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Marshall Space Flight Center, Marshall Space Flight Center, Alabama

June 2007
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FOREWORD

In accordance with the NASA Space Act of 1958, the George C. Marshall Space Flight Center (MSFC) has provided for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

Since July 1, 1960, when MSFC was organized, the reporting of scientific and engineering information has been considered a prime responsibility of the Center. Our credo has been that “research and development work is valuable, but only if its results can be communicated and made understandable to others.”
GEORGE C. MARSHALL SPACE FLIGHT CENTER  
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FY 2005 SCIENTIFIC AND TECHNICAL REPORTS,  
ARTICLES, PAPERS, AND PRESENTATIONS

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Monitoring the atmospheric composition of a crewed spacecraft cabin is central to successfully expanding the breadth and depth of first-hand human knowledge and understanding of space. Highly reliable technologies must be identified and developed to monitor atmospheric composition. This will enable crewed space missions that last weeks, months, and eventually years. Atmospheric composition monitoring is a primary component of any environmental control and life support system. Instrumentation employed to monitor atmospheric composition must be inexpensive, simple, and lightweight and provide robust performance. Such a system will ensure an environment that promotes human safety and health, and that the environment can be maintained with a high degree of confidence. Key to this confidence is the capability for any technology to operate autonomously, with little intervention from the crew or mission control personnel. A study has been conducted using technologies that, with further development, may reach these goals.

Launch vehicles consume large quantities of propellant quickly, causing the mass properties and structural dynamics of the vehicle to change dramatically. Currently, structural load assessments account for this change in a more efficient manner. The method allows for the subtraction of propellant mass as the propellant is used in the simulation. This subtraction is done in the modal domain of the vehicle generalized model. Additional computation required is primarily for constructing the used propellant mass matrix from an initial propellant model and further matrix multiplications and subtractions. An additional eigenvalue solution is required to uncouple the new equations of motion; however, this is a much simpler calculation starting from a system that is already substantially uncoupled. The method was successfully tested in a simulation of Saturn V loads. Results from the method are compared to results from separate structural models for several propellant levels, showing excellent agreement. Further development to encompass more complicated propellant models, including slosh dynamics, is possible.

Quartz crystal microbalances (QCMs) are commonly used to measure the rate of deposition of molecular species on a surface. The measurement is often used to select materials with a low outgassing rate for applications where the material has a line of sight to a contamination-sensitive surface. A quantitative, in situ calibration of the balance, or balances, using a pure material for which the enthalpy of sublimation is known, is described in this Technical Memorandum. Supporting calculations for surface dwell times of deposited materials and the effusion cell Claisen factor are presented along with examples of multiple QCM measurements of outgassing from a common source.

Many microgravity space-science experiments require vibratory acceleration levels that are unachievable without active isolation. The Boeing Corporation’s active rack isolation system (ARIS) employs a novel combination of magnetic actuation and mechanical linkages to address these isolation requirements on the International Space Station.

Effective model-based vibration isolation requires: (1) An isolation device, (2) an adequate dynamic; i.e., mathematical, model of that isolator, and (3) a suitable, corresponding controller. This Technical Memorandum documents the validation of that high-fidelity dynamic model of ARIS.

The verification of this dynamics model was achieved by utilizing two commercial off-the-shelf (COTS) software tools: Deneb’s ENVISION®, and Online Dynamics’ Autolev™. ENVISION is a robotics software package developed for the automotive industry that employs three-dimensional computer-aided design models to facilitate both forward and inverse kinematics analyses. Autolev is a DOS-based interpreter designed, in general, to solve vector-based mathematical problems and specifically to solve dynamics problems using Kane’s method.
This Technical Memorandum describes the development of several high-strength aluminum (Al) alloys that are compatible with hydrogen peroxide ($\text{H}_2\text{O}_2$) propellant for NASA Hypersonic-X (Hyper-X) vehicles’ fuel tanks and structures. The yield strengths for some of these Al-magnesium-based alloys are more than 3 times stronger than the conventional 5254–H112 Al alloy, while maintaining excellent $\text{H}_2\text{O}_2$ compatibility similar to class 1 5254 alloy. The alloy development strategy is to add scandium, zirconium, and other transitional metals with unique electrochemical properties, which will not act as catalysts, to decompose the highly concentrated 90 percent $\text{H}_2\text{O}_2$. Test coupons are machined from sheet metals for $\text{H}_2\text{O}_2$ long-term exposure testing and mechanical properties testing. In addition, the ability to weld the new alloys using friction stir welding has also been explored. The new high-strength alloys could represent an enabling material technology for Hyper-X vehicles, where flight weight reduction is a critical requirement.

A potential fission power system for in-space missions is a heat pipe-cooled reactor coupled to a Brayton cycle. In this system, a heat exchanger (HX) transfers the heat of the reactor core to the Brayton gas. The Safe, Affordable Fission Engine- (SAFE-) 100a is a test program designed to thermally and hydraulically simulate a 95 Btu/s prototypic heat pipe-cooled reactor using electrical resistance heaters on the ground. This Technical Memorandum documents the thermal and structural assessment of the HX used in the SAFE-100a program.

This Technical Memorandum covers revolutionary ideas for space radiation shielding that would mitigate mission costs while limiting human exposure, as studied in a workshop held at Marshall Space Flight Center at the request of NASA Headquarters. None of the revolutionary new ideas examined for the first time in this workshop showed clear promise. The workshop attendees felt that some previously examined concepts were definitely useful and should be pursued. The workshop attendees also concluded that several of the new concepts warranted further investigation to clarify their value.

The International Space Station (ISS) uses high-efficiency particulate air filters to remove particulate matter from the cabin atmosphere. Known as bacteria filter elements (BFEs), there are 13 elements deployed on board the ISS’s U.S. segment in the flight 4R assembly level. The preflight service life prediction of 1 yr for the BFEs is based upon engineering analysis of data collected during developmental testing that used a synthetic dust challenge. While this challenge is considered reasonable and conservative from a design perspective, an understanding of the actual filter loading is required to best manage the critical ISS program resources. Testing was conducted on BFEs returned from the ISS to refine the service life prediction. Results from this testing and implications to ISS resource management are provided.

In the late 1980s, microgravity researchers began to voice their concern that umbilical-transmitted energy could significantly degrade the acceleration environment of microgravity
space science experiments onboard manned spacecraft. Since umbilicals are necessary for many experiments, control designers began to seek ways to compensate for these “indirect” disturbances.

Hampton et al. used the Kane’s method to develop a model of the active rack isolation system (ARIS) that includes (1) actuator control forces, (2) direct disturbance forces, and (3) indirect, actuator-transmitted disturbances. Their model does not, however, include the indirect, umbilical-transmitted disturbances. Since the umbilical stiffnesses are not negligible, these indirect disturbances must be included in the model. Until the umbilicals have been appropriately included, the model will be incomplete.

This Technical Memorandum presents a nonlinear model of ARIS with umbilicals included. Model verification was achieved by utilizing two commercial-off-the-shelf software tools. Various forces and moments were applied to the model to yield simulated responses of the system. Plots of the simulation results show how various critical points on an ARIS-outfitted international standard payload rack behave under the application of direct disturbances, indirect disturbances, and control forces. Simulations also show system response to a variety of initial conditions.

TM—2005–213902

Method for Determination of <5 ppm Oxygen in Sodium Samples. R.S. Reid, J.J. Martin, and G.L. Schmidt*. Propulsion Research Center, Space Transportation Directorate and *New Mexico Institute of Mining and Technology.

