a total size equivalent to the Sahara Desert (8.6(exp 8) ha, or 2.1(exp 9) acres), these projections show that halophyte agriculture and algae systems can provide for the projected world energy demand.
Author
Agriculture; Algae; Aquiculture; Bacteria; Biomass; Fuels; Renewable Energy

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*.

20090025406 NASA Ames Research Center, Moffett Field, CA, USA
An Investigation of State-Space Model Fidelity for SSME Data
Martin, Rodney Alexander; October 06, 2008; 12 pp.; In English; International Conference on Prognostics and Health, 6-9 Oct. 2008, Denver, CO, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 136905.01.01.02.99
Report No.(s): ARC-E-DAA-TN125; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025406

In previous studies, a variety of unsupervised anomaly detection techniques for anomaly detection were applied to SSME (Space Shuttle Main Engine) data. The observed results indicated that the identification of certain anomalies were specific to the algorithmic method under consideration. This is the reason why one of the follow-on goals of these previous investigations was to build an architecture to support the best capabilities of all algorithms. We appeal to that goal here by investigating a cascade, serial architecture for the best performing and most suitable candidates from previous studies. As a precursor to a formal ROC (Receiver Operating Characteristic) curve analysis for validation of resulting anomaly detection algorithms, our primary focus here is to investigate the model fidelity as measured by variants of the AIC (Akaike Information Criterion) for state-space based models. We show that placing constraints on a state-space model during or after the training of the model introduces a modest level of suboptimality. Furthermore, we compare the fidelity of all candidate models including those embodying the cascade, serial architecture. We make recommendations on the most suitable candidates for application to subsequent anomaly detection studies as measured by AIC-based criteria.
Author
Space Shuttle Main Engine; Fault Detection; Systems Health Monitoring; Dynamical Systems; Data Mining; Aerospace Safety; Aerospace Engineering; Electrical Engineering

20090026218 NASA Ames Research Center, Moffett Field, CA, USA
Recent Results on 'Approximations to Optimal Alarm Systems for Anomaly Detection'
Martin, Rodney Alexander; July 06, 2009; 5 pp.; In English; 2008 IEEE International Symposium on Information Theory, 6-11 Jul. 2008, Toronto, Ontario, Canada; Original contains color illustrations
Contract(s)/Grant(s): WBS 136905.01.01.02.99
Report No.(s): ARC-E-DAA-TN-128; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026218

An optimal alarm system and its approximations may use Kalman filtering for univariate linear dynamic systems driven by Gaussian noise to provide a layer of predictive capability. Predicted Kalman filter future process values and a fixed critical threshold can be used to construct a candidate level-crossing event over a predetermined prediction window. An optimal alarm system can be designed to elicit the fewest false alarms for a fixed detection probability in this particular scenario.
Author
Warning Systems; Kalman Filters; Random Noise; Anomalies; Detection

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*.

20090025364 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative. Architecture Analysis Report. Version 1.0
Nov. 2007; 118 pp.; In English
Report No.(s): PB2009-111865; No Copyright; Avail.: CASI: A06, Hardcopy

The purpose of this document is to provide an Architecture Analysis for the Next Generation 9-1-1 (NG9-1-1) System (or system of systems). The U.S. Department of Transportation (USDOT) understands that access to emergency services provided

by 9-1-1 in today's world of evolving technology will ultimately occur within a broader array of interconnected networks comprehensively supporting emergency services--from public access to those services, to the facilitation of the services, to the delivery of the emergency information to dispatchers and first responders.
NTIS
Emergencies; Communication Networks

20090025866 NASA Langley Research Center, Hampton, VA, USA
All-Solid-State UV Transmitter Development for Ozone Sensing Applications
Prasad, Narasimha S.; Singh, Upendra N.; Armstrong, Darrell Jr.; June 22, 2009; 4 pp.; In English; 15th Coherent Laser Radar Conference, 22-26 Jun. 2009, Toulouse, France; Original contains color illustrations
Contract(s)/Grant(s): WBS 736466.11.01.07.42.08
Report No.(s): LF99-8751; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025866

In this paper, recent progress made in the development of an all-solid-state UV transmitter suitable for ozone sensing applications from space based platforms is discussed. A nonlinear optics based UV setup based on Rotated Image Singly Resonant Twisted Rectangle (RISTRA) optical parametric oscillator (OPO) module was effectively coupled to a diode pumped, single longitudinal mode, conductively cooled, short-pulsed, high-energy Nd:YAG laser operating at 1064 nm with 50 Hz PRF. An estimated 10 mJ/pulse with ~10% conversion efficiency at 320 nm has been demonstrated limited only by the pump pulse spatial profile. The current arrangement has the potential for obtaining greater than 200 mJ/pulse. Previously, using a flash-lamp pumped Nd:YAG laser with round, top-hat profile, up to 24% IR-UV conversion efficiency was achieved with the same UV module. Efforts are underway to increase the IR-UV conversion efficiency of the all solid-state setup by modifying the pump laser spatial profile along with incorporating improved OPO crystals.
Author
Transmitters; Solid State; Ozone; Parametric Amplifiers; Nonlinear Optics; Detection; Energy Conversion Efficiency

20090025872 NASA Marshall Space Flight Center, Huntsville, AL, USA
Proximity Operations and Docking Sensor Development
Howard, Richard T.; Bryan, Thomas C.; Brewster, Linda L.; Lee, James E.; March 07, 2009; 10 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, MT, USA; Original contains color and black and white illustrations
Report No.(s): IEEAC paper 1287, Version 1; M09-0272; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025872

The Next Generation Advanced Video Guidance Sensor (NGAVGS) has been under development for the last three years as a long-range proximity operations and docking sensor for use in an Automated Rendezvous and Docking (AR&D) system. The first autonomous rendezvous and docking in the history of the U.S. Space Program was successfully accomplished by Orbital Express, using the Advanced Video Guidance Sensor (AVGS) as the primary docking sensor. That flight proved that the USA now has a mature and flight proven sensor technology for supporting Crew Exploration Vehicles (CEV) and Commercial Orbital Transport Systems (COTS) Automated Rendezvous and Docking (AR&D). NASA video sensors have worked well in the past: the AVGS used on the Demonstration of Autonomous Rendezvous Technology (DART) mission operated successfully in spot mode out to 2 km, and the first generation rendezvous and docking sensor, the Video Guidance Sensor (VGS), was developed and successfully flown on Space Shuttle flights in 1997 and 1998. 12 Parts obsolescence issues prevent the construction of more AVGS units, and the next generation sensor was updated to allow it to support the CEV and COTS programs. The flight proven AR&D sensor has been redesigned to update parts and add additional capabilities for CEV and COTS with the development of the Next Generation AVGS at the Marshall Space Flight Center. The obsolete imager and processor are being replaced with new radiation tolerant parts. In addition, new capabilities include greater sensor range, auto ranging capability, and real-time video output. This paper presents some sensor hardware trades, use of highly integrated laser components, and addresses the needs of future vehicles that may rendezvous and dock with the International Space Station (ISS) and other Constellation vehicles. It also discusses approaches for upgrading AVGS to address parts obsolescence, and concepts for minimizing the sensor footprint, weight, and power requirements. In addition, the testing of the brassboard and proto-type NGAVGS units will be discussed along with the use of the NGAVGS as a proximity operations and docking sensor.
Author
Autonomous Docking; Video Communication; International Space Station; Guidance Sensors; Rendezvous Guidance

20090025914 Rocky Mountain Research Station, Fort Collins, CO, USA; Missouri Univ., Columbia, MO, USA
Digital Voice Recording: An Efficient Alternative for Data Collection
Rumble, M. A.; Juntti, T. M.; Bonnot, T. W.; Millspaugh, J. J.; Jan. 2009; 4 pp.; In English
Report No.(s): PB2009-112243; RMRS-RN-38; No Copyright; Avail.: CASI: A01, Hardcopy

Study designs are usually constrained by logistical and budgetary considerations that can affect the depth and breadth of the research. Little attention has been paid to increasing the efficiency of data recording. Digital voice recording and translation may offer improved efficiency of field personnel. Using this technology, we increased our data collection by 55 percent. Digital voice recording was useful for the intense, repetitive, and structured data set we collected on black-backed woodpecker (Picoides arcticus) nest sites and perhaps for other studies.
NTIS
Birds; Data Acquisition; Data Recording; Digital Systems; Noise (Sound)

20090025917 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Preliminary Analysis of Cost, Value, and Risk. Version 2.0
Feb. 12, 2008; 147 pp.; In English
Report No.(s): PB2009-112220; No Copyright; Avail.: CASI: A07, Hardcopy

Contents: Introduction; Methodology; Alternatives Defined; Value Analysis; Cost Analysis; Risk Analysis; Summary, and Appendices.
NTIS
Costs; Emergencies; Risk

20090025920 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Data Acquisition and Analysis Plan
Mar. 2008; 69 pp.; In English
Report No.(s): PB2009-112218; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this document is to define a comprehensive plan for acquiring and analyzing NG9-1-1 POC data. The plan will assist the NG9-1-1 Project Team and USDOT to evaluate the technical and operational success of the POC. The data acquired from the POC will serve as benchmarks for future large-scale NG9-1-1 technology deployments and further assist in the refinement of the final NG9-1-1 transition plan. The data will facilitate the USDOT, Standards Development Organizations (SDO), industry vendors, PSAP operational community, and future independent evaluators in defining measures of interest for Internet Protocol (IP)-based emergency calling. In addition, this document will identify the data acquisition system put in place to acquire these measures including the software, hardware, and resources required.
NTIS
Data Acquisition; Emergencies

20090026159 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 57, Number 2, August 1922
Clark, F S; Dingley, Nelson; Aug. 1922; 103 pp.; In English
Report No.(s): AD-A500097; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500097

This issue of The Coast Artillery Journal contains the following articles: Improved Training Methods for the Fixed Defenses, by Major Joseph C. Haw, C.A.C.; Origin of the Journal of the USA Artillery, by Major Adam E. Potts, C.A.C.; Organization and Command of the Heavy Artillery of An Army Corps, by Commandant Perney; Mental Conflicts in War, by Dorrell G. Dickerson, M.D.; A Single Base Line for a Fire Command, by Major Fred Seydel, C.A.C.; The Army Music School, by Major Edward L. Dyer, C.A.C.; Notes on Water Work in Submarine Mining, by Lt. Col. John M. Dunn, C.A.C.; Deviations and Errors, by Captain Donald B. Greenwood, C.A.C.; and Radio Communication in the Coast Artillery, by Captain Sanford D. Ashford, Signal Corps (C.A.C.). The remainder of the issue contains the following features: editorials on subcaliber target practice, disability claims by former Soldiers who were gassed in World War I and contend that the gassing causes tuberculosis, and a memorial to the American dead in France; Coast Artillery Board notes; solutions to Employment of Heavy Artillery problems; Movement of Railway Artillery; Bulletin Board; and book reviews.
DTIC
Artillery; Coasts; Education; Fire Control; Military Operations; Telecommunication

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*.

20090025352 National Science and Technology Council, Washington, DC, USA
National Nanotechnology Initiative: Strategy for Nanotechnology-Related Environmental, Health, and Safety Research, February 2008
Feb. 2008; 102 pp.; In English
Report No.(s): PB2009-111828; No Copyright; Avail.: National Technical Information Service (NTIS)

This document describes the NNI strategy for addressing priority research on the environment, health and safety (EHS) aspects of nanomaterials that have been identified in previous reports. Establishing this strategy is the next step in an interagency effort that has been underway for a number of years. This effort has entailed identifying and prioritizing EHS research for nanomatierals; analyzing the current research portfolio in detail; performing a gap analysis to determine areas requiring emphasis; and developing a strategy to address these areas and to sustain the diverse program aimed at advancing knowledge and supporting risk decision making.
NTIS
Nanotechnology; Risk; Safety; Risk Assessment

20090025460 NASA Glenn Research Center, Cleveland, OH, USA
Ka-Band Waveguide Hybrid Combiner for MMIC Amplifiers with Unequal and Arbitrary Power Output Ratio
Simons, Rainee N.; Chevalier, Christine T.; Wintucky, Edwin G.; Freeman, Jon C.; June 07, 2009; 4 pp.; In English; 2009 IEEE MTT-S International Microwave Symposium, 7-12 Jun. 2009, Boston, MA, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 806866.02.03.0645.01
Report No.(s): E-16925; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025460

The design, simulation and characterization of a novel Ka-band (32.05 +/- 0.25 GHz) rectangular waveguide branchline hybrid unequal power combiner is presented. The manufactured combiner was designed to combine input signals, which are nearly in phase and with an amplitude ratio of two. The measured return loss and isolation of the branch-line hybrid are better than 22 and 27 dB, respectively. The application of the branch-line hybrid for combining two monolithic microwave integrated circuit (MMIC) power amplifiers with output power ratio of two is demonstrated. The measured combining efficiency is 92.9% at the center frequency of 32.05 GHz.
Author
Extremely High Frequencies; Integrated Circuits; Power Amplifiers; Microwave Circuits

20090025486 Air Force Research Lab., Kirkland AFB, NM USA
Reset Behavior of High Duty Cycle Pulse Transformers
O'Loughlin, J P; May 2006; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A499770; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Magnetic core pulse transformers operating in a repetitive mode must maintain the core flux density within the saturation bounds of the magnetic material to provide satisfactory performance. The instantaneous flux is established by the time integration of the induced winding voltage. Alternatively, the flux is also determined by the net instantaneous magneto-motive force acting on the core in relation to the core dimensions and material hysteresis characteristics. Core material is typically non-linear and is awkward to model, so the preferred method of flux determination is via the induced voltage integration method. During the output pulse duration, this induced voltage is forced on the core via the winding by the pulsed power source and establishes the instantaneous flux and flux time derivative during the pulse. In the steady state, the integration of the induced voltage that occurs between load pulses, commonly called the back-swing period, must equal the value established by the output or load portion of the pulse to avoid saturation. This back-swing period can be driven by an external forced re-set source or by the stored energy in the transformer acting through the equivalent circuit impedance. In this paper only the stored energy re-set process is analyzed.
DTIC
Transformers; Equivalent Circuits; Hysteresis; Magnetic Fields

20090025498 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 80, Number 4, July-August 1937
Green, Fred M; Cunningham, James H; Smith, Bernard; Cross, Matthew A; Lanham, C T; Melson, Everett W; Simpson, George L; Spaulding, Thomas M; Bundy, Charles W; Aug 1, 1937; 85 pp.; In English; Original contains color illustrations
Report No.(s): AD-A499815; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499815

CONTENTS: DEBUNKING BUNKER HILL By Lieutenant Colonel Fred M. Green; AN AIRCRAFT WARNING SERVICE By Colonel James H. Cunningham; HELIGOLAND: The Gibraltar of the North Sea By Major Bernard Smith; TURRETS and CASEMATES FOR SEACOAST BATTERIES By Colonel Matthew A. Cross; EMPLOYMENT of THE AIR CORPS By Brigadier General H. H. Arnold, Air Corps, U.S.A.; PANIC By Captain C. T. Lanham; OPTICAL GLASS and FIRE CONTROL INSTRUMENTS By Everett W. Melson; AN ALL-TIME COMMAND TEAM By Lieutenant Colonel George L. Simpson; the EARLY LITERATURE of ARTILLERY By Colonel Thomas M. Spaulding; BOFORS ANTIAIRCRAFT GUNS; HEAVIES; NEW STANDARD AA SEARCHLIGHT UNIT By Major Charles W. Bundy; COAST ARTILLERY ACTIVITIES; OPEN FORUM; COAST ARTILLERY BOARD NOTES; COAST ARTILLERY ORDERS; AT the SCHOOLS, 1937-1938s; the CONTRIBUTORS; BOOK REVIEWS
DTIC
Artillery; Coasts

20090025979 Honeywwell Federal Manufacturing and Technologies, Kansas City, MO, USA
Conveyorized Photoresist Stripping Replacement for Flex Circuit Fabrication
Donahue, M.; Feb. 24, 2009; 13 pp.; In English
Contract(s)/Grant(s): DE-AC04-01AL66850
Report No.(s): DE2009-952451; KCP-613-8239; No Copyright; Avail.: National Technical Information Service (NTIS)

A replacement conveyorized photoresist stripping system was characterized to replace the ASI photoresist stripping system. This system uses the qualified ADF-25c chemistry for the fabrication of flex circuits, while the ASI uses the qualified potassium hydroxide chemistry. The stripping process removes photoresist, which is used to protect the copper traces being formed during the etch process.
NTIS
Circuits; Conveyors; Fabrication; Photoresists; Replacing

20090025981 National Renewable Energy Lab., Golden, CO USA
System Impacts from Interconnection of Distributed Resources: Current Status and Identification of Needs for Further Development
Basso, T. S.; Jan. 2009; 44 pp.; In English
Contract(s)/Grant(s): DE-AC36-08-GO28308
Report No.(s): DE2009-948753; NREL/TP-550-44727; No Copyright; Avail.: Department of Energy Information Bridge

Distributed resource (DR) interconnection can contribute to conditions that might go beyond what originally was planned for, designed, and built into the electric grid. A system impact study identifies the electric power system (EPS) impacts that can result if a proposed DR is interconnected without modifications to the area or local EPS. The impact study focuses on potential adverse effects to the operation, safety, and reliability of the area EPS. The decision whether to conduct an engineering system impact review generally lacks a clear, broadly accepted, and strong engineering foundation. Those involved in grid interconnection of DR tend to formulate rules of thumb for impact studies and for establishing their individual preferential resolutions. There are no universally accepted approaches and tools specific to the whole of assessing DR interconnection impacts and resolutions. With the advent of IEEE Standard 1547, modern interconnection equipment has made significant strides by having universal, transparent requirements for interconnection. During grid modernization, however, few changes have been made with the explicit intent to take advantage of accommodating DR to provide benefits to both the DR owner and the grid owner or operator. During these changing times, the grid also is becoming increasingly diverse, and some believe that its existing, site-specific electrical qualities and parameters are less well-known overall. This lack of accommodating DR is not simply a technology issueequipment is available, but the technology needs to be interoperable with other advanced equipment and also with the legacy equipment that makes up the grid, and with grid operations. Further, improved grid operations (e.g., distribution automation) needs to be taken into account. Making the modern grid more robust should include accommodating DR to improve electricity availability for customers, improve grid reliability, and provide additional benefits to both grid operators and their customers. Concurrent with the U.S. Department of Energy research and development (R&D) for grid modernization and with the Energy Independence and Security Act of 2007s smart grid

interoperability framework, better approaches, methods, and tools are needed to aid in the consideration of DR interconnected to the grid, for system impact studies, and for resolution that concomitantly promotes and aligns with interoperability and robustness of the U.S. electricity transmission and distribution (T&D) infrastructure. This report documents and evaluates system impacts from the interconnection of distributed resources to T&D systems, including a focus on renewable DR technologies. The report also identifies system impact-resolution approaches and actions, including extensions of existing approaches. Lastly, the report documents the current challenges and examines what is needed to gain a clearer understanding of what to pursue to better avoid or address system impact issues.
NTIS
Energy Technology; Interoperability; Transparence; Robustness (Mathematics); Reliability

20090026130 Oak Ridge National Lab., TN USA; Electric Power Research Inst., Palo Alto, CA, USA
Effective Lifetime of ACSR Full Tension Splice Connector Operated at Higher Temperature
Wang, J. A. J.; Lara-Curzio, E.; King, T. J.; Graziano, J.; Chan, J.; Mar. 01, 2009; 10 pp.; In English
Contract(s)/Grant(s): DE-AC05-00OR22725
Report No.(s): DE2009-949998; No Copyright; Avail.: National Technical Information Service (NTIS)

This paper is to address the issues related to integrity of ACSR full tension splice connectors operated at high temperatures. A protocol of integrating analytical and experimental approaches to evaluate the integrity of a full tension single-stage splice connector (SSC) assembly during service at high operating temperature was developed. Based on the developed protocol the effective lifetime evaluation was demonstrated with ACSR Drake conductor SSC systems. The investigation indicates that thermal cycling temperature and frequency, conductor cable tension loading, and the compressive residual stress field within a SSC system have significant impact on the SSC integrity and the associated effective lifetime.
NTIS
Connectors; High Temperature

20090026161 Army Research Lab., Aberdeen Proving Ground, MD USA
Interrupt Driven RS-232, Pulse Width Modulation, and Control Processing on a Single 8-bit PIC Chip
Shumarker, Justin; Mar 2009; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-1L162618AH80
Report No.(s): AD-A500061; ARL-TR-4747; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500061

Autopilots utilizing a single processor allow for smaller, lighter, more cost-effective designs than those using multi-processor architecture. Presented here is a software architecture that allows multiple tasks to operate in a real-time mutually exclusive environment using a single 8-bit processor. This type of architecture will be utilized to create an autopilot using a single processor and sensors. The problem is preventing individual tasks from interfering with one another in a real-time environment. The processor selected for this design is the 8-bit microchip programmable integrated circuit (PIC) 18F2420. Hardware limitations on the microchip PIC, such as a lack of symmetric multi-processing, must be emulated in a round-robin interrupt scheduler whereby each task runs in sequence, receiving only a slice of the total processing time available.
DTIC
Automatic Pilots; Chips; Microprocessors; Pulse Duration Modulation

20090026254 Colorado State Univ., Fort Collins, CO USA
Plantenna or a Plant made to Function as an Antenna
Chandraselar, V; Oct 30, 2007; 12 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0463
Report No.(s): AD-A500093; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500093

The Plantenna project has the overlying goal to simply use a plant as an antenna. To do this, special plants called metal hyper accumulators are being tested to observe any antenna like properties. The testing so far has been focused at finding an appropriate testing procedure while analyzing the basic impedance properties of plants concerning the relationships between impedance and test frequency and impedance and plant length. This report will illustrate that the plants behave in an expected

manner with a linear relationship between the impedance and the plant distance as well as providing a valid testing procedure for use on the plants in question.
DTIC
Antennas; Plants (Botany); Impedance

34
FLUID MECHANICS AND THERMODYNAMICS

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

20090025388 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Scramjet Fuel Injection Array Optimization Utilizing Mixed Variable Pattern Search With Kriging Surrogates
Sparkman, Bryan; Mar 2008; 106 pp.; In English
Report No.(s): AD-A500329; AFIT/GOR/ENS/08-19; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Fuel-air mixing analysis of scramjet aircraft is often performed through experimental research or computational fluid dynamics (cfd) algorithms. Design optimization with these approaches is often impossible under a limited budget due to their high cost per run. This investigation uses jetpen, a known inexpensive analysis tool, to build upon a previous case study of scramjet design optimization. Mixed Variable Pattern Search (mvps) is compared to evolutionary algorithms in the optimization of two scramjet designs. The first revisits the previously studied approach and compares the quality of mvps to prior results. The second applies mvps to a new scramjet design in support of the Hypersonic International Flight Research Experimentation (hifire). The results demonstrate the superiority of mvps over evolutionary algorithms and paves the way for design optimization with more expensive approaches.
DTIC
Air Breathing Engines; Computational Fluid Dynamics; Fuel Injection; Kriging; Propulsion System Configurations; Propulsion System Performance; Supersonic Combustion Ramjet Engines

20090025420 NASA Marshall Space Flight Center, Huntsville, AL, USA
An Integrated Solution for Performing Thermo-fluid Conjugate Analysis
Kornberg, Oren; March 10, 2009; 1 pp.; In English; Satellite Thermal Control Workshop, 10-12 Mar. 2009, El Segundo, CA, USA
Contract(s)/Grant(s): NNM05AB50C
Report No.(s): M09-0241; Copyright; Avail.: Other Sources; Abstract Only

A method has been developed which integrates a fluid flow analyzer and a thermal analyzer to produce both steady state and transient results of 1-D, 2-D, and 3-D analysis models. The Generalized Fluid System Simulation Program (GFSSP) is a one dimensional, general purpose fluid analysis code which computes pressures and flow distributions in complex fluid networks. The MSC Systems Improved Numerical Differencing Analyzer (MSC.SINDA) is a one dimensional general purpose thermal analyzer that solves network representations of thermal systems. Both GFSSP and MSC.SINDA have graphical user interfaces which are used to build the respective model and prepare it for analysis. The SINDA/GFSSP Conjugate Integrator (SGCI) is a formbase graphical integration program used to set input parameters for the conjugate analyses and run the models. The contents of this paper describes SGCI and its thermo-fluids conjugate analysis techniques and capabilities by presenting results from some example models including the cryogenic chill down of a copper pipe, a bar between two walls in a fluid stream, and a solid plate creating a phase change in a flowing fluid.
Author
Conjugates; Flow Distribution; Fluid Flow; Thermal Analysis; Three Dimensional Models

20090025423 NASA Marshall Space Flight Center, Huntsville, AL, USA
Numerical Evaluation of the 'Dual-Kernel Counter-flow' Matric Convolution Integral that Arises in Discrete/Continuous (D/C) Control Theory
Nixon, Douglas D.; March 15, 2009; 6 pp.; In English; Southeastern Symposium on Systems Theory 2009, 15-17 Mar. 2009, Tullahoma, TN, USA
Report No.(s): M09-0153; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025423

Discrete/Continuous (D/C) control theory is a new generalized theory of discrete-time control that expands the concept

of conventional (exact) discrete-time control to create a framework for design and implementation of discretetime control systems that include a continuous-time command function generator so that actuator commands need not be constant between control decisions, but can be more generally defined and implemented as functions that vary with time across sample period. Because the plant/control system construct contains two linear subsystems arranged in tandem, a novel dual-kernel counter-flow convolution integral appears in the formulation. As part of the D/C system design and implementation process, numerical evaluation of that integral over the sample period is required. Three fundamentally different evaluation methods and associated algorithms are derived for the constant-coefficient case. Numerical results are matched against three available examples that have closed-form solutions.
Author
Algorithms; Control Theory; Convolution Integrals; Kernel Functions; Systems Engineering; Discrete Functions

20090025446 NASA Langley Research Center, Hampton, VA, USA
Addition of Improved Shock-Capturing Schemes to OVERFLOW 2.1
Burning, Pieter G.; Nichols, Robert H.; Tramel, Robert W.; June 22, 2009; 39 pp.; In English; 19th AIAA Computational Fluid Dynamics, 22-25 Jun. 2009, San Antonio, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 644423.02.39.04.50
Report No.(s): AIAA Paper 2009-3988; LF99-8992; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025446

Existing approximate Riemann solvers do not perform well when the grid is not aligned with strong shocks in the flow field. Three new approximate Riemann algorithms are investigated to improve solution accuracy and stability in the vicinity of strong shocks. The new algorithms are compared to the existing upwind algorithms in OVERFLOW 2.1. The new algorithms use a multidimensional pressure gradient based switch to transition to a more numerically dissipative algorithm in the vicinity of strong shocks. One new algorithm also attempts to artificially thicken captured shocks in order to alleviate the errors in the solution introduced by 'stair-stepping' of the shock resulting from the approximate Riemann solver. This algorithm performed well for all the example cases and produced results that were almost insensitive to the alignment of the grid and the shock.
Author
Algorithms; Flow Distribution; Pressure Gradients; Dissipation; Alignment

20090025449 NASA Langley Research Center, Hampton, VA, USA
A Study of Ablation-Flowfield Coupling Relevant to the Orion Heatshield
Johnston, Christopher O.; Gnoffo, Peter A.; Mazaheri, Alireza; June 22, 2009; 15 pp.; In English; 41st AIAA Thermophysics Conference, 22-25 Jun. 2009, San Antonio, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 736466.11.01.07.43.05.01
Report No.(s): LF99-9071; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025449

The coupled interaction between an ablating surface and the surrounding aerothermal environment is studied. An equilibrium ablation model is coupled to the LAURA flowfield solver, which allows the char ablation rate (m-dot(sub c)) to be computed as part of the flowfield solution. The wall temperature (T(sub w)) and pyrolysis ablation rate (m-dot(sub g)) may be specified by the user, obtained from the steady-state ablation approximation, or computed from a a material response code. A 32 species thermochemical nonequilibrium flowfield model is applied, which permits the treatment of C, H, O, N, and Si containing species. Coupled ablation cases relevant to the Orion heatshield are studied. These consist of diffusion-limited oxidation cases with Avcoat as the ablation material. The m-dot(sub c) values predicted from the developed coupled ablation analysis were compared with those obtained from a typical uncoupled ablation analysis. The coupled results were found to be as much as 50% greater than the uncoupled values. This is shown to be a result of the cumulative effect of the two fundamental approximations inherent in the uncoupled analysis.
Author
Ablation; Flow Distribution; Heat Shielding; Spacecraft Shielding; Aerodynamic Heat Transfer

20090025454 NASA Dryden Flight Research Center, Edwards, CA, USA
Influence of Control Jets on Flush Air-data Sensors
Woodruff, Stephen; June 22, 2009; 1 pp.; In English; 39th AIAA Fluid Dynamics Conference, 22-25 Jun. 2009, San Antonio, Tx, USA
Report No.(s): DFRC-929; No Copyright; Avail.: Other Sources; Abstract Only

Computations are performed to investigate the effect of rocket control motors on flush air-data sensor systems. Such

sensors are critical for the control of space vehicles during launch and re-entry, but are prone to interference from rocket motors, hypersonic-flow effects, etc. Computational analyses provide a means for studying these interference effects and exploring opportunities for mitigating them, either through design techniques or through appropriate processing of the sensor outputs. In the present work, the influence of rocket control motors on the nosecone flush air-data sensors of a launch-abort vehicle is studied. Particular attention is paid to the differential effect of various control-jet combinations on surface pressures. The relative effectiveness of inviscid, viscous, turbulent and two-phase-flow approximations in addressing this problem is also investigated.
Author
Air Data Systems; Jet Control; Hypersonic Flow; Aerospace Vehicles; Rocket Engines

20090025456 NASA Dryden Flight Research Center, Edwards, CA, USA
New Flutter Analysis Technique for CFD-based Unsteady Aeroelasticity
Pak, Chan-gi; Jutte, Christine V.; June 21, 2009; 1 pp.; In English; International Forum on Aeroelasticity and Structural Dynamics (IFASD) 2009, 21-25 Jun. 2009, Seattle, WA, USA
Report No.(s): DFRC-934; No Copyright; Avail.: Other Sources; Abstract Only

This paper presents a flutter analysis technique for the transonic flight regime. The technique uses an iterative approach to determine the critical dynamic pressure for a given mach number. Unlike other CFD-based flutter analysis methods, each iteration solves for the critical dynamic pressure and uses this value in subsequent iterations until the value converges. This process reduces the iterations required to determine the critical dynamic pressure. To improve the accuracy of the analysis, the technique employs a known structural model, leaving only the aerodynamic model as the unknown. The aerodynamic model is estimated using unsteady aeroelastic CFD analysis combined with a parameter estimation routine. The technique executes as follows. The known structural model is represented as a finite element model. Modal analysis determines the frequencies and mode shapes for the structural model. At a given mach number and dynamic pressure, the unsteady CFD analysis is performed. The output time history of the surface pressure is converted to a nodal aerodynamic force vector. The forces are then normalized by the given dynamic pressure. A multi-input multi-output parameter estimation software, ERA, estimates the aerodynamic model through the use of time histories of nodal aerodynamic forces and structural deformations. The critical dynamic pressure is then calculated using the known structural model and the estimated aerodynamic model. This output is used as the dynamic pressure in subsequent iterations until the critical dynamic pressure is determined. This technique is demonstrated on the Aerostructures Test Wing-2 model at NASA's Dryden Flight Research Center.
Author
Computational Fluid Dynamics; Flutter Analysis; Mathematical Models; Transonic Flight; Iteration; Dynamic Structural Analysis; Unsteady Aerodynamics

20090025464 NASA Glenn Research Center, Cleveland, OH, USA
Unsteady Full Annulus Simulations of a Transonic Axial Compressor Stage
Herrick, Gregory P.; Hathaway, Michael D.; Chen, Jen-Ping; May 2009; 19 pp.; In English; AIAA 47th Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2009, Orlando, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 561581.02.08.03.21.03
Report No.(s): NASA/TM-2009-215604; AIAA Paper 2009-1059; E-16895; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025464

Two recent research endeavors in turbomachinery at NASA Glenn Research Center have focused on compression system stall inception and compression system aerothermodynamic performance. Physical experiment and computational research are ongoing in support of these research objectives. TURBO, an unsteady, three-dimensional, Navier-Stokes computational fluid dynamics code commissioned and developed by NASA, has been utilized, enhanced, and validated in support of these endeavors. In the research which follows, TURBO is shown to accurately capture compression system flow range-from choke to stall inception-and also to accurately calculate fundamental aerothermodynamic performance parameters. Rigorous full-annulus calculations are performed to validate TURBO s ability to simulate the unstable, unsteady, chaotic stall inception process; as part of these efforts, full-annulus calculations are also performed at a condition approaching choke to further document TURBO s capabilities to compute aerothermodynamic performance data and support a NASA code assessment effort.
Author
Computational Fluid Dynamics; Transonic Compressors; Turbocompressors; Turbomachinery; Aerodynamic Stalling; Simulation

20090025886 NASA Langley Research Center, Hampton, VA, USA

Development of Methods to Predict the Effects of Test Media in Ground-Based Propulsion Testing

Drummond, J. Philip; Danehy, Paul M.; Gaffney, Richard L., Jr.; Parker, Peter A.; Tedder, Sarah A.; Chelliah, Harsha K.; Cutler, Andrew D.; Bivolaru, Daniel; Givi, Peyman; Hassan, Hassan A.; June 2009; 111 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 599489.02.07.07.03.02.01

Report No.(s): NASA/TM-2009-215766; L-19662; LF99-8753; Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025886

This report discusses work that began in mid-2004 sponsored by the Office of the Secretary of Defense (OSD) Test & Evaluation/Science & Technology (T&E/S&T) Program. The work was undertaken to improve the state of the art of CFD capabilities for predicting the effects of the test media on the flameholding characteristics in scramjet engines. The program had several components including the development of advanced algorithms and models for simulating engine flowpaths as well as a fundamental experimental and diagnostic development effort to support the formulation and validation of the mathematical models. This report provides details of the completed work, involving the development of phenomenological models for Reynolds averaged Navier-Stokes codes, large-eddy simulation techniques and reduced-kinetics models. Experiments that provided data for the modeling efforts are also described, along with with the associated nonintrusive diagnostics used to collect the data.

Author

Computational Fluid Dynamics; Ground Tests; Mathematical Models; Phenomenology; Jet Propulsion; Supersonic Combustion Ramjet Engines; Combustion

20090025902 Geological Survey, Austin, TX, USA

Alternative Regression Equations for Estimation of Annual Peak-Streamflow Frequency for Undeveloped Watershed in Texas Using PRESS Minimization

Asquith, W. H.; Thompson, D. B.; Jun. 2008; 48 pp.; In English

Contract(s)/Grant(s): 0-5521

Report No.(s): PB2009-112559; USGS-SIR-5084; FHWA-TX-08/0-5521-2; No Copyright; Avail.: CASI: A03, Hardcopy

The U.S. Geological Survey, in cooperation with the Texas Department of Transportation and in partnership with Texas Tech University, investigated a refinement of the regional regression method and developed alternative equations for estimation of peak-streamflow frequency for undeveloped watersheds in Texas. A common model for estimation of peak-streamflow frequency is based on the regional regression method. The current (2008) regional regression equations for 11 regions of Texas are based on log(sub 10) transformations of all regression variables (drainage area, main-channel slope, and watershed shape). Exclusive use of log10-transformation does not fully linearize the relations between the variables. As a result, some systematic bias remains in the current equations. The bias results in overestimation of peak streamflow for both the smallest and largest watersheds. The bias increases with increasing recurrence interval. The primary source of the bias is the discernible curvilinear relation in log(sub 10) space between peak streamflow and drainage area. Bias is demonstrated by selected residual plots with superimposed LOWESS trend lines. To address the bias, a statistical framework based on minimization of the PRESS statistic through power transformation of drainage area is described and implemented, and the resulting regression equations are reported. Compared to log(sub 10)-exclusive equations, the equations derived from PRESS minimization have PRESS statistics and residual standard errors less than the log(sub 10)-exclusive equations. Selected residual plots for the PRESS-minimized equations are presented to demonstrate that systematic bias in regional regression equations for peak-streamflow frequency estimation in Texas can be reduced. Because the overall error is similar to the error associated with previous equations and because the bias is reduced, the PRESS-minimized equations reported here provide alternative equations for peak-streamflow frequency estimation.

