FY 1994 Scientific and Technical Reports, Articles, Papers, and Presentations

Compiled by
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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.”

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# FY 1994 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

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The Space Sciences Laboratory (SSL) at Marshall Space Flight Center is a multiprogram facility. Scientific research is conducted in four discipline areas: Earth science and applications, solar-terrestrial physics, astrophysics, and microgravity science and applications. Representatives from each of these discipline areas participate in a Laboratory computer requirements committee, which has developed this document. The purpose of this document is to establish and discuss Laboratory objectives for computing and networking in support of science. The purpose is also to lay the foundation for a collective, multiprogram approach to providing these services. Special recognition is given to the importance of the national and international efforts of our research communities toward the development of interoperable, network-based computer applications.

Based on a new theory, two computer codes have been developed specifically to calculate the exact statistical tolerance limits for normal distributions within unknown means and variances for the one-sided and two-sided cases for the tolerance factor, $k$. The quantity $k$ is defined equivalently in terms of the noncentral $t$-distribution by the probability equation. Two of the four mathematical methods employ the theory developed for the numerical simulation. Several algorithms for numerically integrating and iteratively root-solving the working equations are written to augment the program simulation. The program codes generate some tables of $k$'s associated with the varying values of the proportion and sample size for each given probability to show accuracy obtained from small sample sizes.
A Simplistic Look at Limit Stresses From Random Loading. H.M. Lee. Structures and Dynamics Laboratory. 94N-15710

Utilizing a continuous beam model, this report compares the potential stresses imposed on the beam from a random environment with those resulting from a typical static load analysis or test simulation. The Miles’ equation used to develop peak response accelerations is shown to become a force equation in the hands of strength assessment personnel. This may prove to be unrealistic since hardware dynamic stresses are related to deflection rather than load. Correlation of the stress state for any static analysis or test with the actual dynamic response stress is strictly dependent upon how well the static deflections simulate the predominant dynamic mode shape. The report proposes that the general shape of this predominant mode, along with the peak response accelerations of major masses be used in strength assessments. From these data, a tailored enforced displacement loading may prove to be more effective in reproducing random induced stresses on flight hardware.

On the Design of Structural Components Using Materials With Time-Dependent Properties. P.I. Rodriguez. Structures and Dynamics Laboratory. 94N-16519

The application of the elastic-viscoelastic correspondence principle is presented as a design tool for structural design engineers for composite materials applications. The classical problem of cantilever beams is used as the illustration problem. Both closed-form and approximate numerical solutions are presented for several different problems. The application of the collocation method is presented as a viable and simple design tool to determine the time-dependent behavior and response of viscoelastic composite beams under load.

Study of the National Science Foundation’s South Pole Station as an Analogous Data Base for the Logistical Support of a Moon Laboratory (CDDF Final Report No. 307-52-00-N09). H.H. Hickam, Jr. Mission Operations Laboratory. 94N-17469

The day will come when the United States will want to return to the Earth’s Moon. When that occurs, NASA may look to the Apollo program for technical and inspirational guidance. The Apollo program, however, was designed to be an end to itself—the landing of a man on the Moon and his return safely within the decade of the 1960’s. When that was accomplished, the program folded because it was not self-sustaining. The next time we return to the Moon, we should base our planning on a program that is designed to be a sustained effort for an indefinite period. It is the thrust of this report that the South Pole Station of the National Science Foundation can be used to develop analogs for the construction, funding, and logistical support of a lunar base. Other analogs include transportation and national efforts versus international cooperation. A recommended lunar base using the South Pole Station as inspiration is provided, as well as details concerning economical construction of the base over a 22-year period.
precipitation. Grain boundary precipitation and precipitate free zones (PFZ's) were observed in the wrought alloy after exposing to temperatures above 605 °C (1,120 °F). The fine-grained microstructure observed in the laser and electron-beam glazed NARloy-Z was much more stable at elevated temperatures. Microstructural changes correlated well with hardness measurements.

TM-108432 November 1993
A Simulation Model for Probabilistic Analysis of Space Shuttle Abort Modes. R.T. Hage. Preliminary Design Office. 94N-21859

This report presents a simulation model which has been developed to provide a probabilistic analysis tool to study the various space transportation system abort mode situations. The simulation model is based on Monte Carlo simulation of an event-tree diagram which accounts for events during the space transportation system's ascent and its abort modes. The simulation model considers just the propulsion elements of the shuttle system (i.e., external tank, main engines, and solid boosters). The model was developed to provide a better understanding of the probability of occurrence and successful completion of abort modes during the vehicle's ascent. The results of the simulation runs discussed in this report are for demonstration purposes only, they are not official NASA probability estimates.

TM-108433 December 1993
Performance Assessment of Low Pressure Nuclear Thermal Propulsion. H.P. Gerrish, Jr., and G.E. Doughty. Propulsion Laboratory. 94N-21860

A low pressure nuclear thermal propulsion (LPNTP) system, which takes advantage of hydrogen dissociation/recombination, has been proposed as a means of increasing engine specific impulse (Isp). This paper examines the effect of hydrogen dissociation/recombination on LPNTP Isp. A two-dimensional computer model was used to show that the optimum chamber pressure is approximately 100 psia (at a chamber temperature of 3,000 K), with an Isp ~ 15 s higher than at 1,000 psia. At high chamber temperatures and low chamber pressures, the increase in Isp is due to both lower average molecular weights caused by dissociation and added kinetic energy from monatomic hydrogen recombination. Monatomic hydrogen recombination increases the Isp more than hydrogen dissociation. Variations in the mole fraction of monatomic hydrogen are similar to variations in static pressure along the axial nozzle position. Most recombination occurs close to the nozzle throat. Practical variations in nozzle geometry have minimal impact on recombination. Other models, which can simulate a wider range of nozzle designs, should be used in the future. The uncertainty of the hydrogen kinetic reaction rates at high temperatures (~3,000 K) affects the accuracy of the analysis and should be verified with simple bench tests.

TM-108434 December 1993
Detailed Study of Oxidation/Wear Mechanism in Lox Turbopump Bearings. T.J. Chase and J.P. McCarty. Propulsion Laboratory. 94N-21580

Wear of 440C angular contact ball bearings of the phase II high pressure oxygen turbopump (HPOTP) of the space shuttle main engine (SSME) has been studied by means of various advanced non-destructive techniques (NDT) and modeled with reference to all known material, design, and operation variables. Three modes dominating the wear scenario were found to be the adhesive/sheer peeling (ASP), oxidation, and abrasion. Bearing wear was modeled in terms of the three modes. Lacking a comprehensive theory of rolling contact wear to date, each mode is modeled after well-established theories of sliding wear, while sliding velocity and distance are related to microsliding in ball-to-ring contacts. Microsliding, stress, temperature, and other contact variables are evaluated with analytical software packages of SHABERTH™/SINDA™ and ADORE™. Empirical constants for the models are derived from NIST experiments by applying the models to the NIST wear data. The bearing wear model so established precisely predicts quite well the average ball wear rate for the HPOTP bearings. The wear rate has been statistically determined for the entire population of flight and development bearings based on Rocketdyne records to date. Numerous illustrations are given.

TM-108435 January 1994
MAMS Data for the Convection and Moisture Experiment (CAMEX). A.R. Guillory, G.J. Jedlovec, and R.J. Atkinson. Space Sciences Laboratory. 94N-24080

During the fall of 1993, NASA sponsored a field program called the Convection And Moisture Experiment (CAMEX). The field effort focused on: (1) convective storms in order to investigate their associated electrical properties, precipitation, and
predictability; and (2) atmospheric moisture studies. This document describes the data collected from the Multispectral Atmospheric Mapping Sensor (MAMS) onboard a NASA ER-2 aircraft which was deployed out of NASA/Wallops Flight Facility, Wallops Island, Virginia, from September 11 through October 7, 1993.

TM-108436  
Survey of Visualization and Analysis Tools. P.J. Meyer. Space Sciences Laboratory. 94N-26150

A large number of commercially available visualization and analysis tools are available to the researcher. This document discusses some of the strengths and limitations of some of these tools, from the viewpoint of the Earth sciences discipline. Visualization and analysis tools fall into one of two categories: those that are designed to a specific purpose and are nonextensible, and those that are generic visual programming tools that are extensible. Most of the extensible packages examined incorporate a data flow paradigm.

TM-108437  

This report presents a summary of the spectroscopic study of three systems: LaF₃:Ho³⁺, LaF₃:Er³⁺, and CaF₂:Nd³⁺. When the D levels of Ho³⁺ in LaF₃ were resonantly excited with a laser beam of 640 nm, upconverted emissions were detected from J (416 nm), F (485 nm), and E (546 nm) levels. Energy upconverted emissions were also observed from F and E levels of Ho³⁺ when the material was excited with an 800 nm near infrared laser. When the D levels of Er³⁺ in LaF₃ were resonantly excited with a laser beam of 637 nm, upconverted emissions were detected from the E (540 nm) and P (320, 400, and 468 nm) levels. Energy upconverted emissions were also observed from F, E, and D levels of Er³⁺ when the material was resonantly excited with an 804 nm near infrared laser. When the D levels of Nd³⁺ in CaF₂ were resonantly excited with a laser beam of 577 nm, upconverted emissions were detected from the L (360 and 382 nm), K (418 nm), and I (432 nm) levels. Very weak upconverted emissions were detected when this system was irradiated with a near infrared laser. The numbers in parentheses are the wavelengths of the emissions.

TM-108438  
February 1994

The purpose of this document is to introduce Geographical Information System (GIS) terminology and summarize interviews conducted with scientists in the Earth Science and Applications Division (ESAD). There is a growing need in ESAD for GIS technology. With many different data sources available to the scientists comes the need to be able to process and view these data in an efficient manner. Since most of these data are stored in vastly different formats, specialized software and hardware are needed. Several ESAD scientists have been using a GIS, specifically the Man-computer Interactive Data Access System (McIDAS). McIDAS can solve many of the research problems that arise, but there are areas of research that need more powerful tools; one such example is the multispectral image analysis which is described in this document. Given the strong need for GIS in ESAD, we recommend that a requirements analysis and implementation plan be developed using this document as a basis for further investigation.