Alkali metals used in pumped loops or heat pipes must be sufficiently free of nonmetallic impurities to ensure long heat rejection system life. Life issues are well established for alkali metal systems. Impurities can form ternary compounds between the container and working fluid, leading to corrosion. This Technical Memorandum discusses the consequences of impurities and candidate measurement techniques to determine whether impurities have been reduced to sufficiently low levels within a single-phase liquid metal loop or a closed two-phase heat transfer system, such as a heat pipe. These techniques include the vanadium wire equilibration, neutron activation analysis, plug traps, distillation, and chemical analysis. Conceptual procedures for performing vanadium wire equilibration purity measurements on sodium contained in a heat pipe are discussed in detail.

TM—2005–214007


Human exploration and utilization of space requires habitats to provide appropriate conditions for working and living. These conditions are provided by environmental control and life support systems (ECLSS) that ensure appropriate atmosphere composition, pressure, and temperature; manage and distribute water, process waste matter, provide fire detection and suppression; and other functions as necessary.

The tables in appendix I of NASA RP–1324 “Designing for Human Presence in Space” summarize the life support functions and processes used onboard U.S. and U.S.S.R./Russian space habitats. These tables have been updated to include information on thermal control methods and to provide additional information on the ECLS systems.

TM—2005–214008

An Assessment of the International Space Station’s Trace Contaminant Control Subassembly Process Economics. J.L. Perry, H.E. Cole,* and H.N. El-Lessy**. Spacecraft and Vehicle Systems Department, Engineering Directorate *The Boeing Company, Huntsville, AL, and **The Boeing Company, Houston, TX.

The International Space Station (ISS) Environmental Control and Life Support System includes equipment specifically designed to actively remove trace chemical contamination from the cabin atmosphere. In the U.S. on-orbit segment, this function is provided by the trace contaminant control subassembly (TCCS) located in the atmosphere revitalization subsystem rack housed in the laboratory module, Destiny. The TCCS employs expendable adsorbent beds to accomplish its function leading to a potentially significant life cycle cost over the life of the ISS. Because maintaining the TCCSs proper can be logistically intensive, its performance in flight has been studied in detail to determine where savings may be achieved. Details of these studies and recommendations for improving the TCCS’s process economics without compromising its performance or crew health and safety are presented and discussed.

TM—2005–214061


Contaminated air, whether in a crewed spacecraft cabin or terrestrial work and living spaces, is a pervasive problem affecting human health, performance, and well-being. The need for highly effective, economical air quality processes spans a wide range of terrestrial and space flight applications. Typically, air quality control processes rely on absorption-based processes. Most industrial packed-bed adsorption processes use activated
carbon. Once saturated, the carbon is either dumped or regenerated. In either case, the dumped carbon and concentrated waste streams constitute a hazardous waste that must be handled safely while minimizing environmental impact. Thermal catalytic oxidation processes designed to address waste handling issues are moving to the forefront of cleaner air quality control and process gas decontamination processes. Careful consideration in designing the catalyst substrate and reactor can lead to more complete contaminant destruction and poisoning resistance. Maintenance improvements leading to reduced waste handling and process downtime can also be realized. Performance of a prototype thermal catalytic reaction based on ultrashort waste channel, monolith catalyst substrate design, under a variety of process flow and contaminant loading conditions, is discussed.

TM—2005–214184 September 2005
In-Space Propulsion: Connectivity to In-Space Fabrication and Repair. L. Johnson, D. Harris, A. Trausch, G.L. Matloff,* T. Taylor,** and K. Cutting***. In-Space propulsion Technology Office, Space Transportation Programs/Projects Office, *New York City College of Technology, **BAE Systems, and ***Gray Research.

The connectivity between new in-space propulsion technologies and the ultimate development of an in-space fabrication and repair infrastructure are described in this Technical Memorandum. A number of advanced in-space propulsion technologies are being developed by NASA, many of which are directly relevant to the establishment of such an in-space infrastructure. These include aerocapture, advanced solar-electric propulsion, solar-thermal propulsion, advanced chemical propulsion, tethers, and solar photon sails. Other, further term technologies have also been studied to assess their utility to the development of such an infrastructure.

TM—2005–214186 September 2005

The Advanced Sensor Concepts project was conducted under the Center Director’s Discretionary Fund at the Marshall Space Flight Center. Its objective was to advance the technology originally developed for the Glovebox Integrated Microgravity Isolation Technology project. The objective of this effort was to develop and test several new motion sensors. To date, the investigators have invented seven new technologies during this endeavor and have conceived several others. The innovative basic sensor technology is an absolute position sensor. It employs only two active components, and it is simple, inexpensive, reliable, repeatable, lightweight, and relatively unobtrusive. Two sensors can be utilized in the same physical space to achieve redundancy. The sensor has micrometer positional accuracy and can be configured as a two- or three-dimensional sensor. The sensor technology has the potential to pioneer a new class of linear and rotary sensors. This sensor is the enabling technology for autonomous assembly of modular structures in space and on extraterrestrial locations.

TM—2005–214189 September 2005

During the 113 missions of the Space Transportation System (STS) to date, the Space Shuttle fleet has been exposed to the elements on the launch pad for ≈4,195 days. The Natural Environments Branch at Marshall Space Flight Center archives atmospheric environments to which the Space Shuttle vehicles are exposed. This Technical Memorandum (TM) provides a summary of the historical record of the meteorological conditions encountered by the Space Shuttle fleet during the pad exposure period. Parameters included in this TM are temperature, relative humidity, wind speed, wind direction, sea level pressure, and precipitation. Extremes for each of these parameters for each mission are also summarized. Sources for the data include meteorological towers and hourly surface observations. Data are provided from the first launch of the STS in 1981 through the launch of STS–107 in 2003.

Spotless days are examined as a predictor for the size and timing of a sunspot cycle. For cycles 16–23 the first spotless day for a new cycle, which occurs during the decline of the old cycle, is found to precede minimum amplitude for the new cycle by about \(\approx 34\) mo, having a range of 25–40 mo. Reports indicate that the first spotless day for cycle 24 occurred in January 2004, suggesting that minimum amplitude for cycle 24 should be expected before April 2007, probably sometime during the latter half of 2006. If true, then cycle 23 will be classified as a cycle of shorter period, inferring further that cycle 24 likely will be a cycle of shorter than average minimum and maximum amplitudes and faster than average rise, peaking sometime in 2010.


A multimegawatt-class nuclear fission powered closed cycle magnetohydrodynamic space power plant using a helium/xenon working gas has been studied, to include a comprehensive system analysis. Total plant efficiency was expected to be 55.2 percent including preionization power. The effects of compressor stage number, regenerator efficiency, and radiation cooler temperature on plant efficiency were investigated. The specific mass of the power generation plant was also examined. System specific mass was estimated to be 3 kg/kWe for a net electrical output power of 1 MWe, 2–3 kg/kWe at 2 MWe, and \(\approx 2\) kg/kWe at \(>3\) MWe. Three phases of research and development plan were proposed: (1) Phase I—proof of principle, (2) Phase II—demonstration of power generation, and (3) Phase III—prototypical closed loop test.