NTIS

Frequencies; Optimization; Presses; Watersheds

20090025903 Geological Survey, Reston, VA USA

Evaluation of Acoustic Doppler Velocity Meters to Quantify Flow From Comal Springs and San Marcos Springs, Texas

Gary, M. O.; Gary, R. H.; Asquith, W. H.; Jan. 2008; 45 pp.; In English

Report No.(s): PB2009-112558; USGS-SIR-2008-5083; No Copyright; Avail.: National Technical Information Service (NTIS)

Comal Springs and San Marcos Springs are the two largest springs in Texas, are major discharge points for the San Antonio segment of the Edwards aquifer, and provide habitat for several Federally listed endangered species that depend on

adequate springflows for survival. It is therefore imperative that the Edwards Aquifer Authority have accurate and timely springflow data to guide resource management. Discharge points for Comal Springs and San Marcos Springs are submerged in Landa Lake and in Spring Lake, respectively. Flows from the springs currently (2008) are estimated by the U.S Geological Survey in real time as surface-water discharge from conventional stage-discharge ratings at sites downstream from each spring. Recent technological advances and availability of acoustic Doppler velocity meters (ADVMs) now provide tools to collect data (stream velocity) related to springflow that could increase accuracy of real-time estimates of the springflows. The U.S. Geological Survey, in cooperation with the Edwards Aquifer Authority, did a study during May 2006 through September 2007 to evaluate ADVMs to quantify flow from Comal and San Marcos Springs. The evaluation was based on two monitoring approaches: (1) placement of ADVMs in important spring orificesspring run 3 and spring 7 at Comal Springs, and diversion spring at San Marcos Springs; and (2) placement of ADVMs at the nearest flowing streamsComal River new and old channels for Comal Springs, Spring Lake west and east outflow channels and current (2008) San Marcos River streamflow-gaging site for San Marcos Springs. For Comal Springs, ADVM application at spring run 3 and spring 7 was intended to indicate whether the flows of spring run 3 and spring 7 can be related to total springflow. The findings indicate that even though velocity data from both discharge features reflect changes in flow, the data do not reliably show a direct relation to measured streamflow and thus to total Comal Springs flow. ADVMs at the Comal River new channel and old channel sites provide data that potentially could yield more accurate real-time estimates of total Comal Springs flow than streamflow measured at the downstream Comal River site. For San Marcos Springs, the findings indicate shortcomings with ADVM installations at diversion spring and in the west and east outflow channels. However, the accuracy of streamflow measured at the San Marcos River gage as an estimate of real-time San Marcos Springs flow could potentially be increased through use of ADVM data from that site.
NTIS
Acoustic Velocity; Data Acquisition; Flow Velocity

20090025904 Geological Survey, Reston, VA USA; Environmental Protection Agency, USA
Streamflow, Water Quality, and Metal Loads from Chat Leachate and Mine Outflow into Tar Creek, Ottawa County, Oklahoma, 2005
Cope, C. C.; Becker, M. F.; Andrews, W. J.; DeHay, K.; Jan. 2008; 30 pp.; In English
Report No.(s): PB2009-112549; USGS-SIR-2008-5115; No Copyright; Avail.: National Technical Information Service (NTIS)
Picher mining district is an abandoned lead and zinc mining area located in Ottawa County, northeastern Oklahoma. During the first half of the 20th century, the area was a primary producer of lead and zinc in the USA. Large accumulations of mine tailings, locally referred to as chat, produce leachate containing cadmium, iron, lead, and zinc that enter drainages within the mining area. Metals also seep to local ground water and streams from unplugged shafts, vent holes, seeps, and abandoned mine dewatering wells. Streamflow measurements were made and water-quality samples were collected and analyzed from two locations in Picher mining district from August 16 to August 29 following a rain event beginning on August 14, 2005, to determine likely concentrations and loads of metals from tailings and mine outflows in the part of Picher mining district near Tar Creek. Locations selected for sampling included a tailings pile with an adjacent mill pond, referred to as the Western location, and a segment of Tar Creek from above the confluence with Lytle Creek to below Douthat bridge, referred to as Tar Creek Study Segment. Measured streamflow was less than 0.01 cubic foot per second at the Western location, with streamflow only being measurable at that site on August 16, 2005. Measured streamflows ranged from <0.01 to 2.62 cubic feet per second at Tar Creek Study Segment. One water-quality sample was collected from runoff at the Western location. Total metals concentrations in that sample were 95.3 micrograms per liter cadmium, 182 micrograms per liter iron, 170 micrograms per liter lead, 1,760 micrograms per liter zinc. Total mean metals concentrations in 29 water-quality samples collected from Tar Creek Study Segment from August 1629, 2005, were 21.8 micrograms per liter cadmium, 7,924 micrograms per liter iron, 7.68 micrograms per liter lead, and 14,548 micrograms per liter zinc.
NTIS
Loads (Forces); Oklahoma; Tars; Water Quality

20090025906 Geological Survey, Reston, VA USA
Evaluation of the Acoustic Doppler Velocity Meter for Computation of Discharge Records at Three Sites in Colorado, 2004-2005
Stevens, M. R.; Diaz, P.; Smits, D. E.; Jan. 2008; 25 pp.; In English
Report No.(s): PB2009-112544; USGS-SIR-2007-5236; No Copyright; Avail.: CASI: A03, Hardcopy
The U.S. Geological Survey (USGS), in cooperation with the Colorado Water Conservation Board, conducted a study in

20042005 at three sites in Colorado: Bear Creek at Morrison, Clear Creek near Empire, and Redlands Canal near Grand Junction. The study was done to evaluate acoustic Doppler velocity meter (ADVM) technology in different hydrologic settings that are characteristic of many Colorado streamflow-gaging sites. ADVMs have been tested and used extensively in many parts of the USA by USGS but not in Colorado where relatively small, shallow, clear, coarse-bed streams that ice up in the winter may affect the ADVM suitability. In this study, ADVM instrumentation was successfully used and discharge computations compared favorably, generally within 5 to 10 percent, with conventional USGS stage/discharge methods at the three Colorado sites. However, two factors, encountered in this study, may adversely affect the use of ADVM technology in Colorado. First, for some streams, the depth required (about 1.5 feet for a side-looking instrument) cannot be met during low-flow periods of the year. Second, cold temperatures and freezing-thawing cycles can produce ice effects that could prevent collection of usable ADVM (and stage) data. Some Colorado streamflow-gaging sites have conditions where ADVM measurements may enhance accuracy or ease of computation. Variable backwater from tributary inflow, beaver dams, ice effect, diversion dams, canal operations, or debris are problematic for stage/discharge records, but can be handled by ADVM methods using stage as a variable in the index-velocity equation if necessary. This technique allows for more than one discharge at a given gage height and can reduce or eliminate the need for shift correction for changes in the control. Study results at the three Colorado sites indicate that ADVM technology is a viable, though more expensive alternative to conventional USGS stage/discharge instrumentation. Much of the ADVM discharge computed for this study was within 5 percent of the USGS conventional stage/discharge, except at Clear Creek, where part of the ADVM discharge data were generally in the 5 to 10 percent range of percentage difference.
NTIS
Acoustic Velocity; Colorado

20090025975 NASA Langley Research Center, Hampton, VA, USA
Development of Laser-induced Grating Spectroscopy for Underwater Temperature Measurement in Shock Wave Focusing Regions
Gojani, Ardian B.; Danehy, Paul M.; Alderfer, David W.; Saito, Tsutomu; Takayama, Kazuyoshi; September 29, 2003; 10 pp.; In English; SPIE International Symposium on Optical Systems Design, 29 Sep. - 3 Oct. 2003, Saint Etiennes, France; Original contains black and white illustrations
Contract(s)/Grant(s): 23-713-10-66; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025975

In Extracorporeal Shock Wave Lithotripsy (ESWL) underwater shock wave focusing generates high pressures at very short duration of time inside human body. However, it is not yet clear how high temperatures are enhanced at the spot where a shock wave is focused. The estimation of such dynamic temperature enhancements is critical for the evaluation of tissue damages upon shock loading. For this purpose in the Interdisciplinary Shock Wave Research Center a technique is developed which employs laser induced thermal acoustics or Laser Induced Grating Spectroscopy. Unlike most of gasdynamic methods of measuring physical quantities this provides a non-invasive one having spatial and temporal resolutions of the order of magnitude of 1.0 mm3 and 400 ns, respectively. Preliminary experiments in still water demonstrated that this method detected sound speed and hence temperature in water ranging 283 K to 333 K with errors of 0.5%. These results may be used to empirically establish the equation of states of water, gelatin or agar cells which will work as alternatives of human tissues. Author
Shock Waves; Temperature Measurement; Laser Spectroscopy; Acoustic Velocity; High Temperature; High Pressure; Acoustics

20090026013 NASA Langley Research Center, Hampton, VA, USA
Coherent Anti-Stokes Raman Spectroscopic Thermometry in a Supersonic Combustor
Cutler, A. D.; Danehy, P. M.; Springer, R. R.; OByrne, S.; Capriotti, D. P.; DeLoach, R.; AIAA Journal; December 2003; Volume 41, No. 12, pp. 2451-2459; In English; Aerospace Science Meeting, 14-17 Jan. 2002, Reno, NV, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NCC1-370
Report No.(s): AIAA Paper 2002-0743; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026013

An experiment has been conducted to acquire data for the validation of computational fluid dynamics codes used in the design of supersonic combustors. The flow in a supersonic combustor, consisting of a diverging duct with a single downstream-angled wail injector, is studied. Combustor entrance Mach number is 2 and enthalpy nominally corresponds to Mach 7 flight. The primary measurement technique is coherent anti-Stokes Raman spectroscopy, but surface pressures and

temperatures have also been acquired. Modern design of experiment techniques have been used to maximize the quality of the data set (for the given level of effort) and to minimize systematic errors. Temperature maps are obtained at several planes in the flow for a case in which the combustor is piloted by injecting fuel upstream of the main injector and one case in which it is not piloted. Boundary conditions and uncertainties are characterized.
Author
Raman Spectroscopy; Temperature Measurement; Computational Fluid Dynamics; Hypersonic Speed; Boundary Conditions; Ducts; Injectors

20090026025 Lawrence Livermore National Lab., Livermore, CA USA
Multi-Scale, Multi-Physics Membrane Technology
Henshaw, W. D.; Feb. 23, 2009; 17 pp.; In English
Report No.(s): DE2009-948649; LLNL/TR-410671; No Copyright; Avail.: National Technical Information Service (NTIS)
Our objectives for this 10 week feasability study were to gain an initial theoretical understanding of the numerical issues involved in modeling fluid-structure interface problems and to develop a prototype software infrastructure based on deforming composite grids to test the new approach on simple problems. For our first test case we considered a two-dimensional fluid-solid piston problem in which one half of the domain is occupied by fluid and the other half by a solid. We determined the exact solution to this problem using the method of characteristics and d'Alembert's solution to the wave equation. We solved this problem using our new numerical approximations and veried the results compared to the exact solution. As a second test case we considered a two dimensional problem consisting of a shock in a fluid that strikes a cylindrically shaped solid.
NTIS
Membranes; Deformation; Method of Characteristics; Approximation

20090026032 Idaho National Lab., Idaho Falls, ID, USA
Comparative Analysis of Natural Convection Flows Simulated by Both the Conservation and Incompressible Forms of the Navier-Stokes Equations in a Differentially-Heated Square Cavity
Martineau, R. C.; Berry, R. A.; Esteve, A.; Hamman, K. D.; Knoll, D. A.; Jan. 2009; 58 pp.; In English
Contract(s)/Grant(s): DE-AC07-05ID14517
Report No.(s): DE2009-948591; INL/EXT-09-15333; No Copyright; Avail.: National Technical Information Service (NTIS)
This report illustrates a comparative study to analyze the physical differences between numerical simulations obtained with both the conservation and incompressible forms of the Navier-Stokes equations for natural convection flows in simple geometries. The purpose of this study is to quantify how the incompressible flow assumption (which is based upon constant density advection, divergence-free flow, and the Boussinesq gravitational body force approximation) differs from the conservation form (which only assumes that the fluid is a continuum) when solving flows driven by gravity acting upon density variations resulting from local temperature gradients. Driving this study is the common use of the incompressible flow assumption in fluid flow simulations for nuclear power applications in natural convection flows subjected to a high heat flux (large temperature differences). A series of simulations were conducted on two-dimensional, differentially-heated rectangular geometries and modeled with both hydrodynamic formulations. From these simulations, the selected characterization parameters of maximum Nusselt number, average Nusselt number, and normalized pressure reduction were calculated. Comparisons of these parameters were made with available benchmark solutions for air with the ideal gas assumption at both low and high heat fluxes. Additionally, we generated body force, velocity, and divergence of velocity distributions to provide a basis for further analysis. The simulations and analysis were then extended to include helium at the Very High Temperature gas-cooled Reactor (VHTR) normal operating conditions. Our results show that the consequences of incorporating the incompressible flow assumption in high heat flux situations may lead to unrepresentative results. The results question the use of the incompressible flow assumption for simulating fluid flow in an operating nuclear reactor, where large temperature variations are present. The results show that the use of the incompressible flow assumption with the Boussinesq gravitational body force approximation should be restricted to flows where the density change of a fluid particle along a pathline is negligible.
NTIS
Cavities; Conservation Equations; Free Convection; Incompressible Flow; Navier-Stokes Equation

20090026048 Department of Energy, Washington, DC, USA
Atmospheric Radiation Measurement Climate Research Facility (ACRF) Annual Report 2007
Ferrell, W. R.; Alapaty, K.; Petty, R.; Nov. 01, 2007; 50 pp.; In English
Report No.(s): PB2009-111433; DOE/SC-ARM-0706; No Copyright; Avail.: National Technical Information Service (NTIS)

Through the ARM Program, the DOE funded the development of several highly instrumented ground stations for studying cloud formation processes and their influence on radiative transfer, and for measuring other parameters that determine the radiative properties of the atmosphere. This scientific infrastructure, and resultant data archive, is a valuable national and international asset for advancing scientific knowledge of Earth systems. In fiscal year (FY) 2003, the DOE designated the ARM sites as a national scientific user facility: the ARM Climate Research Facility (ACRF). The ACRF has enormous potential to contribute to a wide range of interdisciplinary science in areas such as meteorology, atmospheric aerosols, hydrology, biogeochemical cycling, and satellite validation, to name only a few. Three primary locations: the Southern Great Plains (SGP), Tropical Western Pacific (TWP), and North Slope of Alaska (NSA); and the portable ARM Mobile Facility are heavily instrumented to collect massive amounts of atmospheric measurements needed to create data files. Using these data, ARM scientists are studying the effects and interactions of sunlight, radiant energy, and clouds to understand their impact on temperatures, weather, and climate. As part of this effort, ARM scientists and ACRF infrastructure staff provide value-added processing to the data files to create new data streams called value-added products. Software tools are provided to help open and analyze these products, which are made available for the science community via the ARM website to aid in further research.
NTIS
Atmospheric Radiation; Climate; Ground Stations; Radiation Measurement; Radiative Transfer; Research Facilities

20090026073 NASA Langley Research Center, Hampton, VA, USA
PLIF Temperature and Velocity Distributions in Laminar Hypersonic Flat-plate Flow
OByrne, S.; Danehy, P. M.; Houwing, A. F. P.; August 17, 2003; 12 pp.; In English; 12th Gordon Research Conference on Laser Diagnostics for Combustion, 17-22 Aug. 2003, Oxford, UK; Original contains color and black and white illustrations
Contract(s)/Grant(s): 713-10-66-01; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026073

Rotational temperature and velocity distributions have been measured across a hypersonic laminar flat-plate boundary layer, using planar laser-induced fluorescence. The measurements are compared to a finite-volume computation and a first-order boundary layer computation, assuming local similarity. Both computations produced similar temperature distributions and nearly identical velocity distributions. The disagreement between calculations is ascribed to the similarity solution not accounting for leading-edge displacement effects. The velocity measurements agreed to within the measurement uncertainty of 2 % with both calculated distributions. The peak measured temperature was 200 K lower than the computed values. This discrepancy is tentatively ascribed to vibrational relaxation in the boundary layer.
Author
Laminar Boundary Layer; Flat Plates; Flow Velocity; Velocity Measurement; Temperature Distribution; Hypersonic Flow; Velocity Distribution; Laser Induced Fluorescence

20090026125 Princeton Univ., NJ USA
Method to Simulate Linear Stability of Impulsively Accelerated Density Interfaces in Ideal-MHD and Gas Dynamics
Samtaney, R.; Feb. 2009; 24 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03073
Report No.(s): DE2009-950506; PPPL-4376; No Copyright; Avail.: Department of Energy Information Bridge

We present a numerical method to solve the linear stability of impulsively accelerated density interfaces in two dimensions such as those arising in the Richtmyer-Meshkov instability. The method uses an Eulerian approach, and is based on an unwind method to compute the temporally evolving base state and a flux vector splitting method for the perturbations. The method is applicable to either gas dynamics or magnetohydrodynamics. Numerical examples are presented for cases in which a hydrodynamic shock interacts with a single or double density interface, and a doubly shocked single density interface. Convergence tests show that the method is spatially second order accurate for smooth flows, and between first and second order accurate for flows with shocks.
NTIS
Gas Dynamics; Ideal Gas; Numerical Analysis; Stability

20090026341 NASA Johnson Space Center, Houston, TX, USA

Boundary Layer Protuberance Simulations in Channel Nozzle Arc Jet

Larin, M. E.; Campbell, C. H.; Pulsonetti, M. V.; [2009]; 1 pp.; In English; 48th AIAA Aerospace Sciences Meeting, 4-7 Jan. 2010, Orland, FL, USA

Contract(s)/Grant(s): 377816.06.02.05.03.05.04

Report No.(s): JSC-CN-18499; Copyright; Avail.: Other Sources; Abstract Only

Various protuberance heights and shapes were modeled in the channel nozzle of the NASA Johnson Space Center Atmospheric Reentry Materials and Strictures Facility with the Data- Parallel Line Relaxation computational fluid dynamics code. The heating on the protuberance was compared to baseline (no protuberance) heating at a single fixed arc jet condition in order to obtain heating augmentation factors that will be used for flight traceability in the Boundary Layer Transition Flight Experiment on Space Shuttle Orbiter flights STS-119 (completed) and STS-128 (future flight). The arc jet simulations were performed in conjunction with the actual ground tests performed on the flight version (selected height and shape) of the protuberance. Thearc jet simulations for the final (flight version) protuberance included non-uniform inflow conditions beginning at the channel nozzle throat. The 2D inflow condition was modeled based on the current best practices methodology and used variable enthalpy and mass flow rate across the throat. Channel walls were modeled as fully catalytic isothermal surfaces, while the test section (consisting of Reaction Cured Glass tiles) was modeled as a partially catalytic radiative equilibrium wall. The results of the protuberance and baseline simulations were compared to the applicable ground test results. In addition, the obtained heating augmentation factors were compared to the factors derived from the STS-119 flight data. The effects of the protuberance shock on the opposite channel wall were also investigated.

Author

Boundary Layer Transition; Computational Fluid Dynamics; Protuberances; Space Shuttle Orbiters; Arc Jet Engines; Channel Flow; Simulation

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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*.

20090025874 Lockheed Martin Space Systems Co., New Orleans, LA, USA

Analysis of Craters in Aerospace Epoxy Primer Films using X-ray Photoelectron Spectroscopy and Micro-reflectance FTIR

Bjorklund, Thomas G.; Pratz, Earl H.; [2009]; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS8-00016

Report No.(s): M09-0298; Copyright; Avail.: Other Sources

No abstract available

Craters; Epoxy Resins; Photoelectron Spectroscopy; Primers (Coatings); X Rays; Fourier Transformation

20090026054 NASA Langley Research Center, Hampton, VA, USA

Laser Induced Fluorescence for Photogrammetric Measurement of Transparent or Reflective Aerospace Structures

Jones, Thomas W.; Dorrington, Adrian A.; Brittman, Paul L.; Danehy, Paul M.; May 04, 2003; 10 pp.; In English; 49th Annual International Instrumentation Symposium (ISA), 4-8 May 2003, Orlando, FL, USA; Original contains color illustrations

Contract(s)/Grant(s): 992-10-80-2700; Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090026054

To support the requirement for non- contacting measurement of polymer membrane structures a new technique based on the principles of photogrammetry has been developed and is described here.

Author

Photogrammetry; Membrane Structures; Laser Induced Fluorescence; High Resolution; Cameras

20090026074 NASA Langley Research Center, Hampton, VA, USA
Portable Fluorescence Imaging System for Hypersonic Flow Facilities
Wilkes, J. A.; Alderfer, D. W.; Jones, S. B.; Danehy, P. M.; Dec. 1, 2003; 13 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 713-10-66-01; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026074

A portable fluorescence imaging system has been developed for use in NASA Langley s hypersonic wind tunnels. The system has been applied to a small-scale free jet flow. Two-dimensional images were taken of the flow out of a nozzle into a low-pressure test section using the portable planar laser-induced fluorescence system. Images were taken from the center of the jet at various test section pressures, showing the formation of a barrel shock at low pressures, transitioning to a turbulent jet at high pressures. A spanwise scan through the jet at constant pressure reveals the three-dimensional structure of the flow. Future capabilities of the system for making measurements in large-scale hypersonic wind tunnel facilities are discussed.
Author
Laser Induced Fluorescence; Hypersonic Wind Tunnels; Three Dimensional Flow; Jet Flow; High Pressure; Imaging Techniques

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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*.

20090025395 Northrop Grumman Corp., San Antonio, TX USA
An in vitro Corneal Model with a Laser Damage Threshold at 2 Micrometers That is Similar to That in the Rabbit
Foltz, Michael S; Denton, Michael L; Schuster, Kurt J; Estlack, Larry E; Thomas, Robert J; Nov 2007; 13 pp.; In English
Contract(s)/Grant(s): FA8650-08-D-6930; Proj-7757
Report No.(s): AD-A500272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Corneal organotypic cultures were generated as per existing methods, which included growth on polycarbonate inserts and air-lifting for one week. The corneal simulant cultures were exposed, with real-time IR imaging, to the 2-micron wavelength output of a thulium fiber laser with 4 mm beam diameter for 0.25 seconds in a thermally controlled environment and then assayed for damage. The in vitro threshold (ED50 value of 12.5 W/sq cm) and peak temperature (77.5 deg C) at threshold irradiance are compared with rabbit corneal data in the literature.
DTIC
Cornea; In Vitro Methods and Tests; Laser Damage; Lasers; Rabbits; Yield Point

20090025441 NASA Langley Research Center, Hampton, VA, USA
High Repetition Rate Pulsed 2-Micron Laser Transmitter for Coherent CO2 DIAL Measurement
Singh, Uprendra N.; Bai, Yingxin; Yu, Jirong; Petros, Mulugeta; Petzar, Paul J.; Trieu, Bo C.; Lee, Hyung; June 22, 2009; 4 pp.; In English; 15th Coherent Laser Radar Conference, 22-26 Jun. 2009, Toulouse, France; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 478643.02.02.02.09
Report No.(s): LF99-8514; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025441

A high repetition rate, highly efficient, Q-switched 2-micron laser system as the transmitter of a coherent differential absorption lidar for CO2 measurement has been developed at NASA Langley Research Center. Such a laser transmitter is a master-slave laser system. The master laser operates in a single frequency, either on-line or off-line of a selected CO2 absorption line. The slave laser is a Q-switched ring-cavity Ho:YLF laser which is pumped by a Tm:fiber laser. The repetition rate can be adjusted from a few hundred Hz to 10 kHz. The injection seeding success rate is from 99.4% to 99.95%. For 1 kHz operation, the output pulse energy is 5.5mJ with the pulse length of approximately 50 ns. The optical-to-optical efficiency is 39% when the pump power is 14.5W. The measured standard deviation of the laser frequency jitter is about 3 MHz.
Author
Carbon Dioxide; Differential Absorption Lidar; Pulsed Lasers; Q Switched Lasers; Transmitters; Laser Applications

20090025444 NASA Langley Research Center, Hampton, VA, USA
Turbulent CO2 Flux Measurements by Lidar: Length Scales, Results and Comparison with In-Situ Sensors
Gilbert, Fabien; Koch, Grady J.; Beyon, Jeffrey Y.; Hilton, Timothy W.; Davis, Kenneth J.; Andrews, Arlyn; Ismail, Syed; Singh, Upendra N.; June 22, 2009; 4 pp.; In English; 15th Coherent Laser Radar Conference, 22-26 Jun. 2009, Toulouse, France; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 478643.02.07.03.01
Report No.(s): LF99-8562; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025444

The vertical CO2 flux in the atmospheric boundary layer (ABL) is investigated with a Doppler differential absorption lidar (DIAL). The instrument was operated next to the WLEF instrumented tall tower in Park Falls, Wisconsin during three days and nights in June 2007. Profiles of turbulent CO2 mixing ratio and vertical velocity fluctuations are measured by in-situ sensors and Doppler DIAL. Time and space scales of turbulence are precisely defined in the ABL. The eddy-covariance method is applied to calculate turbulent CO2 flux both by lidar and in-situ sensors. We show preliminary mean lidar CO2 flux measurements in the ABL with a time and space resolution of 6 h and 1500 m respectively. The flux instrumental errors decrease linearly with the standard deviation of the CO2 data, as expected. Although turbulent fluctuations of CO2 are negligible with respect to the mean (0.1 %), we show that the eddy-covariance method can provide 2-h, 150-m range resolved CO2 flux estimates as long as the CO2 mixing ratio instrumental error is no greater than 10 ppm and the vertical velocity error is lower than the natural fluctuations over a time resolution of 10 s.
Author
Atmospheric Boundary Layer; Carbon Dioxide; Differential Absorption Lidar; Temporal Resolution; Atmospheric Turbulence

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*.

20090025865 Honeywwell Federal Manufacturing and Technologies, Kansas City, MO, USA
Oil Mist Compliance
Lazarus, L. J.; Story, C.; Jan. 2009; 105 pp.; In English
Contract(s)/Grant(s): DE-ACO4-01AL66850
Report No.(s): DE2009-952563; KCP-613-8544S; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes activities at the KCP related to evaluating and modifying machine tools in order to be in compliance with Section 23 of DOE 10 CFR 851, Worker Safety and Health Program. Section 851.23 (a) states that Contractors must comply with the following safety and health standards that are applicable to the hazards in their covered workplace, and subsection 9 contains the following applicable standard: American Congress of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, (2005) (incorporated by reference, see 851.27) when the ACGIH Threshold Limit Values are lower (more protective) than permissible exposure limits in 29 CFR 1910. In the 2005 ACGIH Threshold Limit Value book a Notice of Change was issued for exposure to mineral oil mist used in metalworking fluids (MWFs). The effects of planning for the new facility and which machine tools would be making the transition to the new facility affected which machine tools were modified.
NTIS
Mist; Mineral Oils; Metal Working; Machine Tools

20090026133 Oak Ridge National Lab., TN USA
Effect of Intake Air Filter Condition on Vehicle Fuel Economy
Norman, K.; Huff, S.; West, B.; Feb. 2008; 40 pp.; In English
Report No.(s): DE2009-948545; ORNL/TM-2009/021; No Copyright; Avail.: National Technical Information Service (NTIS)

The study described in this report investigates the effect of one of these maintenance factors, air filter replacement, on vehicle performance and fuel economy. Past studies have indicated that replacing a clogged or dirty air filter can improve vehicle fuel economy. For example, Jaroszczyk, Wake, and Connor reported in 1993 that proper filtration systems make engines more fuel efficient; however, they gave no data or reference information to support this claim. The Organization for

Economic Co-operation and Development claimed in a 1981 report based on earlier research by the Thornton Research Center that excessive pressure across a dirty air filter can cause a 115% increase in fuel consumption. In the Thornton study, six 1970-73 model year vehicles were tested using the Economic Commission for Europe hot-start driving cycle (ECE 15) to explore the fuel economy effects of deliberate malfunctions, defined as maintenance problems such as damaged spark plugs, poor idle mixture, improper idle speed, and restricted air cleaners. Of the six vehicles, only five were tested with restricted air filters, accomplished by masking the cross-sectional area of the air cleaner element.
NTIS
Air Filters; Replacing; Fuel Consumption

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*.

20090025362 Federal Emergency Management Agency, Washington, DC USA
Existing School Buildings: Incremental Seismic Retrofit Opportunties
Jul. 1995; 65 pp.; In English
Contract(s)/Grant(s): EMW-91-3635; BCS-9117732
Report No.(s): PB2009-111869; No Copyright; Avail.: CASI: A04, Hardcopy

The intent of this document is to provide technical guidance to school guidance to school district facility managers for linking specific incremental seismic projects.
NTIS
Buildings; Schools; Earthquakes; Earthquake Resistance

20090025390 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 61, Number 3, September 1924
Green, J A; Dutton, D L; Sep 1924; 98 pp.; In English
Report No.(s): AD-A500285; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of The Coast Artillery Journal contains the following articles: Methods of Fire Adjustment, by Brigadier General R. E. Callan, U.S. Army; Coast Artillery Instruction, by Colonel W. E. Cole, C.A.C.; The Functions of Coast Fortifications in the Positive System of Coast Defense, by Major E. J. Cullen, C.A.C.; Pistols and Pistol Shooting, by Major W. D. Frazer, C.A.C.; Problems of an Officer on National Guard Duty, by Major H. A. Bagg, C.A.C.; Organized Reserve Duty, by Captain M. E. Barker, C.A.C.; and Coast Artillery Prospects, by 1st Lieutenant B. F. Fellers, C.A.C. The remainder of the issue contains the following features: an editorial on General John J. Pershing; Coast Artillery Board notes; Bulletin Board, including essays on Playing the Game, (the essentials of which are effort, fair play, self-control, team work, and set a good example), the Military Attache, the C.A.C. with the Japanese Relief Expedition, a single promotion list for the C.A.C. noncommissioned staff, funds raised for rifle and pistol teams, and history of the U.S. flag; Professional notes on new types of antiaircraft artillery, 3-inch antiaircraft gun mount (model 1923 E), materiel and morale, the keystone of our national defense (the Panama Canal), mine-laying submarines, rapidity of fire of the 155-mm gun, helium supplies, target practice of Batteries A and B, 51st Coast Artillery, airplane superchargers, and world's largest floating dock.
DTIC
Artillery; Coasts; Education; Fire Control; Fires; Warfare

20090025861 Federal Emergency Management Agency, Washington, DC USA
Coastal Construction Manual Volume 1, Principles and Practices of Planning, Siting, Designing, Designing, Constructing, Maintaining Residential Buildings in Coastal Areas FEMA 55, Edition 3 / August 2005
Aug. 2005; 344 pp.; In English
Report No.(s): PB2009-107834; FEMA-55; No Copyright; Avail.: CASI: A15, Hardcopy

The manual provides technical guidance for evaluating natural hazards in coastal areas and mitigating those hazards through sound siting, construction, and maintenance practices. It is not the intent of this manual to encourage the construction of buildings in hazardous coastal areas. Rather, when such construction does occur, following the recommendations in this

manual will help ensure that the buildings are sited, designed, constructed, and maintained in a manner that reduces their vulnerability to natural hazards and therefore reduces the potential for damage.
NTIS
Buildings; Coasts; Construction; Residential Areas; Hazards

20090025982 Sandia National Labs., Albuquerque, NM USA
Experimental Assessment of Unvalidated Assumptions in Classical Plasticity Theory
Brannon, R.; Burghardt, J. A.; Bronowski, D.; Bauer, S.; Jan. 2009; 120 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): DE2009-948711; SAND2009-0351; No Copyright; Avail.: National Technical Information Service (NTIS)

This report investigates the validity of several key assumptions in classical plasticity theory regarding material response to changes in the loading direction. Three metals, two rock types, and one ceramic were subjected to non-standard loading directions, and the resulting strain response increments were displayed in Gudehus diagrams to illustrate the approximation error of classical plasticity theories. A rigorous mathematical framework for fitting classical theories to the data, thus quantifying the error, is provided. Further data analysis techniques are presented that allow testing for the effect of changes in loading direction without having to use a new sample and for inferring the yield normal and flow directions without having to measure the yield surface. Though the data are inconclusive, there is indication that classical, incrementally linear, plasticity theory may be inadequate over a certain range of loading directions. This range of loading directions also coincides with loading directions that are known to produce a physically inadmissible instability for any nonassociative plasticity model.
NTIS
Plastic Properties; Mechanical Properties; Ceramics

20090025987 Lawrence Livermore National Lab., Livermore, CA USA
Model-Based Flaw Localizaton from Perturbations in the Dynamic Response of Complex Mechanical Structures
Chambers, D. H.; Feb. 25, 2009; 12 pp.; In English
Contract(s)/Grant(s): DE-AC52-07NA27344
Report No.(s): DE2009-948655; LLNL-TR-410827; No Copyright; Avail.: National Technical Information Service (NTIS)

A new method of locating structural damage using measured differences in vibrational response and a numerical model of the undamaged structure has been presented. This method is particularly suited for complex structures with little or no symmetry. In a prior study the method successively located simulated damage from measurements of the vibrational response on two simple structures. Here we demonstrate that it can locate simulated damage in a complex structure. A numerical model of a complex structure was used to calculate the structural response before and after the introduction of a void. The method can now be considered for application to structures of programmatic interest. It could be used to monitor the structural integrity of complex mechanical structures and assemblies over their lifetimes. This would allow early detection of damage, when repair is relatively easy and inexpensive. It would also allow one to schedule maintenance based on actual damage instead of a time schedule.
NTIS
Defects; Dynamic Response; Perturbation; Vibration Damping

20090026162 Air Force Research Lab., Tyndall AFB, FL USA
Evaluation of Blast Resistant Rigid Walled Expeditionary Structures
Genelin, Christopher L.; Dinan, Robert J.; Hoeman, John M.; Salim, Hani A; March 2009; 19 pp.; In English; 13th International Symposium on the Interactions of the Effects of Munitions with Structures, 10-15 May 2009, Bruhel, Germany; Original contains color illustrations
Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4915
Report No.(s): AD-A500060; AFRL-RX-TY-TP-2009-4532; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500060

Blast and fragmentation resistance of expeditionary shelters has become of great interest given the current threat environment. One such structure now being considered for deployment utilizes an ISO container sized steel frame with infill panels. The panels consist of a lightweight extruded polystyrene core sandwiched between two galvanized, light-gauge steel sheets. An investigation was conducted into the blast and fragmentation resistance of this new type of shelter and a direct comparison was made to that of a typical ISO container shelter currently deployed in theater. The static resistance function

of the panel system was determined in the laboratory via two experimental methods. A 16-point loading tree simulating a uniform load was utilized on a variety of full-scale panel cross-sections representing seven panel configurations. A vacuum chamber was employed to accomplish static full-scale wall testing. Laboratory resistance data was used to model the dynamic response of the panel system using a single-degree of freedom (SDOF) analysis. Accuracy of the analytical model was verified via three arena blast experiments, each of which included an instrumented ISO container for direct data comparison.
DTIC
Rigid Structures; Shelters

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*.

20090025862 Washington River Protection Solutions, Richland, WA, USA
Evaluation of Frost Heave on Waste Transfer Lines with Shallow Depths in DST Farms
Haq, M. A.; May 2009; 38 pp.; In English
Contract(s)/Grant(s): DE-AC27-99RL14047
Report No.(s): DE2009-952595; RPP-RPT-39400; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this document is to evaluate the effect of frost heave on waste transfer lines with shallow depths in DST farms. Because of the insulation, and well compacted sandy material around waste transfer lines, the type of sandy and gravel soil, and relatively low precipitation at Hanford site, it is concluded that waste transfer lines with one foot of soil covers (sandy cushion material, and insulation) are not expected to undergo frost heave damaging effects.
NTIS
Frost; Heaving; Radioactive Wastes; Buckling; Earth Surface

43
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*.

20090025351 Geological Survey, Reston, VA USA
Log ASCII Standard (LAS) File for Geophysical (Gamma Ray) Wirline Well Logs and Their Application to Geologic Cross Section C-C' Through the Central Appalachian Basin
Trippi, M. H.; Crangle, R. D.; January 2009; 13 pp.; In English
Report No.(s): PB2009-111833; USGS/OFR-2009-1021; No Copyright; Avail.: National Technical Information Service (NTIS)

U.S. Geological Survey (USGS) regional geologic cross section C-C (Ryder and others, 2008) displays key stratigraphic intervals in the central Appalachian basin. For this cross section, strata were correlated by using descriptions of well cuttings and gamma ray well log traces. This report summarizes the procedures used to convert gamma ray curves on paper well logs to the digital Log ASCII (American Standard Code for Information Interchange) Standard (LAS) format using the third-party software application Neuralog. The procedures could be used with other geophysical wireline logs also. The creation of digital LAS files from paper well logs by using Neuralog is very helpful, especially when dealing with older logs with limited or nonexistent digital data. The LAS files from the gamma ray logs of 11 wells used to construct cross section C-C are included in this report.
NTIS
Geological Surveys; Geophysics; Wells; Data Storage

20090025353 Geological Survey, Reston, VA, USA
Water Quality in the High Plains Aquifer, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas and Wyoming, 1999-2004
January 2004; 75 pp.; In English
Report No.(s): PB2009-111834; USGS/CIR-1337; No Copyright; Avail.: National Technical Information Service (NTIS)

This report contains the major findings of a 1999-2004 assessment of water quality in the High Plains aquifer. It is one of a series of reports by the National Water-Quality Assessment (NAWQA) Program that present major findings for principal and other aquifers and major river basins across the Nation. In these reports, water quality is discussed in terms of local, regional, State, and national issues. Conditions in the aquifer system are compared to conditions found elsewhere and to selected national benchmarks, such as those for drinking-water quality. This report is intended for individuals working with water-resource issues in Federal, State, or local agencies, universities, public interest groups, or the private sector. The information will be useful in addressing a number of current issues, such as drinking-water quality, the effects of agricultural practices on water quality, source-water protection, and monitoring and sampling strategies. This report is also for individuals who wish to know more about the quality of ground water in areas near where they live and how that water quality compares to the quality of water in other areas across the region and the Nation.
NTIS
Aquifers; Water Quality; Water Resources; Potable Water; Hydrology; Ground Water

20090025469 NASA Stennis Space Center, Stennis Space Center, MS, USA
Assessment of MODIS NDVI Time Series Data Products for Detecting Forest Defoliation from Gypsy Moth Outbreaks
Spruce, Joseph P.; Sader, Steven; Ryan, Robert E.; Smoot, James; Kuper, Philip; Ross, Kenton; Prados, Donald; Russell, Jeffrey; Gasser, Gerald; McKellip, Rodney; Hargrove, William; [2009]; 39 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNS04AB54T
Report No.(s): SSTI-2220-0185; Copyright; Avail.: Other Sources

No abstract available
Defoliation; Image Classification; Moths; Normalized Difference Vegetation Index; Time Series Analysis; Remote Sensing; Satellite Imagery

20090025945 NASA Marshall Space Flight Center, Huntsville, AL, USA
Impacts of Spatial Scaling Errors on Soil Moisture Retrieval Accuracy at L-Band
Crosson, William L.; Limaye, Ashutosh S.; Laymon, Charles A.; [2009]; 30 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM08AA04A
Report No.(s): M09-0387; Copyright; Avail.: Other Sources

In the near future, data from two microwave remote sensors at L-band will be available with which to estimate near-surface soil moisture. The European Space Agency s Soil Moisture and Salinity Mission (SMOS) is planned for launch in 2009. NASA is moving forward with a new L-band soil moisture mission named Soil Moisture Active/Passive (SMAP). While soil moisture retrieval theory is well-established, the effects of spatial scale are still being studied. In advance of these two L-band missions, it is important to perform studies that will improve our understanding of the various error sources associated with retrieval of soil moisture from satellite sensors. The purpose of this study is to quantify the magnitude of the scaling or aggregation error created in the presence of sub-footprint scale heterogeneity in soil and vegetation properties, which have a non-linear relationship with emitted microwave energy. We address this problem using single-frequency, single-polarization passive L-band microwave simulations for a mixed agricultural region of the USA. This scaling error is caused by the different functional relationships between surface microwave emissivity and soil moisture that exist for different soils and land cover types within a satellite footprint. Although several simplifying assumptions were made, the analysis performed here provides insight into expectations and helps define limits for mission requirements definition. The results obtained here provide guidance for future missions and indicate hydrological and landscape conditions under which errors are expected to be large, and other conditions that are more conducive to accurate soil moisture estimates. Errors associated with spatial aggregation of variable land surface characteristics within 40 km satellite footprints were found to be larger than the baseline mission requirements of 0.04-0.06 VSM over much of the study area. Soil moisture estimation errors were especially large and positive over portions of the domain characterized by mixtures of forests, wetlands and open water or mixtures of forest and pasture. We developed a parameterization for effective optical depth (tau(sub eff)) based on the standard deviation of optical depth (sigma tau) within a footprint. Using the resulting parameterized optical depth in retrievals resulted in a virtual

elimination of soil moisture biases in our simulated setting. In an operational setting, the empirical relationship between tieff and 6ti would need to be determined via a tuning process, and results are not expected to be as good as in the simulated cases presented here. However, the relationship shown here is likely to be universal, so any correction following this functional form is very likely to lead to large improvements over retrievals based simply on weighted mean properties.
Author
Remote Sensors; Soil Moisture; Accuracy; Vegetation; Agriculture; Earth Surface; Ultrahigh Frequencies; Errors

20090025978 NASA Marshall Space Flight Center, Huntsville, AL, USA; Alabama Univ., Birmingham, AL, USA
Spatial Analysis of West Nile Virus: Predictive Risk Modeling of a Vector-borne Infectious Disease in Illinois by Means of NASA Earth Observation Systems
Renneboog, Nathan; Gathings, David; Hemmings, Sarah; Makasa, Emmanuel; Omer, Wigdan; Tipre, Meghan; Wright, Catherine; McAllister, Marilyn; Luvall, Jeffrey C.; [2009]; 1 pp.; In English; Poster at Alabama Univ., Birmingham's Public Health Day; Original contains color illustrations
Report No.(s): M09-0452; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025978

West Nile Virus is a mosquito-borne virus of the family Flaviviridae. It infects birds and various mammals, including humans, and can cause encephalitis that may prove fatal, notably among vulnerable populations. Since its identification in New York City in 1999, WNV has become established in a broad range of ecological settings throughout North America, infecting more than 25,300 people and killing 1133 as of 2008 (CDC,2009). WNV is transmitted by mosquitoes that feed on infected birds. As a result, the degree of human infection depends on local ecology and human exposure. This study hypothesizes that remote sensing and GIS can be used to analyze environmental determinants of WNV transmission, such as climate, elevation, land cover, and vegetation densities, to map areas of WNV risk for surveillance and intervention.
Derived from text
Earth Observations (From Space); Remote Sensing; Risk; Viruses; Digital Elevation Models; Infectious Diseases

20090025992 NASA Marshall Space Flight Center, Huntsville, AL, USA
Elements of Regolith Simulant's Cost Structure--Why Rock Is NOT Cheap
Rickman, Douglas L.; March 17, 2009; 18 pp.; In English; Lunar Regolith/Simulation Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains black and white illustrations
Report No.(s): MSFC-2220; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025992

The cost of lunar regolith simulants is much higher than many users anticipate. After all, it is nothing more than broken rock. This class will discuss the elements which make up the cost structure for simulants. It will also consider which elements can be avoided under certain circumstances and which elements might be altered by the application of additional research and development.
Derived from text
Lunar Rocks; Regolith; Costs; Minerals

44
ENERGY PRODUCTION AND CONVERSION

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

20090025918 Naval Sea Systems Command, Philadelphia, PA USA
Investigating Singularities of the Observability Jacobian for Nonlinear Power Systems
Dafis, C J; Nwankpa, C O; Jul 2005; 7 pp.; In English; 2005 IEEE Electric Ship Technologies Symposium (ESTS 2005), 25-27 Jul. 2005, Philadelphia, PA, USA; Original contains color illustrations
Contract(s)/Grant(s): 051911353510; CH11171
Report No.(s): AD-A499803; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499803

This paper focuses on computing and interpreting the significance of the observability Jacobian singularities. Previous efforts have focused on developing an observability index and determining the effects of model/measurement changes to the

observability formulation. Using this index, the singularities of the Jacobian are extracted, and preliminary results indicate that there is a duality between the loss of stability (whether it be phase or voltage stability), and the loss of observability. Thus, providing a single dual-use metric capable of forecasting both stability and observability characteristics of a system. The results are illustrated using a sample 3-bus system.
DTIC
Nonlinear Systems; Singularity (Mathematics)

45
ENVIRONMENT POLLUTION

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

20090025344 National Energy Technology Lab., Pittsburgh, PA USA
Carbon Dioxide Capture from Existing Coal-Fired Power Plants
Ciferno, J. P.; Ramezan, M.; Skone, T. J.; Nov. 2007; 230 pp.; In English
Report No.(s): PB2009-111414; DOE/NETL-401/110907; No Copyright; Avail.: National Technical Information Service (NTIS)

There is growing concern that emissions of CO2 and other greenhouse gases (GHG) to the atmosphere is resulting in climate change with undefined consequences. This has led to a comprehensive program to develop technologies to reduce CO2 emissions from coal-fired power plants. New technologies, such as advanced combustion systems and gasification technologies hold great promise for economically achieving CO2 reductions. However, if the USA decides to embark on a CO2 emissions control program employing these new and cleaner technologies in new plants only, it may not be sufficient. It will also be necessary to reduce emissions from the existing fleet of power plants. This study will build on the results of previous work to help determine better approaches to capturing CO2 from existing coal-fired power plants. This study significantly increases the information available on the impact of retrofitting CO2 capture to existing PC-fired power plants. This study also provides input to potential electric utility actions concerning GHG emissions mitigation, should the U.S. decide to reduce CO2 emissions. Such information is critical for deciding on the best path to follow for reduction of CO2 emissions, should that become necessary.
NTIS
Carbon Dioxide; Coal; Combustion; Fossil Fuels

20090025347 National Oceanic and Atmospheric Administration, Silver Spring, MD, USA
Value of Preventing Oil Spill Injuries to Natural Resources Along California's Central Coast. Volume 1
Carson, R. T.; Conaway, M. B.; Hanemann, W. M.; Krosnick, J. A.; Martin, K. M.; Mar. 31, 1996; 201 pp.; In English
Report No.(s): PB2009-111623; No Copyright; Avail.: CASI: A10, Hardcopy

The purpose of the California Oil Spill (COS) Contingent Valuation (CV) Study was to execute and document a contingent valuation study of natural resource damages associated with offshore, coastal, or estuarine oil spills in California. The COS CV study developed an estimate of per household ex ante economic value for a program to prevent a specified set of natural resource injuries to those species of birds and intertidal life that are consistently affected by oil spills along California's Central Coast. The COS study team designed and implemented a CV survey following best-available practices for survey design and administration. Respondents were given the opportunity to vote for or against a government program financed by a one-time income tax surcharge on California households. The program would prevent, over the next decade, natural resource injuries from oil spills that harm wildlife and shoreline along California's central Coast.
NTIS
Coasts; Damage; Earth Resources; Injuries; Oil Slicks; Pollution Control; Prevention; Water Pollution

