National Aeronautics and
Space Administration
Langley Research Center

Scientific and Technical
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Scientific and Technical Aerospace Reports

STAR

Volume 45 Number 16

August 20, 2007

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NASA STI Program ... in Profile

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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

The NASA STI Program

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

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

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

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

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

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 45, NUMBER 16 AUGUST 20, 2007

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.

20070023369 NASA Langley Research Center, Hampton, VA, USA

A Review of Hypersonics Aerodynamics, Aerothermodynamics and Plasmadynamics Activities within NASA's Fundamental Aeronautics Program

Salas, Manuel D.; June 25, 2007; 14 pp.; In English; 39th AIAA Thermophysics Conference, 25-28 June 2007, Miami, FL, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2007-4264; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023369

The research program of the aerodynamics, aerothermodynamics and plasmadynamics discipline of NASA's Hypersonic Project is reviewed. Details are provided for each of its three components: 1) development of physics-based models of non-equilibrium chemistry, surface catalytic effects, turbulence, transition and radiation; 2) development of advanced simulation tools to enable increased spatial and time accuracy, increased geometrical complexity, grid adaptation, increased physical-processes complexity, uncertainty quantification and error control; and 3) establishment of experimental databases from ground and flight experiments to develop better understanding of high-speed flows and to provide data to validate and guide the development of simulation tools.

Author

Aeronautical Engineering; Aerothermodynamics; Hypersonics; NASA Programs; Plasma Dynamics; Computational Fluid Dynamics; Mathematical Models

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.

20070023334 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Developing the Federal Aviation Administration's Requirements for Color Use in Air Traffic Control Displays

Xing, Jing; May 2007; 19 pp.; In English

Contract(s)/Grant(s): AM-BHRR522

Report No.(s): DOT/FAA/AM-07/10; No Copyright; Avail.: CASI: A03, Hardcopy

This report describes the materials we developed for the Federal Aviation Administration's requirements for color use in Air Traffic Control (ATC) displays. While many color use guidelines and the Federal Aviation Administration's Human Factors Design Standard (HF-STD-001) provide general information about how to choose color schemes in visual displays, the purpose of this document is for developers of ATC technologies and human factors practitioners to evaluate the use of color from the perspective of ATC operations. This document provides two checklists. The first is a 'To-do' checklist to assess whether the use of a color is effective for its intended purpose of assisting ATC task performance. The second is a 'Do-not do' checklist to assess whether the use of color introduces potential negative effects on performance. While the two checklists may not cover all color use issues, they are pertinent to performance and can serve as a baseline to qualify/disqualify color

schemes in ATC displays. Developers and human factors practitioners are encouraged to reference these checklists for interface design and acquisition evaluation of ATC technologies.
Author
Air Traffic Control; Color; Display Devices; Human Factors Engineering; Aircraft Safety

20070023377 Civil Aerospace Medical Inst., Oklahoma City, OK, USA, AmSafe Aviation, Phoenix, AZ, USA, Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands
Assessment of Injury Potential in Aircraft Side-Facing Seats Using the ES-2 Anthropomorphic Test Dummy
DeWeese, Richard L.; Moorcroft, David M.; Green, Tom; Philippens, M. M. G. M.; May 2007; 30 pp.; In English; Original contains black and white illustrations
Report No.(s): DOT/FAA/AM-07/13; Copyright; Avail.: CASI: A03, Hardcopy

A project was conducted to assess the injury potential of current side facing aircraft seat configurations using the ES-2 Anthropomorphic Test Dummy proposed for use in Federal Motor Vehicle Safety Standards. The ability of inflatable restraint systems to mitigate injuries in these configurations was also assessed. Impact sled tests were conducted at the Federal Aviation Administration's Civil Aerospace Medical Institute using a sidefacing sofa fixture with cushion construction representative of current business jets. The tests simulated three typical seating configurations: occupant in the middle seat, occupant seated next to a rigid wall, and occupant seated next to an armrest end closure. Two types of restraints were evaluated: a three-point body centered conventional restraint with inertia reel and a similar restraint incorporating a new inflatable shoulder restraint (airbag). The test conditions were the 16g, 44 ftls, horizontal impact specified in 14 CFR 25.562 but without yaw. Test setup techniques were developed to ensure consistent occupant positioning. Test repeatability was assessed for some test conditions. f The suitability of the ES-2 for use in aircraft seat testing was evaluated. Injury criteria were calculated from the data gathered during the tests, including criteria currently published in the Federal Aviation Regulations and Federal Motor Vehicle Safety Standards such as the Head Injury Criteria, upper torso restraint loads, Thoracic Trauma Index, and peak lateral pelvis acceleration. Other research criteria and those identified in proposed Federal Motor Vehicle Safety Standards were also calculated. These criteria included neck forces and moments, Preliminary Lateral Nij, Viscous Criteria, rib deflection, abdominal forces, pubic force, upper spine acceleration, and femur torsion. Results were analyzed to identify criteria relevant for aviation use and seating and restraint system configurations that indicated potential improvements in occupant protection for side-facing Seats
Author
Aerospace Medicine; Human Body; Injuries; Positioning; Seats; Aircraft Structures

20070023389 NASA Dryden Flight Research Center, Edwards, CA, USA
Real-time Affective Indices of Potential CRM Breakdown: Qualitative Testing of an Operational Hypothesis
Dickerson, Mark; May 08, 2007; 28 pp.; In English; 2007 Flight Test Safety Workshop, 8-10 May 2007, San Diego, CA, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023389

This viewgraph presentation begins by showing several cases where poor crew resource management (CRM) resulted in aircraft accidents. The presenter reviews the emotional states that are present in a situation that frequently leads to an accident. The operational answer suggested is given as an acronym: PACE, which stand for Probe, Alert, Challenge, Emergency Action.
CASI
Resources Management; Emotional Factors; Flight Crews; Pilots (Personnel); Aviation Psychology; Aircraft Accidents; Flight Hazards; Pilot Error

20070023491 Rice Univ., Houston, TX, USA
Using Computational Cognitive Modeling to Diagnose Possible Sources of Aviation Error
Byrne, M. D.; Kirlik, Alex; The International Journal of Aviation Psychology; Jun. 2003; Volume 15, No. 2, pp. 135-155; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG2-1609; NCC2-1219; NDD2-1321
Report No.(s): PB2007-105492; AHFD-03-14; Copyright; Avail.: Other Sources

We present a computational model of a closed-loop, pilot-aircraft-visual scene-taxiway system created to shed light on possible sources of taxi error. Creating the cognitive aspects of the model using ACT-R required us to conduct studies with subject matter experts to identify experiential adaptations pilots bring to taxiing. Five decision strategies were found, ranging from cognitively-intensive but precise, to fast, frugal but robust. We provide evidence for the model by comparing its behavior

to a NASA Ames Research Center simulation of Chicago O'Hare surface operations. Decision horizons were highly variable; the model selected the most accurate strategy given time available. We found a signature in the simulation data of the use of globally robust heuristics to cope with short decision horizons as revealed by errors occurring most frequently at atypical taxiway geometries or clearance routes. These data provided empirical support for the model.
Author
Cognition; Error Analysis; Errors; Human Factors Engineering; Flight Safety

20070023633 NASA Ames Research Center, Moffett Field, CA, USA
Information Display System for Atypical Flight Phase
Statler, Irving C., Inventor; Ferryman, Thomas A., Inventor; Amidan, Brett G., Inventor; Whitney, Paul D., Inventor; White, Amanda M., Inventor; Willse, Alan R., Inventor; Cooley, Scott K., Inventor; Jay, Joseph Griffith, Inventor; Lawrence, Robert E., Inventor; Mosbrucker, Chris J., Inventor; Rosenthal, Loren J., Inventor; Lynch, Robert E., Inventor; Chidester, Thomas R., Inventor; Prothero, Gary L., Inventor; Andrei, Adi, Inventor; Romanowski, Timothy P., Inventor; Robin, Daniel E., Inventor; Prothero, Jason W., Inventor; April 17, 2007; 22 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS2-99091
Patent Info.: Filed 13 Aug. 2004; US-Patent-7,206,674; US-Patent-Appl-SN-923156; US-Patent-Appl-SN-957376; NASA-Case-ARC-15041-2; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023633

Method and system for displaying information on one or more aircraft flights, where at least one flight is determined to have at least one atypical flight phase according to specified criteria. A flight parameter trace for an atypical phase is displayed and compared graphically with a group of traces, for the corresponding flight phase and corresponding flight parameter, for flights that do not manifest atypicality in that phase.
Official Gazette of the U.S. Patent and Trademark Office
Display Devices; Air Transportation; Data Processing; Flight Operations; Civil Aviation; Information Systems

20070023634 NASA Ames Research Center, Moffett Field, CA, USA
Historical Analysis of Aircraft Flight Parameters
Lynch, Robert E., Inventor; Lawrence, Robert E., Inventor; Chidester, Thomas R., Inventor; Amidan, Brett G., Inventor; Prothero, Gary L., Inventor; Romanowski, Timothy P., Inventor; 9 Jan. 2007; 13 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 22 Feb. 2005; US-Patent-7,161,501; US-Patent-Appl-11/066650; US-Patent-Appl-10/956523; NASA-Case-ARC-15356-2; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023634

Method and system for analyzing and displaying one or more present flight parameter values (FP(t) of an aircraft in motion at a measurement time t(sub n), and for comparing the present flight parameter value with a selected percentage band, containing historical flight parameter data for similar conditions.
Official Gazette of the U.S. Patent and Trademark Office
Flight Characteristics; Histories; Aircraft Maneuvers; Time Measurement; Civil Aviation

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.

20070022832 NASA Dryden Flight Research Center, Edwards, CA, USA
Autonomous Soaring 2005 Flight Data Summary
Allen, Michael J.; [2006]; 680 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: C01, CD-ROM: A99, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022832

Flight testing of the 14ft span CloudSwift UAV was conducted during the summer of 2005. Test maneuvers included

aircraft checkout, Piccolo gain tuning, FTS range tests, and thermal soaring research flights.
Derived from text
Autonomy; Soaring; Pilotless Aircraft; Remotely Piloted Vehicles

20070022838 NASA Glenn Research Center, Cleveland, OH, USA
Failure Maps for Rectangular 17-4PH Stainless Steel Sandwiched Foam Panels
Raj, S. V.; Ghosn, L. J.; May 31, 2007; 24 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2007-214802; E-15935; Copyright; Avail.: CASI: A03, Hardcopy

A new and innovative concept is proposed for designing lightweight fan blades for aircraft engines using commercially available 17-4PH precipitation hardened stainless steel. Rotating fan blades in aircraft engines experience a complex loading state consisting of combinations of centrifugal, distributed pressure and torsional loads. Theoretical failure plastic collapse maps, showing plots of the foam relative density versus face sheet thickness, t, normalized by the fan blade span length, L, have been generated for rectangular 17-4PH sandwiched foam panels under these three loading modes assuming three failure plastic collapse modes. These maps show that the 17-4PH sandwiched foam panels can fail by either the yielding of the face sheets, yielding of the foam core or wrinkling of the face sheets depending on foam relative density, the magnitude of t/L and the loading mode. The design envelop of a generic fan blade is superimposed on the maps to provide valuable insights on the probable failure modes in a sandwiched foam fan blade.
Author
Panels; Stainless Steels; Sandwich Structures; Failure Modes; Fan Blades; Aircraft Engines; Wrought Alloys; Metal Foams

20070022843 NASA Langley Research Center, Hampton, VA, USA
On an Asymptotically Consistent Unsteady Interacting Boundary Layer
Bartels, Robert E.; June 2007; 15 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2007-214868; L-19308; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022843

This paper develops the asymptotic matching of an unsteady compressible boundary layer to an inviscid flow. Of particular importance is the velocity injection or transpiration boundary condition derived by this theory. It is found that in general the transpiration will contain a slope of the displacement thickness and a time derivative of a density integral. The conditions under which the second term may be neglected, and its consistency with the established results of interacting boundary layer are discussed.
Author
Asymptotes; Unsteady Flow; Compressible Boundary Layer; Inviscid Flow

20070023364 NASA Dryden Flight Research Center, Edwards, CA, USA
Neural Net Safety Monitor Design
Larson, Dick; May 07, 2007; 39 pp.; In English; AIAA Infotech\@2007 Conference and Exhibit, 7-10 May 2007, Edwards, CA, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2007-2812; No Copyright; Avail.: CASI: C01, CD-ROM: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023364

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) concept1 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; Flight Tests; Neural Nets; Flight Safety; NASA Programs; Control Systems Design; In-Flight Monitoring

20070023459 NASA Dryden Flight Research Center, Edwards, CA, USA

Shaped Sonic Boom Demonstration/Experiment Airborne Data

Haering ,Edward A., Jr.; Murray, James E.; August 17, 2004; 41 pp.; In English; No Copyright; Avail.: CASI: C01, CD-ROM: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023459

This viewgraph presentation reviews NASA's project to demonstrate that careful design of aircraft contour the resultant sonic boom can maintain a tailored shape, propagating through a real atmosphere down to ground level. The areas in covered in this presentation are: (1) Past airborne shock measurement efforts, (2) SR-71 Sonic Boom Propagation Experiment (3) F-5E Inlet Spillage Shock Measurement (4) Flight test approach (5) GPS data (6) Shaped Sonic Boom Demonstration (SSBD) Mach calibration (7) Super Blanik L-23 sailplane (8) Near-field probing (8a)Maneuvers (8b) Control Room Displays (8c) Pressure Instrumentation (8d) Signatures.

CASI

Aircraft Design; Flight Tests; Sonic Booms; Supersonic Flight; Aerodynamic Noise; Noise Reduction; Contours; Shapes; Aeronautical Engineering; Aerodynamic Configurations

20070023559 NASA Langley Research Center, Hampton, VA, USA, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA, USA

Screening of Potential Landing Gear Noise Control Devices at Virginia Tech For QTD II Flight Test

Ravetta, Patricio A.; Burdisso, Ricardo A.; Ng, Wing F.; Khorrami, Mehdi R.; Stoker, Robert W.; May 21, 2007; 13 pp.; In English; 13th AIAA/CEAS Aeroacoustics Conference, 21-23 May 2007, Rome, Italy; Original contains color illustrations

Contract(s)/Grant(s): NAG1-02084

Report No.(s): AIAA Paper No. 2007-3455; Copyright; Avail.: CASI: A03, Hardcopy

In support of the QTD II (Quiet Technology Demonstrator) program, aeroacoustic measurements of a 26%-scale, Boeing 777 main landing gear model were conducted in the Virginia Tech Stability Tunnel. The objective of these measurements was to perform risk mitigation studies on noise control devices for a flight test performed at Glasgow, Montana in 2005. The noise control devices were designed to target the primary main gear noise sources as observed in several previous tests. To accomplish this task, devices to reduce noise were built using stereo lithography for landing gear components such as the brakes, the forward cable harness, the shock strut, the door/strut gap and the lower truck. The most promising device was down selected from test results. In subsequent stages, the initial design of the selected lower truck fairing was improved to account for all the implementation constraints encountered in the full-scale airplane. The redesigned truck fairing was then retested to assess the impact of the modifications on the noise reduction potential. From extensive acoustic measurements obtained using a 63-element microphone phased array, acoustic source maps and integrated spectra were generated in order to estimate the noise reduction achievable with each device.

Author

Control Equipment; Landing Gear; Noise Reduction; Jet Aircraft Noise; Acoustics

20070023675 Army Research Lab., Cleveland, OH, USA, NASA Glenn Research Center, Cleveland, OH, USA

A Sequential Shifting Algorithm for Variable Rotor Speed Control

Litt, Jonathan S.; Edwards, Jason M.; DeCastro, Jonathan A.; June 25, 2007; 18 pp.; In English; AHS 63rd Annual Forum and Technology Display, 29 April - 3 May 2007, Virginia Beach, VA, USA; Original contains color illustrations

Report No.(s): NASA/TM-2007-214842; ARL-TR-4086; E-16058; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023675

A proof of concept of a continuously variable rotor speed control methodology for rotorcraft is described. Variable rotor speed is desirable for several reasons including improved maneuverability, agility, and noise reduction. However, it has been difficult to implement because turboshaft engines are designed to operate within a narrow speed band, and a reliable drive train that can provide continuous power over a wide speed range does not exist. The new methodology proposed here is a sequential shifting control for twin-engine rotorcraft that coordinates the disengagement and engagement of the two turboshaft engines in such a way that the rotor speed may vary over a wide range, but the engines remain within their prescribed speed bands and provide continuous torque to the rotor; two multi-speed gearboxes facilitate the wide rotor speed variation. The shifting process begins when one engine slows down and disengages from the transmission by way of a standard freewheeling clutch mechanism; the other engine continues to apply torque to the rotor. Once one engine disengages, its gear shifts, the multi-speed gearbox output shaft speed resynchronizes and it re-engages. This process is then repeated with the other engine. By tailoring the sequential shifting, the rotor may perform large, rapid speed changes smoothly, as demonstrated in several examples. The emphasis of this effort is on the coordination and control aspects for proof of concept. The engines, rotor, and transmission are all simplified linear models, integrated to capture the basic dynamics of the problem.

Author

Algorithms; Rotary Wing Aircraft; Rotor Speed; Sequential Control; Speed Control; Transmissions (Machine Elements); Turboshafts; Variability

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

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

20070023632 Air Force Research Lab., Wright-Patterson AFB, OH, USA, NASA Dryden Flight Research Center, Edwards, CA, USA

Automatic Collision Avoidance Technology (ACAT)

Swihart, Donald E.; Skoog, Mark A.; June 12, 2007; 24 pp.; In English; UVS 2007, 12-14 June 2007, Paris, France; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023632

This document represents two views of the Automatic Collision Avoidance Technology (ACAT). One viewgraph presentation reviews the development and system design of Automatic Collision Avoidance Technology (ACAT). Two types of ACAT exist: Automatic Ground Collision Avoidance (AGCAS) and Automatic Air Collision Avoidance (AACAS). The AGCAS Uses Digital Terrain Elevation Data (DTED) for mapping functions, and uses Navigation data to place aircraft on map. It then scans DTED in front of and around aircraft and uses future aircraft trajectory (5g) to provide automatic flyup maneuver when required. The AACAS uses data link to determine position and closing rate. It contains several canned maneuvers to avoid collision. Automatic maneuvers can occur at last instant and both aircraft maneuver when using data link. The system can use sensor in place of data link. The second viewgraph presentation reviews the development of a flight test and an evaluation of the test. A review of the operation and comparison of the AGCAS and a pilot's performance are given. The same review is given for the AACAS is given.

CASI

Collision Avoidance; Flight Tests; Navigation; System Effectiveness; Terrain; Flight Paths; Midair Collisions; Automatic Flight Control

20070023677 NASA Ames Research Center, Moffett Field, CA, USA

Real Time Analysis and Display of Aircraft Approach Maneuvers

Lynch, Robert E., Inventor; Chidester, Thomas R., Inventor; Lawrence, Robert E., Inventor; 1 May 2007; 12 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 22 Feb. 2005; US-Patent-7,212,135; US-Patent-Appl-10/066649; US-Patent-Appl-10/956523; NASA-Case-ARC-15356-3; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023677

Method and system for monitoring and comparing, in real time, performance of an aircraft during an approach to touchdown along a conventional approach path and along a contemplated modified approach path to touchdown. In a first procedure, a flight parameter value at a selected location is compared and displayed, for the planned path and for the modified path. In a second procedure, flight parameter values FP(t(sub m)) at a sequence (t(sub n)}n, of measurement times is compared and displayed, for the planned path and for a contemplated or presently-executed modified path. If the flight parameter for the planned path and for the modified path differ too much from each other, the pilot in command has an option of terminating the approach along the modified path.

Author

Flight Paths; Real Time Operation; Aircraft Landing; Aircraft Maneuvers; Approach Control; Flight Instruments; Aircraft Instruments; Flight Management Systems; Pilot Support Systems

07
AIRCRAFT PROPULSION AND POWER

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

20070023441 NASA Glenn Research Center, Cleveland, OH, USA

Oil-Free Rotor Support Technologies for an Optimized Helicopter Propulsion System

DellaCorte, Christopher; Bruckner, Robert J.; June 2007; 14 pp.; In English; 18th ISABE Conference (ISABE 2007), 2-7 Sep. 2007, Beijing, China; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.07.03.03.02

Report No.(s): NASA/TM-2007-214845; ISABE-2007-1145; E-15976-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023441

An optimized rotorcraft propulsion system incorporating a foil air bearing supported Oil-Free engine coupled to a high power density gearbox using high viscosity gear oil is explored. Foil air bearings have adequate load capacity and temperature capability for the highspeed gas generator shaft of a rotorcraft engine. Managing the axial loads of the power turbine shaft (low speed spool) will likely require thrust load support from the gearbox through a suitable coupling or other design. Employing specially formulated, high viscosity gear oil for the transmission can yield significant improvements (approx. 2X) in allowable gear loading. Though a completely new propulsion system design is needed to implement such a system, improved performance is possible.

Author

Rotary Wing Aircraft; Technology Utilization; Helicopters; Propulsion System Configurations; Systems Engineering; Foil Bearings

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.

20070023332 NASA Dryden Flight Research Center, Edwards, CA, USA

F-15 837 IFCS Intelligent Flight Control System Project

Bosworth, John T.; May 2007; 23 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023332

This viewgraph presentation reviews the use of Intelligent Flight Control System (IFCS) for the F-15. The goals of the

project are: (1) Demonstrate Revolutionary Control Approaches that can Efficiently Optimize Aircraft Performance in both Normal and Failure Conditions (2) Advance Neural Network-Based Flight Control Technology for New Aerospace Systems Designs. The motivation for the development are to reduce the chance and skill required for survival.
CASI
Aerospace Systems; Flight Control; Neural Nets; Aircraft Survivability; Automatic Control

20070023485 NASA Ames Research Center, Moffett Field, CA, USA
Method for Constructing Composite Response Surfaces by Combining Neural Networks with Polynominal Interpolation or Estimation Techniques
Rai, Man Mohan, Inventor; Madavan, Nateri K., Inventor; March 13, 2007; 17 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 31 Jul. 2003; US-Patent-7,191,161; US-Patent-Appl-SN-637087; NASA-Case-ARC-14281-3; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023485

A method and system for data modeling that incorporates the advantages of both traditional response surface methodology (RSM) and neural networks is disclosed. The invention partitions the parameters into a first set of s simple parameters, where observable data are expressible as low order polynomials, and c complex parameters that reflect more complicated variation of the observed data. Variation of the data with the simple parameters is modeled using polynomials; and variation of the data with the complex parameters at each vertex is analyzed using a neural network. Variations with the simple parameters and with the complex parameters are expressed using a first sequence of shape functions and a second sequence of neural network functions. The first and second sequences are multiplicatively combined to form a composite response surface, dependent upon the parameter values, that can be used to identify an accurate mode
Author
Interpolation; Neural Nets; Control Surfaces; Polynomials

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)*.

20070023308 NASA Dryden Flight Research Facility, Edwards, CA, USA
NASA ER-2: Flying Laboratory for Earth Science Studies and Remote Sensing
Navarro, Robert; May 07, 2007; 14 pp.; In English; Annual American Society for Photogrammetry and Remote Sensing Conference: Identifying Geospatial Solutions, 7-11 May 2007, Tampa, FL, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023308

This viewgraph presentation shows views of the ER-2, NASA's Flying Laboratory for Earth Science Studies and Remote Sensing. The presentation briefly reviews the successes of the ER-2, and what the facility provides.
CASI
Airborne Equipment; U-2 Aircraft; Aircraft Equipment

13
ASTRODYNAMICS

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

20070023574 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Spitzer Orbit Determination During In-orbit Checkout Phase
Menon, Premkumar R.; August 16, 2004; 11 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40027

The Spitzer Space Telescope was injected into heliocentric orbit on August 25, 2003 to observe and study astrophysical

phenomena in the infrared range of frequencies. The initial 60 days was dedicated to Spitzer's 'In-Orbit Checkout (IOC)' efforts. During this time high levels of Helium venting were used to cool down the telescope. Attitude control was done using reaction wheels, which in turn were de-saturated using cold gas Nitrogen thrusting. Dense tracking data (nearly continuous) by the Deep Space network (DSN) were used to perform orbit determination and to assess any possible venting imbalance. Only Doppler data were available for navigation. This paper deals with navigation efforts during the IOC phase. It includes Dust Cover Ejection (DCE) monitoring, orbit determination strategy validation and results and assessment of non-gravitational accelerations acting on Spitzer including that due to possible imbalance in Helium venting.
Author
Orbit Determination; Space Infrared Telescope Facility; Spacecraft Temperature; Satellite Tracking

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)*.

20070023390 NASA Johnson Space Center, Houston, TX, USA
Science on the International Space Station: Stepping Stones for Exploration
Robinson, Julie A.; June 28, 2007; 6 pp.; In English; MISSE Symposium, 2007 National Space and Missile, 28-29 Jun. 2007, Keystone, CO, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023390

This viewgraph presentation reviews the state of science research on the International Space Station (ISS). The shuttle and other missions that have delivered science research facilities to the ISS are shown. The different research facilities provided by both NASA and partner organizations available for use and future facilities are reviewed. The science that has been already completed is discussed. The research facilitates the Vision for Space Exploration, in Human Life Sciences, Biological Sciences, Materials Science, Fluids Science, Combustion Science, and all other sciences. The ISS Focus for NASA involves: Astronaut health and countermeasure, development to protect crews from the space environment during long duration voyages, Testing research and technology developments for future exploration missions, Developing and validating operational procedures for long-duration space missions. The ISS Medical Project (ISSMP) address both space systems and human systems. ISSMP has been developed to maximize the utilization of ISS to obtain solutions to the human health and performance problems and the associated mission risks of exploration class missions. Including complete programmatic review with medical operations (space medicine/flight surgeons) to identify: (1) evidence base on risks (2) gap analysis.
CASI
Aerospace Medicine; International Space Station; Life Sciences; Research Facilities; Space Exploration; Space Laboratories; Bioastronautics

16
SPACE TRANSPORTATION AND SAFETY

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

20070022834 NASA Johnson Space Center, Houston, TX, USA
Orbital Debris Environment Assessment and Mitigation for Launch Vehicles
Johnson, Nicholas L.; July 24, 2007; 18 pp.; In English; 7th NRO/AIAA Space Launch Integration Forum, 24-25 July 2007, Chantilly, VA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022834

This viewgraph presentation reviews the debris that is in orbit, and reduction of the orbital debris. Specifically, attention is paid to the reduction of orbital debris from launch vehicle stages after the launch.
CASI
Launch Vehicles; Space Debris; Spacecraft Breakup; Spacecraft Reentry

20070022844 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Stardust Entry: Landing and Population Hazards in Mission Planning and Operations

Desai, P.; Wawrzyniak, G.; August 21, 2006; 17 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference and Exhibit, 21-24 August 2007, Keystone, CO, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2006-6412; Copyright; Avail.: CASI: A03, Hardcopy

The 385 kg Stardust mission was launched on Feb 7, 1999 on a mission to collect samples from the tail of comet Wild 2 and from interplanetary space. Stardust returned to Earth in the early morning of January 15, 2006. The sample return capsule landed in the Utah Test and Training Range (UTTR) southwest of Salt Lake City. Because Stardust was landing on Earth, hazard analysis was required by the National Aeronautics and Space Administration, UTTR, and the Stardust Project to ensure the safe return of the landing capsule along with the safety of people, ground assets, and aircraft. This paper focuses on the requirements affecting safe return of the capsule and safety of people on the ground by investigating parameters such as probability of impacting on UTTR, casualty expectation, and probability of casualty. This paper introduces the methods for the calculation of these requirements and shows how they affected mission planning, site selection, and mission operations. By analyzing these requirements before and during entry it allowed for the selection of a robust landing point that met all of the requirements during the actual landing event.

Author

Aircraft Hazards; Aircraft Landing; Mission Planning; Stardust Mission; Wild 2 Comet; Populations

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*.

20070023694 California Inst. of Tech., Pasadena, CA, USA, Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Coherent Optical Receiver for PPM Signals under Atmospheric Turbulence

Munoz Fernandez, Michela; Vilnrotter, Victor A.; March 5, 2005; 12 pp.; In English; IEEE Aersopace Cofnerence, 5-12 March 2005, Big Sky, MT, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40014

Adaptive combining of experimentally obtained heterodyned pulse position modulated (PPM) signals with pulse-to-pulse coherence in the presence of simulated spatial distortions resembling atmospheric turbulence is demonstrated. The adaptively combined PPM signals are phased up via an LMS algorithm suitably optimized to operate with PPM in the presence of additive shot-noise. A convergence analysis of the algorithm is presented, and results with both, computer simulated and experimentally obtained PPM signals are analyzed.

Author

Atmospheric Turbulence; Optical Communication; Receivers; Satellite Communication; Free-Space Optical Communication; Pulse Position Modulation

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*.

20070023407 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Overview of Demise Calculations, Conceptual Design Studies, and Hydrazine Compatibility Testing for the GPM Core Spacecraft Propellant Tank

Estes, Robert H.; Moore, N. R.; May 14, 2007; 12 pp.; In English; 54th JANNAF Propulsion Conference (CPIA), 14-17 May 2007, Denver, CO, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

NASA's Global Precipitation Measurement (GPM) mission is an ongoing Goddard Space Flight Center (GSFC) project whose basic objective is to improve global precipitation measurements. It has been decided that the GPM spacecraft is to be

a ‘design for demise’ spacecraft. This requirement resulted in the need for a propellant tank that would also demise or ablate to an appropriate degree upon re-entry. This paper will describe GSFC-performed spacecraft and tankage demise analyses, vendor conceptual design studies, and vendor performed hydrazine compatibility and wettability tests performed on 6061 and 2219 aluminum alloys.
Author
Ablation; Propellant Tanks; Reentry; Atmospheric Entry; Models; Spacecraft Construction Materials; Spacecraft

20070023409 NASA Glenn Research Center, Cleveland, OH, USA
Scattered Atomic Oxygen Effects on Spacecraft Materials
Banks, Bruce A.; Miller, Sharon K. R.; deGroh, Kim K.; Demko, Rikako; September 2003; 9 pp.; In English; 9th International Symposium on Materials in a Space Environment, 16-20 Jun. 2003, Noordwijk, Netherlands; Original contains black and white illustrations
Contract(s)/Grant(s): NCC3-1033; Copyright; Avail.: Other Sources

Low Earth orbital (LEO) atomic oxygen cannot only erode the external surfaces of polymers on spacecraft, but can cause degradation of surfaces internal to components on the spacecraft where openings to the space environment exist. Although atomic oxygen attack on internal or interior surfaces may not have direct exposure to the LEO atomic oxygen flux scattered impingement can have serious degradation effects where sensitive interior surfaces are present. The effects of atomic oxygen erosion of polymer interior to an aperture on a spacecraft is simulated using Monte Carlo computational techniques. A 2-dimensional model is used to provide quantitative indications of the attenuation of atomic oxygen flux as a function of distance into a parallel walled cavity. The degree of erosion re1ative is compared between the various interior locations and the external surface of a LEO spacecraft.
Author
Aerospace Environments; Degradation; Erosion; Exposure; Low Earth Orbits; Oxygen Atoms; Cumulative Damage; Earth Orbital Environments; Computerized Simulation

20070023687 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
L2 Earth Atmosphere Observatory: Formation Guidance, Metrology and Control Synthesis
Acikmese, Ahmet Behcet; Mettler, Edward; Breckenridge, William G.; Macenka, Steven A.; Tubbs, Eldred F.; August 16, 2004; 27 pp.; In English; AIAA/AAS Astrodynamics Specialist Conference and Exhibit, 16-19 August 2006, Providence, RI, USA; Original contains black and white illustrations
Report No.(s): AIAA Paper 2004-5212; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39973

The Earth Observatory Formation at L2, a Lagrange libration point, is a unique large aperture (25 m diameter) space telescope concept that will improve the knowledge and understanding of dynamic, chemical and radiative mechanisms that cause changes in the atmosphere, and can lead to the development of models and techniques to predict short and long-term climate changes. The results of this concept definition study show that the telescope concept is feasible, and can have technology readiness in the 2020 time frame. Further advanced development in several subsystems is needed, such as higher efficiency Xenon ion thrusters with throttling, and optical quality large membrane mirror with active shape control. It presents an analysis and solution of guidance, sensing, control, and propulsion problems for a formation of two spacecraft on the Sun-Earth line in the neighborhood of the Sun-Earth L2 point, that observes Earth s atmosphere during continuous solar occultation by the Earth. A system architecture is described for the observatory, and its components that include unique mission specific metrology. The formation must follow a powered trajectory with strictly limited fuel use to observe solar occultation. A configuration of ion thrusters and reaction wheels for translation and attitude control is designed along with algorithms for orbit following and formation control. Simulation results of the orbital and formation dynamics are presented that verify performance of the control systems.
Author
Earth Atmosphere; Libration; Metrology; Models; Observatories; Technology Assessment; Spaceborne Telescopes; Satellite Observation; Meteorological Satellites

20070023692 NASA Johnson Space Center, Houston, TX, USA
Orion-CEV Project Overview To the NASA Sports and Exploration 'Kick-Off' Meeting
Marshall, Paul F.; May 30, 2007; 28 pp.; In English; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023692

This viewgraph presentation reviews the Orion Crew Exploration vehicle (CEV) and its usage in the exploration of the moon and subsequent travel to Mars. Schedules for development and testing of the CEV are shown. Also displayed are various high level design views of the CEV, the launch abort system, the Atlas Docking adapter, and the service module.
CASI
Crew Exploration Vehicle; Lunar Exploration; Production Planning; Schedules

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*.

