FOREWORD

In accordance with the NASA Space Act of 1958, the MSFC has provided for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

Since July 1, 1960, when the George C. Marshall Space Flight Center 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."

The N number shown for the reports listed is assigned by the Center for AeroSpace Information (CASI), Hanover, MD, indicating that the material is unclassified and unlimited and is available for public use. These publications can be purchased from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The N number should be cited when ordering.
GEORGE C. MARSHALL SPACE FLIGHT CENTER
Marshall Space Flight Center, Alabama

FY 2000 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA TECHNICAL MEMORANDA</td>
<td>1</td>
</tr>
<tr>
<td>NASA TECHNICAL PUBLICATIONS</td>
<td>7</td>
</tr>
<tr>
<td>NASA SPECIAL PUBLICATION</td>
<td>11</td>
</tr>
<tr>
<td>MSFC CONFERENCE PUBLICATIONS</td>
<td>12</td>
</tr>
<tr>
<td>NASA CONTRACTOR REPORTS</td>
<td>13</td>
</tr>
<tr>
<td>MSFC PAPERS CLEARED FOR PRESENTATION</td>
<td>14</td>
</tr>
<tr>
<td>INDEX</td>
<td>59</td>
</tr>
</tbody>
</table>
The objective of this research was to construct a chemical sensor/instrumentation package that was smaller in weight and volume than conventional instrumentation. This reduction in weight and volume is needed to assist in further reducing the cost of launching payloads into space. To accomplish this, fiber optic sensors, miniaturized spectrometers, and wireless modems were employed. The system was evaluated using iodine as a calibration analyte.

Prior to the test it had been expected that the beam would lay down a static charge on the cloth and be deflected without damaging the cloth. The burnthrough is thought to be an effect of partial transmission of beam power by a stream of positive ions generated by the high-voltage electron beam from contaminant gas in the "vacuum" chamber. A rough quantitative theoretical computation appears to substantiate this possibility.

A video guidance sensor (VGS) system has flown on both STS–87 and STS–95 to validate a single camera/target concept for vehicle navigation. The main part of the image algorithm was the subtraction of two consecutive images using software. For a nominal size image of 256×256 pixels this subtraction can take a large portion of the time between successive frames in standard rate video, leaving very little time for other computations. The purpose of this project was to integrate the software subtraction into hardware to speed up the subtraction process and allow for more complex algorithms to be performed, both in hardware and software.
and the pin tool's wear was excessive such that the pin tool length has to be manually adjusted for every 5 ft of weldment. Initially, boron-carbide coating was developed for pin tools, but it did not show a significant improvement in wear resistance. Basically, FSW is applicable mainly for butt joining of flat plates. Therefore, FSW of cylindrical articles such as a flange to a duct with practical diameters ranging from 2–5 in. must be fully demonstrated and compared with other proven MMC joining techniques for cylindrical articles.

TM–1999–209877 December 1999


This paper describes the results of a team effort aimed at defining the information flow between disciplines at the Marshall Space Flight Center (MSFC) engaged in the design of space launch vehicles. The information flow is modeled at a first level and is described using three types of templates: an NxN diagram, discipline flow diagrams, and discipline task descriptions. It is intended to provide engineers with an understanding of the connections between what they do and where it fits in the overall design process of the project. It is also intended to provide design managers with a better understanding of information flow in the launch vehicle design cycle.


Double-Plate Penetration Equations. K.B. Hayashida and J.H. Robinson. Structures, Mechanics, and Thermal Department. 20000032469N

This report compares seven double-plate penetration predictor equations for accuracy and effectiveness of a shield design. Three of the seven are the Johnson Space Center original, modified, and new Cour-Palais equations. The other four are the Nysmith, Lundeberg-Stern-Bristow, Burch, and Wilkinson equations. These equations, except the Wilkinson equation, were derived from test results, with the velocities ranging up to 8 km/sec. Spreadsheet software calculated the projectile diameters for various velocities for the different equations. The results were plotted on projectile diameter versus velocity graphs for the expected orbital debris impact velocities ranging from 2 to 15 km/sec. The new Cour-Palais double-plate penetration equation was compared to the modified Cour-Palais single-plate penetration equation. Then the predictions from each of the seven double-plate penetration equations were compared with test results performed at the NASA Marshall Space Flight Center. Because the different equations predict a wide range of projectile diameters at any given velocity, it is very difficult to choose the "right" prediction equation for shield configurations other than those exactly used in the equations' development. Although developed for various materials, the penetration equations alone cannot be relied upon to accurately predict the effectiveness of a shield without using hypervelocity impact tests to verify the design.


Observation of Individual Fluorine Atoms From Highly Oriented Poly(tetrafluoroethylene) Films by Atomic Force Microscopy. J.A. Lee. Materials and Processes Laboratory. 20000032164N

Direct observation of the film thickness, molecular structure, and individual fluorine atoms from highly oriented poly(tetrafluoroethylene) (PTFE) films were achieved using atomic force microscopy (AFM). A thin PTFE film is mechanically deposited onto a smooth glass substrate at specific temperatures by a friction-transfer technique. Atomic resolution images of these films show that the chain-like helical structures of the PTFE macromolecules are aligned parallel to each other with an intermolecular spacing of 5.72 Å, and individual fluorine atoms are clearly observed along these twisted molecular chains with an interatomic spacing of 2.75 Å. Furthermore, the first direct AFM measurements for the radius of the fluorine-helix and of the carbon-helix in subangstrom scale are reported as 1.7 and 0.54 Å respectively.


This technical memorandum documents the results of the research to develop a concept for assessing the structural integrity of impacted composite structures using the strength degradation factor in conjunction with
available finite element tools. For this purpose, a literature search was conducted, a plan for conducting impact testing on two laminates was developed, and a finite element model of the impact process was created. Specimens for the impact testing were fabricated to support the impact testing plan.

TM—2000–210076 February 2000

The Linear Aerospike SR–71 Experiment (LASRE) was performed in support of the Reusable Launch Vehicle (RLV) program to help develop a linear aerospike engine. The objective of this program was to operate a small aerospike engine at various speeds and altitudes to determine how slipstreams affect the engine’s performance. The joint program between government and industry included NASA’s Dryden Flight Research Center, the Air Force’s Phillips Laboratory, NASA’s Marshall Space Flight Center, Lockheed Martin Skunkworks, Lockheed-Martin Astronautics, and Rocketdyne Division of Boeing North American. Ground testing of the LASRE engine produced two successful hot-fire tests, along with numerous cold flows to verify sequencing and operation before mounting the assembly on the SR–71. Once installed on the aircraft, flight testing performed several cold flows on the engine system at altitudes ranging from 30,000 to 50,000 feet and Mach numbers ranging from 0.9 to 1.5. The program was terminated before conducting hot-fires in flight because excessive leaks in the propellant supply systems could not be fixed to meet required safety levels without significant program cost and schedule impacts.

TM—2000–210129 March 2000

This report details the results of a series of fluid motion experiments to investigate the use of magnets to orient fluids in a low-gravity environment. The fluid of interest for this project was liquid oxygen (LO₂) since it exhibits a paramagnetic behavior (is attracted to magnetic fields). However, due to safety and handling concerns, a water-based ferromagnetic mixture (produced by Ferrofluidics Corporation) was selected to simplify procedures. Three ferromagnetic fluid mixture strengths and a nonmagnetic water baseline were tested using three different initial fluid positions with respect to the magnet. Experiment accelerometer data were used with a modified computational fluid dynamics code termed CFX–4 (by AEA Technologies) to predict fluid motion. These predictions compared favorably with experiment video data, verifying the code’s ability to predict fluid motion with and without magnetic influences. Additional predictions were generated for LO₂ with the same test conditions and geometries used in the testing. Test hardware consisted of a cylindrical Plexiglas tank (6-in. bore with 10–in. length), a 6,000-G rare Earth magnet (10-in. ring), three-axis accelerometer package, and a video recorder system. All tests were conducted aboard the NASA Reduced-Gravity Workshop, a KC–135A aircraft.

TM—2000–210130 March 2000
FY 1999 Scientific and Technical Reports, Articles, Papers, and Presentations. J.E. Turner Waits, Compiler. Information Services Department. 20000043603N

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY99. It also includes papers of MSFC contractors.

All of the NASA series reports may be obtained from the NASA Center for Aerospace Information (CASI), 7121 Standard Drive, Hanover, MD 21076–1320.

The information in this report may be of value to the scientific and engineering community in determining...
what information has been published and what is available.

TM—1999–210131 May 1999

This technical memorandum presents a summary by the Electromagnetics and Aerospace Environments Branch at the Marshall Space Flight Center of lightning characteristics and lightning criteria for the protection of aerospace vehicles. Probability estimates are included for certain lightning strikes (peak currents of 200, 100, and 50 kA) applicable to the National Aeronautics and Space Administration Space Shuttle at the Kennedy Space Center, Florida during rollout, on-pad and boost/launch phases. Results of an extensive literature search to compile information on this subject are presented in order to answer key questions posed by the Space Shuttle Program Office at the Johnson Space Center concerning peak lightning current probabilities if a vehicle is hit by a lightning cloud-to-ground stroke. Vehicle-triggered lightning probability estimates for the aforementioned peak currents are still being worked. Section 4.5, however, does provide some insight on estimating these same peaks.


Electrical impedance spectrometry involves measurement of the complex resistance of a load at multiple frequencies. With this information in the form of impedance magnitude and phase, or resistance and reactance, basic structure or function of the load can be estimated. The “load” targeted for measurement and estimation in this study consisted of the water-bearing tissues of the human calf. It was proposed and verified that by measuring the electrical impedance of the human calf and fitting this data to a model of fluid compartments, the lumped-model volume of intracellular and extracellular spaces could be estimated. By performing this estimation over time, the volume dynamics during application of stimuli which affect the direction of gravity can be viewed. The resulting data can form a basis for further modeling and verification of cardiovascular and compartmental modeling of fluid reactions to microgravity as well as countermeasures to the headward shift of fluid during head-down tilt or spaceflight.

TM—2000–210252 May 2000

Mechanical property characterization was performed on AS4/3501–6 graphite/epoxy and SC350G syntactic foam for the SRB Composite Nose Cap Shuttle Upgrades Project. Lamina level properties for the graphite/epoxy were determined at room temperature, 240 °F, 350 °F, 480 °F, 600 °F, and 350 °F after a cycle to 600 °F. Graphite/epoxy samples were moisture conditioned prior to testing. The syntactic foam material was tested at room temperature, 350 °F and 480 °F. A high-temperature test facility was developed at MSFC. Testing was performed with quartz lamp heaters and high resistance heater strips. The thermal history profile of the nose cap was simulated in order to test materials at various times during launch. A correlation study was performed with Southern Research Institute to confirm the test methodology and validity of test results. A-basis allowables were generated from the results of testing on three lots of material.

TM—2000–210279 May 2000

This report presents Mars Global Reference Atmospheric Model 2000 Version (Mars-GRAM 2000) and its new features. All parameterizations for temperature, pressure, density, and winds versus height, latitude, longitude, time of day, and Ls have been replaced by input data tables from NASA Ames Mars General Circulation Model (MGCM) for the surface through 80-km altitude and the University of Arizona Mars Thermosphere General Circulation Model (MTGCM) for 80 to 170 km. A modified Stewart thermospheric model
is still used for higher altitudes and for dependence on solar activity. "Climate factors" to tune for agreement with GCM data are no longer needed. Adjustment of exospheric temperature is still an option. Consistent with observations from Mars Global Surveyor, a new longitude-dependent wave model is included with user input to specify waves having 1 to 3 wavelengths around the planet. A simplified perturbation model has been substituted for the earlier one. An input switch allows users to select either East or West longitude positive. This memorandum includes instructions on obtaining Mars-GRAM source code and data files and for running the program. It also provides sample input and output and an example for incorporating Mars-GRAM as an atmospheric subroutine in a trajectory code.

TM—2000–210331 June 2000
Loads Combination Research at Marshall Space Flight Center. R. Ferebee. Structures, Mechanics, and Thermal Department. 20000068925N

This is the result of a study conducted by the Structural Dynamics Division of the Marshall Space Flight Center concerning the combination of low- and high-frequency dynamic loads for spacecraft design. Low-frequency transient loads are combined with high frequency acoustically induced loads to arrive at a limit load, for design purposes. Different methods are used for combining the loads which can lead to considerable variation in limit loads, depending on which NASA Center did the calculation. This study investigates several different combination methods and compares the combination methods with Spacelab 1 flight data. In addition, the relative timing of low- and high-frequency loads is examined.

TM—2000–210348 June 2000
Application of Rapid Prototyping to the Investment Casting of Test Hardware (MSFC Center Director's Discretionary Fund Final Report, Project No. 98–08). K.G. Cooper and D. Wells. Materials, Processes, and Manufacturing Department.

Investment casting masters of a selected propulsion hardware component, a fuel pump housing, were rapid prototyped on the several processes in-house, along with the new Z-Corp process acquired through this project. Also, tensile samples were prototyped and cast using the same significant parameters. The models were then shelled in-house using a commercial grade zircon-based slurry and stucco technique. Next the shelled models were fired and cast by our in-house foundry contractor (IITRI), with NASA–23, a commonly used test hardware metal. The cast models are compared by their surface finish and overall appearance (i.e., the occurrence of pitting, warping, etc.), as well as dimensional accuracy.


This document lists the significant publications and presentations of the Science Directorate during the period January 1–December 31, 1999. Entries in the main part of the document are categorized according to NASA Reports (arranged by report number), Open Literature, and Presentations (arranged alphabetically by title). Most of the articles listed under Open Literature have appeared in refereed professional journals, books, monographs, or conference proceedings. Although many published abstracts are eventually expanded into full papers for publication in scientific and technical journals, they are often sufficiently comprehensive to include the significant results of the research reported. Therefore, published abstracts are listed separately in a section under Open Literature. Questions or requests for additional information about the entries in this report should be directed to M. Franklin Rose (SD01: (256) 544–7721) or to one of the authors.

TM—2000–210482 September 2000

As part of NASA's focused technology programs for future reusable launch vehicles, a task is underway to study the feasibility of using the polymer matrix composite feedlines instead of metal ones on propulsion systems. This is desirable to reduce weight and manufacturing costs. The task consists of comparing several prototype composite feedlines made by various methods. These methods are electron-beam curing, standard hand lay-up and autoclave cure, solvent assisted resin transfer molding, and thermoplastic tape laying. One of the critical technology drivers for composite
components is resistance to foreign objects damage. This paper presents results of an experimental study of the damage resistance of the candidate materials that the prototype feedlines are manufactured from. The materials examined all have a 5-harness weave of IM7 as the fiber constituent (except for the thermoplastic, which is unidirectional tape laid up in a bidirectional configuration). The resins tested were 977–6, PR 520, SE–SA–1, RS–E3 (e-beam curable), Cycom 823 and PEEK. The results showed that the 977–6 and PEEK were the most damage resistant in all tested cases.

TM—2000–210558 August 2000


Rapid prototyping (RP) is a layer-by-layer-based additive manufacturing process for constructing three-dimensional representations of a computer design from a wax, plastic, or similar material. Wire arc spray (WAS) is a metal spray forming technique, which deposits thin layers of metal onto a substrate or pattern. Marshall Space Flight Center currently has both capabilities in-house, and this project proposed merging the two processes into an innovative manufacturing technique, in which intermediate injection molding tool halves were to be fabricated with RP and WAS metal forming.
The effects that solar proton events have on microelectronics and solar arrays are important considerations for spacecraft in geostationary and polar orbits and for interplanetary missions. Designers of spacecraft and mission planners are required to assess the performance of microelectronic systems under a variety of conditions. A number of useful approaches exist for predicting information about solar proton event fluences and, to a lesser extent, peak fluxes. This includes the cumulative fluence over the course of a mission, the fluence of a worst-case event during a mission, the frequency distribution of event fluences, and the frequency distribution of large peak fluxes.

Naval Research Laboratory (NRL) and NASA Goddard Space Flight Center, under the sponsorship of NASA’s Space Environments and Effects (SEE) Program, have developed a new model for predicting cumulative solar proton fluences and worst-case solar proton events as functions of mission duration and user confidence level. This model is called the Emission of Solar Protons (ESP) model.
seventh test resulted in elimination of combustion instability with the installation of an orifice immediately upstream of the injector. Formulation and implementation of the model are the scope of this presentation.