20090025354 Geological Survey, Reston, VA, USA; Bureau of Reclamation, Washington, DC, USA
Water Quality Conditions in Upper Klamath and Agency Lakes, Oregon, 2006
Lindenberg, M. K.; Hoilman, G.; Wood, T. M.; January 2008; 66 pp.; In English
Report No.(s): PB2009-111837; USGS/SIR-2008-5201; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Geological Survey Upper Klamath Lake water quality monitoring program gathered information from multiparameter continuous water quality monitors, physical water samples, dissolved oxygen production and consumption experiments, and meteorological stations during the June-October 2006 field season. The 2006 study area included Agency

Lake and all of Upper Klamath Lake. Seasonal patterns in water quality were similar to those observed in 2005, the first year of the monitoring program, and were closely related to bloom dynamics of the cyanobacterium (blue-green alga) Aphanizomenon flos-aquae (AFA) in the two lakes. High dissolved oxygen and pH conditions in both lakes before the bloom declined in July, which coincided with seasonal high temperatures and resulted in seasonal lows in dissolved oxygen and decreased pH. Dissolved oxygen and pH in Upper Klamath and Agency Lakes increased again after the bloom recovered. Seasonal low dissolved oxygen and decreased pH coincided with seasonal highs in ammonia and orthophosphate concentrations. Seasonal maximum daily average temperatures were higher and minimum dissolved oxygen concentrations were lower in 2006 than in 2005.
NTIS
Lakes; Meteorological Parameters; Water Quality

20090025355 Congressional Budget Office, Washington, DC, USA
Budgetary Treatment of Emission Allowances Under Cap- and Trade Policies
May 15, 2009; 7 pp.; In English
Report No.(s): PB2009-111926; No Copyright; Avail.: CASI: A02, Hardcopy

The potential introduction of carbon dioxide cap-and-trade policies raises complicated questions about how those policies might be reflected in the federal budget. Federal legislation to limit the emission of greenhouse gases (GHGs) through the issuance of tradable allowances effectively would create a new type of financial instrument of significant value and liquidity. This letter explains the Congressional Budget Office's (CBO's) view that the value of such allowances-whether auctioned or freely distributed-should be recorded on both the revenue and outlay sides of the federal budget. The letter also describes CBO's position regarding the circumstances in which the government's net revenues from the allowances would be less than the value of the allowances themselves because of a so-called revenue offset. The examples used to illustrate various possible budgetary outcomes involve electric generating companies and local distribution companies (LDCs), which have been a focus of policymakers' recent discussions.
NTIS
Carbon Dioxide; Federal Budgets; Policies; Greenhouse Effect

20090025356 National Energy Technology Lab., Morgantown, WV, USA
Storage of Captured Carbon Dioxide Beneath Federal Lands
Grant, T.; May 08, 2009; 75 pp.; In English
Report No.(s): PB2009-111929; DOE/NETL-2009/1358; No Copyright; Avail.: National Technical Information Service (NTIS)

A global effort is underway to assess storage potential for captured carbon dioxide (CO2). In North America, the Carbon Sequestration Atlas of the USA and Canada provided an initial assessment. The analysis presented in this report was done to assess the storage potential beneath Federal lands and further the effort undertaken in the atlas by defining a resource potential beneath a specific category of land. Also considered in this analysis was the location of potential CO2 point sources that might utilize Federal lands for storage, pipeline Right-Of-Way (ROW), and wells located on or near Federal land. Relevant laws, regulations, and legislation at the Federal and State level are also summarized. A significant portion of Federal land is unavailable for leasing due to administrative, statutory, and executive orders. Examples include national parks and lands owned by the Department of Defense (DOD), the Department of Justice (DOJ), and other agencies. These limitations render 44 percent of all Federal acreage unavailable for lease.
NTIS
Carbon Dioxide; Land Use

20090025881 NASA Marshall Space Flight Center, Huntsville, AL, USA
Sub-hourly Variation of Tropospheric Ozone Profiles Measured by Differential Absorption Lidar (DIAL)
Kuang, Shi; Burris, John F.; Newchurch, M. J.; Johnson, Steve; Long, Stephanie; February 03, 2009; 48 pp.; In English; Original contains color and black and white illustrations
Report No.(s): M09-0338; Copyright; Avail.: Other Sources

No abstract available
Ozone; Troposphere; Ozonometry; Temporal Distribution

20090025907 Department of Transportation, Washington, DC, USA
General Health Effects of Transportation Noise
Lee, C. S. Y.; Fleming, G. G.; Jun. 2002; 44 pp.; In English
Report No.(s): PB2009-112467; DTS-34-RR297-LR2; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Railroad Administration (FRA) sponsored preparation of this report to support a rulemaking process about the use of locomotive horns and the accompanying environmental impact statement. This document reviews select current and past research on the effect of transportation noise on physiological and psychological health for both people and wildlife.
NTIS
Health; Noise Pollution; Rail Transportation; Transportation

20090025908 Department of Transportation, Washington, DC, USA
Determination of a Sound Level for Railroad Horn Regulatory Compliance
Rapoza, A. S.; Fleming, G. G.; Oct. 2002; 14 pp.; In English
Report No.(s): PB2009-112465; DTS-34-RR397-LR1; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Railroad Administration (FRA) has undertaken a rulemaking process to address the use of locomotive horns at public highway-railroad grade crossings. This rule includes a provision to regulate the sound level output of railroad horns. This letter report supports the rulemaking by describing the process used to determine a railroad horn output sound level required for motorist detection. This sound level is defined as the sound level at which there is a 95% likelihood that a person with normal hearing will hear (detect) an average train horn at the instant in time at which detection must occur to avoid a collision. Generally, detection is based on the relative strength of the signal in the motorists ambient noise environment. The sound level is tied to an estimate of an average maximum motor vehicle speed and an average maximum locomotive speed. Locomotive horn sound level data measured by the Volpe Center Acoustics Facility at the Transportation Test Center (TTC) in April 2001, along with automotive insertion loss and interior noise data measured and documented by the Volpe Center in earlier research provide the basis for the determination of the likelihood of motorist detection. Section 2 summarizes the elements of the signal-to-noise analysis, which provide the basis for the determination of the detectability of the signal. Section 3 summarizes the elements of signal detection theory used to calculate detectability and a corresponding probability or likelihood that the motorist will detect the horn. Section 4 presents an example calculation.
NTIS
Crossings; Rail Transportation

20090025909 Federal Railroad Administration, Washington, DC USA; Federal Aviation Administration, Cambridge, MA, USA
Effect of Installation Location on Railroad Horn Sound Levels
Rapoza, A. S.; Fleming, G. G.; Sep. 2002; 79 pp.; In English
Report No.(s): PB2009-112462; DTS-34-RR297-LR; FRA/RDV-03/02; No Copyright; Avail.: National Technical Information Service (NTIS)

In response to comments on these two provisions, the FRA, in conjunction with the Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division, has undertaken a measurement study with the primary objective of documenting precisely the effect of installation location on the sound level output and directivity of railroad horns. This study examined through measurements, the sound level inside and around the locomotive for five types of horns, installed in four locations on two models of locomotive. By measuring and documenting the sound level around multiple horn and locomotive combinations in a consistent manner, the change in impacted area, warning effectiveness, and cab noise levels, caused by a change of horn type, installation location or locomotive model, can be evaluated. Secondary objectives of these measurements were to document the effect of the 104 and 111 dBA(A) maximum level settings.
NTIS
Crossings; Installing; Position (Location); Rail Transportation

20090025915 Geological Survey, Reston, VA USA; George Mason Univ., Fairfax, VA, USA
Summary of Mercury and Trace Element Results in Precipitation from the Culpeper, Virginia, Mercury Deposition Network Site (VA-08), 2002-2006
Engle, M. A.; Kolker, A.; Mose, D. E.; East, J. A.; McCord, J. D.; January 2008; 31 pp.; In English
Report No.(s): PB2009-112239; USGS-2008-1232; No Copyright; Avail.: National Technical Information Service (NTIS)

The VA-08 Mercury Deposition Network (MDN) site, southwest of Culpeper, Virginia, was established in autumn of

2002. This site, along with nearby VA-28 (approximately 31 km west) at Big Meadows in Shenandoah National Park, fills a spatial gap in the Mid-Atlantic region of the MDN network and provides Hg deposition data immediately west of the Washington, D.C., metropolitan area. Results for the Culpeper site from autumn of 2002 to the end of 2006 suggest that the highest mercury (Hg) deposition (up to 5.0 g/m2 per quarter of the 6.5-12.6 g/m2 annual Hg deposition) is measured during the second and third quarters of the year (April-September). This is a result of both elevated Hg precipitation concentrations (up to 27 ng/L) and greater precipitation during these months. The data also exhibit a general statistically significant ($p<0.05$) negative correlation between weekly total precipitation and Hg concentrations, suggesting a dilution effect during larger precipitation events, especially during winter and spring. Comparison of results between the Culpeper and Big Meadows sites indicates that although quarterly Hg deposition was not significantly different ($p<0.05$) between sites, quarterly volume-averaged Hg precipitation concentrations were statistically larger ($p<0.05$) and precipitation was significantly lower ($p<0.05$) at VA-08. Lower Hg concentrations at the VA-28 site relative to VA-08 are likely a result of greater total precipitation and thus additional dilution of Hg in precipitation.
NTIS
Deposition; Trace Elements

20090025986 NASA Marshall Space Flight Center, Huntsville, AL, USA
Identifying Optimal Temporal Scale for the Correlation of AOD and Ground Measurements of PM2.5 to Improve the Model Performance in a Real-time Air Quality Estimation System
Li, Hui; Faruque, Fazlay; Williams, Worth; Al-Hamdan, Mohammad; Luvall, Jefrey; Crosson, William; Rickman, Douglas; Limaye, Ashutosh; [2009]; 19 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): USM-MRCSSC-12162005-68D/NNS06A
Report No.(s): MSFC-2215; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025986; http://dx.doi.org/10.1016/j.atmosenv.2009.06.004

Aerosol optical depth (AOD), an indirect estimate of particle matter using satellite observations, has shown great promise in improving estimates of PM 2.5 air quality surface. Currently, few studies have been conducted to explore the optimal way to apply AOD data to improve the model accuracy of PM 2.5 surface estimation in a real-time air quality system. We believe that two major aspects may be worthy of consideration in that area: 1) the approach to integrate satellite measurements with ground measurements in the pollution estimation, and 2) identification of an optimal temporal scale to calculate the correlation of AOD and ground measurements. This paper is focused on the second aspect on the identifying the optimal temporal scale to correlate AOD with PM2.5. Five following different temporal scales were chosen to evaluate their impact on the model performance: 1) within the last 3 days, 2) within the last 10 days, 3) within the last 30 days, 4) within the last 90 days, and 5) the time period with the highest correlation in a year. The model performance is evaluated for its accuracy, bias, and errors based on the following selected statistics: the Mean Bias, the Normalized Mean Bias, the Root Mean Square Error, Normalized Mean Error, and the Index of Agreement. This research shows that the model with the temporal scale of within the last 30 days displays the best model performance in this study area using 2004 and 2005 data sets.
Author
Aerosols; Air Quality; Correlation; Optical Thickness; Real Time Operation; Mathematical Models

20090026045 Forest Service, Albany, CA, USA
Proceedings of the Symposium on Ponderosa Pine; Issues, Trends, and Management. Held in Klamath Falls, Oregon on October 18-21, 2004
Dec. 2005; 290 pp.; In English; Symposium on Ponderosa Pine; Issues, Trends, and Management., October 18 - 21, 2004, Klamath Falls, Oregon
Report No.(s): PB2009-111750; PSW-GTR-198; No Copyright; Avail.: National Technical Information Service (NTIS)

Ponderosa pine is one of the most widely distributed tree species in western North America. It is highly-valued as a source of lumber, but also is key to the health and social value western forests, whether growing in pure stands or in mixture with other conifer and hardwood species. In recent years, management objectives for forests containing this species have shifted from an emphasis on timber production to an emphasis on restoring ecosystem health and reducing the risk of non-characteristic wildfires. The symposium on Ponderosa Pine: Issues, Trends, and Management was convened to provide a venue for researchers and managers to explore the current state-of-our-knowledge, including management practices that help managers to adapt to constantly changing constraints and objectives.
NTIS
Conferences; Conifers; Procedures; Ecosystems; Forests; Health

20090026050 Rincon-Ranch Consulting, Sacramento, CA, USA; Haskew (Harold) and Associates, Inc., Milford, MI, USA; Sierra Research, Inc., Sacramento, CA, USA

Effects of Vapor Pressure, Oxygen Content, and Temperature on CO Exhaust Emissions

Crawford, R.; Haskew, H.; Heiken, J.; McClement, D.; Lyons, J.; May 18, 2009; 128 pp.; In English

Contract(s)/Grant(s): E-74B

Report No.(s): PB2009-111416; CRC-E-74B; No Copyright; Avail.: CASI: A07, Hardcopy

The effects caused by changes in gasoline RVP and oxygen content on exhaust emissions have been of concern for quite some time and adjustments to account for these effects were incorporated into the U.S. EPA's MOBILE series of emission factor models during the 1980s and 1990s. In general, the MOBILE adjustments for RVP and oxygenate effects are based on older model-year vehicles and have not been updated with data obtained from newer model-year vehicles certified to more stringent exhaust and evaporative emissions standards. As a consequence of these MOBILE adjustments, Phoenix, Arizona and Las Vegas, Nevada areas implemented regulations requiring winter gasolines to contain 3.5 percent oxygen by weight and limiting Reid Vapor Pressure to 9 psi in order to reduce CO emissions from on-road motor vehicles. As noted previously, these regulations also created fuel property requirements that differed from those in place throughout the rest of the southwest, including California, and this tended to reduce the flexibility of the fuel supply and distribution system to provide gasoline in Phoenix and Las Vegas during the winter. Given the above, the Coordinating Research Council funded the E-74b vehicle testing program designed primarily to evaluate the effects of RVP and oxygenate content on exhaust CO emissions under conditions similar to those experienced in the Las Vegas and Phoenix areas during winter months. Given their prevalence in the in-use vehicle fleet, this testing focused on recent model-year vehicles certified to Tier 1 and more stringent exhaust emission standards and both enhanced and so-called 'zero' evaporative emissions standards. This project involved vehicle testing, a complete statistical analysis of the data, and the development of updated adjustment factors for RVP and oxygenate effects on exhaust emissions.

NTIS

Exhaust Emission; Oxygen; Pressure Effects; Vapor Pressure

20090026123 Utah Univ., Salt Lake City, UT, USA

Fundamentals of Mercury Oxidation in Flue Gas

Lighty, J. A.; Silcox, G.; Helble, J.; Krishnakumar, B.; Jul. 31, 2008; 39 pp.; In English

Contract(s)/Grant(s): DE-FG26-03NT41797

Report No.(s): DE2009-951264; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this project was to understand the importance of and the contribution of gas-phase and solid-phase coal constituents in the mercury oxidation reactions. The project involved both experimental and modeling efforts. The team was comprised of the University of Utah, Reaction Engineering International, and the University of Connecticut. The objective was to determine the experimental parameters of importance in the homogeneous and heterogeneous oxidation reactions; validate models; and, improve existing models. Parameters studied include HCl, NOx, and SO2 concentrations, ash constituents, and temperature.

NTIS

Flue Gases; Oxidation; Mercury (Metal)

20090026126 CH2M/Hill Hanford Group, Inc., Richland, WA, USA

ALARA Assessment of Settler Sludge Sampling Methods

January 2009; 36 pp.; In English

Contract(s)/Grant(s): DE-AC06-08RL14788

Report No.(s): DE2009-950466; KBC-40179; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this assessment is to compare underwater and above water settler sludge sampling methods to determine if the added cost for underwater sampling for the sole purpose of worker dose reductions is justified. Initial planning for sludge sampling included container, settler and knock-out-pot (KOP) sampling. Due to the significantly higher dose consequence of KOP sludge, a decision was made to sample KOP underwater to achieve worker dose reductions. Additionally, initial plans were to utilize the underwater sampling apparatus for settler sludge. Since there are no longer plans to sample KOP sludge,

the decision for underwater sampling for settler sludge needs to be revisited. The present sampling plan calls for spending an estimated $2,500,000 to design and construct a new underwater sampling system (per A21 C-PL-001 RevOE). This evaluation will compare and contrast the present method of above water sampling to the underwater method that is planned by the Sludge Treatment Project (STP) and determine if settler samples can be taken using the existing sampling cart (with potentially minor modifications) while maintaining doses to workers As Low As Reasonably Achievable (ALARA) and eliminate the need for costly redesigns, testing and personnel retraining.
NTIS
Sampling; Sludge

20090026263 Government Accountability Office, Washington, DC, USA
Aviation and Climate Change: Aircraft Emissions Expected to Grow, but Technological and Operational Improvements and Government Policies Can Help Control Emissions
June 2009; 100 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-09-554; No Copyright; Avail.: CASI: A05, Hardcopy

Aircraft emit greenhouse gases and other emissions, contributing to increasing concentrations of such gases in the atmosphere. Many scientists and the Intergovernmental Panel on Climate Change (IPCC)--a United Nations organization that assesses scientific, technical, and economic information on climate change--believe these gases may negatively affect the earth's climate. Given forecasts of growth in aviation emissions, some governments are taking steps to reduce emissions. In response to a congressional request, GAO reviewed (1) estimates of aviation's current and future contribution to greenhouse gas and other emissions that may affect climate change; (2) existing and potential technological and operational improvements that can reduce aircraft emissions; and (3) policy options for governments to help address commercial aircraft emissions. GAO conducted a literature review; interviewed representatives of government agencies, industry and environmental organizations, airlines, and manufacturers, and interviewed and surveyed 18 experts in economics and aviation on improvements for reducing emissions from aircraft. GAO is not making recommendations. Relevant agencies provided technical comments which we incorporated as appropriate and EPA said emissions standards can have a positive benefit to cost ratio and be an important part of policy options to control emissions.
Derived from text
Climate Change; Commercial Aircraft; Greenhouse Effect; Global Warming; Air Pollution; Exhaust Gases; Air Transportation

20090026265 Government Accountability Office, Washington, DC, USA
Scientific Integrity: EPA's Efforts to Enhance the Credibility and Transparency of Its Scientific Processes
June 09, 2009; 17 pp.; In English
Report No.(s): GAO-09-773T; No Copyright; Avail.: CASI: A03, Hardcopy

The Environmental Protection Agency's (EPA) ability to effectively implement its mission of protecting public health and the environment relies largely on the integrity and transparency of (1) its assessments of the potential human health effects of exposure to chemicals and (2) its federal advisory committees, which are to provide independent, expert reviews of EPA's scientific work, among other functions. EPA's Integrated Risk Information System (IRIS) program is critical in developing the agency s scientific positions on the potential health effects of exposure to toxic chemicals. These positions, used as a basis for environmental risk management decisions by EPA and others, are maintained in IRIS database of more than 540 chemical assessments. Since 2001, GAO has issued a number of reports addressing the importance of integrity and transparency to EPA's chemical assessments and to EPA's federal advisory committees. GAO work on EPA s advisory committees has focused on its Science Advisory Board--1 of 24 EPA federal advisory committees--which convenes panels to review many of the agency's scientific assessments and proposals. This testimony highlights scientific integrity and transparency issues GAO has reported on and relevant EPA reform efforts regarding (1) the IRIS assessment process and (2) federal advisory committee policies and procedures and appointment mechanisms. GAO has supplemented information from its prior reports with a preliminary review of the IRIS assessment process EPA issued on May 21, 2009, and the current appointment mechanisms for members of EPA's federal advisory committees.
Derived from text
Data Bases; Risk; Risk Management; Toxicity; Science; Integrity

46
GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20090026015 NASA Marshall Space Flight Center, Huntsville, AL, USA
The Lunar Regolith
Noble, Sarah; March 17, 2009; 39 pp.; In English; Lunor Regolith Simulant Workshop, 17-20 Mar. 2009, Alabama, USA; Original contains color and black and white illustrations
Report No.(s): M09-0381; MSFC-2221; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026015

A thick layer of regolith, fragmental and unconsolidated rock material, covers the entire lunar surface. This layer is the result of the continuous impact of meteoroids large and small and the steady bombardment of charged particles from the sun and stars. The regolith is generally about 4-5 m thick in mare regions and 10-15 m in highland areas (McKay et al., 1991) and contains all sizes of material from large boulders to sub-micron dust particles. Below the regolith is a region of large blocks of material, large-scale ejecta and brecciated bedrock, often referred to as the 'megaregolith'. Lunar soil is a term often used interchangeably with regolith, however, soil is defined as the subcentimeter fraction of the regolith (in practice though, soil generally refers to the submillimeter fraction of the regolith). Lunar dust has been defined in many ways by different researchers, but generally refers to only the very finest fractions of the soil, less than approx.10 or 20 microns. Lunar soil can be a misleading term, as lunar 'soil' bears little in common with terrestrial soils. Lunar soil contains no organic matter and is not formed through biologic or chemical means as terrestrial soils are, but strictly through mechanical comminution from meteoroids and interaction with the solar wind and other energetic particles. Lunar soils are also not exposed to the wind and water that shapes the Earth. As a consequence, in contrast to terrestrial soils, lunar soils are not sorted in any way, by size, shape, or chemistry. Finally, without wind and water to wear down the edges, lunar soil grains tend to be sharp with fresh fractured surfaces.
Author
Lunar Soil; Regolith; Energetic Particles; Lunar Dust; Lunar Rocks; Microparticles; Organic Materials; Meteoroids; Breccia

20090026075 NASA Ames Research Center, Moffett Field, CA, USA
Modeling the Effect of Plume-Rise on the Transport of Carbon Monoxide over Africa with NCAR CAM
Guan, H.; Chatfield, R. B.; Freitas, S. R.; Bergstrom, R. W.; Longo, K. M.; Atmospheric Chemistry and Physics; November 27, 2008; Volume 8, pp. 6801-6712; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNA05CS26A; Copyright; Avail.: Other Sources

We investigated the effects of fire-induced plume-rise on the simulation of carbon monoxide (CO) over Africa ' and its export during SAFARI 2000 using the NCAR Community Atmosphere Model (CAM) with a CO tracer and a plume-rise parameterization scheme. The plume-rise parameterization scheme simulates the consequences of strong buoyancy of hot gases emitted from biomass burning, including both dry and cloud-associated (pyro-cumulus) lofting. The current implementation of the plume-rise parameterization scheme into the global model provides an opportunity to examine the effect of plume-rise on long-range transport. The CAM simulation with the plume-rise parameterization scheme seems to show a substantial improvement of the agreements between the modeled and aircraft-measured vertical distribution of CO over Southern Africa biomass burning area. The plume-rise mechanism plays a crucial role in lofting biomass-burning pollutants to the middle troposphere. In the presence of deep convection we found that the plume-rise mechanism results in a decrease of CO concentration in the upper troposphere. The plume-rise depletes the boundary layer, and thus leaves lower concentrations of CO to be lofted by the deep convection process. The effect of the plume-rise on free troposphere CO concentration is more important for the source area (short-distance transport) than for remote areas (long-distance transport). A budget analysis of CO burden over Southern Africa reveals the plume-rise process to have a similar impact as the chemical production of CO by OH and CH4. In addition, the plume-rise process has an minor impact on the regional export. These results further confirm and extend previous findings in a regional model study. Effective lofting of large concentration of CO by the plume-rise mechanism also has implications for local air quality forecasting in areas affected by other fire-related pollutants.
Author
Carbon Monoxide; Biomass Burning; High Temperature Gases; Plumes; Boundary Layers; Contaminants; Air Quality

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20090025402 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Convective and Stratiform Precipitation Processes and their Relationship to Latent Heating
Tao, Wei-Kuo; Lang, Steve; Zeng, Xiping; Shige, Shoichi; Takayabu, Yukari; [2009]; 44 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025402

The global hydrological cycle is central to the Earth's climate system, with rainfall and the physics of its formation acting as the key links in the cycle. Two-thirds of global rainfall occurs in the Tropics. Associated with this rainfall is a vast amount of heat, which is known as latent heat. It arises mainly due to the phase change of water vapor condensing into liquid droplets; three-fourths of the total heat energy available to the Earth's atmosphere comes from tropical rainfall. In addition, fresh water provided by tropical rainfall and its variability exerts a large impact upon the structure and motions of the upper ocean layer. An improved convective -stratiform heating (CSH) algorithm has been developed to obtain the 3D structure of cloud heating over the Tropics based on two sources of information: 1) rainfall information, namely its amount and the fraction due to light rain intensity, observed directly from the Precipitation Radar (PR) on board the TRMM satellite and 2) synthetic cloud physics information obtained from cloud-resolving model (CRM) simulations of cloud systems. The cloud simulations provide details on cloud processes, specifically latent heating, eddy heat flux convergence and radiative heating/cooling, that. are not directly observable by satellite. The new CSH algorithm-derived heating has a noticeably different heating structure over both ocean and land regions compared to the previous CSH algorithm. One of the major differences between new and old algorithms is that the level of maximum cloud heating occurs 1 to 1.5 km lower in the atmosphere in the new algorithm. This can effect the structure of the implied air currents associated with the general circulation of the atmosphere in the Tropics. The new CSH algorithm will be used provide retrieved heating data to other heating algorithms to supplement their performance.
Author
Convective Heat Transfer; Latent Heat; Hydrological Cycle; Climate; Earth Atmosphere; Precipitation (Meteorology); Rain; Luminous Intensity; Clouds (Meteorology); Cloud Physics

20090025863 Department of Energy, Washington, DC, USA
ACRF Instrumentation Status and Information
Voyles, J. W.; Apr. 2009; 20 pp.; In English
Report No.(s): DE2009-952584; DOE/SC/ARM/P-09-004.4; No Copyright; Avail.: Department of Energy Information Bridge

The purpose of this report is to provide a concise but comprehensive overview of Atmospheric Radiation Measurement Climate Research Facility instrumentation status. The report is divided into the following five sections: (1) new instrumentation in the process of being acquired and deployed, (2) field campaigns, (3) existing instrumentation and progress on improvements or upgrades, (4) proposed future instrumentation, and (5) Small Business Innovation Research instrument development.
NTIS
Meteorological Instruments; Dosimeters; Recording Instruments; Radiation Measurement

20090025882 NASA Marshall Space Flight Center, Huntsville, AL, USA
Electric Fields, Conductivity, and Estimated Currents from Electrified Clouds based on Instrumented Aircraft Overflight Data
Mach, Douglas M.; Blakeslee, Richard J.; Bateman, Monte G.; Bailey, Jeffrey C.; Journal of Geophysical Research - Atmospheres; May 23, 2009; Volume 114; 47 pp.; In English; Original contains color illustrations
Report No.(s): M09-0339; Copyright; Avail.: Other Sources

Using rotating vane electric field mills and Gerdien capacitors, we measured the electric field profile and conductivity during 850 overflights of clouds and thunderstorms. The measurements were made with NASA ER-2 and Altus-II aircrafts. Peak electric fields, with lightning transients removed, ranged from -1.0 kV / m to 16. kV / m with a mean value of 0.9 kV / m. The median peak field was 0.29 kV / m. Flash rates ranged from 0 to over 27 flashes per min with the mean flash rate of 1.2 flashes per min. The median flash rate for an overpass was 0.25 flashes per min. The positive plus negative conductivity ranged from 0.6 pS / m to 3.6 pS / m at the nominal flight altitudes of 15 to 20 km. The mean and median total conductivity

was 2.2 pS / m. Peak current densities during the overpasses ranged from -2.0 nA /square m to 33. nA / square m. The mean peak current density was 1.9 nA / square m, and the median value was 0.6 nA / square m. Using the peak electric fields, a median field falloff with distance based on all overflights, and cylindrical storm symmetry, the total upward current flow from storms in our data set ranges from -1.3 to 9.4 A with a mean value of 0.8 A. The median total current was 0.27 A. The contributions from lightning field changes do not significantly affect the total derived currents. We found that 7% of the storms were producing current flows above the storms that were opposite in polarity from the standard role that thunderstorms play in the global electric circuit. Approximately one third of the storms had no detectable lightning during the overpasses but still had significant electric fields. Owing to a possible sampling bias, the fraction of nonlightning storms with electric fields may not reflect the global probability of these clouds.
Author
Electric Fields; Lightning; Storms; Thunderstorms; Atmospheric Conductivity; Electrical Resistivity

20090025883 NASA Marshall Space Flight Center, Huntsville, AL, USA
Simulation of the Impact of New Aircraft- and Satellite-based Ocean Surface Wind Measurements on Estimates of Hurricane Intensity
Uhlhorn, Eric; Atlas, Robert; Black, Peter; Buckley, Courtney; Chen, Shuyi; El-Nimri, Salem; Hood, Robbie; Johnson, James; Jones, Linwood; Miller, Timothy; Ruf, Chris; March 02, 2009; 1 pp.; In English; HIRAD OSSE: Interdepartmental Hurricane Conference 2009/The Office of the Federal Coordinator for Meteorological Services and Supporting Research, 2-5 Mar. 2009, Saint Petersburg, FL, USA
Report No.(s): M09-0340; Copyright; Avail.: Other Sources; Abstract Only

The Hurricane Imaging Radiometer (HIRAD) is a new airborne microwave remote sensor currently under development to enhance real-time hurricane ocean surface wind observations. HIRAD builds on the capabilities of the Stepped Frequency Microwave Radiometer (SFMR), which now operates on NOAA P-3, G-4, and AFRC C-130 aircraft. Unlike the SFMR, which measures wind speed and rain rate along the ground track directly beneath the aircraft, HIRAD will provide images of the surface wind and rain field over a wide swath (approximately 3 times the aircraft altitude). To demonstrate potential improvement in the measurement of peak hurricane winds, we present a set of Observing System Simulation Experiments (OSSEs) in which measurements from the new instrument as well as those from existing platforms (air, surface, and space-based) are simulated from the output of a high-resolution (approximately 1.7 km) numerical model. Simulated retrieval errors due to both instrument noise as well as model function accuracy are considered over the expected range of incidence angles, wind speeds and rain rates. Based on numerous simulated flight patterns and data source combinations, statistics are developed to describe relationships between the observed and true (from the model s perspective) peak wind speed. These results have implications for improving the estimation of hurricane intensity (as defined by the peak sustained wind anywhere in the storm), which may often go un-observed due to sampling limitations.
Author
Airborne Equipment; Hurricanes; Mathematical Models; Remote Sensors; Wind Measurement; Remote Sensing; Imaging Radar

20090025884 NASA Marshall Space Flight Center, Huntsville, AL, USA
Surface Wind Vector and Rain Rate Observation Capability of Future Hurricane Imaging Radiometer (HIRAD)
Miller, Timothy; Atlas, Robert; Bailey, M. C.; Black, Peter; El-Nimri, Salem; Hood, Robbie; James, Mark; Johnson, James; Jones, Linwood; Ruf, Christopher; Uhlhorn, Eric; March 02, 2009; 1 pp.; In English; HIRAD OSSE: Interdepartmental Hurrican Conference 2009/The Office of the Federal Coordinator for Meteorological Services and Supporting Research, 2-5 Mar. 2009, Saint Petersburg, FL, USA
Report No.(s): M09-0341; Copyright; Avail.: Other Sources; Abstract Only

The Hurricane Imaging Radiometer (HIRAD) is the next-generation Stepped Frequency Microwave Radiometer (SFMR), and it will offer the capability of simultaneous wide-swath observations of both extreme ocean surface wind vector and strong precipitation from either aircraft (including UAS) or satellite platforms. HIRAD will be a compact, lightweight, low-power instrument with no moving parts that will produce valid wind observations under hurricane conditions when existing microwave sensors (radiometers or scatterometers) are hindered by precipitation. The SFMR i s a proven aircraft remote sensing system for simultaneously observing extreme ocean surface wind speeds and rain rates, including those of major hurricane intensity. The proposed HIRAD instrument advances beyond the current nadir viewing SFMR to an equivalent wide-swath SFMR imager using passive microwave synthetic thinned aperture radiometer technology. The first version of the instrument will be a single polarization system for wind speed and rain rate, with a dual-polarization system to follow for wind vector capability. This sensor will operate over 4-7 GHz (C-band frequencies) where the required tropical cyclone remote

sensing physics has been validated by both SFMR and WindSat radiometers. HIRAD incorporates a unique, technologically advanced array antenna and several other technologies successfully demonstrated by NASA s Instrument Incubator Program. A brassboard (laboratory) version of the instrument has been completed and successfully tested in a test chamber. Development of the aircraft instrument is underway, with flight testing planned for the fall of 2009. Preliminary Observing System Simulation Experiments (OSSEs) show that HIRAD will have a significant positive impact on surface wind analyses as either a new aircraft or satellite sensor. New off-nadir data collected in 2008 by SFMR that affirms the ability of this measurement technique to obtain wind speed data at non-zero incidence angle will be presented, as well as data from the brassboard instrument chamber tests.
Author
Ground Wind; Hurricanes; Microwave Radiometers; Remote Sensing; Wind Velocity; Remote Sensors; Imaging Radar

20090025900 Woods Hole Oceanographic Inst., MA, USA; Massachusetts Univ., Boston, MA, USA; New Hampshire Univ., Durham, NH, USA
Physical Oceanographic Investigation of Massachusetts and Cape Cod Bays. Report to the Massachusetts Bays Program
Geyer, W. R.; Gardner, G. B.; Brown, W. S.; Irish, J.; Butman, B.; Oct. 1992; 505 pp.; In English
Report No.(s): PB2009-111871; MBP-92-03; No Copyright; Avail.: CASI: A22, Hardcopy

The physical oceanographic study of the Massachusetts Bays was designed to provide for the first time a bay-wide description of the circulation and mixing processes on a seasonal basis. Most of the measurements were conducted between April 1990 and June 1991 and consisted of moored observations to study the current flow patterns, hydrographic surveys to document the changes in water properties, high-resolution surveys of velocity and water properties to measure the currents, and acquisition of satellite images to provide a bay-wide picture of the surface temperature and its spatial variability.
NTIS
Ocean Dynamics; Oceanography

20090025901 Geological Survey, Reston, VA USA; Kansas Dept. of Transportation, Topeka, KS, USA
Precipitation-Frequency and Discharge-Frequency Relations for Basins Less Than 32 Square Miles in Kansas
Perry, C. A.; Jan. 2008; 35 pp.; In English
Report No.(s): PB2009-112564; USGS-SIR-2008-5112; No Copyright; Avail.: National Technical Information Service (NTIS)

Precipitation-frequency and discharge-frequency relations for small drainage basins with areas less than 32 square miles in Kansas were evaluated to reduce the uncertainty of discharge-frequency estimates. Gaged-discharge records were used to develop discharge-frequency equations for the ratio of discharge to drainage area (Q/A) values using data from basins with variable soil permeability, channel slope, and mean annual precipitation. Soil permeability and mean annual precipitation are the dominant basin characteristics in the multiple linear regression analyses. In addition, 28 discharge measurements at ungaged sites by indirect surveying methods and by velocity meters also were used in this analysis to relate precipitation-recurrence interval to discharge-recurrence interval. Precipitation-recurrence interval for each of these discharge measurements were estimated from weather-radar estimates of precipitation and from nearby raingages. Time of concentration for each basin for each of the ungaged sites was computed and used to determine the precipitation-recurrence interval based on precipitation depth and duration. The ratio of discharge/drainage area (Q/A) value for each event was then assigned to that precipitation-recurrence interval.
NTIS
Frequencies; Precipitation (Meteorology)

20090025916 National Centers for Environmental Prediction, Silver Spring, MD USA
Guide to Developing a Severe Weather Emergency Plan for Schools
Watson, B. M.; January 2007; 39 pp.; In English
Report No.(s): PB2009-112228; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this guide is to provide assistance to school administrators and teachers in designing a severe weather emergency plan for their school. While not every possible situation is covered by the guide, it will provide enough information to serve as a strong starting point and a general outline of actions to take. The majority of material focuses on thunderstorms

and the hazards they produce--lightning, hail, tornadoes, and flash floods. Thunderstorms can occur suddenly, with little or no warning.
NTIS
Emergencies; Schools; Weather

20090025919 Climate Change Science Program, Washington, DC USA
Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Year 2006
Nov 2005; 225 pp.; In English
Report No.(s): AD-A499786; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499786

The report describes the activities and plans of the Climate Change Science Program (CCSP), which incorporates the U.S. Global Change Research Program, established under the Global Change Research Act of 1990, and the Climate Change Research Initiative, established by the President in 2001. CCSP coordinates and integrates scientific research on climate and global change supported by 13 participating departments and agencies of the U.S. Government. This FY 2006 edition of Our Changing Planet highlights recent advances supported by CCSP participating agencies in each of the program's research and observational elements, as called for in the Strategic Plan for the U.S. Climate Change Science Program released in July 2003. It describes a wide range of new and emerging observational capabilities which, combined with the program's other analytical work, are leading to remarkable advances in understanding the underlying processes responsible for climate variability and change. The document illustrates advances in U.S. modeling capabilities to represent past, present, and potential future changes in the physical and biological dimensions of the Earth system. The report also highlights progress being made to explore the uses and limitations of evolving knowledge to manage risks and opportunities related to climate variability and change. The final chapter documents the program's numerous current activities to promote cooperation between the U.S. scientific community and its worldwide counterparts.
DTIC
Climate; Climate Change; Earth Atmosphere; Ecosystems; Greenhouse Effect

20090025922 National Weather Service, Fort Worth, TX, USA
Official Texas Hurricane Guide, Houston/Galveston Edition. Plan. Act. Survive
May 19, 2009; 29 pp.; In English
Report No.(s): PB2009-112207; No Copyright; Avail.: National Technical Information Service (NTIS)

Contents: Storm Surge; Winds, Flooding and Tornadoes; Preparing Your Home, Business, and Boat; Special Needs and Pets; Emergency Contacts and Your Disaster Supply Kit; Insurance Information; Hurricane Tracking Map; Hurricane Forecasts; Final Checklist; Hurricanes Beulah, Dolly, and Ike; Evacuation, Emergency Information; and Returning Home.
NTIS
Emergencies; Houston (TX); Hurricanes

20090025923 National Weather Service, Fort Worth, TX, USA
Official Texas Hurricane Guide, Coast Bend Edition: Plan. Act. Survive
May 19, 2009; 29 pp.; In English
Report No.(s): PB2009-112206; No Copyright; Avail.: National Technical Information Service (NTIS)

Contents: Storm Surge; Winds, Flooding and Tornadoes; Preparing Your Home, Business, and Boat; Special Needs and Pets; Emergency Contacts and Your Disaster Supply Kit; Insurance Information; Hurricane Tracking Map; Hurricane Forecasts; Final Checklist; Hurricanes Beulah, Dolly, and Ike; Evacuation, Emergency Information; and Returning Home.
NTIS
Coasts; Emergencies; Hurricanes

20090025924 National Weather Service, Fort Worth, TX, USA
Official Texas Hurricane Guide, Rio Grande Valley Edition: Plan. Act. Survive
May 19, 2009; 32 pp.; In English
Report No.(s): PB2009-112205; No Copyright; Avail.: National Technical Information Service (NTIS)

Contents: Storm Surge; Winds, Flooding and Tornadoes; Preparing Your Home, Business, and Boat; Special Needs and

Pets; Emergency Contacts and Your Disaster Supply Kit; Insurance Information; Hurricane Tracking Map; Hurricane Forecasts; Final Checklist; Hurricanes Beulah, Dolly, and Ike; Evacuation, Emergency Information; and Returning Home.
NTIS
Emergencies; Hurricanes; Valleys

20090025926 Department of Agriculture, Washington, DC USA
USA Meteorological Yearbook, 1940
Jan. 1940; 149 pp.; In English
Report No.(s): PB2009-112401; No Copyright; Avail.: CASI: A07, Hardcopy

The USA Meteorological Yearbook, published by the Weather Bureau, was originally printed as part of the Annual Reports of the Weather Bureau. Around the same time that the annual reports ceased to be printed as part of the U. S. Congressional Serial Set, the Meteorological Yearbook began to appear as a separate title within the Serial Set. These reports contain reports and correspondence from the Chief Signal Officer to the Secretary of War for the year from 1861-1891. From 1892 onwards they contain the similar reports for the Chief of the U.S. Weather Bureau. Report year ends June 30, but the meteorological data are for the calendar year. In 1935 the title is changed to USA Meteorological Yearbook.
NTIS
Meteorological Charts; Meteorological Parameters; Tables (Data); United States

20090025927 Department of Agriculture, Washington, DC USA
USA Meteorological Yearbook, 1939
Jan. 1939; 140 pp.; In English
Report No.(s): PB2009-112400; No Copyright; Avail.: CASI: A07, Hardcopy

The USA Meteorological Yearbook, published by the Weather Bureau, was originally printed as part of the Annual Reports of the Weather Bureau. Around the same time that the annual reports ceased to be printed as part of the U. S. Congressional Serial Set, the Meteorological Yearbook began to appear as a separate title within the Serial Set. These reports contain reports and correspondence from the Chief Signal Officer to the Secretary of War for the year from 1861-1891. From 1892 onwards they contain the similar reports for the Chief of the U.S. Weather Bureau. Report year ends June 30, but the meteorological data are for the calendar year. In 1935 the title is changed to USA Meteorological Yearbook.
NTIS
Meteorological Charts; Meteorological Parameters; Tables (Data); United States

20090025928 Department of Agriculture, Washington, DC USA
USA Meteorological Yearbook, 1938
Jan. 1942; 159 pp.; In English
Report No.(s): PB2009-112399; No Copyright; Avail.: CASI: A08, Hardcopy

The USA Meteorological Yearbook, published by the Weather Bureau, was originally printed as part of the Annual Reports of the Weather Bureau. Around the same time that the annual reports ceased to be printed as part of the U. S. Congressional Serial Set, the Meteorological Yearbook began to appear as a separate title within the Serial Set. These reports contain reports and correspondence from the Chief Signal Officer to the Secretary of War for the year from 1861-1891. From 1892 onwards they contain the similar reports for the Chief of the U.S. Weather Bureau. Report year ends June 30, but the meteorological data are for the calendar year. In 1935 the title is changed to USA Meteorological Yearbook.
NTIS
Meteorological Charts; Meteorological Parameters; Tables (Data); United States

20090025930 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1953
Reichelderfer, F. W.; Jan. 1953; 5 pp.; In English
Report No.(s): PB2009-112379; No Copyright; Avail.: CASI: A01, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made

available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090025935 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1922
Marvin, C. F.; Jan. 1922; 32 pp.; In English
Report No.(s): PB2009-112175; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology; Temperature Measurement

20090025936 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1921
Marvin, C. F.; Jan. 1921; 22 pp.; In English
Report No.(s): PB2009-112174; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090025940 NASA Marshall Space Flight Center, Huntsville, AL, USA
Space Weather
Gallagher, Dennis L.; March 28, 2009; 20 pp.; In English; Space Weather, 28 Mar. 2009, Evansville, IN, USA; Original contains color illustrations
Report No.(s): M09-0376; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025940

This slide presentation reviews the hazards and effects of space weather on earth and in space to humans and manmade systems.