TM-108439  
March 1994
Intercomparison of Wildfire and High-Resolution Interferometer Sounder (HIS) Data From STORM-FEST: An Investigation of Wildfire Spectral Channel Discrepancies. G.J. Jedlovec and G.S. Carlson. Space Sciences Laboratory. 94N-29553

This simultaneous collection of HIS spectral measurements aboard the ER-2 during STORM-FEST provided a means to explore calibration problems in the infrared bands of the Wildfire instrument. Large discrepancies in brightness temperatures were noted in Wildfire bands designed to sample the "wings" of the strong ozone absorption band centered at 9.6 μm, where the atmospheric transmittance changes rapidly with wavelength. Examination of interchannel relationships in Wildfire data and
subsequent comparison to Wildfire data synthesized from the HIS measurements suggests that a wavelength shift in the channel spectral response from those determined in the laboratory may have occurred. Based on comparisons from several flights, this spectral shift has been empirically determined to be about 0.15 μm. It is speculated that this problem resulted from a slight misalignment of the spectrometer grating or other optical elements, or was a result of extreme range in temperatures experienced by the instrument throughout the course of an ER-2 flight. A consequence of this temperature fluctuation may be a change in position of the grating in the optical path and could result in the variations in channel spectral response during flight. These findings for Wildfire may have significant bearing on future use of the MAS because of the similarities to the original Wildfire configuration.

TM-108440 March 1994
The Effects of Embedded Internal Delaminations on Composite Laminate Compression Strength; An Experimental Review. A.T. Nettles. Materials and Processes Laboratory. 94N-26127

Delaminations in laminated composite materials can degrade the compressive strength of these materials. Delaminations can form as a result of impact damage or processing flaws. In order to better understand the effects of these delaminations on the compressive behavior of laminated composite plates, programs have been conducted to assess the criticality of prescribed delaminations of known size, shape, and location on the compression strength of laminated composites. A review of these programs is presented along with highlights of pertinent findings from each.

TM-108441 March 1994

NASA has been progressively learning the design and performance of the Russian life support systems utilized in their Mir space station. In 1992 a plan was implemented to assess the benefits of the Mir-1 life support systems to the Freedom program. Three primary tasks focused on: (1) evaluating the operational Mir-1 support technologies and understanding if specific Russian systems could be directly utilized on the American space station and determine if Russian technology design information could prove useful in improving the current design of the planned American life support equipment, (2) evaluating ongoing Russian life support technology development activities to determine areas of potential long-term application to the U.S. space station, and (3) utilizing the expertise the Russians have gained with the long-term operation of their space station life support systems to evaluate the benefits to the current U.S. space station program which included the integration of the Russian Mir-1 designs with the U.S. designs to support a crew of six.

TM-108442 March 1994

One of the most critical components of a space suit is the gloves, yet gloves have traditionally presented significant design challenges. With continued efforts at glove development, a method for evaluating glove performance is needed. This paper presents a pressure-glove evaluation protocol. A description of this evaluation protocol and its development is provided. The protocol allows comparison of one glove design to another, or any one design to bare-handed performance. Gloves for higher pressure suits may be evaluated at current and future design pressures to drive out differences in performance due to pressure effects. Using this protocol, gloves may be evaluated during design to drive out design problems and determine areas for improvement, or fully mature designs may be evaluated with respect to mission requirements. Several different test configurations are presented to handle these cases. This protocol was run on a prototype glove. The prototype was evaluated at two operating pressures and in the unpressurized state, with results compared to bare-handed performance. Results and analysis from this test series was provided, as is a description of the configuration used for this test.

TM-108443 March 1994
Microbiology Report for the Stage 7 and Stage 8 Water Recovery Tests. M.C. Roman and S.A. Minton. Structures and Dynamics Laboratory. 94X-10202

The Water Recovery Test (WRT) Stage 7 and Stage 8 of the Environmental Control and Life
Support System (ECLSS) test program was conducted at NASA/ Marshall Space Flight Center (MSFC). Assessments of the design and operation of a single-loop water recovery system, which combined the potable and hygiene water recovery loops used in previous WRT testing, was performed during the two test stages. Stage 7 operated for 59 days, December 4, 1991, to February 22, 1992. During each day of WRT stage 7, an average of 20 human test subjects generated wastewater from shower, hand wash, oral hygiene, and laundry activities. In addition, test subjects produced humidity condensate (during exercise), and donated urine. Stage 8 operated 84 days, July 14, 1992, to October 7, 1992. This stage was conducted in donor mode operation with no test subject reclaimed water usage. Stage 8 was conducted identically to stage 7 except for one important change in the system configuration. The potable water processor (PWP) feed sterilizer was by-passed throughout stage 8 testing to determine the impact on the subsystem performance and unibed life expectancy.

This report presents the results of the Center Director's Discretionary Fund project "Development of a New Seal for Use on Large Openings of Pressurized Spacecraft." The goal of this project was to design, build, and test an example of the seal invented by the author for use on Space Station Freedom and patented in 1991. The seal features a metallic spring core and replaceable elastomeric sealing elements. The metallic spring is designed to retain the sealing force of the elastomeric element against both sides of face seal gland for any specified amount of waviness or separation of the glands. A seal able to tolerate at least 1.3 mm (0.05 in) of flange distortion or separation and a test fixture of this seal which allowed direct comparison testing of O-rings were built. These designs were tested to compare leakage at different amounts of flange deflection. Results of the testing show the development seal exceeded its requirement to seal 1.3 mm of flange separation by 1 mm. This compared with the O-ring leakage increasing dramatically at 0.5 mm of separation. The development seal also leaked at a lower rate than the O-ring seals in all tests.

Operations Summary for the Convection and Moisture Experiment (CAMEX). V.L. Griffin, A.R. Guilford, M. Susko, and J.E. Arnold. Space Sciences Laboratory. 94N-33004

During the fall of 1993, NASA sponsored a field program called the Convection and Moisture Experiment (CAMEX) at Wallops Island, Virginia. CAMEX was a multidisciplinary experiment design to measure the three-dimensional moisture fields over Wallops Island, and to characterize the multi-frequency radiometric signature of tropical convection over the Gulf Stream and southeastern Atlantic Ocean. This document summarizes the daily CAMEX activities, including ground and aircraft (NASA ER-2) operations, and includes "quick-look" summaries of data acquisition along with data examples provided by the various CAMEX PI's.


Between June and October 1993, a series of hybrid rocket motor tests were performed using the SSSRCS. A total of 10 tests were performed in-house at Marshall Space Flight Center. These tests exposed ASRM compound 17A O-rings to hot, abrasive combustion gases. RSRM V-1115 O-rings were simultaneously exposed to this severe environment for comparison to historical baseline materials and testing efforts. All of the objectives for these tests were satisfied. Although both materials performed well, the ASRM compound 17A material consistently suffered less total heat effect than did the RSRM baseline. This report documents the results and analyses from the O-ring portion of the testing.

Space Shuttle Main Engine Turbopump Bearing Assessment Program. B. Spiegel Breithaupt. Propulsion Laboratory. 94N-28265

This report documents the work done on the bearing assessment program over the past 21/2 years. The objective of the program is to develop a non-destructive evaluation system for the SSME HPOTP's which would be used to detect anomalies in installed bearings without engine disassembly. Data bases of various signatures are obtained by
slowly turning the pump shafts before and after an engine firing. These signatures are then analyzed and compared to the original signatures to more accurately predict bearing wear.

TM-108448 April 1994

This report provides a description of the NASA Marshall Space Flight Center’s Solar Vector Magnetograph Facility and gives a summary of its observations and data reduction during June–October 1993. The systems that make up the facility are a magnetograph telescope, an H-α telescope, a Questar telescope, and a computer code.

TM-108449 April 1994
Ampoule Failure Sensor Time Response Testing—Experiment 1. M.L. Johnson and D.A. Watring. Astrionics and Space Sciences Laboratory. 94N-30199

The response time of an ampoule failure sensor exposed to a liquid or vapor gallium-arsenide (GaAs) is investigated. The experimental configuration represents the sample/ampoule cartridge assembly used in NASA’s Crystal Growth Furnace (CGF). The sensor is a chemical fuse made from a metal with which the semiconductor material reacts more rapidly than it does with the containing cartridge. For the III-IV compound of GaAs, a platinum metal was chosen based on the reaction of platinum and arsenic at elevated temperatures which forms a low melting eutectic. Ampoule failure is indicated by a step change in resistance of the failure sensor on the order of megohms. The sensors will increase the safety of crystal growth experiments by providing an indication that an ampoule has failed. Experimental results indicate that the response times (after a known ampoule failure) for the 0.003 and 0.010 inch ampoule failure sensors are 2.4 and 3.6 minutes, respectively. This ampoule failure sensor will be utilized in the CGF during the second United States Microgravity Laboratory Mission (USML-2) and is the subject of a NASA patent application.

TM-108450 April 1994

This document lists the significant publications and presentations of the Space Sciences Laboratory during the period January 1–December 31, 1993. 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). Also included for completeness is an Appendix (arranged by report number) listing preprints issued by the Laboratory during this reporting period. Some of the preprints have not been published; those already published are so indicated. 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 publications 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 subsection under Open Literature. Questions or requests for additional information about the entries in this report should be directed to Tauna W. Moorehead (ES02; 544-7581) or to one of the authors. The organizational code of the cognizant SSL branch or office is given at the end of each entry.

TM-108451 April 1994
National Aerospace Plane (NASP) X-30 Natural Environment Requirements Document (Rev. 1.0). Dale L. Johnson. Space Sciences Laboratory. 94X-10268

This document defines and summarizes the natural environment design criteria to be used in the design, operational planning, and testing of the proposed, experimental National Aerospace Plane (NASP) X-30 vehicle. Much of the atmospheric design criteria involves climatologies for the Edwards AFB, CA (proposed) launch and landing site, as well as atmospheric design statistics pertaining to flight patterns around the CONUS and orbital/deorbital phases. A design risk of 5 percent or 1 percent is assumed for the proposed flight phases of the X-30 vehicle, as well as pre- and post-launch concerns.