20070022847 NASA Marshall Space Flight Center, Huntsville, AL, USA
Programmable Thermostat Module Upgrade for the Multipurpose Logistics Module
Clark, D. W.; Glasgow, S. d.; Reagan, S. E.; Presson, K. H.; Howard, D. E.; Smith, D. A.; May 2007; 36 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2007-214957; M-1186; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022847

The STS-121/ULF 1.1 mission was the maiden flight of the programmable thermostat module (PTM) system used to control the 28 V shell heaters on the multi-purpose logistics module (MPLM). These PTMs, in conjunction with a data recorder module (DRM), provide continuous closed loop temperature control and data recording of MPLM on-orbit heater operations. This Technical Memorandum discusses the hardware design, development, test, and verification (DDT&V) activities performed at the Marshall Space Flight Center as well as the operational implementation and mission performance. Author
Multi-Purpose Logistics Modules; Thermostats; Programming; Space Logistics; International Space Station

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*.

20070022840 NASA Glenn Research Center, Cleveland, OH, USA
Developmental Considerations on the Free-piston Stirling Power Convertor for Use in Space
Schreiber, Jeffrey G.; May 14, 2007; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): WBS 138494.04.01.01
Report No.(s): NASA/TM-2007-214805; AIAA-2006-4015; E-15938; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022840

Free-piston Stirling power conversion has been considered a candidate for radioisotope power systems for space for more than a decade. Prior to the free-piston Stirling architecture, systems were designed with kinematic Stirling engines with rotary alternators to convert heat to electricity. These systems were proposed with lightly loaded linkages to achieve the necessary life. When the free-piston configuration was initially proposed, it was thought to be attractive due to the relatively high conversion efficiency, acceptable mass, and the potential for long life and high reliability. These features have consistently been recognized by teams that have studied technology options for radioisotope power systems. Since free-piston Stirling

power conversion was first considered for space power applications, there have been major advances in three general areas of development: demonstration of life and reliability, the success achieved by Stirling cryocoolers in flight, and the overall developmental maturity of the technology for both flight and terrestrial applications. Based on these advances, free-piston Stirling convertors are currently being developed for a number of terrestrial applications. They commonly operate with the power, efficiency, life, and reliability as intended, and much of the development now centers on system integration. This paper will summarize the accomplishments of free-piston Stirling power conversion technology over the past decade, review the status, and discuss the challenges that remain.
Author
Free-Piston Engines; Nuclear Electric Power Generation; Computational Fluid Dynamics; Power Converters; Technology Utilization; Radioisotope Heat Sources; Mechanical Engineering; Piston Engines

20070023440 NASA Glenn Research Center, Cleveland, OH, USA
Final Results for the GRC Supporting Technology Development Project for the 110-Watt Stirling Radioisotope Generator (SRG110)
Schreiber, Jeffrey G.; Thieme, Lanny G.; June 2007; 24 pp.; In English; Space Technology and Applications International Forum (STAIF-2007), 11-14 Feb. 2007, Albuquerque, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 138494.04.01.01
Report No.(s): NASA/TM-2007-214839; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023440

From 1999 to 2006, the NASA Glenn Research Center (GRC) supported the development of a high-efficiency, nominal 110-We Stirling Radioisotope Generator (SRG110) for potential use on NASA missions, including deep space missions, Mars rovers, and lunar applications. Lockheed Martin (LM) was the system integrator for the SRG110, under contract to the Department of Energy (DOE). Infinia Corporation (formerly Stirling Technology Company) developed the Stirling convertor, first as a contractor to DOE and then under subcontract to LM. The SRG110 development has been redirected, and recent program changes have been made to significantly increase the specific power of the generator. System development of an Advanced Stirling Radioisotope Generator (ASRG) has now begun, using a lightweight, advanced convertor from Sunpower, Inc. This paper summarizes the results of the supporting technology effort that GRC completed for the SRG110. GRC tasks included convertor extended-duration testing in air and thermal vacuum environments, heater head life assessment, materials studies, permanent magnet aging characterization, linear alternator evaluations, structural dynamics testing, electromagnetic interference (EMI) and electromagnetic compatibility (EMC) characterization, organic materials evaluations, reliability studies, and development of an end-to-end system dynamic model. Related efforts are now continuing in many of these areas to support ASRG development.
Author
Electric Generators; Stirling Cycle; Radioisotope Heat Sources; Stirling Engines; Technology Utilization

20070023575 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Microthrust Propulsion of the LISA Mission
Ziemer, John K.; Merkowitz, Stephen M.; July 12, 2004; 9 pp.; In English; 40th AIAA Joint Propulsion Conference, 12-14 Jul. 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40025

We present the most recent propulsion requirements for the Laser Interferometer Space Antenna (LISA) Mission and describe potential microthruster technology that can meet these requirements. LISA consists of three spacecraft in heliocentric orbits, forming a triangle with 5x l0 (exp 6) km sides that are the arms of three Michelson-type interferometers. Reflective proof masses provide the reference surfaces at the end of the interferometer arms as part of the Gravitational Reference Sensor (GRS) designed to detect gravitational waves. The microthrust propulsion system will be part of the Disturbance Reduction System (DRS), which is responsible for maintaining each spacecraft position within approximately 10 nm around the proof masses. To provide the necessary sensitivity, the GRS must not experience spurious accelerations >15 (exp -10) m/ s(exp 2) in the 0.1 mHz to 1 Hz bandwidth, requiring precision formation flying and drag-free operation of the LISA spacecraft. This leads to the following microthruster performance requirements: a thrust range of 2-30 Micro N, a thrust resolution < 0.1 Micro N, and thrust noise <0.1 Hz(exp -1/2) over the LISA measurement bandwidth. The microthruster must provide this performance for 5 years continuously, contain 10 years worth of propellant, and not disrupt the science measurements. Potential microthruster technologies include Colloid, Field Emission Electric Propulsion (FEEP), and precision cold gas

microthrusters. Each of these technologies is described in detail with focus on the NASA microthruster development of the Busek Colloid Micro-Newton Thruster (CMNT).
Author
Electric Propulsion; Formation Flying; Low Thrust Propulsion; Microrocket Engines; Microthrust; Propulsion; Spacecraft Orbits; Spacecraft Propulsion; LISA (Observatory)

20070023577 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Exploration Rovers Propulsive Maneuver Design
Potts, Christopher L.; Raofi, Behzad; Kangas, Julie A.; August 16, 2004; 19 pp.; In English; AIAA/AAS Astrodynamics Specialst Conference and Exhibit, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40022

The Mars Exploration Rovers Spirit and Opportunity successfully landed respectively at Gusev Crater and Meridiani Planum in January 2004. The rovers are essentially robotic geologists, sent on a mission to search for evidence in the rocks and soil pertaining to the historical presence of water and the ability to possibly sustain life. In order to conduct NASA's 'follow the water' strategy on opposite sides of the planet Mars, an interplanetary journey of over 300 million miles culminated with historic navigation precision. Rigorous trajectory targeting and control was necessary to achieve the atmospheric entry requirements for the selected landing sites. The propulsive maneuver design challenge was to meet or exceed these requirements while preserving the necessary design margin to accommodate additional project concerns. Landing site flexibility was maintained for both missions after launch, and even after the first trajectory correction maneuver for Spirit. The final targeting strategy was modified to improve delivery performance and reduce risk after revealing constraining trajectory control characteristics. Flight results are examined and summarized for the six trajectory correction maneuvers that were planned for each mission.
Author
Mars Exploration; Mars Roving Vehicles; Robotics; Mars Surface; Spacecraft Design; Propulsion System Configurations; Spacecraft Maneuvers

20070023590 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
New Generation Power System for Space Applications
Jones, Loren; Carr, Greg; Deligiannis, Frank; Lam, Barbara; Nelson, Ron; Pantaleon, Jose; Ruiz, Ian; Treicler, John; Wester, Gene; Sauers, Jim; Giampoli, Paul; Haskell, Russ; Mulvey, Jim; Repp, John; August 16, 2004; 7 pp.; In English; International Engery Conversion Engineering Conference, 16 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39948

The Deep Space Avionics (DSA) Project is developing a new generation of power system building blocks. Using application specific integrated circuits (ASICs) and power switching modules a scalable power system can be constructed for use on multiple deep space missions including future missions to Mars, comets, Jupiter and its moons. The key developments of the DSA power system effort are five power ASICs and a module for power switching. These components enable a modular and scalable design approach, which can result in a wide variety of power system architectures to meet diverse mission requirements and environments. Each component is radiation hardened to one megarad) total dose. The power switching module can be used for power distribution to regular spacecraft loads, to propulsion valves and actuation of pyrotechnic devices. The number of switching elements per load, pyrotechnic firings and valve drivers can be scaled depending on mission needs. Telemetry data is available from the switch module via an I2C data bus. The DSA power system components enable power management and distribution for a variety of power buses and power system architectures employing different types of energy storage and power sources. This paper will describe each power ASIC#s key performance characteristics as well as recent prototype test results. The power switching module test results will be discussed and will demonstrate its versatility as a multipurpose switch. Finally, the combination of these components will illustrate some of the possible power system architectures achievable from small single string systems to large fully redundant systems.
Author
Application Specific Integrated Circuits; Spacecraft Power Supplies; Switching Circuits

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*.

20070022797 NASA White Sands Test Facility, NM, USA
Upward Flame Propagation and Wire Insulation Flammability: 2006 Round Robin Data Analysis
Hirsch, David B.; June 04, 2007; 18 pp.; In English; NASA/JAXA Technical Interchange Meeting, 4-8 June 2007, Tsukuba, Kenya; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022797

This viewgraph document reviews test results from tests of different material used for wire insulation for flame propagation and flammability. The presentation focused on investigating data variability both within and between laboratories; evaluated the between-laboratory consistency through consistency statistic h, which indicates how one laboratory s cell average compares with averages from other labs; evaluated the within-laboratory consistency through the consistency statistic k, which is an indicator of how one laboratory s within-laboratory variability compares with the variability of other labs combined; and extreme results were tested to determine whether they resulted by chance or from nonrandom causes (human error, instrument calibration shift, non-adherence to procedures, etc.)
CASI
Flame Propagation; Flammability; Insulation; Combustion; Statistical Analysis

24
COMPOSITE MATERIALS

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

20070022842 NASA Glenn Research Center, Cleveland, OH, USA
Thermal Properties of Oxides With Magnetoplumbite Structure for Advanced Thermal Barrier Coatings
Bansal, Narottam P.; Zhu, Dongming; May 24, 2007; 16 pp.; In English; Sixth International Conference on High Temperature Ceramic Matrix Composites (HTCMC-6), 4-7 September 2007, New Dehli, India; Original contains color illustrations
Report No.(s): NASA/TM-2007-214850; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022842

Oxides having magnetoplumbite structure are promising candidate materials for applications as high temperature thermal barrier coatings because of their high thermal stability, high thermal expansion, and low thermal conductivity. In this study, powders of LaMgAl11O19, GdMgAl11O19, SmMgAl11O19, and Gd0.7Yb0.3MgAl11O19 magnetoplumbite oxides were synthesized by citric acid sol-gel method and hot pressed into disk specimens. The thermal expansion coefficients (CTE) of these oxide materials were measured from room temperature to 1500 C. The average CTE value was found to be approx.9.6x10(exp -6)/C. Thermal conductivity of these magnetoplumbite-based oxide materials was also evaluated using steady-state laser heat flux test method. The effects of doping on thermal properties were also examined. Thermal conductivity of the doped Gd0.7Yb0.3MgAl11O19 composition was found to be lower than that of the undoped GdMgAl11O19. In contrast, thermal expansion coefficient was found to be independent of the oxide composition and appears to be controlled by the magnetoplumbite crystal structure. Thermal conductivity testing of LaMgAl11O19 and LaMnAl11O19 magnetoplumbite oxide coatings plasma sprayed on NiCrAlY/Rene N5 superalloy substrates indicated resistance of these coatings to sintering even at temperatures as high as 1600 C.
Author
Oxides; Thermal Control Coatings; Thermodynamic Properties; Heat Resistant Alloys; Metal Powder

20070023317 NASA Johnson Space Center, Houston, TX, USA
Developing Carbon Nanotube Standards at NASA
Nikolaev, Pasha; Arepalli, Sivaram; Sosa, Edward; Gorelik, Olga; Yowell, Leonard; June 21, 2007; 1 pp.; In English; MSIN07, First International Forum on Metrology, 21-22 Jun. 2007, Rio de Janeiro, Brazil
Contract(s)/Grant(s): NNJ05HI05C; No Copyright; Avail.: Other Sources; Abstract Only

Single wall carbon nanotubes (SWCNTs) are currently being produced and processed by several methods. Many researchers are continuously modifying existing methods and developing new methods to incorporate carbon nanotubes into

other materials and utilize the phenomenal properties of SWCNTs. These applications require availability of SWCNTs with known properties and there is a need to characterize these materials in a consistent manner. In order to monitor such progress, it is critical to establish a means by which to define the quality of SWCNT material and develop characterization standards to evaluate of nanotube quality across the board. Such characterization standards should be applicable to as-produced materials as well as processed SWCNT materials. In order to address this issue, NASA Johnson Space Center has developed a protocol for purity and dispersion characterization of SWCNTs (Ref.1). The NASA JSC group is currently working with NIST, ANSI and ISO to establish purity and dispersion standards for SWCNT material. A practice guide for nanotube characterization is being developed in cooperation with NIST (Ref.2). Furthermore, work is in progress to incorporate additional characterization methods for electrical, mechanical, thermal, optical and other properties of SWCNTs.
Author
Carbon Nanotubes; Composite Materials; Nanotechnology; Standards

20070023393 NASA Langley Research Center, Hampton, VA, USA
Double Vacuum Bag Process for Resin Matrix Composite Manufacturing
Hou, Tan-Hung, Inventor; Jensen, Brian J., Inventor; March 06, 2007; 12 pp.; In English; Original contains black and white illustrations; US-Patent-7,186,367; US-Patent-Appl-SN-110996; US-Patent-Appl-SN-571954; NASA-Case-LAR-16877-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023393

A double vacuum bag molding assembly with improved void management and laminate net shape control which provides a double vacuum enviromnent for use in fabricating composites from prepregs containing air and/or volatiles such as reactive resin matrix composites or composites from solvent containing prepregs with non-reactive resins matrices. By using two vacuum environments during the curing process, a vacuum can be drawn during a B-stage of a two-step cycle without placing the composite under significant relative pressure. During the final cure stage, a significant pressure can be applied by releasing the vacuum in one of the two environments. Inner and outer bags are useful for creating the two vacuum environments with a perforated tool intermediate the two. The composite is placed intermediate a tool plate and a caul plate in the first environment with the inner bag and tool plate defining the first environment. The second environment is characterized by the outer bag which is placed over the inner bag and the tool plate.
Official Gazette of the U.S. Patent and Trademark Office
Bags; Resin Matrix Composites; Vacuum; Manufacturing; Molds

20070023411 NASA Langley Research Center, Hampton, VA, USA
Method of Fabricating a Composite Apparatus
Wilkie, W. Keats, Inventor; Bryant, Robert G., Inventor; Fox, Robert L., Inventor; Hellbaum, Richard F., Inventor; High, James W., Inventor; Jalink, Antony, Jr., Inventor; April 03, 2007; 14 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 3 September 2003; US-Patent-7,197,798; US-Patent-Appl-SN-653824; NASA-Case-LAR-15816-2; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023411

A method for fabricating a piezoelectric macro-fiber composite actuator comprises making a piezoelectric fiber sheet by providing a plurality of wafers of piezoelectric material, bonding the wafers together with an adhesive material to from a stack of alternating layers of piezoelectric material and adhesive material, and cutting through the stack in a direction substantially parallel to the thickness of the stack and across the alternating layers of piezoelectric material and adhesive material to provide at least one piezoelectric fiber sheet having two sides comprising a plurality of piezoelectric fibers in juxtaposition to the adhesive material. The method further comprises bonding two electrically conductive films to the two sides of the piezoelectric fiber sheet. At least one conductive film has first and second conductive patterns formed thereon which are electrically isolated from one another and in electrical contact with the piezoelectric fiber sheet.
Official Gazette of the U.S. Patent and Trademark Office
Fabrication; Piezoelectricity; Composite Materials; Fibers; Actuators

20070023436 NASA Glenn Research Center, Cleveland, OH, USA

A Comparison of Various Stress Rupture Life Models for Orbiter Composite Pressure Vessels and Confidence Intervals

Grimes-Ledesma, Lorie; Murthy, Pappu L. N.; Phoenix, S. Leigh; Glaser, Ronald; June 2007; 21 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 843515.02.01.03.04.04.03

Report No.(s): NASA/TM-2007-214808; Copyright; Avail.: CASI: A03, Hardcopy

In conjunction with a recent NASA Engineering and Safety Center (NESC) investigation of flight worthiness of Kevlar Overwrapped Composite Pressure Vessels (COPVs) on board the Orbiter, two stress rupture life prediction models were proposed independently by Phoenix and by Glaser. In this paper, the use of these models to determine the system reliability of 24 COPVs currently in service on board the Orbiter is discussed. The models are briefly described, compared to each other, and model parameters and parameter uncertainties are also reviewed to understand confidence in reliability estimation as well as the sensitivities of these parameters in influencing overall predicted reliability levels. Differences and similarities in the various models will be compared via stress rupture reliability curves (stress ratio vs. lifetime plots). Also outlined will be the differences in the underlying model premises, and predictive outcomes. Sources of error and sensitivities in the models will be examined and discussed based on sensitivity analysis and confidence interval determination. Confidence interval results and their implications will be discussed for the models by Phoenix and Glaser.

Author

Composite Wrapping; Pressure Vessels; Mathematical Models; Confidence Limits; Life (Durability); Creep Rupture Strength; Space Shuttle Orbiters

20070023439 NASA Glenn Research Center, Cleveland, OH, USA

Oxidation Through Coating Cracks of SiC-Protected Carbon/Carbon

Jacobson, Nathan S.; Roth, Don J.; Rauser, Richard W.; Curry, Donald M.; June 2007; 28 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 377816.06.03.02.08

Report No.(s): NASA/TM-2007-214834; Copyright; Avail.: CASI: A03, Hardcopy

The oxidation of SiC-protected carbon/carbon through machined slots and naturally occurring craze cracks in the SiC was studied. The slot and crack geometries were characterized, and the subsurface oxidation of the carbon/carbon substrate at temperatures of 1000 to 1300 C in air was assessed using weight change, x-ray computed tomography, and optical microscopy of sections. Rate constants were derived from these measurements and compared with a two-step diffusion control model of carbon oxidation. Oxidation kinetic measurements on both the specimens with machined slots and with naturally occurring craze cracks showed good agreement with the model.

Author

Carbon-Carbon Composites; Coating; Crack Geometry; Oxidation; Surface Cracks; Mathematical Models; Silicon Carbides

20070023483 NASA Glenn Research Center, Cleveland, OH, USA

Stress Rupture Life Reliability Measures for Composite Overwrapped Pressure Vessels

Murthy, Pappu L. N.; Thesken, John C.; Phoenix, S. Leigh; Grimes-Ledesma, Lorie; June 2007; 19 pp.; In English; 48th Structures, Structural Dynamics and Materials (SDM) Conference, 23-26 Apr. 2007, Honolulu, HI, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 843515.02.01.03.04.04.03

Report No.(s): NASA/TM-2007-214848; Copyright; Avail.: CASI: A03, Hardcopy

Composite Overwrapped Pressure Vessels (COPVs) are often used for storing pressurant gases onboard spacecraft. Kevlar (DuPont), glass, carbon and other more recent fibers have all been used as overwraps. Due to the fact that overwraps are subjected to sustained loads for an extended period during a mission, stress rupture failure is a major concern. It is therefore important to ascertain the reliability of these vessels by analysis, since the testing of each flight design cannot be completed on a practical time scale. The present paper examines specifically a Weibull statistics based stress rupture model and considers the various uncertainties associated with the model parameters. The paper also examines several reliability estimate measures that would be of use for the purpose of recertification and for qualifying flight worthiness of these vessels. Specifically, deterministic values for a point estimate, mean estimate and 90/95 percent confidence estimates of the reliability are all examined for a typical flight quality vessel under constant stress. The mean and the 90/95 percent confidence estimates are computed using Monte-Carlo simulation techniques by assuming distribution statistics of model parameters based also on

simulation and on the available data, especially the sample sizes represented in the data. The data for the stress rupture model are obtained from the Lawrence Livermore National Laboratories (LLNL) stress rupture testing program, carried out for the past 35 years. Deterministic as well as probabilistic sensitivities are examined.
Author
Composite Wrapping; Pressure Vessels; Reliability; Mathematical Models; Life (Durability); Creep Rupture Strength

20070023679 NASA Langley Research Center, Hampton, VA, USA
Templated Growth of Carbon Nanotubes
Siochik Emilie J., Inventor; 30 Jan. 2007; 5 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 11 May 2005; US-Patent-7,169,374; US-Patent-Appl-11/129751; US-Patent-Appl-60/570964; NASA-Case-LAR-16437-1; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023679

A method of growing carbon nanotubes uses a synthesized mesoporous silica template with approximately cylindrical pores being formed therein. The surfaces of the pores are coated with a carbon nanotube precursor, and the template with the surfaces of the pores so-coated is then heated until the carbon nanotube precursor in each pore is converted to a carbon nanotube.
Author
Carbon Nanotubes; Nanostructure Growth; Silicon Dioxide; 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*.

20070023495 NASA Kennedy Space Center, Cocoa Beach, FL, USA
UV Induced Oxidation of Nitric Oxide
Parrish, Clyde, F., Inventor; Luecke, Dale E., Inventor; January 02, 2007; 6 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 15 May 2003; US-Patent-7,156,957; US-Patent-Appl-SN-440543; NASA-Case-KSC-12458; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023495

Nitric oxide in a gaseous stream is converted to nitrogen dioxide using oxidizing species generated at least in part using in situ UV radiation sources. The sources of the oxidizing species include oxygen and/or hydrogen peroxide. The oxygen may be a component of the gaseous stream or added to the gaseous stream, preferably near a UV radiation source, and is converted to ozone by the UV irradiation. The hydrogen peroxide is decomposed through a combination of vaporization and UV irradiation. The hydrogen peroxide is preferably stored at stable concentration levels, i.e., approximately 50% by volume and increased in concentration in a continuous process preceding vaporization within the flow channel of the gaseous stream and in the presence of the UV radiation sources.
Author
Nitric Oxide; Oxidation; Ultraviolet Radiation; Chemical Reactions

20070023557 NASA Glenn Research Center, Cleveland, OH, USA
N-15 NMR Spectroscopy as a Method for Comparing the Rates of Imidization of Several Diamines
Johnson, J. Christopher; Kuczmarski, Maria A.; [2006]; 28 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 599489.02.07.03; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023557

The relative rates of the conversion of amide-acid to imide was measured for a series or aromatic diamines that have been identified as potential replacements for 4,4'-methylene dianiline (MDA) in high-temperature polyimides and polymer

composites. These rates were compared with the N-15 NMR resonances of the unreacted amines. The initial rates of imidization track with the difference in chemical shift between the amine nitrogens in MDA and those in the subject diamines. This comparison demonstrated that N-15 NMR spectroscopy is appropriate for the rapid screening of candidate diamines to determine their reactivity relative to MDA, and can serve to provide guidance to the process of creating the time-temperature profiles used in processing these materials into polymer matrix composites.
Author
Diamines; Nitrogen 15; Nuclear Magnetic Resonance; Reactivity; Chemical Reactions; Polyimides; Polymerization

20070023673 NASA Glenn Research Center, Cleveland, OH, USA
Catalytic Ignition and Upstream Reaction Propagation in a Platinum Tube
Struk, P. M.; Dietrich, D. L.; Mellish, B. P.; Miller, F. J.; T'ien, J. S.; June 2007; 13 pp.; In English; 2006 Technical Meeting on Combustion Fundamentals and Applications, 21-23 May 2006, Cleveland, OH, USA; Original contains color illustrations
Contract(s)/Grant(s): NNC04AA29A; WBS 519205.02.02
Report No.(s): NASA/TM-2007-214801; E-15934; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023673

A challenge for catalytic combustion in monolithic reactors at elevated temperatures is the start-up or 'light-off' from a cold initial condition. In this work, we demonstrate a concept called 'back-end catalytic ignition that potentially can be utilized in the light-off of catalytic monoliths. An external downstream flame or Joule heating raises the temperature of a small portion of the catalyst near the outlet initiating a localized catalytic reaction that propagates upstream heating the entire channel. This work uses a transient numerical model to demonstrate 'back-end' ignition within a single channel which can characterize the overall performance of a monolith. The paper presents comparisons to an experiment using a single non-adiabatic channel but the concept can be extended to the adiabatic monolith case. In the model, the time scales associated with solid heat-up are typically several orders of magnitude larger than the gas-phase and chemical kinetic time-scales. Therefore, the model assumes a quasi-steady gas-phase with respect to a transient solid. The gas phase is one-dimensional. Appropriate correlations, however, account for heat and mass transfer in a direction perpendicular to the flow. The thermally-thin solid includes axial conduction. The gas phase, however, does not include axial conduction due to the high Peclet number flows. The model includes both detailed gas-phase and catalytic surface reactions. The experiment utilizes a pure platinum circular channel oriented horizontally though which a CO/O2 mixture (equivalence ratios ranging from 0.6 to 0.9) flows at 2 m/s.
Author
Catalysts; Ignition; Mathematical Models; Platinum; Combustion Chemistry; Chemical Reactions

26
METALS AND METALLIC MATERIALS

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

20070022851 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Process for Producing Highly Wettable Aluminum 6061 Surfaces Compatible with Hydrazine
Moore, N. R.; Ferraro, N. W.; Yue, A. F.; Estes, R. H.; May 14, 2007; 12 pp.; In English; 54th JANNAF Propulsion Conference (CPIA), 14-17 May 2007, Denver, CO, USA; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04HS43P; NNG06CA00C; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022851

NASA's Global Precipitation Measurement (GPM) mission is an ongoing Goddard Space Flight Center (GSFC) project whose basic objective is to improve global precipitation measurements. The space-based portion of the mission architecture consists of a primary or core spacecraft and a constellation of NASA and contributed spacecrafts. The efforts described in this paper refer to the core spacecraft (hereafter referred to as simply GPM) which is to be fabricated at GSFC. It has been decided that the GPM spacecraft is to be a 'design-for-demise-spacecraft.' This requirement resulted in the need for a propellant tank that would also demise or ablate to an appropriate degree upon re-entry. Composite overwrapped aluminum lined propellant tanks with aluminum propellant management devices (PMD) were shown by analyses to demise and thus became the baseline configuration for GPM. As part of the GPM tank development effort, long term compatibility and wettability testing with hydrazine was performed on Al6061 and 2219 coupons fabricated and cleaned by conventional processes. Long term compatibility was confirmed. However, the wettability of the aluminum as measured by contact angle produced higher than desired angles (greater than 30 deg.) with excessive scatter. The availability of PMD materials exhibiting consistently low contact angles aids in the design of simple PMDs. Two efforts performed by Angeles Crest Engineering and funded by GSFC

were undertaken to reduce the risk of using aluminum for the GPM PMD. The goal of the first effort was to develop a cleaning or treatment process to produce consistently low contact angles. The goal of the second effort was to prove via testing that the processed aluminum would retain compatibility with hydrazine and retain low contact angle after long term exposure to hydrazine. Both goals were achieved. This paper describes both efforts and the results achieved.
Author
Aluminum; Compatibility; Fabrication; Hydrazines; Wettability; Surface Treatment

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*.

20070022837 NASA Glenn Research Center, Cleveland, OH, USA
An Analysis of Fuel Cell Options for an All-electric Unmanned Aerial Vehicle
Kohout, Lisa L.; Schmitz, Paul C.; May 09, 2007; 30 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2007-214699; Copyright; Avail.: CASI: A03, Hardcopy

A study was conducted to assess the performance characteristics of both PEM and SOFC-based fuel cell systems for an all-electric high altitude, long endurance Unmanned Aerial Vehicle (UAV). Primary and hybrid systems were considered. Fuel options include methane, hydrogen, and jet fuel. Excel-based models were used to calculate component mass as a function of power level and mission duration. Total system mass and stored volume as a function of mission duration for an aircraft operating at 65 kft altitude were determined and compared.
Author
High Altitude; Pilotless Aircraft; Solid Oxide Fuel Cells; Fly By Wire Control

29
SPACE PROCESSING

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

20070023309 NASA Marshall Space Flight Center, Huntsville, AL, USA
Autonomous Payload Operations Onboard the International Space Station
Stetson, Howard K.; Deitsch, David K.; Cruzen, Craig A.; Haddock, Angie T.; March 03, 2007; 25 pp.; In English; 2007 IEEE Aerospace Conference, 3-10 Mar. 2007, Big Sky, MT, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation reviews Payload operations aboard the International Space Station (ISS). The ISS is a multidisciplinary laboratory, technology test bed, and observatory that provides an unprecedented capability for scientific, technological, and international experimentation in low earth orbit. Timeliner was developed to assist in the payload operations. The Timeliner system has been used to provide an intelligent operations layer on top of the existing command and control system On-board the ISS; it has been used to provide on-board operations command and control to replace remote operations. The Timeliner system provides the versatility to execute autonomous operations on the ground and then migrate the autonomous operations to on-board. Using the timeliner system pens the door for planning/re-planning.
CASI
Autonomy; Command and Control; Payloads; Payload Control

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*.

20070023394 NASA Glenn Research Center, Cleveland, OH, USA

Real-time Signal-to-noise Ratio (SNR) Estimation for BPSK and QPSK Modulation Using the Active Communications Channel

Manning, Robert M., Inventor; March 13, 2007; 15 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 21 Oct. 2002; US-Patent-7,190,741; US-Patent-Appl-SN-274756; NASA-Case-LEW-16901-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023394

Method and apparatus for estimating signal-to-noise ratio (SNR) gamma of a composite input signal e(t) on a phase modulated (e.g., BPSK) communications link. A first demodulator receives the composite input signal and a stable carrier signal and outputs an in-phase output signal; a second demodulator receives the composite input signal and a phase-shifted version of the carrier signal and outputs a quadrature-phase output signal; and phase error theta(sub E)(t) contained within the composite input signal e(t) is calculated from the outputs of the first and second demodulators. A time series of statistically independent phase error measurements theta(sub E)(t(sub 1)), theta (sub E)(t(sub 2)),..., theta (sub E)(t(sub k)) is obtained from the composite input signal subtending a time interval delta t = t(sub k) - t(sub 1) whose value is small enough such that gamma(t) and sigma(t) can be taken to be constant in delta t. A biased estimate gamma(sup *) for the signal-to-noise ratio (SNR) gamma if the composite input signal is calculated using maximum likelihood (ML) estimation techniques, and an unbiased estimate gamma(sup ^) for the signal-to-noise ratio (SNR) gamma of the composite input signal is determined from the biased estimate gamma(sup *), such as by use of a look-up table.