CASI
Hazards; Space Weather; Solar Terrestrial Interactions; Solar Activity Effects

20090025948 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1920
Marvin, C. F.; Jan. 1920; 25 pp.; In English
Report No.(s): PB2009-112173; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.

NTIS
Weather; Weather Forecasting; Meteorology; Temperature Measurement

20090025950 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1919
Marvin, C. F.; Jan. 1919; 25 pp.; In English
Report No.(s): PB2009-112172; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.

NTIS
Weather; Weather Forecasting; Meteorology

20090025951 Department of Agriculture, Washington, DC USA
USA Meteorological Yearbook, 1941
Jan. 1941; 136 pp.; In English
Report No.(s): PB2009-112402; No Copyright; Avail.: CASI: A07, Hardcopy

The USA Meteorological Yearbook, published by the Weather Bureau, was originally printed as part of the Annual Reports of the Weather Bureau. Around the same time that the annual reports ceased to be printed as part of the U. S. Congressional Serial Set, the Meteorological Yearbook began to appear as a separate title within the Serial Set. These reports contain reports and correspondence from the Chief Signal Officer to the Secretary of War for the year from 1861-1891. From 1892 onwards they contain the similar reports for the Chief of the U.S. Weather Bureau. Report year ends June 30, but the meteorological data are for the calendar year. In 1935 the title is changed to USA Meteorological Yearbook.
NTIS
Meteorological Charts; Meteorological Parameters; Tables (Data); United States

20090025955 NASA Marshall Space Flight Center, Huntsville, AL, USA
Forecasting Lightning Threat using Cloud-resolving Model Simulations
McCaul, E. W., Jr.; Goodman, S. J.; LaCasse, K. M.; Cecil, D. J.; [2009]; 1 pp.; In English
Report No.(s): M09-0404; Copyright; Avail.: Other Sources; Abstract Only

As numerical forecasts capable of resolving individual convective clouds become more common, it is of interest to see if quantitative forecasts of lightning flash rate density are possible, based on fields computed by the numerical model. Previous observational research has shown robust relationships between observed lightning flash rates and inferred updraft and large precipitation ice fields in the mixed phase regions of storms, and that these relationships might allow simulated fields to serve as proxies for lightning flash rate density. It is shown in this paper that two simple proxy fields do indeed provide reasonable and cost-effective bases for creating time-evolving maps of predicted lightning flash rate density, judging from a series of diverse simulation case study events in North Alabama for which Lightning Mapping Array data provide ground truth. One method is based on the product of upward velocity and the mixing ratio of precipitating ice hydrometeors, modeled as graupel only, in the mixed phase region of storms at the -15\dgc\ level, while the second method is based on the vertically integrated amounts of ice hydrometeors in each model grid column. Each method can be calibrated by comparing domainwide statistics of the peak values of simulated flash rate proxy fields against domainwide peak total lightning flash rate density data from observations. Tests show that the first method is able to capture much of the temporal variability of the lightning threat, while the second method does a better job of depicting the areal coverage of the threat. A blended solution is designed to retain most of the temporal sensitivity of the first method, while adding the improved spatial coverage of the second. Weather Research and Forecast Model simulations of selected North Alabama cases show that this model can distinguish the general character and intensity of most convective events, and that the proposed methods show promise as a means of generating quantitatively realistic fields of lightning threat. However, because models tend to have more difficulty in correctly predicting the instantaneous placement of storms, forecasts of the detailed location of the lightning threat based on single simulations can be in error. Although these model shortcomings presently limit the precision of lightning threat forecasts from individual runs of current generation models, the techniques proposed herein should continue to be applicable as newer and more accurate physically-based model versions, physical parameterizations, initialization techniques and ensembles of cloud-allowing forecasts become available.
Author
Lightning; Weather Forecasting; Atmospheric Models; Clouds (Meteorology); Simulation

20090025957 NASA Marshall Space Flight Center, Huntsville, AL, USA
Partitioning the LIS/OTD Lightning Climatological Dataset into Separate Ground and Cloud Flash Distributions
Koshak, W. J.; Solarkiewicz, R. J.; April 06, 2009; 1 pp.; In English; 4th Annual Geo Chemical Conference, 6-10 Apr. 2009, Cambridge, MA, USA; Original contains color illustrations
Report No.(s): M09-0405; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025957

Presently, it is not well understood how to best model nitrogen oxides (NOx) emissions from lightning because lightning is highly variable. Peak current, channel length, channel altitude, stroke multiplicity, and the number of flashes that occur in a particular region (i.e., flash density) all influence the amount of lightning NOx produced. Moreover, these 5 variables are not the same for ground and cloud flashes; e.g., cloud flashes normally have lower peak currents, higher altitudes, and higher flash densities than ground flashes [see (Koshak, 2009) for additional details]. Because the existing satellite observations of lightning (Fig. 1) from the Lightning Imaging Sensor/Optical Transient Detector (LIS/OTD) do not distinguish between

ground and cloud fashes, which produce different amounts of NOx, it is very difficult to accurately account for the regional/global production of lightning NOx. Hence, the ability to partition the LIS/OTD lightning climatology into separate ground and cloud flash distributions would substantially benefit the atmospheric chemistry modeling community. NOx indirectly influences climate because it controls the concentration of ozone and hydroxyl radicals in the atmosphere. The importance of lightning-produced NOx is empasized throughout the scientific literature (see for example, Huntrieser et al. 1998). In fact, lightning is the most important NOx source in the upper troposphere with a global production rate estimated to vary between 2 and 20 Tg (N)yr(sup -1) (Lee et al., 1997), with more recent estimates of about 6 Tg(N)yr(sup -1) (Martin et al., 2007). In order to make accurate predictions, global chemistry/climate models (as well as regional air quality modells) must more accurately account for the effects of lightning NOx. In particular, the NASA Goddard Institute for Space Studies (GISS) Model E (Schmidt et al., 2005) and the GEOS-CHEM global chemical transport model (Bey et al., 2001) would each benefit from a partitioning of the LIS/OTD lightning climatology. In this study, we introduce a new technique for retrieving the ground flash fraction in a set of N lightning observed from space and that occur within a specific latitude/longitude bin. The method is briefly described and applied to CONUS lightning that have already been partitioned into ground and cloud flashes using independent ground-based observations, in order to assess the accuracy of the retrieval method. The retrieval errors are encouragingly small.
Derived from text
Climate Models; Climatology; Mathematical Models; Lightning; Imaging Techniques; Detection

20090025966 NASA Marshall Space Flight Center, Huntsville, AL, USA
SPoRT - An End-to-End R2O Activity
Jedlovec, Gary J.; April 28, 2009; 1 pp.; In English; 1st NOAA Testbed USWRP Workshop/National Oceanic and Atmospheric Administration, 28-29 Apr. 2009, Boulder, CO, USA
Report No.(s): M09-0432; No Copyright; Avail.: Other Sources; Abstract Only

Established in 2002 to demonstrate the weather and forecasting application of real-time EOS measurements, the Short-term Prediction Research and Transition (SPoRT) program has grown to be an end-to-end research to operations activity focused on the use of advanced NASA modeling and data assimilation approaches, nowcasting techniques, and unique high-resolution multispectral observational data applications from EOS satellites to improve short-term weather forecasts on a regional and local scale. SPoRT currently partners with several universities and other government agencies for access to real-time data and products, and works collaboratively with them and operational end users at 13 WFOs to develop and test the new products and capabilities in a 'test-bed' mode. The test-bed simulates key aspects of the operational environment without putting constraints on the forecaster workload. Products and capabilities which show utility in the test-bed environment are then transitioned experimentally into the operational environment for further evaluation and assessment. SPoRT focuses on a suite of data and products from MODIS, AMSR-E, and AIRS on the NASA Terra and Aqua satellites, and total lightning measurements from ground-based networks. Some of the observations are assimilated into or used with various versions of the WRF model to provide supplemental forecast guidance to operational end users. SPoRT is enhancing partnerships with NOAA / NESDIS for new product development and data access to exploit the remote sensing capabilities of instruments on the NPOESS satellites to address short term weather forecasting problems. The VIIRS and CrIS instruments on the NPP and follow-on NPOESS satellites provide similar observing capabilities to the MODIS and AIRS instruments on Terra and Aqua. SPoRT will be transitioning existing and new capabilities into the AWIIPS II environment to continue the continuity of its activities.
Author
Remote Sensing; Weather Forecasting; Earth Observing System (EOS); NASA Programs

20090026014 NASA Ames Research Center, Moffett Field, CA, USA
Mechanisms for the Intraseasonal Variability of Tropospheric Ozone over the Indian Ocean during the Winter Monsoon
Chatfield, R. b.; Guan, H.; Thompson, A. M.; Smit, H. G. J.; Journal of Geophysical Research - Atmospheres; May 17, 2007; ISSN 0148-0227; Volume 112; 16 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNA05CS26A; RTOP 622-55-54-10; RTOP 622-61-14-10; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1029/2006JD007347

We synthesize daily sonde (vertical) information and daily satellite (horizontal) information to provide an empirical description of ozone origins over the northern Indian Ocean during the INDOEX (Indian Ocean Experiment) field campaign (February-March 1999). This area is shown to be a significant portion of the 'high-ozone tropics'. East-west O3 features and their flow are identified, and ozone origins are compared to other tropical regions, using water vapor as a second tracer. In the

study period, multiple processes contribute to O3 column enhancements, their importance varying strongly by latitude: (1) Low-altitude O3 pollution over the northern Indian Ocean mainly originates from the Indian subcontinent and is traceable to high emission areas. Convective activity south of Sri Lanka helps direct ozone outflow from the northern Indian subcontinent. (2) Middle tropospheric O3 maxima over the northern Indian Ocean originate from various sources, often transitioning within a few hours. Convective venting of Asian pollutants can add 20-30 ppbv to the middle troposphere at 5degN-10degN, alternating with stratospheric influence. (3) A number of cases suggest that strong mixing-in of stratospheric air along the subtropical jet raised tropospheric O3 in early March by approx.40-50 ppbv, especially poleward of approx. 10degN. (4) Influences of lightning and large-scale biomass burning were not strong during this period, in contrast to the situation in Africa and the South Atlantic or locally in Southeast Asia. This work illustrates successes and limitations in approaches to synthesizing disparate information on trace-gas distributions taken from satellite retrieval products and ozonesondes.
Author
Troposphere; Ozone; Indian Ocean; Atmospheric Composition; Contaminants; Water Vapor; Trace Contaminants

20090026020 NASA Marshall Space Flight Center, Huntsville, AL, USA
Preliminary Development and Evaluation of Lightning Jump: Algorithms for the Real-Time Detection of Severe Weather
Petersen, Walter A.; Schultz, Christopher J.; Carey, Larence; [2009]; 64 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NA08NWS4680034
Report No.(s): M09-0422; Copyright; Avail.: Other Sources
No abstract available
Algorithms; Lightning; Thunderstorms; Weather Forecasting

20090026034 Department of Agriculture, Washington, DC USA
USA Meteorological Yearbook, 1942
Jan. 1942; 135 pp.; In English
Report No.(s): PB2009-112403; No Copyright; Avail.: CASI: A07, Hardcopy
The USA Meteorological Yearbook, published by the Weather Bureau, was originally printed as part of the Annual Reports of the Weather Bureau. Around the same time that the annual reports ceased to be printed as part of the U. S. Congressional Serial Set, the Meteorological Yearbook began to appear as a separate title within the Serial Set. These reports contain reports and correspondence from the Chief Signal Officer to the Secretary of War for the year from 1861-1891. From 1892 onwards they contain the similar reports for the Chief of the U.S. Weather Bureau. Report year ends June 30, but the meteorological data are for the calendar year. In 1935 the title is changed to USA Meteorological Yearbook.
NTIS
Meteorological Charts; Meteorological Parameters; Tables (Data); United States

20090026035 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1918
Marvin, C. F.; Jan. 1918; 15 pp.; In English
Report No.(s): PB2009-112171; No Copyright; Avail.: CASI: A03, Hardcopy
The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by

Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026036 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1917
Marvin, C. F.; Jan. 1917; 20 pp.; In English
Report No.(s): PB2009-112170; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026046 National Science Foundation, Arlington, VA USA
Earth Science Literacy-The Big Ideas and Supporting Concepts of Earth Science
May 2009; 13 pp.; In English
Report No.(s): PB2009-111648; EAR-0832415; EAR-0832418,EAR-0832430; No Copyright; Avail.: National Technical Information Service (NTIS)

Earth Science Literacy is an understanding of Earths influence on you and of your influence on Earth. Earth Science Literacy Principles are defined by the scientists who carry out active research in many areas of Earth science and explain the complexities of how our planet works. Earth Science Literacy is shaped by science educators, who can best translate the big ideas of Earth science into language and learning opportunities that can be understood by all. Earth Science Literacy is an ongoing process, continually reshaped and rewritten by new discoveries in the areas of Earth science and learning theory.
NTIS
Earth Sciences; Education; Reading

20090026049 Department of Energy, Washington, DC, USA
Atmospheric Radiation Measurement Climate Research Facility (ACRF) Annual Report 2004
Ferrell, W. R.; Dec. 01, 2004; 42 pp.; In English
Report No.(s): PB2009-111430; DOE/ER-ARM-0403; No Copyright; Avail.: National Technical Information Service (NTIS)

Through the ARM Program, the DOE funded the development of several highly instrumented ground stations for studying cloud formation processes and their influence on radiative transfer, and for measuring other parameters that determine the radiative properties of the atmosphere. This scientific infrastructure, and resultant data archive, is a valuable national and international asset for advancing scientific knowledge of Earth systems. In fiscal year (FY) 2003, the DOE designated the ARM sites as a national scientific user facility: the ARM Climate Research Facility (ACRF). The ACRF has enormous potential to contribute to a wide range of interdisciplinary science in areas such as meteorology, atmospheric aerosols, hydrology, biogeochemical cycling, and satellite validation, to name only a few. Three primary locations: the Southern Great Plains (SGP), Tropical Western Pacific (TWP), and North Slope of Alaska (NSA); and the portable ARM Mobile Facility are heavily instrumented to collect massive amounts of atmospheric measurements needed to create data files. Using these data, ARM scientists are studying the effects and interactions of sunlight, radiant energy, and clouds to understand their impact on

temperatures, weather, and climate. As part of this effort, ARM scientists and ACRF infrastructure staff provide value-added processing to the data files to create new data streams called value-added products. Software tools are then provided to help open and analyze these products. Program documentation, from setting up the sites to developing the value-added products, is available for each step in this process.
NTIS
Atmospheric Radiation; Climate; Ground Stations; Radiation Measurement; Research Facilities

20090026051 Federal Emergency Management Agency, Washington, DC USA
Coastal Construction Manual Volume 3, Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas FEMA P- 55-3, Edition 3, August 2005
Aug. 2005; 299 pp.; In English
Report No.(s): PB2009-107836; FEMA P-55-3; No Copyright; Avail.: CASI: A13, Hardcopy
Many local officials, technical specialists, and representatives of private sector concerns in coastal areas of the USA were contacted for information during the preparation of this manual. FEMA acknowledges the contributions of the individuals and organizations listed here, who provided technical guidance, historical data, graphics materials, regional insights, and other information concerning coastal hazards, building codes and standards, and the siting, design, construction, and maintenance of coastal residential buildings. Through their participation, they helped make this manual a comprehensives, useful tool for reducing building damage caused by natural hazard events in coastal areas of the USA.
NTIS
Buildings; Coasts; Construction; Procedures; Residential Areas

20090026052 Federal Emergency Management Agency, Washington, DC USA
Coastal Construction Manual Volume 2, Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas, FEMA P-55-2, Edition 3, Auugust 2005. -
Aug. 2005; 328 pp.; In English
Report No.(s): PB2009-107835; FEMA P-55-2; No Copyright; Avail.: CASI: A15, Hardcopy
Volume II of this Coastal Construction Manual provides information on determining site-specific loads and designing, constructing, and maintaining a residential building in a coastal area. This volume builds on the background information contained in Volume I and provides detailed guidance for constructing buildings that will resist the damaging effects of natural hazards.
NTIS
Buildings; Coasts; Construction; Procedures; Residential Areas

20090026182 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1916
Marvin, C. F.; Jan. 1916; 19 pp.; In English
Report No.(s): PB2009-112169; No Copyright; Avail.: CASI: A03, Hardcopy
The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Climate; Meteorology

20090026183 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1915
Marvin, C. F.; Jan. 1915; 21 pp.; In English
Report No.(s): PB2009-112168; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Meteorology; Weather

20090026184 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1914
Marvin, C. F.; Jan. 1914; 9 pp.; In English
Report No.(s): PB2009-112167; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026186 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1913
Marvin, C. F.; Jan. 1913; 9 pp.; In English
Report No.(s): PB2009-112166; No Copyright; Avail.: CASI: A02, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather

Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026187 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1911
Moore, W. L.; Jan. 1911; 41 pp.; In English
Report No.(s): PB2009-112164; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026188 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1912
Moore, W. L.; Jan. 1912; 44 pp.; In English
Report No.(s): PB2009-112165; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Weather; Meteorology

20090026189 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1910
Moore, W. L.; Jan. 1910; 41 pp.; In English
Report No.(s): PB2009-112163; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from

the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026190 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1909
Moore, W. L.; Jan. 1909; 44 pp.; In English
Report No.(s): PB2009-112162; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Weather; Meteorology

20090026196 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1908
Moore, W. L.; Jan. 1908; 33 pp.; In English
Report No.(s): PB2009-112161; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026198 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1907
Moore, W. L.; Jan. 1907; 59 pp.; In English
Report No.(s): PB2009-112160; No Copyright; Avail.: CASI: A04, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026200 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1906
Moore, W. L.; Jan. 1906; 24 pp.; In English
Report No.(s): PB2009-112159; No Copyright; Avail.: CASI: A03, Hardcopy

The meteorological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026201 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1905
Moore, W. L.; Jan. 1905; 38 pp.; In English
Report No.(s): PB2009-112158; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather

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NTIS
Weather; Meteorology; Weather Forecasting

20090026203 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1904
Moore, W. L.; Jan. 1904; 45 pp.; In English
Report No.(s): PB2009-112157; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026204 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1903
Moore, W. L.; 1903; 49 pp.; In English
Report No.(s): PB2009-112156; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026205 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1901
Moore, W. L.; 1901; 17 pp.; In English
Report No.(s): PB2009-112155; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from

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NTIS
Meteorology; Weather Forecasting; Weather

20090026207 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1900
Moore, W. L.; 1900; 16 pp.; In English
Report No.(s): PB2009-112154; No Copyright; Avail.: CASI: A03, Hardcopy
The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather Forecasting; Meteorology; Weather

20090026227 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1899
Moore, W. L.; [1900]; 24 pp.; In English
Report No.(s): PB2009-112153; No Copyright; Avail.: CASI: A03, Hardcopy
The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026228 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1898
Moore, W. L.; [1900]; 30 pp.; In English
Report No.(s): PB2009-112152; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026229 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1897
Moore, W. L.; [1900]; 29 pp.; In English
Report No.(s): PB2009-112151; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026230 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1896
Moore, W. L.; [1900]; 28 pp.; In English
Report No.(s): PB2009-112150; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather

Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026231 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1895
Moore, W. L.; [1900]; 36 pp.; In English
Report No.(s): PB2009-112149; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Weather Forecasting; Meteorology

20090026232 Department of Agriculture, Washington, DC USA
Report of the Chief of the Weather Bureau for 1893
Harrington, M. W.; [1900]; 42 pp.; In English
Report No.(s): PB2009-112148; No Copyright; Avail.: CASI: A03, Hardcopy

The meterological service was transferred to the Department of Agriculture, in compliance with an Act of Congress approved October 1, 1890. This Act stipulated that the duties of the Signal Corps pertaining to the weather sevice be performed, on and after July 1, 1891, under the direction of the Secretary of Agriculture. Professor Mark W. Harrington from the University of Michigan faculty was appointed the first civilian Chief of the Weather Bureau. The Service was reorganized to carry out the expressed intention of Congress to develop and extend its work in the interest of agriculture. Funds were made available to increase the distribution of the forecasts and storm warnings in the agricultural districts of the country. A Special Report, dated October 1, 1891, which included a general summary of the operations of the Weather Bureau since its transfer, was submitted by the Chief of the Weather Bureau to the Honorable J. M. Rusk, Secretary, Department of Agriculture. Since that initial report each subsequent annual report features both the practical and theoretical aspects of the work of the Bureau: forecasts, warnings, weather maps, flood and frost warnings, climate research, meterological records, the State Weather Services, instruments, soil physics, crop conditions, and more. Report of the Chief of the Weather Bureau was submitted by Professor Mark W. Harrington, 1891-1894; Professor Willis L. Moore, 1895-1913; Professor Charles F. Marvin, 1913-1934; Dr. Willis L. Gregg, 1934-1938; and Dr. Francis W. Reichelderfer, 1938-1963.
NTIS
Weather; Meteorology; Weather Forecasting

20090026278 NASA Langley Research Center, Hampton, VA, USA
Evidence of Mineral Dust Altering Cloud Microphysics and Precipitation
Min, Qilong; Li, Rui; Lin, Bing; Joseph, Everette; Wang, Shuyu; Hu, Yongxiang; Morris, Vernon; Chang, F.; Atmospheric Chemistry and Physics Discussions (ACPD); November 03, 2008; Volume 8, pp. 18893-18910; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNL06AA00G; NA17AE1625; NA17AE1623; DE-FG02-03ER63531; WBS 720817.04.07.01
Report No.(s): LF99-8557; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026278

Multi-platform and multi-sensor observations are employed to investigate the impact of mineral dust on cloud

microphysical and precipitation processes in mesoscale convective systems. It is clearly evident that for a given convection strength,small hydrometeors were more prevalent in the stratiform rain regions with dust than in those regions that were dust free. Evidence of abundant cloud ice particles in the dust sector, particularly at altitudes where heterogeneous nucleation process of mineral dust prevails, further supports the observed changes of precipitation. The consequences of the microphysical effects of the dust aerosols were to shift the precipitation size spectrum from heavy precipitation to light precipitation and ultimately suppressing precipitation.
Author
Aerosols; Cloud Physics; Nucleation; Convection; Minerals; Clouds; Dust

20090026288 Waterloo Univ., Ontario, Canada; NASA Langley Research Center, Hampton, VA, USA
Appendix C: First Global Observations of Atmospheric COClF from the Atmospheric Chemistry Experiment Mission
Fu, Djian; Boone, Chris D.; Bernath, Peter F.; Walker, Kaley A.; Rinsland, Curtis P.; Weisenstein, Debra K.; Manney, Gloria L.; Journal of Quantitative Spectroscopy and Radiative Transfer; [2009]; Volume 110, Issue 12, pp. 974-985; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNH08CD20C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.jqsrt.2009.02.018

Carbonyl chlorofluoride (COCIF) is an important reservoir of chlorine and Fluorine in the Earth's atmosphere. Satellite-based remote sensing measurements of COCIF, obtained by Received in revised form the Atmospheric Chemistry Experiment (ACE) for a time period spanning February 2004 through April 2007, have been used in a global distribution study. There is a strong Accepted 18 February 2009 source region for COCIF in the tropical stratosphere near 27 km. A layer of enhanced COCIF spans the low- to mid-stratosphere over all latitudes, with volume mixing ratios of 40-100 parts Per trillion by volume, largest in the tropics and decreasing toward the poles. The COCIF volume mixing ratio profiles are nearly zonally symmetric, but they exhibit a small hemispheric asymmetry that likely arises from a hemispheric asymmetry in the parent molecule CCl3F. Comparisons are made with a set of in situ stratospheric measurements from the mid-1980s and with predictions from a 2-D model.
Author
Atmospheric Chemistry; Carbonyl Compounds; Remote Sensing; Earth Atmosphere; In Situ Measurement; Mixing Ratios; Chlorine

20090026304 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Concordiasi Project in Antarctica for the International Polar Year (IPY)
Rabier, F.; Bouchard, A.; Brun, E.; Coerenbecher, A.; Guedj, S.; Guidard, V.; Karbou, F.; Peuch, V.-H.; El Amraoui, L.; Puech, D.; Genghon, C.; Picard, G.; Town, M.; Herzog, A.; Vial, F.; Cocquerez, P.; Cohn, S. A.; Hock, T.; Fox, J.; Cole, H.; Parsons, D.; Powers, J.; Romberg, K.; VanAndel, J.; Deshler, T.; [2009]; 2 pp.; In English; Copyright; Avail.: Other Sources

No abstract available
Antarctic Regions; Temperature Measurement; Ozone Depletion; Meteorological Parameters; In Situ Measurement; Global Positioning System; Climate; Meteorological Balloons

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*.

20090025396 Yale Univ., New Haven, CT USA
Oxygen and Cell Fate Decisions
Lin, Qun; Kim, Yuri; Alarcon, Rodolfo M; Yun, Zhong; May 27, 2009; 10 pp.; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A500268; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Molecular oxygen has been known to play a critical role in a wide range of biological processes including glycolysis, mitochondrial respiration, angiogenesis, pulmonary functions, and cardiovascular activities. An emerging theme has developed in recent years that oxygen has significant impact on embryonic development, maintenance of stem cells, and cellular differentiation or cell fate decisions. Among the notable observations, early embryonic development takes place in a

hypoxic microenvironment. Hematopoietic stem cells appear to be located in hypoxic regions within the bone marrow. Majority of the current observations have shown that hypoxia favors the maintenance of stem cells in undifferentiated states. However, hypoxia can be permissive for certain types of lineage differentiation, such as chondrogenesis. These intriguing observations demonstrate an important role of molecular oxygen in such fundamental biological processes as stem cell maintenance and regulation of cell fate decisions. Herein, we describe some of the latest advances in the biology of molecular oxygen and provide our perspectives on the potential impact of these interesting findings.
DTIC
Hypoxia; Oxygen; Stem Cells

20090025482 NASA Marshall Space Flight Center, Huntsville, AL, USA
Rapid Culture-Independent Microbial Analysis aboard the International Space Station (ISS)
Maule, Jake; Wainwright, Norm; Steele, Andrew; Monaco, Lisa; Morris, Heather; Gunter, Daniel; Damon, Michael; Wells, Mark; [2009]; 75 pp.; In English; Original contains color illustrations
Report No.(s): M09-0355; Copyright; Avail.: Other Sources
No abstract available
International Space Station; Microorganisms; Sample Return Missions; Culture Techniques

20090025880 NASA Marshall Space Flight Center, Huntsville, AL, USA
Developing GIS-Based Eastern Equine Encephalitis Vector-host Models in Tuskegee, Alabama
Jacob, Benjamin G.; Burkett, Nathan; Luvall, Jeff; Parack, Sarah; McClure, Christopher J. W.; Hill, Geoffery E.; Cupp, Eddie W.; Novak, Robert J.; Unnasch, Thomas R.; [2009]; 46 pp.; In English; Original contains color illustrations
Report No.(s): M09-0337; Copyright; Avail.: Other Sources
No abstract available
Encephalitis; Insects; Remote Sensing; Infestation; Regression Analysis; Variance (Statistics)

20090026030 Allermed Labs., Inc., San Diego, CA USA
Development and Production of a Leishmania Skin Test
Neilsen, Jr, Harry S; Mar 2009; 183 pp.; In English
Contract(s)/Grant(s): DAMD17-00-C-0030
Report No.(s): AD-A499940; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499940
Further refinement of the manufacturing process of Leishmania tropica Skin Test Antigen (LtSTA) was made during this contract period to increase the yield and robustness of the parasite during culture. Identity and potency tests for LtSTA were developed and the procedures are being validated. The analysis of dose-response, safety and efficacy data from a phase II clinical trial conducted in Sidi Bouzid, Tunisia in 2007 were compiled and analyzed, and a study report was completed and submitted to the U.S. Army and the FDA. The results of this investigation indicated that a 30ug dose could be used to determine the sensitivity and specificity of the product; the observed sensitivity of the 30ug dose was 0.85 and the observed specificity was 0.97. To evaluate the sensitizing properties of a 30ug does of LtSTA, a phase IIb study was planned and executed in August 2008. The trial was designed to determine if a 30ug dose could be administered intradermally three times without observing sensitization. The study also included 15ug and 50ug doses to evaluate the importance of product concentration in the induction of sensitivity. At the completion of this study, a Type B Meeting with the FDA will be requested to discuss the design of a phase III trial. Participants in this meeting will include Allermed personnel and members of the U.S. Army Leishmania interest group.
DTIC
Antigens; Parasites

20090026158 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 58, Number 1, January 1923
Clark, F S; Dingley, Nelson; Jan.1923; 98 pp.; In English
Report No.(s): AD-A500100; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500100
This issue of The Coast Artillery Journal contains the following articles: Practical Methods of Conservation of Manpower in Theatres of Operation, by Lieutenant Colonel Jay W. Grissinger, G.S.; Position Finding by Airplane, by Captain George W.

Ricker, C.A.C. (Editor's Note: Captain Ricker has furnished a remarkably concise and clear cut statement of the initial experiment in a method of long range fire control whose subsequent development, if vigorously exploited wherever possible, bids fair to revolutionize the potential ties of coast defense armament); Battery 'A' 51st Artillery Fires G.P.F.'s at Moving Targets, extracts from the report of Captain Robert N. Mackin, C.A.C., with comments by Major Rodney H. Smith, C.A.C., the Regimental Commander; and Doctrine of Anti-Aircraft Defense in France, a report from the Military Attache in France; Tables of Organization, French Anti-Aircraft Artillery, a report from the Military Attache in France. This issue also contains an editorial on the work that lies ahead for the Coast Artillery Corps in the areas of communications, fire control, observation of fire, and intelligence; and solutions to Employment of Heavy Artillery problems. The Bulletin Board contains training regulations for Coast Artillery Gunners, including Object of Examination, Classification for Gunners, Eligibility of Candidates, Instruction of Candidates, Boards of Examination, Conduct of the Examination, Report of the Board of Examination, and Scope of the Examination.
DTIC
Air Defense; Artillery; Coasts; Fire Control; Medical Services; Military Operations; Position Sensing; Warfare

20090026160 Northrop Grumman Corp., San Antonio, TX USA
Optical Radiation Bioeffects TO9
Denton, Michael; Feb. 2009; 44 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F41624-02-D-7003; Proj-2312
Report No.(s): AD-A500062; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500062

This report reviews the research investigated by the technical staff of the Optical Radiation Bioeffects Task Order (T.O. 09) during the period 27 April 2004 to 31 October 2008. The productivity of the group is evidenced by the number of projects within the Task Order, the variety of laser bioeffects topics represented by those projects, and the resulting number of written publications and oral presentations at national and international conferences. A brief overview of the results, and their implications in the field of laser bioeffects is provided for each project. The research represented here includes thresholds for damage from exposure to a broad range of laser wavelengths and exposure durations for skin, cornea, and retina in both animal and in vitro models. The primary emphasis on understanding basic mechanisms of laser-tissue interaction, and in identifying safe levels of exposure, has complemented the concurrent computational modeling of the thermal and optical consequences of laser exposure to biological tissue and cells in culture.
DTIC
Biological Effects; Lasers; Military Technology; Optical Properties; Radiation Spectra; Radiobiology; Research and Development

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*.

20090025885 NASA Marshall Space Flight Center, Huntsville, AL, USA
The LAL Assay for Rapid Microbial Detection and its Relationship to Existing Methods
Morris, Heather C.; Monaco, Lisa a.; Maule, Jake; Wainwright, Norman; Steele, Andrew; [2009]; 22 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNM05AB50C
Report No.(s): M09-0343; Copyright; Avail.: Other Sources

No abstract available
Assaying; Microbiology; Microorganisms; Exobiology; Spacecraft Contamination; Spacecraft Environments

20090025939 NASA Johnson Space Center, Houston, TX, USA
Muscle Volume, Strength, and Endurance After Long-Duration Space Flight
Gopalakrishnan, R.; Genc, K. O.; Rice, A. J.; Lee, S. M. C.; Evans, H. J.; Maender, C. C.; Ilaslan, H.; Cavanagh, Peter R.; [2009]; 42 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC9-153
Report No.(s): JSC-CN-18505; Copyright; Avail.: Other Sources
No abstract available
Countermeasures; Muscles; Physical Exercise; Muscular Strength; Long Duration Space Flight; Microgravity; Atrophy; Physiological Effects; Biological Effects; Gravitational Physiology

20090025961 NASA Johnson Space Center, Houston, TX, USA
Right Ventricular Tissue Doppler Assessment in Space during Circulating Volume Modification using the Braslet-M Device
Hamilton, D. R.; Alferova, I. V.; Sargsyan, A. E.; Fincke, E. M.; Magnus, S. H.; Lonchakov, Y. V.; Dulchavsky, S. A.; Ebert, D.; Garcia, K.; Martin, D.; Matveev, V. P.; Melton, S. L.; Bogomolov, V. V.; Duncan, J. M.; [2009]; 27 pp.; In English; Original contains color illustrations
Report No.(s): JSC-CN-18524; Copyright; Avail.: Other Sources
No abstract available
Cardiovascular System; Heart Function; Microgravity; Heart Minute Volume; Blood Circulation; Physiological Effects; Hypervolemia; Fluid Shifts (Biology)

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*.

20090026128 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Lawrence Livermore National Lab., Livermore, CA USA; Los Alamos National Lab., NM USA
Is the World Shrinking or Are We Getting Bigger
Alexandre, M.; Jan. 2009; 38 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2009-950103; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Human Factors Engineering; Labor; Obesity

20090026308 NASA Johnson Space Center, Houston, TX, USA
Refinement of Optimal Work Envelope for Extravehicular Activity Suit Operations
Jaramillo, Marcos A.; Angermiller, Bonnie L.; Morency, Richard M.; Rajulu, Sudhakar L.; November 2008; 28 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2008-214781; S-1032; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026308
The purpose of the Extravehicular Mobility Unit Work Envelope study is to determine and revise the work envelope defined in National Space Transportation System (NSTS) 07700 'System Description and Design Data -- Extravehicular Activities' arising from an action item as a result of the Shoulder Injury Tiger Team findings. The aim of this study is to determine a common work envelope that will encompass a majority of the crew population while minimizing the possibility of shoulder and upper arm injuries. There will be approximately two phases of testing: arm sweep analysis to be performed in the Anthropometry and Biomechanics Facility; and torso lean testing to be performed in the Precision Air Bearing Facility. NSTS 07700 defines the preferred work envelope arm reach in terms of maximum reach, and defines the preferred work envelope torso flexibility of a crew member to be a net 45-degree backward lean. This test served two functions: to investigate the validity of the standard discussed in NSTS 07700; and to provide recommendations to update this standard, if necessary. Author
Extravehicular Mobility Units; Astronaut Locomotion; Spacecrews; Human Body; Astronaut Performance; Anthropometry

20090026365 NASA Johnson Space Center, Houston, TX, USA; Universities Space Research Association, USA
The Effect of Center of Gravity and Anthropometrics on Human Performance in Simulated Lunar Gravity
Mulugeta, Lealem; Chappell, Steven P.; Skytland, Nicholas G.; July 12, 2009; 43 pp.; In English; 39th International Conference on Environmental Systems, 12 - 16 Jul. 2009, Georgia, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

NASA EVA Physiology, Systems and Performance (EPSP) Project at JSC has been investigating the effects of Center of Gravity and other factors on astronaut performance in reduced gravity. A subset of the studies have been performed with the water immersion technique. Study results show correlation between Center of Gravity location and performance. However, data variability observed between subjects for prescribed Center of Gravity configurations. The hypothesis is that Anthropometric differences between test subjects could be a source of the performance variability.
Derived from text
Center of Gravity; Extravehicular Activity; Human Performance; Lunar Gravitation; Physiology; Anthropometry

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*.