TM-108452 April 1994
Vulnerability of Manned Spacecraft to Crew Loss From Orbital Debris Penetration. J.E. Williamsen. Structures and Dynamics Laboratory. 94N-30161
Orbital debris growth threatens the survival of spacecraft systems from impact-induced failures. Whereas the probability of debris impact and spacecraft penetration may currently be calculated, another parameter of great interest to safety engineers is the probability that debris penetration will cause actual spacecraft or crew loss. Quantifying the likelihood of crew loss following a penetration allows spacecraft designers to identify those design features and crew operational protocols that offer the highest improvement in crew safety for available resources.

Within this study, a Manned Spacecraft Crew Survivability (MSCSurv) computer model is developed that quantifies the conditional probability of losing one or more crew members, $P_{\text{loss/pen}}$, following the remote likelihood of an orbital debris penetration into an eight module space station. Contributions to $P_{\text{loss/pen}}$ are quantified from three significant penetration-induced hazards: pressure wall rupture (explosive decompression), fragment-induced injury, and "slow" depressurization. Sensitivity analyses are performed using alternate assumptions for hazard-generating functions, crew vulnerability thresholds, and selected spacecraft design and crew operations parameters. These results are then used to recommend modifications to the spacecraft design and expected crew operations that quantitatively increase crew safety from orbital debris impacts.

**TM-108453**

Root-Sum-Square Structural Strength Verification Approach. H.M. Lee. Structures and Dynamics Laboratory. 94N-30206

Utilizing a proposed fixture design or some variation thereof, this report presents a verification approach to strength test space flight payload components, electronics boxes, mechanisms, lines, fittings, etc., which traditionally do not lend themselves to classical static loading. The fixture, through use of ordered Euler rotation angles derived herein, can be mounted on existing vibration shakers and can provide an innovative method of applying single axis flight load vectors. The versatile fixture effectively loads protoflight or prototype components in all three axes simultaneously by use of a sinusoidal burst of desired magnitude at less than one-third the first resonant frequency. Cost savings along with improved hardware confidence are shown to be the potential, with the end product being an efficient way to verify experiment hardware for both random vibration and strength.

**TM-108454**

A Case Study of Analysis Methods for Large Deflections of a Cantilever Beam. L.D. Craig. Structures and Dynamics Laboratory. 94N-32903

A load case study of geometric nonlinear large deflections of a cantilever beam is presented. The bending strain must remain elastic. Closed form solution and finite element methods of analysis are illustrated and compared for three common load cases. A nondimensional monogram for each case is presented in the summary.

**TM-108456**

A User's Guide to the Trace Contaminant Control Simulation Computer Program. J.L. Perry. Structures and Dynamics Laboratory. 94N-33696

The Trace Contaminant Control Simulation computer program is a tool for assessing the performance of various trace contaminant control technologies for removing trace chemical contamination from a spacecraft cabin atmosphere. The results obtained from the program can be useful in assessing different technology combinations, system sizing, system location with respect to other life support systems, and the overall life cycle economics of a trace contaminant control system. The user's manual is extracted in its entirety from NASA TM-108409 to provide a stand-alone reference for using any version of the program. The first publication of the manual as part of TM-108409 also included a detailed listing of version 8.0 of the program. As changes to the code were necessary, it became apparent that the user's manual should be separate from the computer code documentation and be general enough to provide guidance in using any version of the program. Provided in the guide are tips for input file preparation, general program execution, and output file manipulation. Information concerning source code listings of the latest version of the computer program may be obtained by contacting the author.

**TM-108457**

Trace Contaminant Control Simulation Computer Program—Version 8.1. J.L. Perry. Structures and Dynamics Laboratory. 94N-33973

The Trace Contaminant Control Simulation computer program is a tool for assessing the performance of various process technologies for
removing trace chemical contamination from a spacecraft cabin atmosphere. Included in the simulation are chemical and physical adsorption by activated charcoal, chemical adsorption by lithium hydroxide, absorption by humidity condensate, and low- and high-temperature catalytic oxidation. Means are provided for simulating regenerable as well as nonregenerable systems. The program provides an overall mass balance of chemical contaminants in a spacecraft cabin given specified generation rates. Removal rates are based on device flow rates specified by the user and calculated removal efficiencies based on cabin concentration and removal technology experimental data. Versions 1.0 through 8.0 are documented in NASA TM-108409. TM-108409 also contains a source file listing for version 8.0. Changes to version 8.0 are documented in this technical memorandum and a source file listing for the modified version, version 8.1, is provided. Detailed descriptions for the computer program subprograms are extracted from TM-108409 and modified as necessary to reflect version 8.1. Version 8.1 supersedes version 8.0. Information on a separate user's guide is available from the author.

TM-108459 June 1994

Spacecraft thermal control is accomplished for many components through use of multilayer insulation systems, electrical heaters, and radiator systems. The heaters are commanded to maintain component temperatures within design specifications. The programmable heater control circuit (PHCC) was designed to obtain an effective and efficient means of spacecraft thermal control. The hybrid circuit provides use of control instrumentation as temperature data, available to the spacecraft central data system, reprogramming capability of the local microprocessor during the spacecraft's mission, and the elimination of significant spacecraft wiring. The hybrid integrated circuit has a temperature sensing and conditioning circuit, a microprocessor, and a heater power and control circuit. The device is miniature and housed in a volume which allows physical integration with the component to be controlled. Applications might include alternate battery-powered logic-circuit configurations. A prototype unit with appropriate physical and functional interfaces was procured for testing. The physical functionality and the feasibility of fabrication of the hybrid integrated circuit were successfully verified. The remaining work to develop a flight-qualified device includes fabrication and testing of a Mil-certified part. An option for completing the PHCC flight qualification testing is to enter into a joint venture with industry.

TM-108460 August 1994

This report describes efforts to use digital motion video compression technology to develop a highly portable device that would convert 1990–91
era IBM-compatible and/or Macintosh notebook computers into full-color, motion-video capable multimedia training systems. An architecture was conceived that would permit direct conversion of existing laser-disk-based multimedia courses with little or no reauthoring. The project did not physically demonstrate certain critical video keying techniques, but their implementation should be feasible. This investigation of digital motion video has spawned two significant spaceflight projects at MSFC: one to downlink multiple high-quality video signals from Spacelab, and the other to uplink video conference-quality video in real-time and high quality video offline, plus investigate interactive, multimedia-based techniques for enhancing onboard science operations. Other airborne or spaceborne spinoffs are possible.

**TM-108461**  
*Effect of Microgravity on Crystallization of ZBLAN Fibers*  
D.S. Tucker. Materials and Processes Laboratory.

ZrF$_4$-BaF$_2$-LaF$_3$-AlF$_3$-NaF (ZBLAN) optical fiber was flown onboard the NASA’s KC-135 microgravity aircraft to determine the effects of microgravity on crystal growth in this material. Fiber samples were placed in evacuated quartz ampoules and heated to the crystallization temperature in 0, 1, and 2g. The 1 and 2g samples were observed to slump and crystallize. The 0g samples showed no evidence of crystallization.

**TM-108462**  
*Dynamics Explorer 1, Retarding Ion Mass Spectrometer Summary Spectrograms—81/280 to 81/365 Spin-Time Spectrograms for H$^+$, He$^+$, O$^+$, N$^+$, O$^{++}$, M/Z = 2, and Molecular Ions.*  
DE 1/RIMS Investigators. Space Sciences Laboratory.

The Retarding Ion Mass Spectrometer (RIMS) experiment onboard the Dynamics Explorer 1 (DE 1) satellite was designed to perform energy and mass-per-charge analysis on low-energy ions (<50 eV) with mass/charge ratios ranging from 1 to 40 amu/Z. The DE 1 satellite, carrying the RIMS experiment, was launched into an elliptical polar orbit on August 3, 1981. The ~7.5 hour orbit has perigee of 675 km altitude and apogee of 24,875 km altitude. This document, and those that follow in this series, contains summary RIMS data spectrograms for each orbit for which RIMS data are available.

The RIMS instrument began returning science data on day 280 of 1981 and continued to return usable data until the end of the DE mission in March 1991. It should be noted that studies of the RIMS data set should be conducted only with a thorough awareness of the material described in the introduction section presented here, or in collaboration with a scientist familiar with RIMS data analysis.

**TM-108463**  
*Finite Element Analysis of a Composite Wheelchair Wheel Design.*  
R. Ortega. Structures and Dynamics Laboratory.

The finite element analysis of a composite wheelchair wheel design is presented. The design is the result of a technology utilization request. The designer’s intent is to soften the riding feeling by incorporating a mechanism attaching the wheel rim to the spokes that would allow considerable deflection upon compressive loads. A finite element analysis was conducted to verify proper structural function. Displacement and stress results are presented and conclusions are provided.

**TM-108464**  
M. Herrmann and L. Johnson. Program Development Directorate.

For three decades, magnetospheric field and plasma measurements have been made by diverse instruments flown on spacecraft in many different orbits, widely separated in space and time, and under various solar and magnetospheric conditions. Scientists have used this information to piece together an intricate, yet incomplete view of the magnetosphere. A simultaneous global view, using various light wavelengths and energetic neutral atoms, could reveal exciting new data and help explain complex magnetospheric processes, thus providing us with a clear picture of this region of space.

The George C. Marshall Space Flight Center (MSFC) is responsible for defining the IMI mission which will study this region of space. NASA’s Space Physics Division of the Office of Space Science placed the IMI third in its queue of Solar Terrestrial Probe missions for launch in the 1990’s. A core instrument complement of three images (with the potential addition of one or more mission enhancing instruments) will fly in an elliptical, polar Earth orbit with a apogee of 44,600 km and a perigee of 4,800 km. This paper will address the
mission objectives, spacecraft design considerations, interim results of the MSFC concept definition study, and future plans.