The current model is an independent continuation of modeling presented previously by joint Thiokol-Rocketdyne collaborators Boardman, Hawkins, Wassom, and Claflin. The previous model simulated an unstable independent research and development (IR&D) hybrid motor test performed by Thiokol. There was very good agreement between the model and test data. Like the previous model, the current model was developed using Matrix-x simulation software. However, tests performed at MSFC under the HPTLVB program were actually simulated.

In the current model, the hybrid motor, consisting of the liquid oxygen (lox) injector, the multiport solid fuel grain, and nozzle, was simulated. The lox feedsystem, consisting of the tank, venturi, valve, and feed lines, was also simulated in the model. All components of the hybrid motor and lox feedsystem are treated by a lumped-parameter approach.

Agreement between the results of the transient model and actual test data was very good. This agreement between simulated and actual test data indicated that the combustion instability in the hybrid motor was due to two causes: 1. A lox feedsystem of insufficient stiffness, and 2. A lox injector with an impedance or pressure drop that was too low to provide damping against the feedsystem oscillations. Also, it was discovered that testing with a new grain of solid fuel sustained the combustion instability. However, testing with a used grain of solid fuel caused the combustion instability to gradually decay.

TP—2000–209960  February 2000

TP—2000–209961  February 2000

On the basis of sea surface temperature in the El Niño 3.4 region (5° N.–5° S., 120°–170° W.) during the interval of 1950–1997, Kevin Trenberth previously has identified some 16 El Niño and 10 La Niña, these 26 events representing the extremes of the quasi-periodic El Niño-Southern Oscillation (ENSO) cycle. Runs testing shows that the duration, recurrence period, and sequencing of these extremes vary randomly. Hence, the decade of the 1900’s, especially for El Niño, is not significantly different from that of previous decadal epochs, at least, on the basis of the frequency of onsets of ENSO extremes. Additionally, the distribution of duration for both El Niño and La Niña looks strikingly bimodal, each consisting of two preferred modes, about 8- and 16-mo long for El Niño and about 9- and 18-mo long for La Niña, as does the distribution of the recurrence period for El Niño, consisting of two preferred modes about 21- and 50-mo long. Scatterplots of the recurrence period versus duration for El Niño are found to be statistically important, displaying preferential associations that link shorter (longer) duration with shorter (longer) recurrence periods. Because the last onset of El Niño occurred in April 1997 and the event was of longer than average duration, onset of the next anticipated El Niño is not expected until February 2000 or later.

TP—2000–210074  February 2000

High-cycle fatigue-induced failures in turbine and turbopump blades is a pervasive problem. Single-crystal nickel turbine blades are used because of their superior creep, stress rupture, melt resistance, and thermomechanical fatigue capabilities. Single-crystal materials have highly orthotropic properties making the position of the crystal lattice relative to the part geometry a significant and complicating factor. A fatigue failure criterion based on the maximum shear stress amplitude on the 24 octahedral and 6 cube slip systems is presented for single-crystal nickel superalloys (FCC
crystal). This criterion greatly reduces the scatter in uniaxial fatigue data for PWA 1493 at 1,200 °F in air. Additionally, single-crystal turbine blades used in the Space Shuttle main engine high pressure fuel turbopump/ alternate turbopump are modeled using a three-dimensional finite element (FE) model. This model accounts for material orthotrophy and crystal orientation. Fatigue life of the blade tip is computed using FE stress results and the failure criterion that was developed. Stress analysis results in the blade attachment region are also presented. Results demonstrate that control of crystallographic orientation has the potential to significantly increase a component's resistance to fatigue crack growth without adding additional weight or cost.

TP—2000–210075 March 2000

A four-channel laser transmissometer has been used to probe the soot content of the exhaust plume of the X–34 60k–lb thrust Fastrac rocket engine at NASA's Marshall Space Flight Center. The transmission measurements were made at an axial location =1.65 nozzle diameters from the exit plane and are interpreted in terms of homogeneous radial zones to yield extinction coefficients from 0.5–8.4 per meter. The corresponding soot mass density, spatially averaged over the plume cross section, is, for Rayleigh particles =0.7 µg cm⁻³, and alternative particle distributions are briefly considered. Absolute plume radiancy at the laser wavelength (515 nm) is estimated from the data at =2,200 K equivalent blackbody temperature, and temporal correlations in emission from several spatial locations are noted.

TP—2000–210386 July 2000

Many crystals grown in space have structural flaws believed to result from convective motions during the growth phase. The character of these instabilities is not well understood but is associated with thermal and solutal density variations near the solidification interface in the presence of residual gravity and g-jitter. To study these instabilities in a separate, controlled space experiment, a concentration gradient would first have to be artificially established in a timely manner as an initial condition. This is generally difficult to accomplish in a microgravity environment because the momentum of the fluid injected into a test cell tends to swirl around and mix in the absence of a restoring force. The use of magnetic fields to control the motion and position of liquids has received recent, growing interest. The possibility of using the force exerted by a nonuniform magnetic field on a ferrofluid to not only achieve fluid manipulation but also to actively control fluid motion makes it an attractive candidate for space applications. This paper describes a technique for quickly establishing a linear or exponential fluid concentration gradient using a magnetic field in place of gravity to stabilize the deployment. Also discussed is a photometric technique for measuring the concentration profile using light attenuation. Although any range of concentrations can be realized, photometric constraints impose some limitations on measurements. Results of the ground-based experiments indicate that the species distribution is within 3 percent of the predicted value.

TP—2000–210387 July 2000

The prospects for realizing a magnetohydrodynamic (MHD-) bypass hypersonic airbreathing engine are examined from the standpoint of fundamental thermodynamic feasibility. The MHD-bypass engine, first proposed as part of the Russian AJAX vehicle concept, is based on the idea of redistributing energy between various stages of the propulsion system flow train. The system uses an MHD generator to extract a portion of the aerodynamic heating energy from the inlet and an MHD accelerator to reintroduce this power as kinetic energy in the exhaust stream. In this way, the combustor entrance Mach number can be limited to a specified value even as the flight Mach number increases. Thus, the fuel and air can be efficiently mixed and burned within a practical combustor length, and the flight Mach number operating
envelope can be extended. In this paper, we quantitatively assess the performance potential and scientific feasibility of MHD-bypass engines using a simplified thermodynamic analysis. This cycle analysis, based on a thermally and calorically perfect gas, incorporates a coupled MHD generator-accelerator system and accounts for aerodynamic losses and thermodynamic process efficiencies in the various engine components. It is found that the flight Mach number range can be significantly extended; however, overall performance is hampered by nonsentropic losses in the MHD devices.

TP—2000-210481 August 2000


A static test method for modeling low-velocity foreign object impact events to composites would prove to be very beneficial to researchers since much more data can be obtained from a static test than from an impact test. In order to examine if this is feasible, a series of static indentation and low-velocity impact tests were carried out and compared. Square specimens of many sizes and thicknesses were utilized to cover the array of types of low-velocity impact events. Laminates with π/4 stacking sequence were employed since this is by far the most common type of engineering laminate. Three distinct flexural rigidities under two different boundary conditions were tested in order to obtain damage ranging from that due to large deflection to contact stresses and levels in-between to examine if the static indentation-impact comparisons are valid under the spectrum of damage modes that can be experienced. Comparisons between static indentation and low-velocity impact tests were based on the maximum applied transverse load. The dependent parameters examined included dent depth, back surface crack length, delamination area, and to a limited extent, load-deflection behavior. Results showed that no distinct differences could be seen between the static indentation tests and the low-velocity impact tests, indicating that static indentation can be used to represent a low-velocity impact event.
This history covers the period from 1960 until 1990. It traces the history of the Marshall Space Flight Center in Huntsville, Alabama. The authors treat the Center’s technological contributions to the Nation’s space program. They also review the Center’s cultural and institutional history.
Tenth Biennial Coherent Laser Radar Technology.
M.J. Kavaya, Compiler. Earth Science Department.

The tenth conference on coherent laser radar technology and applications is the latest in a series beginning in 1980 which provides a forum for exchange of information on recent events current status, and future directions of coherent laser radar (or lidar or lader) technology and applications. This conference emphasizes the latest advancement in the coherent laser radar field, including theory, modeling, components, systems, instrumentation, measurements, calibration, data processing techniques, operational uses, and comparisons with other remote sensing technologies.


This document contains the proceedings of the 32nd annual NASA Aerospace Battery Workshop, hosted by the Marshall Space Flight Center on November 16–18, 1999. The workshop was attended by scientists and engineers from various agencies of the U.S. Government, aerospace contractors, and battery manufacturers, as well as international participation in like kind from a number of countries around the world. The subjects covered included nickel-hydrogen, nickel-cadmium, lithium-ion, and silver-zinc technologies.

National Forum on the Future Development of Space.
D. Dooling,* Compiler; D.V. Smitherman, Jr., Editor. Advanced Projects Office and *D2 Associates.

The exploration of space has been a successful national priority for decades. We have landed on the Moon, built the Shuttle, and are building the International Space Station. But, we have only just begun to develop the real commercial potential of space. How large is this potential for the broader business community? What are the technology, policy, and business strategies required to harvest real business value from space? How can we as policymakers, investors, researchers, and business leaders ensure that the commercial development of space advances at a pace and breadth that brings the most benefit to the national economy? To address these related questions, NASA and the U.S. Chamber of Commerce cosponsored a 1-day National Forum on the Future Development of Space, held March 16, 1999, in Washington, D.C. at the U.S. Chamber Headquarters. This report documents the key findings from this forum.


A space elevator is a physical connection from the surface of the Earth to a geostationary Earth orbit (GEO) above the Earth =35.786 km in altitude. Its center of mass is at the geostationary point such that it has a 24-hr orbit and stays over the same point above the equator as the Earth rotates on its axis. The vision is that a space elevator would be utilized as a transportation and utility system for moving people, payloads, power, and gases between the surface of the Earth and space. It makes the physical connection from Earth to space in the same way a bridge connects two cities across a body of water. The Earth-to-GEO space elevator is not feasible today, but could be an important concept for the future development of space in the latter part of the 21st century. It has the potential to provide mass transportation to space in the same way highways, railroads, power lines, and pipelines provide mass transportation across the Earth’s surface. The low energy requirements for moving payloads up and down the elevator could make it possible to achieve cost to orbit <$10/kg. This potential for low-cost mass transportation to space makes consideration of the technology paths required for space elevator construction very important today. The technology paths are beneficial to many other developments and can yield incremental benefits as progress is made toward making space elevator construction feasible. A number of issues were raised and resolved during the workshop that have helped to bring the space elevator concept out of the realm of science fiction and into the realm of possibility. It was found that the space elevator concept is incredibly large and complex, but no issues were without some obvious course of resolution. Given proper planning for the development of critical technologies, it appears that space elevator construction could become feasible.


ABDELDAYEM, H. USRA
PALEY, M.S. USRA
WITHEROW, W.K. SD47
FRAZIER, D.O. SD47

ADAMS, J.H. SD50
BASHINDZHAGYAN, G. Moscow State University
BASHINDZHAGYAN, P. Moscow State University
CHILINGARIAN, A. Yerevan Physics Institute
DRURY, L. Dublin Institute
EGOROV, N. Russian Research Institute
GOLUBKOV, S. Russian Research Institute
KOROTKOVA, N. Moscow State University
PANASYUK, M. Moscow State University
ET AL.

ADAMS, J.L. SD50
SIMMONS, E. SD50
HAGYARD, M.J. SD50
NEWTON, E.K. SD50
BERO, E. SD50

ALEXANDER, R.A. TD31
COLEMAN, H.W. UAH

ALTSTATT, R.L. SverdrupTechnology
EDWARDS, D.L. ED31

ANDERSON, D.M. TD20

ANDERSON, W.E. TD61
BUTLER, K. Boeing
CROCKETT, D. Orbital Sciences Corp.
LEWIS, T. Orbital Sciences Corp.
MCNEAL, C. TD15

ANILKUMAR, A.V. Vanderbilt University
BHOWMICK, J. Vanderbilt University
GRUGEL, R.N. SD47
Utilizing Controlled Vibrations in a Microgravity Environment to Understand and Promote Microstructural Homogeneity During Floating-Zone Crystal Growth. For presentation at Materials Science Conference, Huntsville, AL, June 7, 2000.

ANILKUMAR, A.V. Vanderbilt University
GRUGEL, R.N. SD47
LEE, C.P. Vanderbilt University

ARAKERE, N.K. University of Florida
SWANSON, G.R. ED22

ARAKERE, N.K. University of Florida
SWANSON, G.R. ED22

AUSTIN, R.E. TD13
ISHMAEL, S.D. Dryden Flight Research Center
LACEFIELD, C. Lockheed Martin

AUSTIN, R.E. TD13
RISING, J.J. Lockheed Martin
X-33, Leading the Way to VentureStar™ in this Decade. For presentation at 51st International Astronautical Congress, Rio de Janeiro, Brazil, October 2–6, 2000.

BAILEY, M.D. TD11
BOWER, M.V. UAH
Polar Plate Theory for Orthogonal Anisotropy. For presentation at the 51st International Astronautical Congress, Rio de Janeiro, Brazil, October 2–6, 2000.

BALLARD, R.O. TD51
OLIVE, T. TD51

BANKS, C. Alabama A&M University
YELLESWARAPU, C. Alabama A&M University
SHARMA, A. Alabama A&M University
FRAZIER, D.O. SD47
PENN, B. SD47
ABDEL DAYEM, H. SD47
Characterization of a Fabry-Perot-Based Electrooptic Modulator. For presentation at Optical Society of America ILS Conference, Providence, RI, October 23, 2000.

BARRET, C. TD40

BASHINDZHAGYAN, G. Moscow State University
ADAMS, J.H. SD50
CHILINGARIAN, A. Yerevan Physics Institute
DRURY, L. Dublin Institute
EGOROV, N. Russian Research Institute
GOLUBKOV, S. Russian Research Institute
KOROTKOVA, N. Moscow State University
PANASUK, M. Moscow State University
PODOROZHNIY, D. Moscow State University
ET AL.


BAUER, L.A. FD36

BEDROSSIAN, H. Lockheed Martin
TINKER, M.L. ED21
HIDALGO, H. ED21

BEECH, G.S. ED42
HAMPTON, R.D. UAH

BERNSTEIN, E.L. ED33
NUNES, A.C., JR. ED33

BERRY, S. Tufts University
HYERS, R.W. SD47
RACZ, L.M. Tufts University
ABEDIAN, B. Tufts University

BESHEARS, R.D. ED32

BHADEK, B.N. ED33
SHAH, S.
KAUL, R.
SMITHERS, G.A.
WATSON, M.

BHOWMICK, J. 
KOU, Q. 
ANILKUMAR, A.V. 
GRUGEL, R.N. 
WANG, T. 
Vanderbilt University

BLACKWELL, T. 
AMZAJERDI, F. 
KESTER, T.J. 
SD70

BLACKWELL, W.C. 
MINOW, J.I. 
EVANS, S.W. 
HARDAGE, D.M. 
SUGGS, R.M. 
Sverdrup Technology

BLACKWELL, W.C. 
MINOW, J.I. 
WARREN, K. 
SUGGS, R.M. 
O’DELL, S.L. 
SWARTZ, D.A. 
USRA 
TENNANT, A.F. 
VIRANI, S.N. 
SD50 
SD50 
SD50 
SD50

BLAKESLEE, R.J. 
BAILEY, J. 
KOSHAK, W.J. 
SD60 
SD60 
SD60

BLAND, J.D. 
TD13

BOCCIPIO, D.J. 
BOECK, W. 
GOODMAN, S.J. 
CUMMINS, K. 
CRAMER, J. 
SD60 
Niagara University 
SD60 
Global Atmospherics 
SD60 
Global Atmospherics

BOCCIPIO, D.J. 
CUMMINS, K. 
CHRISTIAN, H.J. 
GOODMAN, S.J. 
SD60 
SD60 
SD60

BOCCIPIO, D.J. 
GOODMAN, S.J. 
HECKMAN, S. 
SD60 
SD60 
SD60

BOCCIPIO, D.J. 
HECKMAN, S. 
GOODMAN, S.J. 
SD60 
SD60 
SD60

BOCCIPIO, D.J. 
HECKMAN, S. 
GOODMAN, S.J. 
SD60 
SD60 
SD60

BONOMETTI, J.A. 
TD40


Development of a Remote Sensing and Microgravity Student GAS Payload. For presentation at NASA/GSFC 99 SSPPO Symposium, Annapolis, MD, September 1999.