A computational method for the analysis of longitudinal-mode liquid rocket combustion instability has been developed based on the unsteady, quasi-one-dimensional Euler equations where the combustion process source terms were introduced through the incorporation of a two-zone, linearized representation: (1) A two-parameter collapsed combustion zone at the injector face, and (2) a two-parameter distributed combustion zone based on a Lagrangian treatment of the propellant spray. The unsteady Euler equations in inhomogeneous form retain full hyperbolicity and are integrated implicitly in time using second-order, high-resolution, characteristic-based, flux-differencing spatial discretization with Roe-averaging of the Jacobian matrix. This method was initially validated against an analytical solution for nonreacting, isentropic duct acoustics with specified admittances at the inflow and outflow boundaries. For small amplitude perturbations, numerical predictions for the amplification coefficient and oscillation period were found to compare favorably with predictions from linearized small-disturbance theory as long as the grid exceeded a critical density (\(\approx 100\) nodes/wavelength). The numerical methodology was then exercised on a generic combustor configuration using both collapsed and distributed combustion zone models with a short nozzle admittance approximation for the outflow boundary. In these cases, the response parameters were varied to determine stability limits defining resonant coupling onset.
This document contains the proceedings of the Fifth International Symposium on Liquid Space Propulsion, held in Chattanooga, TN, October 27–30, 2003. The International Liquid Space Propulsion Symposia provide the principal forum for all aspects of liquid rocket propulsion. The aim of the symposium series is to gather international experts in the field of liquid rocket engines on a regular basis for presentations and discussions of the current status of research and development. Besides an exchange of information about future trends, it also fortifies existing cooperation and acts as a nucleus to establish networks to enhance international scientific collaboration in the liquid rocket propulsion area.

As a space-faring nation, we are at a critical juncture in the evolution of space exploration. NASA has announced its Vision for Space Exploration, a vision of returning humans to the Moon, sending robots and eventually humans to Mars, and exploring the outer solar system via automated spacecraft. However, mission concepts have become increasingly complex, with the potential to yield a wealth of scientific knowledge. Meanwhile, there are significant resource challenges to be met. Launch costs remain a barrier to routine space flight; the ever-changing fiscal and political environments can wreak havoc on mission planning; and technologies are constantly improving, and systems that were state of the art when a program began can quickly become outmoded before a mission is even launched. This Conference Publication describes the workshop and featured presentations by world-class experts presenting leading-edge technologies and applications in the areas of power and propulsion; communications; automation, robotics, computing, and intelligent systems; and transformational techniques for space activities. Workshops such as this one provide an excellent medium for capturing the broadest possible array of insights and expertise, learning from researchers in universities, national laboratories, NASA field Centers, and industry to help better our future in space.

The objective of this Technical Interchange Meeting was to increase the quantity and quality of technical, cost, and programmatic data used to model the impact of investing in different technologies. The focus of this meeting was the Technology Tool Box (TTB), a database of performance, operations, and programmatic parameters provided by technologists and used by systems engineers. The TTB is the data repository used by a system of models known as the Advanced Technology Lifecycle Analysis System (ATLAS). This report describes the result of the November meeting, and also provides background information on ATLAS and the TTB.
On Structural Design of a Mobile Lunar Habitat With Multi-Layered Environmental Shielding. M. Rais-Rohani. NASA's Faculty Fellowship Program, Mississippi State University.

This report presents an overview of a Mobile Lunar Habitat (MLH) structural design consisting of advanced composite materials. The habitat design is derived from the cylindrical-shaped U.S. Lab module aboard the International Space Station (ISS) and includes two lateral ports and a hatch at each end that geometrically match those of the ISS Nodes. Thus, several MLH units can be connected together to form a larger lunar outpost of various architectures. For enhanced mobility over the lunar terrain, the MLH uses six articulated insect-like robotic, retractable legs enabling the habitat to fit aboard a launch vehicle. The carbon-composite shell is sandwiched between two layers of hydrogen-rich polyethylene for enhanced radiation shielding. The pressure vessel is covered by modular double-wall panels for meteoroid impact shielding supported by externally mounted stiffeners. The habitat’s structure is an assembly of multiple parts manufactured separately and bonded together. Based on the geometric complexity of a part and its material system, an appropriate fabrication process is proposed.

CR—2005–213847 January 2005
The 2004 NASA Faculty Fellowship Program Research Reports. J.R. Pruitt, G. Karr,* L.M. Freeman,** and R. Hassan*** (Program Directors) and J.B. Day (Compiler and Editor). Prepared for the Education Programs Department, Customer and Employee Relations Directorate, *The University of Alabama in Huntsville, **The University of Alabama, Tuscaloosa, and ***Alabama A&M University.

For the 40th consecutive year, the NASA Faculty Fellowship Program (NFFP) was conducted at Marshall Space Flight Center (MSFC). The program was sponsored by NASA Headquarters, Washington, DC, and operated under contract by The University of Alabama, The University of Alabama in Huntsville, and Alabama A&M University. In addition, promotion and applications are managed by the American Society for Engineering Education (ASEE) and assessment is completed by Universities Space Research Association (USRA). The nominal starting and finishing dates for the 10-week program were June 1 through August 6, 2004. The primary objectives of the NASA Faculty Fellowship Program are to: (1) Increase the quality and quantity of research collaborations between NASA and the academic community that contribute to the Agency’s space aeronautics and space science mission; (2) Engage faculty from colleges, universities, and community colleges in current NASA research and development; (3) Foster a greater public awareness of NASA science and technology, and therefore facilitate academic and workforce literacy in these areas; (4) Strengthen faculty capabilities to enhance the STEM workforce, advance competition, and infuse mission-related research and technology content into classroom teaching; and (5) Increase participation of underrepresented and underserved faculty and institutions in NASA science and technology.


Single-crystal super alloys are commonly used for components in the hot sections of contemporary jet and rocket engines. Due to the anisotropic nature of single-crystal materials, the use of existing isotropic fracture mechanics calculations leads to errors in stress intensity factors. The difference can be substantial.

Presented in this report is the solution for calculating stress intensity factors in generally anisotropic materials using the \( M \)-integral. Included are examples of this solution applied to Brazilian disk crack growth specimens.
ABBAS, M.M. XD12
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NASA Celebrates the World Year of Physics—Abstract Only. For presentation at the American Association of Physics Teachers, Albuquerque, NM, January 8–12, 2005.

HOOVER, R.B. NP10
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Template for Systems Engineering Tools Trade Study—Abstract Only. For presentation at the 1st International Conference on Innovation and Integration in Aerospace Sciences, Queen’s University Belfast, Northern Ireland, August 4–5, 2005.

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STRONG, J.D. Morgan Research Corp.

Are we There Yet?—Developing In Situ Fabrication and Repair (ISFR) Technologies to Explore and Live on the Moon and Mars—Abstract Only. For presentation at the 1st Space Exploration Conference: Continuing the Voyage of Discovery, Orlando, FL, January 30–February 2, 2005.

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GLADSTONE, G.R. SWRI
WAITE, JR., J.H. University of Michigan
CRAVENS, T.E. University Of Kansas
OSTGAARD, N. University of Bergen
CHANG, S-W. University of California
METZGER, A.E. Jet Propulsion Laboratory (JPL)


BHARDWAJ, A. NRC
ELSNER, R.F. XD12
GLADSTONE, G.R. SWRI
WAITE, JR., J.H. University of Michigan
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CHANG, S-W. University of California
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BRANDuARDI-RAYMONT, G. uCL, MSSL
CRAVENS, T.E. University of Kansas
FORD, P.G. Center for Space Research


BHARDWAJ, A. NRC
ELSNER, R.F. XD12
WAITE, JR., J.H. University of Michigan
GLADSTONE, G.R. SWRI
CRAVENS, T.E. University of Kansas
FORD, P.G. Center for Space Research


BODIFORD, M.P. SD40
BURKS, K.H. SD40
FISKE, M.R. Morgan Research Corp.
MCuGREcuOR, W.L. Morgan Research Corp.
POPE, R.D. Qualis Corp.