20090025494 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Analysis of a Security Protocol in (Mu)CRL
Pang, J.; Jan. 31, 2002; 30 pp.; In English
Report No.(s): PB2009-111424; SEN-R0201; Copyright; Avail.: National Technical Information Service (NTIS)

With the growth and commercialization of the Internet, the security of communication between computers becomes a crucial point. A variety of security protocols based on cryptographic primitives are used to establish secure communication over insecure open networks and distributed systems. Unfortunately, security protocols often contain serious errors. Formal verification can be used to obtain assurance that a protocol cannot be attacked by an intruder. In this paper, we present how the process-algebraic language (Mu)CRL can be used to specify and analyze security protocols. To illustrate the feasibility of our approach, we analyze the Needham-Schroeder public-key protocol and reproduce the error found by Gavin Lowe. Two more definitions of authentication are studied. We give some remarks on our approach and discuss some possible directions for future work.
NTIS
Computer Information Security; Computer Networks; Internets; Protocol (Computers)

20090025496 Center for Mathematics and Computer Science, Amsterdam, Netherlands; Amsterdam Univ., Netherlands; Technische Univ., Eindhoven, Netherlands; VU Informatica, Amsterdam, Netherlands
List, Group or Menu: Organizing Suggestions in Autocompletion Interfaces
Amin, A. K.; Hildebrand, M.; Van Ossenbruggen, J. R.; Evers, V.; Hardman, L.; Jan. 2009; 18 pp.; In English
Report No.(s): PB2009-111418; INS-E0901; Copyright; Avail.: National Technical Information Service (NTIS)

Even though Autocompletion is widely used in search interfaces with different variations, few guidelines exist on how to present autocompletion suggestions. In this paper, we describe two user studies that shows some types of organization strategies help users search faster and easier in a known-item search task. We studied the effect of grouping suggestions in an autocompletion interface to select terms taken from a thesaurus. In the first study, we explored ways of grouping term suggestions from two different thesauri (TGN and WordNet). The results of the first study suggested that the best organization strategies are different when using different thesaurus. Users found Group organization may be appropriate to organize location names from TGN, while Alphabetical works better for WordNet. We then carried out a follow-up study, where we compared three different organization strategies (Alphabetical, Group and Composite) for location name search tasks. The results of the second study indicate that in general, autocompletion interfaces help improve the quality of keyword.
NTIS
Automatic Control; Semantics

20090025913 University Transportation Center, Knoxville, TN, USA
U-12: Data Security Solution for Trusted Truck(reg) II
January 2009; 19 pp.; In English
Report No.(s): PB2009-112327; No Copyright; Avail.: CASI: A03, Hardcopy

Following the successful proof-of-concept demonstration of the Trusted Truck project, an essential subsequent step, addressed by this project, pertained to the development of a robust data security infrastructure. The latter pertains to both the confidentiality of information exchanged, as well as authentication of the various parties communicating. Hence, the primary goal of this project was the development of a resource-efficient, tailor-fit data security protocol for the Trusted Truck project. The solution has been coded and tested on real hardware and forms the basis for moving forward in providing data robustness and integrity for the Trusted Truck network. Beyond the technical and scientific achievement, two students at the University of Tennessee (UT) were supported, thus enhancing the educational charter of both UT and the NTRCI University Transportation Center.
NTIS
Computer Information Security; Trucks

20090025921 Federal Highway Administration, Washington, DC USA; Environmental Protection Agency, Washington, DC USA
Multisector Asset Management Case Studies
January 2008; 88 pp.; In English
Report No.(s): PB2009-112216; No Copyright; Avail.: National Technical Information Service (NTIS)

North Americas infrastructure is integral to our economic, environmental, and cultural vitality. Federal, state, and local entities have been successfully building and operating assets for generations. Across several sectors, our built assets are aging. Some roadway, water, and wastewater systems are more than 100 years old. To meet the renewal challenges and at the same time address the essential expansion and upgrade of our infrastructure, calls for exploring new processes, practices and skills crucial for the long-term sustainable management of assets. New, internationally tested asset management (AM) principles and practices appropriate across multiple sectors are surfacing in the USA (U.S.) and Canada. These innovative AM methods offer established approaches for communities; in systems monitoring capabilities, information handling, and advanced decision support systems that can function across service sectors (e.g., water, wastewater, highways, airports, mass transit). These new tools and techniques are timely in that they enable us to think about choices in more sophisticated ways and enhance our understanding of condition. They facilitate the capacity to better predict failures and in so doing help to make more informed decisions about optimal investment and reinvestment strategies. At the more sophisticated levels, these approaches take into account the service requirements across several sectors.
NTIS
Decision Support Systems; Waste Water; Economics; Highways

20090025934 Executive Office of the President, Washington, DC, USA
Cyberspace Policy Review: Assuring a Trusted and Resilient Information and Communication Infrastructure
Jan. 2009; 76 pp.; In English
Report No.(s): PB2009-112185; No Copyright; Avail.: CASI: A05, Hardcopy

The President directed a 60-day, comprehensive, clean-slate review to assess U.S. policies and structures for cybersecurity. Cybersecurity policy includes strategy, policy, and standards regarding the security of and operations in cyberspace, and encompasses the full range of threat reduction, vulnerability reduction, deterrence, international engagement, incident response, resiliency, and recovery policies and activities, including computer network operations, information assurance, law enforcement, diplomacy, military, and intelligence missions as they relate to the security and stability of the global information and communications infrastructure. The scope does not include other information and communications policy unrelated to national security or securing the infrastructure. The review team of government cybersecurity experts engaged and received input from a broad cross-section of industry, academia, the civil liberties and privacy communities, State governments, international partners, and the Legislative and Executive Branches. This paper summarizes the review teams conclusions and outlines the beginning of the way forward towards a reliable, resilient, trustworthy digital infrastructure for the future.
NTIS
Policies; Computer Networks; Intelligence; Security; Law (Jurisprudence)

20090025954 NASA Johnson Space Center, Houston, TX, USA
RIDS for Red Books from the Spacecraft Monitoring and Control Working Group of the CCSDS
Reynolds, Walter F.; Lucord, Steven A.; Stevens, John E.; June 24, 2009; 48 pp.; In English; CCSDS MOIMS SM&C Working Group Telecon, 24 Jun. 2009, Houston, TX, USA
Report No.(s): JSC-CN-18519; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025954

This document presents a listing of the Review Item Dispositions (RIDs) to be presented to the The Consultative Committee for Space Data Systems (CCSDS).
CASI
Aerospace Systems; Data Systems

20090026037 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Concept of Operations. Version 2.0
Apr. 06, 2007; 58 pp.; In English
Report No.(s): PB2009-111977; No Copyright; Avail.: CASI: A04, Hardcopy

The purpose of this document is to provide a Concept of Operations for the Next Generation 9-1-1 (NG9-1-1) System (or system of systems). The U.S. Department of Transportation (USDOT) understands that access to emergency services provided by 9-1-1 in todays world of evolving technology will ultimately occur within a broader array of interconnected networks comprehensively supporting emergency servicesfrom public access to those services, to the facilitation of the services, to the delivery of the emergency information to dispatchers and first responders. More specifically, USDOT views the NG9-1-1 System as an evolutionary transition to enable the general public to make a 9-1-1 call from any wired, wireless, or Internet Protocol (IP)-based device, and allow the emergency services community to take advantage of Enhanced 9-1-1 (E9-1-1) call delivery and other functions through new internetworking technologies based on open standards. By enabling the general public to access 9-1-1 services through virtually any communications device, the NG9-1-1 System provides a more direct ability to request help or share critical data with emergency services provider from any location. In addition, call takers at the Public Safety Answering Points (PSAP) will be able to transfer emergency calls to another PSAP and forward the location and other critical data, such as text messages, images, video, with the call. The objective of the NG9-1-1 System Initiative, as a USDOT-sponsored research and development project, is to define the system architecture; develop a transition plan that considers responsibilities, costs, schedule, and benefits for deploying IP-based emergency services across the Nation; and implement a working proof-of-concept demonstration system. The NG9-1-1 Initiative is leveraging work from USDOTs earlier Wireless E9-1-1 Initiative, which promoted enhanced location capability for 9-1-1 calls placed from wireless telephones, as well as myriad other industry-wide requirements and technical approaches.
NTIS
Emergencies; Protocol (Computers); Safety; Deployment; Communication Equipment

20090026038 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: NG9-1-1 Preliminary Transition Plan. Version 1.0
Apr. 2008; 88 pp.; In English
Report No.(s): PB2009-111975; No Copyright; Avail.: CASI: A05, Hardcopy

Although the 9-1-1 system has been an unqualified success story for more than 30 years, changes in the publics use of technology, the saturation of the mobile market, and the spread of Voice over Internet Protocol (VoIP) telephony over broadband are contributing to greater expectations that the current system will need to address. Because text, data, images, and video are increasingly common in personal communications and are critical to future transportation safety, the 9-1-1 system will be expected to accommodate highly mobile, dynamic communications modes. The architecture of these communication nodes directly counters the fundamental structure of the current 9-1-1 system. To guide and foster a nationwide vision of a 9-1-1 system for the 21st century, the U.S. Department of Transportation (USDOT) is taking a lead role in the research and development needed to bring about a more capable Next Generation 9-1-1 (NG9-1-1) system that supports emergency call delivery and a response based system that maximizes impact across a diverse stakeholder community. There are, however, a large number of operational, economic, political, and institutional issues that must be addressed and reconciled if the NG9-1-1 system is to be implemented successfully across the nation. Implementing NG9-1-1 will likely be a complicated process, requiring the effective, timely and willing cooperation of an array of stakeholders. To address these issues, the NG9-1-1 Initiative has begun researching and analyzing the strategic transition elements and options that could be followed to further the progress and implementation of NG9-1-1. This Preliminary Transition Plan will help frame how the

government and industry view the deployment of NG9-1-1 and the key decisions that might need to be made by each level of government and the private sector to make implementation a reality.
NTIS
Emergencies; Mobile Communication Systems; Protocol (Computers); Deployment; Broadband

20090026039 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: NG9-1-1 Transition Issues Report. Version 1.0
Feb. 2008; 20 pp.; In English
Report No.(s): PB2009-111976; No Copyright; Avail.: CASI: A03, Hardcopy

A key outcome of the U.S. Department of Transportation (USDOT) Next Generation 9-1-1 (NG9-1-1) Initiative is the identification of well-supported options and crucial transition issues for migrating from todays 9-1-1 system to a NG9-1-1 system across the country. The following analysis documents and summarizes many of the issues facing government, industry, and the general public as the Nation plans for future NG9-1-1 implementation. The scope and breadth of the transition issues characterized here are intentionally broad and includes issues that need to be addressed at the national, state, regional, and local levels to implement NG9-1-1. This analysis recognizes that each issue may affect transition to NG9-1-1 and its stakeholders in different ways. Similarly, the priority of the key issues is also expected to vary over time and by location. Therefore, this analysis presents a list of transition issues that is ordered for ease of reference, not in order of priority. Lastly, as highlighted in this analysis, the answers to these critical questions acknowledge that the migration path chosen by a state, regional, or local 9-1-1 Authority may lessen or exacerbate the importance or impact of these transition issues.
NTIS
Emergencies; Priorities; Migration; Position (Location)

20090026040 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Proof of Concept Testing Report. Version 1.0. September 2008
Sep. 17, 2008; 81 pp.; In English
Report No.(s): PB2009-111974; No Copyright; Avail.: CASI: A05, Hardcopy

This report documents the methodology and results of the U.S. Department of Transportation (USDOT) Next Generation 9-1-1 Initiative (NG9-1-1) Proof of Concept (POC) testing. It describes in detail the NG9-1-1 POC test results and provides a baseline for future testing of NG9-1-1 systems.
NTIS
Emergencies; Safety; Deployment

20090026041 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Proof of Concept Deployment Plan
Feb. 2008; 45 pp.; In English
Report No.(s): PB2009-111972; No Copyright; Avail.: National Technical Information Service (NTIS)

The objective of this document is to define a comprehensive plan to deploy the POC testbed components. The plan will assist the NG9-1-1 Project Team in monitoring and managing deployment activities. The schedule and milestones in this plan will serve as key checkpoints for ensuring that the POC test-bed infrastructure is appropriately deployed at the test facilities and the PSAPs.
NTIS
Deployment; Emergencies; Schedules

20090026042 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Proof of Concept Test Plan. Version 1.0
Jun. 05, 2008; 277 pp.; In English
Report No.(s): PB2009-111973; No Copyright; Avail.: CASI: A13, Hardcopy

This document is the Proof of Concept (POC) Test Plan and procedures that will be used to verify that hardware and application functionality meet the requirements of the U.S. Department of Transportation (USDOT) Next Generation 9-1-1 Initiative (NG9-1-1). It describes the test procedures and provides the base information to validate the Next Generation 9-1-1 proof of concept. This document continues to build on the work that has been completed. The NG9-1-1 Concept of Operations

(CONOPS) High-Level Requirements document and Architecture Analysis report were developed in the initial phases of the project. These documents served as the basis for the initial POC development work.
NTIS
Emergencies; Safety; Deployment

20090026043 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: Human Machine Interface Display Design Document. Version 1.0
Jan. 2008; 96 pp.; In English
Report No.(s): PB2009-111971; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this document is to describe the design for the human machine interface (HMI) display for the Next Generation 9-1-1 (NG9-1-1) System (or system of systems) based on the initial Tier 1 requirements identified for the NG9-1-1 System. The ubiquitous access to 9-1-1 emergency services needed in todays world of evolving technology is driving the need to introduce a broader array of interconnected networks that would comprehensively support emergency services. The U.S. Department of Transportation (USDOT) is leading the effort to introduce the NG9-1-1 System, which is designed to improve management of emergency services throughout all aspects of operations, including public access to the emergency services; facilitation of services; and delivery of emergency information to public safety answering points (PSAP), emergency call centers (ECC), and first responders. USDOT views the NG9-1-1 System as a necessary transition to enable the general public to make a 9-1-1 call1 from any wired, wireless, or Internet Protocol (IP)-based device, and allow the emergency services community to take advantage of enhanced call delivery and advanced functional and operational capabilities through new internetworking2 technologies based on open standards. By enabling access to 9-1-1 services through virtually any communications device, the NG9-1-1 System provides a more direct ability to request help or share critical data from any location with emergency services providers. In addition, call takers at the PSAPs will be able to transfer emergency calls to another PSAP and forward the location and other critical data, such as text messages, images, and video, with the call.
NTIS
Emergencies; Messages; Protocol (Computers); Transponders; Support Systems; Communication Equipment

20090026044 Department of Transportation, Washington, DC, USA
Next Generation 9-1-1 (NG9-1-1) System Initiative: System Description and Requirements Document. Version 2.0
Oct. 10, 2007; 154 pp.; In English
Report No.(s): PB2009-111970; No Copyright; Avail.: National Technical Information Service (NTIS)

The Next Generation 9-1-1 Initiative (NG9-1-1) is a U.S. Department of Transportation (USDOT) research and development project that will help define the system architecture and develop a transition plan that considers responsibilities, costs, schedule, and benefits for deploying Internet Protocol (IP)-based emergency services across the Nation. USDOT understands that access to emergency services provided by Public Safety Answering Points (PSAPs) in todays world of evolving technology will ultimately occur within a broader array of interconnected networks comprehensively supporting emergency servicesfrom public access to those services, to the facilitation of those services, to the delivery of the emergency information to dispatchers and first responders.
NTIS
Emergencies; Internets; Protocol (Computers)

20090026121 Oklahoma State Univ., Stillwater, OK, USA
Two Hundred Seventy-Five (275) Degrees C Downhole Microcomputer System
Hutchens, C.; Miin Soo, H.; Aug. 31, 2009; 168 pp.; In English
Contract(s)/Grant(s): DE-FC26-05NT42656
Report No.(s): DE2009-951266; No Copyright; Avail.: National Technical Information Service (NTIS)

An HC11 controller IC and along with serial SRAM and ROM support ICs chip set were developed to support a data acquisition and control for extreme temperature / harsh environment conditions greater than 275 degrees C. The 68HC11 microprocessor is widely used in well logging tools for control, data acquisition, and signal processing applications and was the logical choice for a downhole controller. This extreme temperature version of the 68HC11 enables new high temperature designs and additionally allows 68HC11-based well logging tools and MWD tools to be upgraded for high temperature operation in deep gas reservoirs, The microcomputer chip consists of the microprocessor ALU, a small boot ROM, 4 kbyte data RAM, counter/timer unit, serial peripheral interface (SPI), asynchronous serial interface (SCI), and the A, B, C, and D parallel ports. The chip is code compatible with the single chip mode commercial 68HC11 except for the absence of the analog

to digital converter system. To avoid mask programmed internal ROM, a boot program is used to load the microcomputer program from an external mask SPI ROM. A SPI RAM IC completes the chip set and allows data RAM to be added in 4 kbyte increments. The HC11 controller IC chip set is implemented in the Peregrine Semiconductor 0.5 micron Silicon-on-Sapphire (SOS) process using a custom high temperature cell library developed at Oklahoma State University. Yield data is presented for all, the HC11, SPI-RAM and ROM. The lessons learned in this project were extended to the successful development of two high temperature versions of the LEON3 and a companion 8 Kbyte SRAM, a 200 degrees C version for the Navy and a 275 degrees C version for the gas industry.
NTIS
Data Acquisition; Microcomputers; Microprocessors

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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*.

20090026266 Government Accountability Office, Washington, DC, USA
Cybersecurity: Continued Federal Efforts Are Needed to Protect Critical Systems and Information
June 25, 2009; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): GAO-09-835T; No Copyright; Avail.: CASI: A03, Hardcopy

Federal laws and policy have assigned important roles and responsibilities to the Department of Homeland Security (DHS) and the National Institute of Standards and Technology (NIST) for securing computer networks and systems. DHS is charged with coordinating the protection of computer-reliant critical infrastructure--much of which is owned by the private sector--and securing its own computer systems, while NIST is responsible for developing standards and guidelines for implementing security controls over information and information systems. GAO was asked to describe cybersecurity efforts at DHS and NIST--including partnership activities with the private sector--and the use of cybersecurity performance metrics in the federal government. To do so, GAO relied on its reports on federal information security and federal efforts to fulfill national cybersecurity responsibilities. GAO has previously made about 30 recommendations to help DHS fulfill its cybersecurity responsibilities and resolve underlying challenges. In addition, GAO has made about 60 recommendations to strengthen security over information systems supporting DHS's programs for border security and its terrorist watch list. DHS has actions planned and underway to implement them.
Derived from text
Computer Networks; Information Systems; Computer Security; Network Control; Systems Management

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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.

20090025391 Army Missile Command, Redstone Arsenal, AL USA
ProtoCore
Mar 10, 2008; 14 pp.; In English; DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500279; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overview of the MATREX ProtoCore system.
DTIC
Application Programming Interface; Computerized Simulation

20090025392 Army Missile Command, Redstone Arsenal, AL USA
MATREX Simulation Initialization
Mar 10, 2008; 9 pp.; In English; DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overview of the MATREX Simulation Initialization.
DTIC
Distributed Interactive Simulation; Simulation

20090025393 Army Missile Command, Redstone Arsenal, AL USA
Advance Testing Capability (ATC)
Mar 10, 2008; 10 pp.; In English; DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500277; No Copyright; Avail.: Defense Technical Information Center (DTIC)
An overview of the Advance Testing Capability (ATC) of MATREX.
DTIC
Air Traffic Control; Distributed Interactive Simulation; Evaluation; System Effectiveness

20090025394 Army Missile Command, Redstone Arsenal, AL USA
MATREX Simulation Architecture
Mar 10, 2008; 11 pp.; In English; DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500276; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The MATREX program has a mission to provide a collection of multi-fidelity models, simulations and tools that are integrated into an established architecture to conduct analyses, experimentation and technology trade-offs.
DTIC
Combat; Simulation

20090025399 Army Research Development and Engineering Command, Fort Belvoir, VA USA
MATREX Run Time Interface (RTI)
Hurt, Tom; Metevier, Chris; Smith, Gary; Vintilescu, John; Snively, Keith; Mar 10, 2008; 12 pp.; In English; 2008 DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500177; No Copyright; Avail.: Defense Technical Information Center (DTIC)
High Level Architecture (HLA) is an architecture for supporting reuse and interoperability for distributed Modeling and Simulation. Run-Time Infrastructure (RTI) is the software execution component of HLA. The RTI software provides a set of services used by federates to coordinate their operations and data exchange during a runtime execution.
DTIC
Application Programming Interface; Computerized Simulation

20090025491 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Source Tree Composition
De Jonge, M.; Feb. 28, 2002; 18 pp.; In English
Report No.(s): PB2009-111427; SEN-R0204; Copyright; Avail.: National Technical Information Service (NTIS)
Dividing software systems in components improves software reusability as well as software maintainability. Components live at several levels, we concentrate on the implementation level where components are formed by source files, divided over directory structures. Such source code components are usually strongly coupled in the directory structure of a software system. Their compilation is usually controlled by a single global build process. This entangling of source trees and build processes often makes reuse of source code components in different software systems difficult. It also makes software systems inflexible because integration of additional source code components in source trees and build processes is difficult. This paper's subject is to increase software reuse by decreasing coupling of source code components. It is achieved by automized assembly of software systems from reusable source code components and involves integration of source trees, build processes, and configuration processes. Application domains include 'generative programming, product-line architectures, and commercial off-the-shelf (COTS)' software engineering.
NTIS
Computer Programming; Computer Programs; Software Engineering; Software Reuse

20090025493 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Linux Kernel as Flexible Product-Line Architecture
De Jonge, M.; Feb. 28, 2002; 10 pp.; In English
Report No.(s): PB2009-111428; SEN-R0205; Copyright; Avail.: National Technical Information Service (NTIS)
The Linux kernel source tree is huge (> 125 MB) and inflexible (because it is difficult to add new kernel components). We propose to make this architecture more flexible by assembling kernel source trees dynamically from individual kernel

components. Users then, can select what component they really need. Hardware vendors can easily support the Linux platform by providing additional separately developed kernel components. We demonstrate how the kernel's build process can be setup for this approach and how individual build processes look like. We use a technique called 'source tree composition' to assemble source trees of components. We demonstrate how it is automated by the tool autobundle. We also propose a kernel component base as central repository of kernel components. It forms a central meeting point for kernel developers and users.
NTIS
Architecture (Computers); Kernel Functions; Unix (Operating System); Software Engineering

20090025974 NASA Langley Research Center, Hampton, VA, USA
Rewriting Logic Semantics of a Plan Execution Language
Dowek, Gilles; Munoz, Cesar A.; Rocha, Camilo; June 2009; 25 pp.; In English
Contract(s)/Grant(s): NCC1-02043; WBS 015792.04.01.0423
Report No.(s): NASA/TM-2009-215770; L-19700; LF99-8984; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025974

The Plan Execution Interchange Language (PLEXIL) is a synchronous language developed by NASA to support autonomous spacecraft operations. In this paper, we propose a rewriting logic semantics of PLEXIL in Maude, a high-performance logical engine. The rewriting logic semantics is by itself a formal interpreter of the language and can be used as a semantic benchmark for the implementation of PLEXIL executives. The implementation in Maude has the additional benefit of making available to PLEXIL designers and developers all the formal analysis and verification tools provided by Maude. The formalization of the PLEXIL semantics in rewriting logic poses an interesting challenge due to the synchronous nature of the language and the prioritized rules defining its semantics. To overcome this difficulty, we propose a general procedure for simulating synchronous set relations in rewriting logic that is sound and, for deterministic relations, complete. We also report on the finding of two issues at the design level of the original PLEXIL semantics that were identified with the help of the executable specification in Maude.
Author
Autonomy; Program Verification (Computers); Semantics

20090026053 Product Manager Tactical Battle Command, Fort Monmouth, NJ USA
Evolutionary Capabilities Developed and Fielded in Nine Months
Crowe, Portia; Cloutier, Robert; CrossTalk: The Journal of Defense Software Engineering; Jun 2009, pp. 15-17; In English
Report No.(s): AD-A499893; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499893

The DoD is facing challenges to rapidly deploy operational capabilities in complex environments where bridging legacy and new technologies are key to success. The challenges arise as a result of diminishing budgets and the need for new capabilities to operate in war environments, including the global war on terrorism. To balance this imperative need with rapid response, we found that our developed Agile life-cycle paradigm was a viable solution to meet challenges brought about by changes in the environment. This article demonstrates how a DoD program used an Agile approach, throughout every phase of the program's life cycle, to rapidly field capabilities.
DTIC
Technology Transfer; Management Information Systems; Project Management

20090026163 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Decisive Routing and Admission Control According to Quality of Service Constraints
Reese, Cindy C.; Mar. 2009; 110 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-09-267
Report No.(s): AD-A499998; AFIT/GE/ENG/09-36; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499998

This thesis will research, model, and propose options to enhance command and control in for communication networks. My goal is to research the viability of combing past research in the areas of network prediction, context-aware routing, and QoSbased routing optimization in order to create an intelligent routing protocol platform for mobile networks. It will consolidate efforts from an Intelligent Agent Based Framework to Maximize Information Utility by Captain John Pecarina, Dial-able Cryptography for Wireless Networks by Major Marnita Eaddie, and Stochastic Estimation and Control of Queues within a Computer Network by Captain Nathan Stuckey. My thesis will create a platform that is greater than the sum of its

individual parts. The platform will take predictions about the health of the network and will take the priority level of a commodity that needs to be routed, and then will this information to intelligently route the commodity in such a way as to optimize the flow of network traffic. Developing this platform will ensure that the forward commander can make intelligent decisions at the right time using the right information and on the right network.
DTIC
Command and Control; Communication Networks; Decision Making

20090026214 NASA Ames Research Center, Moffett Field, CA, USA
A Survey of New Trends in Symbolic Execution for Software Testing and Analysis
Pasareanu, Corina S.; Visser, Willem; June 25, 2009; 14 pp.; In English; Original contains black and white illustrations
Report No.(s): ARC-E-DAA-TN-140; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026214

Symbolic execution is a well-known program analysis technique which represents values of program inputs with symbolic values instead of concrete (initialized) data and executes the program by manipulating program expressions involving the symbolic values. Symbolic execution has been proposed over three decades ago but recently it has found renewed interest in the research community, due in part to the progress in decision procedures, availability of powerful computers and new algorithmic developments. We provide a survey of some of the new research trends in symbolic execution, with particular emphasis on applications to test generation and program analysis. We first describe an approach that handles complex programming constructs such as input data structures, arrays, as well as multi-threading. We follow with a discussion of abstraction techniques that can be used to limit the (possibly infinite) number of symbolic configurations that need to be analyzed for the symbolic execution of looping programs. Furthermore, we describe recent hybrid techniques that combine concrete and symbolic execution to overcome some of the inherent limitations of symbolic execution, such as handling native code or availability of decision procedures for the application domain. Finally, we give a short survey of interesting new applications, such as predictive testing, invariant inference, program repair, analysis of parallel numerical programs and differential symbolic execution.
Author
Program Verification (Computers); Data Structures; Symbolic Programming; Predictions; Algorithms; Computers

20090026335 NASA Ames Research Center, Moffett Field, CA, USA
Automatic Testcase Generation for Flight Software
Bushnell, David Henry; Pasareanu, Corina; Mackey, Ryan M.; April 13, 2008; 23 pp.; In English; NASA Planetary Spacecraft Fault Management Workshop, 13 Apr. 2008, Louisiana, USA; Original contains color illustrations
Contract(s)/Grant(s): NNA07BB97C
Report No.(s): ARC-E-DAA-TN-102; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026335

The TacSat3 project is applying Integrated Systems Health Management (ISHM) technologies to an Air Force spacecraft for operational evaluation in space. The experiment will demonstrate the effectiveness and cost of ISHM and vehicle systems management (VSM) technologies through onboard operation for extended periods. We present two approaches to automatic testcase generation for ISHM: 1) A blackbox approach that views the system as a blackbox, and uses a grammar-based specification of the system's inputs to automatically generate *all* inputs that satisfy the specifications (up to prespecified limits); these inputs are then used to exercise the system. 2) A whitebox approach that performs analysis and testcase generation directly on a representation of the internal behaviour of the system under test. The enabling technologies for both these approaches are model checking and symbolic execution, as implemented in the Ames' Java PathFinder (JPF) tool suite. Model checking is an automated technique for software verification. Unlike simulation and testing which check only some of the system executions and therefore may miss errors, model checking exhaustively explores all possible executions. Symbolic execution evaluates programs with symbolic rather than concrete values and represents variable values as symbolic expressions. We are applying the blackbox approach to generating input scripts for the Spacecraft Command Language (SCL) from Interface and Control Systems. SCL is an embedded interpreter for controlling spacecraft systems. TacSat3 will be using SCL as the controller for its ISHM systems. We translated the SCL grammar into a program that outputs scripts conforming to the grammars. Running JPF on this program generates all legal input scripts up to a prespecified size. Script generation can also be targeted to specific parts of the grammar of interest to the developers. These scripts are then fed to the SCL Executive. ICS's in-house coverage tools will be run to measure code coverage. Because the scripts exercise all parts of the grammar, we expect them to provide high code coverage. This blackbox approach is suitable for systems for which we do not have access to the source code. We are applying whitebox test generation to the Spacecraft Health INference Engine (SHINE) that

is part of the ISHM system. In TacSat3, SHINE will execute an on-board knowledge base for fault detection and diagnosis. SHINE converts its knowledge base into optimized C code which runs onboard TacSat3. SHINE can translate its rules into an intermediate representation (Java) suitable for analysis with JPF. JPF will analyze SHINE's Java output using symbolic execution, producing testcases that can provide either complete or directed coverage of the code. Automatically generated test suites can provide full code coverage and be quickly regenerated when code changes. Because our tools analyze executable code, they fully cover the delivered code, not just models of the code. This approach also provides a way to generate tests that exercise specific sections of code under specific preconditions. This capability gives us more focused testing of specific sections of code.
Author
Applications Programs (Computers); Fault Detection; Program Verification (Computers); Systems Health Monitoring; Software Reliability; Flight Management Systems

20090026368 NASA Ames Research Center, Moffett Field, CA, USA
Tool Support for Parametric Analysis of Large Software Simulation Systems
Schumann, Johann; Gundy-Burlet, Karen; Pasareanu, Corina; Menzies, Tim; Barrett, Tony; September 15, 2008; 2 pp.; In English; Tools Workshop: Automated Software Engineering, 15 Sep. 2008, L'Aquila, Italy; Original contains color illustrations
Contract(s)/Grant(s): NNA07BB97C
Report No.(s): ARC-E-DAA-TN-169; Copyright; Avail.: CASI: A01, Hardcopy

The analysis of large and complex parameterized software systems, e.g., systems simulation in aerospace, is very complicated and time-consuming due to the large parameter space, and the complex, highly coupled nonlinear nature of the different system components. Thus, such systems are generally validated only in regions local to anticipated operating points rather than through characterization of the entire feasible operational envelope of the system. We have addressed the factors deterring such an analysis with a tool to support envelope assessment: we utilize a combination of advanced Monte Carlo generation with n-factor combinatorial parameter variations to limit the number of cases, but still explore important interactions in the parameter space in a systematic fashion. Additional test-cases, automatically generated from models (e.g., UML, Simulink, Stateflow) improve the coverage. The distributed test runs of the software system produce vast amounts of data, making manual analysis impossible. Our tool automatically analyzes the generated data through a combination of unsupervised Bayesian clustering techniques (AutoBayes) and supervised learning of critical parameter ranges using the treatment learner TAR3. The tool has been developed around the Trick simulation environment, which is widely used within NASA. We will present this tool with a GN&C (Guidance, Navigation and Control) simulation of a small satellite system.
Author
Computer Programs; Systems Simulation; Complex Systems; Systems Analysis; Combinatorial Analysis; Computerized Simulation; Monte Carlo Method

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20090025397 Defense Inst. of Security Assistance Management, Wright-Patterson AFB, OH USA
Defense Security Assistance Management System (DSAMS), Part 2
Berdahl, Nels E; DISAM Journal, v21 n1 p83-105, Fall 1998; Jan 1998; Volume 21, No. 1, pp. 83-105; In English
Report No.(s): AD-A500257; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The feature article of the summer issue of the DISAM Journal discussed the background and development methodology of the Defense Security Assistance Management System (DSAMS). This article continues the discussion of DSAMS with an update on development efforts during the summer and a look at some details of the actual software. Multi-service Case Execution teams continue defining case execution requirements of the new system. Many execution process reviews will be complete by the end of 1998, but this effort will continue into next year as a single team integrates the various teams' work products. A second team will tackle the remaining processes needed for full Case Execution functionality. The DSAMS team tested and deployed DSAMS Release 4 toward the end of the summer. This release updated the commercial off-the-shelf (COTS) software and was needed to ensure the DSAMS application would be Year 2000 (Y2K) compliant. Release 5 has additional case development capabilities and will be distributed this fall. Additional Navy and Air Force sites will begin using

the Release 5 software during the winter and spring months. Army use of DSAMS will begin as soon as data conversion issues are resolved.
DTIC
Commercial Off-the-Shelf Products; Computer Programming; Computer Programs; Financial Management; Management Systems; Security; Software Engineering; Warning Systems

20090025468 NASA Langley Research Center, Hampton, VA, USA
Baseline Assessment and Prioritization Framework for IVHM Integrity Assurance Enabling Capabilities
Cooper, Eric G.; DiVito, Benedetto L.; Jacklin, Stephen A.; Miner, Paul S.; June 2009; 22 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 645846.02.07.07.15.02
Report No.(s): NASA/TM-2009-215764; L-19688; LF99-8858; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025468

Fundamental to vehicle health management is the deployment of systems incorporating advanced technologies for predicting and detecting anomalous conditions in highly complex and integrated environments. Integrated structural integrity health monitoring, statistical algorithms for detection, estimation, prediction, and fusion, and diagnosis supporting adaptive control are examples of advanced technologies that present considerable verification and validation challenges. These systems necessitate interactions between physical and software-based systems that are highly networked with sensing and actuation subsystems, and incorporate technologies that are, in many respects, different from those employed in civil aviation today. A formidable barrier to deploying these advanced technologies in civil aviation is the lack of enabling verification and validation tools, methods, and technologies. The development of new verification and validation capabilities will not only enable the fielding of advanced vehicle health management systems, but will also provide new assurance capabilities for verification and validation of current generation aviation software which has been implicated in anomalous in-flight behavior. This paper describes the research focused on enabling capabilities for verification and validation underway within NASA s Integrated Vehicle Health Management project, discusses the state of the art of these capabilities, and includes a framework for prioritizing activities.
Author
Software Engineering; Structural Health Monitoring; Systems Health Monitoring; Program Verification (Computers); Fault Detection

20090026164 Virginia Univ., Charlottesville, VA USA
Software Exploit Prevention and Remediation via Software Memory Protection
Coleman, Clark L; Co, Michele; Davidson, Jack W; Knight, John C; Nguyen-Tuong, Anh; Hiser, Jason D; May 2009; 28 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-07-2-0029; Proj-NICE
Report No.(s): AD-A499993; AFRL-RI-RS-TR-2009-140; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499993

Deployed software often contains memory overwriting vulnerabilities which can be exploited by malicious users who provide input that causes critical data to be overwritten in the program (called a memory overwriting exploit). There are a wide variety of such exploits (e.g. buffer overflows, formatting string exploits, etc.). Some defenses have been limited to defeating memory overwrites in heap or stack memory, and most defenses require access to source code. The Software Memory Protection (SMP) project addresses these limitations and shortcomings by supplying a general defense against all known memory overwriting exploits, requiring no source or object code or recompilation of the protected application, with a remediation mechanism that does not rely on crashing the program to defeat attempted exploits. Therefore, SMP: (i) can defend a program binary for which no source code is available, including its linked libraries; (ii) need not be combined with any other defense against memory overwriting; and (iii) does not turn exploits into potential DOS (denial of service) attacks. SMP can be applied to a binary during testing, field deployment, or both.
DTIC
Computer Information Security; Prevention; Protection

20090026333 NASA Ames Research Center, Moffett Field, CA, USA
Closing the Certification Gaps in Adaptive Flight Control Software
Jacklin, Stephen A.; August 18, 2008; 19 pp.; In English; AIAA 2008 Guidance, Navigation, and Control Conference, 18-21 Aug. 2008, Hawaii, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS: 457280.02.07.01.01
Report No.(s): ARC-E-DAA-TN-166; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026333

Over the last five decades, extensive research has been performed to design and develop adaptive control systems for aerospace systems and other applications where the capability to change controller behavior at different operating conditions is highly desirable. Although adaptive flight control has been partially implemented through the use of gain-scheduled control, truly adaptive control systems using learning algorithms and on-line system identification methods have not seen commercial deployment. The reason is that the certification process for adaptive flight control software for use in national air space has not yet been decided. The purpose of this paper is to examine the gaps between the state-of-the-art methodologies used to certify conventional (i.e., non-adaptive) flight control system software and what will likely to be needed to satisfy FAA airworthiness requirements. These gaps include the lack of a certification plan or process guide, the need to develop verification and validation tools and methodologies to analyze adaptive controller stability and convergence, as well as the development of metrics to evaluate adaptive controller performance at off-nominal flight conditions. This paper presents the major certification gap areas, a description of the current state of the verification methodologies, and what further research efforts will likely be needed to close the gaps remaining in current certification practices. It is envisioned that closing the gap will require certain advances in simulation methods, comprehensive methods to determine learning algorithm stability and convergence rates, the development of performance metrics for adaptive controllers, the application of formal software assurance methods, the application of on-line software monitoring tools for adaptive controller health assessment, and the development of a certification case for adaptive system safety of flight.
Author
Adaptive Control; Certification; Flight Control; On-Line Systems; Aircraft Control

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*.

20090026213 NASA Ames Research Center, Moffett Field, CA, USA
Human/Automation Trade Methodology for the Moon, Mars and Beyond
Korsmeyer, David J.; September 29, 2009; 1 pp.; In English; 59th International Astronautical Congress Conference, 29 Sep. 2008, Glasgow, Scotland, UK
Contract(s)/Grant(s): WBS 282938.02.03.20.99
Report No.(s): ARC-E-DAA-TN-115; No Copyright; Avail.: Other Sources; Abstract Only

It is possible to create a consistent trade methodology that can characterize operations model alternatives for crewed exploration missions. For example, a trade-space that is organized around the objective of maximizing Crew Exploration Vehicle (CEV) independence would have the input as a classification of the category of analysis to be conducted or decision to be made, and a commitment to a detailed point in a mission profile during which the analysis or decision is to be made. For example, does the decision have to do with crew activity planning, or life support? Is the mission phase trans-Earth injection, cruise, or lunar descent? Different kinds of decision analysis of the trade-space between human and automated decisions will occurs at different points in a mission's profile. The necessary objectives at a given point in time during a mission will call for different kinds of response with respect to where and how computers and automation are expected to help provide an accurate, safe, and timely response. In this paper, a consistent methodology for assessing the trades between human and automated decisions on-board will be presented and various examples discussed.
Author
Automation; Operations Research; Space Exploration; Cybernetics

20090026216 NASA Ames Research Center, Moffett Field, CA, USA
Reactive, Safe Navigation for Lunar and Planetary Robots
Utz, Hans; Ruland, Thomas; September 08, 2008; 11 pp.; In English; Space 2008, 8 Sep. 2008, San Diego, CA, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNA07BB97C
Report No.(s): ARC-E-DAA-TN-160; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026216

When humans return to the moon, Astronauts will be accompanied by robotic helpers. Enabling robots to safely operate near astronauts on the lunar surface has the potential to significantly improve the efficiency of crew surface operations. Safely operating robots in close proximity to astronauts on the lunar surface requires reactive obstacle avoidance capabilities not available on existing planetary robots. In this paper we present work on safe, reactive navigation using a stereo based high-speed terrain analysis and obstacle avoidance system. Advances in the design of the algorithms allow it to run terrain analysis and obstacle avoidance algorithms at full frame rate (30Hz) on off the shelf hardware. The results of this analysis are fed into a fast, reactive path selection module, enforcing the safety of the chosen actions. The key components of the system are discussed and test results are presented.
Author
Robots; Terrain Analysis; Obstacle Avoidance; Lunar Surface; Navigation; Robotics

20090026328 NASA Ames Research Center, Moffett Field, CA, USA
Workflow Agents vs. Expert Systems: Problem Solving Methods in Work Systems Design
Clancey, William J.; Sierhuis, Maarten; Seah, Chin; [2009]; 61 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS: 282938.02.08.20.9
Report No.(s): ARC-E-DAA-TN-147; Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026328

During the 1980s, a community of artificial intelligence researchers became interested in formalizing problem solving methods as part of an effort called 'second generation expert systems' (2nd GES). How do the motivations and results of this research relate to building tools for the workplace today? We provide an historical review of how the theory of expertise has developed, a progress report on a tool for designing and implementing model-based automation (Brahms), and a concrete example how we apply 2nd GES concepts today in an agent-based system for space flight operations (OCAMS). Brahms incorporates an ontology for modeling work practices, what people are doing in the course of a day, characterized as 'activities.' OCAMS was developed using a simulation-to-implementation methodology, in which a prototype tool was embedded in a simulation of future work practices. OCAMS uses model-based methods to interactively plan its actions and keep track of the work to be done. The problem solving methods of practice are interactive, employing reasoning for and through action in the real world. Analogously, it is as if a medical expert system were charged not just with interpreting culture results, but actually interacting with a patient. Our perspective shifts from building a 'problem solving' (expert) system to building an actor in the world. The reusable components in work system designs include entire 'problem solvers' (e.g., a planning subsystem), interoperability frameworks, and workflow agents that use and revise models dynamically in a network of people and tools. Consequently, the research focus shifts so 'problem solving methods' include ways of knowing that models do not fit the world, and ways of interacting with other agents and people to gain or verify information and (ultimately) adapt rules and procedures to resolve problematic situations.
Author
Expert Systems; Problem Solving; Artificial Intelligence; Software Engineering

20090026330 NASA Ames Research Center, Moffett Field, CA, USA
An Optimal Control Modification to Model-Reference Adaptive Control for Fast Adaptation
Nguyen, Nhan T.; Krishnakumar, Kalmanje; Boskovic, Jovan; August 18, 2008; 18 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 18 Aug. 2008, Hawaii, USA; Original contains color and black and white illustrations
Report No.(s): ARC-E-DAA-TN-151; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026330

This paper presents a method that can achieve fast adaptation for a class of model-reference adaptive control. It is well-known that standard model-reference adaptive control exhibits high-gain control behaviors when a large adaptive gain is used to achieve fast adaptation in order to reduce tracking error rapidly. High gain control creates high-frequency oscillations that can excite unmodeled dynamics and can lead to instability. The fast adaptation approach is based on the minimization of the squares of the tracking error, which is formulated as an optimal control problem. The necessary condition

of optimality is used to derive an adaptive law using the gradient method. This adaptive law is shown to result in uniform boundedness of the tracking error by means of the Lyapunov s direct method. Furthermore, this adaptive law allows a large adaptive gain to be used without causing undesired high-gain control effects. The method is shown to be more robust than standard model-reference adaptive control. Simulations demonstrate the effectiveness of the proposed method.
Author
Adaptation; Model Reference Adaptive Control; Optimal Control; Flight Control; Aircraft Control

20090026331 NASA Ames Research Center, Moffett Field, CA, USA
Field Testing of Utility Robots for Lunar Surface Operations
Fong, Terrence; Bualat, Maria; Deans, Matt; Allan, Mark; Bouyssounouse, Xavier; Broxton, Michael; Edwards, Laurence; Lee, Pascal; Lee, Susan Y.; Lees, David; Park, Eric; Pedersen, Liam; Smith, Trey; To, Vinh; Utz, Hans; Pacis, Estrellina; Schreckenghost, Debra; September 09, 2008; 14 pp.; In English; Space 2008, 9 Sep. 2009, California, USA; Original contains color illustrations
Report No.(s): ARC-E-DAA-164; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026331

Since 2004, NASA has been working to return to the Moon. In contrast to the Apollo missions, two key objectives of the current exploration program is to establish significant infrastructure and an outpost. Achieving these objectives will enable long-duration stays and long-distance exploration of the Moon. To do this, robotic systems will be needed to perform tasks which cannot, or should not, be performed by crew alone. In this paper, we summarize our work to develop 'utility robots' for lunar surface operations, present results and lessons learned from field testing, and discuss directions for future research.
Author
Lunar Surface; Field Tests; Robotics; Robots; Moon

20090026332 NASA Ames Research Center, Moffett Field, CA, USA
FootFall: A Ground Based Operations Toolset Enabling Walking for the ATHLETE Rover
SunSpiral, Vytas; Chavez-Clemente, Daniel; Broxton, Michael; Keely, Leslie; Mihelich, Patrick; Mittman, David; Collins, Curtis; September 09, 2008; 14 pp.; In English; Space 2008, 9 Sep. 2008, California, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS: 431731.04.01.02
Report No.(s): ARC-E-DAA-TN-158; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026332

The ATHLETE (All-Terrain Hex-Limbed Extra-Terrestrial Explorer) vehicle consists of six identical, six degree of freedom limbs. FootFall is a ground tool for ATHLETE intended to provide an operator with integrated situational awareness, terrain reconstruction, stability and safety analysis, motion planning, and decision support capabilities to enable the efficient generation of flight software command sequences for walking. FootFall has been under development at NASA Ames for the last year, and having accomplished the initial integration, it is being used to generate command sequences for single footfalls. In this paper, the architecture of FootFall in its current state will be presented, results from the recent Human Robotic Systems Project?s Integrated Field Test (Moses Lake, Washington, June, 2008) will be discussed, and future plans for extending the capabilities of FootFall to enable ATHLETE to walk across a boulder field in real time will be described.
Author
Applications Programs (Computers); Robotics; Stability Tests; Walking; Man Machine Systems; Decision Support Systems; Lakes

64
NUMERICAL ANALYSIS

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

20090025462 NASA Glenn Research Center, Cleveland, OH, USA
Probabilistic Multi-Factor Interaction Model for Evaluating Continuous Smooth Curves
Chamis, Christos C.; May 04, 2009; 7 pp.; In English; 50th AIAA/SDM Conference, 4-7 May 2009, Palm Springs, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 561581.02.10.03.23
Report No.(s): E-16963; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025462

The Multi-Factor Interaction Model (MFIM) is used to evaluate the divot weight (foam weight ejected) from launch

external tanks. The MFIM has sufficient degrees of freedom to evaluate a large number of factors that may contribute to the divot ejection. It also accommodates all interactions by its product form. Each factor has an exponent that satisfies only two points the initial and final points. They are selected so that the MFIM will generate a common curve to fit the individual point data. The results show that the approach used generates the continuous curve.
Author
Mathematical Models; Metal Foams; Probability Theory