BURKE, M.W. UAH
JUDGE, R.A. UAH
PUSEY, M.L. SD48

BURKE, M.W. SD48
JUDGE, R.A. SD48
PUSEY, M.L. SD48

CAMPBELL, C.W. JAYA Corporation
KEITH, A.G. AD10

CARDELINO, B.H. Spelman College
MOORE, C.E. SD40
CARDELINO, C.A. Georgia Institute of Technology
FRAZIER, D.O. SD40
BACHMAN, K.J. North Carolina State University

CARRASQUILLO, E.J. SD47
GRIFFIN, M.R. Tech-Masters
HAMMOND, M.S. SD47
JOHNSON, M.L. SD47
GRUGEL, R.N. SD47

CARRINGTON, C.K. FD02
FIKES, J. FD02
CASH, W. SD50
SHIPLEY, A. SD50
OSTERMAN, S. SD50
JOY, M.K. SD50

CARRUTH, M.R., JR. ED31
FERGUSON, D. Glenn Research Center
SUGGS, R.M. ED31
MCCOLLUM, M. ED31

CARUSO, S.V. ED36
CLARK-INGRAM, M.A. ED36

CASH, W. SD50
SHIPLEY, A. SD50
OSTERMAN, S. SD50
JOY, M.K. SD50

CHAKRABARTI, S. TD40
SCHMIDT, G.R. TD40

CHRISTIAN, H.J. SD60
BLAKESLEE, R.J. SD60
GOODMAN, S.J. SD60

CHUA, D. SD50
PARKS, G.K. SD50
BRITTNACHER, M. SD50
GERMANY, G.A. SD50
SPANN, J.F. SD50

CISSOM, R.D. FD32
COBB, B.J. FD32
RAMAGE, K.S. Teledyne Brown Engineering

COFFEY, V.N. SD50
CHANDLER, M.O. SD50
MOORE, T.E. GSFC

COMFORT, R.H. UAH
RICHARDS, P.G. UAH
LIAO, J.-H. UAH
CRAVEN, P.D. SD50

COOK, S.A. TD15

CRAIG, L. ED22
JACOBSON, D. SD70
MOSIER, D. GSFC
NEIN, M. Pace and Waite, Inc.
PAGE, T. ED26
REDDING, D. JPL
SUTHERLIN, S. Raytheon
WILKERSON, G. Microcraft

CRAWFORD, K. ED13

CROUCH, M. SD42
CARSWELL, W.E. UAH
FARMER, J.T. SD42
ROSE, F. Pace and Waite, Inc.
TIDWELL, P. Micro Craft, Inc.
Quench Module Insert (QMI) and Diffusion Module Insert (DMI) Furnace Development. For presentation at Space Technology and Application International Forum (STAIF-00), Albuquerque, NM, January 30–February 3, 2000.

CRUZEN, C.A. TD54
DABNEY, R.W. TD54
LOMAS, J.J. TD54
Test Results for the Automated Rendezvous and Capture System. For presentation at AAS Guidance and Control Conference, Breckenridge, CO, February 2–6, 2000.

DAVIS, J.M. SD50
DELAY, T.K.  

DENNIS, H.J., JR.  
SANDERS, T.  

DILL, C.C.  

DING, R.J.  

DISCHINGER, H.C., JR.  
HAMILTON, G.S.  
WU, H.-I.  
Texas A&M University  
The Use of Human Factors Simulation to Conserve Operations Expense. For presentation at SouthEast Simulation Conference, Huntsville, AL, October 6–7, 1999.

DONAHUE, B.B.  
PEARSON, J.B.  
Boeing  
Advanced Plasma Propulsion for Human Missions to Jupiter. For presentation at Annual ASME Executive Committee Meeting, Nashville, TN, November 18, 1999.

DOWNEY, J.P.  

DOWNEY, J.P.  

DOWNEY, J.P.  

DOWNEY, J.P.  

DUSSON, M.C.  
ALVES, J.  
HUTCHINSON, S.L.  

EDWARDS, D.L.  
CARRUTH, M.R.  
VAUGHN, J.A.  
SCHNEIDER, T.A.  
KAMENETZKY, R.R.  
GRAY, P.  
Native American Services  

EDWARDS, D.L.  
FINCKENOR, M.M.  

EFFINGER, M.R.  
CLINTON, R.G., JR.  
DENNIS, J.  
ELAM, S.  
GENGE, G.  
ECKEL, A.  
JASKOWIAK, M.H.  
KISER, J.D.  
LANG, J.  
Glenn Research Center  
GENGE, G.  
ECKEL, A.  
JASKOWIAK, M.H.  
KISER, J.D.  
LANG, J.  

EFFINGER, M.R.  
ECKEL, A.  
JASKOWIAK, M.H.  
KISER, J.D.  
LANG, J.  

ENG, R. SD73  
KEGLEY, J. SD73  
KEIDEL, J. SD73


ENG, R. SD73  
STAHL, P. SD73  
KEIDEL, J. SD73  
KEGLEY, J. SD73  
GEARY, J.M. UAH


ENGBERG, R.C. ED27  
LASSITER, J.O. ED27  
MCGEE, J.K. SRS Technologies


ENGELHAUPT, D. UAH  
RAMSEY, B.D. SD50  
O’DELL, S.L. SD50  
JONES, W.D. SD50  
RUSSELL, J.K. SD50


ERICKSON, R.J. FD21  
MASON, R.K. Hamilton Sundstrand


ESCHER, W.J.D. SAIC  
RODDY, J.E. SAIC  
HYDE, E.H. TD15


ETHRIDGE, E.C. SD47  
TUCKER, D.S. SD47


EWING, F. USRA  
DONOVAN, D. Raytheon  
PUSEY, M.L. SD48


FALCONER, D.A. SD50  
MOORE, R.L. SD50  
GARY, G.A. SD50


FALCONER, D.A. SD50  
MOORE, R.L. SD50  
PORTER, J.G. SD50  
HATHAWAY, D.H. SD50


FARMER, R.C. SECA, Inc.  
CHENG, G. SECA, Inc.  
TRINH, H.P. TD61  
TUCKER, P.K. TD61

HUTT, J.J. TD61

MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

FERRARO, R.
COLTON, M.
DEBLONDE, G.
JEDLOVEC, G.J.
LEE, T.

FILLINGIM, M.O.
PARKS, G.K.
CHEN, L.J.
BRITTNACHER, M.
GERMANY, G.A.
SPANN, J.F.
LARSON, D.
LIN, R.P.

FINCKENOR, M.M.
CLARK-INGRAM, M.A.

FINCKENOR, M.M.
KAMENETZKY, R.R.
VAUGHN, J.A.
MELL, R.
DESPANDE, M.S.

FINGER, M.H.
WILSON-HODGE, C.A.

FIORUCCI, T.
LAKIN, D.R., II
REYNOLDS, T.D.
Optical Sciences Corp.

FISHER, M.F.
CHAMPION, R.H., JR.
Vehicle Engineering Development Activities at the Marshall Space Flight Center. For presentation at PERC 11th Symposium, Penn State University, University Park, PA, November 18–19, 1999.

FORK, R.L.
COLE, S.T.
DIFFEY, W.M.
GAMBLE, L.J.
KEYS, A.S.

FORSYTHE, E.
PUSEY, M.L.

FOWLER, S.B.
Flutter Analysis of the X–33. For presentation at 41st AIAA SDM Conference, Atlanta, GA, April 3–6, 2000.
HARRIS, D. ED21
PARKS, R. ED73
BRUNTY, J. ED21

FRAZIER, D.O. SD40

GALLAGHER, D.L. SD50
BILITZA, D.

GALLAGHER, D.L. SD50
MOORE, J.

GALLAGHER, D.L. SD50
OBER, D.

GALLAGHER, D.L. SD50
SANDEL, B.R.

GAMBRELL, S. ASRI
STEPHENSON, A. DA01
The Impact of NASA’s Technology at the State and Local Government Level. For presentation at the Council of State Governments, Quebec City, Canada, December 4, 1999.

GARCIA, R. TD63

GENGE, G.G. TD61
MARSH, M.W. TD61

GERRISH, H. TD40

GHOSH, K.K. NAS/NRC/SD50
RAMSEY, B.D. SD50
SADUN, A.C. University of Colorado
SOUNDARARAJAPERUMAL, S. Indian Institute of Technology
WANG, J.R. Yunnan Observatory

GIBLIN, T.W. SD50
CONNAUGHTON, V.
VAN PARADIJS, J.
PREECE, R.D.
BRIGGS, M.S.
KOVELIOTOU, C.
WIJERS, R.A.
FISHMAN, G.J. SD50

GIBSON, H. ED32
MOORE, C. ED32
THOM, R. ED32

GIBSON, U.J. Dartmouth College
HORRELL, E.E. Dartmouth College
KOU, Y. Dartmouth College
PUSEY, M.L. SD48
GILLIES, D.C.  SD47

GILLIES, D.C.  SD47
The Current Microgravity Materials Science Program. For presentation at Materials Science Conference, Huntsville, AL, June 8, 2000.

GILLIES, D.C.  SD47

GILLIES, D.C.  SD47
ENGEL, H.P.  SD47

GODFROY, T.  TD40
VAN DYKE, M.  TD40
DICKENS, R.  TD40
PEDERSEN, K.  TD40
LENARD, R.  TD40
HOUTS, M.  TD40

GOLDSTEIN, J.  Dartmouth College
DENTON, R.E.  Dartmouth College
HUDSON, M.K.  Dartmouth College
MIFTAKHOVA, E.G.  Dartmouth College
MENIETTI, J.D.  University of Iowa
GALLAGHER, D.L.  SD50

GOODMAN, S.J.  SD60
BUECHLER, D.E.  UAH
DRISCOLL, K.T.  UAH
BURGESS, D.W.  NEXRAD
MAGSIG, M.A.  NEXRAD

GOODMAN, S.J.  SD60
BUECHLER, D.E.  GHCC
DRISCOLL, K.T.  GHCC
BURGESS, D.W.  NOAA/NWS/OSF
MAGSIG, M.A.  University of Oklahoma

GRAY, P.A.  ED31
EDWARDS, D.L.  ED31
CARRUTH, M.R.  ED31
CAMPBELL, J.W.  ED31

GRIFFIN, L.W.  TD64
DORNEY, D.J.  Virginia Commonwealth University

GRODSINSKY, C.M.  Bicron Corp.
WHORTON, M.S.  TD55

GRUBBS, R.P.  AD32
LINDBLOM, W.  Computer Sciences Corp.
GEORGE, S.  Computer Sciences Corp.
GRUGEL, R.N. SD47

GRUGEL, R.N. SD47

GRUGEL, R.N. SD47
Novel Materials for Application as Shielding During Extended Space Flights. For presentation at Radiation Shielding Workshop, Berkeley, CA, August 8, 2000.

GRUGEL, R.N. BRUSH, L.N. SD47

GRUGEL, R.N. FEDOSEYEV, A.I. SD47

GRUGEL, R.N. FEDOSEYEV, A.I. SD47
Novel Directional Solidification of Hypermonotectic Alloys. For presentation at Materials Science Conference, Huntsville, AL, June 6, 2000.

GRUGEL, R.N. FEDOSEYEV, A.I. SD47
An Experimental and Mathematical Study to Evaluate the Role of Ultrasonic Energy in Promoting Microstructural Uniformity During Controlled Directional Solidification Processing. For presentation at 3rd International Aerospace Congress, Moscow, Russia, August 24, 2000.

GRUGEL, R.N. FEDOSEYEV, A.I. SD47
Modeling of Ultrasonically Generated Liquid-Liquid Dispersions During Controlled Directional Solidification. For presentation at University of New York, Stony Brook, NY, October 18, 2000.

GRUGEL, R.N. FEDOSEYEV, A.I. SD47

GRUGEL, R.N. MUZURUK, K. SD47

GRUGEL, R.N. WATTS, J. SD47

GUBAREV, M. National Research Council
CISZAK, E. USRA
PONOMAREV, I. X-Ray Optical Systems
JOY, M.K. SD50

GUBAREV, M. National Research Council
CISZAK, E. USRA
PONOMAREV, I. X-Ray Optical Systems
JOY, M.K. SD50

GUILLORY, A.R. SD60
JEDLOVEC, G.J. SD60
ATKINSON, R.J. Lockheed Martin
HOOD, R.E. SD60
LAFONTAINE, F.J. Raytheon ITSS

HADAWAY, J.B. UAH
GEARY, J.M. UAH
REARDON, P. UAH
PETERS, B. UAH
KEIDEL, J. SD74
CHAUVERS, G. SD74


HAGOPIAN, J. FD34
MEARS, T. Teledyne Brown Engineering

HAKKILA, J. SD50
HAGLIN, D.J. SD50
PENDLETON, G.N. SD50
MALLOWI, R.S. SD50
MEEGAN, C.A. SD50
ROGER, R.J. SD50


HALL, D.K. ED11
KIRKICI, H. ED11/Auburn University
HILLARD, G.B. Glenn Research Center
SCHWEICKART, D. U.S. Air Force
DUNBAR, B.

HAMAKER, J. VS20

HAMILTON, G.S. ED42
HALL, M.L. ED42

HAMPTON, R.D. UAH
BEECH, G.S. ED42

HAMPTON, R.D. TD55
WHORTON, M.S. TD55

HAN, S. Tennessee Tech. University
BAI, D. TD40
SCHMIDT, G.R. TD40

HANSON, J.M. TD54

HARDAGE, D.M. ED03
PEARSON, S.D. ED03

HARMON, B.A. SD50
FISHMAN, G.J. SD50
WILSON, C.A. SD50
PACIESAS, W.S. UAH
ZHANG, S.N. UAH
FINGER, M.H. USRA
KOSHUT, T.M. USRA
MCCOLLOUGH, M.L. USRA
ROBINSON, C.R. USRA
RUBIN, B.C. USRA

HARRIS, L. ED23
BARBOKA, J. Alabama A&M University
ROJAS-OVIEDO, R. Alabama A&M University
DENG, Z.T. Alabama A&M University

HATHAWAY, D.H. SD50

HATHAWAY, D.H. SD50
BECK, J.G. Stanford University
BOGART, R.S. Stanford University
BACHMANN, K.T. Birmingham-Southern
KHATRI, G. Birmingham-Southern
PETITTO, J.M. Birmingham-Southern
HAN, S. Tennessee Tech. University
RAYMOND, J. Tennessee Tech. University

HATHAWAY, D.H. SD50
WILSON, R.M. SD50
REICHMANN, E.J. SD50

HAYNES, M.W. AD23

HELLIWELL, J.R. University of Manchester, UK
SNEILL, E.H. SD48/NRC
CHAYEN, N.E. Blackett Laboratory
JUDGE, R.A. SD48/NRC
BOGGON, T.J. University of Manchester, UK

HENDERSON, A.J., JR. ED36

HENDERSON, A.J., JR. ED36

HIDALGO, H., JR. ED21

HODEL, A.S. TD55

HODGE, A.J. ED34
KAUL, R.K. ED34
MCMAHON, W.M. ED34
REINARTS, T. United Space Alliance

HOLDER, D.W. FD21
PARKER, D. Hamilton Sundstrand

HOLT, J.B. TD64
RUF, J.H. TD64
FDNS CFD Code Benchmark for RBCC Ejector Mode Operation. For presentation at PERC Symposium on Propulsion, Penn State University, PA, November 18–19, 1999.