BODIFORD, M.P. SD40
GILLEY, S.D. Tec-Masters, Inc.
HOWARD, R.W. Teledyne Brown Engineering
KuENNEDY, J.P. Teledyne Brown Engineering
RAY, J.A. Teledyne Brown Engineering

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BODIFORD, M.P. SD40
BROWN, G.N. SY10
MCuGREcuOR, W.L. Morgan Research Corp.


BODIFORD, M.P. SD40
FISKE, M.R. Morgan Research Corp.


BONAMENTE, M. UAH
LIEU, R. UAH
MITTAZ, P.D. UAH
KAASTRA, J.S. SRON Utrecht
NEVALAINEN, J. Harvard-Smithsonian


BONOMETTI, J.A. NP40
SORENSEN, K.F. NP23
JANSEN, R. University of Toledo
DANKANICH, J.W. Gray Research, Inc.
FRAME, K.L. Gray Research, Inc.


BRADSHAW, R.C. University of Massachusetts
SCHMIDT, D.P. University of Massachusetts
ROGERS, J.R. XD42
KELTON, K.F. Washington University
HYERS, R.W. University of Massachusetts


BRAGG-SITTON, S.M. ER11


BRAGG-SITTON, S.M. ER11


BROWN, K.K. TD51
NELSON, K.W. TD51


BURNS, L. RAYTHEON
DECKER, L. EV13

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CARPENTER, P.K. XD42/BAE Systems
GILLIES, D.C. XD41


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CARPENTER P.K. XD42/BAE Systems


CARPENTER, P.K. XD42/BAE Systems


CARRASQUILLO, R.L. EV50

CARRASQUILLO, R.L. EV50

CARRINGTON, C.K. SP20

CARTER, D.L. EV50
TABB, D. EV50
TATARA, J.D. Qualis Corp.

CASE, J.T. University of Missouri-Rolla
ROBBINS, J. University of Missouri-Rolla
KHARKOVSKY, S. University of Missouri-Rolla
HEPBURN, F.L. EM20

CASE, J.T. University of Missouri-Rolla
ROBBINS, J. University of Missouri-Rolla
KHARKOVSKY, S. University of Missouri-Rolla
HEPBURN, F.L. EM20

CECIL, D. UAH
GOODMAN, S.J. XD11
BOCCIPPIO, D.J. XP11

ZIPSER, E.J. University of Utah

CHANDLER, F. The Boeing Company
GRAYSON, G. The Boeing Company
MAZURKIVICH, P. NP60

CHANDLER, M.O. XD12
AVANOVA, L.A. XD12


CHANG, H. XD42/UAH
SMITH, D.D. XD42/University of Mexico
FULLER, K.A. National Space Science and Technology Center
DIMMOCK, J.O. UAH
GREGORY, D.A. UAH
FRAZIER, D.O. XD42

CHANG, H. XD42/UAH
SMITH, D.D. XD42/University of New Mexico


CHANG, J. Purple Mountain Laboratory
SCHMIDT, W.K.H. Max-Planck-Institut für Aeronomie
ADAMS, J.H. XD12

AHN, H.S. University of Maryland
BASHINDZHAGYAN, G.L. Moscow State University
BATKOV, K.E. Moscow State University
CHRISTL, M. Louisiana State University
FAZELY, A.F. Southern University
GANEL, O. University of Maryland

ET AL.

CHAUVER, D.G. XD22
BENGTSON, R. University of Texas at Austin
BREIZMAN, B. University of Texas at Austin
CHANG-DIAZ, F. XD22
JONES, J. XD22
DOBSON, C. XD22

Status of Magnetic Nozzle and Plasma Detachment Experiment—Abstract Only. For presentation at the 53rd JPM/2nd LPS/SP Joint Meeting (JANNAF), Monterey, CA, December 5–8, 2005.

CHAUVER, D.G. XD22


CHENG, G.C. UAB
MELLOCA, D.G. UAB
FARMER, R.C. UAB


CHEW, G. SAIC
PELACCIO, D.G. SAIC
CHIROUX, R. SAIC
PERVAN, S. SAIC
RAUWOLF, G.A. SAIC
WHITE, C. ER11

Preliminary Assessment of Thrust Augmentation of NEP Based Missions—Extended Abstract. For presentation at the American Institute of Aeronautics and Astronautics—Space 2005 Space Conference, Long Beach, CA, August 30–September 1, 2005.

COFFEY, V.N. XD12
SINGH, N. UAH
AVANOV, L.A. XD12


CHOUDHARY, D.P. SD50


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Global Lightning Activity—Abstract Only. For presentation at the Cosmosphere and Space Center, Wichita, KA, April 14–15, 2005, and at the Mexican Meteorological Conference, Cancun, Mexico, February 28–March 4, 2005.

CHRISTIAN, H.J. XD11


CHUNG, Y.T. The Boeing Company
LO, W. The Boeing Company
FOWLER, S.B. XP01
TOWNER, R. Jacobs Sverdrup


CLINTON, R.G. XD40
SOFRAN, F.R. XD40
BASSLER, J.A. XD40
SCHLAGHECK, R.A. XD40
COOK, M.B. XD40


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AVANOV, L.A. XD12

Modeled and Observed Relationship Between Ion Energization and the Broadband ELF Spectrum—Abstract Only. For presentation at and conference proceedings of
the American Geophysical Union 2005 Fall Meeting, San Francisco, CA, December 5–9, 2005.

COLE, J.W. XD20
Metallic Hydrogen and Nontube Magnets — Abstract Only.
For presentation at the Army’s National Ground Intelligence Center Workshop (MAD Scientist 2004), Charlottesville, VA, November 3–5, 2004.

COLE, J.W. XD20

COMARAZAMY, D.E. University of Puerto Rico
GONZALEZ, J.E. Santa Clara University
LUVALL, J.C. XD11
RICKMAN, D.L. XD11

COOK, S. NP01
TYSON, R. NP01

COOKE, W.J. EV13
MOSER, D. Morgan Research Corp.

COOKE, W.J. EV13
SWIFT, W.R. Raytheon/EV13
SUGGS, R.M. EV13

COOKE, W.J. EV13
MCNAMARA, H.A. EV13

COSMO, M.L. Harvard-Smithsonian Center for Astrophysics
LORENZINI, E.C. Harvard-Smithsonian Center for Astrophysics
GRAMER, D.J. Orbital Technologies Corp.
HOFFMAN, J.H. The University of Texas
MAZZOLENI, A.P. North Carolina State University

COX, M.C. Vanderbilt University
ANILKUMAR, A.V. Vanderbilt University
GRUGEL, R.N. XD41
HOFMEISTER, W.H. XD41

CRAVEN, P.O. XD12
LIEMOHN, M. XD12
CHANDLER, M.O. XD12
MOORE, T. XD12

CRAVENS, T.E. University of Kansas
CLARK, J. University of Kansas
BHARDWAJ, A. NRC
ELSNER, R.F. XD12
WAITE, JR., J.H. University of Michigan
ACTON, L.W. Montana State University
MAURELLIS, A.N. Space Research Organization Netherlands
GLADSTONE, G.R. SWRI

CROSSON, W.L. XD11
ESTES, M.E. XD11
KAHN, M. XD11
LAPENTA, W.M. XD11
QUATTROCHI, D.A. XD11
Mesoscale Modeling of Atlanta, GA Utilizing a New High-Resolution Landcover Data Set — Abstract Only. For
presentation at the 86th Annual AMS Meeting, Atlanta, GA, January 29–February 02, 2006.