20090026029 Arizona State Univ., Tempe, AZ USA
Normalized Implicit Radial Models for Scattered Point Cloud Data without Normal Vectors
Nielson, Gregory M; Mar 23, 2009; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W911NF-05-1-0301
Report No.(s): AD-A499959; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499959

We describe some new methods for obtaining a mathematical representation of a surface that approximates a scattered point cloud, {(x y z) i N} i i i , , = 1,L, without the use or need of normal vector data. The fitting surface is defined implicitly as the level set of a field function which is a linear combination of trivariate radial basis functions. Optimal approximations are based upon normalized least squares criteria which lead to eigenvalue/eigenvector characterizations. The normalized aspect allows for the exclusion of the need of normal vector estimates which is one of the unique features of this new method. Localizing techniques are introduced to allow for the efficient application of these new methods to large data sets. The use of a variety of radial basis functions are introduced through various examples that illustrate the performance and efficiency of the new methods.
DTIC
Least Squares Method; Approximation; Estimates

65
STATISTICS AND PROBABILITY

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

20090025350 Geological Survey, Reston, VA USA; Bureau of Reclamation, Washington, DC, USA
Summary of Survival Data from Juvenile Coho Salmon in the Klamath River, Northern California, 2008
Beeman, J. W.; Juhnke, S.; Hansel, H. C.; January 2009; 14 pp.; In English
Report No.(s): PB2009-111819; USGS/OFR-2009-1019; No Copyright; Avail.: CASI: A03, Hardcopy

A study to estimate the effects of Iron Gate Dam discharge on ESA-listed juvenile coho salmon during their seaward migration to the ocean was begun in 2005. Estimates of survival through various reaches of river downstream from the dam were completed in 2006, 2007, and 2008 as part of this process. This report describes the estimates of survival during 2008, and is a complement to similar reports from 2006 and 2007. In each year, a series of models were evaluated to determine apparent survival and recapture probabilities of radio-tagged fish in several river reaches between Iron Gate Hatchery at river kilometer 309 and a site at river kilometer 33. These results indicate most trends in survival among reaches were similar to those from 2006 and 2007, but the magnitudes of the estimated survivals were lower in 2008. The differences in survivals from Iron Gate Hatchery to river kilometer 33 in 2006 (0.653 SE 0.039), 2007 (0.497 SE 0.044), and 2008 (0.406 SE 0.032) were caused primarily by differences in survival upstream from the Scott River. This report is intended as a brief description of the survivals estimated from the fish released in 2008 to be used by others interested in the data.
NTIS
California; Fishes; Rivers; Survival

20090025450 NASA Langley Research Center, Hampton, VA, USA
Recent Advances in Model-Assisted Probability of Detection
Thompson, R. Bruce; Brasche, Lisa J.; Lindgren, Eric; Swindell, Paul; Winfree, William P.; June 24, 2009; 7 pp.; In English; 4th European-American Workshop on Reliability of NDE, 24-26 Jun. 2009, Berlin, Germany; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 736466.02.09.07.99
Report No.(s): LF99-9094; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025450

The increased role played by probability of detection (POD) in structural integrity programs, combined with the

significant time and cost associated with the purely empirical determination of POD, provides motivation for alternate means to estimate this important metric of NDE techniques. One approach to make the process of POD estimation more efficient is to complement limited empirical experiments with information from physics-based models of the inspection process or controlled laboratory experiments. The Model-Assisted Probability of Detection (MAPOD) Working Group was formed by the Air Force Research Laboratory, the FAA Technical Center, and NASA to explore these possibilities. Since the 2004 inception of the MAPOD Working Group, 11 meetings have been held in conjunction with major NDE conferences. This paper will review the accomplishments of this group, which includes over 90 members from around the world. Included will be a discussion of strategies developed to combine physics-based and empirical understanding, draft protocols that have been developed to guide application of the strategies, and demonstrations that have been or are being carried out in a number of countries. The talk will conclude with a discussion of future directions, which will include documentation of benefits via case studies, development of formal protocols for engineering practice, as well as a number of specific technical issues.
Author
Detection; Probability Theory; Inspection; Models; Transfer Functions

20090026027 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Robust Sensitivity Analysis for the Joint Improvised Explosive Device Defeat Organization (JIEDDO) Proposal Selection Model
Willy, Christina J; Mar 2009; 135 pp.; In English; Original contains color illustrations
Report No.(s): AD-A499984; AFIT/GOR/ENS/09-17; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499984

Throughout Operations Iraqi Freedom and Enduring Freedom, the Department of Defense (DoD) faced challenges not experienced in its previous military operations. The enemy's unwavering dedication to the use of improvised explosive devices (IEDs) against the coalition forces continues to challenge the day-to-day operations of the current war. The Joint Improvised Explosive Device Defeat Organization's (JIEDDO) proposal solicitation process enables military and nonmilitary organizations to request funding for the development of Counter-Improvised Explosive Device (C-IED) projects. Decision Analysis (DA) methodology serves as a tool to assist the decision maker (DM) in making an informed decision. This research applies Value Focused Thinking (VFT), a specific methodology within DA, to the JIEDDO proposal selection process to assist DMs in filtering out proposals that do not meet desired C-IED objectives. This research evaluated the validity of the previously developed JIEDDO Proposal Value Model to address the following questions: (1) Does the value model adequately reflect JIEDDO's decision process; and (2) Given the dynamic environment of the current war, how confident can we be in the model's ability to continually and effectively screen proposals based JIEDDO's current values? The author utilizes multivariate techniques to investigate JIEDDO's ability to make consistent decisions within their proposal evaluation process. Once it has been determined that the model effectively screens proposals, it is possible to proceed with the second question. By consolidating and applying n-way sensitivity analysis techniques, the author proposes a consistent sensitivity analysis image profiling technique.
DTIC
Contracts; Countermeasures; Decision Support Systems; Decision Theory; Defense Program; Explosive Devices; Explosives; Sensitivity Analysis

20090026311 NASA Johnson Space Center, Houston, TX, USA
Intermediate/Advanced Research Design and Statistics
Ploutz-Snyder, Robert; July 13, 2009; 223 pp.; In English; Foundations II Institute: Advanced Practice of Institutional Research, 13-17 Jul. 2009, Detroit, MI, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18516; Copyright; Avail.: CASI: A10, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026311

The purpose of this module is To provide Institutional Researchers (IRs) with an understanding of the principles of advanced research design and the intermediate/advanced statistical procedures consistent with such designs
Derived from text
Statistical Analysis; Statistical Correlation; Research

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*.

20090025868 Brookhaven National Lab., Upton, NY USA; European Organization for Nuclear Research, Geneva, Switzerland

Weak-Strong Simulation of Head-On Beam-Beam Compensation in the RHIC

Luo, Y.; Abreu, N.; Fischer, W.; Maria, R.; Robert-Demolaize, G.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2009-952548; BNL-81828-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

In the Relativistic Heavy Ion Collider (RHIC) beams collide in the two interaction points IP6 and IP8. To further increase the bunch intensity above 2 X lO(sub 11) or further reduce the transverse emittance in polarized proton operation, there will not be enough tune space between the current working area (2/3, 7/10) to hold the beam-beam generated tune spread. We proposed a low energy DC electron beam (e-lens) with similar Gaussian transverse profiles to collide with the proton beam at IPIO. Early studies have shown that e-Iens does reduce the proton-proton beam-beam tune spread. In this article, we carried out numerical simulation to investigate the effects of the head-on beam-beam effect on the proton's colliding beam lifetime and emittance growth. The preliminary results including scans of compensation strength, phase advances between IP8 and IPl0, electron beam transverse sizes are presented. In these studies, the particle loss in the multi-particle simulation is used for the comparison between different conditions.

NTIS

Beam Interactions; Simulation

20090025899 Brookhaven National Lab., Upton, NY USA; MIT-Bates, MA, USA

MeRHIC--Staging Approach to eRHIC

Ptitsyn, V.; Beebe-Wang, J.; Ben-Zvi, I.; Burrill, A.; Calga, R.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C,, Canada

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2009-952558; BNL-81849-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

Design of a medium energy electron-ion collider (MeRHIC) is under development at the Collider Accelerator Department at BNL. The design envisions construction of a 4 GeV electron accelerator in a local area inside and near the RHIC tunnel. Electrons will be produced by a polarized electron source and accelerated in energy recovery linacs. Collisions of the electron beam with 100 GeV/u heavy ions or with 250 GeV polarized protons win be arranged in the existing IP2 interaction region of RHIC. The luminosity of electron-proton collisions at the 10(sup 32) cm(sup -2)(s sup -1) level will be achieved with 50 mA CW electron current and presently available proton beam parameters. Efficient proton beam cooling at collision energy may bring the luminosity to 10(sup 33) cm(sup -2)(sup s-1). An important feature of MeRHIC is that it serves as a first stage of eRHIC, a future electron-ion collider at BNL with both higher luminosity and energy reach. The majority of MeRHIC accelerator components will be used in eRHIC.

NTIS

Electrons; Particle Accelerators

20090025925 Brookhaven National Lab., Upton, NY USA

BNL 703 MHz SRF Cryomodule Demonstration

Burrill, A.; Ben-Zvi, I.; Calaga, R.; Dalesio, L.; May 2009; 5 pp.; In English

Contract(s)/Grant(s): DE-AC02-98CH10886

Report No.(s): DE2009-952531; BNL-81801-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

This paper win present the preliminary results of the testing of the 703 MHz SRF cryomodule designed for use in the ampere class ERL under construction at Brookhaven National Laboratory. The preliminary cavity tests, carried out at Thomas Jefferson Laboratory, demonstrated cavity performance of 20 MV1m with a Qo of lx10(sup 10) results we expect to reproduce in the horizontal configuration. This test of the entire string assembly will allow us to evaluate all of the additional cryomodule components not previously tested in the VTA and win prepare us for our next milestone test which will be delivery of electrons

from our injector through the cryomodule to the beam dump. This will also be the first demonstration of an accelerating cavity designed for use in an ampere class ERL, a key development which holds great promise for future machines.
NTIS
Superconducting Cavity Resonators; Accelerators; Electrons; Injectors

20090025952 Brookhaven National Lab., Upton, NY USA
Minimizing Emittance Growth During H-injection in the AGS Booster
Brown, K. A.; Ahrens, L.; Gardner, C.; Gassner, D.; Raparia, D.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952530; BNL-81800-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
As part of the efforts to increase polarization and luminosity in RHIC during polarized proton operations we have modified the injection optics and stripping foil geometry in the AGS Booster in order to reduce the emittance growth during H- injection. In this paper we describe the modifications, the injection process. and present results from beam experiments.
NTIS
Emittance; Injection

20090025953 Brookhaven National Lab., Upton, NY USA
Booster to AGS Transfer Line: Comparison Between Model and Measurements
Brown, K. A.; Ahrens, L.; Bonati, R.; Gassner, D.; Glenn, W.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952529; BNL-81799-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
The Booster to AGS (BtA) transfer line was designed to match both ions and protons into the AGS lattice. For proton beam operation the only constraint on the optics is to define a match to the AGS lattice. For ion operation there are additional constraints introduced by a stripping foil in the upstream part of the transfer line. For polarized proton operation there is the complication that the AGS lattice is distorted by the presence of two partial snake magnets. In the 2008 polarized proton run it was observed that there was a significant optical injection mismatch. Beam experiments were conducted that showed disagreement with the model of the BtA line. In addition, these studies revealed some minor problems with the instrumentation in the line. A new model and more reliable measurements of the transfer line magnet currents have been implemented. Another series of experiments was conducted to test these modifications and to collect a more complete set of data to allow better understanding of the beam dynamics during the transfer and better understanding of the instrumentation. In this paper we will present the results of these experiments and the comparison to the new model of the BtA.
NTIS
Line Current; Ions

20090025960 Brookhaven National Lab., Upton, NY USA
Landau Damping with High Frequency Impedance
Blaskiewicz, M.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952527; BNL-81797-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Coupled bunch longitudinal stability in the presence of high frequency impedances is considered. A frequency domain technique is developed and compared with simulations. The frequency domain techniqe allows for absolute stability tests and is applied to the problem of longitudinal stability in RHIC with the new 56 MHz RF system.
NTIS
High Frequencies; Impedance; Landau Damping

20090025962 Brookhaven National Lab., Upton, NY USA
Investigation of the Radiation Background in the Interaction Region of the Medium-Energy Electron Relativistic Heavy Ion Collider (MeRHIC)
Beebe-Wang, J.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952526; BNL-81796-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
There are three main sources of the radiation background in MeRHIC: forward synchrotron radiation generated upstream of the detector, the direct backward radiation caused by the photons hitting beam pipe downstream of the detector, and the

indirect secondary radiation caused by hard photons hitting vacuum systems, masks, collimators, absorbers or any other elements in the interaction region. In this paper, we first calculate the primary radiation distribution by employing electromagnetic theory. Then we obtain the direct backward scattering rate by applying the kinematic Born approximation deduced from scattering dynamics. The diffuse scattering cross section is calculated as a function of the surface properties of the MeRHIC vacuum system. Finally, the dominating physical processes and minimization of indirect secondary radiation is presented and discussed.
NTIS
Background Radiation; Synchrotron Radiation

20090025964 Brookhaven National Lab., Upton, NY USA
Statistical Analysis of the Multipole Components in the Magnetic Field of the RHIC Arc Regions
Beebe-Wang, J.; Jain, A.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952525; BNL-81794-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

The existence of multipolar components in the dipole and quadrupole magnets is one of the factors limiting the beam stability in the RHIC operations. Therefore, the statistical properties of the non-linear fields are crucial for understanding the beam behavior and for achieving the superior performance in RHIC. In an earlier work, the field quality analysis of the RHIC interaction regions (IR) was presented. Furthernore, a procedure for developing non-linear IR models constructed from measured multipolar data of RHIC IR magnets was described. However, the field quality in the regions outside of the RHIC IR had not yet been addressed. In this paper, we present the statistical analysis of multipolar components in the magnetic fields of the RHIC arc regions. The emphasis is on the lower order components, especially the sextupole in the arc dipole and the 12-pole in the quadrupole magnets, since they are shown to have the strongest effects on the beam stability. Finally, the inclusion of the measured multipolar components data of RHIC arc regions and their statistical properties into tracking models is discussed.
NTIS
Magnetic Dipoles; Magnetic Fields; Multipoles; Statistical Analysis

20090025968 Brookhaven National Lab., Upton, NY USA
First Polarized Proton Collisiions at a Beam Energy of 250 GeV in RHIC
Bai, M.; Alessi, A. J.; Bonati, R.; Atonian, G.; Bazilevsky, A.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952523; BNL-81791-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

After providing collisions of polarized protons at a beam energy of 100 GeV since 2001, the Relativistic Heavy Ion Collider (RHIC) at BNL had its first opportunity to collide polarized protons at its maximum beam energy of 250 GeV in the 2009 polarized proton operations. Equipped with two full Siberian snakes in each ring, RHIC preserves polarization during acceleration from injection to lOO GeV with precise control of the betatron tunes and vertical orbit distortions. However, the strong intrinsic spin resonances beyond 100 GeV are more than two times stronger than those below 100 GeV, requiring much tighter tolerances on vertical orbit distortions and betatron tunes.
NTIS
Nucleon-Nucleon Interactions; Proton Beams; Protons

20090025980 Fermi National Accelerator Lab., Batavia, IL, USA; Lancaster Univ., UK
Status of Higgs Boson Searches at the Tevatron
Sopczak, A.; Mar. 25, 2009; 20 pp.; In English
Report No.(s): DE2009-950513; FERMILAB/CONF-09-088-E-PPD-T; No Copyright; Avail.: National Technical Information Service (NTIS)

Over the last years the Tevatron Run-II has extended several limits on Higgs boson masses and coupling which were pioneered during the LEP accelerator operation between 1989 and 2000. Higgs boson searches will also be at the forefront of research at the LHC. This review concisely discusses the experimental constraints set by the CDF and DO collaborations in winter 2008/2009 at the beginning of the LHC era. Model-independent and model dependent limits on Higgs boson masses and couplings have been set and interpretations are discussed both in the Standard Model and in extended models. Recently,

for the first time the Tevatron excludes a SM Higgs boson mass range (160-170 GeV) beyond the LEP limit at 95% CL. The experimental sensitivities are estimated for the completion of the Tevatron programme.
NTIS
Higgs Bosons; Particle Accelerators; Estimating

20090026026 Fermi National Accelerator Lab., Batavia, IL, USA; Yale Univ., New Haven, CT, USA
Searches for New Physics in the TT-bar Events at CDF
Loginov, A.; Jan. 20, 2009; 3 pp.; In English
Report No.(s): DE2009-948604; FERMILAB-CONF-08-589-E; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Standard Model (Particle Physics); Quarks

20090026124 Princeton Univ., NJ, USA
Study of Muon Neutrino to Electron Neutrino Oscillations in the MINOS Experiment
Yang, T.; Mar. 2009; 303 pp.; In English
Report No.(s): DE2009-950512; No Copyright; Avail.: National Technical Information Service (NTIS)
The observation of neutrino oscillations (neutrino changing from one flavor to another) has provided compelling evidence that the neutrinos have non-zero masses and that leptons mix, which is not part of the original Standard Model of particle physics. The theoretical framework that describes neutrino oscillation involves two mass scales ((Delta)m(sub atm)(sup 2) and (Delta)m(sub sol)(sup 2)), three mixing angles ((theta)(sub 12), (theta)(sub 23), and (theta)(sub 13)) and one CP violating phase ((delta)(sub CP)). Both mass scales and two of the mixing angles ((theta)(sub 12) and (theta)(sub 23)) have been measured by many neutrino experiments. The mixing angle (theta)(sub 13), which is believed to be very small, remains unknown. The current best limit on (theta)13 comes from the CHOOZ experiment: (theta)(sub 13) < 11(sup o) at 90% C.L. at the atmospheric mass scale. (delta)(sub CP) is also unknown today. MINOS, the Main Injector Neutrino Oscillation Search, is a long baseline neutrino experiment based at Fermi National Accelerator Laboratory. The experiment uses a muon neutrino beam, which is measured 1 km downstream from its origin in the Near Detector at Fermilab and then 735 km later in the Far Detector at the Soudan mine. By comparing these two measurements, MINOS can obtain parameters in the atmospheric sector of neutrino oscillations. MINOS has published results on the precise measurement of (Delta)m(sub atm)(sup 2) and (theta)(sub 23) through the disappearance of muon neutrinos in the Far Detector and on a search for sterile neutrinos by looking for a deficit in the number of neutral current interactions seen in the Far Detector.
NTIS
Electron Oscillations; Muons; Neutrinos; Oscillations

20090026127 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
DARHT 2 kA Cathode Development
Mar. 2009; 116 pp.; In English
Report No.(s): DE2009-950109; HIFAN-1698; No Copyright; Avail.: National Technical Information Service (NTIS)
In the campaign to achieve 2 kA of electron beam current, we have made several changes to the DARHT-II injector during 2006-2007. These changes resulted in a significant increase in the beam current, achieving the 2 kA milestone. Until recently (before 2007), the maximum beam current that was produced from the 6.5-inch diameter (612M) cathode was about 1300 A when the cathode was operating at a maximum temperature of 1140 C. At this temperature level, the heat loss was dominated by radiation which is proportional to temperature to the fourth power. The maximum operating temperature was limited by the damage threshold of the potted filament and the capacity of the filament heater power supply, as well as the shortening of the cathode life time. There were also signs of overheating at other components in the cathode assembly. Thus it was clear that our approach to increase beam current could not be simply trying to run at a higher temperature and the preferred way was to operate with a cathode that has a lower work function. The dispenser cathode initially used was the type 612M made by SpectraMat. According to the manufacturer's bulletin, this cathode should be able to produce more than 10 A/cm(sup 2) of current density (corresponding to 2 kA of total beam current) at our operating conditions. Instead the measured emission (space charge limited) was 6 A/cm(sup 2). The result was similar even after we had revised the activation and handling procedures to adhere more closely to the recommend steps (taking longer time and nonstop to do the out-gassing). Vacuum was a major concern in considering the cathode's performance. Although the vacuum gauges at the injector vessel indicated 10(sup -8) Torr, the actual vacuum condition near the cathode in the central region of the vessel, where there might be

significant out-gassing from the heater region, was never determined. Poor vacuum at the surface of the cathode degraded the emission (by raising the work function value). We reexamined all the components in the cathode region and eliminated those parts that were suspected to be potential sources of contamination, e.g., feed-throughs with zinc coating. Finally, we considered a change in the cathode type, by using a different combination of impregnation and coating.
NTIS
Beam Currents; Cathodes

20090026132 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA
Analysis of Systematic Errors in Lateral Shearing Interferometry for EUV Optical Testing
Naulleau, P.; Goldberg, K. A.; Miyakawa, R.; Feb. 24, 2009; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-05CH11231
Report No.(s): DE2009-949972; LBNL-1623E; No Copyright; Avail.: Department of Energy Information Bridge
Lateral shearing interferometry (LSI) provides a simple means for characterizing the aberrations in optical systems at EUV wavelengths. In LSI, the test wavefront is incident on a low-frequency grating which causes the resulting diffracted orders to interfere on the CCD. Due to its simple experimental setup and high photon efficiency, LSI is an attractive alternative to point diffraction interferometry and other methods that require spatially filtering the wavefront through small pinholes which notoriously suffer from low contrast fringes and improper alignment. In order to demonstrate that LSI can be accurate and robust enough to meet industry standards, analytic models are presented to study the effects of unwanted grating and detector tilt on the system aberrations, and a method for identifying and correcting for these errors in alignment is proposed. The models are subsequently verified by numerical simulation. Finally, an analysis is performed of how errors in the identification and correction of grating and detector misalignment propagate to errors in fringe analysis.
NTIS
Error Analysis; Extreme Ultraviolet Radiation; Interferometers; Interferometry; Shearing; Systematic Errors

20090026135 Brookhaven National Lab., Upton, NY USA
Reduction of Beta(star) and Increase of Luminosity at RHIC
Pilat, F.; Bai, M.; Bruno, D.; Cameron, P.; Drees, A.; May 04, 2009; 6 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952557; BNL-81845-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
The reduction of Beta(star) beyond the 1m design value at RHIC has been consistently achieved over the last 6 years of RHIC operations resulting in an increase of luminosity for different running modes and species. During the recent 2007-08 deuteron-gold run the reduction to 0.70 from the design 1m achieved a 30% increase in delivered luminosity. The key ingredients allowing the reduction have been the capability of efficiently developing ramps with tune and coupling feedback, orbit corrections on the ramp, and collimation, to minimize beam losses in the final focus triplets, the main aperture limitations for the collision optics. We will describe the operational strategy used to reduce the Beta(star), at first squeezing the beam at store, to test feasibility, followed by the operationally preferred option of squeezing the beam during acceleration, and the resulting luminosity increase. We will conclude with future plans for the beta squeeze.
NTIS
Luminosity; Particle Accelerators; Collisions

20090026136 Brookhaven National Lab., Upton, NY USA
eRHIC Ring-Ring Design with Head-On Beam-Beam Compensation
Montag, C.; Blaskiewicz, M.; Fischer, W.; MacKay, W. W.; Pozdeyev, E.; May 04, 2009; 6 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952556; BNL-81840-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
The luminosity of the eRHIC ring-ring design is limited by the beam-beam effect exerted on the electron beam. Recent simulation studies have shown that the beam-beam limit can be increased by means of an electron lens that compensates the beam-beam effect experienced by the electron beam, This scheme requires proper design of the electron ring, providing the

correct betatron phase advance between interaction point and electron lens. We review the performance of the eRHIC ring-ring version and discuss various parameter sets, based on different cooling schemes for the proton/ion beam.
NTIS
Electron Beams; Luminosity; Proton Beams

20090026137 Brookhaven National Lab., Upton, NY USA
Interaction Region Design for a RHIC-Based Medium Energy Electron-Ion Collider
Montag, C.; Beebe-Wang, J.; Parker, B.; Trbojevic, D.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952555; BNL-81839-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
As a first step in a staged approach towards a RHIC-based electron-ion collider, installation of a 4 GeV energy-recovery linac (ERL) in one of the RHIC interaction region is currently under investigation. To minimize costs, the interaction region of this collider has to use the present RHIC magnets for focusing of the high-energy ion beam. Meanwhile, electron low-beta focusing needs to be added in the limited space available between the existing separator dipoles. We discuss the challenges and present the current design status of this e-A interaction region.
NTIS
Linear Accelerators; Ion Beams

20090026138 Brookhaven National Lab., Upton, NY USA
RHIC Progress and Future
Montag, C.; May 04, 2009; 7 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952554; BNL-81837-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
The talk reviews RHIC performance, including unprecedented manipulations of polarized beams and recent low energy operations. Achievements and limiting factors of RHIC operation are discussed, such as intrabeam scattering, electron cloud, beam-beam effects, magnet vibrations, and the efficiency of novel countermeasures such as bunched beam stochastic cooling, beam scrubbing and chamber coatings, future upgrade plans and the pertinent R&D program will also be presented.
NTIS
Research and Development; Stochastic Processes

20090026139 Brookhaven National Lab., Upton, NY USA
RHIC BPM System Average Orbit Calculations
Michnoff, R.; Cerniglia, P.; Degen, C.; Hulsart, R.; Minty, M.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952553; BNL-81836-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
RHIC beam position monitor (RPM) system average orbit was originally calculated by averaging positions of 10000 consecutive turns for a single selected bunch. Known perturbations in RHIC particle trajectories, with multiple frequencies around 10 Hz, contribute to observed average orbit fluctuations. In 2006, the number of turns for average orbit calculations was made programmable; this was used to explore averaging over single periods near 10 Hz. Although this has provided an average orbit signal quality improvement, an average over many periods would further improve the accuracy of the measured closed orbit. A new continuous average orbit calculation was developed just prior to the 2009 RHIC run and was made operational in March 2009. This paper discusses the new algorithm and performance with beam.
NTIS
Orbit Calculation; Beams (Radiation); Particle Trajectories

20090026140 Brookhaven National Lab., Upton, NY USA
High Power Fast Ramping Power Supplies
Marneris, I.; Bajon, E.; Bonati, R.; Roser, T.; Sandberg, J.; May 04, 2009; 7 pp.; In English; Particle Accelerator Conference (PAC09), Vancouver, B.C., Canada on May 4-8, 2009, 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952551; BNL-81834-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Hundred megawatt level fast ramping power converters to drive proton and heavy ion machines are under research and

development at accelerator facilities in the world. This is a leading edge technology. There are several topologies to achieve this power level. Their advantages and related issues will be discussed.
NTIS
Heavy Ions; Particle Accelerators; Supplying

20090026141 Brookhaven National Lab., Upton, NY USA
Small Gap Magnets and Vacuum Chambers for eRHIC
Meng, W.; Hao, Y.; Jain, A. K.; Litvinenko, V. N.; Mahler, G.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952552; BNL-81835-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
eRHIC(1)(2)(3), a future high luminosity electron-ion collider at Brookhaven National Laboratory (BNL), will add polarized electrons to the list of colliding species in RHIC. A 10-30 GeV electron energy recovery linac (ERL) will require up to six passes around the RHIC 3.8 km circumference. We are developing and testing small (5 mm) gap dipole and quadrupole magnets and vacuum chambers for cost-effective eRHIC passes (4). We are also studying the sensitivity of eRHIC pass optics to magnet and alignment errors in such a small magnet structure. We present the magnetic and mechanical designs of the small gap eRHIC components and prototyping test progress.
NTIS
Magnets; Particle Accelerators; Vacuum Chambers

20090026143 Brookhaven National Lab., Upton, NY USA; European Organization for Nuclear Research, Geneva, Switzerland
Overview of Magnetic Nonlinear Beam Dynamics in RHIC
Luo, Y.; Bai, M.; Beebe-Wang, J.; Bengtsson, J.; Calaga, R.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952549; BNL-81829-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
In this article we review our studies of nonlinear beam dynamics due to the nonlinear magnetic field errors in the Relativistic Heavy Ion Collider (RHIC). Nonlinear magnetic field errors, including magnetic field errors in interaction regions (IRs), chromatic sextupoles, and sextupole components from arc main dipoles are discussed. Their effects on beam dynamics and beam dynamic aperture are evaluated. The online methods to measure and correct the IR nonlinear field errors, second order chromaticities, and horizontal third order resonance are presented. The overall strategy for nonlinear corrections in RHIC is discussed.
NTIS
Nonlinearity; Beam Interactions; Correction; Errors

20090026144 Brookhaven National Lab., Upton, NY USA
Coherent Electron Cooling
Litvinenko, V.; May 04, 2009; 7 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952547; BNL-81827-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Cooling intense high-energy hadron beams remains a major challenge in modern accelerator physics. Synchrotron radiation is still too feeble, while the efficiency of two other cooling methods, stochastic and electron, falls rapidly either at high bunch intensities (i.e. stochastic of protons) or at high energies (e-cooling). In this talk a specific scheme of a unique cooling technique, Coherent Electron Cooling, win be discussed. The idea of coherent electron cooling using electron beam instabilities was suggested by Derbenev in the early 1980s, but the scheme presented in this talk, with cooling times under an hour for 7 TeV protons in the LHC, would be possible only with present-day accelerator technology. This talk will discuss the principles and the main limitations of the Coherent Electron Cooling process. The talk win describe the main system components, based on a high-gain free electron laser driven by an energy recovery linac, and will present some numerical examples for ions and protons in RHIC and the LHC and for electron-hadron options for these colliders, BNL plans a demonstration of the idea in the near future.
NTIS
Cooling; Electron Beams; Linear Accelerators; Stochastic Processes

20090026145 Brookhaven National Lab., Upton, NY USA
Simulations on the AGS Horizontal Tune Jump Mechanism
Lin, F.; Huang, H.; Luccio, A.; Roser, T.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), Vancouver, B.C., Canada on May 4-8, 2009, 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952546; BNL-81826-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

A new horizontal tune jump mechanism has been proposed to overcome the horizontal intrinsic resonances and preserve the polarization of the proton beam in the Alternating Gradient Synchrotron (AGS) during the energy ramp. An adiabatic change of the AGS lattice is needed to avoid the emittance growth in both horizontal and vertical planes, as the emittance growth can deteriorate the polarization of the proton beam. Two critical questions are necessary to be answered: how fast can the lattice be changed and how much emittance growth can be tolerated from both optics and polarization points of view. Preliminary simulations, using a realistic AGS lattice and acceleration rate, have been carried out to give a first glance of this mechanism. Results with different optics are presented in this paper.
NTIS
Polarization; Gradients; Emittance; Synchrotrons

20090026146 Brookhaven National Lab., Upton, NY USA; Advanced Energy Systems, Inc., Medford, NY, USA
Experiment to Test the Viability of a Gallium-Arsenide Cathode in a SRF Electron Gun
Kewisch, J.; Ben-Zvi, I.; Rao, T.; Burrill, A.; Pate, D.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952545; BNL-81824-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

Strained gallium arsenide cathodes are used in electron guns for the production of polarized electrons. In order to have a sufficient quantum efficiency lifetime of the cathode the vacuum in the gun must be 10(sup -11) Torr or better, so that the cathode is not destroyed by ion back bombardment or through contamination with residual gases. AU successful polarized guns are DC guns, because such vacuum levels can not be obtained in normal conducting RF guns. A superconductive RF gun may provide a sufficient vacuum level due to cryo-pumping of the cavity walls. We report on the progress of our experiment to test such a gun with normal GaAs-Cs crystals.
NTIS
Cathodes; Electron Guns; Gallium Arsenides; Viability

20090026147 Brookhaven National Lab., Upton, NY USA; Argonne National Lab., IL USA
AGS Polarized Proton Operation in Run 2009
Huang, H.; Ahrens, L.; Bai, M.; Brown, K. A.; Gardner, C.; May 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952544; BNL-81823-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

After installation of two partial snakes in the Brookhaven Alternating Gradient Synchrotron (AGS), a polarized proton beam with 1.5 x 10(sup 11) intensity and 65% polarization has been achieved. There are residual polarization losses due to horizontal resonances over the whole energy ramp and some polarization loss due to vertical intrinsic resonances. Many efforts have been put in to reduce the emittances corning into the AGS and to consequently reduce polarization loss. This paper presents the accelerator setup and preliminary results from run 2009 operations.
NTIS
Proton Beams; Protons

20090026148 Brookhaven National Lab., Upton, NY USA
Enhancing RHIC Luminosity Capabilities with In-situ Beam Pipe Coating
Hershcovitch, A.; Blaskiewicz, M.; Fischer, W.; Poole, H. J.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952543; BNL-81821-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

Electron clouds have been observed in many accelerators, including the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory (BNL). They can limit the machine performance through pressure degradation, beam

instabilities or incoherent emittance growth. The formation of electron clouds can be suppressed with beam pipe surfaces that have low secondary electron yield. At the same time, high wall resistivity in accelerators can result in levels of ohmic heating unacceptably high for superconductmg magnets. This is a concern for the RHIC machine, as its vacuum chamber in the superconducting dipoles is made from relatively high resistivity 316LN stainless steel. The high resistivity can be addressed with a copper (Cu) coating; a reduction in the secondary electron yield can be achieved with a titanium nitride (TiN) or amorphous carbon (a-C) coating. Applying such coatings in an already constructed machine is rather challenging. We started developing a robotic plasma deposition technique for in-situ coating of long, small diameter tubes. The technique entails fabricating a device comprised of staged magnetrons and/or cathodic arcs mounted on a mobile mole for deposition of about 5 micro m (a few skin depths) of Cu followed by about 0.1 micro m of TiN (or a-C).
NTIS
Coating; Luminosity; Pipes (Tubes)

20090026149 Brookhaven National Lab., Upton, NY USA
Matrix Solution of Coupling Impedance in Multi-Layer Circular Cylindrical Structures
Hang, H.; Choi, E.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952542; BNL-81818-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Continuing interest in computing the coupling impedance of cylindrical multi-layer beam tubes led to several recent publications. A novel matrix method is here presented in which radial wave propagation is treated in analogy to longitudinal transmission lines. Starting from the Maxwell equations the solutions for monopole electromagnetic fields are in each layer described by a 2x2 matrix. Assuming isotropic material properties within one layer, the radially transverse field components at the inner boundary of a layer are uniquely determined by matrix transfer of the field components at its outer boundary. By imposing power flow constraints on the matrix, field matching between layers is enforced and replaced by matrix multiplication. The coupling impedance of a stainless steel beam tube defined by a matrix is given as a representative demonstration.
NTIS
Cylindrical Bodies; Impedance; Laminates; Matrices (Mathematics); Matrix Methods

20090026150 Brookhaven National Lab., Upton, NY USA
AGS Fast Spin Resonance Jump, Magnets and Power Supplies
Glenn, J. W.; Huang, H.; Jain, A.; Liaw, C. J.; Marneris, I.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952541; BNL/81817-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
In order to cross more rapidly the 82 weak spin resonances caused by the horizontal tune and the partial snakes, we plan to jump the horizontal tune 82 times during the acceleration of polarized protons. The current in the magnets creating this tune jump win rise in 100 micro s, hold flat for about 4 ms and fan to zero in 100 micro s. Laminated beam transport quadrupole magnets have been recycled by installing new two turn coils and longitudinal laminated pole tip shims that reduce inductance and power supply current. The power supply uses a high voltage capacitor discharge to raise the magnet current, which is then switched to a low voltage supply, and then the current is switched back to the high voltage capacitor to zero the current. The current in each of the magnet pulses must match the order of magnitude change in proton momentum during the acceleration cycle. The magnet, power supply and operational experience are described.
NTIS
Magnets; Spin Resonance; Supplying

20090026151 Brookhaven National Lab., Upton, NY USA
LHC Beam-Beam Compensation Studies at RHIC
Fischer, W.; Luo, Y.; Abreu, N.; DeMaria, R.; Calaga, R.; May 04, 2009; 7 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952540; BNL-81816-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Long-range and head-on beam-beam effects are expected to limit the LHC performance with design parameters. To mitigate long-range effects current carrying wires parallel to the beam were proposed. Two such wires are installed in RHIC

where they allow studying the effect of strong long-range beam-beam effects, as well as the compensation of a single long-range interaction. The tests provide benchmark data for simulations and analytical treatments. To reduce the head-on beam-beam effect electron lenses were proposed for both the LHC and RHIC. We present the experimental long-range beam-beam program and report on head-on compensations studies at RHIC, which are based on simulations.
NTIS
Beam Interactions; Hadrons

20090026152 Brookhaven National Lab., Upton, NY USA
Design of the Fundamental Mode Damper and the HOM Dampers for the 56 MHz SRF Cavity
Choi, E. M.; Hahn, H.; Ben-Zvi, I.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952536; BNL-81807-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
A 56 MHz Superconducting RF cavity is under development for the Relativistic Heavy Ion Collider (RHIL) aiming at luminosity enhancement The 56 MHz SRF cavity can adiabatically rebucket the beam from the 28 MHz accelerating cavities, provide shorter bunches and significantly enhance the luminosity. The 56 MHz SRF cavity will be turned on at store, therefore, the fundamental mode should be damped while the beam is injected and accelerated. The feature requires Ii fundamental mode damper (FD). The mechanical design of the FD is challenging since the fundamental mode damper has to be physically withdrawn while the cavity is turned on. This motion introduces a frequency change of the cavity. Since for stability the cavity frequency must be kept below the beam frequency in this phase, we chose a judicious axial placement of the FD to minimize the frequency shift. Various studies of the FD were done with prototype cavity tests and numerical simulations. The engineering issues were addressed. Higher-order mode (HOM) dampers are necessary for stable operation of RHIC with the 56 MHz SRF cavity. The physics study of the HOM dampers will be presented in the paper. Based on the stability criteria of the cavity, the HOMs are properly damped by having two HOM dampers. The fundamental mode is filtered out by a 5 element high pass filter. The HOMs were identified and the external Q factors were obtained from tests of the prototype cavity and compared to simulations with the CST Microwave Studio (Trade Name) program.
NTIS
Cavities; Superconducting Cavity Resonators

20090026153 Brookhaven National Lab., Upton, NY USA; OMEGA-P, Inc., New Haven, CT, USA; National Lab. for High Energy Physics, Ibaraki, Japan
Proof-of-Principle Experiment of the Ferroelectric Tuner for the 1.3 GHz Gun Cavity
Hahn, H.; Choi, E.; Shchelkunov, S. V.; Hirshfield, J. L.; Kasakov, S.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952535; BNL-81806-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
A novel ferroelectric frequency tuner was developed by the Omega-P company and was tested at the Brookhaven National Laboratory on a 1.3 GHz RF cavity at room temperature. The tuner is based on the ferroelectric property of having a permittivity variable with an applied electric field. The achievable frequency tuning range can be estimated from the reactive impedance change due to an applied voltage via a S(sub 11) measurement at the tuner port. The frequency shift can be measured directly with a S(sub 21) measurement across the gun cavity with the tuner connected and activated. The frequency change due to an applied 5 kV obtained from the two methods is in reasonable agreement. The reactive impedance measurement yields a value in the range between 3.2 kHz and 14 kHz, while 9 kHz is the result from the direct measurement. The detail description of the experiment and the analysis will be discussed in the paper.
NTIS
Cavities; Ferroelectric Materials; Ferroelectricity; Proving; Tuners

20090026154 Brookhaven National Lab., Upton, NY USA
First Observation of an Electron Beam Emitted from a Diamond Amplified Cathode
Chang, X.; Ben-Zvi, I.; Burrill, A.; Kewisch, J.; Muller, E.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC090, 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952534; BNL-81805-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
We observed, for the first time, the emission of an electron beam from a hydrogenated diamond in the emission mode on

a phosphor screen. Our experimental device is based on the following concept: the primary electrons of a few keV energy generate a large number of secondary electron-hole pairs in a hydrogenated diamond, and then the secondary electrons are transmitted to the opposite face of the diamond and emitted from its negative-electron-affinity (NEA) surface. Under our present conditions, the maximum emission gain of the primary electron is about 40, and the bunch charge is 50pC/0.5mm2. Our achievement led to new understanding of the hydrogenated surface of the diamond. We propose an electron-trapping mechanism near the hydrogenated surface. The probability of electron trapping in our tests is about 70%. The hydrogenated diamond was demonstrated to be extremely robust. After exposure to air for days, the sample exhibited no observable degradation in emission.
NTIS
Cathodes; Diamonds; Electron Beams; Emittance

20090026155 Brookhaven National Lab., Upton, NY USA; European Organization for Nuclear Research, Geneva, Switzerland
Transverse Impedance Localization Using Intensity Dependent Optics
Arduini, G.; Calaga, R.; Metral, E.; Papottio, G.; Quatraro, D.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952533; BNL-81803-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
Measurements of transverse impedance in the SPS to track the evolution over the last few years show discrepancies compared to the analytical estimates of the major contributors. Recent measurements to localize the major sources of the transverse impedance using intensity dependent optics are presented. Some simulations using HEADTAIL to understand the limitations of the reconstruction and related numerical aspects are also discussed.
NTIS
Impedance; Position (Location)

20090026156 Brookhaven National Lab., Upton, NY USA
Status of LHC Crab Cavity Simulations and Beam Studies
Calaga, R.; Assmann, R.; Barranco, J.; Caspers, F.; Solyak, N.; May 04, 2009; 5 pp.; In English; Particle Accelerator Conference (PAC09), 4-8 May 2009, Vancouver, B.C., Canada
Report No.(s): DE2009-952532; BNL-81802-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge
The LHC crab cavity program is advancing rapidly towards a first prototype which is anticipated to be tested during the early stages of the LHC phase I upgrade and commissioning. The general project status and some aspects related to crab optics, collimation, aperture constraints impedances, noise effects. Beam transparency and machine protection critical for a safe and robust operation of LHC beams with crab cavities are addressed here.
NTIS
Cavities; Simulation; Apertures

20090026255 Ibaraki Univ., Hitachi, Japan
Perfect Blind-Channel Shortening for Multicarrier Systems
Kameyana, Hirokazu; Miyajima, Teruyuki; Ding, Zhi; Apr 2008; 12 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0382
Report No.(s): AD-A500064; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500064
In multicarrier systems, when the order of a channel impulse response is larger than the length of the cyclic prefix (CP), there is a significant performance degradation due to interblock interference (IBI). This paper proposes a blind-channel shortening method in which the equalizer parameter vector is formed by the noise subspace of the received signal correlation matrix so that the output power is maximized. The proposed method can not only shorten the effective channel impulse response to within the CP length but also maximize the output signal-to-interference-and-noise ratio while eliminating the IBI. We point out that the performance depends on the choice of a decision delay and propose a simple method for determining the appropriate delay. We propose both a batch algorithm and an adaptive algorithm and show by simulation that they are superior to the conventional algorithm
DTIC
Frequency Division Multiplexing; Signal to Noise Ratios; Degradation; Correlation

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*.