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

Binary Phase Shift Keying; Communication Networks; Phase Modulation; Signal to Noise Ratios; Channels (Data Transmission); Quadrature Phase Shift Keying

20070023438 NASA Glenn Research Center, Cleveland, OH, USA

Modeling and Analysis of Space Based Transceivers

Moore, Michael S.; Price, Jeremy C.; Abbott, Ben; Liebetreu, John; Reinhart, Richard C.; Kacpura, Thomas J.; June 2007; 17 pp.; In English; IEEE/NASA Software Engineering Workshop, 4-6 Apr. 2005, Greenbelt, MD, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 22-041-20-06

Report No.(s): NASA/TM-2007-214828; Copyright; Avail.: CASI: A03, Hardcopy

This paper presents the tool chain, methodology, and initial results of a study to provide a thorough, objective, and quantitative analysis of the design alternatives for space Software Defined Radio (SDR) transceivers. The approach taken was to develop a set of models and tools for describing communications requirements, the algorithm resource requirements, the available hardware, and the alternative software architectures, and generate analysis data necessary to compare alternative designs. The Space Transceiver Analysis Tool (STAT) was developed to help users identify and select representative designs, calculate the analysis data, and perform a comparative analysis of the representative designs. The tool allows the design space to be searched quickly while permitting incremental refinement in regions of higher payoff.

Author

Quantitative Analysis; Transmitter Receivers; Mathematical Models; Software Engineering

20070023568 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Recent Project Experience Mars Reconnaissance Orbiter (MRO)

Hammer, Brian C.; May 3, 2006; 16 pp.; In English; 8th Annual Quality Mission Software Workshop (QMSW), 3 May 2006, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39972

This viewgraph presentation reviews the experiences of the Mars Reconnaissance Orbiter (MRO). It includes an overview

of the MRO mission; the challenges of data Management and Transport; a representation of the end-to-end flow for the telemetry data; a review of the data issues, and Coherent File Distribution Protocol (CFDP) uses and issues.
CASI
Mars Reconnaissance Orbiter; Data Acquisition; Data Processing; Extraterrestrial Communication

20070023571 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Transferring Files Between the Deep Impact Spacecrafts and the Ground Data System Using the CCSDS File Delivery Protocol (CFDP): A Case Study
Sanders, Felicia A.; Jones, Grailing, Jr.; Levesque, Michael; June 19, 2006; 6 pp.; In English; SpaceOps Conference, 16-24 Jun. 2006, Rome, Italy; Original contains color illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39954

The CCSDS File Delivery Protocol (CFDP) Standard could reshape ground support architectures by enabling applications to communicate over the space link using reliable-symmetric transport services. JPL utilized the CFDP standard to support the Deep Impact Mission. The architecture was based on layering the CFDP applications on top of the CCSDS Space Link Extension Services for data transport from the mission control centers to the ground stations. On July 4, 2005 at 1:52 A.M. EDT, the Deep Impact impactor successfully collided with comet Tempel 1. During the final 48 hours prior to impact, over 300 files were uplinked to the spacecraft, while over 6 thousand files were downlinked from the spacecraft using the CFDP. This paper uses the Deep Impact Mission as a case study in a discussion of the CFDP architecture, Deep Impact Mission requirements, and design for integrating the CFDP into the JPL deep space support services. Issues and recommendations for future missions using CFDP are also provided.
Author
Data Acquisition; Protocol (Computers); Data Transmission; Data Transfer (Computers)

20070023637 NASA Glenn Research Center, Cleveland, OH, USA
Near Field Radiation Characteristics of Implantable Square Spiral Chip Inductor Antennas for Bio-Sensors
Nessel, James A.; Simons, Rainee N.; Miranda, Felix A.; July 11, 2007; 11 pp.; In English; IEEE International Symposium on Antennas and Propagation, 9-15 Jun. 2007, Honolulu, HI, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 685676.01.03.01
Report No.(s): NASA/TM-2007-214811; E-15966; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023637

The near field radiation characteristics of implantable Square Spiral Chip Inductor Antennas (SSCIA) for Bio-Sensors have been measured. Our results indicate that the measured near field relative signal strength of these antennas agrees with simulated results and confirm that in the near field region the radiation field is fairly uniform in all directions. The effects of parameters such as ground-plane, number of turns and microstrip-gap width on the performance of the SSCIA are presented. Furthermore, the SSCIA antenna with serrated ground plane produce a broad radiation pattern, with a relative signal strength detectable at distances within the range of operation of hand-held devices for self-diagnosis.
Author
Spiral Antennas; Inductors; Near Fields; Radiation Distribution; Chips (Electronics); Fabrication; Bioinstrumentation; Miniaturization

20070023640 NASA Langley Research Center, Hampton, VA, USA
Airborne RF Measurement System (ARMS) and Analysis of Representative Flight RF Environment
Koppen, Sandra V.; Ely, Jay J.; Smith, Laura J.; Jones, Richard A.; Fleck, Vincent J.; Salud, Maria Theresa; Mielnik, John J.; July 2007; 62 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.19
Report No.(s): NASA/TP-2007-214883; L-19344; Copyright; Avail.: CASI: A04, Hardcopy

Environmental radio frequency (RF) data over a broad band of frequencies (30 MHz to 1000 MHz) were obtained to evaluate the electromagnetic environment in airspace around several airports. An RF signal measurement system was designed utilizing a spectrum analyzer connected to the NASA Lancair Columbia 300 aircraft's VHF/UHF navigation antenna. This

paper presents an overview of the RF measurement system and provides analysis of sample RF signal measurement data. This aircraft installation package and measurement system can be quickly returned to service if needed by future projects requiring measurement of an RF signal environment or exploration of suspected interference situations.
Author
Frequency Measurement; Radio Frequencies; Airborne Equipment; General Aviation Aircraft; Avionics; Flight Instruments; Spectrum Analysis; Electromagnetism

20070023646 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Large Phased Array Radar Using Networked Small Parabolic Reflectors
Amoozegar, Farid; July 12, 2006; In English; Evolving Space Communication Architectures, 12 Jul. 2006, Waltham, MA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40104

Multifunction phased array systems with radar, telecom, and imaging applications have already been established for flat plate phased arrays of dipoles, or waveguides. In this paper the design trades and candidate options for combining the radar and telecom functions of the Deep Space Network (DSN) into a single large transmit array of small parabolic reflectors will be discussed. In particular the effect of combing the radar and telecom functions on the sizes of individual antenna apertures and the corresponding spacing between the antenna elements of the array will be analyzed. A heterogeneous architecture for the DSN large transmit array is proposed to meet the radar and telecom requirements while considering the budget, scheduling, and strategic planning constrains.
Author
Flat Plates; Parabolic Reflectors; Phased Arrays; Telecommunication; Deep Space Network

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*.

20070023319 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Space Technology-5 (ST-5) Li-Ion Battery Build and Performance
Rao, Gopalakrishna M.; Stewart, Karen; April 23, 2007; 18 pp.; In English; Space Power Workshop, 24-26 April 2007, Los Angeles, CA, USA; Original contains black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023319

A viewgraph presentation of Space Technology-5's mission using lithium ion batteries to further investigate space weather is shown.
CASI
Metal Ions; Lithium Batteries; Technology Utilization; Space Missions; Electrical Engineering

20070023388 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Compact 600 GHz Electronically Tunable Vector Measurement System for Submillimeter Wave Imaging
Dengler, Robert; Maiwald, Frank; Siegel, Peter H.; June 11, 2006; 27 pp.; In English; IEEE MTT-s International Microwave Symposium, 11-16 Jun. 2006, San Francisco, CA, USA; Original contains color and black and white illustrations
Report No.(s): THPG-04; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39913

The design of a complete vector measurement system being tested over 560-635 GHz is presented. The topics include: 1) Current State-of-the-Art in Vector Measurements; 2) Submillimeter Active Imaging Requirements; 3) 600 GHz Vector Measurement System; 4) 450 MHz IF Signal; 5) 450 MHz IF signal \@ 1 kHz Res. BW; 6) 450 MHz IF Signal Mixed with Shifted 450 MHz Reference Signal; 7) Reference Signal Offset Generator; 8) Cavity Bandpass Filter; 9) Miniature Multistage Helical Filter; 10) X36 450 MHz Multiplier; 11) 600 GHz Test Setup; 12) 600 GHz Transmit Module; 13) 600 GHz Receive Module; 14) Performance Tests: Amplitude Stability & Dynamic Range; 15) Performance Tests: Phase Stability; 16) Stability at Imaging Bandwidths; 17) Phase Measurement Verification; and 18) The Next Step: Imaging.
CASI
Imaging Techniques; Submillimeter Waves; Electrical Engineering; Vector Currents; Performance Tests; Tunable Filters

20070023391 NASA Pasadena Office, CA, USA

Evolutionary Technique for Automated Synthesis of Electronic Circuits

Stoica, Adrian, Inventor; Salazar-Lazaro, Carlos Harold, Inventor; February 27, 2007; 12 pp.; In English; Original contains black and white illustrations; US-Patent- 7,184,943; NASA-Case-NPO-20535-2; US-Patent-Appl-SN-768754; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023391

An evolvable circuit includes a plurality of reconfigurable switches, a plurality of transistors within a region of the circuit, the plurality of transistors having terminals, the plurality of transistors being coupled between a power source terminal and a power sink terminal so as to be capable of admitting power between the power source terminal and the power sink terminal, the plurality of transistors being coupled so that every transistor to transistor terminal coupling within the region of the circuit comprises a reconfigurable switch.

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

Circuits; Automatic Control; Electronics; Synthesis

20070023396 NASA Langley Research Center, Hampton, VA, USA

Carbon Nanotube-based Sensor and Method for Continually Sensing Changes in a Structure

Jordan, Jeffry D., Inventor; Watkins, Anthony Neal, Inventor; Oglesby, Donald M., Inventor; Ingram, JoAnne L., Inventor; March 27, 2007; 10 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 13 Jul. 2004; US-Patent-7,194,912; US-Patent-Appl-SN-890843; NASA-Case-LAR-16475-1; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023396

A sensor has a plurality of carbon nanotube (CNT)-based conductors operatively positioned on a substrate. The conductors are arranged side-by-side, such as in a substantially parallel relationship to one another. At least one pair of spaced-apart electrodes is coupled to opposing ends of the conductors. A portion of each of the conductors spanning between each pair of electrodes comprises a plurality of carbon nanotubes arranged end-to-end and substantially aligned along an axis. Because a direct correlation exists between resistance of a carbon nanotube and carbon nanotube strain, changes experienced by the portion of the structure to which the sensor is coupled induce a change in electrical properties of the conductors.

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

Carbon Nanotubes; Sensors; Methodology; Electric Conductors

20070023417 NASA Marshall Space Flight Center, Huntsville, AL, USA

Low Power, High Voltage Power Supply with Fast Rise/Fall Time

Bearden, Douglas B., Inventor; February 13, 2007; 6 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 10 Mar. 2006; US-Patent-7,1777,164; US-Patent-Appl-SN-376632; NASA-Case-MFS-32137-1; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023417

A low power, high voltage power supply system includes a high voltage power supply stage and a preregulator for programming the power supply stage so as to produce an output voltage which is a predetermined fraction of a desired voltage level. The power supply stage includes a high voltage, voltage doubler stage connected to receive the output voltage from the preregulator and for, when activated, providing amplification of the output voltage to the desired voltage level. A first feedback loop is connected between the output of the preregulator and an input of the preregulator while a second feedback loop is connected between the output of the power supply stage and the input of the preregulator.

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

High Voltages; Low Voltage; Power Supplies; Voltage Regulators

20070023486 NASA Langley Research Center, Hampton, VA, USA

Device and Method for Connections Made Between a Crimp Connector and Wire

Yost, William T., Inventor; Cramer, K. Elliott, Inventor; Perey, Daniel F., Inventor; February 27, 2007; 21 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 9 Sep. 2004; US-Patent-7,181,942; US-Patent-Appl-SN-943649; US-Patent-Appl-SN-550740; NASA-Case-LAR-16575-1; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023486

An ultrasonic device and method obtains desirable crimp connections between a crimp connector and a wire, or bundle

of wires, by assessing the desirability of connections made in a wire-to-wire connection and in other situations where two materials with good acoustic propagation characteristics are joined together via deformation. An embodiment of the device as a crimping tool comprises a compressing means, pulse-generating circuitry. at least one ultrasonic transmitting transducer, at least one ultrasonic receiving transducer, receiving circuitry, and a display. The user may return to a previously crimped connection and assess the desirability of the connection by compressing the device about the connection, sending an acoustic signal through the crimp, andco111paring the received signal to a signal obtained from known desirable connections.
Author
Connectors; Folding; Ultrasonics; Wire; Tools

20070023499 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Hollow Cathode and Keeper-region Plasma Measurements Using Ultra-fast Miniature Scanning Probes
Goebel, Dan M.; Jameson, Kristina K.; Watkins, Ron M.; Katz, Ira; July 12, 2004; 16 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Fort Lauderdale, Florida, July 11-14, 2004, 11-14 Jul. 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39989

In order to support the development of comprehensive performance and life models for future deep space missions that will utilize ion thrusters, we have undertaken a study of the plasma structure in hollow cathodes using an new pneumatic scanning probe diagnostic. This device is designed to insert a miniature probe directly into the hollow cathode orifice from either the upstream insert region in the interior of the hollow cathode, or from the downstream keeper-plasma region at the exit of the hollow cathode, to provide complete axial profiles of the discharge plasma parameters. Previous attempts to diagnose this region with probes was Limited by the melting of small probes in the intense discharge near the orifice, or caused significant perturbation of the plasma by probes large enough to survive. Our new probe is extremely compact, and when configured as a single Langmuir probe, the ceramic tube insulator is only 0.5mm in diameter and the current collecting conductor has a total area of 0.002 cm2. A series of current-voltage characteristics are obtained by applying a rapid sawtooth voltage waveform to the probe as it is scanned by the pneumatic actuator into and out of the plasma region, The bellow-sealed pneumatic drive scans the probe 4 cm in the cathode insert region and 10 cm in the anode/keeper plasmas region at average speeds of about 1 mm/msec, and the residence time at the end of the insertion stroke in the densest part of the plasma near the orifice is measured to be only 10 msec. Since the voltage sweep time is fast compared to the motion of the probe, axial profiles of the plasma density, temperature and potential with reasonable spatial resolution are obtained. Measurements of the internal cathode pressures and the axial plasma-parameter profiles for a hollow cathode operating at discharge currents of up to 35 A in xenon will be presented.
Author
Hollow Cathodes; Scanners; Miniaturization; Electrostatic Probes; Pneumatic Probes

20070023532 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Design of a Wideband 900 GHz Balanced Frequency Tripler for Radioastronomy
Tripon-Canseliet, Charlotte; Maestrini, Alain; Mehdi, Imran; September 30, 2004; 2 pp.; In English; Infrared and Millimeterwave Conference, 28-30 Sep. 2004, Karlsrhue, Germany; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40037

We report on the design of a fix-tuned split-block waveguide balanced frequency tripler working nominally at 900GHz. It uses a GaAs Schottky planar diode pair in a balanced configuration. The circuit will be fabricated with JPL membrane technology in order to minimize dielectric loading. The multiplier is bias-less to dramatically ease the mounting and the operating procedure. At room temperature, the expected output power is 50- 130 (micro)W in the band 800-970 GHz when the tripler is pumped with 4mW. By modifying the waveguide input and output matching circuit, the multiplier can be tuned to operate at lower frequencies.
Author
Broadband; Frequencies; Radio Astronomy; Dielectrics; Waveguides; Electrical Engineering; Fabrication

20070023579 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Qualification and Reliability for MEMS and IC Packages

Ghaffarian, Reza; September 26, 2004; 10 pp.; In English; Surface Mount Technology Association (SMTA), 26-30 Sep. 2004, Chicago, IL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39978

Advanced IC electronic packages are moving toward miniaturization from two key different approaches, front and back-end processes, each with their own challenges. Successful use of more of the back-end process front-end, e.g. microelectromechanical systems (MEMS) Wafer Level Package (WLP), enable reducing size and cost. Use of direct flip chip die is the most efficient approach if and when the issues of know good die and board/assembly are resolved. Wafer level package solve the issue of known good die by enabling package test, but it has its own limitation, e.g., the I/O limitation, additional cost, and reliability. From the back-end approach, system-in-a-package (SIAP/SIP) development is a response to an increasing demand for package and die integration of different functions into one unit to reduce size and cost and improve functionality. MEMS add another challenging dimension to electronic packaging since they include moving mechanical elements. Conventional qualification and reliability need to be modified and expanded in most cases in order to detect new unknown failures. This paper will review four standards that already released or being developed that specifically address the issues on qualification and reliability of assembled packages. Exposures to thermal cycles, monotonic bend test, mechanical shock and drop are covered in these specifications. Finally, mechanical and thermal cycle qualification data generated for MEMS accelerometer will be presented. The MEMS was an element of an inertial measurement unit (IMU) qualified for NASA Mars Exploration Rovers (MERs), Spirit and Opportunity that successfully is currently roaring the Martian surface Author

Microelectromechanical Systems; Reliability Analysis; Integrated Circuits; Qualifications; Electronic Packaging

20070023589 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

The Pulse Width Modulator ASIC for Deep Space Missions

Carr, Gregory A.; Wester, Gene W.; Lam, Barbara; Bennett, Johnny; Franco, Lauro; Woo, Erika; August 16, 2004; 5 pp.; In English; International Engery Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40011

The Jet Propulsion Laboratory has started the development of a Pulse Width Modulator Application Specific Integrated Circuit (PWMA). This development is leveraging the previous development of the Switch Control ASIC (SCA). The purpose of the development is to provide the control for a selected range of power converter topologies and to meet the stringent environmental requirements of deep space missions. The PWMA will include several power control functions that are not normally included on the off-the-shelf components available today. One key functional requirement is the ability to implement an N + K redundant power converter with the ability to control the charging of a battery. Other applications will be the typical point of load isolated and non-isolated power converters. The purpose the development is not only to provide a much needed flight part, but also to accelerate the engineering process by using a standard cell library from previous ASIC developments. Under previous developments with Boeing and Lockheed Martin, JPL has produced three ASICs. Each ASIC has been implemented by using an analog standard cell library. One such development was the SCA, which is design to provide a floating power switch control. The functional verification of this ASIC has been completed and the cells used have been targeted for the new development of the PWMA. The primary function of the PWMA is to provide the control function of a point of load power converter. The design is an isolated 60 W converter with a 33 V output. In architecting the design, several functions were left up to the power converter design in order to make the ASIC more generic. The ASIC can be used for several power converter topologies and power levels. Some additional features have been added to the ASIC to provide the interfaces for multi-phase topologies and battery control functions. An N+K fault tolerant strategy has been implemented in order to provide the battery control functions. The PWMA has been developed to provide an ASIC with several functions not normally available in the off the shelf controllers. These functions have been added to enable the power converter designers to achieve fault tolerant designs and battery control functions.

Author

Application Specific Integrated Circuits; Pulse Duration; Electric Batteries; Power Converters

20070023591 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Design of a Wideband 6-Anode Frequency Tripler at 300 GHz with Optimum Balance

Maestrini, Alain; Tripon-Canseliet, Charlotte; Mehdi, Imran; September 28, 2004; 2 pp.; In English; Infrared and Millimeterwave Conference, 28-30 Sep. 2004, Karlsrhue, Germany; Original contains fold-outs or oversized pages that could not be scanned; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39966

We report on the design methodology of a fix-tuned split-block waveguide balanced frequency tripler working nominally at 300 GHz. It features six GaAs Schottky planar diodes in a balanced configuration. The circuit will be fabricated with JPL membrane technology in order to minimize dielectric loading and insure an accurate and uniform thickness of the substrate. The multiplier power handling is limited by the breakdown voltage of the diodes that depends on the doping level of the active layer. With six diodes, the current choice for the doping level leads to medium power handling capabilities of about 50 mW. Increasing the number of diodes to eight would be an option but would lead to increased difficulties in design and fabrication. Author

Broadband; Fabrication; Gallium Arsenides; Schottky Diodes; Anodes

20070023682 NASA Ames Research Center, Moffett Field, CA, USA

Metallic Nanowire Interconnections for Integrated Circuit Fabrication

Ng, Hou Tee, Inventor; Li, Jun, Inventor; Meyyappan, Meyya, Inventor; 15 May 2007; 10 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 24 Mar. 2004; US-Patent-7,217,650; US-Patent-Appl-10/816576; US-Patent-appl-10/390254; NASA-Case-ARC-15042-2; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023682

A method for fabricating an electrical interconnect between two or more electrical components. A conductive layer is provided on a substarte and a thin, patterned catalyst array is deposited on an exposed surface of the conductive layer. A gas or vapor of a metallic precursor of a metal nanowire (MeNW) is provided around the catalyst array, and MeNWs grow between the conductive layer and the catalyst array. The catalyst array and a portion of each of the MeNWs are removed to provide exposed ends of the MeNWs.

Author

Catalysts; Integrated Circuits; Nanowires; Nanotechnology; Nanofabrication; Metals; Insulation

20070023697 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Frequency Dependence of Single-event Upset in Advanced Commerical PowerPC Microprocessors

Irom, Frokh; Farmanesh, Farhad F.; Swift, Gary M.; Johnston, Allen H.; July 19, 2004; 5 pp.; In English; IEEE Nuclear and Space Radiation Effects Conference, 19-20 June 2004, Atlanta, GA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39993

This paper examines single-event upsets in advanced commercial SOI microprocessors in a dynamic mode, studying SEU sensitivity of General Purpose Registers (GPRs) with clock frequency. Results are presented for SOI processors with feature sizes of 0.18 microns and two different core voltages. Single-event upset from heavy ions is measured for advanced commercial microprocessors in a dynamic mode with clock frequency up to 1GHz. Frequency and core voltage dependence of single-event upsets in registers is discussed.

Author

Dynamic Response; Frequencies; Microprocessors; Single Event Upsets; Integrated Circuits; Registers (Computers)

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*.

20070022848 NASA Dryden Flight Research Center, Edwards, CA, USA

CFD to Flight: Some Recent Success Stories of X-plane Design to Flight Test at the NASA Dryden Flight Research Center

Cosentino, Gary B.; May 25, 2007; 21 pp.; In English; Frontiers of Computational Fluid Dynamics Workshop, 20-21 Jun. 2007, Davis, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070022848

Several examples from the past decade of success stories involving the design and ight test of three true X-planes will be described: in particular, X-plane design techniques that relied heavily upon computational fluid dynamics (CFD). Three specific examples chosen from the authors personal experience are presented: the X-36 Tailless Fighter Agility Research Aircraft, the X-45A Unmanned Combat Air Vehicle, and, most recently, the X-48B Blended Wing Body Demonstrator Aircraft. An overview will be presented of the uses of CFD analysis, comparisons and contrasts with wind tunnel testing, and information derived from the CFD analysis that directly related to successful flight test. Some lessons learned on the proper application, and misapplication, of CFD are illustrated. Finally, some highlights of the flight-test results of the three example X-planes will be presented. This overview paper will discuss some of the authors experience with taking an aircraft shape from early concept and three-dimensional modeling through CFD analysis, wind tunnel testing, further re ned CFD analysis, and, finally, flight. An overview of the key roles in which CFD plays well during this process, and some other roles in which it does not, are discussed. How wind tunnel testing complements, calibrates, and verifies CFD analysis is also covered. Lessons learned on where CFD results can be misleading are also given. Strengths and weaknesses of the various types of ow solvers, including panel methods, Euler, and Navier-Stokes techniques, are discussed. The paper concludes with the three specific examples, including some flight test video footage of the X-36, the X-45A, and the X-48B.

Author

Blended-Wing-Body Configurations; Computational Fluid Dynamics; Flight Tests; Aircraft Design; Wind Tunnel Tests; X-36 Aircraft; X-45 Aircraft

20070023401 NASA Langley Research Center, Hampton, VA, USA

Nonstandard Analysis and Shock Wave Jump Conditions in a One-Dimensional Compressible Gas

Baty, Roy S.; Farassat, Fereidoun; Hargreaves, John; May 2007; 81 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): DE-AC52-06NA25396; WBS 561581.02.08.07.18.02

Report No.(s): LA-14334; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023401

Nonstandard analysis is a relatively new area of mathematics in which infinitesimal numbers can be defined and manipulated rigorously like real numbers. This report presents a fairly comprehensive tutorial on nonstandard analysis for physicists and engineers with many examples applicable to generalized functions. To demonstrate the power of the subject, the problem of shock wave jump conditions is studied for a one-dimensional compressible gas. It is assumed that the shock thickness occurs on an infinitesimal interval and the jump functions in the thermodynamic and fluid dynamic parameters occur smoothly across this interval. To use conservations laws, smooth pre-distributions of the Dirac delta measure are applied whose supports are contained within the shock thickness. Furthermore, smooth pre-distributions of the Heaviside function are applied which vary from zero to one across the shock wave. It is shown that if the equations of motion are expressed in nonconservative form then the relationships between the jump functions for the flow parameters may be found unambiguously. The analysis yields the classical Rankine-Hugoniot jump conditions for an inviscid shock wave. Moreover, non-monotonic entropy jump conditions are obtained for both inviscid and viscous flows. The report shows that products of generalized functions may be defined consistently using nonstandard analysis; however, physically meaningful products of generalized functions must be determined from the physics of the problem and not the mathematical form of the governing equations.

Author

Shock Waves; Functions (Mathematics); Compressible Flow; Gas Flow; Wave Propagation; Mathematical Models

20070023569 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Integrated Thermal Energy Management System (ITEMS)

Best, Frederick; Kurwitz, Cable; Birur, Gajana C.; April 25, 2006; 16 pp.; In English; Space Power Workshop, 25-27 Apr. 2006, Manhattan Beach, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40010

A viewgraph presentation describing the Integrated Thermal Energy Management System (ITEMS) is shown. The topics include: 1) The Benefits of Two-Phase Flow; 2) Description; and 3) Hardware.

CASI

Thermal Energy; Mechanical Engineering; Technology Utilization; Two Phase Flow

20070023593 Florida Agricultural and Mechanical Univ., Tallahassee, FL, USA

Active-Adaptive Control of Inlet Separation Using Supersonic Microjets

Alvi, Farrukh S.; [2007]; 42 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG1-02059; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023593

Flow separation in internal and external flows generally results in a significant degradation in aircraft performance. For internal flows, such as inlets and transmission ducts in aircraft propulsion systems, separation is undesirable as it reduces the overall system performance. The aim of this research has been to understand the nature of separation and more importantly, to explore techniques to actively control it. In this research, we extended our investigation of active separation control (under a previous NASA grant) where we explored the use of microjets for the control of boundary layer separation. The geometry used for the initial study was a simple diverging Stratford ramp, equipped with arrays of microjets. These early results clearly show that the activation of microjets eliminated flow separation. Furthermore, the velocity-field measurements, using PIV, also demonstrate that the gain in momentum due to the elimination of separation is at least an order of magnitude larger (two orders of magnitude larger in most cases) than the momentum injected by the microjets and is accomplished with very little mass flow through the microjets. Based on our initial promising results this research was continued under the present grant, using a more flexible model. This model allows for the magnitude and extent of separation as well as the microjet parameters to be independently varied. The results, using this model were even more encouraging and demonstrated that microjet control completely eliminated significant regions of flow separation over a wide range of conditions with almost negligible mass flow. Detailed studies of the flowfield and its response to microjets were further examined using 3-component PIV and unsteady pressure measurements, among others. As the results presented this report will show, microjets were successfully used to control the separation of a much larger extent and magnitude than demonstrated in our earlier experiments. In fact, using the appropriate combination of control parameters (microjet, location, angle and pressure) separation was completely eliminated for the largest separated flowfield we could generate with the present model. Separation control also resulted in a significant reduction in the unsteady pressures in the flow where the unsteady pressure field was found to be directly responsive to the state of the flow above the surface. Hence, our study indicates that the unsteady pressure signature is a strong candidate for a flow state sensor , which can be used to estimate the location, magnitude and other properties of the separated flowfield. Once better understood and properly utilized, this behavior can be of significant practical importance for developing and implementing online control.

Author

Active Control; Engine Inlets; Boundary Layer Separation; Mathematical Models; Adaptive Control; Inlet Flow; Supersonic Jet Flow

20070023635 NASA Langley Research Center, Hampton, VA, USA

Orbiter Entry Aeroheating Working Group Viscous CFD Boundary Layer Transition Trailblazer Solutions

Wood, William A.; Erickson, David W.; Greene, Francis A.; June 2007; 22 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 23-376-70-30-08

Report No.(s): NASA/TM-2007-214882; L-19281; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023635

Boundary layer transition correlations for the Shuttle Orbiter have been previously developed utilizing a two-layer boundary layer prediction technique. The particular two-layer technique that was used is limited to Mach numbers less than 20. To allow assessments at Mach numbers greater than 20, it is proposed to use viscous CFD to the predict boundary layer properties. This report addresses if the existing Orbiter entry aeroheating viscous CFD solutions, which were originally

intended to be used for heat transfer rate predictions, adequately resolve boundary layer edge properties and if the existing two-layer results could be leveraged to reduce the number of needed CFD solutions. The boundary layer edge parameters from viscous CFD solutions are extracted along the wind side centerline of the Space Shuttle Orbiter at reentry conditions, and are compared with results from the two-layer boundary layer prediction technique. The differences between the viscous CFD and two-layer prediction techniques vary between Mach 6 and 18 flight conditions and Mach 6 wind tunnel conditions, and there is not a straightforward scaling between the viscous CFD and two-layer values. Therefore: it is not possible to leverage the existing two-layer Orbiter flight boundary layer data set as a substitute for a viscous CFD data set; but viscous CFD solutions at the current grid resolution are sufficient to produce a boundary layer data set suitable for applying edge-based boundary layer transition correlations.
Author
Aerodynamic Heating; Boundary Layer Transition; Computational Fluid Dynamics; Spacecraft Reentry; Space Shuttle Orbiters; Viscous Flow; Trailblazer 1 Reentry Vehicle

35
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*.

20070023432 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Encrypting Digital Camera with Automatic Encryption Key Deletion
Oakley, Ernest C., Inventor; July 03, 2007; 10 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 23 Apr. 2003; US-Patent-7,240,208; US-Patent-Appl-SN-424287; NASA-Case-NPO-30703-1; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023432

A digital video camera includes an image sensor capable of producing a frame of video data representing an image viewed by the sensor, an image memory for storing video data such as previously recorded frame data in a video frame location of the image memory, a read circuit for fetching the previously recorded frame data, an encryption circuit having an encryption key input connected to receive the previously recorded frame data from the read circuit as an encryption key, an un-encrypted data input connected to receive the frame of video data from the image sensor and an encrypted data output port, and a write circuit for writing a frame of encrypted video data received from the encrypted data output port of the encryption circuit to the memory and overwriting the video frame location storing the previously recorded frame data.
Official Gazette of the U.S. Patent and Trademark Office
Cryptography; Digital Cameras; Video Data; Automatic Control

20070023496 NASA Langley Research Center, Hampton, VA, USA
Magnetic Field Response Measurement Acquisition System
Woodward, Stanley E., Inventor; Taylor, Bryant D., Inventor; January 09, 2007; 50 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 15 Jun. 2006; US-Patent-7,159,774; US-Patent-Appl-SN-305854; US-Patent-Appl-SN-839445; US-Patent-Appl-SN-467844; US-Patent-Appl-SN-467840; US-Patent-Appl-SN-467841; US-Patent-Appl-SN-467113; NASA-Case-LAR-17280-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023496

Magnetic field response sensors designed as passive inductor- capacitor circuits produce magnetic field responses whose harmonic frequencies correspond to states of physical properties for which the sensors measure. Power to the sensing element is acquired using Faraday induction. A radio frequency antenna produces the time varying magnetic field used for powering the sensor, as well as receiving the magnetic field response of the sensor. An interrogation architecture for discerning changes in sensor's response frequency, resistance and amplitude is integral to the method thus enabling a variety of measurements. Multiple sensors can be interrogated using this method, thus eliminating the need to have a data acquisition channel dedicated to each sensor. The method does not require the sensors to be in proximity to any form of acquisition hardware. A vast array of sensors can be used as interchangeable parts in an overall sensing system.
Author
Circuits; Data Acquisition; Magnetic Fields; Resonance; Measuring Instruments

20070023594 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Progress on Background-Limited Membrane-Isolated TES Bolometers for Far-IR/Submillimeter Spectroscopy

Kenyon, M.; Day, P. K.; Bradford, C. M.; Bock, J. J.; Leduc, H. G.; May 29, 2006; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40089

To determine the lowest attainable phonon noise equivalent power (NEP) for membrane-isolation bolometers, we fabricated and measured the thermal conductance of suspended Si3N4 beams with different geometries via a noise thermometry technique. We measured beam cross-sectional areas ranging from 0.35 x 0.5 (micro)m(sup 2) to 135 x 1.0 (micro)m(sup 2) and beam lengths ranging from (micro)m to 8300 (micro)m. The measurements directly imply that membrane-isolation bolometers are capable of reaching a phonon noise equivalent power (NEP) of 4 x 10(sup -20)W/Hz(sup 1)/O . This NEP adequate for the Background-Limited Infrared-Submillimeter Spectrograph (BLISS) proposed for the Japanese SPICA observatory, and adequate for NASA's SAFIR observatory, a 10-meter, 4 K telescope to be deployed at L2. Further, we measured the heat capacity of a suspended Si<base>3N<base>4 membrane and show how this result implies that one can make membrane-isolation bolometers with a response time which is fast enough for BLISS.