CROSSON, W.L. XD11
LIMAYE, A. XD11
LAYMON, C.A. ISO4


CRUZEN, C.A. EO03
DYER, S.V. EO03
GIBBS III, R.E. The Boeing Company
CECH, J.G. Teledyne Brown Engineering


CURRERI, P.A. XD40


CURRERI, P.A. XD40

In Situ Resources in Space—Abstract Only. For presentation at the National Space and Missle Materials Symposium, Summerlin, NV, June 27–July 1, 2005.

DARDEN, C. National Weather Service Forecast Office
GATLIN, P. National Weather Service Forecast Office
BURKS, J. National Weather Service Forecast Office
GOODMAN, S.J. XD11
BUECHLER, D. The Global Hydrology and Climate Center
HALL, J. The Global Hydrology and Climate Center


DARROUZET, F. Belgian Institute for Space Aeronomy
DE KEYSER, J. Belgian Institute for Space Aeronomy
DECREAU, P. Laboratoire de Physique et Chimie de l’Environnement
GALLAGHER, D.L. XD12
PIERRARD, V. Belgian Institute for Space Aeronomy
LEMAIRE, J. Belgian Institute for Space Aeronomy
DANDOURAS, I. Centre d’Etude Spatiale des Rayonnements

MATSUI, H. Space Science Center
DUNLOP, M. Rutherford Appleton Laboratory
ANDRE, M. Swedish Institute of Space Physics

Analysis of Plasmaspheric Plumes: CLUSTER and IMAGe Observations and Numerical Simulations—Abstract Only. For presentation at and publication in proceedings of the Session C5 of the General Congress of the French Physical Society (SFP) and Belgian Physical Society (BPS), Lille, France, August 29–September 2, 2005.

DAVIS, J.M. XD12
WEST, E.A. XD12
MOORE, R.L. XD12
GARY, G.A. XD12
KOBYASHI, K. XD12
OBERRIGHT, J.E. GSFC
EVANS, D.C. GSFC
WOOD, H.J. GSFC
SABA, J. LMSAL, GSFC
ALEXANDER, D. Rice University


DAVIS, J.M. XD12
WEST, E.A. XD12
MOORE, R.L. XD12
GARY, G.A. XD12
KOBYASHI, K. XD12
OBERRIGHT, J.E. GSFC
EVANS, D.C. GSFC
SABA, J. LMSAL, GSFC
ALEXANDER, D. Rice University


DAVIS, S.E. EM10
HERALD, S.D. ICRC Aerospace Services
STOLZFUS, J.M. NASA White Sands Test Facility
ENGEL, C.D. Qualis Corp.
BOHLEN, J.W. Northrop Grumman Integrated Systems
PALM, T. Northrop Grumman Integrated Systems
ROBINSON, J.J. The Boeing Company Phantom Works

DECKER, R. 
LEACH, R. Morgan Research Corp.

DECKER, R. PRICKETT, T. ROBERTS, B. 

DELAY, T. 

DICKERSON, T. MYRABO, L.N. Rensselaer Polytechnic Institute

DING, J. 

DISCHINGER, JR., H.C. MULLINS, J.B. 

DISCHINGER, P. 

DISCHINGER, P. 

DOMINIAK, P. CISZAK, E.M. 

DORNEY, D.J. SONDAAK, D.L. Boston University

DORNEY, S.M. HAIMES, B. MIT

DOYLE, M. O’NEIL, D.A. SAIC

DRAKE, G.W. KAPLAN, G. ERC, INC./AFRL/PRSP
HAL, L. AFRL/PRSP
HAWKINGS, T. AFRL/PRSP
LARUE, J. AFRL/PRSP
A New Family of Ionic Liquids 1-Amino-3-Alkyl-1,2,3-Triazolium Nitrates—Abstract Only. For publication in the Journal of Chemical Crystallography.

DUARTE, L.A. 

ECCLES, W. KASZYSKI, P. Vanderblt University
STULGIES, B. Vanderblt University
GOSTOWSKI, R. XD22
BLEVINS, J.A. XD22
Strained Hydrocarbons at Potential Hypergolic Fuels—Abstract and Presentation. For presentation at the

ECCLES, W. XD20

ELAM, S. ER32
HOLMES, R. ER32
HICKMAN, R. ER32
MCKECHNIE, T. ER32
THOM, G. ER32

ELAM, S. ER32
HOLMES, R. ER32
REYNOLDS, D. ER32
MCKECHNIE, T. ER32
THOM, G. ER32
VPS Functional Gradient Coatings for Injector Faceplates—Abstract Only. For presentation at the 53rd JANNAF Propulsion Meeting/2nd Liquid Propulsion Subcommittee/1st Spacecraft Propulsion Joint Meeting, Monterey, CA, December 5–8, 2005.

ELSNER, R.F. XD12
BHARDWAJ, A. XD12/NRC
GLADSTONE, G.R. SWRI
WAITE, JR., J.H. University of Michigan
CRAVENS, T.E. University of Kansas
FORD, P.G. Center for Space Research
BRANDUARDI-RAYMONT, G. UCL, MSSL
RAMSAY, G. UCL, MSSL
RAMSEY, B.O. XD12
Chandra X-Ray Observatory Observations of the Jovian System—Abstract Only. For presentation at the Six Years of Science With Chandra Symposium Chandra X-Ray Center, Cambridge, MA, November 2–4, 2005.

ELSNER, R.F. XD12
BHARDWAJ, A. XD12
GLADSTONE, G.R. SWRI
WAITE, JR., J.H. University of Michigan
CRAVENS, T.E. University of Kansas
FORD, P.G. Center for Space Research
BRANDUARDI-RAYMONT, G. UCL, MSSL
RAMSEY, B.O. XD12
Chandra X-Ray Observatory Observations of the Jovian System—Abstract Only. For presentation at the Six Years of Science With Chandra Symposium Chandra X-Ray Center, Cambridge, MA, November 2–4, 2005.

ELSNER, R.F. XD12
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CRAVENS, T.E. University of Kansas
FORD, P.G. Center for Space Research
BRANDUARDI-RAYMONT, G. UCL, MSSL
RAMSEY, B.O. XD12
Chandra X-Ray Observatory Observations of the Jovian System—Abstract Only. For presentation at the Six Years of Science With Chandra Symposium Chandra X-Ray Center, Cambridge, MA, November 2–4, 2005.
Cryogenic Performance of Trex SiC Mirror—Abstract Only. For presentation at the Mirror Technology Days, Huntsville, AL, August 16–18, 2005.


Heated Promoted Combustion—Initial Test Results—Presentation. For presentation at the National Space and Missiles Materials Symposium, Summerlin, NV, June 27–July 1, 2005.


FARR, R.A. WILET, J.T. VITARIUS, P. Freeland Innovations

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Charging Technology Conference, Tsukuba, Japan, April 4–8, 2005.

FERGUSON, D.C. NP23 VAYNER, B.V. Ohio Aerospace Institute GALOFARO, J.T. NASA GRC HILLARD, G.B. NASA GRC
Arcing in LEO—Does the Whole Array Discharge?—Final Paper. For presentation at the 9th Spacecraft Charging Technology Conference, Tsukuba, Japan, April 4–8, 2005.