20090025500 Coast Artillery Training Center, Fort Monroe, VA USA
The Coast Artillery Journal. Volume 59, Number 1, July 1923
Clark, F S; Dutton, D L; Jul 1923; 97 pp.; In English
Report No.(s): AD-A500102; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500102

This issue of The Coast Artillery Journal contains the following articles: The Campaign of Coronel and the Falklands -- August 1, 1914 to March 14, 1915, by Captain Edward S. Kellogg, U.S. Navy; The Determination of Azimuth by Means of the Binaural Sense, by Captain Richard B. Webb, C.A.C.; The Present Status of Sub-Aqueous Sound Ranging, by Major Harvey C. Allen, C.A.C. and The Importance of Coast Artillery in Our National Defense, by Major Robert R. Welshmer, C.A.C. The remainder of the journal contains the following features: an editorial on the importance of the Coast Artillery Corps relative to the Infantry in the case of an invasion by sea; Coast Artillery Board notes; solution to the last Employment of Heavy Artillery problem; Bulletin Board; and book reviews.
DTIC
Artillery; Coasts; Defense Program; Military Operations; Navy; Sound Ranging; Underwater Acoustics; Warfare

20090025937 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nondestructive Evaluation Methods for the Ares I Common Bulkhead Bond Line
Walker, James; Ragasa, Scott; Sanders, Rose; Lovell, Don; McDougal, Matthew; [2009]; 13 pp.; In English; Original contains black and white illustrations
Report No.(s): M09-0363; Copyright; Avail.: Other Sources

The current design of the Ares I Upper Stage uses a common bulkhead between the liquid hydrogen and liquid oxygen tanks. The bulkhead consists of spin-formed aluminum domes welded to Y-rings and bonded to a perforated phenolic honeycomb core. The honeycomb core is perforated to allow the air in the cells to be evacuated which increases the thermal insulating properties of the bulkhead, helping to maintain the propellant at the proper condition. Nondestructive evaluation methods are being developed and proven for the dome to Y-ring weld, the as-machined spin-formed dome material and the core-to-dome bond line of the common bulkhead. The development of nondestructive evaluation methods for inspecting the core-to-dome bond lines are outlined in this work with a focus on thermographic, shearographic, and ultrasonic methods.
Author
Ares 1 Upper Stage; Bulkheads; Nondestructive Tests; Thermography; Ultrasonics

20090026010 NASA Langley Research Center, Hampton, VA, USA
Design of Quiet Rotorcraft Approach Trajectories
Padula, Sharon L.; Burley, Casey L.; Boyd, D. Douglas, Jr.; Marcolini, Michael A.; June 2009; 30 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 877868.02.07.07
Report No.(s): NASA/TM-2009-215771; L-19701; LF99-9005; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026010

A optimization procedure for identifying quiet rotorcraft approach trajectories is proposed and demonstrated. The procedure employs a multi-objective genetic algorithm in order to reduce noise and create approach paths that will be acceptable to pilots and passengers. The concept is demonstrated by application to two different helicopters. The optimized paths are compared with one another and to a standard 6-deg approach path. The two demonstration cases validate the optimization procedure but highlight the need for improved noise prediction techniques and for additional rotorcraft acoustic data sets.
Author
Genetic Algorithms; Rotary Wing Aircraft; Noise Reduction; Trajectories; Helicopters; Acoustic Properties; Aircraft Design

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*.

20090025984 NASA Marshall Space Flight Center, Huntsville, AL, USA
Nuclear Thermal Rocket Element Environmental Simulator (NTREES)
Schoenfeld, Michael; February 10, 2009; 12 pp.; In English; Space Nuclear System Forum, 10-12 Feb. 2009, Houston, TX, USA; Original contains color and black and white illustrations
Report No.(s): M09-0463; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025984

A detailed description of the Nuclear Thermal Rocket Element Environmental Simulator (NTREES) is presented. The contents include: 1) Design Requirements; 2) NTREES Layout; 3) Data Acquisition and Control System Schematics; 4) NTREES System Schematic; and 5) NTREES Setup.
CASI
Environment Simulators; Test Facilities; Control Systems Design; Thermal Energy; Nuclear Energy

74
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*.

20090025489 Arizona Univ., Tucson, AZ, USA
Ground-Based LiDAR Rock Slope Mapping and Assessment
Kemeny, J.; Turner, K.; Sep. 2008; 113 pp.; In English
Contract(s)/Grant(s): DTFH68-05-X-00041
Report No.(s): PB2009-111755; No Copyright; Avail.: National Technical Information Service (NTIS)

LiDAR (Light Detection and Ranging), also often referred to as 3D laser scanning, is an emerging three-dimensional mapping technology that employs a laser and a rotating mirror or housing to rapidly scan and image volumes and surficial areas such as rock slopes and outcrops, buildings, bridges and other natural and man-made objects. Ground-based or terrestrial LiDAR refers to tripod-based measurements, as opposed to airborne LiDAR measurements made from airplanes or helicopters. The purpose of this report was to determine whether the new technology of ground-based LiDAR could assist FHWA with highway rock slope stability. This report includes discussions of currently available LiDAR hardware and software, the current state of LiDAR for highway geotechnical applications (rock mass characterization, rockfall characterization, as-built 3D measurements), best-practices for field scanning and for point cloud data processing, and expected trends in the industry in the near future.
NTIS
Laser Applications; Mapping; Optical Radar; Rangefinding; Rocks; Scanning; Slopes; Stability

20090025933 NASA Marshall Space Flight Center, Huntsville, AL, USA
Alignment System for Full-Shell Replicated X-Ray Mirrors
Gubarev, Mikhail; Arnold, William; Ramsey, Brian; April 20, 2009; 13 pp.; In English; SPIE/EUV and X-Ray Optics, Snergy with Laboratory and Space, 20-23 Apr. 2009, Prague, Czech Republic; Original contains color illustrations
Report No.(s): M09-0434; M09-0441; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025933

We are developing grazing-incidence x-ray optics for high-energy astrophysical applications using the electroformnickel replication process. For space-based applications these optics must be light-weight yet stable, which dictates the use of very-thin-walled full-shell mirrors. Such shells have been fabricated with resolution as good as 11 arcsec for hard x-rays, and technology enhancements under development at MSFC are aimed at producing mirrors with resolution better than 10 arcsec.

The challenge, however, is to preserve this resolution during mounting and assembly. We present here a status report on a mounting and alignment system currently under development at Marshall Space Flight Center designed to meet this challenge. Author

Alignment; Astrophysics; Fabrication; Mirrors; Systems Engineering; X Ray Optics

75
PLASMA PHYSICS

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

20090025976 Princeton Univ., NJ USA

Expression for the Temperature Gradient in Chaotic Fields

Hudson, S. R.; Dec. 2008; 12 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03073

Report No.(s): DE2009-952502; PPPL-4373; No Copyright; Avail.: National Technical Information Service (NTIS)

A coordinate system adapted to the invariant structures of chaotic magnetic fields is constructed. The coordinates are based on a set of ghost-surfaces, dened via an action-gradient DGow between the minimax and minimizing periodic orbits. The construction of the chaotic coordinates allows an expression describing the temperature gradient across a chaotic magnetic field to be derived. The results are in close agreement with a numerical calculation.

NTIS

Chaos; Temperature Gradients

20090026024 Lawrence Livermore National Lab., Livermore, CA USA

Isochoric Heating of Reduced Mass Targets by Ultra-intense Laser Produced Relativistic Electrons

Neumayer, P.; Lee, H. J.; Offerman, D.; Shipton, E.; Kemp, A.; Feb. 18, 2009; 9 pp.; In English

Report No.(s): DE2009-948650; LLNL/PROC-410671; No Copyright; Avail.: National Technical Information Service (NTIS)

We present measurements of the chlorine K-alpha emission from reduced mass targets, irradiated with ultra-high intensity laser pulses. Chlorinated plastic targets with diameters down to 50 micrometers and mass of a few 10(sup -8) g were irradiated with up to 7 J of laser energy focused to intensities of several 10(sup 19)W/cm(sup 2). The conversion of laser energy to K-alpha radiation is measured, as well as high resolution spectra that allow observation of line shifts, indicating isochoric heating of the target up to 18 eV. A zero-dimensional 2-temperature equilibration model, combined with electron impact K-shell ionization and post processed spectra from collisional radiative calculations reproduces the observed K-alpha yields and line shifts, and shows the importance of target expansion due to the hot electron pressure.

NTIS

Electrons; Heating; High Energy Electrons; Isochoric Processes; Lasers; Relativistic Particles; Targets

20090026115 Princeton Univ., NJ USA

Spatially Resolving X-Ray Crystal Spectrometer for Measurement of Ion-Temperature and Rotation-Velocity Profiles on the Alcator C-Mod Tokamak

Hill, K. W.; Lee, S. G.; Broennimann, C.; Eikenberry, E. F.; Mar. 24, 2009; 8 pp.; In English

Contract(s)/Grant(s): DE-ACO2-09CH11466

Report No.(s): DE2009-951311; PPPL-4394; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Ion Temperature; Temperature Measurement; Temperature Profiles; Velocity Distribution; X Ray Spectrometers; Rotation

20090026116 Princeton Univ., NJ USA

Overview of Results from the National Spherical Torus Experiment (NSTX)

Gates, D. A.; Foley, J.; Maqueda, R.; Yuh, H.; Zakharov, L.; Mar. 24, 2009; 50 pp.; In English

Contract(s)/Grant(s): DE-ACO2-09CH11466

Report No.(s): DE2009-951306; PPPL-4393; No Copyright; Avail.: National Technical Information Service (NTIS)

The mission of NSTX is the demonstration of the physics basis required to extrapolate to the next steps for the spherical torus (ST), such as a plasma facing component test facility (NHTX) or an ST based component test facility (ST-CTF), and to support ITER. Key issues for the ST are transport, and steady state high beta operation. To better understand electron transport, a new high-k scattering diagnostic was used extensively to investigate electron gyro-scale fluctuations with varying electron temperature gradient scale-length. Results from n = 3 braking studies are consistent with the flow shear dependence of ion transport. New results from electron Bernstein wave emission measurements from plasmas with lithium wall coating applied indicate transmission efficiencies near 70% in H-mode as a result of reduced collisionality. Improved coupling of High Harmonic Fast-Waves has been achieved by reducing the edge density relative to the critical density for surface wave coupling. In order to achieve high bootstrap current fraction, future ST designs envision running at very high elongation. Plasmas have been maintained on NSTX at very low internal inductance li - 0.4 with strong shaping (K - 2.7, omega - 0.8) with BetaN approaching the with-wall beta limit for several energy confinement times. By operating at lower collisionality in this regime, NSTX has achieved record non-inductive current drive fraction fNI %. Instabilities driven by super-Alfvenic ions will be an important issue for all burning plasmas, including ITER. Fast ions from NBI on NSTX are super-Alfvenic. Linear TAE thresholds and appreciable fast-ion loss during multi-mode bursts are measured and these results are compared to theory. The impact of n > 1 error fields on stability is a important result for ITER. RWM/RFA feedback combined with n=3 error field control was used on NSTX to maintain plasma rotation with Beta above the no-wall limit. Other highlights are: results of lithium coating experiments, momentum confinement studies, scrape-off layer width scaling, demonstration of divertor heat load mitigation in strongly shaped plasmas, and coupling of CHI plasmas to OH ramp-up. These results advance the ST towards next step fusion energy devices such as NHTX and ST-CTF.

NTIS

Plasma Control; Tokamak Devices; Toruses; Plasma Physics; Thermonuclear Reactions

20090026117 Princeton Univ., NJ USA

Diagnostics for the Biased Electrode Experiment on NSTX

Roquemore, A. L.; Zweben, S. J.; Bus, C. E.; Kaita, R.; Marsalsa, R. J.; Mar. 20, 2009; 18 pp.; In English

Contract(s)/Grant(s): DE-ACO2-09CH11466

Report No.(s): DE2009-951305; PPPL-4392; No Copyright; Avail.: National Technical Information Service (NTIS)

A linear array of four small biased electrodes was installed in NSTX in an attempt to control the width of the scrape-off layer (SOL) by creating a strong local poloidal electric field. The set of electrodes were separated poloidally by a 1 cm gap between electrodes and were located slightly below the midplane of NSTX, 1 cm behind the RF antenna and oriented so that each electrode is facing approximately normal to the magnetic field. Each electrode can be independently biased to + or - 100 volts. Present power supplies limit the current on two electrodes to 30 amps the other two to 10 amps each. The effect of local biasing was measured with a set of Langmuir probes placed between the electrodes and another set extending radially outward from the electrodes, and also by the gas puff imaging diagnostic (GPI) located 1 m away along the magnetic field lines intersecting the electrodes. Two fast cameras were also aimed directly at the electrode array. The hardware and controls of the biasing experiment will be presented and the initial effects on local plasma parameters will be discussed.

NTIS

Bias; Diagnosis; Electric Fields; Electrodes

20090026118 Princeton Univ., NJ USA

Response to 'Comment on 'Turbulent Equipartition Theory of Toroidal Momentum Pinch''

Hahm, T. S.; Diamond, P. H.; Gurcan, O. D.; Rewoldt, G.; May 12, 2009; 10 pp.; In English

Contract(s)/Grant(s): DE-AC02-09CH11466

Report No.(s): DE2009-951303; PPPL-4390; No Copyright; Avail.: Department of Energy Information Bridge

This response demonstrates that the comment by Peeters et al. contains an incorrect and misleading interpretation of our paper (Hahm et al., Phys. Plasmas 15, 055902 (2008)) regarding the density gradient dependence of momentum pinch and the turbulent equipartition (TEP) theory.

NTIS

Equipartition Theorem; Momentum; Turbulence

76
SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering*; and *36 Lasers and Masers*.

20090025867 Brookhaven National Lab., Upton, NY USA
Beam Emittance Measurements in RHIC
Zelenski, A.; Atoyan, G.; Bunce, G.; Bazilevskiy, A.; Connolly, R.; May 04, 2009; 6 pp.; In English; the Particle Accelerator Conference (PAC09), 4-9 May 2009, Vancouver, B.C., Canada
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952559; BNL-81865-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

The RHIC proton polarimeters can operate in scanning mode, giving polarization. profiles and transverse beam intensity profile (beam emittance) measurements. The polarimeters function as wire scanners, providing a very good signal/noise ratio and high counting rate. This allows accurate bunch-by-bunch emittance measurements during fast target sweeps (< 1 s) through the beam. Very thin carbon strip targets make these measurements practically non-destructive. Bunch by bunch emittance measurements are a powerful tool for machine set-up; in RHIC, individual proton beam transverse emittances can only be measured by CNI polarimeter scans. We discuss the consistency of these measurements with Ionization Profile Monitors (IPMs) and vernier scan luminosity measurements. Absolute accuracy limitations and crosscalibration of different techniques are also discussed.
NTIS
Emittance; Particle Accelerators

20090025956 Brookhaven National Lab., Upton, NY USA
Stochastic Cooling in RHIC
Brennan, J. M.; Blaskiewicz, M.; May 2009; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952528; BNL-81798-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

After the success of longitudinal stochastic cooling of bunched heavy ion beam in RHIC, transverse stochastic cooling in the vertical plane of Yellow ring was installed and is being commissioned with proton beam. This report presents the status of the effort and gives an estimate, based on simulation, of the RHIC luminosity with stochastic cooling in aU planes.
NTIS
Cooling; Ion Beams; Stochastic Processes

20090025967 Brookhaven National Lab., Upton, NY USA
Observation and Simulation of Beam-Beam Induced Emittance Growth in RHIC
Beebe-Wang, J.; Zhang, S. Y.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952524; BNL-81793-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

in the recent years the peak luminosity of the RHIC polarized proton run has been improved. However, as a consequence, the luminosity lifetime is reduced. The beam emittance growth during the beam storage is a main contributor to the luminosity lifetime reduction, and it seems to be caused mainly by the beam-beam effect during collision. A simulation study of the emittance growth is performed with RHIC machine parameters using the LIFETRAC code. The initial results of this study were reported in an earlier paper. We present, in this paper, an in depth investigation of the emittance growth for a range of beam-beam parameters and bunch lengths. The simulation results are also compared to the available data from experimental measurements.
NTIS
Emittance; Simulation

20090025973 Brookhaven National Lab., Upton, NY USA
Commissioning of the New AGS MMPS Transformers
Bajon, E.; Badea, V. S.; Bonati, R.; Marneris, I.; Porqueddu, R.; May 2009; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-952522; BNL-81789-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

The Brookhaven AGS Main Magnet Power Supply (MMPS) is a thyristor control supply rated at 5500 Amps. +/-9000

Volts. The peak magnet power is 50 MWatts. The power supply is fed from a motor/generator manufactured by Siemens. During rectify and invert operation the P Bank power supplies are used. During the flattops the F Bank power supplies are used. The P Bank power supplies are fed from two 23 MVA transformers and the F Bank power supplies are fed from two 5.3 MYA transformers. The fundamental frequency of the F Bank power supplies is 1440 Hz, however the fundamental frequency of the P banks was 720 Hz. It was very important to reduce the ripple during rectify to improve polarized proton operations. For this reason and also because the original transformers were 45 years old we replaced these transformers with new ones and we made the fundamental frequency of both P and F banks 1440 Hz. This paper will highlight the major hurdles that were involved during the installation of the new transformers. It will present waveforms while running at different power levels up to 6MW full load. It will show the transition from the F-Bank power supplies to the P-Banks and also show the improvements in ripple made on the P-Bank power supplies.
NTIS
Linear Accelerators; Transformers

20090026119 Brookhaven National Lab., Upton, NY USA
Internal Electric-Field-Lines Distribution in CdZnTe Detectors Measured Using X-Ray Mapping
Bolotnikov, A. E.; Camarda, G. S.; Cui, Y.; Hossain, A.; Yang, G.; Oct. 19, 2008; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-951300; BNL--82184-2009-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

The ideal operation of CdZnTe devices entails having a uniformly distributed internal electric field. Such uniformity especially is critical for thick long-drift-length detectors, such as large-volume CPG and 3-D multi-pixel devices. Using a high-spatial resolution X-ray mapping technique, we investigated the distribution of the electric field in real devices. Our measurements demonstrate that in thin detectors, <5 mm, the electric field-lines tend to bend away from the side surfaces (i.e., a focusing effect). In thick detectors, >1 cm, with a large aspect ratio (thickness-to-width ratio), we observed two effects: the electric field lines bending away from or towards the side surfaces, which we called, respectively, the focusing field-line distribution and the defocusing field-line distribution. In addition to these large-scale variations, the field-line distributions were locally perturbed by the presence of extended defects and residual strains existing inside the crystals. We present our data clearly demonstrating the non-uniformity of the internal electric field.
NTIS
Electric Fields; Radiation Detectors; X Rays; Zinc Tellurides

20090026120 Brookhaven National Lab., Upton, NY USA
Deliquescence and Efflorescence of Small Particles: Unifying Perspectives from Nucleation Theory
McGraw, R.; Lewis, E.; Feb. 23, 2009; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2009-951298; BNL--82086-2009-CP; No Copyright; Avail.: Department of Energy Information Bridge

We examine size dependent deliquescence/efflorescence phase transformation for particles down to several nanometers in size. A thin layer criterion (TLC) is introduced to define a deliquescence relative humidity (DRH) for small particles. The usual bulk deliquescence conditions are recovered in the limit of large dry particle size. Nano-size particles are shown to deliquesce to metastable states via a nucleation process at relative humidity just below the DRH. The nucleation barrier is located at a critical solution layer thickness and vanishes at the DRH defined by the TLC. Methods from nucleation theory form the basis for the analysis and yield new insights into the theory, facilitate the interpretation of measurements, and point to unification of deliquescence and efflorescence processes for particles in the nano regime. Methods include thermodynamic area constructions, Legendre transforms relating the binary free-energy surfaces for deliquescence and efflorescence processes, and application of nucleation theorems.
NTIS
Nucleation; Phase Transformations

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

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

20090025417 NASA Marshall Space Flight Center, Huntsville, AL, USA
A Method for Incorporating General Relativity in Electromagnetic Particle-in-Cell Code
Watson, Michael; Nishikawa, Ken-Ichi; [2009]; 17 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NASA-INTEG04-0000-0046; NASA-06-SWIFT306-0027; HST-AR-10966-01; NSF PHY-0114343; NSF AST-0506719
Report No.(s): M09-0366; Copyright; Avail.: Other Sources
No abstract available
Algorithms; Maxwell Equation; Relativistic Effects; Relativistic Particles; Electromagnetism

20090025873 NASA Marshall Space Flight Center, Huntsville, AL, USA
Radiation from Relativistic Shocks with Turbulent Magnetic Fields
Nishkawa, K.; Medvedev, M.; Zhang, B.; Hardee, P.; Niemiec, J.; Mizuno, A.; Nordlund, A.; Frederiksen, J.; Sol, H.; Pohl, M.; Hartmann, D. H.; Oka, M.; Fishman, J.; March 30, 2009; 1 pp.; In English; Frontier of Space Astrophysics: Gamma Ray Bursts and Neutron Stars, 30 Mar. - 4 Apr. 2009, Cairo, Alexandria, Egypt
Report No.(s): M09-0296; Copyright; Avail.: Other Sources; Abstract Only
Recent PIC simulations of relativistic electron-positron (electron-ion) jets injected into a stationary medium show that particle acceleration occurs at shocked region. The simulation results show that the Weibel instability is responsible for generating and amplifying highly nonuniform, small-scale magnetic fields. These magnetic fields contribute to the electron's transverse deflection behind the shock. The 'jitter' radiation from deflected electrons in turbulent magnetic fields has different properties than synchrotron radiation which is calculated in a uniform magnetic field. This jitter radiation may be important to understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets, and supernova remnants. New recent calculation of spectra with various different Lorentz factors of jets (two electrons) and initial magnetic fields. New spectra based on small simulations will be presented.
Author
Magnetic Fields; Synchrotron Radiation; Turbulence; Relativistic Particles; Astrophysics

20090026321 Princeton Univ., NJ, USA
First Evidence of WW and WZ Diboson Production with Semi-Leptonic Decays at a Hadron Collider
Haley, J. G. B.; Jun. 2009; 214 pp.; In English
Report No.(s): DE2009-950511; No Copyright; Avail.: National Technical Information Service (NTIS)
Presented is a measurement of the simultaneous production of a W(sup (+-)) boson in association with a second weak boson (W(sup (+-)) or Z(sup 0)) in p(bar p) collisions at (radical)s = 1.96 TeV. Events are consider with one electron or one muon, missing transverse energy, and at least two hadronic jets. The data were collected by the D0 detector in Run IIa of the Tevatron accelerator and correspond to 1.07 fb(sup -1) of integrated luminosity for each of the two channels (WW/WZ (yields) e(nu)q(bar q) and WW/WZ (yields) (mu)(nu)q(bar q)). The cross section for WW + WZ production is measured to be 20.2 (+-) 2.5(stat) (+-) 3.6(sys) (+-) 1.2(lum) pb with a Gaussian significance of 4.4 standard deviations above the background-only scenario. This measurement is consistent with the Standard Model prediction and represents the first direct evidence for WW and WZ production with semi-leptonic decays at a hadron collider.
NTIS
Bosons; Hadrons

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*.

20090025407 NASA Ames Research Center, Moffett Field, CA, USA
Enabling and Enhancing Space Mission Success and Reduction of Risk through the Application of an Integrated Data Architecture
Brummett, Robert C.; October 23, 2008; 1 pp.; In English; IAASS Conference: Building a Safer Space Together, 21-23 Oct. 2008, Rome, Italy
Contract(s)/Grant(s): WBS 60476
Report No.(s): ARC-E-DAA-TN133; No Copyright; Avail.: Other Sources; Abstract Only

The engineering phases of design, development, test, and evaluation (DDT and E) and subsequent planning, preparation, and operation (Ops) of space vehicles in a complex and distributed environment requires massive and continuous flows of information across the enterprise and across temporal stages of the vehicle lifecycle. The resulting capabilities at each subsequent stage depend in part on the capture, preparation, storage, and subsequent provision of information from prior stages. The USA National Aeronautics and Space Administration (NASA) is currently designing a fleet of new vehicles that will replace the Space Shuttle and expand space operations and exploration capabilities. This includes the 2 stage human rated lift vehicle Ares 1 and its associated crew vehicle the Orion, and a service module; the heavy lift cargo vehicle, Ares 5, and an associated cargo stage known as the Earth Departure Stage; and a Lunar Lander vehicle that contains a descent stage, and ascent stage, and a habitation module. A variety of concurrent assorted ground operations infrastructure including software and facilities are also being developed, assorted technology and assembly designs and development for equipment such as EVA suits, life support systems, command and control technologies are also in the pipeline. The development is occurring in a distributed manner, with project deliverables being contributed by a large and diverse assortment of vendors and most space faring nations. Critical information about all of the components, software, and procedures must be shared during the DDT and E phases and then made readily available to the mission operations staff for access during the planning, preparation, and operations phases, and also need to be readily available for system to system interactions. The Constellation Data Systems Project (CxDS) is identifying the needs, and designing and deploying systems and processes to support these needs. This paper details the steps and processes that NASA is applying within the Constellation Program to manage this data and information, and to insure that the correct information is available, correctly annotated, and can be provisioned digitally to enhance response times, and support engineering analysis and anomaly resolution.
Author
Space Missions; Risk Management; Information Flow; Aerospace Vehicles; Spacecraft Design; Aerospace Engineering; Project Management; Data Integration; Data Management

20090025871 NASA Marshall Space Flight Center, Huntsville, AL, USA
Growing a Training System and Culture for the Ares I Upper Stage Project
Scott, David W.; March 07, 2009; 8 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, MT, USA; Original contains color and black and white illustrations
Report No.(s): IEEEAC Paper 1550, Version 9; M09-0270; M09-0425; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025871

In roughly two years time, Marshall Space Flight Center s (MSFC) Mission Operations Laboratory (MOL) has incubated a personnel training and certification program for about 1000 learners and multiple phases of the Ares I Upper Stage (US) project. Previous MOL-developed training programs focused on about 100 learners with a focus on operations, and had enough full-time training staff to develop courseware and provide training administration. This paper discusses 1) the basics of MOL's training philosophy, 2) how creation of a broad, structured training program unfolded as feedback from more narrowly defined tasks, 3) how training philosophy, development methods, and administration are being simplified and tailored so that many Upper Stage organizations can 'grow their own' training yet maintain consistency, accountability, and traceability across the project, 4) interfacing with the production contractor's training system and staff, and 5) reaping training value from existing materials and events.
Author
Education; Personnel Development; Project Management; Training Analysis; Educational Resources

20090025998 National Optical Astronomy Observatories, Tucson, AZ, USA; National Solar Observatory, Tucson, AZ, USA
NOAO/NSO Newsletter: Issue 98
June 2009; 46 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

The science highlights in this issue include brief articles on probing the gas in protoplanetary disks with TEXES on Gemini-N, NOAO 4-m Speckle Interferometry observations of massive stars, and comparing magnetic fields in the solar photosphere and chromosphere at equatorial and polar latitudes. The other contents include 1) director's Office; 2) NOAO Gemini Science Center; 3) Observational Programs; 4) Science data Management; 5) Data Products Program; 6) Cerro Tololo Inter-american Observatory; 7) Kitt Peak National Observatory; 8) National Solar Observatory; and 9) Public Affairs and Educational Outreach.
CASI
Solar Observatories; Telescopes; Radio Astronomy; Astrophysics

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*.

20090025348 Institute of Museum and Library Services, Washington, DC, USA
Status of Technology and Digitization in the Nation's Museums and Libraries, January 2006
Jan. 2006; 153 pp.; In English
Report No.(s): PB2009-111804; No Copyright; Avail.: CASI: A08, Hardcopy

The Institute of Museum and Library Services is committed to helping libraries and museums take full advantage of the power of technology. Through grantmaking, research, conferences, and publications the Institute helps to create and share best practices and provide important data for administrators, policy makers, and the public. As part of its mandate to analyze needs and trends of museum and library services, the Institute is pleased to present the 2004 survey on the use of technology and digitization in the nations libraries and museums.
NTIS
Digital Techniques; Internets; Libraries; Museums; On-Line Systems; Surveys

20090025363 National Oceanic and Atmospheric Administration, Silver Spring, MD, USA
Education Strategic Plan 2009-2029. Focusing on Science, Service and Stewardship
Jan. 2009; 40 pp.; In English
Report No.(s): PB2009-111868; No Copyright; Avail.: CASI: A03, Hardcopy

NOAA's Education Mission is to advance environmental literacy and promote a diverse workforce in ocean, coastal, Great Lakes, weather, and climate sciences, encouraging stewardship and increasing informed decision making for the Nation.
NTIS
Education; Strategy; Educational Resources

20090025387 Defence Science and Technology Organization, Australia
The Scenario Analysis Tool Suite: A User's Guide
Dilek, Cigdem; Jan 2009; 30 pp.; In English; Original contains color illustrations
Report No.(s): AD-A500350; DSTO-GD-0560; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document is a user guide for the software product, the Scenario Analysis Tool Suite (version 1.5). The tool suite implements several scenario analysis techniques, Morphological analysis, Field Anomaly Relaxation analysis, Battelle approach, Bayesian approach, as well as an extended approach of combining methods. Thus the tool provides the opportunity to compare these techniques using a specific strategic question and provides computer support for the new combined technique.
DTIC
Manuals; Software Development Tools

20090025389 Army Missile Command, Redstone Arsenal, AL USA
C3Grid Overview
Mar 10, 2008; 20 pp.; In English; DoD M&S (Modeling and Simulation) Conference, 10-14 Mar. 2008, Orlando, FL, USA; Original contains color illustrations
Report No.(s): AD-A500312; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overview of the MATREX C3Grid. C3Grid: * Provides robust highly parametric C4ISR modeling capability for Network Centric Warfare (NCW) that enables the use of existing combat simulations to support Army transformation. * Creates and allows representation of information flow topologies unique to message type, decision points and data processes. * Interface for management of the Common Operating Picture (COP) for the force structure according to information flow using blue/red deconfliction, target correlation, aggregation and information dissemination. * Interfaces for integration of external services including communication effects, fusion, human performance modeling and Command & Control devices.
DTIC
Combat; Command and Control; Simulation

20090025490 National Library of Medicine, Bethesda, MD, USA
Directory of Information Resources in the USA, General Toxicology
Jun. 1969; 298 pp.; In English
Report No.(s): PB2009-111672; ED 038 308; No Copyright; Avail.: CASI: A13, Hardcopy

Listed are institutions and organizations which can serve as information sources on toxicology. Each entry gives the toxicology-related interests of the institution, holdings (of publications), publications of the institution, and information services provided. Poison control centers are listed separately as an appendix. Other appendices list some professional organizations having substantial interest in toxicology and some periodicals of toxicological interest. There is a geographic index to institutions and a subject index.
NTIS
Directories; Toxicology; United States; Information Dissemination

20090025495 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Supporting Subject Matter Annotation Using Heterogeneous Thesauri: A User Study in Web Data Reuse
Hildebrand, M.; Van Ossenbruggen, J. R.; Hardman, L.; Jacobs, G.; Feb. 2009; 22 pp.; In English
Report No.(s): PB2009-111419; INS-E0902; Copyright; Avail.: National Technical Information Service (NTIS)

We performed a user experiment in which museum professionals used vocabularies from the Web for annotating the subject matter of museum objects. We study the requirements on the underlying RDF dataset, search algorithms and user interface design in a real world setting. We identify the advantages of reusing vocabularies from the Web and discuss how and to what extent the disadvantages can be overcome. The study is performed at the Print Room of the Rijksmuseum Amsterdam, where currently a large collection of prints, photographs and drawings is being catalogued. We report on the analysis of the current practice of professional cataloguers, the iterative design of an annotation tool and a qualitative evaluation of this tool with a user experiment in a realistic annotation environment. We discuss our findings in terms of their impact on the RDF data, the semantic search functionality and the user interface.
NTIS
Data Bases; Heterogeneity; Thesauri

20090025499 Defense Inst. of Security Assistance Management, Wright-Patterson AFB, OH USA
The NATO Codification System: A Bridge to Global Logistics Knowledge
Eddy, Brenda; Arnett, Steven; DISAM Journal; Jan 1998; Volume 21, No. 1, pp. 39-51; In English
Report No.(s): AD-A500206; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA500206

The NATO Codification System (NCS) has been in place since the mid-1950s. It provides standards for the use of a common stock identification system throughout the NATO alliance. We tend to take this common language of NATO logistics for granted in field operations. The NCS is quickly appreciated, however, when the operational commander finds himself in a joint environment with partner countries each using something different. In his address to the 8th NATO Symposium on Codification, in May 1997, General de Brigade Jean-Marc Renucci, Chief de la Division Organization et Logistique, Etat-Major des Armees France, spoke of his experience during the peacekeeping operations in the former Yugoslavia. He explained how multinational coalitions have been increasingly used for peacekeeping since the fall of the Berlin Wall. In the

former Yugoslavia, for example, more than 30 nations were involved under the framework of the United Nations. Gen. Renucci described the patchwork of UN battalions, Non-Governmental Organizations (NGOs), and other charitable agencies. The experience of the French Forces was that the lack of a common technical language led to an intolerable waste of resources. With the transfer of authority and responsibility from the UN to NATO, the forces were able to set up a very efficient system of cross-support, specifically through the use of the NCS. The NCS is an invisible partner in the day-to-day business of logistics. Beginning in the USA, and then expanding to NATO, multinational use of the NCS today is growing at a faster rate than ever before. This article provides an overview of this little publicized aspect of international logistics support.
DTIC
Coding; Inventory Controls; Logistics; Logistics Management; North Atlantic Treaty Organization (NATO)

20090025931 Federal Maritime Commission, Washington, DC, USA
Federal Maritime Commission Strategic Plan: Fiscal Years 2010-2015
Dec. 03, 2008; 20 pp.; In English
Report No.(s): PB2009-112199; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Maritime Commission ('FMC') is pleased to issue the following 2010-2015 Strategic Plan. This plan is different from the agency's former 2003-2008 Strategic Plan in several ways. First, it replaces the five former strategic goals contained in the earlier plan with three goals in an attempt to better capture the agency's focus. Second. it sets goals and objectives which directly link to the 2010 Annual Plan and will continue to do so for subsequent annual plans through 2015. Third. it contains targets and measures linked to objectives via strategies. Fourth. the plan drives the agency's budgetary process via an organizational linkage table. This is in conformance with the spirit and letter of the Government Performance and Results Act of 1993; OMB Circular A-11 Preparation of Submission of Strategic Plans, and Annual Program Performance Reports and the recently issued Executive Order 13450 - Improving Government Program Performance.
NTIS
Linkages; Strategy; Plans

20090026022
Urban Frontier: A Call to Action
Anderson, E.; Case, T.; Covert, K.; Doraratz, M.; Hope, K.; Sep. 2006; 28 pp.; In English
Report No.(s): PB2009-111606; No Copyright; Avail.: National Technical Information Service (NTIS)

Thousands of organizations spend billions of dollars each year producing and using geospatial data, from public officials at all levels of government to business and community organizations and members of the public at large. But they still dont have the information they need to solve critical problems. They may need more data than they can afford. Or they may need data from outside their operational area or jurisdictional boundary. Or they may find the data they need, but in an incompatible format. Meanwhile, the complexity of such issues as emergency preparedness and response, community social and environmental health, and development and business direction continue to grow, while our ability to respond lags behind. The development of regional geospatial information networks could solve those problems, creating a powerful tool for operations management, performance measurement, and strategic planning. Networks could give America a competitive edge in global markets, too, and strengthen citizen participation in our democracy back home at the same time.
NTIS
Geographic Information Systems; Information Management

20090026157 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Communication Free Robot Swarming
Gray, Zachary C; Mar 2009; 99 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-JON09-219
Report No.(s): AD-A500135; AFIT/GCE/ENG/09-03; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA500135

As the military use of unmanned aerial vehicles increases, a growing need for novel strategies to control these systems exists. One such method for controlling many unmanned aerial vehicles simultaneously is the through the use of swarm algorithms. This research explores a swarm robotic algorithm developed by Kadrovach implemented on Pioneer Robots in a

real-world environment. An adaptation of his visual sensor is implemented using stereo vision as the primary method of sensing the environment. The swarm members are prohibited from explicitly communicating other than passively through the environment. The resulting implementation produces a communication free swarming algorithm. The algorithm is tested for performance of the visual sensor, performance of the algorithm against stationary targets, and finally, performance against dynamic targets. The results show expected behavior of the swarm model as implemented on the Pioneer robots providing a foundation for future research in swarm algorithms.
DTIC
Algorithms; Artificial Intelligence; Computer Vision; Robotics; Robots; Swarming

20090026257 SET Corp. (Science, Engineering, and Technology), Arlington, VA USA
Design Issues of a Mind Snaps Implementation
Alonso, Rafael; Li, Hua; May 2009; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-08-C-0212; Proj-R665
Report No.(s): AD-A499996; AFRL-RI-RS-TR-2009-141; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA499996

The intelligence analysis process consists of a complex, iterative, highly-branched sequence of information gathering and processing steps. Throughout the process, the analyst needs to refer to the hypotheses and information he or she was manipulating at previous points in the process. A key enabler for the analytic process would be to provide analysts with semantic bookmarks, i.e., a mechanism that would allow them to return to a particular point in the analysis and recreate the complete context they had at that time. A key element of the programmatic vision for the next phase of IARPA's A-SpaceX program is to define, explore, and implement such semantic bookmarks, which are referred to as Mind Snaps. We have completed a short (approximately six months) seedling to explore the Mind Snaps concept, focusing on answering several research questions. The answers to these questions will serve not only to better define and understand Mind Snaps, but also guide possible programmatic goals.
DTIC
Data Processing; Analysis (Mathematics); Information Retrieval

20090026327 NASA Ames Research Center, Moffett Field, CA, USA
Automated Data Assimilation and Flight Planning for Multi-Platform Observation Missions
Oza, Nikunj; Morris, Robert A.; Strawa, Anthony; Kurklu, Elif; Keely, Leslie; August 24, 2008; 6 pp.; In English; NASA Earth Science Technology Conference, 24 Aug. 2008, Maryland, USA; Original contains color illustrations
Report No.(s): ARC-E-DAA-TN-132; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026327

This is a progress report on an effort in which our goal is to demonstrate the effectiveness of automated data mining and planning for the daily management of Earth Science missions. Currently, data mining and machine learning technologies are being used by scientists at research labs for validating Earth science models. However, few if any of these advanced techniques are currently being integrated into daily mission operations. Consequently, there are significant gaps in the knowledge that can be derived from the models and data that are used each day for guiding mission activities. The result can be sub-optimal observation plans, lack of useful data, and wasteful use of resources. Recent advances in data mining, machine learning, and planning make it feasible to migrate these technologies into the daily mission planning cycle. We describe the design of a closed loop system for data acquisition, processing, and flight planning that integrates the results of machine learning into the flight planning process.
Author
Flight Plans; Data Acquisition; Machine Learning; Data Mining; Assimilation; Management Methods; Earth Sciences

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20090025929 NASA Marshall Space Flight Center, Huntsville, AL, USA
Xenia Spacecraft Study Addendum: Spacecraft Cost Estimate
Hill, Spencer; Hopkins, Randall; March 16, 2009; 9 pp.; In English; Original contains color illustrations
Report No.(s): M09-0362; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025929

This slide presentation reviews the Xenia spacecraft cost estimates as an addendum for the Xenia Spacecraft study. The NASA/Air Force Cost model (NAFCPOM) was used to derive the cost estimates that are expressed in 2009 dollars.
CASI
Cost Estimates; Spacecraft Design; Production Costs

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

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

20090026169 North Carolina Agricultural and Technical State Univ., Greensboro, NC USA
Undergraduate Scholarship for Global Positioning Systems Research
Dunn, Derrek B; May 18, 2009; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-02-1-1041; 210021(4-41214)
Report No.(s): AD-A500352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Due to the significant deficit of under-represented minorities who pursue careers in navigation related fields, this grant requested funds to support the scholarship activities of a selected undergraduate student at North Carolina A&T State University. The funding supported the student's attendance at conferences to present technical papers, summer internship experiences, and paying of a stipend and tuition during the academic year to support the scholar's studies. Also, during the academic year the scholar had the opportunity to participate in other research activities that the principal investigator was conducting.
DTIC
Global Positioning System; University Program; Students

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*.