Author

Bolometers; Infrared Spectroscopy; Submillimeter Waves; Far Infrared Radiation; Infrared Radiation; Membranes; Fabrication

20070023595 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Adaptive Nulling for the Terrestrial Planet Finder Interferometer

Peters, Robert D.; Lay, Oliver P.; Jeganathan, Muthu; Hirai, Akiko; May 27, 2006; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40087

A description of adaptive nulling for Terrestrial Planet Finder Interferometer (TPFI) is presented. The topics include: 1) Nulling in TPF-I; 2) Why Do Adaptive Nulling; 3) Parallel High-Order Compensator Design; 4) Phase and Amplitude Control; 5) Development Activates; 6) Requirements; 7) Simplified Experimental Setup; 8) Intensity Correction; and 9) Intensity Dispersion Stability. A short summary is also given on adaptive nulling for the TPFI.

CASI

Interferometers; Terrestrial Planets; Adaptive Control; Null Zones

20070023645 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Nulling Coronagraph for TPF-C

Shao, Michael; Levine, Bruce Martin; Wallace, James Kent; Orton, Glenn S.; Schmidtlin, Edouard; Lane, Benjamin F.; Seager, Sara; Tolls, Volker; Lyon, Richard G.; Samuele, Rocco; Tenerelli, Domenick J.; Woodruff, Robert; Ge, Jian; May 14, 2006; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40090

The nulling coronagraph is one of 5 instrument concepts selected by NASA for study for potential use in the TPF-C mission. This concept for extreme starlight suppression has two major components, a nulling interferometer to suppress the starlight to ~10(sup -10) per airy spot within 2 (lamda)/D of the star, and a calibration interferometer to measure the residual scattered starlight. The ability to work at 2 (lamda)/D dramatically improves the science throughput of a space based coronagraph like TPF-C. The calibration interferometer is an equally important part of the starlight suppression system. It measures the measures the wavefront of the scattered starlight with very high SNR, to 0.05nm in less than 5 minutes on a 5mag star. In addition, the post coronagraph wavefront sensor will be used to measure the residual scattered light after the coronagraph and subtract it in post processing to 1~2x10(sup -11) to enable detection of an Earthlike planet with a SNR of 5~10.

Author

Coronagraphs; Terrestrial Planets; Planet Detection; Null Zones

36
LASERS AND MASERS

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

20070022845 NASA Langley Research Center, Hampton, VA, USA
Compact and Rugged Transceiver for Coherent Doppler Wind Lidar Applications in Space
Kavaya, Michael J.; Koch, Grady J.; Yu, Jirong; Amzajerdian, Farzin; Singh, Upendra N.; Trieu, Bo C.; Modlin, Ed A.; Petros, Mulugeta; Bai, Yingxin; Reithmaier, Karl; Petzar, Paul J.; June 19, 2007; 5 pp.; In English; 1st Annual NASA Science Technology Conference, 19-21 June 2007, Adelphi, MD, USA; Original contains color and black and white illustrations
Report No.(s): Paper No. B11P4; Copyright; Avail.: CASI: A01, Hardcopy

High-accuracy, vertical profiles of the horizontal vector wind in earth s atmosphere, with the global coverage of an orbiting sensor, are a highly desired measurement of NASA, NOAA, and many other agencies and countries. It is the consensus of NASA and NOAA that the most cost effective, lowest risk measurement method with the earliest achievable mission date is the hybrid Doppler lidar method which utilizes both coherent- and direct-detection Doppler lidars to obtain the desired profiles. NASA Langley Research Center (LaRC) has advanced the 2-micron pulsed solid-state laser greatly over the past 15 years and has recently demonstrated 1.2 J of pulse energy whereas the requirement for a 400-km hybrid Doppler lidar mission is only 0.25 J. The IIP project reported here is an effort to increase the ruggedness and to compactly package the LaRC state-of-the-art laser technology.
Author
Doppler Radar; Optical Radar; Ruggedness; Transmitter Receivers; Wind Profiles; Coherent Radar; Fabrication

20070023678 NASA Marshall Space Flight Center, Huntsville, AL, USA
Fiber Coupled Laser Diodes with Even Illumination Pattern
Howard, Richard T., Inventor; 6 Feb. 2007; 11 pp.; In English; Original contains black and white illustrations; US-Patent-7,174,077; US-Patent-Appl-10/631220; NASA-Case-MFS-31843-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023678

An optical fiber for evenly illuminating a target. The optical fiber is coupled to a laser emitting diode and receives laser light. The laser light travels through the fiber optic and exits at an exit end. The exit end has a diffractive optical pattern formed thereon via etching, molding or cutting, to reduce the Gaussian profile present in conventional fiber optic cables The reduction of the Gaussian provides an even illumination from the fiber optic cable.
Author
Fiber Lasers; Fiber Optics; Laser Outputs; Semiconductor Lasers

37
MECHANICAL ENGINEERING

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

20070022839 NASA Glenn Research Center, Cleveland, OH, USA
Status of the NASA Stirling Radioisotope Project
Schreiber, Jeffrey G.; May 2007; 25 pp.; In English; International Stirling Forum 2006, 26-27 Sep. 2006, Osnabruck, Germany; Original contains color illustrations
Contract(s)/Grant(s): WBS 138494.04.01.01
Report No.(s): NASA/TM-2007-214804; E-15937; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022839

Free-piston Stirling power conversion has been considered a candidate for radioisotope power systems for space for more than a decade. Prior to the free-piston Stirling architecture, systems were designed with kinematic Stirling engines that used linkages and rotary alternators to convert heat to electricity. These systems were able to achieve long life by lightly loading the linkages; however, the live was nonetheless limited. When the free-piston configuration was initially proposed, it was

thought to be attractive due to the relatively high conversion efficiency, acceptable mass, and the potential for long life and high reliability based on wear-free operation. These features have consistently been recognized by teams that have studied technology options for radioisotope space power systems. Since free-piston Stirling power conversion was first considered for space power applications, there have been major advances in three general areas of development: hardware that has demonstrated long-life and reliability, the success achieved by Stirling cryocoolers in space, and the overall developmental maturity of the technology for both space and terrestrial applications. Based on these advances, free-piston Stirling convertors are currently being developed for space power, and for a number of terrestrial applications. They commonly operate with the power, efficiency, life, and reliability as intended, and much of the development now centers on system integration. This paper will summarize the accomplishments of free-piston Stirling power conversion technology over the past decade, review the status of development with regard to space power, and discuss the challenges that remain.
Author
Stirling Engines; Nuclear Electric Power Generation; Free-Piston Engines; Mechanical Engineering; Technology Utilization; Radioisotope Heat Sources

20070022841 ASRC Aerospace Corp., Cleveland, OH, USA
Unsteady Velocity Measurements in the NASA Research Low Speed Axial Compressor: Smooth Wall Configuration
Lepicovsky, Jan; May 2007; 114 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNC06BA07B; WBS 561581.02.08.03.21.02
Report No.(s): NASA/CR-2007-214815; E-15971; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022841

The report is a collection of experimental unsteady data acquired in the first stage of the NASA Low Speed Axial Compressor in configuration with smooth (solid) wall treatment over the first rotor. The aim of the report is to present a reliable experimental data base that can be used for analysis of the compressor flow behavior, and hopefully help with further improvements of compressor CFD codes. All data analysis is strictly restricted to verification of reliability of the experimental data reported. The report is divided into six main sections. First two sections cover the low speed axial compressor, the basic instrumentation, and the in-house developed methodology of unsteady velocity measurements using a thermo-anemometric split-fiber probe. The next two sections contain experimental data presented as averaged radial distributions for three compressor operation conditions, including the distribution of the total temperature rise over the first rotor, and ensemble averages of unsteady flow data based on a rotor blade passage period. Ensemble averages based on the rotor revolution period, and spectral analysis of unsteady flow parameters are presented in the last two sections. The report is completed with two appendices where performance and dynamic response of thermo-anemometric probes is discussed.
Author
Low Speed; Unsteady Flow; Velocity Measurement; Computational Fluid Dynamics; Walls; Turbocompressors

20070023433 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Self Mountable and Extractable Ultrasonic/Sonic Anchor
Bar-Cohen, Yoseph, Inventor; Sherrit, Stewart, Inventor; January 02, 2007; 11 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 1 Dec. 2004; US-Patent-7,156,189; US-Patent-Appl-SN-001465; NASA-Case-NPO-40827-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023433

Self drilling anchors and related methods and apparatus. In one embodiment an apparatus comprises a drill bit, a hammer mechanism for hammering the drill bit in a first direction and in a second direction, and a selection mechanism for controlling whether, at a given point in time, the drill bit is hammered in the first or second direction.
Official Gazette of the U.S. Patent and Trademark Office
Anchors (Fasteners); Drilling; Ultrasonics; Mounting

20070023498 Wyle Labs., Inc., Houston, TX, USA
Volatile Organic Analyzer (VOA) in 2006: Repair, Revalidation, and Restart of Elektron Event
Limero, Thomas; July 22, 2007; 5 pp.; In English; 16th International Conference on Ion Mobility, 22-26 Jul. 2007, Mikkeli, Finland; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Volatile Organic Analyzer (VOA) was launched to the International Space Station (ISS) in August 2001 and was the first instrument to provide near real-time measurement of volatile organic compounds in a spacecraft atmosphere. The VOA

performed an analysis of the ISS air approximately twice a month for most of its operation through May 2003. This intermittent operation, caused by a software interface issue with the ISS communication bus, slowed the validation of the VOA. However, operational validation was completed in 2003 when analysis of air samples collected in grab sample containers (GSCs) compared favorably with simultaneous VOA runs (1). The VOA has two channels that provide redundant function, albeit at slightly reduced performance, when only one channel is operating (2). Most target compounds can be detected on both channels. In January 2003, the VOA identified a malfunction in the channel 2 preconcentrator and it shut down that channel. The anomaly profile suggested that a fuse might have failed, but the root cause could not be determined. In May 2003, channel 1 was shut down when the detector s elevated temperature could not longer be maintained. Since both VOA channels were now deactivated, VOA operations ended until an in-flight repair could be planned and executed. This paper describes the process to repair the VOA and to revalidate it for operations, and then an account is given of the VOA s contribution following a contingency event on ISS.
Derived from text
Volatile Organic Compounds; Analyzers; Maintenance; Spacecraft Instruments; Elektron Satellites

20070023681 NASA Marshall Space Flight Center, Huntsville, AL, USA
Systems, Methods and Apparatus for Determining Physical Properties of Fluids
Butas, John P., Inventor; VanBuskirk, Paul D., Inventor; June 05, 2007; 26 pp.; In English; Original contains black and white illustrations; US-Patent-7,228,241; US-Patent-Appl-SN-152810; NASA-Case-MFS-32175-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023681

In some embodiments, systems and methods and apparatus are provided through which the equation of state is used to control a process through analyses of one or more properties of a fluid through an interactive modeler that models the equation of state for the fluid in the process based on measured signals and for selectively enabling the modeling of control changes to the process. In some embodiments, a device generates an indication of machine health based on variations on the equation of state for a fluid in a machine. In some embodiments, one or more properties for the fluid from at least one unmeasured machine parameter in the interactive modeler are determined for the machine at various operating states. In some embodiments, a difference between an expected one or more properties of the fluid beyond a set point indicates the health of the machine
Author
Equations of State; Thermodynamic Properties; Volume; Systems Health Monitoring; Fluids; Computer Systems Design

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*.

20070023368 NASA Langley Research Center, Hampton, VA, USA, Army Research Lab., Hampton, VA, USA
Analysis of the Effects of Sea Disposal on a One-Ton Container
Jackson, Wde C.; Jackson, Karen E.; Fasanella, Edwin L.; Kelley, John; July 2007; 50 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 732759.07.09
Report No.(s): NASA/TM-2007-214881; ARL-TR-3883; L-19368; Copyright; Avail.: CASI: A03, Hardcopy

Excess and obsolete stocks of chemical warfare material (CWM) were sea disposed by the USA between 1919 and 1970. One-ton containers were used for bulk storage of CWM and were the largest containers sea disposed. Disposal depths ranged from 300 to 17,000 feet. Based on a Type D container assembly drawing, three independent analyses (one corrosion and two structural) were performed on the containers to address the corrosion resistance from prolonged exposure to sea water and the structural response during the descent. Corrosion predictions were made using information about corrosion rates and the disposal environment. The structural analyses employed two different finite element codes and were used to predict the buckling and material response of the container during sea disposal. The results of these investigations are summarized below. Detailed reports on each study are contained in the appendices.
Author
Chemical Warfare; Sea Water; Containers; Disposal; Structural Analysis; Mechanical Properties

20070023494 NASA Langley Research Center, Hampton, VA, USA

System and Method for Detecting Cracks and their Location

Woodward, Stanley E., Inventor; Shams, Qamar A., Inventor; June 19, 2007; 9 pp.; In English; Original contains black and white illustrations

Patent Info.: Filed 12 Sep. 2005; US-Patent-7,231,832; US-Patent-Appl-SN-229439; US-Patent-Appl-SN-611170; NASA-Case-LAR-16970-1; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023494

A system and method are provided for detecting cracks and their location in a structure. A circuit coupled to a structure has capacitive strain sensors coupled sequentially and in parallel to one another. When excited by a variable magnetic field, the circuit has a resonant frequency that is different for unstrained and strained states. In terms of strained states, the resonant frequency is indicative of a region of the circuit that is experiencing strain induced by strain in a region of the structure in proximity to the region of the circuit. An inductor is electrically coupled to one end of each circuit. A magnetic field response recorder wirelessly transmits the variable magnetic field to the inductor and senses the resonant frequency of the circuit so-excited by the variable magnetic field.

Author

Cracks; Detection; Cracking (Fracturing); Structural Strain; Position; Position (Location); Identifying

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*.

20070023695 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Complexity Computational Environment: Data Assimilation SERVOGrid

Donnellan, Andrea; Parker, Jay; Fox, Geoffrey; Pierce, Marlon; Rundle, John; McLeod, Dennis; June 22, 2004; 5 pp.; In English; NASA Earth Science Technology Conference, 26 June 2004, Palo Alto, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39968

We are using Web (Grid) service technology to demonstrate the assimilation of multiple distributed data sources (a typical data grid problem) into a major parallel high-performance computing earthquake forecasting code. Such a linkage of Geoinformatics with Geocomplexity demonstrates the value of the Solid Earth Research Virtual Observatory (SERVO) Grid concept, and advance Grid technology by building the first real-time large-scale data assimilation grid Here we develop the next steps for both the SERVO concept and the identified need for a Solid Earth problem-solving environment. We use a challenging motivating problem of importance to NASA namely integrating NASA space geodetic observations with numerical simulations of a changing earth.

Author

Assimilation; Earth Environment; Earthquakes; Web Services; Seismology; Predictions; Systems Engineering; Systems Integration

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*.

20070022802 Science Systems and Applications, Inc., USA, NASA Langley Research Center, Hampton, VA, USA

Validation of GOES-10 Satellite-derived Cloud and Radiative Properties for the MASRAD ARM Mobile Facility Deployment

Khaiyer, M. M.; Doelling, D. R.; Palikonda, R.; Mordeen, M. L.; Minnis, P.; March 26, 2007; 1 pp.; In English; 17th Annual ARM Science Team Meeting, 26-30 March 2007, Monterey, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

This poster presentation reviews the process used to validate the GOES-10 satellite derived cloud and radiative properties. The ARM Mobile Facility (AMF) deployment at Pt Reyes, CA as part of the Marine Stratus Radiation Aerosol and Drizzle

experiment (MASRAD), 14 March - 14 September 2005 provided an excellent chance to validate satellite cloud-property retrievals with the AMF's flexible suite of ground-based remote sensing instruments. For this comparison, NASA LaRC GOES10 satellite retrievals covering this region and period were re-processed using an updated version of the Visible Infrared Solar-Infrared Split-Window Technique (VISST), which uses data taken at 4 wavelengths (0.65, 3.9,11 and 12 m resolution), and computes broadband fluxes using improved CERES (Clouds and Earth's Radiant Energy System)-GOES-10 narrowband-to-broadband flux conversion coefficients. To validate MASRAD GOES-10 satellite-derived cloud property data, VISST-derived cloud amounts, heights, liquid water paths are compared with similar quantities derived from available ARM ground-based instrumentation and with CERES fluxes from Terra.
Derived from text
Cloud Physics; GOES 10; Remote Sensing; Satellite Observation; Proving

20070022806 NASA Langley Research Center, Hampton, VA, USA
Improvements to GOES Twilight Cloud Detection over the ARM SGP
Yost, c. R.; Trepte, Q.; Khaiyer, M. M.; Palikonda, R.; Nguyen, L.; March 26, 2007; 1 pp.; In English; 17th Annual ARM Science Team Meeting, 26-30 Mar. 2007, Monterey, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): WBS 188362.02.07; Copyright; Avail.: CASI: A01, Hardcopy

The current ARM satellite cloud products derived from Geostationary Operational Environmental Satellite (GOES) data provide continuous coverage of many cloud properties over the ARM Southern Great Plains domain. However, discontinuities occur during daylight near the terminator, a time period referred to here as twilight. This poster presentation will demonstrate the improvements in cloud detection provided by the improved cloud mask algorithm as well as validation of retrieved cloud properties using surface observations from the Atmospheric Radiation Measurement Southern Great Plains (ARM SGP) site.
Author
Cloud Physics; GOES Satellites; Twilight Glow

20070022809 Michigan State Univ., East Lansing, MI, USA
Introduction to Special Issue on Tropical Deforestation
Walker, Rorbert T.; International Regional Science Review; 2004; Volume 27, No. 3, pp. 243-246; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources
ONLINE: http://irx.sagepub.com/cgi/content/refs/27/3/243

This paper is serves as an introduction to a special issue on tropical deforestation.
CASI
Deforestation; Geophysics; Land Use; Tropical Regions

20070022816 Michigan State Univ., East Lansing, MI, USA
Theorizing Land Cover and Land Use Changes: The Case of Tropical Deforestation
Walker, Robert; International Regional Science Review; 2004; Volume 27, No. 3, pp. 247-270; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1177/0160017604266026

This article addresses land-cover and land-use dynamics from the perspective of regional science and economic geography. It first provides an account of the so-called spatially explicit model, which has emerged in recent years as a key empirical approach to the issue. The article uses this discussion as a springboard to evaluate the potential utility of von Thuenen to the discourse on land-cover and land-use change. After identifying shortcomings of current theoretical approaches to land use in mainly urban models, the article filters a discussion of deforestation through the lens of bid-rent and assesses its effectiveness in helping us comprehend the destruction of tropical forest in the Amazon basin. The article considers the adjustments that would have to be made to existing theory to make it more useful to the empirical issues.
Author
Amazon Region (South America); Deforestation; Land Use; Rain Forests

20070022817 Michigan State Univ., East Lansing, MI, USA
Mapping Process to Pattern in the Landscape Change of the Amazonian Frontier
Walker, Robert; Annals of the Association of American Geographers; 2003; Volume 93, Issue 2, pp. 376-398; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1111/1467-8306.9302008

Changes in land use and land cover are dynamic processes reflecting a sequence of decisions made by individual land

managers. In developing economies, these decisions may be embedded in the evolution of individual households, as is often the case in indigenous areas and agricultural frontiers. One goal of the present article is to address the land use and land-cover decisions of colonist farmers in the Amazon Basin as a function, in part, of household characteristics. Another goal is to generalize the issue of tropical deforestation into a broader discussion on forest dynamics. The extent of secondary forest in tropical areas has been well documented in South America and Africa. Agricultural-plot abandonment often occurs in tandem with primary forest clearance and as part of the same decision-making calculus. Consequently, tropical deforestation and forest succession are not independent processes in the landscape. This article presents a framework that integrates them into a model of forest dynamics at household level, and in so doing provides an account of the spatial pattern of deforestation that has been observed in the Amazon's colonization frontiers.
Author
Amazon Region (South America); Deforestation; Land Use; Decision Making; Land Management

20070022821 Michigan State Univ., East Lansing, MI, USA
Land Use and Land Cover Change in Forest Frontiers: The Role of Household Life Cycles
Walker, Robert; International Regional Science Review; 2002; Volume 25, No. 2, pp. 169-199; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1177/016001760202500202

Tropical deforestation remains a critical issue given its present rate and a widespread consensus regarding its implications for the global carbon cycle and biodiversity. Nowhere is the problem more pronounced than in the Amazon basin, home to the world's largest intact, tropical forest. This article addresses land cover change processes at household level in the Amazon basin, and to this end adapts a concept of domestic life cycle to the current institutional environment of tropical frontiers. In particular, it poses a risk minimization model that integrates demography with market-based factors such as transportation costs and accessibility. In essence, the article merges the theory of Chayanov with the household economy framework, in which markets exist for inputs (including labor), outputs, and capital. The risk model is specified and estimated, using survey data for 261 small producers along the Transamazon Highway in the eastern sector of the Brazilian Amazon.
Author
Amazon Region (South America); Deforestation; Demography; Land Use; Risk

20070022824 Hobart and William Smith Coll., Geneva, NY, USA
Fire in the Brazilian Amazon: A Spatially Explicit Model for Policy Impact Analysis
Arima, Eugenio Y.; Simmons, Cynthia S.; Walker, Robert T.; Cochrane, Mark A.; Journal of Regional Science; August 2007; Volume 47, Issue 3, pp. 541-567; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1111/j.1467-9787.2007.00519.x

This article implements a spatially explicit model to estimate the probability of forest and agricultural fires in the Brazilian Amazon. We innovate by using variables that reflect farmgate prices of beef and soy, and also provide a conceptual model of managed and unmanaged fires in order to simulate the impact of road paving, cattle exports, and conservation area designation on the occurrence of fire. Our analysis shows that fire is positively correlated with the price of beef and soy, and that the creation of new conservation units may offset the negative environmental impacts caused by the increasing number of fire events associated with early stages of frontier development.
Author
Amazon Region (South America); Forest Fires; Farmlands; Economic Impact

20070022825 Florida Univ., Gainesville, FL, USA
Roads Investments, Spatial Intensification and Deforestation in the Brazilian Amazon
Pfaff, Alexander; Robalino, Juan; Walker, Robert; Aldrich, Steven; Caldas, Marcellus; Reis, Eustaquio; Perz, Stephen; Bohrer, Claudio; Arima, Eugenio; Laurance, William; Kibry, Kathryn; Journal of Regional Science; February 2007; Volume 47, Issue 1, pp. 109-123; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1111/j.1467-9787.2007.00502.x

Understanding the impact of road investments on deforestation is part of a complete evaluation of the expansion of infrastructure for development. We find evidence of spatial spillovers from roads in the Brazilian Amazon: deforestation rises in the census tracts that lack roads but are in the same county as and within 100 km of a tract with a new paved or unpaved

road. At greater distances from the new roads the evidence is mixed, including negative coefficients of inconsistent significance between 100 and 300 km, and if anything, higher neighbor deforestation at distances over 300 km.
Author
Amazon Region (South America); Deforestation; Roads

20070022826 Michigan State Univ., East Lansing, MI, USA
Theorizing Land Cover and Land Use Change: The Peasant Economy of Colonization in the Amazon Basin
Caldas, Marcellus; Walker, Robert; Arima, Eugenio; Perz, Stephen; Aldrich, Stephen; Simmons, Cynthia; Annals of the Association of American Geographers; March 2007; Volume 97, No. 1, pp. 86-110; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1111/j.1467-8306.2007.00525.x

This paper addresses deforestation processes in the Amazon basin. It deploys a methodology combining remote sensing and survey-based fieldwork to examine, with regression analysis, the impact household structure and economic circumstances on deforestation decisions made by colonist farmers in the forest frontiers of Brazil. Unlike most previous regression-based studies, the methodology implemented analyzes behavior at the level of the individual property. The regressions correct for endogenous relationships between key variables, and spatial autocorrelation, as necessary. Variables used in the analysis are specified, in part, by a theoretical development integrating the Chayanovian concept of the peasant household with spatial considerations stemming from von Thuenen. The results from the empirical model indicate that demographic characteristics of households, as well as market factors, affect deforestation in the Amazon. Thus, statistical results from studies that do not include household-scale information may be subject to error. From a policy perspective, the results suggest that environmental policies in the Amazon based on market incentives to small farmers may not be as effective as hoped, given the importance of household factors in catalyzing the demand for land. The paper concludes by noting that household decisions regarding land use and deforestation are not independent of broader social circumstances, and that a full understanding of Amazonian deforestation will require insight into why poor families find it necessary to settle the frontier in the first place.
Author
Amazon Region (South America); Deforestation; Land Use; Remote Sensing; Economic Factors

20070022827 Florida Univ., Gainesville, FL, USA
Beyond Population and Environment: Household Life Cycle Demography and Land Use Allocation among Small Farm Colonists in the Amazon
Perz, Stephen G.; Walker, Robert T.; Caldas, Marcellus M.; Human Ecology; December 2006; Volume 24, No. 6, pp. 829-849; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1007/s10745-006-9039-8

Most research featuring demographic factors in environmental change has focused on processes operating at the level of national or global populations. This paper focuses on household-level demographic life cycles among colonists in the Amazon, and evaluates the impacts on land use allocation. The analysis goes beyond prior research by including a broader suite of demographic variables, and by simultaneously assessing their impacts on multiple land uses with different economic and ecological implications. We estimate a system of structural equations that accounts for endogeneity among land uses, and the findings indicate stronger demographic effects than previous work. These findings bear implications for modeling land use, and the place of demography in environmental research.
Author
Amazon Region (South America); Demography; Land Use; Environment Effects; Econometrics

20070022828 Michigan State Univ., East Lansing, MI, USA
Land-Cover and Land-Use Change in the Brazilian Amazon: Smallholders, Ranchers and Frontier Stratification
Aldrich, Stephen P.; Walker, Robert T.; Arima, Eugenio Y.; Caldas, Marcellus M.; Browder, John O.; Perz, Stephen; Economic Geography; July 2006; Volume 82, No. 3, pp. 265-288; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://www.clarku.edu/econgeography/issue.cfm?issue=2006_03.html#Art_2

Tropical deforestation is a significant driver of global environmental change, given its impacts on the carbon cycle and biodiversity. Loss of the Amazon forest, the focus of this article, is of particular concern because of the size and the rapid rate at which the forest is being converted to agricultural use. In this article, we identify what has been the most important driver

of deforestation in a specific colonization frontier in the Brazilian Amazon. To this end, we consider (1) the land-use dynamics of smallholder households, (2) the formation of pasture by large-scale ranchers, and (3) structural processes of land aggregation by ranchers. Much has been written about relations between smallholders and ranchers in the Brazilian Amazon, particularly those involving conflict over land, and this article explicates the implications of such social processes for land cover. Toward this end, we draw on panel data (1996-2002) and satellite imagery (1986-1999) to show the deforestation that is attributable to small- and largeholders, and the deforestation that is attributable to aggregations of property arising from a process that we refer to as frontier stratification. Evidently, most of the recent deforestation in the study area has resulted from the household processes of smallholders, not from conversions to pasture pursuant to the appropriations of smallholders' property by well-capitalized ranchers or speculators.
Author
Amazon Region (South America); Brazil; Land Use; Stratification; Deforestation

20070022829 Michigan State Univ., East Lansing, MI, USA
Loggers and Forest Fragmentation: Behavioral Models of Road Building in the Amazon Basin
Arima, Eugenio Y.; Walker, Robert T.; Perz, Stephen G.; Caldas, Marcellus; Annals of the Association of American Geographers; [2005]; Volume 94, Issue 3, pp. 525-541; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: 10.1111/j.1467-8306.2005.00473.x

Although a large literature now exists on the drivers of tropical deforestation, less is known about its spatial manifestation. This is a critical shortcoming in our knowledge base since the spatial pattern of land-cover change and forest fragmentation, in particular, strongly affect biodiversity. The purpose of this article is to consider emergent patterns of road networks, the initial proximate cause of fragmentation in tropical forest frontiers. Specifically, we address the road-building processes of loggers who are very active in the Amazon landscape. To this end, we develop an explanation of road expansions, using a positive approach combining a theoretical model of economic behavior with geographic information systems (GIs) software in order to mimic the spatial decisions of road builders. We simulate two types of road extensions commonly found in the Amazon basin in a region: showing the fishbone pattern of fragmentation. Although our simulation results are only partially successful, they call attention to the role of multiple agents in the landscape, the importance of legal and institutional constraints on economic behavior, and the power of GIs as a research tool.
Author
Amazon Region (South America); Deforestation; Forests; Fragmentation; Mathematical Models; Roads; Topography

20070022830 Florida Univ., Gainesville, FL, USA
Unofficial Road Building in the Brazilian Amazon: Dilemmas and Models for Road Governance
Perz, Stephen G.; Overdevest, Christine; Caldas, Marcellus M.; Walker, Robert T.; Arima, Eugenio Y.; Environmental Conservation; June 2007; Volume 34, Issue 2, pp. 112-121; In English
Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only
ONLINE: http://dx.doi.org/10.1017/S0376892907003827

Unofficial roads form dense networks in landscapes, generating a litany of negative ecological outcomes, but unofficial roads in frontier areas are also instrumental in local livelihoods and community development. This trade-off poses dilemmas for the governance of unofficial roads. Unofficial road building in frontier areas of the Brazilian Amazon illustrates the challenges of 'road governance.' Both state-based and community based governance models exhibit important liabilities for governing unofficial roads. Whereas state-based governance has experienced difficulties in adapting to specific local contexts and interacting effectively with local interest groups, community-based governance has a mixed record owing to social inequalities and conflicts among local interest groups. A state-community hybrid model may offer more effective governance of unofficial road building by combining the oversight capacity of the state with locally grounded community management via participatory decision-making.
Author
Amazon Region (South America); Brazil; Roads; Topography; Models; Ecology

20070022831 Florida Univ., Gainesville, FL, USA

Unofficial Road Building in the Amazon: Socioeconomic and Biophysical Explanations

Perz, Stephen G.; Caldas, Marcellus M.; Arima, Eugenio; Walker, Robert J.; Development and Change; May 2007; Volume 38, Issue 3, pp. 529-551; In English

Contract(s)/Grant(s): NCC5-694; Copyright; Avail.: Other Sources; Abstract Only

ONLINE: http://dx.doi.org/10.1111/j.1467-7660.2007.00422.x

Roads have manifold social and environmental impacts, including regional development, social conflicts and habitat fragmentation. 'Road ecology' has emerged as an approach to evaluate the various ecological and hydrological impacts of roads. This article aims to complement road ecology by examining the socio-spatial processes of road building itself. Focusing on the Brazilian Amazon, a heavily-studied context due to forest fragmentation by roads, the authors consider non-state social actors who build 'unofficial roads' for the purpose of gaining access to natural resources to support livelihoods and community development. They examine four case studies of roads with distinct histories in order to explain the socio-spatial processes behind road building in terms of profit maximization, land tenure claims, co-operative and conflictive political ecologies, and constraints as well as opportunities afforded by the biophysical environment. The study cases illustrate the need for a multi-pronged theoretical approach to understanding road building, and call for more attention to the role of non-state actors in unofficial road construction.