HOLT, K. TD53
MAJUMDAR, A. TD53
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Institution</th>
<th>Title</th>
<th>Conference/Publication Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedayat, A.</td>
<td>Sverdrup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holzapfel, W.L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carlstrom, J.E.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grego, L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reese, E.D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hood, R.E.</td>
<td>SD60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guillory, A.R.</td>
<td>SD60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoover, R.B.</td>
<td>SD50</td>
<td>Cryoconite and Ice-Bubble Microbial Ecosystems in Antarctica. For presentation at SPIE Conference, San Diego, CA, July 30–August 4, 2000.</td>
<td></td>
</tr>
<tr>
<td>Horwitz, J.L.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeng, W.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevenson, B.A.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wu, X.-Y.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany, G.A.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Su, Y.-J.</td>
<td>Los Alamos National Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craven, P.D.</td>
<td>SD50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich, F.J.</td>
<td>Air Force Research Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horwitz, J.L.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeng, W.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevenson, B.A.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wu, X.-Y.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany, G.A.</td>
<td>UAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craven, P.D.</td>
<td>SD50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rich, F.J.</td>
<td>Air Force Research Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houts, M.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonometti, J.A.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morton, J.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hrbud, I.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bitteker, L.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Van Dyke, M.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Godfroy, T.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedersen, K.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dobson, C.</td>
<td>TD40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Et al.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horack, J.M.</td>
<td>SD01</td>
<td>Science Communications: Providing a Return on Investment to the Taxpayer. For publication on Explorezone.com, 1999/2000.</td>
<td></td>
</tr>
<tr>
<td>Borchelt, R.E.</td>
<td>SD01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Development and Results of a First Generation Least Expensive Approach to Fission: Module Tests and Results. For presentation at Eighth International Conference on Nuclear Engineering, Baltimore, MD, April 2–6, 2000.

HOUTS, M. TD40
VAN DYKE, M. TD40
GODFROY, T. TD40
MARTIN, J.J. TD40
DICKENS, R. TD40
PEDERSON, K. TD40
POSTON, D. Los Alamos National Lab
REID, B. Los Alamos National Lab
LIPINSKI, R. Sandia National Labs
ET AL.


HOUTS, M. TD40
VAN DYKE, M. TD40
GODFROY, T. TD40
PEDERSEN, K. TD40
MARTIN, J.J. TD40
DICKENS, R. TD40
SALVAIL, P.
HRBUD, I.


HOWARD, R.T. ED19
BRYAN, T.C. ED19
BOOK, M.L. ED19


HOUTS, M. TD40
VAN DYKE, M. TD40
GODFROY, T. TD40
PEDERSON, K. TD40
MARTIN, J.J. TD40
DICKENS, R. TD40
SALVAIL, P.
HRBUD, I.


HRBUD, I. TD40
ROSE, M.F. SD01
OLESON, S.R. NYMA Inc.
JENKINS, R.M. Auburn University


HUDSON, S.T. Mississippi State University
ZOLADZ, T.F. TD63
GRIFFIN, L.W. TD63


HUETER, U. TD15


HUETER, U. TD15


HUETER, U. TD15


HUMPHRIES, W.R., JR. MP01

Space Shuttle Propulsion Safety Upgrades. For presentation at Navy, Air Force/French Combustion
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)


HUTT, J.J. 

HYDE, D.W. 
LAKIN, D.R., II 
ASQUITH, T.E. 

HYDE, E.H. 
ESCHER, D.W. 
HECK, M.T. 
RODDY, J.E. 

HYERS, R.W. 
JOHNSON, W.L. 
SAVAGE, L. 
ROGERS, J.R. 

HYERS, R.W. 
TRAPAGA, G. 
ABEDIAN, B. 
MATSON, D.M. 


JAAP, J. 
MUERY, K. 

JACOBS, W.A. 

JACOBS, W.A. 

JACOBSON, D. 

JARZEMBSKI, M.A. 
SRIVASTAVA, V. 

JEDLOVEC, G.J. 
LERNER, J.A. 
IWAI, H. 
HAINES, S. 

JOHNSON, C.L. 

JOHNSON, C.L. 
JOHNSON, C.L.  
LEIFER, S.  

JOHNSON, D.L.  
RAWLINS, M.A.  
_Hurricane Properties for KSC and Mid-Florida Coastal Sites. For presentation at AMS Conference, Orlando, FL, September 11–15, 2000._

JOHNSON, D.L.  
VAUGHAN, W.W.  

JOHNSTON, N.J.  
CLINTON, R.G., JR.  
MCMAHON, W.M.  

JONES, C.S., Ill  
ADAMS, G.  
COLLIGAN, K.  
_Demonstration of a Large-Scale Tank Assembly via Circumferential Friction Stir Welds. For presentation at 11th AeroMat Conference & Exposition, Seattle, WA, June 26–29, 2000._

JONES, M.R.  
FARMER, J.T.  
BREEDING, S.P.  
_Two Fiber Optical Fiber Thermometry. For presentation at 2000 International Mechanical Engineering Conference & Exposition, Orlando, FL, November 5, 2000._

JONES, W.D.  
O’DELL, S.L.  
_MSFC Research in Lightweight, X-Ray Mirrors for the Constellation-X Mission. For presentation at OSA Optical Fabrication and Testing Topical Meeting, Quebec City, Canada, June 18–22, 2000._

JOY, M.K.  
_Astronomical X-Ray Optics. For publication in Handbook of Optics, 2000._

KAVAYA, M.J. SD60

KAVAYA, M.J. SD60

KHAZANOV, G.V. University of Alaska, Fairbanks
STONE, N.H. SD50
KRIVORUTSKY, E.N. University of Alaska, Fairbanks
LIEMOHN, M.W. University of Michigan

KHINE, Y.Y.
WALKER, J.S.
SZOFRAN, F.R. SD47

KIM, C. Chonbuk National University
BOLLER, T. Max-Planck Institute
GHOSH, K.K. NRC
SWARTZ, D.A. USRA
RAMSEY, B.D. SD50

KIM, S. Hoseo University, Korea
GRUGEL, R.N. SD47

KNOX, J.C. FD21

KOCZOR, R.J. SD01
PHILLIPS, T.

KOLODZIEJCZAK, J.J. SD50
ELSNER, R.F. SD50
AUSTIN, R.A.
O'DELL, S.L. SD50

KOMAR, D.R. TD53
MCDONALD, J.
Sverdrup Technology
DRACO Flowpath Performance & Environments. For presentation at Penn State PERC Symposium, State College, PA, November 18, 1999.

KOSHAK, W.J. SD60
SOLAKIEWICZ, R.J. Chicago State University

LAFONTAINE, F.J. Raytheon ITSS
HOOD, R.E. SD60
GUILLORAY, A.R. SD60

LAMB, D.J. SD72

LANSING, M.D. UAH
WALKER, J.L. ED32
RUSSELL, S.S. ED32


Magnetic Flux Compression Concept for Nuclear Pulse Propulsion and Power. For presentation at Magneto- and Plasma-Aerospace Applications Workshop, Moscow, Russia, April 5–7, 2000.


LITCHFORD, R.J. TD40
ROBERTSON, T. TD40
HAWK, C.W. UAH
TURNER, M. UAH
KOELFGEN, S. UAH


LONDON, J.R., III TD14

LONDON, J.R., III TD14

LU, H.-I. USRA
ROBERTSON, F.R. SD60


LUVALL, J.C. SD60
KAY, J.J. University of Waterloo
FRASER, R.F. University of Waterloo


LUVALL, J.C. SD60
KAY, J.J. University of Waterloo
FRASER, R.F. University of Waterloo


LUVALL, J.C. SD60
RICKMAN, D.L. SD60

The Use of Thermal Remote Sensing to Study Thermodynamics of Ecosystem Development. For presentation at Workshop on Multi/Hyperspectral Sensors, Measurements, Modeling, and Simulation, Redstone Arsenal, AL, November 7–9, 2000.

LYLES, G.M. TD15

LYLES, G.M. TD15
Advances in Space Transportation Technology Toward the NASA Goals. For presentation at 51st International Astronautical Congress, Rio de Janeiro, Brazil, October 2–6, 2000.

MACLEOD, T.C. SD22
HO, F.D. UAH


MAJUMDAR, A. ED25
POLSGROVE, R. ED25
TILLER, B. ED25


MALIZIA, A. SD50
BASSANI, L. SD50
DEAN, A.J. SD50
MCCOLLOUGH, M.L. SD50
STEPHEN, J.B. SD50
ZHANG, S.N. SD50


MALONE, C.C. USRA
KARR, L. SD48


MALONE, C.C. SD48
SUMIDA, J. SD48
PUSEY, M.L. SD48

MARTIN, J.J. TD40
HOLT, J.B. TD40

MAZURUK, K. SD47

MAZURUK, K. SD47
GRUGEL, R.N. SD47

MCCLURE, J.C. University of Texas
EVANS, D.M. University of Texas
TANG, W. University of Texas
NUNES, A.C., JR. ED33

MCOLLOUGH, M.L. USRA/SD50
FISHMAN, G.J. SD50
WALTMAN, E.B. Naval Research Lab

MCOLLOUGH, M.L. USRA/SD50
WILSON, C.A. SD50

MCOLLOUGH, M.L. USRA/SD50
WILSON, C.A. SD50
SUN, X. UAH

MCGHEE, D.S. ED21

MCGILL, P. ED33

MCGILL, P. ED33

MCGILL, P. ED33
RUSSELL, S.S. ED32

MEEGAN, C.A. SD50

MEEGAN, C.A. SD50

MENDE, S.B. University of CA, Berkeley
HEETDERKS, H. University of CA, Berkeley
FREY, H.U. University of CA, Berkeley
LAMPTON, M. University of CA, Berkeley
GELLER, S.P. University of CA, Berkeley
SPANN, J.F. SD50
FUSELIER, S.A. Lockheed Martin
MURPHREE, S. University of Calgary
ET AL.
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

GELLER, S.P. University of CA, Berkeley
STOCK, J.M. University of CA, Berkeley
ABIAD, R. University of CA, Berkeley
SIEGMUND, O.H.W. University of CA, Berkeley
SPANN, J.J., JR. SD50
ET AL.

MINOW, J.I. Sverdrup Technology
BLACKWELL, W.C. Sverdrup Technology
NEERGAARD, L. Sverdrup Technology
EVANS, S.W. ED44
OWENS, J.K. ED44
HARDAGE, D.M. ED03

MITROFANOV, I.G.
LITVAK, M.L.
ANFIMOV, D.S.
SANIN, A.B.
BRIGGS, M.S. SD50
PACIESAS, W.S.
PENDLETON, G.N.
PREECE, R.D.
MEEGAN, C.A. SD50

MOORE, R.L. SD50
FALCONER, D.A. SD50
PORTER, J.G. SD50
Subresolution Fibrillation in X-Ray Microflares Observed by Yohkoh SXT. For presentation at Sagamihara, Tokyo, Japan Institute of Space and Astronautical Science, Kanagawa, Japan, December 6, 1999.

MOORE, R.L. SD50
HATHAWAY, D.H. SD50
REICHMANN, E.J. SD50

MOORE, R.L. SD50
STERLING, A.C. SD50
Onset of the Magnetic Explosion in Filament-Eruption Flares and CMEs. For presentation at Catholic University of America, Washington, DC, March 6–9, 2000.

MOORE, R.L. SD50
STERLING, A.C. SD50

MOORE, R.L. SD50
PRINCE, A.S. Thiokol
SELVIDGE, S.A. Thiokol
PHelps, J. MP51
MARTIN, C.L. TD53
LAWRENCE, T.W. ED34

NADARAJAH, A. University of Toledo
LI, H. University of Toledo
KONNERT, J.H. Naval Research Lab
PUSEY, M.L. SD48

NAFTEL, J.C. TD13
X-33, Stepping Stone to Low Cost Access to Space. For presentation at International Space University, Valparaiso, Chile, Summer Session 2000.

NALL, M. SD10
ASKEW, R. SD10

NEERGAARD, L. IIT Research Institute
EFFINGER, M.R. ED34
NEGUEHUELA, I. SAX SDC (Italy) 
REIG, P. University of Crete 
FINGER, M.H. SD50 
ROCHE, P. University of Leicester 
Detection of X-Ray Pulsations From the Be/X-Ray Transient A 0535+26 During a Disc Loss Phase of the Primary. For publication in Astronomy & Astrophysics, Heidelberg, Germany, 1999/2000.

NEWTON, E.K. SD50 
GIBLIN, T.W. SD50 

ROCHE, E. University of Leicester 
Detection of X-Ray Pulsations From the Be/X-Ray Transient A 0535+26 During a Disc Loss Phase of the Primary. For publication in Astronomy & Astrophysics, Heidelberg, Germany, 1999/2000.

NEGUHUELA, I. SAX SDC (Italy) 
REIG, P. University of Crete 
FINGER, M.H. SD50 
ROCHE, P. University of Leicester 
Detection of X-Ray Pulsations From the Be/X-Ray Transient A 0535+26 During a Disc Loss Phase of the Primary. For publication in Astronomy & Astrophysics, Heidelberg, Germany, 1999/2000.

NEWTON, E.K. SD50 
GIBLIN, T.W. SD50 

NEGUHUELA, I. SAX SDC (Italy) 
REIG, P. University of Crete 
FINGER, M.H. SD50 
ROCHE, P. University of Leicester 
Detection of X-Ray Pulsations From the Be/X-Ray Transient A 0535+26 During a Disc Loss Phase of the Primary. For publication in Astronomy & Astrophysics, Heidelberg, Germany, 1999/2000.

NEWTON, E.K. SD50 
GIBLIN, T.W. SD50 
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

PANADA, B. IIT Research Institute
JERMAN, G. ED33

PAPILA, N. University of Florida
SHYY, W. University of Florida
GRIFFIN, L.W. TD64
HUBER, F. Riverbend Design Services
TRAN, K. Boeing

PARHI, S. SD50
SUSS, S.T. SD50

PARHI, S. SD50
SUSS, S.T. SD50

PARK, N. Oklahoma State
REAGAN, S. ED42
FRANKS, G. ED42
JONES, W.G. ED42

PARKS, G.K. SD50
BRITTNERCHER, M. SD50
CHUA, D. SD50
FILLINGIM, M.O. SD50
GERMANY, G. SD50
SPANN, J.F. SD50

PATEL, S.K. SD50
JOY, M.K. SD50
CARLSTROM, J.E. University of Chicago
HOLDER, G.P. University of Chicago

REES, E.D. University of Chicago
GOMEZ, P.L. Rutgers University
HUGHES, J.P. Rutgers University
GREGO, L. Harvard-Smithsonian
HOZAPBEL, W.L. University of CA, Berkeley

PATTERSON, M. Ceramic Composites
MCQUISTON, D. Ceramic Composites
JASKOWIAK, M. Glenn Research Center
ELAM, S. TD61
EFFINGER, M.R. ED34

PECK, J. ED21
BRUNTY, J. ED21

PETERS, P.N. SD47

PETERS, P.N. SD47
SISK, R.C. SD47
SEN, S. SD47
KAUKLER, W.F. SD47
CURREN, P.A. SD47
WANG, F.C. SD47

PETERS, W. TD61

PETERS, W. TD61
ROGERS, P. TD61
LAWRENCE, T.W. TD61
DAVIS, D. TD61
D’AGOSTINO, M. TD61
BROWN, A. TD61

Politès, M.E. ED10

Porter, J.G. SD50
Davis, J.M. SD50
Gary, G.A. SD50
West, E.A. SD50
Rabin, D.M. NOAO/NSO
Thomas, R.J. GSFC
Davila, J.M. GSFC

Pusey, M.L. SD48
Burke, M.W. UAH
Judge, R.A. UAH

Pusey, M.L. SD48
Snell, E.H. SD48
Judge, R.A. SD48
Chayen, N.E. Imperial College, UK
Bogggon, T.J. Univ. of Manchester, UK
Helliwell, J.R. Univ. of Manchester, UK

Pusey, M.L. SD48
Sumida, J. USRA

Pusey, M.L. SD48
Sumida, J. SD48
Fluorescence Studies of Protein Crystal Nucleation. For presentation at SPIE Conference, San Diego, CA, August 1, 2000.

Quast, P. TRW
Tung, F. TRW

Widner, J. TRW
West, M. TD55
Chandra X-ray Observatory Pointing Control System Performance During Transfer Orbit and Initial On-orbit Operations. For presentation at 23rd Annual AAS Guidance and Control Conference, Breckenridge, CO, February 2-6, 2000.