TM-108465 August 1994

Fabrication of a lunar ceramic was conducted according to a statistically designed experiment. The method of cold pressing was used since the consumption of electrical energy is kept to a minimum, a priority in the lunar environment. This traditional fabrication technique also provides an initial data source on which further investigations can be based. Results obtained from using 2 percent binder, a cold pressing pressure of 276 MPa, and 24 hours sintering time yielded the greatest compressive strength of 247 MPa. Analysis of each variable’s influence on the compressive strength is also presented.

TM-108466 September 1994

Phthalocyanines have been used as a pigment in coatings and related applications for many years. These pigments are some of the most stable organic pigments known. The phthalo blue and green pigments have been shown to be ultraviolet (UV) stable and thermally stable to over 400 °C. These phthalocyanines are both a semiconductor and photoconductor, exhibiting catalytic activity and photostabilization capability of polymers. Many metal free and metallic phthalocyanine derivatives have been prepared. Development of the new classes of phthalocyanine pigment could be used as coating on NASA spacecraft material such as glass to decrease the optical degradation from UV light, the outside of the space station modules for UV protection, and coating on solar cells to increase lifetime and efficiency.

TM-108467 September 1994

The feasibility of using densification or subcooling with respect to standard temperature propellants on the Space Transportation System (STS) in order to achieve a payload gain is discussed in this report. The objective is to determine the magnitude of the payload gain and to identify any system impacts to the space shuttle on either flight systems or ground systems. Results show that a payload benefit can be obtained by subcooling the liquid hydrogen (LH₂) from a nominal temperature of 36.4 to 28.5 °R and by subcooling the liquid oxygen (LO₂) from a nominal temperature of 164 °R to either 132.1 or 141.4 °R. When the propellants are subcooled to 28.5 and 132.1 °R for the LH₂ and LO₂, respectively, a maximum payload gain of 7,324 lb can be achieved, and when the propellants are subcooled to 28.5 and 141.5 °R for the LH₂ and LO₂, respectively, a maximum payload gain of 6,841 lb can be achieved. If the LH₂ is subcooled to 28.5 °R while the LH₂ and LO₂ remains at the nominal conditions, a maximum payload gain of 1,303 lb can be achieved.

TM-4511 August 1993
Terrestrial Environment (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Development, 1993 Revision. D.L. Johnson, Editor. Space Sciences Laboratory. 94N-14824

This document provides guidelines on terrestrial environment data specifically applicable in the development of design requirements/specifications for NASA aerospace vehicles and associated equipment development. The primary geographic areas encompassed are the John F. Kennedy Space Center, FL; Vandenberg AFB, CA; Edwards AFB, CA; Michoud Assembly Facility, New Orleans, LA; John C. Stennis Space Center, MS; Lyndon B. Johnson Space Center, Houston, TX; and the White Sands Missile Range, NM. In addition, a section has been included to provide information on the general distribution of natural environmental extremes in the conterminous United States that may be needed to specify design criteria in the transportation of space vehicle subsystems and components. A summary of climatic extremes for worldwide operational needs is also included. Although not considered as a specific vehicle design criterion, a section on atmospheric attenuation has been added since sensors on certain Earth orbital experiment missions are influenced by the Earth’s atmosphere. This document presents the latest available information on probable climatic extremes and supersedes information presented in TM X-64589, TM X-64757, TM X-78118, and TM-82473. Information is included on atmospheric chemistry, seismic criteria, and on a mathematical model to predict atmospheric dispersion of
aerospace engine exhaust cloud rise and growth. There is also a section on atmospheric cloud phenomena. The information in this report is recommended for use in the development of aerospace vehicle and associated equipment design and operational criteria, unless otherwise stated in contract work specifications. The environmental data in this report are primarily limited to information below 90 km.

TM-4527 June 1994

This document provides definitions of the natural near-Earth space environment suitable for use in the initial development/design phase of any space vehicle. The natural environment includes the neutral atmosphere, plasma, charged particle radiation, electromagnetic radiation (EMR), meteoroids, orbital debris, magnetic field, physical and thermal constants, and gravitational field. Communications and other unmanned satellites operate in geosynchronous-Earth orbit (GEO); therefore, some data are given for GEO, but emphasis is on altitudes from 200 to 1,000 km (low-Earth orbit (LEO)). This document does not cover the induced environment or other effects resulting from presence of the space vehicle. Manmade factors are included as part of the ambient natural environment; i.e., orbital debris and radio frequency (RF) noise generated on Earth, because they are not caused by the presence of the space vehicle but form part of the ambient environment that the space vehicle experiences.

TM-4594 April 1994

The Lunar Ultraviolet Telescope Experiment (LUTE) is a 1-meter telescope for imaging from the lunar surface of the ultraviolet spectrum between 1,000 and 3,500 angstroms. There have been several endorsements of the scientific value of a LUTE. In addition to the scientific value of LUTE, its educational value and the information it can provide on the design of operating hardware for long-term exposure in the lunar environment are important considerations.

This report provides the results of the LUTE phase A activity begun at the George C. Marshall Space Flight Center in early 1992. It describes the objective of LUTE (science, engineering, and education), a feasible reference design concept that has evolved, and the subsystem trades that were accomplished during the phase A.

This project serves to define an appropriate methodology for effective prioritization of efforts required to develop replacement technologies mandated by imposed and forecast legislation. The methodology used is a semiquantitative approach derived from quality function deployment techniques (QFD Matrix). This methodology aims to weigh the full environmental, cost, safety, reliability, and programmatic implications of replacement technology development to allow appropriate identification of viable candidates and programmatic alternatives. The results are being implemented as a guideline for consideration for current NASA propulsion systems.

Total Systems Design Analysis of High Performance Structures. V. Verderaime. Structures and Dynamics Laboratory.

Designer-control parameters were identified at interdiscipline interfaces to optimize structural systems performance and downstream development and operations with reliability and least life-cycle cost. Interface tasks and iterations are tracked through a matrix of performance disciplines integration versus manufacturing, verification, and operations interactions for a total system design analysis. Performance integration tasks include shapes, sizes, environments, and materials. Integrity integrating tasks are reliability and recurring structural costs. Significant interface designer control parameters were noted as shapes, dimensions, probability range factors, and cost. Structural failure concept is presented, and first-order reliability and deterministic methods, benefits, and limitations are discussed. A deterministic reliability technique combining benefits of both is proposed for static structures which is also timely and economically verifiable. Though launch vehicle environments were primarily considered, the system design process is applicable to any surface system using its own unique field environments.


Probabilistic structural analyses and design methods are steadily gaining acceptance within the aerospace industry. The safety factor approach to design has long been the industry standard, and is believed by many to be overly conservative, and thus costly. A probabilistic approach to design may offer substantial cost savings. This report summarizes several probabilistic approaches; the probabilistic failure analysis (PFA) methodology developed by Jet Propulsion Laboratory, fast probability integration (FPI) methods, the NESSUS finite element code, and response surface methods. Example problems are provided to help identify the advantages and disadvantages of each method.


In order to increase the structural performance of cryogenic tanks, the aerospace industry is beginning to employ low-profile bulkheads in new generation launch vehicle designs. This report details the analysis and test of one such dome made from 2219 aluminum. Such domes have two potential failure modes under internal pressure, general tensile failure and hoop compression buckling (in regions near the Equator). The test determined the buckling load and ultimate tensile load of the hardware and showed that both compared well with the analysis predictions. This effort was conducted under the auspices of NASA and the General Dynamics Cryogenic Tank Technology Program (CTTP).


Launch vehicle designs typically make extensive use of cylindrical skin stringer construction. Structural analysis methods are well developed for preliminary design of this type of construction. This report describes an automated, iterative method to obtain a minimum weight preliminary design.

Structural optimization has been researched extensively, and various programs have been written for this purpose. Their complexity and ease of use depends on their generality, the failure modes...
considered, the methodology used, and the rigor of the analysis performed. This computer program employs closed-form solutions from a variety of well-known structural analysis references and joins them with a commercially available numerical optimizer called the "Design Optimization Tool" (DOT).

Any ring and stringer stiffened shell structure of isotropic materials that has beam type loading can be analyzed. Plasticity effects are not included. It performs a more limited analysis than programs such as PANDA, but it provides an easy and useful preliminary design tool for a large class of structures.

This report briefly describes the optimization theory, outlines the development and use of the program, and describes the analysis techniques that are used. Examples of program input and output, as well as the listing of the analysis routines, are included.

TP-3458 January 1994
Results of a Laboratory Experiment That Tests Rotating Unbalanced-Mass Devices for Scanning Gimbaled Payloads and Free-Flying Spacecraft (CDDF Final Report No. 92-02). D.C. Alhorn and M.E. Polites. Astrionics Laboratory and Structures and Dynamics Laboratory. 94N-23574

Rotating unbalanced-mass (RUM) devices are a new way to scan space-based, balloon-borne and ground-based gimbaled payloads, like x-ray and gamma-ray telescopes. They can also be used to scan free-flying spacecraft. Circular scans, linear scans, and raster scans can be generated. A pair of RUM devices generates the basic scan motion and an auxiliary control system using torque motors control moment gyros, or reaction wheels keeps the scan centered on the target and produces some complementary motion for raster scanning. Previous analyses and simulation results show that this approach offers significant power savings compared to scanning only with the auxiliary control system especially with large payloads and high scan frequencies. However, these claims have never been proven until now. This paper describes a laboratory experiment which tests the concept of scanning gimbaled payload with RUM devices. A description of the experiment is given and test results that prove the concept are presented. The test results are compared with those from a computer simulation model of the experiment and the differences are discussed.