Author

Amazon Region (South America); Biophysics; Roads; Sociology; Economics; Ecology; Forests

20070023316 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Progress in Modeling Global Atmospheric CO2 Fluxes and Transport: Results from Simulations with Diurnal Fluxes

Collatz, G. James; Kawa, R.; April 24, 2007; 1 pp.; In English; 8th TransCom Workshop, 24-27 Apr. 2007, West Lafayette, IN, USA; No Copyright; Avail.: Other Sources; Abstract Only

Progress in better determining CO2 sources and sinks will almost certainly rely on utilization of more extensive and intensive CO2 and related observations including those from satellite remote sensing. Use of advanced data requires improved modeling and analysis capability. Under NASA Carbon Cycle Science support we seek to develop and integrate improved formulations for 1) atmospheric transport, 2) terrestrial uptake and release, 3) biomass and 4) fossil fuel burning, and 5) observational data analysis including inverse calculations. The transport modeling is based on meteorological data assimilation analysis from the Goddard Modeling and Assimilation Office. Use of assimilated met data enables model comparison to CO2 and other observations across a wide range of scales of variability. In this presentation we focus on the short end of the temporal variability spectrum: hourly to synoptic to seasonal. Using CO2 fluxes at varying temporal resolution from the SIB 2 and CASA biosphere models, we examine the model's ability to simulate CO2 variability in comparison to observations at different times, locations, and altitudes. We find that the model can resolve much of the variability in the observations, although there are limits imposed by vertical resolution of boundary layer processes. The influence of key process representations is inferred. The high degree of fidelity in these simulations leads us to anticipate incorporation of realtime, highly resolved observations into a multiscale carbon cycle analysis system that will begin to bridge the gap between top-down and bottom-up flux estimation, which is a primary focus of NACP.

Author

Atmospheric Composition; Diurnal Variations; Simulation; Remote Sensing; Atmospheric Models; Carbon Dioxide; Transport Theory

20070023365 NASA Dryden Flight Research Center, Edwards, CA, USA

NASA Global Hawk: A Unique Capability for the Pursuit of Earth Science

Naftel, J. Chris; June 25, 2007; 4 pp.; In English; 32nd International Symposium on Remote Sensing of Environment, 25-29 Jun. 2007, San Jose, Costa Rica; No Copyright; Avail.: CASI: A01, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023365

For more than 2 years, the NASA Dryden Flight Research Center has been preparing for the receipt of two Advanced Concept Technology Demonstration Global Hawk air vehicles from the USA Air Force. NASA Dryden intends to establish a Global Hawk Project Office, which will be responsible for developing the infrastructure required to operate this unmanned aerial system and establishing a trained maintenance and operations team. The first flight of a NASA Global Hawk air vehicle

is expected to occur in 2008. The NASA Global Hawk system can be used by a variety of customers, including U.S. Government agencies, civilian organizations, universities, and state governments. A combination of the vehicle s range, endurance, altitude, payload power, payload volume, and payload weight capabilities separates the Global Hawk unmanned aerial system from all other platforms available to the science community.
Author
Earth Sciences; Pilotless Aircraft; Air Defense; Remote Sensing; Autonomy

20070023395 NASA Ames Research Center, Moffett Field, CA, USA
Analysis of Leaf Area Index and Fraction of PAR Absorbed by Vegetation Products from the Terra MODIS Sensor: 2000-2005
Yang, Wenze; Huang, Dong; Tan, Bin; Stroeve, Julienne C.; Shabanov, Nikolay V.; Knyazikhin, Yuri; Nemani, Ramakrishna R.; Myneni, Ranga B.; IEEE Transactions on Geoscience and Remote Sensing; July 2006; Volume 44, No. 7, pp. 1829-1842; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNA04CC69C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/TGRS.2006.871214

The analysis of two years of Collection 3 and five years of Collection 4 Terra Moderate Resolution Imaging Spectroradiometer (MODIS) Leaf Area Index (LAI) and Fraction of Photosynthetically Active Radiation (FPAR) data sets is presented in this article with the goal of understanding product quality with respect to version (Collection 3 versus 4), algorithm (main versus backup), snow (snow-free versus snow on the ground), and cloud (cloud-free versus cloudy) conditions. Retrievals from the main radiative transfer algorithm increased from 55% in Collection 3 to 67% in Collection 4 due to algorithm refinements and improved inputs. Anomalously high LAI/FPAR values observed in Collection 3 product in some vegetation types were corrected in Collection 4. The problem of reflectance saturation and too few main algorithm retrievals in broadleaf forests persisted in Collection 4. The spurious seasonality in needleleaf LAI/FPAR fields was traced to fewer reliable input data and retrievals during the boreal winter period. About 97% of the snow covered pixels were processed by the backup Normalized Difference Vegetation Index-based algorithm. Similarly, a majority of retrievals under cloudy conditions were obtained from the backup algorithm. For these reasons, the users are advised to consult the quality flags accompanying the LAI and FPAR product.
Author
Leaf Area Index; MODIS (Radiometry); Photosynthetically Active Radiation; Terra Spacecraft; Vegetation

20070023398 NASA Ames Research Center, Moffett Field, CA, USA, Boston Univ., Boston, MA, USA
Assessment of the Broadleaf Crops Leaf Area Index Product from the Terra MODIS Instrument
Tan, Bin; Hu, Jiannan; Huang, Dong; Yang, Wenze; Zhang, Ping; Shabanov, Nikolay V.; Knyazikhin, Yuri; Nemani, Ramakrishna R.; Myneni, Ranga B.; Agricultural and Forest Meteorology; December 14, 2005; Volume 135, Issues 1-4, pp. 124-134; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNA04CC69C; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1016/j.agrformet.2005.10.008

The first significant processing of Terra MODIS data, called Collection 3, covered the period from November 2000 to December 2002. The Collection 3 leaf area index (LAI) and fraction vegetation absorbed photosynthetically active radiation (FPAR) products for broadleaf crops exhibited three anomalies (a) high LAI values during the peak growing season, (b) differences in LAI seasonality between the radiative transfer-based main algorithm and the vegetation index based back-up algorithm, and (c) too few retrievals from the main algorithm during the summer period when the crops are at full flush. The cause of these anomalies is a mismatch between reflectances modeled by the algorithm and MODIS measurements. Therefore, the Look-Up-Tables accompanying the algorithm were revised and implemented in Collection 4 processing. The main algorithm with the revised Look-Up-Tables generated retrievals for over 80% of the pixels with valid data. Retrievals from the back-up algorithm, although few, should be used with caution as they are generated from surface reflectances with high uncertainties.
Author
Farm Crops; Leaf Area Index; MODIS (Radiometry); Terra Spacecraft; Vegetation

20070023406 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Improving Assimilation of SeaWiFS Data by the Application of Bias Correction with a Local SEIK Filter
Nerger, Lars; Gregg, Watson W.; [2007]; 27 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Daily surface chlorophyll concentrations are estimated by assimilating chlorophyll data from the Sea-viewing Wide

Field-of-view Sensor (SeaWiFS) into the NASA Ocean Biogeochemical Model (NOBM). The assimilation is performed by the ensemble-based singular 'evolutive' interpolated Kalman (SEIK) filter, which is simplified here by the use of a static error covariance matrix. The filter operates with a localized filter analysis and is amended by an online bias correction scheme. The performance of the filter algorithm is assessed by comparison with independent in situ data over the 7-year period 1998 - 2004. The root-mean square (RMS) log error, the bias and the correlation coefficient of logarithmic fields are considered for the performance evaluation. The assimilation provides surface chlorophyll concentrations with about 3.3% lower error than SeaWiFS data. While the error is only slightly lower on a global scale, the assimilation shows significantly smaller errors than SeaWiFS data in many of the major oceanic basins. The assimilation estimate exhibits a very small bias of -0.025 log chlorophyll. The correlation with the in situ data is increased by the assimilation from 0.52 for the free-run model to 0.83, which is slightly larger than the correlation of 0.81 of SeaWiFS data.
Author
Chlorophylls; Error Analysis; Estimating; In Situ Measurement; Kalman Filters; Ocean Models; Sea-Viewing Wide Field-of-View Sensor; Oceanographic Parameters

20070023460 Boston Univ., Boston, MA, USA
The Importance of Measurement Errors for Deriving Accurate Reference Leaf Area Index Maps for Validation of Moderate-Resolution Satellite LAI Products
Huang, Dong; Yang, Wenze; Tan, Bin; Rautiainen, Miina; Zhang, Ping; Hu, Jiannan; Shabanov, Nikolay V.; Linder, Sune; Knyazikhin, Yuri; Myneni, Ranga B.; IEEE Transactions on Geoscience and Remote Sensing; July 2006; Volume 44, No. 7, pp. 1866-1871; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNA04CC69C; NAS5-96061; Copyright; Avail.: Other Sources
ONLINE: http://dx.doi.org/10.1109/TGRS.2006.876025

The validation of moderate-resolution satellite leaf area index (LAI) products such as those operationally generated from the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor data requires reference LAI maps developed from field LAI measurements and fine-resolution satellite data. Errors in field measurements and satellite data determine the accuracy of the reference LAI maps. This paper describes a method by which reference maps of known accuracy can be generated with knowledge of errors in fine-resolution satellite data. The method is demonstrated with data from an international field campaign in a boreal coniferous forest in northern Sweden, and Enhanced Thematic Mapper Plus images. The reference LAI map thus generated is used to assess modifications to the MODIS LAI/fPAR algorithm recently implemented to derive the next generation of the MODIS LAI/fPAR product for this important biome type.
Author
Errors; Leaf Area Index; MODIS (Radiometry); Accuracy; Mathematical Models; Biophysics

20070023631 Colorado State Univ., Fort Collins, CO, USA
Combined Radar and Radiometer Analysis of Precipitation Profiles for a Parametric Retrieval Algorithm
Masunaga, Hirohiko; Kummerow, Christian D.; Journal of Atmospheric and Oceanic Technology; July 2005; Volume 22, Issue 7, pp. 909-929; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG5-13694; Copyright; Avail.: Other Sources

A methodology to analyze precipitation profiles using the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI) and precipitation radar (PR) is proposed. Rainfall profiles are retrieved from PR measurements, defined as the best-fit solution selected from precalculated profiles by cloud-resolving models (CRMs), under explicitly defined assumptions of drop size distribution (DSD) and ice hydrometeor models. The PR path-integrated attenuation (PIA), where available, is further used to adjust DSD in a manner that is similar to the PR operational algorithm. Combined with the TMI-retrieved nonraining geophysical parameters, the three-dimensional structure of the geophysical parameters is obtained across the satellite-observed domains. Microwave brightness temperatures are then computed for a comparison with TMI observations to examine if the radar-retrieved rainfall is consistent in the radiometric measurement space. The inconsistency in microwave brightness temperatures is reduced by iterating the retrieval procedure with updated assumptions of the DSD and ice-density models. The proposed methodology is expected to refine the a priori rain profile database and error models for use by parametric passive microwave algorithms, aimed at the Global Precipitation Measurement (GPM) mission, as well as a future TRMM algorithms.
Author
Precipitation (Meteorology); Precipitation Measurement; Rain; Satellite Observation; Algorithms; Multisensor Fusion; Remote Sensing

45
ENVIRONMENT POLLUTION

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

20070023463 Maryland Univ. Baltimore County, Baltimore, MD, USA, NASA Goddard Space Flight Center, Greenbelt, MD, USA

3D Aerosol-Cloud Radiative Interaction Observed in Collocated MODIS and ASTER Images of Cumulus Cloud Fields

Wen, Guoyong; Marshak, Alexander; Cahalan, Robert F.; Remer, Lorraine A.; Kleidman, Richard G.; [2007]; 41 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

3D aerosol-cloud interaction is examined by analyzing two images containing cumulus clouds in biomass burning regions in Brazil. The research consists of two parts. The first part focuses on identifying 3D cloud impacts on the reflectance of pixel selected for the MODIS aerosol retrieval based purely on observations. The second part of the research combines the observations with radiative transfer computations to identify key parameters in 3D aerosol-cloud interaction. We found that 3D cloud-induced enhancement depends on optical properties of nearby clouds as well as wavelength. The enhancement is too large to be ignored. Associated biased error in 1D aerosol optical thickness retrieval ranges from 50% to 140% depending on wavelength and optical properties of nearby clouds as well as aerosol optical thickness. We caution the community to be prudent when applying 1D approximations in computing solar radiation in dear regions adjacent to clouds or when using traditional retrieved aerosol optical thickness in aerosol indirect effect research.

Author

Aerosols; Biomass Burning; Cloud Cover; Cumulus Clouds; Combustion Products; Atmospheric Effects; Condensation Nuclei; Man Environment Interactions; Climate Change; Reflectance

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*.

20070022883 NASA Goddard Space Flight Center, Greenbelt, MD, USA

MeV Ion Anisotropies in the Vicinity of Interplanetary Shocks

Richardson, I. G.; Cane, H. V.; von Rosenvinge, T. T.; May 22, 2007; 1 pp.; In English; American Geophysical Union 2007 Joint Assembly, 22-25 May 2007, Acapulco, Mexico

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: Other Sources; Abstract Only

The anticipated signatures of interplanetary shock acceleration to be found in energetic ion anisotropies in the vicinity of interplanetary shocks include near-isotropic particle distributions consistent with of diffusive shock acceleration, ‘pancake’ distributions indicative of shock drift acceleration, and flow reversals, suggestive of a particle acceleration region passing by the observing spacecraft. In practice, while clear examples of these phenomena exist, more typically, particle anisotropies near interplanetary shocks show considerable variation in time and space, both in individual events and from event to event. We investigate the properties of MeV/n ions in the vicinity of a number of interplanetary shocks associated with the largest energetic particle events of solar cycle 23, and previous cycles, including their intensity-time profiles, anisotropies, and relationship with local solar wind structures, using observations from the IMP 8, ISEE-3, Helios 1 and 3 spacecraft. The aim is to help to understand the role of shocks in major solar energetic particle events.

Author

Anisotropy; Interplanetary Shock Waves; Ions; Solar Cycles

20070023320 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Interplanetary Coronal Mass Ejections During 1996 - 2007

Richardson, I. G.; Cane, H. V.; May 22, 2007; 1 pp.; In English; American Geophysical Union 2007 Joint Assembly, 22-25 May 2007, Acapulco, Mexico

Contract(s)/Grant(s): NNG06E090A; Copyright; Avail.: Other Sources; Abstract Only

Interplanetary coronal mass ejections, the interplanetary counterparts of coronal mass ejections at the Sun, are the major drivers of interplanetary shocks in the heliosphere, and are associated with modulations of the galactic cosmic ray intensity, both short term (Forbush decreases caused by the passage of the shock, post-shock sheath, and ICME), and possibly with longer term modulation. Using several in-situ signatures of ICMEs, including plasma temperature, and composition, magnetic

fields, and cosmic ray modulations, made by near-Earth spacecraft, we have compiled a 'comprehensive' list of ICMEs passing the Earth since 1996, encompassing solar cycle 23. We summarize the properties of these ICMEs, such as their occurrence rate, speeds and other parameters, the fraction of ICMEs that are classic magnetic clouds, and their association with solar energetic particle events, halo CMEs, interplanetary shocks, geomagnetic storms, shocks and cosmic ray decreases.
Author
Coronal Mass Ejection; Interplanetary Shock Waves; Geophysics; Sun

20070023324 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Airborne Validation of Spatial Properties Measured by the CALIPSO Lidar
McGill, Matthew J.; Vaughan, Mark A.; Trepte, Charles Reginald; Hart, William D.; Hlavka, Dennis L.; Winker, David M.; Keuhn, Ralph; [2007]; 23 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The primary payload onboard the Cloud-Aerosol Lidar Infrared Pathfinder Satellite Observations (CALIPSO) satellite is a dual-wavelength backscatter lidar designed to provide vertical profiling of clouds and aerosols. Launched in April 2006, the first data from this new satellite was obtained in June 2006. As with any new satellite measurement capability, an immediate post-launch requirement is to verify that the data being acquired is correct lest scientific conclusions begin to be drawn based on flawed data. A standard approach to verifying satellite data is to take a similar, or validation, instrument and fly it onboard a research aircraft. Using an aircraft allows the validation instrument to get directly under the satellite so that both the satellite instrument and the aircraft instrument are sensing the same region of the atmosphere. Although there are almost always some differences in the sampling capabilities of the two instruments, it is nevertheless possible to directly compare the measurements. To validate the measurements from the CALIPSO lidar, a similar instrument, the Cloud Physics Lidar, was flown onboard the NASA high-altitude ER-2 aircraft during July- August 2006. This paper presents results to demonstrate that the CALIPSO lidar is properly calibrated and the CALIPSO Level 1 data products are correct. The importance of the results is to demonstrate to the research community that CALIPSO Level 1 data can be confidently used for scientific research.
Author
Aerosols; CALIPSO (Pathfinder Satellite); Optical Radar; Satellite Observation; Cloud Physics; Remote Sensing; Satellite Instruments; Airborne Radar; Spatial Distribution

20070023500 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Surface Ruptures and Building Damage of the 2003 Bam, Iran, Earthquake Mapped by Satellite Synthetic Aperture Radar Interferometric Correlation
Fielding, Eric J.; Talebian, M.; Rosen, P. A.; Nazari, H.; Jackson, J. A.; Ghorashi, M.; Walker, R.; Journal of Geophysical Research; March 4, 2005; ISSN 0148-0227; Volume 110; 15 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40041; http://dx.doi.org/10.1029/2004JB003299

We use the interferometric correlation from Envisat synthetic aperture radar (SAR) images to map the details of the surface ruptures related to the 26 December 2003 earthquake that devastated Bam, Iran. The main strike-slip fault rupture south of the city of Bam has a series of four segments with left steps shown by a narrow line of low correlation in the coseismic interferogram. This also has a clear expression in the field because of the net extension across the fault. Just south of the city limits, the surface strain becomes distributed over a width of about 500 m, probably because of a thicker layer of soft sedimentary material.
Author
Interferometry; Synthetic Aperture Radar; Correlation; Rupturing; Iran; Earth Surface; Thematic Mapping; Earthquake Damage

20070023688 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
The QuakeSim Project: Numerical Simulations for Active Tectonic Processes
Donnellan, Andrea; Parker, Jay; Lyzenga, Greg; Granat, Robert; Fox, Geoffrey; Pierce, Marlon; Rundle, John; McLeod, Dennis; Grant, Lisa; Tullis, Terry; June 22, 2004; 5 pp.; In English; NASA Earth Science Technology Conference, 26 Jun. 2004, Palo Alto, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40002

In order to develop a solid earth science framework for understanding and studying of active tectonic and earthquake processes, this task develops simulation and analysis tools to study the physics of earthquakes using state-of-the art modeling,

data manipulation, and pattern recognition technologies. We develop clearly defined accessible data formats and code protocols as inputs to the simulations. these are adapted to high-performance computers because the solid earth system is extremely complex and nonlinear resulting in computationally intensive problems with millions of unknowns. With these tools it will be possible to construct the more complex models and simulations necessary to develop hazard assessment systems critical for reducing future losses from major earthquakes.
Author
Earth Sciences; Earthquakes; Tectonics; Direct Numerical Simulation; Prototypes

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20070022846 NASA Marshall Space Flight Center, Huntsville, AL, USA
Statistical Aspects of the North Atlantic Basin Tropical Cyclones: Trends, Natural Variability, and Global Warming
Wilson, Robert M.; May 2007; 64 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TP-2007-214905; M-1185; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070022846

Statistical aspects of the North Atlantic basin tropical cyclones for the interval 1945- 2005 are examined, including the variation of the yearly frequency of occurrence for various subgroups of storms (all tropical cyclones, hurricanes, major hurricanes, U.S. landfalling hurricanes, and category 4/5 hurricanes); the yearly variation of the mean latitude and longitude (genesis location) of all tropical cyclones and hurricanes; and the yearly variation of the mean peak wind speeds, lowest pressures, and durations for all tropical cyclones, hurricanes, and major hurricanes. Also examined is the relationship between inferred trends found in the North Atlantic basin tropical cyclonic activity and natural variability and global warming, the latter described using surface air temperatures from the Armagh Observatory Armagh, Northern Ireland. Lastly, a simple statistical technique is employed to ascertain the expected level of North Atlantic basin tropical cyclonic activity for the upcoming 2007 season.
Author
Cyclones; Global Warming; Tropical Storms; River Basins; Atlantic Ocean; Variability

20070022884 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Midweek Increase in U.S. Summer Rain and Storm Heights, Suggests Air Pollution Invigorates Rainstorms
Bell, Thomas L.; Rosenfeld, Daniel; Kim, Kyu-Myong; Yoo, Jung-Moon; Hahnenberger, Maura; January 2007; 42 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Tropical Rainfall Measuring Mission (TRMM) satellite data show a significant midweek increase in summertime rainfall over the southeast U.S., due to afternoon intensification. TRMM radar data show a significant midweek increase in rain area and in the heights reached by afternoon storms. Weekly variations in model-reanalysis wind patterns over the region and in rain-gauge data are consistent with the satellite data. A midweek decrease of rainfall over the nearby Atlantic is also seen. EPA measurements of particulate concentrations show a midweek peak over much of the U.S. These observations are consistent with the theory that anthropogenic air pollution suppresses cloud-drop coalescence and early rainout during the growth of thunderstorms over land, allowing more water to be carried above the 0 C isotherm, where freezing yields additional latent heat, invigorating the storms--most dramatically evidenced by the shift in the midweek distribution of afternoon-storm heights--and producing large ice hydrometeors. The enhanced convection induces regional convergence, uplifting and an overall increase of rainfall. Compensating downward air motion suppresses convection over the adjacent ocean areas. Pre-TRMM-era data suggest that the weekly cycle only became strong enough to be detectable beginning in the 1980's. Rain-gauge data also suggest that a weekly cycle may have been detectable in the 1940's, but with peak rainfall on Sunday or Monday, possibly explained by the difference in composition of aerosol pollution at that time. This 'weekend effect' may thus offer climate researchers an opportunity to study the regional climate-scale impact of aerosols on storm development and monsoon-like circulation.
Author
Air Pollution; Rainstorms; Summer; United States; Meteorology

20070023315 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Using Multi-scale Modeling Systems to Study the Precipitation Processes

Tao, Wei-Kuo; April 12, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Numerical cloud models, which are based the non-hydrostatic equations of motion, have been extensively applied to cloud-scale and mesoscale processes during the past four decades. Because cloud-scale dynamics are treated explicitly, uncertainties stemming from convection that have to be parameterized in (hydrostatic) large-scale models are obviated, or at least mitigated, in cloud models. Global models will use the non-hydrostatic framework when their horizontal resolution becomes about 10 km, the theoretical limit for the hydrostatic approximation. This juncture will be reached one to two decades from now. Recently, a multi-scale modeling system with unified physics was developed at NASA Goddard. It consists of (1) a cloud-resolving model (CRM), (2) a regional scale model, (3) a coupled CRM and global model, and (4) a land modeling system. The same microphysical processes, long and short wave radiative transfer processes and the explicit cloud-radiation, and cloudland surface interactive processes are applied in this multi-scale modeling system. In this talk, a review of developments and applications of the multi-scale modeling system will be presented. In particular, the results from using multi-scale modeling system to study the interactions between clouds, precipitation, and aerosols will be presented.
Author

Clouds (Meteorology); Scale Models; Precipitation (Meteorology); Mesoscale Phenomena

20070023570 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Recent Advances in Spaceborne Precipitation Radar Measurement Techniques and Technology

Im, Eastwood; Durden, Stephen L.; Tanelli, Simone; June 11, 2006; 7 pp.; In English; 7th International Symposium on Tropospheric Profiling : Needs and Technology (ISTP), 11-17 Jun. 2006, Boulder, CO, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/39957

NASA is currently developing advanced instrument concepts and technologies for future spaceborne atmospheric radars, with an over-arching objective of making such instruments more capable in supporting future science needs and more cost effective. Two such examples are the Second-Generation Precipitation Radar (PR-2) and the Nexrad-In-Space (NIS). PR-2 is a 14/35-GHz dual-frequency rain radar with a deployable 5-meter, wide-swath scanned membrane antenna, a dual-polarized/ dual-frequency receiver, and a realtime digital signal processor. It is intended for Low Earth Orbit (LEO) operations to provide greatly enhanced rainfall profile retrieval accuracy while consuming only a fraction of the mass of the current TRMM Precipitation Radar (PR). NIS is designed to be a 35-GHz Geostationary Earth Orbiting (GEO) radar for providing hourly monitoring of the life cycle of hurricanes and tropical storms. It uses a 35-m, spherical, lightweight membrane antenna and Doppler processing to acquire 3-dimensional information on the intensity and vertical motion of hurricane rainfall.
Author

Precipitation (Meteorology); Radar Measurement; Technology Utilization; Flight Instruments; Multispectral Radar; Antenna Design

20070023592 NASA Langley Research Center, Hampton, VA, USA

In-Service Evaluation of the Turbulence Auto-PIREP System and Enhanced Turbulence Radar Technologies

Prince, Jason B.; Buck, Bill K.; Robinson, Paul A.; Ryan, Tim; July 2007; 95 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL06AA03B

Report No.(s): NASA/CR-2007-214887; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023592

From August 2003 to December 2006, In-Service Evaluations (ISE) of the Turbulence Auto-PIREP System (TAPS) and Enhanced Turbulence (E-Turb) Radar, technologies developed in NASA's Turbulence Prediction and Warning System (TPAWS) element of its Aviation Safety and Security Program (AvSSP), were conducted. NASA and AeroTech Research established an industry team comprising AeroTech, Delta Air Lines, Rockwell Collins, and ARINC to conduct the ISEs. The technologies were installed on Delta aircraft and their effectiveness was evaluated in day-to-day operations. This report documents the establishment and conduct of the ISEs and presents results and feedback from various users.
Author

Turbulence; Meteorological Radar; Civil Aviation; Technology Utilization; Aircraft Pilots; Automatic Control; Maintenance; Transport Aircraft

20070023636 NASA Langley Research Center, Hampton, VA, USA

The Continuous Intercomparison of Radiation Codes (CIRC): Phase I Cases

Oreopoulos, Lazaros; Mlawer, Eli; Delamere, Jennifer; Shippert, Timothy; Turner, David D.; Miller, Mark A.; Minnis, Patrick; Clough, Shepard; Barker, Howard; Ellingson, Robert; March 26, 2007; 1 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 188362.02.07.; Copyright; Avail.: CASI: A01, Hardcopy

CIRC aspires to be the successor to ICRCCM (Intercomparison of Radiation Codes in Climate Models). It is envisioned as an evolving and regularly updated reference source for GCM-type radiative transfer (RT) code evaluation with the principle goal to contribute in the improvement of RT parameterizations. CIRC is jointly endorsed by DOE's Atmospheric Radiation Measurement (ARM) program and the GEWEX Radiation Panel (GRP). CIRC's goal is to provide test cases for which GCM RT algorithms should be performing at their best, i.e, well characterized clear-sky and homogeneous, overcast cloudy cases. What distinguishes CIRC from previous intercomparisons is that its pool of cases is based on observed datasets. The bulk of atmospheric and surface input as well as radiative fluxes come from ARM observations as documented in the Broadband Heating Rate Profile (BBHRP) product. BBHRP also provides reference calculations from AER's RRTM RT algorithms that can be used to select the most optimal set of cases and to provide a first-order estimate of our ability to achieve radiative flux closure given the limitations in our knowledge of the atmospheric state.

Derived from text

Algorithms; Radiative Transfer; Atmospheric General Circulation Models; Computer Programs; Radiation Measurement

20070023671 Colorado State Univ., Fort Collins, CO, USA

Toward a Global Map of Raindrop Size Distributions, Part 1, Rain-Type Classification and Its Implications for Validating Global Rainfall Products

L'Ecuyer, Tristan S.; Kummerow, Christian; Berg,Wesley; Journal of Hydrometeorology; October 2004; Volume 5, pp. 831-849; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAG5-13694; NAG5-13637; NAG5-11189; Copyright; Avail.: Other Sources

Variability in the global distribution of precipitation is recognized as a key element in assessing the impact of climate change for life on earth. The response of precipitation to climate forcings is, however, poorly understood because of discrepancies in the magnitude and sign of climatic trends in satellite-based rainfall estimates. Quantifying and ultimately removing these biases is critical for studying the response of the hydrologic cycle to climate change. In addition, estimates of random errors owing to variability in algorithm assumptions on local spatial and temporal scales are critical for establishing how strongly their products should be weighted in data assimilation or model validation applications and for assigning a level of confidence to climate trends diagnosed from the data. This paper explores the potential for refining assumed drop size distributions (DSDs) in global radar rainfall algorithms by establishing a link between satellite observables and information gleaned from regional validation experiments where polarimetric radar, Doppler radar, and disdrometer measurements can be used to infer raindrop size distributions. By virtue of the limited information available in the satellite retrieval framework, the current method deviates from approaches adopted in the ground-based radar community that attempt to relate microphysical processes and resultant DSDs to local meteorological conditions. Instead, the technique exploits the fact that different microphysical pathways for rainfall production are likely to lead to differences in both the DSD of the resulting raindrops and the three-dimensional structure of associated radar reflectivity profiles. Objective rain-type classification based on the complete three-dimensional structure of observed reflectivity profiles is found to partially mitigate random and systematic errors in DSDs implied by differential reflectivity measurements. In particular, it is shown that vertical and horizontal reflectivity structure obtained from spaceborne radar can be used to reproduce significant differences in Z(sub dr) between the easterly and westerly climate regimes observed in the Tropical Rainfall Measuring Mission Large-scale Biosphere-Atmosphere (TRMM-LBA) field experiment as well as the even larger differences between Amazonian rainfall and that observed in eastern Colorado. As such, the technique offers a potential methodology for placing locally observed DSD information into a global framework.

Author

Climatology; Drop Size; Precipitation (Meteorology); Rain; Raindrops; Size Distribution; Precipitation Particle Measurement; Precipitation Measurement

48
OCEANOGRAPHY

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

20070022880 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Promoting Lifelong Ocean Education-2 Years Later: Charting Progress and Adjusting Course
Meeson, Blanche; McDougall, Carrie; Simms, Eric; Walker, Sharon; Keener-Chavis, Paula; July 16, 2006; 1 pp.; In English; National Marine Eudcator Associztion (NMEA) Conference, 16-20 July 2006; Copyright; Avail.: Other Sources; Abstract Only

Session participants will identify how their regional or national efforts contribute to the overall progress on the education recommendations in the USCOP and the work that remains. They will examine progress, identify shortcomings, and suggest course corrections in current and planned efforts. This session will build upon VADM Lautenbacher's keynote presentation on ocean education. Examples, such as ocean literacy efforts at regional and national levels, will be highlighted to stimulate discussion on progress, challenges, and solutions. Working in small groups, participants will consider actions that they, their organizations, or NMEA might take to further the ocean and aquatic education agenda.
Author
Education; Oceans; Regions

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*.