Quattrochi, D.A. SD60
Emerson, C.W. Western Michigan University
Lam, N.S. Louisiana State University
Quin, H.-L. California State University

Quattrochi, D.A. SD60
Luvall, J.C. SD60
Estes, M.G., Jr. SD60

Quattrochi, D.A. SD60
Luvall, J.C. SD60
Estes, M.G., Jr. SD60

Quattrochi, D.A. SD60
Luvall, J.C. SD60
Estes, M.G., Jr. USRA
RAKOCZY, J. SD71
MONTGOMERY, E.E. SD71
LINDER, J. SD71

Recent Enhancements of the Phased Array Mirror Extendible Large Aperture (PAMELA) Telescope Testbed at MSFC. For presentation at Astronomical Telescopes and Instrumentation Conference, Munich, Germany, March 27–31, 2000.

RAMACHANDRAN, N. USRA/SD47
LESLIE, F.W. SD47

Magnetic Susceptibility Effects and Lorentz Damping in Diamagnetic Fluids. For presentation at ITAM Conference, Chicago, IL, August 27, 2000.

RAMACHANDRAN, N. USRA/SD47
MAZURUK, K. USRA/SD47
VOLZ, M.P. SD47


RAMACHANDRAN, N. USRA/SD47
YEH, Y.P. Cray Research
SMITH, A.W. SD47
HEAMAN, J.P. SD47


RAMSEY, B.D. SD50
ENGELHAUPT, D. SD50
SPEEGLE, C.O. SD50
O’DELL, S.L. SD50
AUSTIN, R.A. SD50
ELSNER, R.F. SD50
KOLODZIEJCZAK, J.J. SD50
WEISSKOPF, M.C. SD50


RAWLIBNIS, M.A. Raytheon
JOHNSON, D.L. ED44
BATTTS, G.W. Computer Sciences Corp.


RAY, C.D. FD21
PERRY, J.L. FD21
CALLAHAN, D.M. ION Corporation

S. Smith, SD74
R. Eng, SD74
P. Stahl, SD74

Multi-Use Space Optics Test Facility. For presentation at OSA Optical Meeting, Quebec, Canada, June 18-23, 2000.

J.L. Reuter, FD21


D.L. Rickman, SD60
J.C. Luvall, SD60
J.M. Wersinger, Auburn University
P. Mask, Auburn University
D.E. Kessel, University of Georgia

The Design of a Remote Sensing Data Acquisition Campaign for Precision Agriculture and Some Early Results. For presentation at 1999 National Sensing Application Conference and Workshop, Auburn, AL, November 15-17, 1999.

D.L. Rickman, SD60
S. Schiller, SD60
J.C. Luvall, SD60


D.L. Rickman, SD60
J.C. Luvall, SD60
S. Schiller, South Dakota State Univ.


J.M. Ritter, SD71


J.M. Ritter, SD71

K.J. Voss, University of Miami


J. Roads, Scripps Institution of Oceanography
F.R. Robertson, Purdue University
R. Oglesby, University of North Carolina
S. Marshall, University of Georgia


W. Roark, Mevatec
D. Cockrell, SD46
C. Coker, SD46
C. Baughner, SD46


B.C. Roberts, ED44
F. Leahy, Raytheon


J.R. Rogacki, TD01


J.R. Rogers, SD47
R.W. Hyers, SD47
M.B. Robinson, SD47
L. Savage, SD47


J.R. Rogers, SD47
R.W. Hyers, SD47
T. Rathz, SD47
L. Savage, SD47
M.B. Robinson, SD47

ROGERS, J.R. SD47
HYERS, R.W. SD47
RATHZ, T.J. SD47
SAVAGE, L. SD47
ROBINSON, M.B. SD47


ROGERS, J.R. SD47
HYERS, R.W. SD47
SAVAGE, L. SD47
ROBINSON, M.B. SD47
RATHZ, T.J. University of Alabama


ROMAN, J. ED25


ROMAN, M.C. FD21


ROSS, R. Lockheed Martin
MORGAN, D. Lockheed Martin
CROCKETT, D. Lockheed Martin
MARTINEZ, L. Lockheed Martin
ANDERSON, W.E. TD15
MCNEAL, C. TD15


ROTHENBERG, J. SD60
CUTTEN, D.R. UAH
HOWELL, J.N. NOAA
DARBY, L.S. NOAA
HARDEY, R.M. NOAA
TRATT, D.M. JPL
MENZIES, R.T. JPL


ROZANOV, A.Y. Russian Academy of Science
HOOVER, R.B. SD50


ROZANOV, A.Y. Russian Academy of Science
HOOVER, R.B. SD50


RUF, J.H. TD64


RUF, J.H. TD64
LEHMAN, M. Penn State University
PAL, S. Penn State University
SANTORO, R.J. Penn State University


RUSSELL, C. ED33
BJORKMAN, G. Lockheed Martin


RUSSELL, S.S. ED32
LANSING, M.D. UAH
WALKER, J.L. ED32

RUSSELL, S.S.  ED32
WALKER, J.L.  ED32
LANSING, M.D.  ED32


SACKHEIM, R.L.  DA01
Transportation—The Key to Unlocking the Final Frontier. For presentation at NASA Reusable Launch Vehicle Exposition, Dryden Flight Research Center, CA, June 22, 2000.

SACKHEIM, R.L.  DA01

SACKHEIM, R.L.  DA01
HOUTS, M.  DOE

SAFIE, F.M.  QS10
BELYEU, R.L.  Hernandez Engineering

SAMIR, U.  ISRAEL
ISRAELEVICH, P.  ISRAEL
WRIGHT, K.H., JR.  UAH
STONE, N.H.  SD50


SCHALLHORN, P.  Sverdron Technology
PALMITER, C.  Sverdron Technology
FARMER, J.T.  ED25
LYCANS, R.  Sverdron Technology
TILLER, B.  ED25


SCHLAGHECK, R.A.  SD44
TRACH, B.  Boeing

SCHLAGHECK, R.A.  SD44
TRACH, B.  Boeing
Microgravity Research Results and Experiences from the NASA MIR Space Station Program. For presentation at 51st International Astronautical Congress, Rio de Janeiro, Brazil, October 2–6, 2000.

SCHMIDT, G.R.  TD40
BONOMETTI, J.A.  TD40
MORTON, P.J.  TD40


SCHNEIDER, T.A.  ED31
VAUGHN, J.A.  ED31
CARRUTH, M.R., JR.  ED31
EDWARDS, D.L.  ED31
HEARD, J.W.  ED31

SCHORR, A.A. MP51
ENDORCOTT, J.B.


SCHROCK, K. ED18
FREESTONE, T. ED18
BELL, L. ED18


SCHUNK, R.G. ED26
CHUNG, T.J. UAH


SCHUNK, R.G. ED26
CHUNG, T.J. UAH


SCHUNK, R.G. ED26
WESSLING, F.C. UAH


SCHWARTZ, D.A. Smithsonian
DAVID, L.P. Smithsonian
DONNELLY, R.H. Smithsonian
DEWEY, D. MIT
MARSHALL, H.L. MIT
ELSNER, R.F. SD50
KOLODZIEJCZAK, J.J. SD50
O’DELL, S.L. SD50
TENNANT, A.F. SD50
ET AL.


SELLERS, C.C. University of Illinois
WALKER, J.S. University of Illinois
SZOFIRAN, F.R. SD47
MOTakef, S. Cape Simulations, Inc.


SEVER, T.L. SD60


SEYBERT, C.D. University of CA, Berkeley
EVANS, J.W. University of California
LESLEI, F.W. SD47
JONES, W.K., JR. Motorola


SEYBERT, C.D. University of CA, Berkeley
EVANS, J.W. University of California
LESLEI, F.W. SD47
JONES, W.K., JR. Motorola

Exploiting the Temperature Dependence of Magnetic Susceptibility to Control Convection in Fundamental Studies of Solidification Phenomena. For presentation at Microgravity Materials Science Conference, Huntsville, AL, June 7, 2000.

SEYBERT, C.D. University of CA, Berkeley
EVANS, J.W. University of California
LESLEI, F.W. SD47
JONES, W.K., JR. Motorola


SHAW, E.J. VS20

SHIPLEY, A. SD50
CASH, W. SD50
JOY, J. SD50

SHKOLNIKOV, I. UAH
SHTESSEL, Y. UAH
WHORTON, M.S. TD55
JACKSON, M. TD55

SHTESSEL, Y.B. UAH
HALL, C.E. TD55

SHTESSEL, Y.B. UAH
HALL, C.E. TD55
JACKSON, M. TD55

SHULAR, D.A. ED25
SMITHERS, G.A. ED24
PLAWSKY, J.L. Rensselaer Polytechnic

SHY, W. University of Florida
PAPILA, N. University of Florida

TUCKER, K. TD64
VAIDYANATHAN, R. University of Florida
GRIFFIN, L.W. TD64

SIMPSON, J. GSFC
KUMMEROW, C.D.
MENEIGHINI, R.
HOU, A.
ADLER, R.F.
HUFFMAN, G.
BARKSTROM, B.
WIELICKI, B.
GOODMAN, S.J. SD60

SHTESSEL, Y.B. UAH
HALL, C.E. TD55
JACKSON, M. TD55

SINGER, J. MP01

SIPIERA, P.P. Harper College
HOOVER, R.B. SD50

SKETOE, J.G. Boeing
CLARK, A. ED44

SKOFRONICK-JACKSON, G.M.
WANG, J.R.
HEYMSFIELD, G.M.
HOOD, R.E. SD60

SLADE, K.N. Duke University
TINKER, M.L. ED21
LASSITER, J.O. ED27
ENGBERG, R.C. ED27

SMITHERMAN, D.V., JR. FD02

SOHN, B.-J. Seoul National University
ROBERTSON, F.R. SD60
SMITH, E.A. SD60
PARK, S.-C. Seoul National University

SPANN, J.F. SD50
ABBAS, M.M. SD50
SUSS, S.T. SD50
VENTURINI, C.C. UAH
COMFORT, R.H. UAH

SPANN, J.F. SD50
ABBAS, M.M. SD50
VENTURINI, C.C. UAH

SPANN, J.F. SD50
ABBAS, M.M. SD50

VENTURINI, C.C. SD50
COMFORT, R.H. SD50

SPANN, J.F. SD50
VENTURINI, C.C. UAH
ABBAS, M.M. SD50
COMFORT, R.H. UAH

SPEEGLE, C.O. Raytheon ITSS
RAMSEY, B.D. SD50
ENGELHAUPT, D. UAH
The Fabrication of Replicated Optics for Hard X-Ray Astronomy. For presentation at Optical Society of America Optical Fabrication and Testing Meeting, Quebec, Canada, June 18–22, 2000.

SPENCER, R.W. SD60

SPRINGER, A.M. TD14

STANLEY, T.T. International Space Systems, Inc.
ALEXANDER, R.A. TD31
LANDRUM, B. UAH

STEFANESCU, D.M. University of Alabama
CATALINA, A.V. SD47
JURETZKO, F.R. University of Alabama
MUKHERJEE, S. SD47/USRA
SEN, S.
Particle Engulfment and Pushing Microgravity Experiments and Mathematical Modeling. For presentation at First International Symposium on

STEFANESCU, D.M. University of Alabama
MUKHERJEE, S. University of Alabama
JURETZKO, F.R. University of Alabama
CATALINA, A.V. USRA
SEN, S. USRA
CURRERI, P.A. SD47

Particle Engulfment and Pushing by Solidifying Interfaces. For publication in Proceedings of Materials Science Conference, Huntsville, AL, June 7, 2000.

STERLING, A.C. SD50


STERLING, A.C. SD50

Sigmoid CME Source Regions at the Sun: Some Recent Results. For publication in Journal of Atmospheric and Solar-Terrestrial Physics, 2000.

STERLING, A.C. SD50
MOORE, R.L. SD50


STEVENSON, B.A. UAH
HORWITZ, J.L. UAH
GERMANY, G. UAH
CRAVEN, P.D. SD50
MOORE, T.E. GSFC
GILES, B.L. GSFC
PARKS, G.K. Univ. of Washington, Seattle
SU, Y.U. Los Alamos National Lab


SU, C.-H. SD47
BREBRICK, R.F. Marquette University
BURGER, A. Fisk University
MATYI, R.J. University of Wisconsin
SHAH, Y.-G. USRA
VOLZ, M.P. SD47
SHIH, H.-D. Central Research Labs


SU, C.-H. SD47
DUDLEY, M. State University of New York
MATYI, R.J. University of Wisconsin
FETH, S. UAH/SD47
LEHOCZKY, S.L. SD47


SU, C.-H. SD47
FETH, S. UAH
LEHOCZKY, S.L. SD40
MOKK, H. Oak Ridge National Lab
SCRIPA, R. UAB
ZHU, S. USRA


SU, C.-H. SD47
FETH, S. UAH
ZHU, S. USRA
LEHOCZKY, S.L. SD47
WANG, L.J. University of Tennessee


SU, C.-H. SD47
POLETI'O, G. SD50

The Fall 2000 and Fall 2001 SOHO-Ulysses Quadratures. For presentation at 34th ESLAB Symposium, Noordwijk, The Netherlands, October 3-5, 2000.
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

SUSS, S.T.  SD50  DOLD, P.  Albert-Ludwigs University
POLETTI, G.  SD50  KAISER, N.  Albert-Ludwigs University
Fine Structure in the Corona and Solar Wind at High  MOTAKEF, S.  CAPE Simulations, Inc.
Heliographic Latitudes at Solar Maximum. For  VOLZ, M.P.  SD47
presentation at 34th ESLAB Symposium, Noordwijk,  WALKER, J.S.  University of Illinois
The Netherlands, October 3–5, 2000.

SUSS, S.T.  SD50  THOMAS, R.J.  New Mexico Inst. of Mining & Tech.
POLETTO, G.  Osservatorio Astrofisico  KREHBIEL, P.R.  New Mexico Inst. of Mining & Tech.
ROMOLI, M.  Universita di Firenze  RISON, W.  New Mexico Inst. of Mining & Tech.
NEUGEBAUER, M.  JPL  HAMLIN, T.  New Mexico Inst. of Mining & Tech.
GOLDSTEIN, B.E.  JPL  BOCCIPPIO, D.J.  SD60
SIMNETT, G.  U of Birmingham, UK  GOODMAN, S.J.  SD60
The May 1997 SOHO-Ulysses Quadrature. For  CHRISTIAN, H.J.  SD60

SUSS, S.T.  SD50  Comparison of Ground-Based 3-Dimensional Lightning
TSURUTANI, B.T.  JPL  Mapping Observations with Satellite-Based LIS
Solar Winds. For publication in Encyclopedia of

SUMIDA, J.  USRA  THOMAS, L.D.  VS10
FORSYTHE, E.  USRA  SMITH, C.A.  QTEC, Inc.
PUSEY, M.L.  SD48  BEVERIDGE, J.  Advanced Engineering Environments for Space
Preparation and Characterization of Fluorescent  Transportation System Development. For presentation
Derivatives of Chicken Egg White Lysozyme. For  at IAF Congress, Rio de Janeiro, Brazil, October 2000.

SUMRALL, J.  NASA Headquarters  TIMOFEEVA, T.V.
LONDON, J.R., III  TD14  NESTEROV, V.N.
Future-X Pathfinder—Quick, Low Cost Flight Testing  ANTIPIN, M.Y.
for Tomorrow’s Launch Vehicles. For presentation at  CLARK, R.D.
IAF 50th International Astronautical Congress,  SANGHADASA, M.
Amsterdam, The Netherlands, October 4–8, 1999.

SWANSON, G.R.  ED22  CARDELINO, B.H.
ARAKERE, N.K.  University of Florida  MOORE, C.E.
Fatigue Failure of Space Shuttle Main Engine Turbine  FRAZIER, D.O.  SD40
Blades. For presentation at SEM IX International  Molecular Modeling and Experimental Study of

SCHWARTZ, D.A.  SD50  TOUTANJI, H.A.  UAH
CHEN, Y.  SD50  EFFINGER, M.R.  ED34
RAMSEY, B.D.  Background Simulation for the MSFC GSPC Balloon  Effects of High Temperature on the Tensile Behavior
Payload. For presentation at 45th Annual SPIE Meeting,  of Cement-Based Materials. For presentation at Cement

SZOFRAN, F.R.  SD47  TOWNSEND, J.S.  ED21
BENZ, K.W.  Albert-Ludwigs University  PECK, J.  ED21
COBB, S.D.  SD47  AYALA, S.  Sverdrup Technology
CROSS, A.  UAH

TRINH, H.P. 

TRINH, H.P. 