FINCKENOR, J. EV32 CORDER, J.G. EV32/Jacobs Sverdrup MEEHAN, J. EV32 OWENS, J. EV32/Quals Corp. TIDWELL, P. EV32

FINCKENOR, J. EV32 CORDER, J.G. EV32/Jacobs Sverdrup OWENS, J. EV32/Quals Corp. MEEHAN, J. EV32/Quals Corp. TIDWELL, P. Allied Aerospace

FINCKENOR, J. EM50 CORDER, J.G. EV32/Jacobs Sverdrup OWENS, J. EV32/Quals Corp. MEEHAN, J. EV32/Quals Corp. TIDWELL, P. Allied Aerospace


FISHMAN, G.J. XD12

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FISHMAN, G.J. XD12
PENDLETON, G. Dynetics Corp.

FLACHBART, R.H. ER23
HASTINGS, L.J. ER23
HEDAYAT, A. ER23
NELSON, S.L. ER23
TUCKER, S.P. Alpha Technology Inc.

FLYNN, K. NP60
GUBERT, M. NP60

FOOTE, J.P. XD21
LITCHFORD, R.J. XD21

FOOTE, J.P. XD21
LITCHFORD, R.J. XD21

FORD, P.G. MIT Kavli Institute for Astrophysics and Space Research
ELSNER, R.F. XD12

FRADY, G. ER41

FRAZIER, D.O. SD40
PALEY, M.S. SD40/AZ Tech
STRONG, J.D. Morgan Research Corp.

FREUNDLICH, A. University of Houston
IGNATIEV, A. University of Houston
HORTON, C. University of Houston
DUKE, M. Colorado School of Mines
CURRERI, P.A. XD40
SIBILLE, L. BAE Systems

GAENSLER, B.M. Harvard-Smithsonian Center for Astrophysics
KOUVELIOTOU, C. Harvard-Smithsonian Center for Astrophysics
GELFAND, J.D. Stanford University/National Radio Astronomy Observatory
TAYLOR, G.B. Ben Gurion University
EICHLER, D. University of Amsterdam
WIJERS, R.A.M.J. Stanford University
GRANOT, J. Institute for Advanced Study
RAMIREZ-RIUZ, E. Ben Gurion University
LYUBARSKY, Y.E. ET AL.
An Expanding Radio Nebula Produced by a Giant Flare from the Magnetar SGR 1806–20—Abstract Only. For publication in Nature.


Strong Pitch-Angle diffusion of the Ring Current Ions Induced by Electromagnetic Ion Cyclotron Waves—Abstract Only. For presentation at the American Geophysical Union Fall Meeting, San Francisco, CA, December 5–9, 2005.


Field-Aligned Density Structure in the Outer Plasmasphere—Abstract Only. For presentation at the American Geophysical Union Fall Meeting, San Francisco, CA, December 5–9, 2005.


WU, K. SD50
SARIPALLI, L. SD50

GHOSH, K.K. USRA
FINGER, M.H. XD12
SWARTZ, D.A. XD12
TENNANT, A.F. XD12
WU, K. UCL, MSSL

GILL, P.S. ED03
GARCIA, D. ED03
VAUGHAN, W.W. UAH

GITTEMEIR, K.A. UAH
HAWK, C.W. UAH
FINCKENOR, M.M. EM50
WATTS, E. Qualis Corp.

GITTEMEIR, K.A. UAH
HAWK, C.W. UAH
FINCKENOR, M.M. EM50
WATTS, E. Qualis Corp.

GLUCH, R. Brigham Young University
QUATTROCHI, D.A. XD11

GOODMAN, S.J.  
BLAKESLEE, R.J.  
BOCCIPPIO, D.J.  
CHRISTIAN, H.J.  
KOSHAK, W.J.  
PETERSEN, W.A.  

GORTI, S.  
FORSYTHE, E.L.  
PUSEY, M.L.  
Kinetic Roughening and Energetics of Tetragonal Lysozyme Crystal Growth: A Preliminary Atomic Force Microscopy Investigation—Abstract Only. For publication in ACTA Crystallographica D.

GRADL, P.R.  
STEPHENS, W.  

GRANOT, J.  
RAMIREZ-RUIZ, E.  
TAYLOR, G.B.  
GRANT, J.  

GRANT, J.  

GRANT, J.  

GREENWOOD, T.  
TWICHELL, W.  
FERRARI, D.  
KUCK, F.  

GREGORY, D.A.  
HERREN, K.A.  
ION Milling of Sapphire—Abstract Only. For publication in Electrochemical and Solid-State Letters and American Institute of Physics.

GRIFFEY, A.M.  

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GRUDEL, R.N.  
High Tensile Strength Amalgams for In-Space Repair and Fabrication—Abstract Only. For presentation at the Continuing the Voyage of Discovery—1st Space Exploration Conference, Orlando, FL, February 2–4, 2005.


GWALTNEY, D.A. 
FERGUSON, M.I. 

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FERGUSON, M.I. 

GWALTNEY, D.A. 
DUTTON, K. Jacobs Sverdrup 

GWALTNEY, D.A. 
BRISCOE, J.M. 

GWALTNEY, D.A. 
DUTTON, K. Jacobs Sverdrup 

HAMILTON, J.T. 

HAMILTON, J.T. 
ASM Student Technology and Career Night—Presentation. For presentation at the American Society of Materials Student Career Night, Huntsville, AL, March 29, 2005.

HAMILTON, J.T. 

HAMILTON, J.T. 
Test Laboratory 2005. For presentation at the Test Week 2005, Huntsville, AL, June 6–9, 2005.

HARMSEN, E. 
LUVALL, J.C. 
GONZALEZ, J. 

HATHAWAY, D.H. 
WILSON, R.M. 

HATHAWAY, D.H. 

HATHAWAY, D.H. 
HATHAWAY, D.H. XD12
CHOWDHARY, D. California State University

HATHAWAY, D.H. XD12
WILLIAMS, P.E. University of Texas
CUNTHZ, M. University of Texas

HEATON, A.F. EV40

HEDAYAT, A. ER23
NELSON, S.L. ER23
HASTINGS, L.J. Alpha Technology Inc.
FLACHBART, R.H. ER23
TUCKER, S.P. ER23

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HERALD, S.D. ICRC Aerospace Services
ENGEL, C.D. Qualis Corp.
DAVIS, S.E. EM10

HERMILLER, J. Cornerstone Research Group, Inc.
STAHL, H.P. XD30

HICKMAN, R. ER11
MIRELES, O. ER11
HOUTS, M. ER11

HISSAM, D.A. ER34
LEBERMAN, M. ER34
MCLEROY, R. ERC

HJORTH, J. University of Copenhagen
SOLLERMAN, J. University of Copenhagen/Stockholm University
GOROSABEL, J. Instituto de Astrofisica de Andalucia
GRANOT, J. Kavli Institute
KLOSE, S. Thuringer Landessternwarte
MONOLOTOU, C. XD12
MELINDER, J. Stockholm University
RAMIREZ-RUIZ, E. Institute for Advanced Study
STARLING, R. University of Amsterdam ET AL.

HJORTH, J. University of Copenhagen
WATSON, D. University of Copenhagen
FYNBO, J.P. University of Copenhagen
PRICE, P.A. University of Hawaii
JENSEN, B.L. University of Copenhagen
JORGENSEN, U.G. University of Copenhagen
KUBAS, D. ESO Santiago
GOROSABEL, J. Instituto de Astrofisica de Andalucia
KOUVELIOTOU, C. XD12
The Optical Afterglow of a Short Y-Ray Burst—Abstract Only. For publication in Nature.