TP-3463 February 1994
Thermocapillary Flow With Evaporation and Condensation and Its Effect on Liquid Retention in Low-G Fluid Acquisition Devices, MSFC Center Director's Discretionary Fund Final Report, Project No. 91-15. G.R. Schmidt. Propulsion Laboratory. 94N-27639

The steady motion, thermal and free surface behavior of a volatile, wetting liquid in microgravity are studied using scaling and numerical techniques. The objective is to determine whether the thermocapillary and two-phase convection arising from thermodynamic nonequilibrium along the porous surfaces of spacecraft liquid acquisition devices could cause the retention failures observed with liquid hydrogen and heated vapor pressurant. The study also examines why these devices seem immune to retention loss when pressurized with heated helium or heated directly through the porous structure. Results show that highly wetting fluids exhibit large negative and positive dynamic pressure gradients toward the meniscus interface when superheated and subcooled, respectively. With superheating, the pressure variation and recoil force arising from liquid/vapor phase change exert the same influence on surface morphology and promote retention. With subcooling, however, the pressure distribution produces a suction that degrades mechanical equilibrium of the surface. This result indicates that thermocapillary-induced deformation arising from subcooling and condensation is the likely cause for retention loss. In addition, increasing the level of nonequilibrium by reducing accommodation coefficient suppresses deformation and explains why this failure mode does not occur in instances of direct screen heating or pressurization with a heated inert gas.

TP-3488 May 1994
Aerodynamic Characteristics of the National Launch System (NLS) 1 1/2 Stage Launch Vehicle. A.M. Springer and D.C. Pokora. Structures and Dynamics Laboratory. 94N-37577

The National Aeronautics and Space Administration (NASA) is studying ways of assuring more reliable and cost effective means to space. One launch system studied was the NLS which included the 1 1/2 stage vehicle. This document encompasses the aerodynamic characteristics of the 1 1/2 stage vehicle. To support the detailed configuration definition, two wind tunnel tests were conducted in the NASA Marshall Space Flight Center's 14 x 14-Inch Trisonic Wind Tunnel during 1992. The tests were a static stability and a pressure test, each utilizing 0.004 scale models. The static stability test resulted in the forces and moments acting on the vehicle. The
aerodynamics for the reference configuration with and without feedlines and an evaluation of three proposed engine shroud configurations were also determined. The pressure test resulted in pressure distributions over the reference vehicle with and without feedlines including the reference engine shrouds. These pressure distributions were integrated and balanced to the static stability coefficients resulting in distributed aerodynamic loads on the vehicle. The wind tunnel tests covered a Mach range of 0.60 to 4.96. These ascent flight aerodynamic characteristics provide the basis for trajectory and performance analysis, loads determination, and guidance and control evaluation.

TP-3490 June 1994
The Corrosion Protection of Several Aluminum Alloys By Chromic Acid and Sulfuric Acid Anodizing. M.D. Danford. Materials and Processes Laboratory. 94N-37578

The corrosion protection afforded 7075-T6, 7075-T3, 6061-T6, and 2024-T3 aluminum alloys by chromic acid and sulfuric acid anodizing was examined using electrochemical techniques. From these studies, it is concluded that sulfuric acid anodizing provides superior corrosion protection compared to chromic acid anodizing.

TP-3499 July 1994
Universal First-Order Reliability Concept Applied to Semistatic Structures. V. Verderaime. Structures and Dynamics Laboratory.

A reliability design concept was developed for semistatic structures which combines the prevailing deterministic method with the first-order reliability method. The proposed method surmounts deterministic deficiencies in providing uniformly reliable structures and improved safety audits. It supports risk analyses and reliability selection criteria. The method provides a reliability design factor derived from the reliability criterion which is analogous to the current safety factor for sizing structures and verifying reliability response. The universal first-order reliability method should also be applicable for air and surface vehicles semistatic structures.

TP-3501
Illustrated Structural Application of Universal First-Order Reliability Method. V. Verderaime. Structures and Dynamics Laboratory.

The general application of the proposed first-order reliability method was achieved through the universal normalization of engineering probability distribution data. The method superimposes prevailing deterministic techniques and practices on the first-order reliability method to surmount deficiencies of the deterministic method and provide benefits of reliability techniques and predictions. A reliability design factor is derived from the reliability criterion to satisfy a specified reliability and is analogous to the deterministic safety factor. Its application is numerically illustrated on several practical structural design and verification cases with interesting results and insights. Two concepts of reliability selection criteria are suggested. Though the method was developed to support affordable structures for access to space, the method should also be applicable for most high-performance air and surface transportation systems.

TP-3506 September 1994
Damage Tolerance of Candidate Thermoset Composites for Use on Single Stage to Orbit Vehicles. A.T. Nettles, D. Lance, and A. Hodge. Materials and Processes Laboratory.

Four fiber/resin systems were compared for resistance to damage and damage tolerance. One toughened epoxy and three toughened bismaleimide (BMI) resins were used, all with IM7 carbon fiber reinforcement. A statistical design of experiments technique was used to evaluate the effects of impact energy, specimen thickness, and tup diameter on the damage area as computed by C-scans, and residual compression-after-impact (CAI) strength. Results showed that two of the BMI systems sustained relatively large damage zones, yet had an excellent retention of CAI strength.

TP-3507 September 1994

A major difficulty associated with $H_\infty$ and $\mu$-synthesis methods is the order of the resulting compensator. Whereas model and/or controller reduction techniques are sometimes applied, performance and robustness properties are not preserved. By directly constraining compensator order during the optimization process, these properties are better preserved, albeit at the expense of computational complexity. This paper presents a novel homotopy algorithm to synthesize fixed-order mixed $H_2/H_\infty$ compensators. Numerical results are presented for a four-disk
Butt-weld joints are most commonly designed into pressure vessels which then become as reliable as the weakest increment in the weld chain. In practice, weld material properties are determined from tensile test specimen and provided to the stress analyst in the form of a stress versus strain diagram. Variations in properties through the thickness of the weld and along the width of the weld have been suspect but not explored because of inaccessibility and cost.

The purpose of this study is to investigate analytical and computational methods used for analysis of welds. The weld specimens are analyzed using classical elastic and plastic theory to provide a basis for modeling the inelastic properties in a finite-element solution. The results of the analysis are compared to experimental data to determine the weld behavior and the accuracy of prediction methods. The weld considered in this study is a multiple-pass aluminum 2219-T87 butt weld with thickness of 1.40 in.

The weld specimen is modeled using the finite-element code ABAQUS. The finite-element model is used to produce the stress-strain behavior in the elastic and plastic regimes and to determine Poisson's ratio in the plastic region. The value of Poisson's ratio in the plastic regime is then compared to experimental data. The results of the comparisons are used to explain multipass weld behavior and to make recommendations concerning the analysis and testing of welds.
CP-3250  December 1993
Microgravity Studies of Organic and Polymeric
Cardelino, Editors. 94N-24338

CP-3253  February 1994
Second Annual International Space University
Alumni Conference. L. Johnson and P.
Robinson, Compilers. 94N-31425

CP-3254  February 1994
The 1993 NASA Aerospace Battery Workshop.
J.C. Brewer, Compiler. 94N-28100

CP-3257  December 1993
LDEF Materials Results for Spacecraft
Applications. Ann Whitaker and John Gregory,
Compilers. 94N-31012

CP-3272  May 1994
Joint Launch + One Year Science Review of
USML-1 and USMP-1 With the Microgravity
Measurement Group, Volumes I and II. N.
Ramachandran, D.O. Frazier, S.L. Lehoczky,
and C.R. Baugher, Editors.

CP-3282  September 1994
Advanced Earth-to-Orbit Propulsion
Technology—1994, Volumes I and II. R.J.
Richmond and S.T. Wu, Editors.
RP-1324 January 1994
Designing for Human Presence in Space: An Introduction to Environmental Control and Life Support Systems. Paul Wieland. Structures and Dynamics Laboratory. 94N-27437

RP-1341 June 1994
A Shadowgraph Study of Space Transportation System (STS): The Space Shuttle Launch Vehicle (SSLV). A.M. Springer. Structures and Dynamics Laboratory. 94N-36741

RP-1347 August 1994
X-Ray and Gamma-Ray Astronomy Detectors.
R. Decher, B.D. Ramsey, and R.A. Austin.
Space Sciences Laboratory.
CR-4581 February 1994
94N-33898

CR-4602 May 1994

CR-4605 May 1994

CR-4628 September 1994

CR-193842 July 1993
N94-14903

CR-193843 July 1993
N94-14905

CR-193844 May 1993
N94-14906

CR-193845 May 1993
N94-15109

CR-193846 August 1993
N94-14907

CR-193847 August 31, 1993
X93-36400

CR-193848 September 1993
Development of a 100 mJ, 5 Hz, Flashlamp-Pumped Cr, TM: YAG Coherent Lidar Transmitter. NAS8-39153. Coherent Technologies, Inc.
X93-36395

CR-193849 September 1993
N94-15831

CR-193850 August 31, 1993
N94-15532

CR-193851 June 11, 1993
N94-15766

CR-193852 February 1993
N94-17442

CR-193853 February 15, 1993
X93-36310

CR-193854 July 23, 1993
X93-11076

CR-193855 August 1993
FNAS Phase Partitions. NAS8-36955. The University of Alabama in Huntsville.