TROLINGER, J.D. 

TROLINGER, J.D. 

TROLINGER, J.D. 
MetroLaser, Inc.
RANGEL, R. 
University of California, Irvine
COIMBRA, C. 
Drexel University
LAL, R.B. 
Alabama A&M University
WITHEROW, W.K. 
SD48
ROGERS, J.R. 
SD47

TROLINGER, J.D. 
MetroLaser, Inc.
RANGEL, R. 
University of California, Irvine
COIMBRA, C. 
Drexel University
WITHEROW, W.K. 
SD48
ROGERS, J.R. 
SD47

TU, J.-N. 
UAH
WU, X.-Y. 
UAH
HORWITZ, J.L. 
UAH
STEVENSON, B.A. 
UAH
MOORE, T.E. 
GSFC
COFFEY, V.N. 
SD50


TUCKER, D.S. 
SD70
WORKMAN, G.L. 
UAH
SMITH, G.A. 
UAH


TUCKER, P.K. 
TD64
SHYY, W. 
University of Florida
VAIDYANATHAN, R. 
University of Florida


TUCKER, P.K. 
TD64
SHYY, W. 
University of Florida
VAIDYANATHAN, R. 
University of Florida

Optimization of a GO2/GH2 Swirl Coaxial Injector Element. For presentation at PERC Symposium on Propulsion, Penn State University, PA, November 18–19, 1999.

TURNER, S. 
TD14

VAIDYANATHAN, R. 
University of Florida
PAPILA, N. 
University of Florida
SHYY, W. 
University of Florida
TUCKER, P.K. 
TD64
GRiffin, L.W. 
TD64
HAFTKA, R. 
University of Florida
FITZ-COY, N. 
University of Florida


VAIDYANATHAN, R. 
Advanced Ceramics
WALISH, J. 
Advanced Ceramics
FOX, M. 
Advanced Ceramics
RIGALI, M. 
Advanced Ceramics
SUTARIA, M. 
Advanced Ceramics
GILLESPIE, J.W., JR. 
University of Delaware
YARLAGADDA, S. 
University of Delaware
EFFINGER, M.R. 
ED34

VAN DYKE, M. TD40

VAN DYKE, M. TD40
GODFROY, T. TD40
HOUTS, M. TD40
DICKENS, R. TD40
DOBSON, C. TD40
PEDERSON, K. TD40
REID, B. Los Alamos National Lab

VAUGHN, J.A. ED31
FINCKENOR, M.M. ED31
KAMENETZKY, R.R. ED31
SCHULER, P. Triton Systems, Inc.

VAUGHN, J.A. ED31
SCHULER, P. Triton Systems, Inc.

VENTURINI, C.C. UAH
SPANN, J.F. SD50
ABBAS, M.M. SD50
COMFORT, R.H. UAH
A Dust Grain Photoemission Experiment. For presentation at 8th Workshop on the Physics of Dusty Plasmas, Santa Fe, NM, April 26–28, 2000.

VIKRAM, C.S. UAH
WITHEROW, W.K. SD48

VIKRAM, C.S. UAH
WITHEROW, W.K. SD48

VIKRAM, C.S. UAH
WITHEROW, W.K. SD48

VIKRAM, C.S. UAH
WITHEROW, W.K. SD48

VIKRAM, C.S. UAH
WITHEROW, W.K. SD48

VOLZ, M.P. SD47
MAZURUK, K. SD47

VOLZ, M.P. SD47
MAZURUK, K. SD47

VOLZ, M.P. SD47
MAZURUK, K. SD47


WEISSKOPF, M.C. SD50

WEISSKOPF, M.C. SD50

WEISSKOPF, M.C. SD50
The Chandra X-Ray Observatory—an Overview. For presentation at 33rd COSPAR Scientific Assembly, Warsaw, Poland, July 20, 2000.

WEISSKOPF, M.C. SD50
BECKER, W.
ELSNER, R.F.
KAHN, S.
KOLODZIEJCZAK, J.J.
MURRAY, S.
O’DELL, S.L.
PAERELS, F.
SHIBAZAKI, N.
ET AL.
Results of a Deep Chandra Observation of the Crab Nebula and Pulsar. For presentation at The American Astronomical Society (AAS), Honolulu, HI, November 8, 2000.

WEISSKOPF, M.C. SD50
HESTER, J.J. Arizona State University
TENNANT, A.F. SD50
ELSNER, R.F. SD50
SCHULZ, N.S. MIT
MARSHALL, H.L. MIT
KAROVSKA, M. Harvard-Smithsonian
NICHOLS, J.S. Harvard-Smithsonian
ET AL.

WEISSKOPF, M.C. SD50
TANANBAUM, H.
VAN SPEYBROECK, L.
O’DELL, S.L.

WEST, E.A. SD50
PORTER, J.G. SD50
DAVIS, J. SD50
GARY, A. SD50
SPANN, J.F. SD50

WHITAKER, A.F. ED30

WHITEMAN, D.N.
EVANS, K.D.
DEMOZ, B.
STARR, D.O.
TOBIN, D.
FELTZ, W.
JEDLOVEC, G.J.
GUTMAN, S.I.
SCHWEMMER, G.K.
ET AL.

WHORTON, M.S. SD50
CALISE, A.J. Georgia Institute of Technology

WHORTON, M.S. TD55
MYERS, G.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Paper Title</th>
<th>Institution(s)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams, E.</td>
<td>Global Lightning Variations Caused by Changes in Thunderstorm Flash Rate and by Changes in Number of Thunderstorms.</td>
<td>SD60</td>
<td></td>
</tr>
<tr>
<td>Rothkin, K.</td>
<td></td>
<td>SD60</td>
<td></td>
</tr>
<tr>
<td>Stevenson, D.</td>
<td></td>
<td>SD60</td>
<td></td>
</tr>
<tr>
<td>Boccioppio, D.J.</td>
<td></td>
<td>SD60</td>
<td></td>
</tr>
<tr>
<td>Williams, R.W.</td>
<td>High Head Unshrouded Impeller Pump Stage Technology.</td>
<td>TD64</td>
<td></td>
</tr>
<tr>
<td>Skelley, S.E.</td>
<td></td>
<td>TD64</td>
<td></td>
</tr>
<tr>
<td>Stewart, E.T.</td>
<td></td>
<td>TD64</td>
<td></td>
</tr>
<tr>
<td>Droege, A.R.</td>
<td></td>
<td>TD64</td>
<td></td>
</tr>
<tr>
<td>Prueger, G.H.</td>
<td></td>
<td>Boeing</td>
<td></td>
</tr>
<tr>
<td>Chen, W.-C.</td>
<td></td>
<td>Boeing</td>
<td></td>
</tr>
<tr>
<td>Williams, M.</td>
<td></td>
<td>Boeing</td>
<td></td>
</tr>
<tr>
<td>Finger, M.H.</td>
<td></td>
<td>USRA</td>
<td></td>
</tr>
<tr>
<td>Scott, D.M.</td>
<td>XTE J1946+274 = GRO J1944+26 Observations with RXTE and BATSE. For presentation at Rossi 2000: Astrophysics with the Rossi X-Ray Timing Explorer.</td>
<td>USRA/SD50</td>
<td></td>
</tr>
<tr>
<td>Wilson, C.A.</td>
<td></td>
<td>SD50</td>
<td></td>
</tr>
<tr>
<td>Mccollough, M.L.</td>
<td>XTE J1118+480. For publication in International Astronomical Union Circular No. 7390, Cambridge, MA, 2000.</td>
<td>SD50</td>
<td></td>
</tr>
</tbody>
</table>
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

YEH, Y.P. Silicon Graphics Inc.
RAMACHANDRAN, N. USRA/SD47
SMITH, A.W. SD47
HEAMAN, J.P. SD47

YOUNG, R.B. SD48
BRIDGE, K.Y. SD48
VAUGHN, J.R. SD48

YOUNG, R.B. SD48
BRIDGE, K.Y. SD48

ZENG, W. UAH
HORWITZ, J.L. UAH
STEVENSON, B.A. UAH
WU, X.-Y. UAH
SU, Y.-J. Los Alamos National Lab
CRAVEN, P.D. SD50
RICH, F.J. Air Force Research Lab
MOORE, T.E. Goddard
Topside Ionosphere Parameters Observed by POLAR and DMSP at High Latitudes. For presentation at Fall AGU, San Francisco, CA, December 5, 2000.

ZHANG, T.X. SD48
HWANG, K.S. SD48
WU, S.T. SD50
STONE, N.H. SD50
CHANG, C.L. SD50
DROBOT, A. SD50

ZHU, JJ. Louisiana State University
BANKER, B.D. Louisiana State University
HALL, C.E. TD55

ZHU, S. USRA
SU, C.-H. SD47
CARPENTER, P. USRA
LEHOCZYK, S.L. SD47

ZHU, S. USRA
SU, C.-H. SD47
LEHOCZKY, S.L. SD47
HARRIS, M.T. Air Force Research Lab.
GEORGE, M.A. UAH
ILA, D. Alabama A&M University

Substrate Preparations in Epitaxial ZnO Film Growth. For presentation at Eleventh American Conference on Crystal Growth and Epitaxy, Vail, CO, August 13–18, 2000.

ZHU, S. USRA
SU, C.-H. SD47
LEHOCZKY, S.L. SD47
HARRIS, M.T. AFRL/SNHX
CALLAHAN, M.J. SD47
GEORGE, M.A. UAH
MCCARTY, P. UAH


ZHU, S. USRA
SU, C.-H. SD47
LEHOCZKY, S.L. SD47
HARRIS, M.T. Air Force Research Lab
CALLAHAN, M.J. Air Force Research Lab
MCCARTY, P. UAH
GEORGE, M.A. UAH
HARRIS, M.T. USRA
GEORGE, M.A. UAH
MCCARTY, P. UAH

Substrate Preparations in Epitaxial ZnO Film Growth. For publication in Journal of Crystal Growth, 2000.

ZHU, S. USRA
SU, C.-H. SD47
LEHOCZKY, S.L. SD47
HARRIS, M.T. AFRL/SNHX
CALLAHAN, M.J. AFRL/SNHX
MCCARTY, P. UAH
GEORGE, M.A. UAH


ZHU, S. USRA
SU, C.-H. SD47
LEHOCZKY, S.L. SD47
HARRIS, M.T. AFRL/SNHX
CALLAHAN, M.J. AFRL/SNHX
MCCARTY, P. UAH
GEORGE, M.A. UAH


ZIMMERMAN, F.R. ED33

ZOLADZ, T.F. TD63
INDEX

TECHNICAL MEMORANDA

Bishop, R. ................................................................. 2
Carter, R.W. .............................................................. 1
Cooper, K.G. ............................................................. 5, 6
DeLay, T.K. .............................................................. 3
Dewberry, B. ............................................................ 4
Ding, J. ................................................................. 1, 2
Elam, S.K. ............................................................... 3
Ferebee, R. ............................................................... 5
Fox, D. ................................................................. 2
Frugomeni, J.M. ..................................................... 1
Hayashida, K.B. .................................................... 2
Holland, W. ............................................................ 2
Holt, J.B. ............................................................... 3
Humphries, W.R., Sr. ............................................. 2
James, B.F. ........................................................... 4
Johnson, D.L. ........................................................ 4
Justus, C.G. ............................................................ 4
Lee, J.A. ............................................................... 1, 2
Martin, J.J. ............................................................. 3
Nettles, A.T. .......................................................... 5
Newton, R.L. ........................................................ 1
Nunes, A.C., Jr ...................................................... 1
Ortega, R. ............................................................... 2
Price, J.M. ............................................................. 2
Robinson, J.H. ....................................................... 2
Russell, C.K. .......................................................... 1
Summers, F.G. ....................................................... 5
Sutherland, T. ........................................................ 1
Turner Waits, J.E ................................................... 3
Vaughan, W.W. ..................................................... 4
Wells, D. ............................................................... 5
Woodard, D. ........................................................ 1
Zimmerman, F.R. .................................................. 1

Dobson, C.C. .......................................................... 9
Douglas, M.J. ....................................................... 10
Eskridge, R.H. ....................................................... 9
Gee, G.B. .............................................................. 7
Gerasimenko, L.M. ............................................... 7
Hoover, R.B. ........................................................ 7
Knight, K.C. ........................................................ 7
Lee, M.H. ............................................................. 9
Leslie, F. .............................................................. 9
Lineberry, J.T. ...................................................... 9
Litchford, R.J. ....................................................... 9
Nettles, A.T. ........................................................ 10
Ragozina, A.L. ...................................................... 7
Ramachandran, N. ............................................... 9
Rocker, M. ........................................................... 7
Rozanov, A.Y. ....................................................... 7
Stassinopoulos, E.G. ............................................. 7
Swanson, G.R. ...................................................... 8
Ushatinskaya, G.T. ............................................... 7
Whitley, M.R. ....................................................... 7
Wilson, R.M. ....................................................... 8
Xapsos, M.A. ........................................................ 7
Zheligallo, E.A. ..................................................... 7

SPECIAL PUBLICATIONS

Dunar, A.J. ........................................................... 11
Waring, S.P. ........................................................ 11

CONFERENCE PUBLICATIONS

Brewer, J.C. .......................................................... 12
Dooling, D. .......................................................... 12
Kavaya, M.J. ........................................................ 12
Smitherman, D.V., Jr. ......................................... 12

CONTRACTOR REPORTS

EMC Compliance ................................................ 13
University of Illinois .......................................... 13
Science Applications International Corporation .... 13
Space Environments and Effects Program ............ 13

TECHNICAL PUBLICATIONS

Arakere, N.K. ....................................................... 8
Barth, J.L. ............................................................ 7
Bityurin, V.A. ....................................................... 9
Burke, E.A. .......................................................... 7
Christenson, R.L. ............................................... 7
Cole, J.W. ........................................................... 9