HOLDER, D. EV50
FORT, J. Hamilton Sundstrand
BARONE, M. Hamilton Sundstrand
MURDOCH, K. Hamilton Sundstrand
HOLLINGER, G.A. Swarthmore College
BRISCOE, J.M. EI21

HOOVER, R.B. XD12

HOOVER, R.B. XD12

HOUTS, M.G. NP50
BRAGG-SITTON, S.M. ER11
MIRELES, O. ER11
ET AL.

HOUTS, M.G. NP50

HOUTS, M.G. NP50
SCHEMIDT, G.R. NP50
BRAGG-SITTON, S.M. NP50
HICKMAN, R. NP50
HISSAM, A. NP50
HOUSTON, V. NP50
MARTIN, J. NP50
MIRELES, O. NP50
REID, B. NP50
ET AL.

HOWARD, R.T. EV21
JOHNSON, A.S. EV21
BRYAN, T.C. EV21
BOOK, M.L. EV21
Simulation and Ground Testing with the AVGS—Final Paper. For presentation at the SPIE Defense and Security Symposium, Orlando, FL, March 28–April 1, 2005.

HOWARD, R.W. SY10
In Situ Fabrication Technologies: Meeting the Challenge for Exploration—Presentation. For presentation at the National Space and Missile Materials Symposium, Las Vegas, NV, June 27–July 1, 2005.

HOWELL, J.T. FD02
FIKES, J.C. SP20
O’NEILL, M.J. Entech, Inc.
Novel Space-Based Solar Power Technologies and Architectures for Earth and Beyond—Abstract Only. For presentation at the 56th International Astronautical Congress, Fukuoka, Japan, October 17–21, 2005.

HOWELL, J.T. FD02
FIKES, J.C. SP20
MANKINS, J.C. NASA Headquarters
In-Space Cryogenic Propellant Depot Stepping Stone—Abstract Only. For presentation at the 56th International Astronautical Congress, Fukuoka, Japan, October 17–21, 2005.

HOWELL, J.T. FD02
O’NEILL, M.J. Entech, Inc.
High-Voltage Array Ground Test for Direct-Drive Solar Electric Propulsion—Abstract Only. For presentation at the 56th International Astronautical Congress, Fukuoka, Japan, October 17–21, 2005.

HOWELL, J.T. FD02
CARRINGTON, C.K. SP20
MANKINS, J.C. NASA Headquarters

HUEBNER, L.D. NP60
SAIYED, N.H. NASA Headquarters
SWINT, M.S. NP60
Advanced Development Projects for Constellation From the Next Generation Launch Technology Program Elements—Abstract Only. For presentation at the 56th International Astronautical Congress, Fukuoka, Japan, October 17–22, 2005.

HULCHER, A.B. ED34
YOUNG, G. ATK Thiokol Propulsion
Film Delivery Module for Fiber Replacement Fabrication of Hybridized Composite Structures—Abstract Only. For
HULL, M.S.        Luna Innovations Inc.        
TASSELL, V.        Luna Innovations Inc.        
PENNINGTON, C.D.   Luna Innovations Inc.        
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TINKER, M.L.        EV11
DOZIER, G.          Auburn University

HULL, P.V.         EV11/Jacobs Sverdrup
CANFIELD, S.L.      Tennessee Technological University

HYERS, R.W.        University of Massachusetts
LEE, J.             University of Massachusetts
BRADSHAW, R.C.      University of Massachusetts
ROGERS, J.R.        XD42
RATHZ, T.J.         UAH
WALL, J.J.          University of Tennessee
CHOO, H.            University of Tennessee
LIAW, P.K.          University of Tennessee

HYERS, R.W.        University of Massachusetts
SANSOUCIE, M.P.    EV11
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HANLON, A.B.       University of Massachusetts
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FREUNDLICH, A.     University of Houston
ALEMU, A.          University of Houston
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SERVER, T.         XD11
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SIAM-SERVER: An Environmental Monitoring and Decision Support System for Meso-america—Abstract Only. For presentation at the Lecture for the City of Knowledge, City of Knowledge Foundation, Panama City, Panama, August 18, 2005.

IRWIN, R.W.        Purdue University
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MUNK, M. TD05
MOON, S.A. Gray Research

JEDLOVEC, G.J. XD11
NAIR, U. UAH
HAINES, S.L. UAH
Detection of Tornado Damage Tracks With EOS Data—Abstract Only. For publication in the Journal of Weather and Forecasting.

JETT, T.R. EM10
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TRAUSH, A. TD05
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TAYLOR, T. BAE Systems
CUTTING, K. Gray Research

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MATLOFF, G.L. Gray Research/New York City College of Technology
The Interstellar Conspiracy—Final Paper. For publication in Analog (Science-Fact Article).

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MONTGOMERY, S. NP40

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JUSTUS, C.G. Morgan Research Corp.
DUVALL, A.L. Morgan Research Corp.
KELLER, V.W. EV13


The Optomechanical Design and Operation of the Ionospheric Mapping and Geocoronal Experiment—Abstract Only. For presentation at and publication in the proceedings of the SPIE Optics and Photonics, San Diego, CA, July 31–August 4, 2005.


KHARKOVSKY, S. University of Missouri-Rolla
CASE, J.T. University of Missouri-Rolla
ABOU-KHOUSA, M.A. University of Missouri-Rolla
ZOUGHIL, R. University of Missouri-Rolla
HEPBURN, F.L. EM20

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HEPBURN, F. EM20
WALKER, J. EM20
ZOUGHI, R. University of Missouri-Rolla


KHARKOVSKY, S. University of Missouri-Rolla
CASE, J.T. University of Missouri-Rolla
ZOUGHI, R. University of Missouri-Rolla
HEPBURN, F. EM20


KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12


KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12

Analysis of Bare-Tether Systems as a Thruster for MXER Studies—Abstract Only. For publication in the Journal of Geophysical Research.

KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12

Current Collection by Grid-Sphere Electrode in Space—Abstract Only. For presentation at and publication in the proceedings of the 53rd JANNAF Propulsion Meeting/2nd Liquid Propulsion Subcommittee/1st Spacecraft Propulsion Joint Meeting, Monterey, CA, December 5–8, 2005.

KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12

Strong Pitch-Angle Diffusion of Ring Current Ions in Geomagnetic Storm-Associated Conditions—Abstract Only. For publication in AGU Monograph.

KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12

Cross-Scale Couplng in the Inner Magnetosphere—Abstract Only. For presentation at the American Geophysical Union, San Francisco, CA, November 5–9, 2005.

KHAZANOV, G.V. XD12
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SORENSEN, K. XD12

Do Electromagnetc Ion Cyclotron Waves Cause the Strong Pitch-Angle Diffusion of Ring Current Ions?—Abstract Only. For presentation at the American Geophysical Union, San Francisco, CA, December 5–9, 2005.

KHAZANOV, G.V. XD12
KRIVORUTSKY, E.N. NRC
SORENSEN, K. XD12
Christian, H.J.  
Retrieving Storm Electric Fields From Aircraft Field Mill Data. Part II: Applications—Abstract Only. For publication in the Journal Of Atmospheric and Oceanic Technology/AMS.

Koshak, W.J.  
Retrieving Storm Electric Fields From Aircraft Field Mill Data. Part I: Theory—Abstract Only. For publication in the Journal of Atmospheric and Oceanic Technology/AMS.

Kouveliotou, C.  

Kouveliotou, C.  
Observations of Soft Gamma Repeaters—Abstract Only. For presentation at the Triggering Relativistic Jets Meeting, Cozumel, Mexico, March 28–April 1, 2005.

Kouveliotou, C.  