CR-193856 August 1993
Particle Engulfment and Pushing by Solidifying Interfaces (PEPSI)—Final Report. NAS8-39715. The University of Alabama.
N94-17079
NASA CONTRACTOR REPORTS  
(Abstracts for these reports may be obtained from STAR)

CR-193857 December 1991  

CR-193858 November 1992  

CR-193859 July 1993  

CR-193860 November 15, 1992  

CR-193861 July 1992  

CR-193862 November 1993  

CR-193863 April 1993  

CR-193864 April 1993  

CR-193865 March 1993  

CR-193866 July 1993  

CR-193867 June 15, 1993  
Application of Hard Coatings to Substrates at Low Temperatures—Final Report. NAS8-37686. BIRL Industrial Research Laboratory.  N94-17122

CR-193868 September 1993  

CR-193869 July 1992  

CR-193870 July 9, 1993  

CR-193871 December 1992  
Slit-Scan Radiographic System for Intermediate-Size Rocket Motors, SBIR 89-1 Phase II Research Study. NAS8-38954. Bio-Imaging Research, Inc.  X93-36406

CR-193872 November 1992  

CR-193873 October 1993  

CR-193874 April 1993  
Advanced Transportation System Studies Technical Area 3 Alternate Propulsion Subsystem
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

NAS8-39210. Rocketdyne.  
N94-21271

CR-193875  
Space Transfer Concepts and Analysis for Exploration Missions—Final Report, Phase I.  
NAS8-37857. Boeing.  
N94-70849

CR-193876  
NAS8-37857. Boeing.  
N94-18820

CR-193877  
October 31, 1993  
NAS8-38609. The University of Alabama in Huntsville.  
N94-19494

CR-193878  
December 9, 1993  
Natural Environmental Analysis—Final Report.  
NAS8-37129. The University of Tennessee Space Institute.  
N94-71064

CR-193879  
October 15, 1993  
NAS8-39235. Remtech, Inc.  
N94-24664

CR-193880  
December 13, 1993  
NAS8-39131. Auburn University.  
N94-24066

CR-193881  
October 1993  
NAS8-38575. Harris Corp.  
N94-24470

CR-193882  
August 11, 1993  
NAS8-36670. Logicon Control Dynamics, Inc.  
N94-24309

CR-193883  
January 1994  
Microbiological Analysis of Debris From Space Transportation System (STS)-55 Spacelab D-2.  
NAS8-37814. Sverdrup Technology, Inc.  
N94-24310

CR-193884  
January 18, 1994  
NAS8-38609. The University of Alabama in Huntsville.  
N94-24484

CR-193885  
January 18, 1994  
NAS8-38609. The University of Alabama in Huntsville.  
N94-24461

CR-193886  
July 15, 1988  
N94-71755

CR-193887  
December 1, 1993  
NAS8-38963. Resource Technologies Group, Inc.  
X93-36401

CR-193888  
November 1993  
Space Portable Spectroreflectrometer—SBIR Phase II—Final Report.  
NAS8-38970. AZ Technology, Inc.  
X93-36402

CR-193889  
August 1993  
NAS8-38609. The University of Alabama in Huntsville.  
N94-24665

CR-193890  
December 14, 1993  
NAS8-39131. Auburn University.  
N94-24111

CR-193891  
October 1993  
NAS8-38609. The University of Alabama in Huntsville.  
N94-24088

CR-193892  
December 1992  
Optimization Techniques Applied to Passive Measure for In-Orbit Spacecraft Survivability—Multibumper Regression and Optimization

CR-193893 May 28, 1993
Humidity Effects on Soluble Core Mechanical and Thermal Properties (Polyvinyl Alcohol/Microballoon Composite) Type “CG” Extendospheres, Volume II—Final Report. NAS8-37800. Aerojet ASRM Division.
N94-24224

CR-193894 September 1993
N94-24802

CR-193895 September 1993
N94-24064

CR-193896 August 1993
N94-24067

CR-193897 September 1993
N94-24057

CR-193898 September 1993
N94-24057

CR-193899 September 1993
N94-25020

CR-193900 September 1, 1993
Flex Bearing UUEC Final Report Volume II—Appendix. NAS8-38100. Thiokol Corp.
N94-71524

CR-193901 September 14, 1993
Flex Bearing UUEC Final Report Volume II. NAS8-38100. Thiokol Corp.
N94-24588

CR-193902 November 1993
N94-24112

CR-193903 November 1993
N94-24065

CR-193904 December 1992
N94-24965

CR-193905 November 29, 1993
N94-23549

CR-193906 November 1993
N94-24050

CR-193907 September 30, 1993
N94-24174

CR-193908 December 14, 1993
N94-24852

CR-193909 February 1994
N94-24359

CR-193910 December 1993
N94-25000

CR-193911 December 10, 1993
N94-27377

23
CR-193912 December 1993

CR-193913 January 20, 1994

CR-193914 December 3, 1993

CR-193915 December 31, 1993

CR-193916 September 1993

CR-193917 September 1993

CR-193918 September 1993

CR-193919 October 31, 1993
STE Thrust Chamber Technology Main Injector Technology Program and Nozzle Advanced Development Program (ADP)—Final Report. NAS8-37490. United Technologies Pratt and Whitney. N94-25019

CR-193920 October 29, 1993

CR-193921 November 1993
Lightning Tests and Analyses of Tunnel Bond Straps and Shielded Cables on the Space Shuttle Solid Rocket Booster—Final Report. NAS8-36300. United Technologies USBI. N94-24801

CR-193922 December 8, 1993

CR-193923 December 9, 1993

CR-193924 August 12, 1993

CR-193925 February 27, 1992

CR-193926 January 1994

CR-193927 October 27, 1993

CR-193928 February 1994
Superfluid Helium Sloshing Dynamics Induced Oscillations and Fluctuations of Angular Momentum, Force and Moment Actuated on Spacecraft Driven by Gravity Gradient or Jitter Accelerations Associated With Slew Motion—Final Report. NAS8-38609: The University of Alabama in Huntsville. N94-27931
CR-193929  September 1992
Materials Characterization on Efforts for Ablative Materials. NAS8-38609. The University of Alabama in Huntsville. N94-27230

CR-193930  February 15, 1994
BATSE Data Analysis—Final Report. NAS8-38609. The University of Alabama in Huntsville. N94-26685

CR-193931  January 1994

CR-193932  October 1993

CR-193933  March 1994

CR-193934  December 10, 1993

CR-193935  February 9, 1994
Space Experiments With Particle Accelerators (SEPAC)—Final Report. NAS8-39569. Nichols Research Corp. N94-27664

CR-193936  January 13, 1994

CR-193937  September 2, 1993

CR-193938  November 17, 1993

CR-193939  December 15, 1993

CR-193940  October 1993

CR-193941  October 22, 1993

CR-193942  November 1993

CR-193943  February 28, 1994

CR-193944  February 15, 1994

CR-193945  January 31, 1994

CR-193946  March 16, 1994

CR-193947  February 28, 1994
CR-193948 March 1994

CR-193949 November 16, 1993

CR-193950 March 9, 1994

CR-193951 April 20, 1994

CR-193952 April 20, 1994

CR-193953 April 20, 1994

CR-193954 February 23, 1994

CR-193955 March 10, 1994

CR-193956 January 1994

CR-193957 March 8, 1994

CR-193958 April 10, 1994

CR-193959 February 1, 1994

CR-193960 April 6, 1994

CR-193961 April 6, 1994

CR-193962 April 6, 1994

CR-193963 March 31, 1994

CR-193964 March 4, 1994

CR-193965 March 1994
CR-193984 June 13, 1994

CR-193985 April 1994

CR-193986 October 16, 1993
Reliability and Requirements Analysis for Space Exploration Initiative Vehicles. NAS8-39212. Science Applications International Corp. X94-10400

CR-193987 September 1993

CR-193988 September 1993

CR-193989 July 1994
Analysis for 7Be and 10Be on LDEF Materials and Their Sources. NAS8-38609. The University of Alabama in Huntsville.

CR-193990 March 1994
Inducer Analysis/Pump Model Development—Final Report. NAS8-38868. SECA, Inc.

CR-193991 May 1994

CR-193992 April 1994

CR-193993 June 30, 1994

CR-193994 April 1994

CR-193995 April 1994

CR-193996 April 1994

CR-193997 April 1994

CR-193998 July 26, 1994

CR-193999 July 22, 1994

CR-194000 July 26, 1994

CR-194001 July 26, 1994

CR-194002 July 26, 1994
Reusable Thermally-Controlled Container for Storage and Transport of Biological Samples—
SBIR Phase I Final Report. NAS8-40141. Space Hardware Optimization Technology, Inc.

CR-194003 June 1, 1994

CR-194004 July 26, 1994

CR-194005 May 25, 1994

CR-194006 June 1994

CR-194007 July 26, 1994

CR-194008 July 1994

CR-194009 July 26, 1994
Coherent Phase Cavitation Monitoring System for Turbomachinery—SBIR Phase I Final Report. NAS8-40102, AI Signal Research, Inc. X93-36509

CR-194010 July 26, 1994

CR-194011 July 26, 1994
Advanced SIC Pointing and Stabilization Mirror Assembly for GEO Mission—SBIR Phase I Final Report. NAS8-40142, SSG, Inc. X93-36479

CR-194012 July 22, 1994

CR-194013 July 26, 1994

CR-194014 June 22, 1994

CR-194015 July 25, 1994

CR-194016 July 26, 1994

CR-194017 July 26, 1994

CR-194018 July 21, 1994

CR-194019 July 20, 1994

CR-194020 July 26, 1994
A Zero-G Spacecraft Refrigeration System Using Air as the Refrigerant—SBIR Phase I

CR-194021 July 25, 1994

CR-194022 July 25, 1994

CR-194023 July 25, 1994

CR-196493 July 1994

CR-196494 July 25, 1994

CR-196495 July 25, 1994

CR-196496 July 1994

CR-196497 July 20, 1994

CR-196498 July 25, 1994

CR-196499 July 17, 1994

CR-196500 July 1994
Development of Electrochemical Super Capacitors for EMA Applications—SBIR Final Report. NAS8-40119. GINER, Inc. X93-36530

CR-196501 July 26, 1994

CR-196502 July 25, 1994

CR-196503 July 22, 1994

CR-196504 July 1994

CR-196505 July 25, 1994
High Rate Flywheel Energy Source for Thrust Vector Control Electro-Mechanical Actuators—SBIR Final Report. NAS8-40137. SatCon Technology Corp. X93-36510

CR-196506 July 1994
CR-196507 March 31, 1994

CR-196508 March 1993

CR-196509 May 1994

CR-196510 August 15, 1994

CR-196511 April 1994
Advanced Transportation System Studies Technical Area 3, Alternate Propulsion Subsystem

CR-196512 July 1994

CR-196513 August 1994

CR-196514 August 24, 1994

CR-196515 August 1, 1994
ABDELDAYEM, H. ES76
BANKS, C.
HICKS, R.
PENN, B.G.
FRAZIER, D.O.
Large Third-Order Nonlinearities of Metal-Free Phthalocyanines Films. For presentation at the OSA Annual Meeting, Dallas, TX, October 2–7, 1994.