59
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbas, M.M.</td>
<td>47, 51</td>
</tr>
<tr>
<td>Abdeldayem, H.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Abedian, B.</td>
<td>15, 31</td>
</tr>
<tr>
<td>Abiad, R.</td>
<td>37</td>
</tr>
<tr>
<td>Ackerman, E.</td>
<td>17</td>
</tr>
<tr>
<td>Adams, G.</td>
<td>32</td>
</tr>
<tr>
<td>Adams, J.H.</td>
<td>14, 15, 26</td>
</tr>
<tr>
<td>Adams, J.H., Jr.</td>
<td>34, 52</td>
</tr>
<tr>
<td>Adams, J.L.</td>
<td>14</td>
</tr>
<tr>
<td>Adler, R.F.</td>
<td>46</td>
</tr>
<tr>
<td>Alexander, R.A.</td>
<td>14, 47</td>
</tr>
<tr>
<td>Alstott, R.L.</td>
<td>14</td>
</tr>
<tr>
<td>Alves, J.</td>
<td>20</td>
</tr>
<tr>
<td>Amzajerdian, F.</td>
<td>16</td>
</tr>
<tr>
<td>Anderson, D.M.</td>
<td>14</td>
</tr>
<tr>
<td>Anderson, W.E.</td>
<td>14, 36, 43</td>
</tr>
<tr>
<td>Anfimov, D.S.</td>
<td>37</td>
</tr>
<tr>
<td>Anilkumar, A.V.</td>
<td>14, 16</td>
</tr>
<tr>
<td>Antipin, M.Y.</td>
<td>49</td>
</tr>
<tr>
<td>Arakere, N.K.</td>
<td>14, 49</td>
</tr>
<tr>
<td>Askew, R.</td>
<td>37</td>
</tr>
<tr>
<td>Asquith, T.E.</td>
<td>31</td>
</tr>
<tr>
<td>Atkinson, R.J.</td>
<td>26</td>
</tr>
<tr>
<td>Austin, R.A.</td>
<td>33, 41</td>
</tr>
<tr>
<td>Austin, R.E.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Ayala, S.</td>
<td>49</td>
</tr>
<tr>
<td>Bachman, K.J.</td>
<td>18</td>
</tr>
<tr>
<td>Bachmann, K.T.</td>
<td>28</td>
</tr>
<tr>
<td>Bai, D.</td>
<td>27</td>
</tr>
<tr>
<td>Bailey, J.</td>
<td>16</td>
</tr>
<tr>
<td>Bailey, M.D.</td>
<td>15</td>
</tr>
<tr>
<td>Ballard, R.O.</td>
<td>15</td>
</tr>
<tr>
<td>Banker, B.D.</td>
<td>55</td>
</tr>
<tr>
<td>Banks, C.</td>
<td>15</td>
</tr>
<tr>
<td>Barboka, J.</td>
<td>28</td>
</tr>
<tr>
<td>Barkstrom, B.</td>
<td>46</td>
</tr>
<tr>
<td>Barret, C.</td>
<td>15</td>
</tr>
<tr>
<td>Bashindzhagyan, G.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Bashindzhagyan, P.</td>
<td>14</td>
</tr>
<tr>
<td>Bassani, L.</td>
<td>35</td>
</tr>
<tr>
<td>Batts, G.W.</td>
<td>41</td>
</tr>
<tr>
<td>Bauer, L.A.</td>
<td>15</td>
</tr>
<tr>
<td>Baugher, C.</td>
<td>42</td>
</tr>
<tr>
<td>Bautz, M.</td>
<td>38</td>
</tr>
<tr>
<td>Beck, J.G.</td>
<td>28</td>
</tr>
<tr>
<td>Becker, W.</td>
<td>53</td>
</tr>
<tr>
<td>Becket, W.</td>
<td>53</td>
</tr>
<tr>
<td>Beck, J.G.</td>
<td>28</td>
</tr>
<tr>
<td>Bautz, M.</td>
<td>38</td>
</tr>
<tr>
<td>Beck, J.G.</td>
<td>28</td>
</tr>
<tr>
<td>Becker, W.</td>
<td>53</td>
</tr>
<tr>
<td>Becket, W.</td>
<td>53</td>
</tr>
<tr>
<td>Beck, J.G.</td>
<td>28</td>
</tr>
<tr>
<td>Bautz, M.</td>
<td>38</td>
</tr>
<tr>
<td>Becket, W.</td>
<td>53</td>
</tr>
<tr>
<td>Beck, J.G.</td>
<td>28</td>
</tr>
<tr>
<td>Becker, W.</td>
<td>53</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Bune, A.V.</td>
<td>17, 48</td>
</tr>
<tr>
<td>Burger, A.</td>
<td>17, 48</td>
</tr>
<tr>
<td>Burgess, D.W.</td>
<td>25</td>
</tr>
<tr>
<td>Burke, M.W.</td>
<td>18, 40</td>
</tr>
<tr>
<td>Butler, K.</td>
<td>14</td>
</tr>
<tr>
<td>Butt, Y.M.</td>
<td>38</td>
</tr>
<tr>
<td>Calise, A.J.</td>
<td>53</td>
</tr>
<tr>
<td>Callahan, D.M.</td>
<td>41</td>
</tr>
<tr>
<td>Callahan, M.J.</td>
<td>56</td>
</tr>
<tr>
<td>Cameron, R.</td>
<td>38</td>
</tr>
<tr>
<td>Campbell, C.W.</td>
<td>18</td>
</tr>
<tr>
<td>Campbell, J.W.</td>
<td>25</td>
</tr>
<tr>
<td>Caraccioli, P.</td>
<td>52</td>
</tr>
<tr>
<td>Cardelino, B.H.</td>
<td>18, 49</td>
</tr>
<tr>
<td>Cardelino, C.A.</td>
<td>18</td>
</tr>
<tr>
<td>Carlstrom, J.E.</td>
<td>29, 32, 39, 41</td>
</tr>
<tr>
<td>Carpenter, P.</td>
<td>55</td>
</tr>
<tr>
<td>Carrascoillo, E.J.</td>
<td>18</td>
</tr>
<tr>
<td>Carrington, C.K.</td>
<td>18, 38</td>
</tr>
<tr>
<td>Carruth, M.R.</td>
<td>20, 25</td>
</tr>
<tr>
<td>Carruth, M.R., Jr.</td>
<td>18, 44</td>
</tr>
<tr>
<td>Carruthers, C.</td>
<td>17</td>
</tr>
<tr>
<td>Carswell, W.E.</td>
<td>18, 19</td>
</tr>
<tr>
<td>Carter, J.</td>
<td>32</td>
</tr>
<tr>
<td>Caruso, S.V.</td>
<td>18</td>
</tr>
<tr>
<td>Cash, W.</td>
<td>18, 32, 46</td>
</tr>
<tr>
<td>Cassanto, J.M.</td>
<td>32</td>
</tr>
<tr>
<td>Catalina, A.V.</td>
<td>47, 48</td>
</tr>
<tr>
<td>Cha, S.S.</td>
<td>34</td>
</tr>
<tr>
<td>Chakrabarti, S.</td>
<td>19</td>
</tr>
<tr>
<td>Champion, R.H., Jr.</td>
<td>23</td>
</tr>
<tr>
<td>Chandler, M.O.</td>
<td>19, 21, 48</td>
</tr>
<tr>
<td>Chang, C.L.</td>
<td>55</td>
</tr>
<tr>
<td>Chattopadhyay, K.</td>
<td>17</td>
</tr>
<tr>
<td>Chavers, G.</td>
<td>27</td>
</tr>
<tr>
<td>Chayen, N.E.</td>
<td>28, 40</td>
</tr>
<tr>
<td>Chen, L.</td>
<td>32</td>
</tr>
<tr>
<td>Chen, L.J.</td>
<td>23</td>
</tr>
<tr>
<td>Chen, W.-C.</td>
<td>54</td>
</tr>
<tr>
<td>Chen, Y.</td>
<td>49</td>
</tr>
<tr>
<td>Chen, Y.-S.</td>
<td>52</td>
</tr>
<tr>
<td>Cheng, G.</td>
<td>22</td>
</tr>
<tr>
<td>Chilingarian, A.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Christensen, E.R.</td>
<td>23</td>
</tr>
<tr>
<td>Christian, H.J.</td>
<td>16, 17, 19, 49</td>
</tr>
<tr>
<td>Chu, T.</td>
<td>55</td>
</tr>
<tr>
<td>Chua, D.</td>
<td>19, 39</td>
</tr>
<tr>
<td>Chung, T.J.</td>
<td>45</td>
</tr>
<tr>
<td>Cissom, R.D.</td>
<td>19</td>
</tr>
<tr>
<td>Ciszak, E.</td>
<td>26</td>
</tr>
<tr>
<td>Clark, A.</td>
<td>46</td>
</tr>
<tr>
<td>Clark, R.D.</td>
<td>49</td>
</tr>
<tr>
<td>Clark-Ingram, M.A.</td>
<td>18, 23</td>
</tr>
<tr>
<td>Clinton, R.G., Jr.</td>
<td>20, 32</td>
</tr>
<tr>
<td>Coan, B.</td>
<td>38</td>
</tr>
<tr>
<td>Cobb, B.J.</td>
<td>19</td>
</tr>
<tr>
<td>Cobb, S.D.</td>
<td>49</td>
</tr>
<tr>
<td>Cochran, J.C.</td>
<td>56</td>
</tr>
<tr>
<td>Cockrell, D.</td>
<td>42</td>
</tr>
<tr>
<td>Coffey, V.N.</td>
<td>19, 50</td>
</tr>
<tr>
<td>Coimbra, C.</td>
<td>50</td>
</tr>
<tr>
<td>Coker, C.</td>
<td>42</td>
</tr>
<tr>
<td>Cole, S.T.</td>
<td>23</td>
</tr>
<tr>
<td>Coleman, H.W.</td>
<td>14</td>
</tr>
<tr>
<td>Colligan, K.</td>
<td>32</td>
</tr>
<tr>
<td>Colton, M.</td>
<td>23</td>
</tr>
<tr>
<td>Comfort, R.H.</td>
<td>19, 21, 47, 51</td>
</tr>
<tr>
<td>Connaughton, V.</td>
<td>24</td>
</tr>
<tr>
<td>Cook, S.A.</td>
<td>19</td>
</tr>
<tr>
<td>Craig, L.</td>
<td>19</td>
</tr>
<tr>
<td>Cramer, J.</td>
<td>16</td>
</tr>
<tr>
<td>Craven, P.D.</td>
<td>19, 21, 29, 34, 48, 55</td>
</tr>
<tr>
<td>Crawford, K.</td>
<td>19</td>
</tr>
<tr>
<td>Crockett, D.</td>
<td>14, 17, 43</td>
</tr>
<tr>
<td>Cross, A.</td>
<td>49</td>
</tr>
<tr>
<td>Crouch, M.</td>
<td>19</td>
</tr>
<tr>
<td>Cruzen, C.A.</td>
<td>19</td>
</tr>
<tr>
<td>Cummins, K.</td>
<td>16</td>
</tr>
<tr>
<td>Curreri, P.A.</td>
<td>39, 48</td>
</tr>
<tr>
<td>Cutten, D.R.</td>
<td>43</td>
</tr>
<tr>
<td>D’Agostino, M.</td>
<td>39</td>
</tr>
<tr>
<td>Dabney, R.W.</td>
<td>19</td>
</tr>
<tr>
<td>Darby, L.S.</td>
<td>43</td>
</tr>
<tr>
<td>David, L.P.</td>
<td>45</td>
</tr>
<tr>
<td>Davila, J.M.</td>
<td>40</td>
</tr>
<tr>
<td>Davis, D.</td>
<td>39</td>
</tr>
<tr>
<td>Davis, J.</td>
<td>53</td>
</tr>
<tr>
<td>Davis, J.M.</td>
<td>19, 40</td>
</tr>
<tr>
<td>Dean, A.J.</td>
<td>35</td>
</tr>
<tr>
<td>Deblonde, G.</td>
<td>23</td>
</tr>
<tr>
<td>Delay, T.K.</td>
<td>20</td>
</tr>
<tr>
<td>Demoz, B.</td>
<td>53</td>
</tr>
<tr>
<td>Deng, Z.T.</td>
<td>28</td>
</tr>
<tr>
<td>Dennis, H.J., Jr.</td>
<td>20</td>
</tr>
<tr>
<td>Dennis, J.</td>
<td>20</td>
</tr>
<tr>
<td>Denton, R.E.</td>
<td>25</td>
</tr>
<tr>
<td>Name</td>
<td>Pages</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Deshpande, M.S.</td>
<td>23</td>
</tr>
<tr>
<td>Dewey, D.</td>
<td>45</td>
</tr>
<tr>
<td>Dickens, R.</td>
<td>25, 29, 30, 51</td>
</tr>
<tr>
<td>Diffey, W.M.</td>
<td>23</td>
</tr>
<tr>
<td>Dill, C.C.</td>
<td>20</td>
</tr>
<tr>
<td>Ding, R.J.</td>
<td>20</td>
</tr>
<tr>
<td>Dischinger, H.C., Jr.</td>
<td>20</td>
</tr>
<tr>
<td>Dobson, C.</td>
<td>29, 51, 52</td>
</tr>
<tr>
<td>Dold, P.</td>
<td>49</td>
</tr>
<tr>
<td>Donahue, B.B.</td>
<td>20</td>
</tr>
<tr>
<td>Dong, P.</td>
<td>54</td>
</tr>
<tr>
<td>Donnelly, R.H.</td>
<td>45</td>
</tr>
<tr>
<td>Donovan, D.</td>
<td>22</td>
</tr>
<tr>
<td>Dorney, D.J.</td>
<td>25, 52</td>
</tr>
<tr>
<td>Dougan, H.</td>
<td>36</td>
</tr>
<tr>
<td>Downey, J.P.</td>
<td>20</td>
</tr>
<tr>
<td>Driscoll, K.T.</td>
<td>17, 25</td>
</tr>
<tr>
<td>Drobot, A.</td>
<td>55</td>
</tr>
<tr>
<td>Drooge, A.R.</td>
<td>54</td>
</tr>
<tr>
<td>Drury, L.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Dudley, M.</td>
<td>48</td>
</tr>
<tr>
<td>Dunbar, B.</td>
<td>27</td>
</tr>
<tr>
<td>Dunn, M.C.</td>
<td>20</td>
</tr>
<tr>
<td>Eckel, A.</td>
<td>20, 21</td>
</tr>
<tr>
<td>Edwards, D.L.</td>
<td>14, 20, 25, 38, 44</td>
</tr>
<tr>
<td>Effinger, M.R.</td>
<td>20, 21, 37, 39, 49, 50</td>
</tr>
<tr>
<td>Egorov, N.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Elam, S.</td>
<td>20, 21, 39</td>
</tr>
<tr>
<td>Ellingson, B.</td>
<td>21</td>
</tr>
<tr>
<td>Elliot, H.A.</td>
<td>21</td>
</tr>
<tr>
<td>Elsner, R.F.</td>
<td>21, 33, 38, 41, 45, 53</td>
</tr>
<tr>
<td>Emerson, C.W.</td>
<td>21, 40</td>
</tr>
<tr>
<td>Emrick, W.J., Jr.</td>
<td>21</td>
</tr>
<tr>
<td>Endicott, J.B.</td>
<td>45</td>
</tr>
<tr>
<td>Eng, R.</td>
<td>22, 42</td>
</tr>
<tr>
<td>Engberg, R.C.</td>
<td>22, 47</td>
</tr>
<tr>
<td>Engel, H.P.</td>
<td>25</td>
</tr>
<tr>
<td>Engelhaupt, D.</td>
<td>22, 38, 41, 47</td>
</tr>
<tr>
<td>Erickson, R.J.</td>
<td>22</td>
</tr>
<tr>
<td>Escher, D.W.</td>
<td>31</td>
</tr>
<tr>
<td>Escher, W.J.D.</td>
<td>22</td>
</tr>
<tr>
<td>Eskenasi, M.I.</td>
<td>38</td>
</tr>
<tr>
<td>Eskridge, R.</td>
<td>52</td>
</tr>
<tr>
<td>Estes, M.G., Jr.</td>
<td>40</td>
</tr>
<tr>
<td>Ethridge, E.C.</td>
<td>22</td>
</tr>
<tr>
<td>Evans, D.M.</td>
<td>36</td>
</tr>
<tr>
<td>Evans, J.W.</td>
<td>45</td>
</tr>
<tr>
<td>Evans, K.D.</td>
<td>53</td>
</tr>
<tr>
<td>Evans, S.W.</td>
<td>16, 37</td>
</tr>
<tr>
<td>Ewing, F.</td>
<td>22</td>
</tr>
<tr>
<td>Falconer, D.A.</td>
<td>22, 37</td>
</tr>
<tr>
<td>Faranda, J.</td>
<td>17</td>
</tr>
<tr>
<td>Farmer, J.T.</td>
<td>19, 32, 44</td>
</tr>
<tr>
<td>Farmer, R.C.</td>
<td>22</td>
</tr>
<tr>
<td>Fedoseyev, A.I.</td>
<td>26</td>
</tr>
<tr>
<td>Feltz, W.</td>
<td>53</td>
</tr>
<tr>
<td>Ferguson, D.</td>
<td>18</td>
</tr>
<tr>
<td>Ferraro, R.</td>
<td>23</td>
</tr>
<tr>
<td>Feth, S.</td>
<td>17, 48</td>
</tr>
<tr>
<td>Fikes, J.</td>
<td>18</td>
</tr>
<tr>
<td>Fillingim, M.O.</td>
<td>19, 23, 51</td>
</tr>
<tr>
<td>Finckenor, M.M.</td>
<td>23, 27, 37, 54</td>
</tr>
<tr>
<td>Finger, M.H.</td>
<td>14, 20, 25, 38, 44</td>
</tr>
<tr>
<td>Fiorucci, T.</td>
<td>23</td>
</tr>
<tr>
<td>Fisher, M.F.</td>
<td>23</td>
</tr>
<tr>
<td>Fishman, G.F.</td>
<td>54</td>
</tr>
<tr>
<td>Fishman, G.J.</td>
<td>23, 24, 27, 36</td>
</tr>
<tr>
<td>Fitz-Coy, N.</td>
<td>50</td>
</tr>
<tr>
<td>Fork, R.L.</td>
<td>23</td>
</tr>
<tr>
<td>Forsythe, E.</td>
<td>23, 49</td>
</tr>
<tr>
<td>Fowler, S.B.</td>
<td>23</td>
</tr>
<tr>
<td>Fox, M.</td>
<td>50</td>
</tr>
<tr>
<td>Frady, G.</td>
<td>23</td>
</tr>
<tr>
<td>Franks, G.</td>
<td>39</td>
</tr>
<tr>
<td>Fraser, R.F.</td>
<td>35</td>
</tr>
<tr>
<td>Frazier, D.O.</td>
<td>14, 15, 18, 24, 49</td>
</tr>
<tr>
<td>Freestone, T.</td>
<td>45</td>
</tr>
<tr>
<td>Frey, H.U.</td>
<td>36</td>
</tr>
<tr>
<td>Friedfield, R.</td>
<td>17</td>
</tr>
<tr>
<td>Fuselier, S.A.</td>
<td>36</td>
</tr>
<tr>
<td>Gallagher, D.L.</td>
<td>24, 25</td>
</tr>
<tr>
<td>Gamble, L.J.</td>
<td>23</td>
</tr>
<tr>
<td>Gambrell, S.</td>
<td>24</td>
</tr>
<tr>
<td>Garcia, R.</td>
<td>24, 52</td>
</tr>
<tr>
<td>Gary, A.</td>
<td>53</td>
</tr>
<tr>
<td>Gary, G.A.</td>
<td>22, 40</td>
</tr>
<tr>
<td>Geary, J.M.</td>
<td>22, 27</td>
</tr>
<tr>
<td>Geller, S.P.</td>
<td>36, 37</td>
</tr>
<tr>
<td>Genge, G.</td>
<td>20, 21</td>
</tr>
<tr>
<td>Genge, G.G.</td>
<td>24</td>
</tr>
<tr>
<td>George, M.A.</td>
<td>56</td>
</tr>
<tr>
<td>George, S.</td>
<td>25</td>
</tr>
<tr>
<td>Germany, G.</td>
<td>19, 39, 48</td>
</tr>
<tr>
<td>Germany, G.A.</td>
<td>19, 23, 29, 55</td>
</tr>
<tr>
<td>Gerrish, H.</td>
<td>24</td>
</tr>
<tr>
<td>Gerry, M.</td>
<td>18</td>
</tr>
</tbody>
</table>
Leahy, F ............................................................. 42
Ledbetter, F.E., III ................................................ 34
Lee, C.P ............................................................... 14
Lee, J ................................................................. 21, 30, 34, 52
Lee, J.A ............................................................... 34
Lee, T ................................................................. 23
Lehman, M .......................................................... 43
Lehoczky, S.L .................................................. 17, 34, 48, 55, 56
Leifer, S ............................................................. 32
Lenard, R .......................................................... 25
Lerner, J.A .......................................................... 31
Leslie, F.W ....................................................... 34, 41, 45
Lester, C.N .......................................................... 34
Leung, W.C ........................................................ 34
Lewin, W.H.G .................................................. 54
Lewis, T ............................................................. 14
Li, H ................................................................. 37
Liao, J.-H ........................................................... 19
Liemohn, M.W ................................................ 33
Lin, R.P ............................................................. 23
Lindblom, W ...................................................... 25
Linder, J ............................................................ 41
Lineberry, J.T .................................................... 34
Lipinski, R .......................................................... 30
Litchford, R.J .................................................... 34, 35
Litvak, M.L ........................................................ 37
Liu, J ................................................................. 52
Lomas, J.J .......................................................... 19
London, J., III ................................................... 35, 49
Lowndes, D.H .................................................. 56
Lu, H.-I ............................................................. 35
Luvall, J.C ......................................................... 35, 40, 42, 44
Lycans, R ........................................................... 44
Lyles, G.M ........................................................ 35
Ma, X ............................................................... 17
Macleod, T.C ..................................................... 35
Magsig, M.A ..................................................... 25
Majumdar, A .................................................... 28, 35
Malizia, A .......................................................... 35
Mallozzi, R.S ..................................................... 17, 27
Malone, C.C ..................................................... 35
Mankins, J.C ..................................................... 30
Manning, W ..................................................... 52
Marsh, M.W ...................................................... 24
Marshall, H.L .................................................... 45, 53
Marshall, S ......................................................... 38, 42
Martin, C.L ........................................................ 37
Martin, J.J .......................................................... 29, 30, 36
Martinez, L ........................................................... 17, 43
Mask, P ............................................................. 42
Mason, D ........................................................... 17
Mason, R.K ....................................................... 22
Matson, D.M ..................................................... 31
Matyi, R.J .......................................................... 48
Mazuruk, K ........................................................ 36, 41, 51, 52
McCarty, P ......................................................... 56
McCaul, E.W ..................................................... 25
McCune, J.C ...................................................... 36
McCollough, M.L ............................................. 28, 35, 36, 54
McCollum, M ..................................................... 18
McDanal, A.J ..................................................... 38
McDonald, J ...................................................... 33
McGee, J.K ......................................................... 22
McGhee, D.S ...................................................... 36
McGill, P ............................................................ 36
McMahon, W.M ............................................. 28, 32
McNeal, C ......................................................... 14, 17, 43
McNeal, C.L., Jr ................................................ 36
McNider, R.T ..................................................... 34
McQuiston, D .................................................... 39
Mead, F.B., Jr .................................................... 52
Mears, T ............................................................. 27
Meegan, C.A ..................................................... 27, 36, 37
Meehan, E .......................................................... 32
Mell, R ............................................................... 23
Mende, S.B ......................................................... 36
Meneghini, R ..................................................... 46
Menietti, J.D ....................................................... 25
Menzies, R.T ..................................................... 43
Metcalf, T ........................................................... 38
Miftakhova, E.G ................................................... 25
Mims, K ............................................................. 23
Minow, J.I ......................................................... 16, 37, 38
Mitrofanov, I.G ................................................... 37
Mohr, J.J ........................................................... 41
Montgomery, E.E ............................................. 41
Mook, H ............................................................. 48
Moore, C ........................................................... 24
Moore, C.E ......................................................... 18, 49
Moore, J ............................................................ 24
Moore, R.L ......................................................... 22, 37, 48
Moore, T.E ........................................................ 19, 21, 29, 34, 48, 50, 55
Morgan, D .......................................................... 43
Morgan, R.E ....................................................... 37
Morgan, S.H ..................................................... 17
Morton, J ............................................................ 29
<table>
<thead>
<tr>
<th>Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morton, P.J.</td>
<td>16, 17, 44</td>
</tr>
<tr>
<td>Mosier, D.</td>
<td>19</td>
</tr>
<tr>
<td>Motakef, S.</td>
<td>45, 49</td>
</tr>
<tr>
<td>Muery, K.</td>
<td>31</td>
</tr>
<tr>
<td>Mukherjee, S.</td>
<td>47, 48</td>
</tr>
<tr>
<td>Muntele, I.</td>
<td>56</td>
</tr>
<tr>
<td>Murphee, S.</td>
<td>36</td>
</tr>
<tr>
<td>Murray, S.</td>
<td>53</td>
</tr>
<tr>
<td>Muzuruk, K.</td>
<td>26</td>
</tr>
<tr>
<td>Myers, G.</td>
<td>53</td>
</tr>
<tr>
<td>Myrabo, L.N.</td>
<td>52</td>
</tr>
<tr>
<td>Nadarajah, A.</td>
<td>37</td>
</tr>
<tr>
<td>Naftel, J.C.</td>
<td>37</td>
</tr>
<tr>
<td>Nall, M.</td>
<td>37</td>
</tr>
<tr>
<td>Naumann, R.J.</td>
<td>18</td>
</tr>
<tr>
<td>Ndap, J.-O.</td>
<td>17</td>
</tr>
<tr>
<td>Neergaard, L.</td>
<td>37</td>
</tr>
<tr>
<td>Negueruela, I.</td>
<td>38</td>
</tr>
<tr>
<td>Nein, M.</td>
<td>19</td>
</tr>
<tr>
<td>Nesterov, V.N.</td>
<td>49</td>
</tr>
<tr>
<td>Neugebauer, M.</td>
<td>49</td>
</tr>
<tr>
<td>Newton, E.K.</td>
<td>14, 38</td>
</tr>
<tr>
<td>Nichols, J.S.</td>
<td>53</td>
</tr>
<tr>
<td>Noneman, S.</td>
<td>38</td>
</tr>
<tr>
<td>Nunes, A.C., Jr.</td>
<td>15, 36, 38</td>
</tr>
<tr>
<td>Ober, D.</td>
<td>24</td>
</tr>
<tr>
<td>O'Dell, S.L.</td>
<td>16, 21, 22, 32, 33, 38, 41, 45, 53</td>
</tr>
<tr>
<td>Oglesby, R.</td>
<td>38, 42</td>
</tr>
<tr>
<td>Oleson, S.R.</td>
<td>30</td>
</tr>
<tr>
<td>Olive, T.</td>
<td>15</td>
</tr>
<tr>
<td>O'Neil, M.J.</td>
<td>38</td>
</tr>
<tr>
<td>Ong, J.</td>
<td>38</td>
</tr>
<tr>
<td>Osterman, S.</td>
<td>18</td>
</tr>
<tr>
<td>Owens, J.K.</td>
<td>37</td>
</tr>
<tr>
<td>Paciesas, W.S.</td>
<td>27, 37</td>
</tr>
<tr>
<td>Paerels, F.</td>
<td>53</td>
</tr>
<tr>
<td>Page, R.H.</td>
<td>17</td>
</tr>
<tr>
<td>Page, T.</td>
<td>19</td>
</tr>
<tr>
<td>Pal, S.</td>
<td>43</td>
</tr>
<tr>
<td>Paley, M.S.</td>
<td>14, 18</td>
</tr>
<tr>
<td>Palmiter, C.</td>
<td>44</td>
</tr>
<tr>
<td>Panada, B.</td>
<td>39</td>
</tr>
<tr>
<td>Panasyuk, M.</td>
<td>14, 15</td>
</tr>
<tr>
<td>Papila, N.</td>
<td>39, 46, 50</td>
</tr>
<tr>
<td>Paradis, Van, J.</td>
<td>24, 54</td>
</tr>
<tr>
<td>Parhi, S.</td>
<td>39</td>
</tr>
<tr>
<td>Park, N.</td>
<td>39</td>
</tr>
<tr>
<td>Park, S.-C.</td>
<td>47</td>
</tr>
<tr>
<td>Parker, D.</td>
<td>28</td>
</tr>
<tr>
<td>Parks, G.K.</td>
<td>19, 23, 39, 48</td>
</tr>
<tr>
<td>Parks, R.</td>
<td>24</td>
</tr>
<tr>
<td>Patel, S.K.</td>
<td>32, 39, 41</td>
</tr>
<tr>
<td>Patterson, M.</td>
<td>39</td>
</tr>
<tr>
<td>Pearson, J.B.</td>
<td>20</td>
</tr>
<tr>
<td>Pearson, S.D.</td>
<td>27</td>
</tr>
<tr>
<td>Peck, J.</td>
<td>39, 49</td>
</tr>
<tr>
<td>Pedersen, K.</td>
<td>25, 29, 30, 51</td>
</tr>
<tr>
<td>Pendleton, G.N.</td>
<td>17, 27, 37</td>
</tr>
<tr>
<td>Penn, B.</td>
<td>15</td>
</tr>
<tr>
<td>Perkinson, D.</td>
<td>18</td>
</tr>
<tr>
<td>Perry, J.L.</td>
<td>41</td>
</tr>
<tr>
<td>Peters, B.</td>
<td>27</td>
</tr>
<tr>
<td>Peters, P.N.</td>
<td>39</td>
</tr>
<tr>
<td>Peters, W.</td>
<td>39</td>
</tr>
<tr>
<td>Petitto, J.M.</td>
<td>28</td>
</tr>
<tr>
<td>Phelps, J.</td>
<td>37</td>
</tr>
<tr>
<td>Phillips, T.</td>
<td>33</td>
</tr>
<tr>
<td>Piszczor, M.F.</td>
<td>38</td>
</tr>
<tr>
<td>Pitalo, S.K.</td>
<td>55</td>
</tr>
<tr>
<td>Plawsky, J.L.</td>
<td>46</td>
</tr>
<tr>
<td>Podorozhnyi, D.</td>
<td>15</td>
</tr>
<tr>
<td>Pokros, M.</td>
<td>32</td>
</tr>
<tr>
<td>Poletto, G.</td>
<td>48, 49</td>
</tr>
<tr>
<td>Polites, M.E.</td>
<td>40</td>
</tr>
<tr>
<td>Polsgrove, R.</td>
<td>35</td>
</tr>
<tr>
<td>Ponomarev, I.</td>
<td>26</td>
</tr>
<tr>
<td>Porter, J.G.</td>
<td>22, 37, 40, 53</td>
</tr>
<tr>
<td>Poston, D.</td>
<td>30, 51</td>
</tr>
<tr>
<td>Preece, R.D.</td>
<td>17, 24, 37</td>
</tr>
<tr>
<td>Prince, A.S.</td>
<td>37</td>
</tr>
<tr>
<td>Prueger, G.H.</td>
<td>54</td>
</tr>
<tr>
<td>Pusey, M.L.</td>
<td>18, 22, 23, 24, 28, 32, 35, 37, 40, 49</td>
</tr>
<tr>
<td>Qiu, H.-L.</td>
<td>40</td>
</tr>
<tr>
<td>Quast, P.</td>
<td>40</td>
</tr>
<tr>
<td>Quattrochi, D.A.</td>
<td>21, 40</td>
</tr>
<tr>
<td>Rabin, D.M.</td>
<td>40</td>
</tr>
<tr>
<td>Rablau, C.I.</td>
<td>17</td>
</tr>
<tr>
<td>Racz, L.M.</td>
<td>15</td>
</tr>
<tr>
<td>Rakoczzy, J.</td>
<td>41</td>
</tr>
<tr>
<td>Ramachandran, N.</td>
<td>34, 41, 48, 55</td>
</tr>
<tr>
<td>Ramage, K.S.</td>
<td>19</td>
</tr>
<tr>
<td>Ramsey, B.D.</td>
<td>22, 24, 33, 38, 41, 47, 49</td>
</tr>
<tr>
<td>Rangel, R.</td>
<td>50</td>
</tr>
<tr>
<td>Rathz, T.J.</td>
<td>42, 43</td>
</tr>
<tr>
<td>Rawlins, M.A.</td>
<td>32, 41</td>
</tr>
<tr>
<td>Ray, C.D.</td>
<td>41</td>
</tr>
</tbody>
</table>
### REPORT DOCUMENTATION PAGE