20070022836 NASA Johnson Space Center, Houston, TX, USA
Construction and Use of Resting 12-Lead High Fidelity ECG 'SuperScores' in Screening for Heart Disease
Schlegel, T. T.; Arenare, B.; Greco, E. C.; DePalma, J. L.; Starc, V.; Nunez, T.; Medina, R.; Jugo, D.; Rahman, M.A.; Delgado, R.; September 30, 2007; 1 pp.; In English; Computers in Cardiology 2007, 30 September - 3 October 2007, Durham, NC, USA; Copyright; Avail.: Other Sources; Abstract Only

We investigated the accuracy of several conventional and advanced resting ECG parameters for identifying obstructive coronary artery disease (CAD) and cardiomyopathy (CM). Advanced high-fidelity 12-lead ECG tests (approx. 5-min supine) were first performed on a 'training set' of 99 individuals: 33 with ischemic or dilated CM and low ejection fraction (EF less than 40%); 33 with catheterization-proven obstructive CAD but normal EF; and 33 age-/gender-matched healthy controls. Multiple conventional and advanced ECG parameters were studied for their individual and combined retrospective accuracies in detecting underlying disease, the advanced parameters falling within the following categories: 1) Signal averaged ECG, including 12-lead high frequency QRS (150-250 Hz) plus multiple filtered and unfiltered parameters from the derived Frank leads; 2) 12-lead P, QRS and T-wave morphology via singular value decomposition (SVD) plus signal averaging; 3) Multichannel (12-lead, derived Frank lead, SVD lead) beat-to-beat QT interval variability; 4) Spatial ventricular gradient (and gradient component) variability; and 5) Heart rate variability. Several multiparameter ECG SuperScores were derivable, using stepwise and then generalized additive logistic modeling, that each had 100% retrospective accuracy in detecting underlying CM or CAD. The performance of these same SuperScores was then prospectively evaluated using a test set of another 120 individuals (40 new individuals in each of the CM, CAD and control groups, respectively). All 12-lead ECG SuperScores retrospectively generated for CM continued to perform well in prospectively identifying CM (i.e., areas under the ROC curve greater than 0.95), with one such score (containing just 4 components) maintaining 100% prospective accuracy. SuperScores retrospectively generated for CAD performed somewhat less accurately, with prospective areas under the ROC curve typically in the 0.90-0.95 range. We conclude that resting 12-lead high-fidelity ECG employing and combining the results of several advanced ECG software techniques shows great promise as a rapid and inexpensive tool for screening of heart disease.
Author
Coronary Artery Disease; Electrocardiography; Heart Diseases; Detection; Bioinstrumentation

20070022849 Nanobac Life Sciences, Houston, TX, USA

Association between Randall's Plaque and Calcifying Nanoparticles

Ciftcioglu, Neva; Vejdani, Kaveh; Lee, Olivia; Mathew, Grace; Aho, Katja M.; Kajander, Olavi; McKay, David S.; Jones, Jeff A.; Hayat, Matthew; Stoller, Marshall L.; [2007]; 33 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Randall's plaques, first described by Alexander Randall in the 1930s, are small subepithelial calcifications in the renal papillae (RP) that also extend deeply into the renal medulla. Despite the strong correlation between the presence of these plaques and the formation of renal stones, the precise origin and pathogenesis of Randall s plaque formation remain elusive. The discovery of calcifying nanoparticles (CNP) and their detection in many calcifying processes of human tissues has raised hypotheses about their possible involvement in renal stone formation. We collected RP and blood samples from 17 human patients who had undergone laparoscopic nephrectomy due to neoplasia. Homogenized RP tissues and serum samples were cultured for CNP. Scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDS) analysis were performed on fixed RP samples. Immunohistochemical staining (IHS) was applied on the tissue samples using CNP-specific monoclonal antibody (mAb). Randall s plaques were visible on gross inspection in 11 out of 17 collected samples. Cultures of all serum samples and 13 tissue homogenates had CNP growth within 4 weeks. SEM revealed spherical apatite formations in 14 samples, with calcium and phosphate peaks detected by EDS analysis. IHS was positive in 9 out of 17 samples. A strong link was found between the presence of Randall s plaques and the detection of CNP, also referred to as nanobacteria. These results suggest new insights into the etiology of Randall's plaque formation, and will help us understand the pathogenesis of stone formation. Further studies on this topic may lead us to new approaches on early diagnosis and novel medical therapies of kidney stone formation.

Author

Calcification; Nanoparticles; Kidney Stones; Immunology; Histochemical Analysis; Calculi; Etiology

20070023419 NASA Johnson Space Center, Houston, TX, USA

Three-dimensional Model of Tissue and Heavy Ions Effects

Ponomarev, Artem L.; Sundaresan, Alamelu; Huff, Janice L.; Cucinotta, Francis A.; July 08, 2007; 1 pp.; In English; International Congress of Radiation Research, 8-12 July 2007, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

A three-dimensional tissue model was incorporated into a new Monte Carlo algorithm that simulates passage of heavy ions in a tissue box . The tissue box was given as a realistic model of tissue based on confocal microscopy images. The action of heavy ions on the cellular matrix for 2- or 3-dimensional cases was simulated. Cells were modeled as a cell culture monolayer in one example, where the data were taken directly from microscopy (2-d cell matrix), and as a multi-layer obtained from confocal microscopy (3-d case). Image segmentation was used to identify cells with precise areas/volumes in an irradiated cell culture monolayer, and slices of tissue with many cell layers. The cells were then inserted into the model box of the simulated physical space pixel by pixel. In the case of modeled tissues (3-d), the tissue box had periodic boundary conditions imposed, which extrapolates the technique to macroscopic volumes of tissue. For the real tissue (3-d), specific spatial patterns for cell apoptosis and necrosis are expected. The cell patterns were modeled based on action cross sections for apoptosis and necrosis estimated from current experimental data. A spatial correlation function indicating a higher spatial concentration of damaged cells from heavy ions relative to the low-LET radiation cell damage pattern is presented. The spatial correlation effects among necrotic cells can help studying microlesions in organs, and probable effects of directionality of heavy ion radiation on epithelium and endothelium.

Author

Heavy Ions; Three Dimensional Models; Tissues (Biology); Culture Techniques

20070023434 NASA Johnson Space Center, Houston, TX, USA

An Additional Potential Factor for Kidney Stone Formation during Space Flights: Calcifying Nanoparticles (Nanobacteria): A Case Report

Jones, Jeffrey A.; Ciftcioglu, Neva; Schmid, Joseph; Griffith, Donald; [2007]; 11 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Spaceflight-induced microgravity appears to be a risk factor for the development of urinary calculi due to skeletal calcium liberation and other undefined factors, resulting in stone disease in crewmembers during and after spaceflight. Calcifying nanoparticles, or nanobacteria, reproduce at a more rapid rate in simulated microgravity conditions and create external shells of calcium phosphate in the form of apatite. The questions arises whether calcifying nanoparticles are niduses for calculi and contribute to the development of clinical stone disease in humans, who possess environmental factors predisposing to the

development of urinary calculi and potentially impaired immunological defenses during spaceflight. A case of a urinary calculus passed from an astronaut post-flight with morphological characteristics of calcifying nanoparticles and staining positive for a calcifying nanoparticle unique antigen, is presented.
Author
Urology; Kidney Stones; Manned Space Flight; Calcification; Nanoparticles

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*.

20070022875 NASA Johnson Space Center, Houston, TX, USA, Wyle Labs., Inc., Houston, TX, USA
Space Environment Effects on Stability of Medications Flown on Space Shuttles and the International Space Station (ISS)
Daniels, Vernie; Du, Jianping; Crady, Camille; Satterfield, Rick; Putcha, Lakshmi; [2007]; 1 pp.; In English; 2007 ACCP Annual Meeting, 14-17 October 2007, Denver, CO, USA; Copyright; Avail.: Other Sources; Abstract Only

The purpose is to assess physical and chemical degradation of select pharmaceutical formulations from the Shuttle and ISS medical kits. Eleven pharmaceuticals dispensed as different dosage forms were selected based on their physical / chemical characteristics and susceptibility to environmental factors such as, temperature, humidity and light sensitivity. When available, ground-controls of the study medications with matching brand and lot numbers were used for comparison. Samples retrieved from flight were stored along with their matching controls in a temperature and humidity controlled environmental chamber. Temperature, humidity, and radiation data from the Shuttle and ISS were retrieved from onboard HOBO U12 Temp/RH Data Loggers, and from passive dosimeters. Physical and chemical analyses of the pharmaceuticals were conducted using validated USA Pharmacopeia (USP) methods. Results indicated degradation of 6 of the 11 formulations returned from space flights. Four formulations, Amoxicillin / Clavulanate, promethazine, sulfamethoxazole / trimethoprim, and ciprofloxacin tablets depicted discoloration after flight. Chemical content analyses using High or Ultra Performance Liquid Chromatography (HPLC / UPLC) methods revealed that dosage forms of Amoxicillin / Clavulanate, promethazine, sulfamethoxazole / trimethoprim, lidocaine, ciprofloxacin and mupirocin contained less than 95% of manufacturer s labeled claim of active drug compound. Shuttle and ISS environments affect stability and shelf life of certain mediations flown on these missions. Data analysis is in progress to examine the effect of specific space flight environmental factors on pharmaceutical stability. The degradation profiles generated from ground studies in analog environments will be useful in establishing predictive shelf-life profiles for medications intended for use during long-term space exploration missions.
Author
Aerospace Environments; International Space Station; Space Shuttles; Pharmacology; Storage Stability; Degradation

20070023333 Gulhane Military Medical Academy Hospital, Eskisehir, Turkey, Civil Aerospace Medical Inst., Oklahoma City, OK, USA
First-Generation H1 Antihistamines Found in Pilot Fatalities of Civil Aviation Accidents, 1990-2005
Sen, Ahmet; Akin, Ahmet; Craft, Kristi J.; Cranfield, Dennis V.; Chaturvedi, Arvind K.; May 2007; 17 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): AM-B-07-TOX-202
Report No.(s): DOT/FAA/AM-07/12; Copyright; Avail.: CASI: A03, Hardcopy

First-generation H1-receptor antagonists are popularly used for alleviating allergy and cold symptoms, but these antihistaminics cause drowsiness and sedation. Such side effects could impair performance and, thus, could be the cause or a factor in accidents. Therefore, the prevalence of these antagonists was evaluated in aviation accident pilot fatalities. During civil aircraft accident investigations, postmortem samples from pilots involved in fatal aviation accidents are submitted to the Civil Aerospace Medical Institute (CAMI) for toxicological analyses. These analytical findings are stored in a database. This CAMI Toxicology Database was examined for the presence of the first-generation antihistamines in pilot fatalities of civil aircrafi accidents that occurred during a 16-year (1990-2005) period. Of 5383 fatal aviation accidents from which CAMI received specimens, there were 338 accidents wherein pilot fatalities (cases) were found to contain the antihistaminics brompheniramine, chlorpheniramine, diphenhydramine, doxylamine, pheniramine, phenyltoloxamine, promethazine, and triprolidine. Of the 338 accidents, 304 were general aviation accidents; 175 of the 338 pilots held private pilot airman

certificates. Antihistamines were detected alone in 103 fatalities (1 antihistamine in 94 fatalities and 2 antihistamines in 9), while other drug(s) and/or ethanol were also present in an additional 235 fatalities. Thirty-five of the 338 fatalities had more than 1 antihistamine. The antihistamines were found in approximately 4 and 11% of the fatalities/accidents in 1990 and in 2004, respectively. Although blood was not available for the analyses in all 338 cases, the blood concentrations (ng/mL) were 5-200 (n = 8) for brompheniramine; 4-61 14 (n = 67) for chlorpheniramine; 9-3800 (n = 125) for diphenhydramine; 10- 1309 (n = 33) for doxylamine; and 4 (n = 1) for phenyltoloxamine. The use of antihistamine(s), with/without other drug(s) and/or ethanol, was determined by the National Transportation Safety Board to be the cause in 13 and a factor in 50 of the 338 accidents. The majority of the accidents were of the general aviation category. There was an overall increasing trend in the , . use of antihistamines by aviators during the 16-year span. Blood levels of the antihistaminics were in the sub-therapeutic to toxic range. Findings from this study will be useful in investigating future accidents involving antihistamines.
Author

Accident Investigation; Aerospace Medicine; Aircraft Accidents; Aircraft Pilots; Antihistaminics; Decongestants; Physiological Effects

20070023642 NASA Johnson Space Center, Houston, TX, USA

Evaluating Trauma Sonography for Operational Use in the Microgravity Environment

Kirkpatrick, Andrew W.; Jones, Jeffrey A.; Sargsyan, Ashot; Hamilton, Douglas; Melton, Shannon; Beck, George; Nicolaou, Savvas; Campbell, Mark; Dulchavsky, Scott; [2007]; 23 pp.; In English; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Sonography is the only medical imaging modality aboard the ISS, and is likely to remain the leading imaging modality in future human space flight programs. While trauma sonography (TS) has been well recognized for terrestrial trauma settings, the technique had to be evaluated for suitability in space flight prior to adopting it as an operational capability. The authors found the following four-phased evaluative approach applicable to this task: 1) identifying standard or novel terrestrial techniques for potential use in space medicine; 2) developing and testing these techniques with suggested modifications on the ground (1g) either in clinical settings or in animal models, as appropriate; 3) evaluating and refining the techniques in parabolic flight (0g); and 4) validating and implementing for clinical use in space. In Phase I of the TS project, expert opinion and literature review suggested TS to be a potential screening tool for trauma in space. In Phase II, animal models were developed and tested in ground studies, and clinical studies were carried out in collaborating trauma centers. In Phase III, animal models were flight-tested in the NASA KC-135 Reduced Gravity Laboratory. Preliminary results of the first three phases demonstrated potential clinical utility of TS in microgravity. Phase IV studies have begun to address crew training issues, on-board imaging protocols, and data transfer procedures necessary to offer the modified TS technique for space use.
Author

Aerospace Medicine; Microgravity; Sonograms; Manned Space Flight; International Space Station; Injuries

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*.

20070023305 NASA Johnson Space Center, Houston, TX, USA

Human Challenges in Exploration Missions

Lloyd, Charles W.; June 9, 2007; 26 pp.; In English; 21st Century Explorers Scotland, 9-24 Jun. 2007, Scotland, UK; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023305

This viewgraph presents an overview using pictures some of the history of human exploration of the new frontiers of Earth and then examines some of the challenges to human exploration of space. Particular attention is given to the environmental factors and to the social and human factors that effect humans in space environments.
CASI

Aerospace Environments; Space Exploration; Spacecrews; Space Psychology; Space Habitats; Bioastronautics

20070023306 NASA Johnson Space Center, Houston, TX, USA
Preliminary Assessment of Artificial Gravity Impacts to Deep-Space Vehicle Design
Jooslen, B. Kent; February 2007; 112 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 604746.04.01
Report No.(s): JSC-63743; No Copyright; Avail.: CASI: A06, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023306

Even after more than thirty years of scientific investigation, serious concerns regarding human physiological effects of long-duration microgravity exposure remain. These include loss of bone mineral density, skeletal muscle atrophy, and orthostatic hypertension, among others. In particular, 'Safe Passage: Astronaut Care for Exploration Missions,' states 'loss of bone density, which apparently occurs at a rate of 1% per month in microgravity, is relatively manageable on the short-duration missions of the space shuttle, but it becomes problematic on the ISS [International Space Station]. ...If this loss is not mitigated, interplanetary missions will be impossible.' While extensive investigations into potential countermeasures are planned on the ISS, the delay in attaining full crew complement and onboard facilities, and the potential for extending crews tours of duty threaten the timely (< 20 years!) accumulation of sufficient data for countermeasures formulation. Indeed, there is no guarantee that even with the data, a practical or sufficiently robust set of countermeasures will be forthcoming. Providing an artificial gravity (AG) environment by crew centrifugation aboard deep-space human exploration vehicles, long a staple technique of science fiction, has received surprisingly limited engineering assessment. This is most likely due to a number of factors: the lack of definitive design requirements, especially acceptable artificial gravity levels and rotation rates, the perception of high vehicle mass and performance penalties, the incompatibility of resulting vehicle configurations with space propulsion options (i.e., aerocapture), the perception of complications associated with de-spun components such as antennae and photovoltaic arrays, and the expectation of effective crew micro-gravity countermeasures. These perception and concerns may have been overstated, or may be acceptable alternatives to countermeasures of limited efficacy. This study was undertaken as an initial step to try to understand the implications of and potential solutions to incorporating artificial gravity in the design of human deep-space exploration vehicles. Of prime interest will be the mass penalties incurred by incorporating AG, along with any mission performance degradation.
Derived from text
Artificial Gravity; Bone Mineral Content; Centrifuging; Countermeasures; Musculoskeletal System; Physiological Effects; Gravitational Physiology

20070023641 NASA Langley Research Center, Hampton, VA, USA
Usability Study of Two Collocated Prototype System Displays
Trujillo, Anna C.; July 2007; 33 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA/TM-2007-214884; L-19326; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023641

Currently, most of the displays in control rooms can be categorized as status screens, alerts/procedures screens (or paper), or control screens (where the state of a component is changed by the operator). The primary focus of this line of research is to determine which pieces of information (status, alerts/procedures, and control) should be collocated. Two collocated displays were tested for ease of understanding in an automated desktop survey. This usability study was conducted as a prelude to a larger human-in-the-loop experiment in order to verify that the 2 new collocated displays were easy to learn and usable. The results indicate that while the DC display was preferred and yielded better performance than the MDO display, both collocated displays can be easily learned and used.
Author
Display Devices; Prototypes; Collocation; Human Factors Engineering; Control Systems Design

20070023686 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Portable Universal Hazardous Gas Detector
Houseman, John; Sinha, M. P.; Shapiro, A. A.; Young, Rebecca; Arkin, C. R.; Kibelka, Gottfried; July 28, 2004; 11 pp.; In English; JANNAF 32nd Propellant Development and Charachterization (PDCS), 28 Jul. 2004, Seattle, WA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39984

Experimental work on the Miniature Mass Spectrometer (MMS) at JPL has resulted in a 'table top' configuration with a CCD detector that has demonstrated a detection limit of 50 parts per billion. The CCD detector operates at ambient temperature. Intelligent Ion, Inc., a commercial instrument developer, has taken out a license on the JPL technology and has built a prototype using a Faraday Cup Array detector as a placeholder detector. The prototype instrument was tested at

Kennedy Space Center and demonstrated detection limits in the parts per million range. The test results are presented as well as detailed photographs of the prototype instrument. A presentation of the MMS was made to an expert review panel for 'On-Board Environmental Monitoring Systems for the International Space Station (ISS).' The scores obtained by the MMS system are presented. The prototype instrument will be retro fitted with a CCD array detector in August 2004 and will again be tested at KSC. The instrument is expected to show a detection level for hydrazines of 10 ppb and a detection level for solvents below 10 ppb.The expectations are based on raw data from the first batch of CCD's that was tested.
Author
Gas Detectors; Mass Spectrometers; Miniaturization; Aerospace Engineering; Life Support Systems; Spacecraft Environments

55
EXOBIOLOGY

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

20070023693 California Inst. of Tech., Pasadena, CA, USA, Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Roadmap for NASA's Search for Other Earths
Beichman, Charles; Traub, Wesley A.; Devirian, Michael; Burrows, Adam; July 31, 2005; 21 pp.; In English; SPIE 50th Annual Conference, 31 July - 4 August 2005, San Diego, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40020

This viewgraph document describes NASA's plan for searching for other planets capable of supporting life. As part of the Vision for Space Exploration, the President requested that NASA pursue the use of advanced telescope searches for Earth-like planets and habitable environments around other stars. Several science questions are asked in the presentation and the answers to some of the questions that NASA has are shown. Plans for future telescopes are reviewed. Three missions, SIM, TPF-C and TPF-I, that are planned to examine possible extra-solar planets, how the information they will give will assist us in further understanding the process of planetary formation, and the possibility that any planet discovered is capable of life is explained.
CASI
Extrasolar Planets; Planetary Evolution; Astronomical Observatories; Planet Detection; Planetary Systems; Exobiology; Extraterrestrial Life; Life Detectors

61
COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20070023370 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Developing Fault Models for Space Mission Software
Nikora, Allen P.; Munson, John C.; July 14, 2003; 25 pp.; In English; Space Mission Challenges for Information Technology, 14 Jul. 2003, Pasadena, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39961

A viewgraph presentation on the development of fault models for space mission software is shown. The topics include: 1) Goal: Improve Understanding of Technology Fault Generation Process; 2) Required Measurement; 3) Measuring Structural Evolution; 4) Module Attributes; 5) Principal Components of Raw Metrics; 6) The Measurement Process; 7) View of Structural Evolution at the System and Module Level; 8) Identifying and Counting Faults; 9) Fault Enumeration; 10) Modeling Fault Content; 11) Modeling Results; 12) Current and Future Work; and 13) Discussion and Conclusions.
CASI
Mathematical Models; Space Missions; Fault Tolerance; Computer Systems Programs

20070023647 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
A Duality Between Forward and Adjoint MPI Communication Routines
Cheng, Benny N.; June 6, 2006; In English; SGI Users Group Meeting, 6-9 Jun. 2006, Las Vegas, NV, USA; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40106

In this article, we explore a natural duality that exist between MPI communication routines in parallel programs, and show the ease of its adjoint implementation via pointers.
Author
Ocean Models; Parallel Programming; Duality Theorem; Adjoints

20070023650 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA, Texas Univ., Dallas, TX, USA
Deductive Glue Code Synthesis for Embedded Software Systems Based on Code Patterns
Liu, Jian; Fu, Jicheng; Zhang, Yansheng; Bastani, Farokh; Yen, I-Ling; Tai, Ann; Chau, Savio N.; June 14, 2006; 8 pp.; In English; ACM Sig Plan/Sig Bed Conference on Languages, Compilers, and Tools for Embedded System, 14 Jun. 2006, Ottawa, Canada; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40116

Automated code synthesis is a constructive process that can be used to generate programs from specifications. It can, thus, greatly reduce the software development cost and time. The use of formal code synthesis approach for software generation further increases the dependability of the system. Though code synthesis has many potential benefits, the synthesis techniques are still limited. Meanwhile, components are widely used in embedded system development. Applying code synthesis to component based software development (CBSD) process can greatly enhance the capability of code synthesis while reducing the component composition efforts. In this paper, we discuss the issues and techniques for applying deductive code synthesis techniques to CBSD. For deductive synthesis in CBSD, a rule base is the key for inferring appropriate component composition. We use the code patterns to guide the development of rules. Code patterns have been proposed to capture the typical usages of the components. Several general composition operations have been identified to facilitate systematic composition. We present the technique for rule development and automated generation of new patterns from existing code patterns. A case study of using this method in building a real-time control system is also presented.
Author
Computer Systems Design; Software Engineering; Automatic Control; Computer Components; Network Synthesis; Deduction; Embedded Computer Systems; Computer Programs

62
COMPUTER SYSTEMS

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

20070023420 NASA Dryden Flight Research Center, Edwards, CA, USA
Compression of a Data Stream by Selection among a Set of Compression Tools
Arlid, Bertelrud, Inventor; Russell, Franz, Inventor; February 20, 2007; 12 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 26 Mar. 2002; US-Patent-7,180,943; US-Patent-Appl-SN-113637; NASA-Case-DRC-001-049; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023420

A stream of raw data is compressed prior to transmissio in a communication channel by a system which includes modules for choosing a current segment of the raw data stream for processing and defining a set of operators for representing data segments by a mathematical operation and parameters thereof. The system performs a competitive evaluation of different tools comprising different combinations of one or more of the operators and the parameters threrof with respect to the current data segment in order to determine relative abilities among the different tools to reduce the number of bits required to represent the current data segment. The system then selects a tool and a set of parameters thereof found in the competitive evaluation to have a superior ability relative to others of the different tools to reduce a number of bits required to represent the current data segment.
Official Gazette of the U.S. Patent and Trademark Office
Data Flow Analysis; Data Compression; Channels (Data Transmission); Systems Analysis

20070023651 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Ensemble Weight Enumerators for Protograph LDPC Codes
Divsalar, Dariush; July 9, 2006; 5 pp.; In English; IEEE International Symposium on Information Theory, 9-14 Jul. 2006, Seattle, WA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40117

Recently LDPC codes with projected graph, or protograph structures have been proposed. In this paper, finite length ensemble weight enumerators for LDPC codes with protograph structures are obtained. Asymptotic results are derived as the block size goes to infinity. In particular we are interested in obtaining ensemble average weight enumerators for protograph LDPC codes which have minimum distance that grows linearly with block size. As with irregular ensembles, linear minimum distance property is sensitive to the proportion of degree-2 variable nodes. In this paper the derived results on ensemble weight enumerators show that linear minimum distance condition on degree distribution of unstructured irregular LDPC codes is a sufficient but not a necessary condition for protograph LDPC codes.
Author
Parity; Computer Programs; Graphs (Charts); Asymptotes; Accumulators (Computers)

20070023685 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Open-systems Architecture of a Standardized Command Interface Chip-set for Switching and Control of a Spacecraft Power Bus
Ruiz, B. Ian; Burke, Gary R.; Lung, Gerald; Whitaker, William D.; Nowicki, Robert M.; August 16, 2004; 20 pp.; In English; International Engery Conversion Engineering Conference, 16-19 Aug. 2004, Providence, RI, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39995

This viewgraph presentation reviews the architecture of the The CIA-AlA chip-set is a set of mixed-signal ASICs that provide a flexible high level interface between the spacecraft's command and data handling (C&DH) electronics and lower level functions in other spacecraft subsystems. Due to the open-systems architecture of the chip-set including an embedded micro-controller a variety of applications are possible. The chip-set was developed for the missions to the outer planets. The chips were developed to provide a single solution for both the switching and regulation of a spacecraft power bus. The Open-Systems Architecture allows for other powerful applications.
CASI
Architecture (Computers); Bus Conductors; Chips (Electronics); Integrated Circuits; Spacecraft Control; Application Specific Integrated Circuits

20070023691 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands
Authority and Responsibility of the Dismounted Soldier, Part B: Improving the Situational Awareness Using the Soldier Digital Assistant in a Simulated Environment.
Verwijs, C.; deBruin, R.; vanVliet, A. J.; April 2007; 49 pp.; In Dutch; Original contains color illustrations
Report No.(s): TNO-DV 2007 A142; TD2007-0076; Copyright; Avail.: Other Sources

Using a simulated environment the hypothesis was tested that dismounted units would be able to operate more effectively when they have rich and up-to-date information available. A virtual gaming environment and a simulated Soldier Digital Assistant (SDA) were developed to this end. The results show that soldiers using the simulated SDA could navigate faster through unknown terrain, experience more efficiency and have a higher situational awareness then soldiers without the SDA. The lessons learned on using virtual game environments for research are discussed.
Author
Situational Awareness; Decision Support Systems; Navigation Aids; Simulation; Military Technology

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*.

20070023572 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Reduction of User Interaction by Autonomy
Morfopoulos, Arin; McHenry, Michael; Matthies, Larry; August 24, 2006; 7 pp.; In English; Performance Matrics for

Intelligent Systems Workshop, 24-26 Aug. 2004, Gaithersburg, MD, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39992

This paper describes experiments that quantify the improvement that autonomous behaviors enable in the amount of user interaction required to navigate a robot in urban environments. Many papers have discussed various ways to measure the absolute level of autonomy of a system; we measured the relative improvement of autonomous behaviors over teleoperation across multiple traverses of the same course. We performed four runs each on an 'easy' course and a 'hard' course, where half the runs were teleoperated and half used more autonomous behaviors. Statistics show 40-70% reductions in the amount of time the user interacts with the control station; however, with the behaviors tested, user attention remained on the control station even when he was not interacting. Reducing the need for attention will require better obstacle detection and avoidance and better absolute position estimation.
Author
Autonomy; Robots; Robotics; Attention

20070023573 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Mars Exploration Rover Operations with the Science Activity Planner
Jeffrey S. Norris; Powell, Mark W.; Vona, Marsette A.; Backes, Paul G.; Wick, Justin V.; April 18, 2005; 6 pp.; In English; International Conference on Robotics and Automation, Barcelona, Spain, April 18, 2005, 18 Apr. 2005, Barcelona, Spain; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39975

The Science Activity Planner (SAP) is the primary science operations tool for the Mars Exploration Rover mission and NASA's Software of the Year for 2004. SAP utilizes a variety of visualization and planning capabilities to enable the mission operations team to direct the activities of the Spirit and Opportunity rovers. This paper outlines some of the challenging requirements that drove the design of SAP and discusses lessons learned from the development and use of SAP in mission operations.
Author
Teleoperators; Mars Roving Vehicles; Task Planning (Robotics); Scheduling; Telerobotics

20070023576 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Verifying AI Plan Models: Even the Best Laid Plans Need to be Verified
Smith, Margaret; Cucullu, Gordon; Holzmann, Gerard; Smith, Benjamin; July 20, 2004; 26 pp.; In English; 4th Annual NASA OFfice of Safety and Mission Assurance Software Assurance Symposium, 20-22 Jul. 2004, Morgantown, WV, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39980

This viewgraph presentation reviews work on model checking, and specifically the SPIN model checker. The goal of this work is to retire a significant class of risks associated with the use of Artificial Intelligence (Al) Planners on Missions. This effort must provide tangible testing results to a mission using Al technology. It is hoped that the work should be possible to leverage the technique and tools throughout NASA
CASI
Artificial Intelligence; Mission Planning; Models; Proving

20070023638 NASA Glenn Research Center, Cleveland, OH, USA
Towards Autonomous Inspection of Space Systems Using Mobile Robotic Sensor Platforms
Wong, Edmond; Saad, Ashraf; Litt, Jonathan S.; June 2007; 17 pp.; In English; Original contains color illustrations
Report No.(s): NASA/TM-2007-214838; ARL-TR-3930; AIAA-2006-7411; Copyright; Avail.: CASI: A03, Hardcopy

The space transportation systems required to support NASA's Exploration Initiative will demand a high degree of reliability to ensure mission success. This reliability can be realized through autonomous fault/damage detection and repair capabilities. It is crucial that such capabilities are incorporated into these systems since it will be impractical to rely upon Extra-Vehicular Activity (EVA), visual inspection or tele-operation due to the costly, labor-intensive and time-consuming nature of these methods. One approach to achieving this capability is through the use of an autonomous inspection system comprised of miniature mobile sensor platforms that will cooperatively perform high confidence inspection of space vehicles and habitats. This paper will discuss the efforts to develop a small scale demonstration test-bed to investigate the feasibility of using autonomous mobile sensor platforms to perform inspection operations. Progress will be discussed in technology areas

including: the hardware implementation and demonstration of robotic sensor platforms, the implementation of a hardware test-bed facility, and the investigation of collaborative control algorithms.
Author
Aerospace Systems; Autonomy; Robotics; Space Transportation System; Sensors; Test Stands; Miniaturization; Space Platforms

64
NUMERICAL ANALYSIS

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

20070023497 NASA Ames Research Center, Moffett Field, CA, USA
Enhanced Elliptic Grid Generation
Kaul, Upender K., Editor; 12 Jun. 2007; 8 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 7 Nov. 2003; US-Patent-7,231,329; US-Patent-Appl-SN-706478; US-Patent-Appl-SN-425750; NASA-Case-ARC-14710-1; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023497

Method and system for generating an elliptic grid in generalized coordinates in two or three dimensions, where one or more decay parameters near a boundary segment of a grid are determined as part of the grid solution, rather than being prescribed initially by a user. The decay parameters may vary with one or more generalized coordinates and determine the rate(s) at which separation distances between adjacent grid lines change as one moves toward or away from a grid boundary segment.
Official Gazette of the U.S. Patent and Trademark Office
Grid Generation (Mathematics); Ellipticity; Mathematical Models; Elliptic Differential Equations

20070023643 NASA Johnson Space Center, Houston, TX, USA
A Comparison of Two Skip Entry Guidance Algorithms
Rea, Jeremy R.; Putnam, Zachary R.; August 20, 2007; 20 pp.; In English; AIAA Guidance, Navigation, and Control Conference, 20-23 Aug. 2007, Hilton Head, SC, USA; Original contains color illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Orion capsule vehicle will have a Lift-to-Drag ratio (L/D) of 0.3-0.35. For an Apollo-like direct entry into the Earth's atmosphere from a lunar return trajectory, this L/D will give the vehicle a maximum range of about 2500 nm and a maximum crossrange of 216 nm. In order to y longer ranges, the vehicle lift must be used to loft the trajectory such that the aerodynamic forces are decreased. A Skip-Trajectory results if the vehicle leaves the sensible atmosphere and a second entry occurs downrange of the atmospheric exit point. The Orion capsule is required to have landing site access (either on land or in water) inside the Continental USA (CONUS) for lunar returns anytime during the lunar month. This requirement means the vehicle must be capable of flying ranges of at least 5500 nm. For the L/D of the vehicle, this is only possible with the use of a guided Skip-Trajectory. A skip entry guidance algorithm is necessary to achieve this requirement. Two skip entry guidance algorithms have been developed: the Numerical Skip Entry Guidance (NSEG) algorithm was developed at NASA/JSC and PredGuid was developed at Draper Laboratory. A comparison of these two algorithms will be presented in this paper. Each algorithm has been implemented in a high-fidelity, 6 degree-of-freedom simulation called the Advanced NASA Technology Architecture for Exploration Studies (ANTARES). NASA and Draper engineers have completed several monte carlo analyses in order to compare the performance of each algorithm in various stress states. Each algorithm has been tested for entry-to-target ranges to include direct entries and skip entries of varying length. Dispersions have been included on the initial entry interface state, vehicle mass properties, vehicle aerodynamics, atmosphere, and Reaction Control System (RCS). Performance criteria include miss distance to the target, RCS fuel usage, maximum g-loads and heat rates for the first and second entry, total heat load, and control system saturation. The comparison of the performance criteria has led to a down select and guidance merger that will take the best ideas from each algorithm to create one skip entry guidance algorithm for the Orion vehicle.
Author
Algorithms; Atmospheric Entry; Entry Guidance (STS); Crew Exploration Vehicle; Technology Utilization

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20070023684 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Numerical Simulation of Two-grid Ion Optics Using a 3D Code

Anderson, John R.; Katz, Ira; Goebel, Dan; July 11, 2004; 14 pp.; In English; 40th AIAA Joint Propulsion Conference, 12-14 Jul. 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40012

A three-dimensional ion optics code has been developed under NASA's Project Prometheus to model two grid ion optics systems. The code computes the flow of positive ions from the discharge chamber through the ion optics and into the beam downstream of the thruster. The rate at which beam ions interact with background neutral gas to form charge exchange ions is also computed. Charge exchange ion trajectories are computed to determine where they strike the ion optics grid surfaces and to determine the extent of sputter erosion they cause. The code has been used to compute predictions of the erosion pattern and wear rate on the NSTAR ion optics system; the code predicts the shape of the eroded pattern but overestimates the initial wear rate by about 50%. An example of use of the code to estimate the NEXIS thruster accelerator grid life is also presented. Author

Ion Optics; Ion Engines; Mathematical Models; Three Dimensional Models; Computational Grids; Digital Simulation; Computerized Simulation

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*.