ABDELDAYEM, H. ES74
FRAZIER, D.O.
ET AL.
Polydiacetylenes: Excellent Candidates as Nonlinear Optical Material. For presentation at the 1993 OSA, Toronto, Canada, October 3–8, 1993.

ABDELDAYEM, H. ES74
SHIELDS, A.
WITHEROW, W.
PENN, B.
FRAZIER, D.O.

ABDELDAYEM, H. ES76
WITHEROW, W.K.
PENN, B.
FRAZIER, D.O.
Novel Phenomenon of CW Laser Fanning in Organic Solutions. For publication in Optical Letters, Washington, DC.

ABDELDAYEM, H. ES74
WITHEROW, W.
SHIELDS, A.
PENN, B.
FRAZIER, D.O.

ADAMS, A.M. PS05

ASAKIMORI, K. ES64
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CHERRY, M.L.
CHRISTL, M.J.
MOON, K.H.
ET AL.

AUSTIN, R.E. PT01
COOK, S.A.
Single Stage to Orbit Rocket: The Next Generation of Space Transportation. For publication in Aerospace American.

AXFORD, W.I. ES82
SUESS, S.T.
The Heliosphere. For publication in EOS, Transactions, American Geophysical Union, Washington, DC.

BANKSTON, C.D. EB53

BARRET, C. ED15

BARRETT, E.C. ES44
DODGE, J.
GOODMAN, H.M.
JANOWIAK, J.
KIDD, C.
SMITH, E.A.
The First Wetnet Precipitation Intercomparison Project. For publication in Remote Sensing Reviews, Reading, United Kingdom.

BARRETT, E.C. ES42
ADLER, R.F.
ARPE, K.
BAUER, P.
BERG, W.
ET AL.
The First Wetnet Precipitation Intercomparison Project (PIP-1): Interpretation of Results.
For publication in Remote Sensing Reviews, New York, NY.

BARRY, R.G. ES42
SCHARFEN, G.F.
KNOWLES, K.W.
GOODMAN, S.J.

BASKARAN, S. ES76
NOEVER, D.
SCHUSTER, P.

BASKARAN, S. ES76
NOEVER, D.

BATTISTA, B.F. (Sverdrup)
CHESSER, B.L.
MAJUMDAR, A.K.
NGUYEN, D.
OWEN, J.W. ED64

BAUGHER, C.R. ES75
RAMACHANDRAN, N.
Basic Features of the STS/Spacelab Vibration Environment. For presentation at the 24th ICES and 5th European Symposium on Space Environmental Control Systems, Friedrichshafen, Germany, June 20–23, 1994.

BERNHARDT, P.A. ES53
SIEFRING, C.L.
RODRIGUEZ, P.
HAAS, D.G.
POLLOCK, C.J.

ET AL.
The Ionospheric Focused Heating (IFH) Experiment. For publication in the Journal of Geophysical Research, Washington, DC.

BESHEARS, R.D. EH13
HEDIGER, L.H.

BIANCA, C.J. ED21
GREENBERG, H.S.
JOHNSON, S.E.
Reusable LH2 Tank Technology Demonstration Through Ground Test. For presentation at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 27–29, 1994.

BIAO, Y. ES75
AZOULAY, M.
GEORGE, M.A.
BURGER, A.
COLLINS, W.E.
ET AL.

BIFANO, T.G. (Boston University)
DRUEDING, T.W.
FAWCETT, S.C. EB53
Contouring Algorithm for Ion Figuring. For publication in Precision Engineering, Journal of ASPE.

BLAKESLEE, R. ES43
BAILEY, J.
CHRISTIAN, H.

BODIFORD, M.P. EO38
Standardization of CCSDS Packet User Data Telemetry Construction Techniques. For presentation at the 1994 International

BOND, R. (IIT Research Institute)
MALONE, T.W. EH21
RYBICKI, D.J. (Martin Marietta)

BOOTE, R.E. EH12

BORDELON, W.J. ED34
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RAYBURN, J.

BUCY, R.P. ES76
PANOSKALTSIS-MORTARI, A.
HUANG, G.-Q.
LI, J.
KARR, L.
ET AL.
Heterogeneity of Single-Cell Cytokine Gene Expression in Clonal T Cell Populations. For publication in the Journal of Experimental Medicine, New York, NY.

BUECHLER, D. ES43
CHRISTIAN, H.J.
GOODMAN, S.J.

BUKLEY, A.P. PS02

BUKLEY, A.P. PS02

BUKLEY, A.P. PS02
JOHNSON, C.D. (UAH)

BUKLEY, A.P. PS02
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ANDERSON, J.B.
DRISKILL, T.C.

BURGESS, F. (USBI)
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HOPPE, D. EH54

BURNS, H.D. EH12
Surface Contamination Analysis Team Overview. For presentation at the Aerospace Environmental Technology Conference, Huntsville, AL, August 10–11, 1994.

BURSEY, R. (United Technologies)
HALUCK, D.
THOM, R. EH14
Incorporation of Silicon Nitride Rolling Elements Into the Pratt and Whitney High Pressure Oxidizer Turbopump for the Space Shuttle Main Engine. For presentation at the 1994 Conference

CAMPBELL, J. ES65

CAMPINS, H. ES84
TELESCO, C.
OSIP, D.
RIEKE, G.
RIEKE, M.
SCHULZ, B.
The Color Temperature of (2060) Chiron: A Warm and Small Nucleus. For publication in the Astronomical Journal, Seattle, WA.

CANABAL, F., III. ED32

CARTER, D.C. ES76
RUKER, F.
HO, J.X.
LIM, K.
KEELING, K.
GILLILAND, G.
JI, X.

CAUZZI, G. ES82
FALCHI, A.
FALCIANI, R.
SMALDONE, L.A.
SCHWARTZ, R.
HAGYARD, M.
Coordinated Studies of Solar Activity Phenomena. For publication in Astronomy and Astrophysics, Reinhold, NY.

CHANDLER, M.O. ES83

CHANG, T. JA01
TORR, M.R.
TORR, D.G.
RICHARDS, P.G.
The N2 Lyman Birge Hopfield Bands as Measured by the Imaging Spectrometric Observatory From ATLAS-1. For presentation at the American Geophysical Union Spring 1994 Meeting, Baltimore, MD, May 23–27, 1994.

CHEN, K.-T. ES75
GEORGE, M.A.
ZHANG, Y.
BURGER, A.
SU, C.-H.
SHA, Y.-G.
GILLIES, D.C.
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CHEN, K.T. ES75
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BURGER, A.
ET AL.

CHEN, P.S. EH23
SANDERS, J.H.
LIAW, Y.K.
ZIMMERMAN, F.
Ductility Degradation of VPS NARloy-Z at Elevated Temperatures. For publication in Materials Science and Engineering, Long Island, NY.

CHEN, P.S. EH24
PANDA, B.
BHAT, B.N.
Elemental Partitioning in y and yl as Used to Develop Hydrogen-Resistant Iron-Base Super alloys. For publication in Metallurgical Transactions.

CHEN, P.S. (IIT Research Institute) EH24
PANDA, B.
LEE, J.A.
BHAT, B.N.
Chemical Compatibility of Cast Waspaloy Composites Reinforced With Tungsten Wires.

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DENG, Z.-T.
LIAW, G.-S.

CHOW, A.S.
MO, J.D. (Memphis State University)

CHRISTENSEN, E.
CLARK, K.
BRUNTY, J.
FRADY, G.
RAYBURN, J.
System Level Structural Optimization of Launch Vehicles. For presentation at the Fifth AIAA Symposium on Multidisciplinary Analysis and Optimization, Panama City, FL, September 7–9, 1994.

CHRISTIAN, H.J.
The Optical Transient Detector. For presentation at the 1994 AGU Fall Meeting, San Francisco, CA, December 4–9, 1994.

COLBERT, R.F.
BATTISTA, B.F.
MAJUMDAR, A.K.
SHULAR, D.A.
OWEN, J.W.

COLE, H.J.
ASHLEY, P.R.
CITES, J.S.


COMFORT, R.H.
RICHARDS, P.G.
CRAVEN, P.D.
CHANDLER, M.O.

CORDER, E.L.

CRABB, T.M. (Orbital Technologies Corp.)
HINMAN-SWEENEY, E.

CRAVEN, P.D.
COMFORT, R.H.
RICHARDS, P.G.
GREBOWSKY, J.
Comparisons of Modeled N⁺, O⁺, H⁺, and He⁺ in the Midlatitude Ionosphere With Mean Densities and Temperatures From Atmospheric Explorer. For publication in the Journal of Geophysical Research, Washington, DC.

CREECH, S.D.
PP03

CRYSTER, T.
NANDI, G.C.
HINMAN-SWEENEY, E.M.
DWIVEDI, S.N.
LYONS, D.W.
Dynamics, Control, and Finite Element Design of a Research Testbed for Manipulator-Coupled
Spacecraft. For publication in the Journal of Robotic Systems, Riverside, CA.

CRYSTER, T. EB62
NANDI, G.C.
HINMAN-SWEENEY, E.M.
DWIVEDI, S.N.
LYONS, D.W.

CURREN, P.A. ES75
KAUKLER, W.F.
ROSENBERGER, F.

CURREN, P.A. ES75
Preliminary Science Results for the United States Microgravity Payload Mission 2. For presentation at the Sixth Annual Spacebound Conference, Montreal, Quebec, Canada, May 18–20, 1994.