20090025877 Lockheed Martin Space Systems Co., New Orleans, LA, USA
Advanced Signal Processing Techniques Applied to Terahertz Inspections on Aerospace Foams
Trinh, Long Buu; March 07, 2009; 9 pp.; In English; International Workshop on Optical Terahertz Science and Technology/Optical Society of America, 7-11 Mar. 2009, Santa Barbara, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS8-00016
Report No.(s): M09-0299; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025877

The space shuttle's external fuel tank is thermally insulated by the closed cell foams. However, natural voids composed of air and trapped gas are found as by-products when the foams are cured. Detection of foam voids and foam de-bonding is a formidable task owing to the small index of refraction contrast between foam and air (1.04:1). In the presence of a denser binding matrix agent that bonds two different foam materials, time-differentiation of filtered terahertz signals can be employed to magnify information prior to the main substrate reflections. In the absence of a matrix binder, de-convolution of the filtered

time differential terahertz signals is performed to reduce the masking effects of antenna ringing. The goal is simply to increase probability of void detection through image enhancement and to determine the depth of the void.
Author
External Tanks; Foams; Fuel Tanks; Signal Processing; Aerospace Engineering

20090025959 Embry-Riddle Aeronautical Univ., Daytona Beach, FL, USA
Data Analysis of the Floating Potential Measurement Unit aboard the International Space Station
Barjatya, Aroh; Swenson, Charles M.; Thompson, Donald C.; Wright, Kenneth H., Jr.; Review of Scientific Instruments; April 17, 2009; Volume 80, Issue 5; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNM05AA22A
Report No.(s): M09-0412; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025959; http://dx.doi.org/10.1063/1.3116085

We present data from the Floating Potential Measurement Unit (FPMU), that is deployed on the starboard (S1) truss of the International Space Station. The FPMU is a suite of instruments capable of redundant measurements of various plasma parameters. The instrument suite consists of: a Floating Potential Probe, a Wide-sweeping spherical Langmuir probe, a Narrow-sweeping cylindrical Langmuir Probe, and a Plasma Impedance Probe. This paper gives a brief overview of the instrumentation and the received data quality, and then presents the algorithm used to reduce I-V curves to plasma parameters. Several hours of data is presented from August 5th, 2006 and March 3rd, 2007. The FPMU derived plasma density and temperatures are compared with the International Reference Ionosphere (IRI) and USU-Global Assimilation of Ionospheric Measurement (USU-GAIM) models. Our results show that the derived in-situ density matches the USU-GAIM model better than the IRI, and the derived in-situ temperatures are comparable to the average temperatures given by the IRI.
Author
Algorithms; International Space Station; Integrated Truss Structure S1; Earth Ionosphere; Data Acquisition; Instrument Packages

89
ASTRONOMY

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

20090026019 NASA Marshall Space Flight Center, Huntsville, AL, USA; ATK Launch Systems, Brigham City, UT, USA
Common Infrastructure for Neo Scientific and Planetary Defense Missions
Adams, Robert; Wilks, Rodney; [2009]; 10 pp.; In English; Original contains color illustrations
Report No.(s): M09-0413; Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026019

While defending the Earth against collisions with asteroids and comets has garnered increasing attention over the past few decades, our knowledge of the threats and methods of mitigation remain inadequate. There exists a considerable gap in knowledge regarding the size, composition, location, internal structure and formation of near earth asteroids and comets. Although estimates have been made, critical experiments have not yet been conducted on the effectiveness of various proposed mitigation techniques. Closing this knowledge gap is of interest to both the planetary defense and planetary science communities. Increased scientific knowledge of asteroid and comet composition and structure can confirm or advance current theories about the formation of the solar system. This proposal suggests a joint effort between these two communities to provide an economical architecture that supports multiple launches of characterization and mitigation payloads with minimal response time. The science community can use this architecture for characterization missions of opportunity when multiple scientific targets or targets of uncommon scientific value present themselves, while the planetary defense community would be able to fire characterization or mitigation payloads at targets that present a threat to the Earth. Both communities would benefit from testing potential mitigation techniques, which would reveal information on the internal structure of asteroids and comets. In return, the Earth would have the beginnings of a viable response system should an impact threat prove real in the near future.
Author
Space Missions; Earth (Planet); General Overviews; Solar System

20090026316 NASA Marshall Space Flight Center, Huntsville, AL, USA
Reading the Metal Diaries of the Universe: Tracing Cosmic Chemical Evolution from the Reionization Epoch till the Present
Hartmann, D.; Kouveliotou, C.; Fishman, G.; Meegan, C.; ODell, S.; Ramsey, B.; vanderHorst, A.; Weisskopf, M.; Wilson-Hodge, C.; Piro, L.; Natalucci, L.; den-Herder, J-W; Ubertini, P.; Kaastra, J.; Hemsen, W.; Ohashi, T.; Abel, T.; Amati, L.; Petrosian, V.; Rasmussen, A.; Barthelmy, S.; Gehrels, N.; Kelley, R,; Beacom, J.; Snowden, S., et al.; [2009]; 9 pp.; In English; Original contains color illustrations
Report No.(s): M09-0358; Copyright; Avail.: Other Sources
No abstract available
Metals; Planetary Evolution; Star Formation; Galactic Clusters; Cosmology; Universe

20090026338 NASA Marshall Space Flight Center, Huntsville, AL, USA
The 'Main Sequence' of Explosive Solar Active Regions: Discovery and Interpretation
Falconer, David A.; Moore, Ronald L.; Gary, G. Allen; Adams, Mitzi; [2009]; 4 pp.; In English; Original contains color illustrations
Report No.(s): M09-0356-1; Copyright; Avail.: Other Sources
No abstract available
Coronal Mass Ejection; Sun; SOHO Mission; Magnetic Signatures; Main Sequence Stars

90
ASTROPHYSICS

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

20090025932 Environmental Protection Agency, Washington, DC USA; National Oceanic and Atmospheric Administration, Washington, DC, USA
EPA-NOAA Brewer UV-Ozone Network -2 (UNVnet2): Overview and Current Status
Jan. 2006; 26 pp.; In English
Report No.(s): PB2009-112186; No Copyright; Avail.: National Technical Information Service (NTIS)
To produce high quality solar UV spectral irradiance and total column ozone measurements for our research and collaborating researchers.
NTIS
Light (Visible Radiation); Ozone; Solar Radiation; Solar Spectra; Ultraviolet Spectra

20090025963 NASA Marshall Space Flight Center, Huntsville, AL, USA
Does a Polar Coronal Hole's Flux Emergence Follow a Hale's-like Law?
Cirtain, J. W.; Savcheva, A.; DeLuca, E. E.; Golub, L.; [2009]; 9 pp.; In English
Report No.(s): M09-0414; Copyright; Avail.: Other Sources
No abstract available
Coronal Holes; Polar Regions; Polarity; X Ray Telescopes

91
LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20090025425 NASA Marshall Space Flight Center, Huntsville, AL, USA
Propelling Exploration to the Moon and Beyond
Cook, Stephen A.; April 14, 2009; 2 pp.; In English
Report No.(s): M09-0083; No Copyright; Avail.: Other Sources; Abstract Only
As the Constellation Program enters its fourth year, the Ares Projects have made substantial progress toward sending human explorers beyond Earth orbit. The Ares I crew launch vehicle, which will take six astronauts or cargo to the International Space Station or four astronauts to rendezvous with Ares V for missions to the Moon, is the first human-rated

vehicle NASA has developed in over 30 years. Since the Exploration Systems Architecture Study in 2005, the Ares Projects have completed a successful system requirements review, system definition review, and preliminary design review for the Ares I crew launch vehicle. The Ares I elements are well into development, beginning with the Shuttle-derived, five-segment solid rocket motor that will provide first-stage propulsion. The first stage team has poured its first production simulation article motor and will be pouring and firing the first five-segment development motor in 2009. Large-scale tooling has been installed and tested to produce propellant tanks for the liquid-fuel upper stage at Marshall Space Flight Center (MSFC) in Alabama. The initial upper stage units and main propulsion test article will be manufactured and tested at MSFC before transferring to Michoud Assembly Facility in Louisiana. The upper stage engine team has completed powerpack testing using Apollo J-2 heritage hardware and begun construction of a new altitude test stand at Stennis Space Center in Mississippi. The flight and integrated testing group has designed and built hardware for the Ares I-X test flight scheduled for 2009, as well as begun refurbishing existing infrastructure to support ground testing. Additionally, a base configuration has been selected for the Ares V cargo launch vehicle, which will send the Altair lunar lander and Orion to the Moon. Today, the Ares Projects are well on the way to building America s next generation of exploration-capable launch vehicles.
Author
Ares 5 Cargo Launch Vehicle; Constellation Program; International Space Station; Flight Tests; Space Exploration; Moon

20090025875 NASA Marshall Space Flight Center, Huntsville, AL, USA
Characterization of Rock Types at Meridiani Planum, Mars using MER 13-Filter Pancam Spectra
Nuding, D. L.; Cohen, B. A.; March 22, 2009; 2 pp.; In English; Lunar and Planetary Science Conference, 22-25 Mar. 2009, Houston, TX, USA; Original contains color illustrations
Report No.(s): M09-0329; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025875

The Mars Exploration Rover Opportunity has traversed more than 13 km across Meridiani Planum, finding evidence of ancient aqueous environments that, in the past, may have been suitable for life. Meridiani bedrock along the rover traverse is a mixture in composition and bulk mineralogy between a sulfate-rich sedimentary rock and hematite spherules ('blueberries'). On top of the bedrock, numerous loose rocks exist. These rocks consist of both local bedrock and 'cobbles' of foreign origin. The cobbles provide a window into lithologic diversity and a chance to understand other types of martian rocks and meteorites. This study was also an attempt to establish a method to expand upon those of Mini-TES to remotely identify rocks of interest to make efficient use of the rover s current resources.
Derived from text
Lithology; Mars Exploration; Mars Surface; Planetary Geology; Rocks

20090025876 NASA Marshall Space Flight Center, Huntsville, AL, USA
Santorini, Another Meteorite on Mars and Third of a Kind
Schroeder, C.; Ashley, J. W.; Chapman, M. G.; Cohen, B. A.; Farrand, W. H.; Fleischer, I.; Gellert, R.; Herkenhoff, K. E.; Johnson, J. R.; Jolliff, B. L.; Joseph, J.; Klingelhoefer, G.; Morris, R. V.; Squyres, S. W.; Wright, S. P.; March 22, 2009; 2 pp.; In English; Lunar and Planetary Science Conference, 22-25 Mar. 2009, Houston, TX, USA; Original contains color and black and white illustrations
Report No.(s): M09-0330; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025876

The Mars Exploration Rover (MER) Opportunity has been studying Meridiani Planum for five years. On sol 1634 of its mission, Opportunity left Victoria crater after investigating it for approximately 682 sols [1] and is now on a journey towards Endeavour, a 24 km diameter crater about 12 km southeast of Victoria. A priority along the way is the investigation of cobbles, which in the jargon of the MER science team denotes any loose rock fragment larger than a couple of centimeters. Cobbles investigated thus far are of diverse origin [2] and provide the only means to investigate material other than the ubiquitous sulfate-rich outcrop, basaltic sand or hematiterich spherules dubbed blueberries. Some of these cobbles are meteorites [3]. Meteorites on Mars are not just a curiosity that make Mars a more Earth-like planet. Metallic iron in meteorites, for example, may be used as a more sensitive tracer for volatile surface interactions compared to igneous minerals [4]. Between sols 1713 and 1749, including the period of Mars solar conjunction, Opportunity investigated a cobble informally named Santorini. Its chemical and mineralogical composition is very similar to Barberton and Santa Catarina, two cobbles that were identified as meteorites and which are probably related to each other [3]. Santorini was investigated with the rover s Panoramic Camera (Pancam), Microscopic Imager (MI), Alpha-Particle X-ray Spectrometer (APXS) and Moessbauer (MB) spectrometer. The miniature Thermal Emission Spectrometer (mini-TES) was not operational at the time. The Rock Abrasion Tool (RAT) could

not be used to brush off potential dust coatings because of unfavorable geometry.
Derived from text
Mars Surface; Meteorites; Mars Roving Vehicles; Mars Exploration; X Ray Spectrometers

20090025878 NASA Marshall Space Flight Center, Huntsville, AL, USA
Characterizing the Effect of Shock on Isotopic Ages I: Ferroan Anorthosite Major Elements
Edmunson, J.; Cohen, B. A.; Spilde, M. N.; March 22, 2009; 2 pp.; In English; Lunar and Planetary Science Conference, 22-25 Mar. 2009, Houston, TX, USA; Original contains color illustrations
Report No.(s): M09-0331; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025878

A study underway at Marshall Space Flight Center is further characterizing the effects of shock on isotopic ages. The study was inspired by the work of L. Nyquist et al. [1, 2], but goes beyond their work by investigating the spatial distribution of elements in lunar ferroan anorthosites (FANs) and magnesium-suite (Mg-suite) rocks in order to understand the processes that may influence the radioisotope ages obtained on early lunar samples. This paper discusses the first data set (major elements) obtained on FANs 62236 and 67075.
Derived from text
Anorthosite; Lunar Geology; Lunar Soil; Isotopes; Mineralogy; Lunar Rocks; Geochronology

20090025879 NASA Marshall Space Flight Center, Huntsville, AL, USA
The International Lunar Network (ILN) Anchor Nodes Mission Update
Cohen, B. A.; Bassler, J. A.; McDougal, J. M.; Harris, D. W.; Hill, L.; Hammond, M. S.; Morse, B. J.; Reed, C. L. B.; Kirby, K. W.; Morgan, T. H.; March 22, 2009; 2 pp.; In English; Lunar and Planetary Science Conference, 22-25 Mar. 2009, Houston, TX, USA
Report No.(s): M09-0332; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025879

NASA s Science Mission Directorate (SMD) established the Lunar Quest Program (LQP) to accomplish lunar science objectives embodied in the National Academies report The Scientific Context for Exploration of the Moon (2007) and the NASA Advisory Council-sponsored Workshop on Science Associated with the Lunar Exploration Architecture (2007). A major element of LQP's lunar flight projects is the International Lunar Network (ILN), a network of small geophysical nodes on the lunar surface. NASA plans to provide the first two stations around 2014 and a second pair in the 2016-2017 timeframe. International involvement to provide additional stations will build up the network so that 8-10 nodes could be simultaneously operating. This flight project complements SMD's initiatives to build a robust lunar science community through R&A lines and increases international participation in NASA's robotic exploration of the moon.
Derived from text
Geophysics; Lunar Exploration; Lunar Programs; Lunar Surface; Robotics

20090025889 NASA Marshall Space Flight Center, Huntsville, AL, USA
Mineralogy of the Lunar Crust in Spatial Context: First Results from the Moon Mineralogy Mapper (M3)
Pieters, C. M.; Boardman, J.; Buratti, B.; Clark, R.; Combe, J-P; Green, R.; Goswami, J. N.; Head, J. W., III; Hicks, M.; Isaacson, P.; Klima, R.; Kramer, G.; Kumar, S.; Lundeen, S.; Malaret, E.; McCord, T. B.; Mustard, J.; Nettles, J.; Petro, N.; Runyon, C.; Staid, M. I.; Sunshine, J.; Taylor, L.; Tompkins, S.; Varanasi, P.; March 09, 2009; 2 pp.; In English; Chandrayaan-1 Science Team Meeting, 9-11 Mar. 2009, Bangalore, India; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM05AB26C
Report No.(s): M09-0357; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025889

India's Chandrayaan-1 successfully launched October 22, 2008 and went into lunar orbit a few weeks later. Commissioning of instruments began in late November and was near complete by the end of the year. Initial data for NASA's Moon Mineralogy Mapper (M3) were acquired across the Orientale Basin and the science results are discussed here. M 3 image-cube data provide mineralogy of the surface in geologic context. A major new result is that the existence and distribution of massive amounts of anorthosite as a continuous stratigraphic crustal layer is now irrefutable.
Derived from text
Lunar Crust; Mineralogy; Moon; India; Structural Basins; Thematic Mapping

20090025941 NASA Marshall Space Flight Center, Huntsville, AL, USA

Lunar History

Edmunson, Jennifer E.; March 17, 2009; 22 pp.; In English; Lunar Regolith/Simulant Workshop Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains color and black and white illustrations

Report No.(s): M09-0379; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025941

This section of the workshop describes the history of the moon, and offers explanations for the importance of understanding lunar history for engineers and users of lunar simulants. Included are summaries of the initial impact that is currently in favor as explaining the moon's formation, the crust generation, the creation of craters by impactors, the era of the lunar cataclysm, which some believe effected the evolution of life on earth, the nature of lunar impacts, crater morphology, which includes pictures of lunar craters that show the different types of craters, more recent events include effect of micrometeorites, solar wind, radiation and generation of agglutinates. Also included is a glossary of terms.

CASI

Lunar Evolution; Lunar Rocks; Moon; Selenology; Lunar Composition

20090025942 NASA Marshall Space Flight Center, Huntsville, AL, USA

Elements of Regolith Simulant's Cost Structure

Rickman, Douglas L.; March 17, 2009; 10 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains color and black and white illustrations

Report No.(s): M09-0380; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090025942

The cost of lunar regolith simulants is much higher than many users anticipate. After all, it is nothing more than broken rock. This class will discuss the elements which make up the cost structure for simulants. It will also consider which elements can be avoided under certain circumstances and which elements might be altered by the application of additional research and development.

Derived from text

Costs; Lunar Rocks; Regolith; Simulation

20090025943 NASA Johnson Space Center, Houston, TX, USA

Three-Dimensional Planetary Surface Tracking Based on a Simple Ultra-Wideband Impulse-Radio Infrastructure

Barton, Richard J.; Ni, David; Ngo, Phong; [2010]; 1 pp.; In English; 2010 IEEE Aerospace Conference, 6-13 Mar. 2010, Big Sky, MT, USA

Report No.(s): JSC-CN-18510; No Copyright; Avail.: Other Sources; Abstract Only

Several prototype ultra-wideband (UWB) impulse-radio (IR) tracking systems are currently under development at NASA Johnson Space Center (JSC). These systems are being studied for use in tracking of Lunar/Mars rovers and astronauts during early exploration missions when satellite navigation systems (such as GPS) are not available. To date, the systems that have been designed and tested are intended only for two-dimensional location and tracking, but these designs can all be extended to three-dimensional tracking with only minor modifications and increases in complexity. In this presentation, we will briefly review the design and performance of two of the current 2-D systems: one designed specifically for short-range, extremely high-precision tracking (approximately 1-2 cm resolution) and the other designed specifically for much longer range tracking with less stringent precision requirements (1-2 m resolution). We will then discuss a new multi-purpose system design based on a simple UWB-IR architecture that can be deployed easily on a planetary surface to support arbitrary three-dimensional localization and tracking applications. We will discuss utilization of this system as an infrastructure to provide both short-range and long-range tracking and analyze the localization performance of the system in several different configurations. We will give theoretical performance bounds for some canonical system configurations and compare these performance bounds with both numerical simulations of the system as well as actual experimental system performance evaluations.

Author

Broadband; Planetary Surfaces; Radio Tracking

20090025944 NASA Marshall Space Flight Center, Huntsville, AL, USA
Terrestrial and Lunar Geological Terminology
Schrader, Christian; March 17, 2009; 15 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville,AL, USA; Original contains color and black and white illustrations
Report No.(s): M09-0382; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025944

This section is largely a compilation of defining geological terms concepts. Broader topics, such as the ramifications for simulant design and in situ resource utilization, are included as necessary for context.
Derived from text
Mineralogy; Lunar Surface; Moon; Lunar Geology; Terminology

20090025946 NASA Marshall Space Flight Center, Huntsville, AL, USA
What We Do Not Know and Probably Need to Know
Gaier, J. R.; Rickman, Douglas L.; March 17, 2009; 9 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA
Report No.(s): M09-0390; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025946

By far the most important database to help us determine the engineering questions we need to address comes from the Apollo experience. In combing through the Apollo Mission Reports and Technical Debriefings there are numerous references to the problems caused by lunar dust during the missions. These have been sorted into nine classes of difficulties.
Derived from text
Lunar Dust; Apollo Flights; Lunar Geology; Manned Space Flight; Lunar Occultation

20090025947 NASA Marshall Space Flight Center, Huntsville, AL, USA
MSFC Lunar Environments Test System (LETS) System Development
Craven, Paul; Vaughn, Jason; Schneider, Todd; Norwood, Joey; Abbas, Mian; Alexander, Reginald; March 17, 2009; 20 pp.; In English; Third Lunar Regolith Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains color and black and white illustrations
Report No.(s): M09-0391; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025947

A review of the NASA MSFC Lunar Environment Test System (LETS) System Development is presented. The contents include: 1) MSFC LETS Chamber Status; 2) LETS Simulant Containment Box Development; 3) Tests Conducted in LETS To date: Simulant Dust Migration; 4) Summary; and 5) Forward Work.
CASI
Environmental Tests; Lunar Environment; Systems Engineering; Lunar Surface

20090025949 NASA Marshall Space Flight Center, Huntsville, AL, USA
Ares I Stage Separation System Design Certification Testing
Mayers, Stephen L.; Beard, Bernard B.; Smith, R. Kenneth; Patterson, Alan; April 14, 2009; 29 pp.; In English; 56th JANNAF Propulsion Meeting, 14-17 Apr. 2009, Las Vegas, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNM05AB50C
Report No.(s): M09-0394; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025949

NASA is committed to the development of a new crew launch vehicle, the Ares I, that can support human missions to low Earth orbit (LEO) and the moon with unprecedented safety and reliability. NASA's Constellation program comprises the Ares I and Ares V launch vehicles, the Orion crew vehicle, and the Altair lunar lander. Based on historical precedent, stage separation is one of the most significant technical and systems engineering challenges that must be addressed in order to achieve this commitment. This paper surveys historical separation system tests that have been completed in order to ensure staging of other launch vehicles. Key separation system design trades evaluated for Ares I include single vs. dual separation plane options, retro-rockets vs. pneumatic gas actuators, small solid motor quantity/placement/timing, and continuous vs. clamshell interstage configuration options. Both subscale and full-scale tests are required to address the prediction of complex dynamic loading scenarios present during staging events. Test objectives such as separation system functionality, and

pyroshock and debris field measurements for the full-scale tests are described. Discussion about the test article, support infrastructure and instrumentation are provided.
Author
Certification; Constellation Program; Stage Separation; Systems Engineering; Ares 1 First Stage

20090025958 NASA Johnson Space Center, Houston, TX, USA
Molecular Composition of Carbonaceous Globules in the Bells (CM2) Chondrite
Clemett, S. J.; Nakamura-Messenger, K.; Thomas-Keprta, K. L.; Robinson, G.-A.; Mckay, D. S.; July 13, 2009; 1 pp.; In English; 72nd Annual Meeting of the Meteoritical Society, 13-18 Jul. 2009, Nancy, France
Report No.(s): JSC-CN-18521; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025958

Some meteorites and IDPs contain micron-size carbonaceous globules that are associated with significant H and/or N isotopic anomalies. This has been interpreted as indicating that such globules may contain at least partial preserved organic species formed in the outer reaches of the proto-solar disk or the presolar cold molecular cloud. Owing to their small sizes, relatively little is known about their chemical compositions. Here we present in situ measurements of aromatic molecular species in organic globules from the Bells (CM2) chondrite by microprobe two-step laser mass spectrometry. This meteorite was chosen for study because we have previously found this meteorite to contain high abundances of globules that often occur in clusters. The Bells (CM2) globules are also noteworthy for having particularly high enrichments in H-2. and N-15. In this study, we identified individual globules and clusters of globules using native UV fluorescence.
Derived from text
Chemical Composition; Chondrites; Globules

20090025983 NASA Marshall Space Flight Center, Huntsville, AL, USA
Towards Designing an Integrated Architecture for NEO Characterization, Mitigation, Scientific Evaluation, and Resource Utilization
Adams, Robert B.; LaPointe, Michael; Wilks, Rod; Allen, Brian; April 27, 2009; 1 pp.; In English; 1st IAA Planetary Defense Conference, 27-30 Apr. 2009, Grenada, Spain; Original contains color illustrations
Report No.(s): M09-0456; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025983

This poster reviews the planning and design for an integrated architecture for characterization, mitigation, scientific evaluation and resource utilization of near earth objects. This includes tracks to observe and characterize the nature of the threat posed by a NEO, and deflect if a significant threat is posed. The observation stack can also be used for a more complete scientific analysis of the NEO.
CASI
Characterization; Near Earth Objects; Deflection; Extraterrestrial Resources

20090025988 NASA Marshall Space Flight Center, Huntsville, AL, USA
NASA: Engineering Space Exploration - Launching to the Moon, Mars, and Beyond
Malone, Roy; March 11, 2009; 33 pp.; In English; Launching to the Moon, Mars, and Beyond, 11 Mar. 2009, Huntsville, AL, USA; Original contains black and white illustrations
Report No.(s): MSFC-2217; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025988

This presentation reviews NASA's program of space exploration, including information about NASA's mission, the human urge to explore, the timeline for the development of the exploration, and what NASA plans to explore and prove during the return to the moon. Also include are views of the planned vehicles, and a review of progress to date in the design and construction of the vehicles. Some of the benefits of space exploration are also reviewed.
CASI
Moon; Space Exploration; Lunar Exploration; Constellation Program

20090025990 NASA Marshall Space Flight Center, Huntsville, AL, USA
Terrestrial and Lunar Geological Terminology for Non-Geoscientists
Schrader, Christian M.; March 17, 2009; 36 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains black and white illustrations
Report No.(s): MSFC-2218; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025990

This slide presentation reviews several geologic concepts applicable to lunar geology with particular interest in creating lunar regolith simulant. Fundamental ways in which the Moon differs from the Earth. Concepts that are described in detail are: minerals, glass, and rocks.
CASI
Lunar Geology; Minerals; Moon; Terminology; Selenology; Lunar Rocks

20090025991 NASA Marshall Space Flight Center, Huntsville, AL, USA
Lunar Regolith Figures of Merit
Rickman, Doug; Scjrader. Cjrostoam; Jpe;zer. Jams; Fourroux, Kathy; March 17, 2009; 30 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains black and white illustrations
Report No.(s): MSFC-2219; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025991

This viewgraph presentation reviews the lunar regolith figures of merit. The contents include: 1) A quick review of Figures-of-Merit (FoM); 2) Software Implementation of FoM Algorithms; and 3) Demonstration of the Software.
CASI
Lunar Rocks; Regolith; Figure of Merit; Software Engineering

20090025993 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The Moon Mineralogy (M3) Imaging Spectrometer: Early Assessment of the Spectral, Radiometric, Spatial and Uniformity Properties
Green, Robert O.; Pieters, C. M.; Boardman, J.; Barr, D.; Bruce, C.; Bousman, J.; Chatterjee, A.; Eastwood, M.; Essandoh, V.; Geier, S.; Glavich, T.; Green, R.; Haemmerle, V.; Hyman, S.; Hovland, L.; Koch, T.; Lee, K.; Lundeen, S.; Motts, E.; Mouroulis, P.; Paulson, S.; Plourde, K.; Racho, C.; Robinson, D.; Rodriquez, J., et al.; January 29, 2009; 2 pp.; In English; Chandrayaan-1 Science and Operations Management, 29-30 Jan. 2009, Bangalore, India; Original contains black and white illustrations
Report No.(s): MSFC-2216; Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025993

The Moon Mineralogy Mapper's (M3) is a high uniformity and high signal-to-noise ratio NASA imaging spectrometer that is a guest instrument on the Indian Chandrayaan-1 Mission to the Moon. The laboratory measured spectral, radiometric, spatial, and uniformity characteristics of the M3 instrument are given. The M3 imaging spectrometer takes advantage of a suite of critical enabling capabilities to achieve its measurement requirement with a mass of 8 kg, power usage of 15 W, and volume of 25X18X12 cm. The M3 detector and spectrometer are cooled by a multi-stage passive cooler. This paper presents early M3 performance assessment results.
Derived from text
Imaging Spectrometers; Mineralogy; Moon; Radiometers

20090026003 NASA Johnson Space Center, Houston, TX, USA
NASA Missions Enabled by Space Nuclear Systems
Scott, John H.; Schmidt, George R.; June 08, 2009; 27 pp.; In English; Nuclear Emerging Technologies for Space (NETS - 2009), 15-18 Jun. 2009, Atlanta, GA, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18457; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026003

This viewgraph presentation reviews NASA Space Missions that are enabled by Space Nuclear Systems. The topics include: 1) Space Nuclear System Applications; 2) Trade Space for Electric Power Systems; 3) Power Generation Specific Energy Trade Space; 4) Radioisotope Power Generation; 5) Radioisotope Missions; 6) Fission Power Generation; 7) Solar

Powered Lunar Outpost; 8) Fission Powered Lunar Outpost; 9) Fission Electric Power Generation; and 10) Fission Nuclear Thermal Propulsion.
CASI
NASA Space Programs; Space Missions; Electric Power Supplies; Nuclear Propulsion

20090026004 NASA Johnson Space Center, Houston, TX, USA
Liquid Oxygen/Liquid Methane Test Results of the RS-18 Lunar Ascent Engine at Simulated Altitude Conditions at NASA White Sands Test Facility
Melcher, John C., IV; Allred, Jennifer K.; August 2, 2009; 13 pp.; In English; 45th AIAA/ASME/SAE/ASEE Joint Propulsion, 2-5 Aug. 2009, Denver, CO, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18473; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026004

Tests were conducted with the RS-18 rocket engine using liquid oxygen (LO2) and liquid methane (LCH4) propellants under simulated altitude conditions at NASA Johnson Space Center White Sands Test Facility (WSTF). This project is part of NASA's Propulsion and Cryogenics Advanced Development (PCAD) project. 'Green' propellants, such as LO2/LCH4, offer savings in both performance and safety over equivalently sized hypergolic propulsion systems in spacecraft applications such as ascent engines or service module engines. Altitude simulation was achieved using the WSTF Large Altitude Simulation System, which provided altitude conditions equivalent up to ~122,000 ft (~37 km). For specific impulse calculations, engine thrust and propellant mass flow rates were measured. LO2 flow ranged from 5.9 - 9.5 lbm/sec (2.7 - 4.3 kg/sec), and LCH4 flow varied from 3.0 - 4.4 lbm/sec (1.4 - 2.0 kg/sec) during the RS-18 hot-fire test series. Propellant flow rate was measured using a coriolis mass-flow meter and compared with a serial turbine-style flow meter. Results showed a significant performance measurement difference during ignition startup due to two-phase flow effects. Subsequent cold-flow testing demonstrated that the propellant manifolds must be adequately flushed in order for the coriolis flow meters to give accurate data. The coriolis flow meters were later shown to provide accurate steady-state data, but the turbine flow meter data should be used in transient phases of operation. Thrust was measured using three load cells in parallel, which also provides the capability to calculate thrust vector alignment. Ignition was demonstrated using a gaseous oxygen/methane spark torch igniter. Test objectives for the RS-18 project are 1) conduct a shakedown of the test stand for LO2/methane lunar ascent engines, 2) obtain vacuum ignition data for the torch and pyrotechnic igniters, and 3) obtain nozzle kinetics data to anchor two-dimensional kinetics codes. All of these objectives were met with the RS-18 data and additional testing data from subsequent LO2/methane test programs in 2009 which included the first simulated-altitude pyrotechnic ignition demonstration of LO2/methane.
Author
Liquid Oxygen; Methane; Rocket Engines; Test Facilities; Liquefied Natural Gas; Cryogenics; Altitude Simulation

20090026005 NASA Johnson Space Center, Houston, TX, USA
Angle of Attack Modulation for Mars Entry Terminal State Optimization
Lafleur, Jarret M.; Cerimele, Christopher J.; [2009]; 20 pp.; In English; AIAA Atmospheric Flight Mechanics Conference, 10-13 Aug. 2009, Chicago, IL, USA; Original contains color and black and white illustrations
Report No.(s): JSC-CN-18477; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026005

From the perspective of atmospheric entry, descent, and landing (EDL), one of the most foreboding destinations in the solar system is Mars due in part to its exceedingly thin atmosphere. To benchmark best possible scenarios for evaluation of potential Mars EDL system designs, a study is conducted to optimize the entry-to-terminal-state portion of EDL for a variety of entry velocities and vehicle masses, focusing on the identification of potential benefits of enabling angle of attack modulation. The terminal state is envisioned as one appropriate for the initiation of terminal descent via parachute or other means. A particle swarm optimizer varies entry flight path angle, ten bank profile points, and ten angle of attack profile points to find maximum-final-altitude trajectories for a 10 30 m ellipsled at 180 different combinations of values for entry mass, entry velocity, terminal Mach number, and minimum allowable altitude. Parametric plots of maximum achievable altitude are shown, as are examples of optimized trajectories. It is shown that appreciable terminal state altitude gains (2.5-4.0 km) over pure bank angle control may be possible if angle of attack modulation is enabled for Mars entry vehicles. Gains of this magnitude could prove to be enabling for missions requiring high-altitude landing sites. Conclusions are also drawn regarding trends in the bank and angle of attack profiles that produce the optimal trajectories in this study, and directions for future work are identified.
Author
Angle of Attack; Atmospheric Entry; Mars (Planet); Mars Landing; Parachute Descent; Descent Trajectories; Mars Missions

20090026011 NASA Marshall Space Flight Center, Huntsville, AL, USA
Overview of Figure of Merit Analyses of Simulants and the Fit-to-Use Matrix
Schrader, Christian M.; Rickman, Douglas L.; March 17, 2009; 17 pp.; In English; Lunar Regolith/Simulant Workshop, 17-20 Mar. 2009, Huntsville, AL, USA; Original contains black and white illustrations
Report No.(s): MSFC-2222; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026011

This slide slide presentation reviews the lunar regolith simulants and presents a comparison of the different types and their uses. Figures of Merit (FoM) algorithms have been developed to quantitatively compare the distributions in different granular materials. These algorithms have been used to compare the different lunar regolith simulants to the Apollo 16 reference material for composition and particle size distribution. The results of this comparison of the various forms of lunar regolith simulants are examined.
CASI
Figure of Merit; Granular Materials; Lunar Rocks; Regolith; Simulation; Evaluation; Comparison; Selenology

20090026215 NASA Ames Research Center, Moffett Field, CA, USA
Workshop Report on Deep Mars: Accessing the Subsurface of Mars on Near Term Missions
Langhoff, Stephanie R., Editor; June 2008; 35 pp.; In English; Deep Mars: Accessing the Subsurface of Mars on Near Term Missions workshop, 1-2 Mra. 2008, Moffett Field, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WU 292487.01.01.02
Report No.(s): NASA/CP-2008-214586; ARC-E-DAA-TN-142; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026215

The workshop encompassed three major themes. The first theme was the scientific objectives of drilling, which center on the search for clues to the existence of past life and to the geological and climate history of Mars. Key questions are where and how deep to drill? Planetary protection issues were stressed as an important consideration in the design of any drilling mission. Secondly, architectures for drilling missions were discussed, including an overview of most of the current drills in operation that would be applicable to drilling on Mars. Considerable emphasis was placed on remote operation and drilling automation technologies. Finally, alternatives to conventional drilling were discussed. These included underground moles, penetrometers, horizontal drilling, impactors, and access to the subsurface from subsurface cavities. Considerable discussion centered on the possible Mars drilling missions that could be performed in both the near and longer term. The workshop participants concluded that useful science could be obtained today using low-cost impactors, with or without a sheperding spacecraft.
Author
Mars Environment; Penetrometers; Mars Missions; Geology; Climate; Planetary Protection

20090026303 NASA Johnson Space Center, Houston, TX, USA
An Assessment of Dust Effects on Planetary Surface Systems to Support Exploration Requirements
Wagner, Sandra; December 2008; 30 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2008-213722; S-0979; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026303

Apollo astronauts learned, first hand, how problems with dust impact lunar surface missions. After three days, lunar dust contamination on Extravehicular Activity (EVA) suit bearings led to such great difficulty in movement that another EVA would not have been possible. Dust clinging to EVA suits was transported into the Lunar Module. During the return trip to Earth, when microgravity was reestablished, the dust became airborne and floated through the cabin. Crews inhaled the dust and it irritated their eyes. Some mechanical systems aboard the spacecraft were damaged due to dust contamination. Study results obtained by Robotic Martian missions indicate that Martian surface soil is oxidative and reactive. Exposures to the reactive Martian dust will pose an even greater concern to the crew health and the integrity of the mechanical systems. The Advanced Integration Matrix Dust Assessment Team was tasked to identify systems that will be affected by the respective dust, how they will be affected, associated risks of dust exposure, requirements that will need to be developed, identify knowledge gaps, and recommend scientific measurements to obtain information needed to develop requirements, and to design and manufacture the surface systems that will support crew habitation in the lunar and Martian outposts.
Author
Aerospace Medicine; Extravehicular Activity; Lunar Dust; Planetary Surfaces; Technology Assessment

20090026329 NASA Ames Research Center, Moffett Field, CA, USA
Lunar Commercialization Workshop
Martin, Gary L.; August 2008; 12 pp.; In English; Space Studies Program (SSP -09), 1 Aug. 2008, Barcelona, Spain; Original contains color illustrations
Report No.(s): ARC-E-DAA-TN-159; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026329

This slide presentation describes the goals and rules of the workshop on Lunar Commercialization. The goal of the workshop is to explore the viability of using public-private partnerships to open the new space frontier. The bulk of the workshop was a team competition to create a innovative business plan for the commercialization of the moon. The public private partnership concept is reviewed, and the open architecture as an infrastructure for potential external cooperation. Some possible lunar commercialization elements are reviewed.
CASI
Moon; Space Commercialization; Lunar Logistics; Lunar Resources

20090026361 NASA Langley Research Center, Hampton, VA, USA
Dynamic Stability Testing of the Mars Science Laboratory Entry Capsule
Schroenenberger, Mark; Yates, Leslie; Hathaway, Wayne; June 22, 2009; 19 pp.; In English; 41st AIAA Thermophysics Conference, 22-25 Jun. 2009, San Antonio, TX, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 857464.02.07.08
Report No.(s): AIAA Paper 2009-3917; LF99-8967; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026361

Results from a 26 shot ballistic range test of the Mars Science Laboratory (MSL) entry capsule are presented. The supersonic pitch damping properties of the MSL capsule were characterized between Mach 1.35 and Mach 3.5 and total angles-of-attack from 0 to 30 degrees. In flight, the MSL entry capsule will utilize a radial center-of-gravity offset to produce a non-zero trim angle-of-attack. This offset trim angle will produce lift, enabling the capsule to fly a guided entry and reducing the landing footprint dimensions to within 10 km of the desired landing site. A lifting configuration could not be tested at the ballistic range used for this test as the models would swerve into the range walls, possibly damaging cameras, the coordinate reference system or other facility assets. Ballistic (non-lifting) data was extracted and will be implemented in a conservative fashion to ensure that the dynamic stability characteristics of the flight vehicle are bounded. A comparison between the MSL pitch damping results and the dynamic model of the Mars Exploration Rover capsule shows generally close agreement with no significant differences in damping characteristics due to the change in backshell geometry. Dynamic moments are also compared to the MSL reaction control system (RCS) control authority to show the controller has sufficient margin to easily damp any dynamic stability effects.
Author
Dynamic Models; Dynamic Stability; Mars Exploration; Stability Tests; Ballistics; Mars Landing; Space Capsules

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SOLAR PHYSICS

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

20090025890 NASA Marshall Space Flight Center, Huntsville, AL, USA
STEREO Observations of Energetic Neutral Hydrogen Atoms during the 5 December 2006 Solar Flare
Mewaldt, R. A.; Leske, R. A.; Stone, E. C.; Barghouty, A. F.; Labrador, A. W.; Cohen, C. M. S.; Cummings, A. C.; Davis, A. J.; vonRosenvinge, T. T.; Wiedenbeck, M. E.; The Astrophysical Journal - Letters; February 11, 2009; Volume 693, pp. L11-L15; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS5-03131; SA2715-26309
Report No.(s): M09-0359; Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090025890; http://dx.doi.org/10.1088/0004-637X/693/1/L11

We report the discovery of energetic neutral hydrogen atoms emitted during the X9 solar event of December 5, 2006. Beginning ~1 hour following the onset of this E79 flare, the Low Energy Telescopes (LETs) on both the STEREO A and B spacecraft observed a sudden burst of 1.6 to 15 MeV protons beginning hours before the onset of the main solar energetic particle (SEP) event at Earth. More than 70% of these particles arrived from a longitude within 10 of the Sun, consistent with the measurement resolution. The derived emission profile at the Sun had onset and peak times remarkably similar to the GOES

soft X-ray profile and continued for more than an hour. The observed arrival directions and energy spectrum argue strongly that the particle events less than 5 MeV were due to energetic neutral hydrogen atoms (ENAs). To our knowledge, this is the first reported observation of ENA emission from a solar flare/coronal mass ejection. Possible origins for the production of ENAs in a large solar event are considered. We conclude that the observed ENAs were most likely produced in the high corona and that charge-transfer reactions between accelerated protons and partially-stripped coronal ions are an important source of ENAs in solar events.
Derived from text
Energetic Particles; Hydrogen Atoms; Neutral Gases; Solar Flares

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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.

20090026021 NASA Marshall Space Flight Center, Huntsville, AL, USA
Launching the Future of Science and Exploration
Shivers, Charles H.; April 30, 2009; 20 pp.; In English; Huntsville Optimist Club, 30 Apr. 2009, Alabama, USA; Original contains color illustrations
Report No.(s): M09-0454; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090026021

This slide presentation reviews the impact that NASA and more specifically the Marshall Space Flight Center (MSFC) has had in science and exploration of Earth. the moon, the solar system and the universe. Some of the contributions that MSFC has made to NASA's missions and the plans for future explorations are reviewed. Also there are views of the contributions to improvement of human life on earth and the impact of the understanding of some natural phenomena made possible by the technology and scientific discoveries of MSFC.
CASI
NASA Programs; Technology Utilization; Technology Transfer

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