20070023652 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

JMR Noise Diode Stability and Recalibration Methodology after Three Years On-Orbit

Brown, Shannon; Desai, Shailen; Keihm, Stephen; Ruf, Christopher; February 28, 2006; 9 pp.; In English; IEEE Microrad 2006, 28 Feb. - 3 Mar. 2006, San Juan, Puerto Rico; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40119

The Jason Microwave Radiometer (JMR) is included on the Jason-1 ocean altimeter satellite to measure the wet tropospheric path delay (PD) experienced by the radar altimeter signal. JMR is nadir pointing and measures the radiometric brightness temperature (T(sub B)) at 18.7, 23.8 and 34.0 GHz. JMR is a Dicke radiometer and it is the first radiometer to be flown in space that uses noise diodes for calibration. Therefore, monitoring the long term stability of the noise diodes is essential. Each channel has three redundant noise diodes which are individually coupled into the antenna signal to provide an estimate of the gain. Two significant jumps in the JMR path delays, relative to ground truth, were observed around 300 and 700 days into the mission. Slow drifts in the retrieved products were also evident over the entire mission. During a recalibration effort, it was determined that a single set of calibration coefficients was not able to remove the calibration jumps and drifts, suggesting that there was a change in the hardware and time dependent coefficients would be required. To facilitate the derivation of time dependent coefficients, an optimal estimation based calibration system was developed which iteratively determines that set of calibration coefficients which minimize the RMS difference between the JMR TBs and on-Earth hot and cold absolute references. This optimal calibration algorithm was used to fine tune the front end path loss coefficients and derive a time series of the JMR noise diode brightness temperatures for each of the nine diodes. Jumps and drifts, on the order of 1% to 2%, are observed among the noise diodes in the first three years on-orbit.

Author

Diodes; Oceans; Noise (Sound); Acoustic Instability; Calibrating; Microwave Radiometers

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*.

20070023426 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Vertically-coupled Whispering Gallery Mode Resonator Optical Waveguide, and Methods
Matsko, Andrey B., Inventor; Savchenkov, Anatolly A., Inventor; Matleki, Lute, Inventor; February 27, 2007; 7 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 5 Jun. 2006; US-Patent-7,184,624; US-Patent-Appl-SN-422147; NASA-Case-NPO-42312-1; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023426

A vertically-coupled whispering gallery mode (WGM) resonator optical waveguide, a method of reducing a group velocity of light, and a method of making a waveguide are provided. The vertically-coupled WGM waveguide comprises a cylindrical rod portion having a round cross-section and an outer surface. First and second ring-shaped resonators are formed on the outer surface of the cylindrical rod portion and are spaced from each other along a longitudinal direction of the cylindrical rod. The first and second ringshaped resonators are capable of being coupled to each other by way an evanescent field formed in an interior of the cylindrical rod portion.
Official Gazette of the U.S. Patent and Trademark Office
Coupled Modes; Optical Waveguides; Resonators; Whispering Gallery Modes

20070023696 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
An Integrated Optimal Estimation Approach to Spitzer Space Telescope Focal Plane Survey
Bayard, David S.; Kang, Bryan H.; Brugarolas, Paul B.; Boussalis, D.; June 21, 2004; 12 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 21-25 June 2004, Glasgow, UK; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39942

This paper discusses an accurate and efficient method for focal plane survey that was used for the Spitzer Space Telescope. The approach is based on using a high-order 37-state Instrument Pointing Frame (IPF) Kalman filter that combines both engineering parameters and science parameters into a single filter formulation. In this approach, engineering parameters such as pointing alignments, thermomechanical drift and gyro drifts are estimated along with science parameters such as plate scales and optical distortions. This integrated approach has many advantages compared to estimating the engineering and science parameters separately. The resulting focal plane survey approach is applicable to a diverse range of science instruments such as imaging cameras, spectroscopy slits, and scanning-type arrays alike. The paper will summarize results from applying the IPF Kalman Filter to calibrating the Spitzer Space Telescope focal plane, containing the MIPS, IRAC, and the IRS science Instrument arrays.
Author
Calibrating; Space Infrared Telescope Facility; Focal Plane Devices; Estimating; Foci

75
PLASMA PHYSICS

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

20070023371 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Experimentally Determined Plasma Parameters in a 30 cm Ion Engine
Sengupta, Anita; Goebel, Dan; Fitzgerald, Dennis; Owens, Al; Tynan, George; Dorner, Russ; July 11, 2004; 23 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 11-14 Jul. 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40016

Single planar Langmuir probes and fiber optic probes are used to concurrently measure the plasma properties and neutral density variation in a 30cm diameter ion engine discharge chamber, from the immediate vicinity of the keeper to the near grid plasma region. The fiber optic probe consists of a collimated optical fiber recessed into a double bore ceramic tube fitted with

a stainless steel light-limiting window. The optical fiber probe is used to measure the emission intensity of excited neutral xenon for a small volume of plasma, at various radial and axial locations. The single Langmuir probes, are used to generate current-voltage characteristics at a total of 140 spatial locations inside the discharge chamber. Assuming a maxwellian distribution for the electron population, the Langmuir probe traces provide spatially resolved measurements of plasma potential, electron temperature, and plasma density. Data reduction for the NSTAR TH8 and TH15 throttle points indicates an electron temperature range of 1 to 7.9 eV and an electron density range of 4e10 to le13 cm(sup -3), throughout the discharge chamber, consistent with the results in the literature. Plasma potential estimates, computed from the first derivative of the probe characteristic, indicate potential from 0.5V to 11V above the discharge voltage along the thruster centerline. These values are believed to be excessively high due to the sampling of the primary electron population along the thruster centerline. Relative neutral density profiles are also obtained with a fiber optic probe sampling photon flux from the 823.1 nm excited to ground state transition. Plasma parameter measurements and neutral density profiles will be presented as a function of probe location and engine discharge conditions. A discussion of the measured electron energy distribution function will also be presented, with regards to variation from pure maxwellian. It has been found that there is a distinct primary population found along the thruster centerline, which causes estimates of electron temperature, electron density, and plasma potential, to err on the high side, due this energetic population. Computation of the energy distribution fimction of the plasma clearly indicates the presence of primaries, whose presence become less obvious with radial distance from the main discharge plume.
Author
Ion Engines; Ion Propulsion; Plasma Potentials; Engine Tests; Test Facilities; Electron Energy

20070023372 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Discharge Chamber Performance of the NEXIS Ion Thruster
Goebel, Dan M.; Polk, James; Sengupta, Anita; FROM; July 12, 2004; 11 pp.; In English; 40th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 11-14 Jul. 2004, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/39985

The Nuclear-Electric Xenon Ion System (NEXIS) thruster was designed to produce greater than or equal to 70% efficiency at ISPs in excess of 6500 sec and total power levels in excess of 15 kW. In order to achieve this performance, the thruster requires a large area plasma generator capable of high propellant utilimtion efficiency and low discharge loss while producing a very flat, uniform beam profile. Fortunately, larger thrusters can be made more uniform and efficient due to the higher volume to surface ratio, provided that the magnetic cusp confinement is designed properly and the thruster length to diameter ratio is adequate. This paper describes the discharge chamber performance of the NEXIS Laboratory Model (LM) thruster. The LM discharge chamber is 65 cm in diameter at the grid plane and uses 6 ring-cusps to provide magnetic confinement of the plasma. The thruster was tested with flat carbon-carbon composite grids with the hole pattern masked to 57 cm in diameter and a conventional Type-B '1/2' diameter hollow cathode. During the preliminary 'discharge only' tests, the LM thruster demonstrated profile factors of 0.84 and a discharge loss of about 160 eV/ion at 25 V discharge voltage and over 90% propellant utilization efficiency in simulated beam extraction experiments at 3.9 A of beam current. Analysis of the data from these tests used the discharge-only model developed by Brophy. Subsequent beam extraction experiments validated the key variables used in the model to predict the performance from the discharge-only data, and demonstrated 3.9 A of beam current at over 90% propellant utilization efficiency with a flatness parameter of better than 0.8 and a discharge loss of about 185 eV/ion. The slightly higher discharge loss measured during beam extractions was found to be due to a lower screen transparency in the as-manufactured LM grid set. Plasma measurements with a scanning probe internal to the thruster near the screen grid showed plasma densities over 1 x 10(exp 11) per cubic centimeter and electron temperatures of 3.5 to 5.5 eV depending on the operation parameters. The performance of the NEXIS discharge chamber contributed to the over 78% thruster efficiency measured during beam extraction at 7500 sec ISP and 25 kW of power, and over 81% thruster efficiency measured at 8500 sec ISP.
Author
Ion Engines; Xenon; Nuclear Electric Propulsion; Mechanical Engineering; Thrust Chambers; Plasma Jets

20070023558 NASA Marshall Space Flight Center, Huntsville, AL, USA
Chaotic Motion of Relativistic Electrons Driven by Whistler Waves
Khazanov, G. V.; Telnikhin, A. A.; Kronberg, Tatiana K.; January 16, 2007; 26 pp.; In English; To appear in Plasma Physics and Controlled Fusion; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Canonical equations governing an electron motion in electromagnetic field of the whistler mode waves propagating along the direction of an ambient magnetic field are derived. The physical processes on which the equations of motion are based .are

identified. It is shown that relativistic electrons interacting with these fields demonstrate chaotic motion, which is accompanied by the particle stochastic heating and significant pitch angle diffusion. Evolution of distribution functions is described by the Fokker-Planck-Kolmogorov equations. It is shown that the whistler mode waves could provide a viable mechanism for stochastic energization of electrons with energies up to 50 MeV in the Jovian magnetosphere.
Author
Electron Mobility; Equations of Motion; High Energy Electrons; Relativistic Particles; Stochastic Processes; Whistlers; Plasma Physics; Chaos

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*.

20070023431 NASA Glenn Research Center, Cleveland, OH, USA
Gap/silicon Tandem Solar Cell with Extended Temperature Range
Landis, Geoffrey A., Inventor; December 12, 2006; 12 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed 31 Mar. 2003; US-Patent-7,148,417; US-Patent-Appl-SN-403714; NASA-Case-LEW-17,396-1; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023431

A two-junction solar cell has a bottom solar cell junction of crystalline silicon, and a top solar cell junction of gallium phosphide. A three (or more) junction solar cell has bottom solar cell junctions of silicon, and a top solar cell junction of gallium phosphide. The resulting solar cells exhibit improved extended temperature operation.
Official Gazette of the U.S. Patent and Trademark Office
Temperature Distribution; Energy Gaps (Solid State); Semiconductor Junctions; Solar Cells

20070023588 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Device Concepts Based on Spin-dependent Transmission in Semiconductor Heterostructures
Ting, David Z. - Y.; Cartoixa, X.; July 21, 2004; 18 pp.; In English; 3rd International Conference on the Physics and Applications of Spin-Related Phenomena in Semiconductors, 21-23 Jul. 2004, Santa Barbara, CA, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40015

We examine zero-magnetic-field spin-dependent transmission in nonmagnetic semiconductor heterostructures with structural inversion asymmetry (SIA) and bulk inversion asymmetry (BIA), and report spin devices concepts that exploit their properties. Our modeling results show that several design strategies could be used to achieve high spin filtering efficiencies. The current spin polarization of these devices is electrically controllable, and potentially amenable to highspeed spin modulation, and could be integrated in optoelectronic devices for added functionality.
Author
Semiconductors (Materials); Optoelectronic Devices; Spin

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20070022795 General Accounting Office, Washington, DC, USA
Polar-Orbiting Operational Environmental Satellites: Restructuring Is Under Way, but Technical Challenges and Risks Remain
April 2007; 63 pp.; In English; Original contains color and black and white illustrations
Report No.(s): GAO-07-498; No Copyright; Avail.: CASI: A04, Hardcopy

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) is a tri-agency acquisition managed by the Departments of Commerce and Defense and the National Aeronautics and Space Administration which experienced escalating costs, schedule delays, and technical difficulties. These factors led to a June 2006 decision to restructure the program thereby decreasing the program's complexity, increasing its estimated cost to $12.5 billion, and delaying the first two satellites

by 3 to 5 years. GAO was asked to (1) assess progress in restructuring the acquisition, (2) evaluate progress in establishing an effective management structure, (3) assess the reliability of the cost and schedule estimate, and (4) identify the status and key risks facing the program s major segments. To do so, GAO analyzed program and contractor data, attended program reviews, and interviewed program officials. GAO recommends that the appropriate executives approve key acquisition documents, the Secretary of Defense delay reassigning the Program Executive, and the Secretary of Commerce ensure that program authorities identify and address staffing needs. Agency officials agreed with all of the recommendations except delaying the Program Executive's reassignment. GAO believes that proceeding with this reassignment would increase program risks.
Author
Cost Estimates; NOESS; Schedules; Space Station Polar Platforms; Contract Management; Project Planning; Mission Planning

20070023356 Civil Aerospace Medical Inst., Oklahoma City, OK, USA
Operational Use of the Air Traffic Selection and Training Battery
King, Raymond E.; Manning, Carol A.; Drechsler, Gena K.; May 2007; 11 pp.; In English
Contract(s)/Grant(s): AM-HRR-523
Report No.(s): DOT/FAA/AM-07/14; No Copyright; Avail.: CASI: A03, Hardcopy

The Federal Aviation Administration (FAA) is commencing a massive hiring of air traffic control specialists using a new selection procedure, the Air Traffic Selection and Training (AT-SAT) computerized test battery. Before AT-SAT could be used for hiring purposes, however, the issue of its potential for adverse impact (potential unfair discrimination) had to be addressed. A previous project reweighted the subtests and adjusted the overall constant to mitigate potential group differences that could result in adverse impact, without unduly compromising validity. A subsequent study used research participants and found that this effort appeared to have achieved its goal of mitigating group differences that could result in adverse impact. The present study endeavors to: 1) describe how AT-SAT functions as an operational selection method with respect to the several applicant pools, and 2) determine how the reweighting effort fares with actual applicants in the goal of reducing/eliminating group differences that could result in adverse impact. Of the 854 applicants who have taken AT-SAT as part of a job application process (rather than as according to a research protocol), 219 applicants (25.64%) voluntarily disclosed their race; gender was known for 253 (29.63%). The results suggest that the reweighting effort is paying dividends as group differences that could result in adverse impact are not in evidence. While the initial numbers reported here are relatively small, the issue of group differences that could result in adverse impact will be continually monitored. Longitudinal validation, comparing AT-SAT results to training and on-the-job performance, is a research priority due to concerns about the overall passing rate of 93.33%, which is higher than the expected passing rate of 67%.
Author
Air Traffic Controllers (Personnel); Employment; Performance Tests; Qualifications; Mental Performance; Personnel Selection; Aptitude

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*.

20070022885 National Optical Astronomy Observatories, Tucson, AZ, USA, National Solar Observatory, Tucson, AZ, USA
National Optical Astronomy Observatory/National Solar Observatory Newsletter: Issue 89
Isbell, Douglas, Editor; March 2007; 38 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

This edition of the Newsletter from the National Optical Astronomy Observatory contains short articles on: Science Highlights: The Evershed Flow: From the Chromosphere to the Photosphere, and High Spectral Resolution in the Mid-lR with TEXES on Gemini. Included in the newsletter are summaries from: the NOAO Gemini Science Center, the Observational Programs, the Data Products program, Cerro Tololo Inter-American Observatory, Kitt Peak National Observatory, National Solar Observatory, and Public Affairs and Educational Outreach.
CASI
Observatories; Solar Observatories

89
ASTRONOMY

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

20070022855 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Far-ultraviolet Spectroscopy of O+o Binaries in the Magellanic Clouds
Sonneborn, George; Iping, R. C.; Gies, D.; Vander Hucht, K.; Kaper, L.; May 27, 2007; 1 pp.; In English; American Astronomical Society 210th Meeting, 27-31 May 2007, Honolulu, HI, USA; Copyright; Avail.: Other Sources; Abstract Only

We report FUSE observations in 2006 of three O-type, double-lined spectroscopic binaries in the Magellanic Clouds. Their binary nature was discovered only in the past several years. The systems have very short periods (1.4 - 2.25 days), represent rare, young evolutionary stages of massive stars and binaries, and provide a unique glimpse at some of the most massive systems that form in dense clusters of massive stars. The systems are: LH54-425 in the LMC (O3IIIf + O6V, P=2.25 days, approx. 100+50 Mo), J053441-693139 in the LMC (O2-31f + O6V, P=1.4 days, 41+27 Mo), and Hodge 53-47 in the SMC (O6V + O4-5IIIf, P=2.2 days, 24+14 Mo, where the O4 star appears to be less massive than the O6 star). These represent some of the most massive binaries known. Their short periods indicates that wind interaction and mass transfer are likely important factors in their evolution. The spectra provide quantitative and systematic studies of phase-dependent stellar wind properties, wind collision effects in O+O binaries at lower metallicities, improved radial velocity curves, and FUV spectrophotometric changes as a function of orbital phase.
Author
Far Ultraviolet Radiation; Ultraviolet Spectroscopy; Far UV Spectroscopic Explorer; O Stars; Binary Stars; Magellanic Clouds

20070022878 NASA Goddard Space Flight Center, Greenbelt, MD, USA
New Frontiers for Massive Star Winds: Imaging and Spectroscopy with the James Webb Space Telescope
Sonneborn, George; June 18, 2007; 1 pp.; In English; International Workshop on Clumping in Hot-Star Winds, 18-22 June 2007, Potsdam, Germany; No Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope scheduled for launch in 2013. JWST will find the first stars and galaxies that formed in the early universe, connecting the Big Bang to our own Milky Way galaxy. JWST will peer through dusty clouds to see stars forming planetary systems, connecting the Milky Way to our own Solar System. JWST's instruments are designed to work primarily in the infrared range of 1 - 28 microns, with some capability in the visible range. JWST will have a large mirror, 6.5 meters in diameter, and will be diffraction-limited at 2 microns (0.1 arcsec resolution). JWST will be placed in an L2 orbit about 1.5 million km from the Earth. The instruments will provide imaging, coronography, and multi-object and integral-field spectroscopy across the full 1 - 28 micron wavelength range. The breakthrough capabilities of JWST will enable new studies of massive star winds from the Milky Way to the early universe.
Author
Imaging Techniques; James Webb Space Telescope; Massive Stars; Solar System; Spectroscopy; Stellar Winds; Milky Way Galaxy; Big Bang Cosmology

20070022879 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Imaging and Spectroscopy with the James Webb Space Telescope
Sonneborn, George; June 08, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The James Webb Space Telescope (JWST) is a large, infrared-optimized space telescope scheduled for launch in 2013. JWST will find the first stars and galaxies that formed in the early universe, connecting the Big Bang to our own Milky Way galaxy. JWST will peer through dusty clouds to see stars forming planetary systems, connecting the Milky Way to our own Solar System. JWST's instruments are designed to work primarily in the infrared range of 1 - 28 microns, with some capability in the visible range. JWST will have a large mirror, 6.5 meters in diameter, and will be diffraction-limited at 2 microns (0.1 arcsec resolution). JWST will be placed in an L2 orbit about 1.5 million km from the Earth. The instruments will provide imaging, coronography, and multi-object and integral-field spectroscopy across the full 1 - 28 micron wavelength range. The breakthrough capabilities of JWST will enable new studies of star formation and evolution in the Milky Way, nearby galaxies, and the early universe.
Author
Imaging Techniques; James Webb Space Telescope; Spectroscopy; Milky Way Galaxy; Solar System

20070022881 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Co/Ni Ratio Between Is Approximately 0.35 - 8.0 GeV/nucleon from the TIGER-2001 Flight

deNolfo, G. A.; Barbier, L. M.; Binns, W. R.; Cummings, J. R.; Geier, S.; Israel, M. N.; Link, J. T.; Mewaldt, R. A.; Mitchell, J. W.; Rauch, B. F.; Schindler, S. M.; Scott, L. M.; Stone, E. C.; Streitmatter, R. E.; Waddington, C. J.; July 03, 2007; 1 pp.; In English; International Cosmic Ray Conference, 3-11 July 2007, Merida, Yucatan, Mexico

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: Other Sources; Abstract Only

The Trans-Iron Galactic Element Recorder (TIGER) was launched in December 2001 and 2003 from McMurdo, Antarctica and was designed to observe elements ranging from 14 < Z < 40 over an extended energy range. Observations of radioactive isotopes produced during explosive nucleosynthesis such as Ni-59 that decay only through electron capture provide important constraints on the delay between nucleosynthesis and the acceleration of galactic cosmic rays (GCRs). The isotopes of Co and Ni at low energies, in particular, the observations of the Ni-59 and Co-59 from the Cosmic Ray Isotope Spectrometer (CRIS) on the Advanced Composition Explorer, indicate a significant time delay (greater than 7.6 x 10^4 yr) between GCR nucleosynthesis and acceleration. While TIGER is not able to resolve isotopes, observations of the elemental abundances of Co and Ni at high energies further constrain models for the acceleration and propagation of GCRs. The 2001 & 2003 flights of TIGER lasted a total of approx. 50 days and collected sufficient statistics to study the Co/Ni elemental ratio over a wide range in energies. We present the elemental ratio of Co/Ni in galactic cosmic rays between approx. 0.8- 5.0 GeV/nucleon and compare these results with previous measurements and models for cosmic-ray propagation.

Author

Cobalt Isotopes; Nickel Isotopes; Isotope Ratios; Nucleons; Galactic Cosmic Rays

20070022882 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Cosmic Ray Helium Intensities over the Solar Cycle from ACE

DeNolfo, G. A.; Yanasak, N. E.; Binns, W. R.; Cohen, C. M. S.; Cummings, A. C.; Davis, A. J.; George, J. S.; Hink. P. L.; Israel, M. H.; Lave, K.; Leske, R. A.; Mewaldt, R. A.; Moskalenko, I. V.; Ogliore, R.; Stone, E. C.; Von Rosenvinge, T. T.; Wiedenback, M. E.; July 03, 2007; 1 pp.; In English; International Cosmic Ray Conference, 3-11 July 2007, Merida, Yucatan, Mexico

Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: Other Sources; Abstract Only

Observations of cosmic-ray helium energy spectra provide important constraints on cosmic ray origin and propagation. However, helium intensities measured at Earth are affected by solar modulation, especially below several GeV/nucleon. Observations of helium intensities over a solar cycle are important for understanding how solar modulation affects galactic cosmic ray intensities and for separating the contributions of anomalous and galactic cosmic rays. The Cosmic Ray Isotope Spectrometer (CRIS) on ACE has been measuring cosmic ray isotopes, including helium, since 1997 with high statistical precision. We present helium elemental intensities between approx. 10 to approx. 100 MeV/nucleon from the Solar Isotope Spectrometer (SIS) and CRIS observations over a solar cycle and compare these results with the observations from other satellite and balloon-borne instruments, and with GCR transport and solar modulation models.

Author

Galactic Cosmic Rays; Solar Cycles; Advanced Composition Explorer; Spectrometers; Helium Isotopes; Intensity

20070023323 NASA Goddard Space Flight Center, Greenbelt, MD, USA, Universities Space Research Association, Greenbelt, MD, USA

Determination of Black Hole Mass in Cyg X-1 by Scaling of Spectral Index-QPO Frequency Correlation

Shaposhnikov, Nickolai; Titarchuk, Lev; [2007]; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023323

It is well established that timing and spectral properties of Galactic Black Hole (BH) X-ray binaries (XRB) are strongly correlated. In particular, it has been shown that low frequency Quasi-Periodic Oscillation (QPO) nu(sub low) - photon index GAMMA correlation curves have a specific pattern. In a number of the sources studied the shape of the index-low frequency QPO correlations are self-similar with a position offset in the nu(sub low) - GAMMA plane determined by a BH mass M(sub BH). Specifically, Titarchuk & Fiorito (2004) gave strong theoretical and observational arguments that the QPO frequency values in this nu(sub low) - GAMMA correlation should be inversely proportional to M(sub BH). A simple translation of the correlation for a given source along frequency axis leads to the observed correlation for another source. As a result of this translation one can obtain a scaling factor which is simply a BH mass ratio for these particular sources. This property of the correlations offers a fundamentally new method for BH mass determination in XRBs. Here we use the observed QPO-index correlations observed in three BH sources: GRO J1655-40, GRS 1915+105 and Cyg X-1. The BH mass of (6.3 plus or minus

0.5) solar mass in GRO J1655-40 is obtained using optical observations. RXTE observations during the recent 2005 outburst yielded sufficient data to establish the correlation pattern during both rise and decay of the event. We use GRO J1655-40 as a standard reference source to measure the BH mass in Cyg X-1. We also revisit the GRS 1915+105 data as a further test of our scaling method. We obtain the BH mass in Cyg X-1 in the range 7.6-9.9.
Author
Black Holes (Astronomy); Mass Ratios; Oscillations; Periodic Variations; X Ray Binaries; Cygnus Constellation; Low Frequencies; Correlation

20070023325 Denver Univ., Denver, CO, USA
Cosmic Ray Electron Science with GLAST
Ormes, J. F.; Moiseev, Alexander; [2007]; 2 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Cosmic ray electrons at high energy carry information about their sources, their definition in local magnetic fields and their interactions with the photon fields through which they travel. The spectrum of the particles is affected by inverse Compton losses and synchrotron losses, the rates of which are proportional to the square of the particle's energy making the spectra very steep. However, GLAST will be able to make unique and very high statistics measurements of electrons from approx. 20 to approx. 700 GeV that will allow us to search for anisotropies in anival direction and spectral features associated with some dark matter candidates. Complementary information on electrons of still higher energy will be required to see effects of possible individual cosmic ray sources.
Author
Electron Energy; High Energy Electrons; Galactic Cosmic Rays; Electron Sources; Gamma Rays; Telescopes

20070023331 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Recoiling from a Kick in the Head-On Case
Choi, Dae-Il; Kelly, Bernard J.; Boggs, William D.; Baker, John G.; Centrella, Joan; Van Meter, James; [2007]; 10 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): O5-BEFS-05-0044; Copyright; Avail.: CASI: A02, Hardcopy

Recoil 'kicks' induced by gravitational radiation are expected in the inspiral and merger of black holes. Recently the numerical relativity community has begun to measure the significant kicks found when both unequal masses and spins are considered. Because understanding the cause and magnitude of each component of this kick may be complicated in inspiral simulations, we consider these effects in the context of a simple test problem. We study recoils from collisions of binaries with initially head-on trajectories, starting with the simplest case of equal masses with no spin; adding spin and varying the mass ratio, both separately and jointly. We find spin-induced recoils to be significant even in head-on configurations. Additionally, it appears that the scaling of transverse kicks with spins is consistent with post-Newtonian (PN) theory, even though the kick is generated in the nonlinear merger interaction, where PN theory should not apply. This suggests that a simple heuristic description might be effective in the estimation of spin-kicks.
Author
Black Holes (Astronomy); Gravitational Waves; Recoilings; Spin-Orbit Interactions

20070023360 NASA Goddard Inst. for Space Studies, New York, NY, USA
The Suzaku Observation of the Nucleus of the Radio Loud Active Galaxy Centaurus A: Constraints on Abundances in the Accreting Material
Markowitz, A.; Takahashi, T.A; Watanabe, S.; Nakazawa, K.; Fukazawa, Y.; Kokubun, M.; Makishima, K.; Awaki, H.; Bamba, A.; Isobe, N.; Kataoka, J.; Madejski, G.; Mushotzky, R.; Okajima, T.; Ptak, A.; Reeves, J. N.; Ueda, Y.; Yamasaki, T.; Yaqoob, T.; [2007]; 17 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: A03, Hardcopy

A Suzaku observation of the nucleus of the radio-loud AGN Centaurus A in 2005 has yielded a broadband spectrum spanning 0.3 to 250 keV. The hard X-rays are fit by two power laws, absorbed by columns of 1.5 and 7 x 10(exp 23) per square centimeter. The dual power-laws are consistent with previous suggestions that the powerlaw components are X-ray emission from the sub-pc VLBI jet and from Bondi accretion at the core, or are consistent with a partial covering interpretation. The soft band is dominated by thermal emission from the diffuse plasma and is fit well by a two-temperature VAPEC model, plus a third power-law component to account for scattered nuclear emission, kpc-scale jet emission, and emission from X-ray Binaries and other point sources. Narrow fluorescent emission lines from Fe, Si, S, Ar, Ca and Ni are detected. The width of

the Fe Ka line yields a 200 light-day lower limit on the distance from the black hole to the line-emitting gas. K-shell absorption edges due to Fe, Ca, and S are detected. Elemental abundances are constrained via the fluorescent lines strengths, absorption edge depths and the diffuse plasma emission lines. The high metallicity ([Fe/H]=+0.l) of the circumnuclear material compared to that in the metal-poor outer halo suggests that the accreting material could not have originated in the outer halo unless enrichment by local star formation has occurred. Relative abundances are consistent with enrichment from Type II and Ia supernovae.
Author
Abundance; Active Galactic Nuclei; Centaurus Constellation; Radio Emission; Black Holes (Astronomy); Accretion Disks

20070023361 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Constellation-X Mission: Science Prospects and Technology Challenges
Petre, Robert; May 14, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

This talk will describe the Constellation-X mission. It will present the key scientific goals, relating to strong gravity, dark energy, ultra-dense matter and cosmic structure. The mission configuration will be described. Emphasis will be placed on the design and anticipated implementation of the X-ray mirror system.
Author
Constellation-X; Technologies; Space Missions; Research and Development

20070023363 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The Diffuse X-ray Background, from Earth's Exosphere to the Edge of the Universe: Or, One Astronomer's Signal is Another Astronomer's Contamination
Snowden, Steve; April 24, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The 'X-ray background' means various things to various people. It's origin is comprised of emission from objects as close as Earth's exosphere to as far away as the most distant clusters of galaxies. It is comprised of the emission of truly diffusely distributed plasmas and the superposition of the emission from unresolved point-like objects. To add to the confusion, in general there is no redshift information so there is very little information on where an individual X-ray may originate. This talk will address the evolution of our understanding of origin of the X-ray background and the current best-guess about what is really going on.
Author
Exosphere; Diffuse Radiation; Universe; X Ray Astronomy

20070023462 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evidence of the Exponential Decay Emission in the Swift Gamma-ray Bursts
[2007]; 30 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; 18740153; Copyright; Avail.: CASI: A03, Hardcopy

We present a systematic study of the steep decay emission of gamma-ray bursts (GRBs) observed by the Swift X-Ray Telescope (XRT). In contrast to the analysis in recent literature, instead of extrapolating the data of Burst Alert Telescope (BAT) down into the XRT energy range, we extrapolated the XRT data up to the BAT energy range, 15-25 keV, to produce the BAT and XRT composite light curve. Based on our composite light curve fitting, we have confirmed the existence of an exponential decay component which smoothly connects the BAT prompt data to the XRT steep decay for several GRBs. We also find that the XRT steep decay for some of the bursts can be well fitted by a combination of a power-law with an exponential decay model. We discuss that this exponential component may be the emission from an external shock and a sign of the deceleration of the outflow during the prompt phase.
Author
Gamma Ray Bursts; Particle Decay; X Ray Telescopes; Swift Observatory; Spectrum Analysis

20070023648 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
MegaMIR: The Megapixel Mid-Infrared Instrument for the Large Binocular Telescope Interferometer
Mainzer, Amanda K.; Young, Erick; Hong, John; Werner, Mike; Hinz, Phil; Gorjan, Varoujan; Ressler, Michael E.; May 27, 2006; 11 pp.; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40110