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Kouveliotou, C.  
Magnetars—Abstract Only. For presentation at A Life With Stars, Amsterdam, Netherlands, August 21–26, 2005.

Krivorutsky, E.N.  

Lal, R.B.  
Advanced Sensors for NASA’s Exploration Missions—Presentation. For presentation at the National Science Foundation (NSF) Workshop on Sensors, Huntsville, AL, June 7, 2005.
LAYMON, C.A. XD11
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Impurity Studies of Cd0.8Zn0.2Te Crystals Using Photoluminescence and Glow Discharge Mass Spectroscopy—Abstract Only. For presentation at the 16th American Conference on Crystal Growth and Epitaxy, Big Sky, MT, July 10–15, 2005.

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LEHOCZKY, S.L. SD46


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LI, C. SD46
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<tr>
<th>Name</th>
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<td>GRADL, P.R.</td>
<td>ER32</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<tr>
<td>KINNEY, T.</td>
<td>Qualis Corp.</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<tr>
<td>LAVEDE, B.</td>
<td>ERC Inc.</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<tr>
<td>PECK, J.</td>
<td>EV31</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<tr>
<td>MACLEOD, T.C.</td>
<td>EI51</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<tr>
<td>PHILLIPS, T.A.</td>
<td>EI51</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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<td>HO, F.D.</td>
<td>UAH</td>
<td>Characteristics of Ferroelectric Logic Gates Using a Spice-Based Model—Abstract Only. For presentation at the International Meeting on Ferroelectricity, Foz do Igacu, Brazil, September 5–9, 2005, and publication in the Ferroelectrics Journal.</td>
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FIMOGNARI III, P.H. UAH

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Applications of the Electrodynamic Tether to Interstellar Travel—Final Paper. For publication in the Journal of the British Interplanetary Society.

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MEM: A Physics-Based Directional Meteoroid Model—Abstract Only. For presentation at the 4th European Conference on Space Debris, Darmstadt, Germany, April 18–20, 2005.

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Sanford, J.  E112
Reuse of International Space Station (ISS) Modules as Lunar Habitat—Abstract Only. For presentation at the 1st Space Exploration Conference, Orlando, FL, January 30−February 1, 2005.

Milton, M.E.  SX10
Christl, M.  SX10

Milton, M.E.  SX10
Deep Space Test Bed—Presentation. For presentation at the National Space and Missile Material Symposium, Summerlin, NV, June 27−July 1, 2005.

Minor, J.L.  ED03
Newton, R.  NP60
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MOONEY, J.T. UAH
STAHLE, H.P. XD30

MOORE, R.L. XD12
STERLING, A.C. XD12
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DAVIS, J.M. XD12

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NEUMANN, B. HQS
MCMILLAN, V. EDO3

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NIELSEN, D. ATK Thiokol Inc.
TOWNSEND, J. ED21
KAPPUS, K. ED21
DRISKILL, T. ED21
TORRES, I. ED21
PARKS, R. ED21

NISHIKAWA, K.I. University of Alabama/Tuscaloosa
HARDEE, P. University of Alabama/Tuscaloosa
HEDEDAL, C.B. Niels Bohr Institute/Department of Astrophysics
RICHARDSON, G. UAH
SOL, H. LUTH
PREECE, R. UAH
FISHMAN, G.J. XD12

NISHIKAWA, K.I. University of Alabama/Tuscaloosa
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HEDEDAL, C.B. Niels Bohr Institute/Department of Astrophysics
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Particle Acceleration, Magnetic Field Generation, and Emission in Relativistic Shocks—Abstract Only. For presentation at and publication in the proceedings of the Astrophysical Sources of High-Energy Particles and Radiation, Torun, Poland, June 20–24, 2005.
NISHIKAWA, K.I. University of Alabama/Tuscaloosa
RAMIREZ-RUIZ, E. Institute for Advanced Study
HARDEE, P. University of Alabama/Tuscaloosa
HEDEDAL, C. Niels Bohr Institute/Department of Astrophysics
KOUVELIOTOU, C. XD12
FISHMAN, G.J. XD12
MIZUNO, Y. NRC


NISHIKAWA, K.I. University of Alabama/Tuscaloosa
RAMIREZ-RUIZ, E. Institute for Advanced Study
HARDEE, P. University of Alabama/Tuscaloosa
HEDEDAL, C. Niels Bohr Institute/Department of Astrophysics
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HEDEDAL, C. Niels Bohr Institute/Department of Astrophysics
KOUVELIOTOU, C. XD12
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MIZUNO, Y. NRC


NOUSEK, J.A. Pennsylvania State University
KOUVELIOTOU, C. XD12
GRUPE, D. Pennsylvania State University
PAGE, K. University of Leicester
GRANOT, J. Stanford University
RAMIREZ-RUIZ, E. Institute for Advanced Study
PATEL, S.K. IPA with NASA/XD12
BURROWS, D.N. Pennsylvania State University
MANGANO, V. INAF
BARTHELMEY, S.D. GSFC


PALOSZ, W. SD42/BAE Systems
Vapor Transport of ZnO in Closed Ampoules—Abstract Only. For publication in the Journal of Crystal Growth.

PARIS, D. NAFP—Clark Atlanta
TREVINO, L.C. EV23
WATSON, M.D. EV23


OLIVER, S.T. EV31
Analysis of a Circular Composite Disk Subjected to Edge Rotations and Hydrostatic Pressure—Final Paper. Thesis to be presented to the Department of Mechanical and Aerospace Engineering, UAH, Huntsville, AL, October 2004.

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Analysis of a Circular Composite Disk Subjected to Edge Rotations and Hydrostatic Pressure—Final Paper. Thesis to be presented to the Department of Mechanical and Aerospace Engineering, UAH, Huntsville, AL, October 2004.
Analysis of Surface Charging for a Candidate Solar Sail Mission Using NASCAP–2K—Final Paper. For presentation at the 9th Spacecraft Charging Technology Conference, Tsukuba, Japan, April 4–8, 2005.

PARKER, L.N. ED44 Jacobs Sverdrup
MINOW, J.I. EV13
DAVIS, V.A. SAIC
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PATRICK, M.P. ED12
COOPER, A.E. ED12
POWERS, W.T. ED12


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PEARSON, J.B. XD21
LEWIS, R.A. R Lewis Company


PERRY, J.L. EV51


PERRY, J.L. EV51
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ROYCHOUDHURY, S. Precision Combustion, Inc.
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PHILLIPS, T.A. EI52
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HO, F.D. uAH

Modeling of a Metal-Ferroelectric-Semiconductor Field-Effect Transistor Nand Gate—Abstract Only. For presentation at the 11th International Meeting on Ferroelectricity, Foz do Iguacu, Brazil, September 5–9, 2005, and to be published in the Ferroelectrics Journal.

PIKUTA, E.V. XD12
ITOH, T. RIKEN BioResource Center
HOOVER, R.B. XD12

Anaerobic Decomposition of Cellulose by Alkaliphilic Microbial Community of Owens Lake, California—

PETERSEN, W.A. XD11
CHRISTIAN, H.J. XD11
RUTLEDGE, S.A. XD11


PETERSEN, W.A. XD11
KNUPP, K. XD11
WALTERS, J. XD11
DEIERLING, W. XD11
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Abstract Only. For presentation at and publication in the proceedings of The International Symposium of Optical Science and Technology 50th Annual Meeting—Instruments, Methods, and Missions for Astrobiology IX, San Diego, CA, July 31–August 4, 2005.

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GANEL, O. University of Maryland

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