<table>
<thead>
<tr>
<th>Form Approved</th>
<th>OMB No. 0704-0188</th>
</tr>
</thead>
</table>

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports (7040-0188), Washington, DC 20503.

<table>
<thead>
<tr>
<th>1. AGENCY USE ONLY (Leave Blank)</th>
<th>2. REPORT DATE</th>
<th>3. REPORT TYPE AND DATES COVERED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>January 2001</td>
<td>Technical Memorandum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. TITLE AND SUBTITLE</th>
<th>5. FUNDING NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2000 Scientific and Technical Reports, Articles, Papers, and Presentations</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. AUTHORS</th>
<th>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</th>
<th>8. PERFORMING ORGANIZATION REPORT NUMBER</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</th>
<th>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Aeronautics and Space Administration Washington, DC 20546</td>
<td>NASA/TM—2001–210795</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. SUPPLEMENTARY NOTES</th>
<th>12a. DISTRIBUTION/AVAILABILITY STATEMENT</th>
<th>12b. DISTRIBUTION CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared by Information Services Department, Center Operations Directorate</td>
<td>Unclassified–Unlimited Subject Category 99 Availability: NASA CASI (301) 621–0390 Nonstandard Distribution</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13. ABSTRACT (Maximum 200 words)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 2000. It also includes papers of MSFC contractors. After being announced in STAR, all the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The information in this report may be of value to the scientific and engineering community in determining what information has been published and what is available.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14. SUBJECT TERMS</th>
<th>15. NUMBER OF PAGES</th>
<th>16. PRICE CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific and Technical Report, Articles, Papers, Presentations</td>
<td>76</td>
<td>A05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. SECURITY CLASSIFICATION OF REPORT</th>
<th>18. SECURITY CLASSIFICATION OF THIS PAGE</th>
<th>19. SECURITY CLASSIFICATION OF ABSTRACT</th>
<th>20. LIMITATION OF ABSTRACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unclassified</td>
<td>Unclassified</td>
<td>Unclassified</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)

Prepared by AOS 04-229-16

298-102