The Megapixel Mid-infrared Instrument (MegaMIR) is a proposed Fizeau-mode camera for the Large Binocular

Telescope operating at wavelengths between 5 and 28 micrometers. The camera will be used in conjunction with the Large Binocular Telescope Interferometer (LBTI), a cryogenic optical system that combines the beams from twin 8.4-m telescopes in a phase coherent manner. Unlike other interferometric systems, the co-mounted telescopes on the LBT satisfy the sine condition, providing diffraction-limited resolution over the 40' field of view of the camera. With a 22.8-m baseline, MegaMIR will yield 0.1' angular resolution, making it the highest resolution wide field imager in the thermal infrared for at least the next decade. MegaMIR will utilize a newly developed 1024 x 1024 pixel Si:As detector array that has been optimized for use at high backgrounds. This new detector is a derivative of the Wide-field Infrared Survey Explorer (WISE) low-background detector. The combination of high angular resolution and wide field imaging will be a unique scientific capability for astronomy. Key benefits will be realized in planetary science, galactic, and extra-galactic astronomy. High angular resolution is essential to disentangle highly complex sources, particularly in star formation regions and external galaxies, and MegaMIR provides this performance over a full field of view. Because of the great impact being made by space observatories like the Spitzer Space Telescope, the number of available targets for study has greatly increased in recent years, and MegaMIR will allow efficient follow up science.
Author
Infrared Radiation; Pixels; Binoculars; Infrared Telescopes; Infrared Interferometers; Infrared Instruments

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ASTROPHYSICS

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

20070022852 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Performance of the Three-Dimensional Track Imager (3-DTI) for Gamma-Ray Telescopes
Son, Seunghee; Barbier, L, M.; Bloser, P. F.; Floyd, S. R,; Hunter, S. D.; Krizmanic, J. F.; Link, J. T.; McConnell, M. L.; DeNolfo, Georgia; Ryan, J. M.; July 03, 2007; 1 pp.; In English; 2007 International Cosmic Ray Conference, 3-11 Jul. 2007, Merida, Yucatan, Mexico
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

We have been developing a gas time projection chamber for the imaging of gamma-rays between 0.3 - 50 MeV, the Three-Dimensional Track Imager (3DTI). The detector is being designed for use on satellite experiments for the imaging of astrophysical gamma-ray sources. Electrons produced by pair production or Compton scattering ionize the gas and these ionization electrons are detected by the cross-strip micro-well detector at the bottom of the chamber. Discrete component of front end electronics and time digitization electronics have been developed. We will present results of prototype microwell detector and laboratory set-up in various gas mixtures.
Author
Astrophysics; Gamma Ray Telescopes; Imaging Techniques; Chambers

20070023322 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relativistic Iron K Emission and Absorption in the Seyfert 1.9 Galaxy MCG-05-23-16
Braito, V.; Reeves, J. N.; Dewangan, G. C.; George, I.; Griffiths, R.; Markowitz, A.; Nandra, K.; Porquet, D.; Ptak, A.; Turner, T. J.; Yaqoob, T.; Weaver, K.; [2007]; 42 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG04GB78A; Copyright; Avail.: CASI: A03, Hardcopy

We present the results of the simultaneous deep XMM-Newton and Chandra observations of the bright Seyfert 1.9 galaxy MCG-5-23-16, which is thought to have one of the best known examples of a relativistically broadened iron Kalpha line. We detected a narrow sporadic absorption line at 7.7 keV which appears to be variable on a time-scale of 20 ksec. If associated with FeXXVI this absorption is indicative of a possible variable high ionization, high velocity outflow. The time averaged spectral analysis shows that the iron K-shell complex is best modeled with an unresolved narrow emission component (FWHM less than 5000 kilometers per second, EW approx. 60 eV) plus a broad component. This latter component has FWHM approx. 44000 kilometers per second, an EW approx. 50 eV and its profile is well described with an emission line originating from the accretion disk viewed with an inclination angle approx. 40 deg. and with the emission arising from within a few tens of gravitational radii of the central black hole. The time-resolved spectral analysis of the XMM-Newton EPIC-pn spectrum shows that both the narrow and broad components of the Fe K emission line appear to be constant within the errors. The analysis of the XMM-Newton/RGS spectrum reveals that the soft X-ray emission of MCG-5-23-16 is likely dominated by several emission lines superimposed on an unabsorbed scattered power-law continuum. The lack of strong Fe L shell emission

together with the detection of a strong forbidden line in the O VII triplet supports a scenario where the soft X ray emission lines are produced in a plasma photoionized by the nuclear emission.
Author
Emission Spectra; Iron; Seyfert Galaxies; K Lines; Active Galactic Nuclei; Mathematical Models; Absorptivity

20070023326 Universities Space Research Association, Greenbelt, MD, USA
LAT Perspectives in Detection of High Energy Cosmic Ray Electrons
Moiseev, Alexander; Ormes, J. F.; Funk, Stefan; [2007]; 2 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The GLAST Large Area Telescope (LAT) science objectives and capabilities in the detection of high energy electrons in the energy range from 20 GeV to approx. 1 TeV are presented. LAT simulations are used to establish the event selections. It is found that maintaining the efficiency of electron detection at the level of 30% the residual hadron contamination does not exceed 2-3% of the electron flux. LAT should collect approx. ten million of electrons with the energy above 20 GeV for each year of observation. Precise spectral reconstruction with high statistics presents us with a unique opportunity to investigate several important problems such as studying galactic models of IC radiation, revealing the signatures of nearby sources such as high energy cutoff in the electron spectrum, testing the propagation model, and searching for KKDM particles decay through their contribution to the electron spectrum.
Author
Cosmic Rays; Detection; High Energy Electrons; Gamma Ray Telescopes; Electron Energy; Energy Spectra

20070023358 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Eta Carinae and Other Luminous Blue Variables
Corcoran, M. F.; [2006]; 5 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023358

Luminous Blue Variables (LBVs) are believed to be evolved, extremely massive stars close to the Eddington Limit and hence prone to bouts of large-scale, unstable mass loss. I discuss current understanding of the evolutionary state of these objects, the role duplicity may play and known physical characteristics of these stars using the X-ray luminous LBVs Eta Carinae and HD 5980 as test cases.
Author
Massive Stars; Variable Stars; Stellar Evolution; Astrophysics; Blue Stars

20070023362 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Testing Special Relativity at High Energies with Astrophysical Sources
Stecker, F. W.; May 30, 2007; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

Since the group of Lorentz boosts is unbounded, there is a question as to whether Lorentz invariance (LI) holds to infinitely short distances. However, special and general relativity may break down at the Planck scale. Various quantum gravity scenarios such as loop quantum gravity, as well as some forms of string theory and extra dimension models may imply Lorentz violation (LV) at ultrahigh energies. The Gamma-Ray Large Area Space Telescope (GLAST), to be launched in mid-December, will measure the spectra of distant extragalactic sources of high energy gamma-rays, particularly active galactic nuclei and gamma-ray bursts. GLAST can look for energy-dependent gamma-ray propagation effects from such sources as a signal of Lorentz invariance violation. These sources may also exhibit the high energy cutoffs predicted to be the result of intergalactic annihilation interactions with low energy photons having a flux level as determined by various astronomical observations. With LV the threshold for such interactions can be significantly raised, changing the predicted absorption turnover in the observed spectrum of the sources. Stecker and Glashow have shown that the existence such absorption features in the spectra of extragalactic sources puts constraints on LV. Such constraints have important implications for some quantum gravity and large extra dimension models. Future spaceborne detectors dedicated to measuring gamma-ray polarization can look for birefringence effects as a possible signal of loop quantum gravity. A very small LV may also result in the modification or elimination of the GZK effect, thus modifying the spectrum of ultrahigh energy cosmic rays. This possibility can be explored with ground-based arrays such as Auger or with a space based detector system such as the proposed OWL satellite mission.
Author
Astrophysics; Relativity; Lorentz Transformations; Extragalactic Radio Sources; Gamma Ray Bursts

20070023556 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Intrinsic Properties of the Stellar Clusters in the M82 Starburst Complex: Propagating Star Formation?

Satyapal, S; Watson, Dan M.; Pipher, J. L.; Forrest, W. J.; Greenhouse, M. A.; Smith, H. A.; Fischer, J.; Woodward, Charles E.; The Astrophysical Journal; Jul 1, 1997; Volume 483, pp. 148-0160; In English

Contract(s)/Grant(s): NSF AST-89-57238; NSF AST-93-57392; NSF AST-91-16644; NSF AST-94-53354; NSF AST-91-07769; NGS-5077-93

Report No.(s): AD-A464454; Copyright; Avail.: Other Sources

Near-Infrared spectroscopy combined with high spatial resolution imaging have been used in this work to probe the central 500 pc of M82. Imaging observations in the 2.36 micrometers CO band head are added to our previously published near-infrared hydrogen recombination line imaging, near-infrared broadband imaging, and 3.29 micrometers dust feature imaging observations, in order to study the nature of the starburst stellar population. A starburst model is constructed and compared with the observations of the stellar clusters in the starburst complex. Our analysis implies that the typical age for the starburst clusters is 10(exp 7) yr. In addition, our high spatial resolution observations indicate that there is an age dispersion within the starburst complex that is correlated with projected distance from the center of the galaxy. The inferred age dispersion is 6 x 10(exp 6) yr. If the starburst in M82 is propagating outward from the center, this age dispersion corresponds to a velocity of propagation, originating in the center, of ~50 km s(exp -1). Our quantitative analysis also reveals that a Salpeter initial mass function, extending from 0.1 to 100 solar Mass, can fit the observed properties of M82 without using up more than 30% of the total dynamical mass in the starburst.

Author

Star Clusters; Star Formation; Starburst Galaxies; Stellar Evolution; Galactic Evolution; Galactic Nuclei

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20070022789 Eloret Corp., Moffett Field, CA, USA

Planetary Mission Entry Vehicles Quick Reference Guide. Version 3.0

Davies, Carol; Arcadi, Marla; [2006]; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NNA04BC25C

Report No.(s): NASA/SP-2006-3401; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070022789

This is Version 3.0 of the planetary mission entry vehicle document. Three new missions, Re-entry F, Hayabusa, and ARD have been added to the previously published edition (Version 2.1). In addition, the Huygens mission has been significantly updated and some Apollo data corrected. Due to the changing nature of planetary vehicles during the design, manufacture and mission phases, and to the variables involved in measurement and computation, please be aware that the data provided herein cannot be guaranteed. Contact Carol Davies at cdavies\@mail.arc.nasa.gov to correct or update the current data, or to suggest other missions.

Author

Aerospace Vehicles; Space Missions; Spacecraft Configurations; Spacecraft Design; Unmanned Spacecraft

20070022835 NASA Johnson Space Center, Houston, TX, USA

Submicrometer Organic Grains: Widespread Constituents of the Early Solar System

Messenger, Scott; Nakamuri-Messenger, Keiko; Keller, Lindsay; Matrajt, Graciela; Clemett, Simon; Ito, Motoo; [2007]; 1 pp.; In English; Goldschmidt 2007: Atoms to Planets, 19-24 August 2007, Cologne, Germany; Copyright; Avail.: CASI: A01, Hardcopy

Primitive meteorites and interplanetary dust particles (IDPs) contain remants of interstellar organic matter, marked by anomalous H and N isotopic ratios. These isotopic anomalies are attributed to mass fractionation during chemical reactions at cryogenic temperatures (10-100K) in a cold molecular cloud. Significant variations in the chemistry and isotopic compositions of organic compounds within and between these samples suggest varying histories of alteration and dilution of the presolar components. Recent studies have reported large H and N isotopic anomalies preserved in sub-m organic inclusions in both meteorites and IDPs. In the Tagish Lake meteorite, the largest H and N isotopic anomalies are associated with sub-m, hollow organic globules. The common physical, chemical, and isotopic characteristics of these globules suggest that they

formed before being incorporated into their parent meteorite. These organic globules probably originated as organic ice coatings that formed on preexisting ice or mineral grains in a cold molecular cloud. Radiation driven photochemistry may have processed them into refractory organic grains. This model implies that submicrometer organic grains were widely distributed throughout the solar nebula during the epoch of planet formation. Submicrometer organic particles were detected by the Giotto and Vega encounters with comet Halley, termed CHON particles based on their major element chemistry. The first direct samples of cometary dust (comet Wild-2) were returned by the Stardust spacecraft in January 2006. These samples exhibit widely varying, fine grained mineralogy similar to anhydrous IDPs, including submicrometer carbonaceous grains. The submicrometer organic grains from comet Wild-2 exhibit H and N isotopic anomalies of similar magnitude to those commonly observed in primitive meteorites and IDPs. Isotopically anomalous, submicrometer organic grains have now been observed in meteorites, IDPs, the Oort-cloud comet Halley, and the Kuiper-belt comet Wild-2, suggesting that such grains were prevalent throughout the protoplanetary disk.
Author
Organic Materials; Solar System; Granular Materials; Interplanetary Dust

20070023366 NASA Johnson Space Center, Houston, TX, USA
International Space Station Research: Accomplishments and Pathways for Exploration and Fundamental Research
Robinson, Julie A.; [2007]; 1 pp.; In English; AIAA Aerospace Sciences Meeting to be held on Jan. 7-10, 2008 in Reno, NV; No Copyright; Avail.: Other Sources; Abstract Only

Beginning with the launch of the European Columbus module planned for December 2007, we approach a transition in the assembly of the International Space Station (ISS) that is of great importance for the sciences. During the following 18 months, we will operate the first experiments in Columbus physical science resource facilities and also launch and commission the Japanese Kibo module. In addition, two Multi-purpose Logistics Module (MPLM) flights will deliver the U.S. Combustion Integrated Rack (CIR) and Fluids Integrated Rack (FIR) along with their first science experiments. These facilities provide significant new capabilities for basic and applied physical science research in microgravity. New life support technologies will come online throughout 2008, and we will reach the milestone of a 6-person crew planned for April 2009. A larger crew enables significant more scientific use of all the facilities for the life of ISS. Planning for the use of the International Space Station as a national laboratory is also maturing as we near the completion of assembly, enabling access to ISS as a research platform for other government agencies and the private sector. The latest updates on National Laboratory implementation will also be provided in this presentation. At the same time as these significant increases in scientific capability, there have been significant ongoing accomplishments in NASA's early ISS research both exploration related and fundamental research. These accomplishments will be reviewed in context as harbingers of the capabilities of the International Space Station when assembly is complete. The Vision for Space Exploration serves to focus NASA's applied investigations in the physical sciences. However, the broader capability of the space station as a National Laboratory and as a nexus for international collaboration will also influence the study of gravity-dependent processes by researchers around the world.
Author
International Space Station; Space Exploration; Research and Development; Physical Sciences

20070023435 NASA Glenn Research Center, Cleveland, OH, USA
Lunar Simulation in the Lunar Dust Adhesion Bell Jar
Gaier, James R.; Sechkar, Edward A.; June 14, 2007; 16 pp.; In English; 45th Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2007, Reno, NV, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 083229.02.99.05
Report No.(s): NASA/TM-2007-214704; AIAA Paper-2007-0963; Copyright; Avail.: CASI: A03, Hardcopy

The Lunar Dust Adhesion Bell Jar has been assembled at the NASA Glenn Research Center to provide a high fidelity lunar simulation facility to test the interactions of lunar dust and lunar dust simulant with candidate aerospace materials and coatings. It has a sophisticated design which enables it to treat dust in a way that will remove adsorbed gases and create a chemically reactive surface. It can simulate the vacuum, thermal, and radiation environments of the Moon, including proximate areas of illuminated heat and extremely cold shadow. It is expected to be a valuable tool in the development of dust repellant and cleaning technologies for lunar surface systems.
Author
Adhesion; Lunar Dust; Lunar Surface; Simulation; Test Facilities; Aerospace Environments

20070023437 NASA Glenn Research Center, Cleveland, OH, USA

Lunar Dust on Heat Rejection System Surfaces: Problems and Prospects

Gaier, James R.; Jaworske, Donald A.; June 2007; 15 pp.; In English; Space Technology and Applications International Forum, 11-15 Feb. 2007, Albuquerque, NM, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 997180.10.03.01

Report No.(s): NASA/TM-2007-214814; STAIF Paper number 26; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20070023437

Heat rejection from power systems will be necessary for human and robotic activity on the lunar surface. Functional operation of such heat rejection systems is at risk of degradation as a consequence of dust accumulation. The Apollo astronauts encountered marked degradation of performance in heat rejection systems for the lunar roving vehicle, science packages, and other components. Although ground testing of dust mitigation concepts in support of the Apollo mission identified mitigation tools, the brush concept adopted by the Apollo astronauts proved essentially ineffective. A better understanding of the issues associated with the impact of lunar dust on the functional performance of heat rejection systems and its removal is needed as planning gets underway for human and robotic missions to the Moon. Renewed emphasis must also be placed on ground testing of pristine and dust-covered heat rejection system surfaces to quantify degradation and address mitigation concepts. This paper presents a review of the degradation in performance of heat rejection systems encountered on the lunar surface to-date, and will discuss current activities underway to evaluate the durability of candidate heat rejection system surfaces and current dust mitigation concepts.

Author

Lunar Dust; Lunar Surface; Heat Radiators; Systems Engineering; Degradation

20070023478 NASA Johnson Space Center, Houston, TX, USA

The Formation and Chronology of the PAT 91501 Impact-Melt L-Chondrite with Vesicle-Metal-Sulfide Assemblages

Benedix, G. K.; Ketcham, R. A.; Wilson, L.; McCoy, T. J.; Bogard, D. D.; Garrison, D. H.; Herzog, G. F.; Xue, S.; Klein, J.; Middleton, R.; [2007]; 39 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NSF EAR-03-45710; NSF EAR-01-13480; Copyright; Avail.: CASI: A03, Hardcopy

The L chondrite Patuxent Range (PAT) 41 91501 is an 8.5-kg unshocked, homogeneous, igneous-textured impact melt that cooled slowly compared to other meteoritic impact melts in a crater floor melt sheet or sub-crater dike. We conducted mineralogical and tomographic studies of previously unstudied mm- to cm-sized metal-sulfide-vesicle assemblages and chronologic studies of the silicate host. Metal-sulfide clasts constitute about 1 vol.%, comprise zoned taenite, troilite and pentlandite, and exhibit a consistent orientation between metal and sulfide and of metal-sulfide contacts. Vesicles make up approximately 2 vol.% and exhibit a similar orientation of long axes. Ar-39-Ar-40 measurements date the time of impact at 4.461 +/- 0.008 Gyr B.P. Cosmogenic noble gases and Be-10 and Al-2l activities suggest a pre-atmospheric radius of 40-60 cm and a cosmic ray exposure age of 25-29 Myr, similar to ages of a cluster of L chondrites. PAT 91501 dates the oldest known impact on the L chondrite parent body. The dominant vesicle-forming gas was S2 (approximately 15-20 ppm), which formed in equilibrium with impact-melted sulfides. The meteorite formed in an impact melt dike beneath a crater, as did other impact melted L chondrites, such as Chico. Cooling and solidification occurred over approximately 2 hours. During this time, approximately 90% of metal and sulfide segregated from the local melt. Remaining metal and sulfide grains oriented themselves in the local gravitational field, a feature nearly unique among meteorites. Many of these metal sulfide grains adhered to vesicles to form aggregates that may have been close to neutrally buoyant. These aggregates would have been carried upward with the residual melt, inhibiting further buoyancy-driven segregation. Although similar processes operated individually in other chondritic impact melts, their interaction produced the unique assemblage observed in PAT 91501.

Author

Chondrites; Chronology; Impact Melts; Meteorite Collisions; Meteoritic Composition; Mineralogy; Sulfides; Petrology

20070023501 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Revised Model of Jupiter's Inner Electron Belts: Updating the Divine Radiation Model

Garrett, Henry B.; Levin, Steven M.; Bolton, Scott J.; Evans, Robin W.; Bhattacharya, Bidushi; Geophysical Research Letters; February 26, 2005; ISSN 0094-8276; Volume 32; 5 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://hdl.handle.net/2014/40040; http://dx.doi.org/10.1029/2004GL021986

In 1983, Divine presented a comprehensive model of the Jovian charged particle environment that has long served as a reference for missions to Jupiter. However, in situ observations by Galileo and synchrotron observations from Earth indicate the need to update the model in the inner radiation zone. Specifically, a review of the model for 1 MeV < E < 100 MeV trapped

electrons suggests that, based on the new synchrotron observations, the pitch angle distributions within L < 4 need to be updated by introducing two additional components: one near the Jovian magnetic equator and one at high magnetic latitudes. We report modifications to the model that reproduce these observations. The new model improves the fit to synchrotron emission observations and remains consistent with the original fit to the in situ Pioneer and Voyager data. Further modifications incorporating observations from the Galileo and Cassini spacecraft will be reported in the future.
Author
Jupiter (Planet); Electrons; Mathematical Models; Inner Radiation Belt; Geophysics

20070023565 NASA Johnson Space Center, Houston, TX, USA
Constellation Program Mission Operations Project Office Status and Support Philosophy
Smith, Ernest; Webb, Dennis; [2007]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

The Constellation Program Mission Operations Project Office (CxP MOP) at Johnson Space Center in Houston Texas is preparing to support the CxP mission operations objectives for the CEV/Orion flights, the Lunar Lander, and and Lunar surface operations. Initially the CEV will provide access to the International Space Station, then progress to the Lunar missions. Initial CEV mission operations support will be conceptually similar to the Apollo missions, and we have set a challenge to support the CEV mission with 50% of the mission operations support currently required for Shuttle missions. Therefore, we are assessing more efficient way to organize the support and new technologies which will enhance our operations support. This paper will address the status of our preparation for these CxP missions, our philosophical approach to CxP operations support, and some of the technologies we are assessing to streamline our mission operations infrastructure.
Author
Constellation Program; Space Shuttle Missions; Crew Exploration Vehicle; Aerospace Technology Transfer

20070023644 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Terrestrial Planet Finder Interferometer Technology Status and Plans
Lawson, Perter R.; Ahmed, A.; Gappinger, R. O.; Ksendzov, A.; Lay, O. P.; Martin, S. R.; Peters, R. D.; Scharf, D. P.; Wallace, J. K.; Ware, B.; May 24, 2006; In English; SPIE Astronomical Telescopes and Instrumentation, 24-31 May 2006, Orlando, FL, USA; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40088

A viewgraph presentation on the technology status and plans for Terrestrial Planet Finder Interferometer is shown. The topics include: 1) The Navigator Program; 2) TPF-I Project Overview; 3) Project Organization; 4) Technology Plan for TPF-I; 5) TPF-I Testbeds; 6) Nulling Error Budget; 7) Nulling Testbeds; 8) Nulling Requirements; 9) Achromatic Nulling Testbed; 10) Single Mode Spatial Filter Technology; 11) Adaptive Nuller Testbed; 12) TPF-I: Planet Detection Testbed (PDT); 13) Planet Detection Testbed Phase Modulation Experiment; and 14) Formation Control Testbed.
CASI
Interferometers; Planet Detection; Terrestrial Planets; Technology Utilization

20070023649 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Near Sun Free-Space Optical Communications from Space
Biswas, Abhijit; Khatri, F.; Boroson, D.; March 4, 2006; 7 pp.; In English; IEEE Aerospace Conference, 4-11 Mar. 2006, Big Sky, MT, USA; Original contains black and white illustrations; Copyright; Avail.: Other Sources
ONLINE: http://hdl.handle.net/2014/40091

Free-space optical communications offers expanded data return capacity, from probes distributed throughout the solar system and beyond. Space-borne and Earth-based optical transceivers used for communicating optically, will periodically encounter near Sun pointing. This will result in an increase in the scattered background light flux, often contributing to degraded link performance. The varying duration of near Sun pointing link operations relative to the location of space-probes, is discussed in this paper. The impact of near Sun pointing on link performance for a direct detection photon-counting communications system is analyzed for both ground- and space-based Earth receivers. Finally, impact of near Sun pointing on spaceborne optical transceivers is discussed.
Author
Free-Space Optical Communication; Solar System; Sun; Space Probes; Transmitter Receivers

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SOLAR PHYSICS

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

20070022877 NASA Goddard Space Flight Center, Greenbelt, MD, USA
IMP 8 GME Particle Observations Over Three Solar Cycles
Richardson, Ian; Cane, Hilary; Von Rosenvinge, Tycho; McGuire, Robert; July 03, 2007; 1 pp.; In English; 2007 International Cosmic Ray Conference, 3-11 July 2007, Merida, Yucatan, Mexico
Contract(s)/Grant(s): NNG06EO90A; No Copyright; Avail.: Other Sources; Abstract Only

The Goddard Medium Energy experiment on the IMP 8 spacecraft has made nearly continuous observations of the near-Earth energetic particle environment from its launch in October, 1973 until near present. We summarize several aspects of these observations, including solar energetic particle events, CIR-associated events, and cosmic ray modulations. In particular, we note that, as expected fiom the pattern of smaller recurrent (27 day) cosmic ray modulations seen in the mid 1980's A less than 0 solar minimum compared to the previous and following (A greater than 0) minima, recurrent modulations are again reduced in the current solar minimum.
Author
Solar Cycles; Explorer 50 Satellite; Energetic Particles

20070023318 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Survey of Interplanetary Coronal Mass Ejections During 1996 - 2007
Richardson, Ian; Cane, Hilary; May 22, 2007; 1 pp.; In English; 30th International Cosmic Ray Conference, 3-11 July 2007, Merida, Yucatan, Mexico
Contract(s)/Grant(s): NNG06E090A; No Copyright; Avail.: Other Sources; Abstract Only

Interplanetary coronal mass ejections, the interplanetary counterparts of coronal mass ejections at the Sun, are the major drivers of interplanetary shocks in the heliosphere, and are associated with modulations of the galactic cosmic ray intensity, both short term (Forbush decreases caused by the passage of the shock, post-shock sheath, and ICME) and possibly with longer term modulation. Using several in-situ signatures of ICMEs, including plasma temperature, and composition, magnetic fields, and cosmic ray modulations, made by near-Earth spacecraft, we have compiled a 'comprehensive' list of ICMEs passing the Earth since 1996, encompassing solar cycle 23. We summarize the properties of these ICMEs, such as their occurrence rate, speeds, association with solar energetic particle events, shocks and cosmic ray decreases.
Author
Coronal Mass Ejection; Galactic Cosmic Rays; Interplanetary Shock Waves; Sun; Surveys

93
SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

20070022793 NASA Langley Research Center, Hampton, VA, USA
Effects of RAM Exposure on a Low Earth Orbit BroadBand Radiometer (BBR): CERES Experience and Implications for EarthCARE
Matthews, Grant; Priestley, Kory; Thomas, Susan; Hess, Pil; Cooper, Denise; Walikainen, Dale; May 07, 2007; 5 pp.; In English; Meeting held on May 7-9, 2007, Noordwijk, Netherlands; Original contains color illustrations
Contract(s)/Grant(s): WBS 921266.04.07.07; Copyright; Avail.: CASI: A01, Hardcopy

In order to best detect real changes in the Earth's climate system it is estimated that space based instrumentation measuring the global Earth Radiation Budget (ERB) must remain calibrated with a stability of 0.3% per decade. This level of stability is beyond the specified accuracy of existing ERB programs such as the Clouds and the Earth's Radiant Energy System (CERES, using three broadband radiometric scanning channels: the shortwave (SW 0.3 - 5?m), total (0.3 - >100 micron), and window (8 - 12 micron)). When in low earth orbit, it has been shown that optical response to blue-UV radiance can be reduced significantly (> 3%) due to UV hardened contaminants deposited on the surface of the optics. Evidence suggests that exposure of telescope optics to the forward looking ram direction is the primary cause of this contamination build up. With typical onboard calibration lamps emitting very low energy in the blue-UV region, this darkening is not directly measurable using standard internal calibration techniques. This paper describes a study using a model of ram exposure induced

contaminant deposition and darkening, in conjunction standard established in-flight vicarious and internal calibration techniques to derive the spectral shape of the darkening to which a broadband instrument is subjected. The results of the model when applied to the CERES instruments are shown. These findings are of great importance to the EarthCARE project, whose BBR uses one broadband telescope permanently looking forward at 45 degrees, with continual exposure to the ram direction. Specific attention may therefore be needed in the design of BBR optics and on-board calibration in order to prevent or compensate for the spectral darkening seen in the CERES project.
Author
Ceres (Experiment); Earth Radiation Budget; Radiometers; Remote Sensing; Terrestrial Radiation

20070023424 NASA Johnson Space Center, Houston, TX, USA
Finding Uncertainties that Cause the Age Dependence of Dose Limits to Be Immature
Cucinotta, Francis A.; July 13, 2007; 1 pp.; In English; 18th Annual NASA Space Radiation Investigators' Workshop, 13-15 July 2007, Rohnert Park, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Space radiation permissible exposure limits (PEL) are intended to set acceptable levels of cancer risks, and avoid any clinical significant non-cancer effects. The 1989 recommendation of the National Council of Radiation Protection and Measurements (NCRP) recommended a strong age dependence of dose limits that departed drastically from the then mature 1970 dose limits recommendations from the National Academy of Science, which were independent of age. In 2000, the NCRP recommended revised limits that showed a similar trend of risk with age to the 1989 report. In this model, the cancer risk per Sv varies by more than 2-fold for ages between 30- and 50-yr. Therefore for galactic cosmic rays exposure, astronaut age has a larger influence on risk then radiation shielding mass or material composition, vehicle propulsion method, or position in the solar cycle. For considering the control of mission costs and resources, the possibility of using astronaut age as a trade variable in mission design could be considered. However, the uncertainties in describing the age dependence on risk have not been fully explored. We discuss biological factors that influence the age dependence of radiation risks, including susceptibility, expression and latency, and radiation quality. These factors depend not only on the individual s age, but also their genetic sensitivity and interaction with other environmental factors. Epidemiological data is limited in describing the age dependence on risk. The 2005, BEIR VII report recommends an age dependence for cancer risk attributable solely to the life-table disagreeing strongly with the NCRP model. However, BEIR VII also noted the limited power of human data for concomitantly describing both age and age after exposure dependences of cancer risks. Many experimental studies have shown that high LET radiation (e.g., high charge and energy (HZE) nuclei and neutrons) display reduced latency compared to low LET radiation, suggesting distinct biological factors are important. We discuss potential molecular mechanisms that would influence the age dependence of radiation risks. A probability distribution function for the uncertainties in age-dependence of risk models is described and predictions for Mars missions discussed. Our report suggests that theoretical considerations based on new experimental studies are needed to ensure the correct age dependence in space radiation risk models and the resulting Astronaut PEL.
Author
Extraterrestrial Radiation; Aging (Biology); Radiation Dosage; Cancer

99
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.

20070023367 NASA Dryden Flight Research Center, Edwards, CA, USA
Six Decades of Flight Research: An Annotated Bibliography of Technical Publications of NASA Dryden Flight Research Center, 1946-2006
Fisher, David F.; May 2007; 785 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TP-2007-213684; H-2651; No Copyright; Avail.: CASI: A99, Hardcopy
ONLINE: http://hdl.handle.net/2060/20070023367

Titles, authors, report numbers, and abstracts are given for nearly 2900 unclassified and unrestricted technical reports and papers published from September 1946 to December 2006 by the NASA Dryden Flight Research Center and its predecessor organizations. These technical reports and papers describe and give the results of 60 years of flight research performed by the NACA and NASA, from the X-1 and other early X-airplanes, to the X-15, Space Shuttle, X-29 Forward Swept Wing, X-31,

and X-43 aircraft. Some of the other research airplanes tested were the D-558, phase 1 and 2; M-2, HL-10 and X-24 lifting bodies; Digital Fly-By-Wire and Supercritical Wing F-8; XB-70; YF-12; AFTI F-111 TACT and MAW; F-15 HiDEC; F-18 High Alpha Research Vehicle, F-18 Systems Research Aircraft and the NASA Landing Systems Research aircraft. The citations of reports and papers are listed in chronological order, with author and aircraft indices. In addition, in the appendices, citations of 270 contractor reports, more than 200 UCLA Flight System Research Center reports, nearly 200 Tech Briefs, 30 Dryden Historical Publications, and over 30 videotapes are included.

Author

Bibliographies; Flight Tests; Research Aircraft; Space Flight; Research and Development; Histories

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