DAKHOUL, Y. (Sverdrup)
KUMAR, G.
GRIFFITH, D.
WARSI, S.
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DANIEL, R.L. (Rocketdyne)
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DATLOWE, D.W. ES66
IMHOF, W.L.
FISHMAN, G.J.
FINGER, M.H.
Compton Gamma Ray Observatory/BATSE Observations of Energetic Electrons Scattered by Cyclotron Resonance With Waves From Powerful VLF Transmitters. For publication in the Journal of Geophysical Research, Washington, DC.

DAVIS, J. ES82
BAGDIGIAN, D.
BUSCHMANN, S.
GRAIG, G.
RUSSELL, J.
WALLACE, K.

DAVIS, J. ES52
BAGDIGIAN, D.
BUSCHMANN, S.
GRAIG, G.
RUSSELL, J.
WALLACE, K.

DAVIS, J. ES52
BAGDIGIAN, D.
BUSCHMANN, S.
GRAIG, G.
RUSSELL, J.
WALLACE, K.

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RAMSEY, B.D.
AUSTIN, R.

DELCOURT, D.C. (CNRS)
MARTIN, R.F.
SAUVAUD, J.A.
MOORE, T.E.
Centrifugal Trapping in the Magnetotail. For publication in Geophysical Research Letters, Washington, DC.

DELCOURT, D.C. ES53
MOORE, T.E.

DELCOURT, D.C. ES53
SAUVAUD, J.A.
MOORE, T.E.
Centrifugal Flow Reversal in the Equatorial Magnetosphere. For publication in the American Geophysical Union Monograph, Washington, DC.

DELCOURT, D.C. CRPE/CNRS
SAUVAUD, J.A. CESR/CNRS
MOORE, T.E. ES53
Polar Wind Ion Dynamics in the Magnetotail. For publication in the Journal of Geophysical Research, Washington, DC.

DENG, Z.-T. ED33
LIAW, G.-S.
CHOU, L.C.

DURRICKSON, J.H. ES64
EBY, P.B.
FOUNTAIN, W.F.
PARNELL, T.A.
WATTS, J.W.
MOON, K.H.
ET AL.

Direct Electron Pairs Along Heavy Ion Tracks. For presentation at the Korean Physical Society Meeting, Taigu, Korea, October 23–24, 1993.

DILL, K.M. (Sverdrup)
BALLARD, R.O.
McINTYRE, S.D. EP21

DILLS, M. (United Technologies)
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SCHROEDER, M.

BENJAMIN, T. ED32

DITTLMAR, M.L. EO23
HALE, J.P.

DODGE, J.C. ES44
GOODMAN, H.M.
The WetNet Project. For publication in the Journal of Remote Sensing Reviews, Reading, United Kingdom.

DRUEDING, T.W. (Boston University)
BIFANO, T.G.
FAWCETT, S.C. EB53

DUGAL-WHITEHEAD, N.R. EB72
MOORES, G. (Micon Eng.)
Reliability of Series Arc Protection on PMAD Test Bed. For presentation at the Intersociety

DUMBACHER, D.L. PT31
KLEVATI?, P.L.
DC-XA—First Step to a Reusable Launch Vehicle. For presentation at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 27, 1994.

DUNCAN, E.F. JA61
SCHLAGHECK, R.A.
CRYSEL, W.B. (Boeing)
RIDER, J.W. (Teledyne Brown)

DUNCAN, E.F. JA63
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CRYSEL, W.B.
RYDER, J.W.

EAGLES, D.M. ES74
Possible High-Current Superconductivity at Room Temperature in Oxidized Polypropylene and Other Quasi One-Dimensional Systems. For publication in Physica C, Amsterdam, The Netherlands.

ELROD, M. PD25

EMSLIE, A.G. ES66
HORACK, J.M.

ENGELHAUPT, D. EB53
FAWCETT, S.C.
ROOD, R.W.

ENGLER, T.O. EO37

EWING, F. ES76
FORSYTHE, E.
PUSEY, M.
Orthorhombic Lysozyme Solubility. For publication in Acta Crystallographica D, Munksgaard, Noerre Soegade 35, DK-1370, Copenhagen, Denmark.

FAJARDO-ACOSTA, S.B. ES63
TELESCO, C.M.
KNACKE, R.F.

FAWCETT, S.C. EB53

FAWCETT, S.C. EB53

FAWCETT, S.C. EB53
Neutral Ion Sources in Precision Manufacturing. For publication in Technology 2003, Anaheim, CA, December 7–9, 1993.

FAWCETT, S.C. EB53
DRUEDING, T.W.
BIFANO, T.G.
FAWCETT, S.C. EB53
ENGELHAUPT, D. (UAH)
Development of Wolter I X-Ray Optics by Diamond Turning and Electrochemical Replication. For publication in the Journal of ASPE.

FAWCETT, S.C. EB53
ENGELHAUPT, D.

FEKEL, F.C. ES82
HENRY, G.W.
HAMPTON, M.L.
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FISHMAN, G.J. ES66
BHAT, P.N.
MALLOZZI, R.
HORACK, J.M.
KOSHUT, T.
ET AL.
Discovery of Intense Gamma-Ray Flashes of Atmospheric Origin. For publication in Science, Washington, DC.

FISHER, G.J. ES81

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MOORE, T.E.
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PUSEY, M.L.
The Effects of Temperature and Na-Cl Concentration on Tetragonal Lysozyme Face Growth Rates. For publication in the Journal of Crystal Growth, Amsterdam, The Netherlands.

FOSTER, C.L.
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NURRE, G.S.
TILL, W.A.

FRADKOV, V. ES76
MANI, S.
GLICKSMAN, M.
ROGERS, J.
DOWNEY, J.
Coarsening of Three-Dimensional Droplets by Two-Dimensional Diffusion, Part II—Theory. For publication in the Journal of Electronic Materials, Lexington, MA.

FROST, A.L. ED34
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GALLAGHER, D.L. ES83
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MOORE, T.E.

On the Azimuthal Variation of the Equatorial Plasmapause. For publication in the Journal of Geophysical Research, Washington, DC.

GALLAGHER, D.L. ES83
CRAVEN, P.D.
COMFORT, R.H.


GALLAGHER, D.L. ES53
CRAVEN, P.D.
COMFORT, R.H.


GALLAGHER, N.B. (Bend Research)
McCRAVY, S.B.
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OGLE, K. ED62


GANGULI, G. ES53
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ROMERO, H.
HEELIS, R.
MOORE, T.E.
POLLOCK, C.J.

Coupling of Micro- and Macro-Processes Due to Velocity Shear: An Application to the Low Altitude Ionosphere. For publication in the Journal of Geophysical Research, Washington, DC.

GARCIA, G.
(Universidad Autonoma de San Luis Potosi)
McCLURE, J.C. (University of Texas at El Paso)
HOU, H.

Gas Flow Observation During VPPA Welding Using a Shadowgraph Technique. For presentation at the Metallurgical Research Meeting, Saltillo, Mexico, October 6–8, 1993.

GARCIA, R.
McCONNAUGHEY, P.K.


GARY, G.A. ES82
DEMOULIN, P.


GARY, G.A. ES52
DEMOULIN, P. (Observatoire de Paris)


GILES, B.L. ES53
MOORE, T.E.
COMFORT, R.H.

The Ionosphere as an Alpha Particle Source. For presentation at the Spring AGU Meeting, Baltimore, MD, May 22–27, 1994.

GILLIES, D.C. ES75
LEHOCZKY, S.L.
GERNERT, N.
BALDASSARRE, G.
BAHR, C.W.

GOLDBERG, B.E. EP11
CRUIT, W.
Prioritization of Environmental Factors Within the Scope of Large Propulsion Programs. For presentation at the AGARD Propulsion and Energetics Panel 84th Meeting, Oslo, Norway, August 27–September 3, 1994.

GOLDBERG, B.E. EP12
CRUIT, W.
SCHUTZENHOFER, S.
EVERHART, K.
Prioritization Methodology for Chemical Replacement. For presentation at the 84th Symposium of the Propulsion and Energetics Panel, Alesund, Norway, September 1, 1994.

GOODMAN, S.J. ES44
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Margin Considerations in SSTO O₂/H₂ Engines. For presentation at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 27–29, 1994.

GROVE, J.E. ES66
KROEGER, R.L.
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WILSON, R.B.
HARMON, B.A.
RUBIN, R.C.
FISHMAN, G.J.
IAUC 5838: GRO J1008-57. For publication in the IAU Circular, Cambridge, MA.

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Refilling Flows in a Detached Plasmaspheric Flux Tube. For presentation at the American Geophysical Union Fall Meeting, San Francisco, CA, December 5-9, 1994.


Plasma Distributions Near the TSS-1 Satellite: The Deployed Phase. For publication in the Journal of Geophysical Research, Washington, DC.


Improved Method for Calibrating Filter Vector Magnetographs. For publication in Solar Physics, Tucson, AZ.


Virtual Reality as a Human Factors Design Analysis Tool. For presentation at the Southeastern Simulation Conference, Huntsville, AL, October 18-19, 1993.

HAMAKER, J.W. PP03

HANSON, J. EL58
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HANSON, J.M. EL58
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HARMON, B.A. ES84
Observation of Black Hole Candidates With BATSE. For presentation at the Snowmass Conference on “Particle and Nuclear Astrophysics in the Next Millennium,” Snowmass, CO, July 6–9, 1994.

HARMON, B.A. ES84
FISHMAN, G.J.
RUBIN, B.C.
WILSON, C.A.
ET AL.
V1357 Cygni. For publication in IAU Circular No. 5881, Cambridge, MA.

HARMON, B.A. ES84
FISHMAN, G.J.
PACIESAS, W.S.
ZHANG, S.N.
X-Ray Nova in Ophiuchus. For publication in IAU Circular No. 5900, Cambridge, MA.

HARMON, B.A. ES84
PACIESAS, W.S.
X-Ray Nova in Ophiuchus (Cir. No. 5913). For publication in IAU Circular No. 5913, Cambridge, MA.

HARMON, B.A. ES84
PACIESAS, W.S.
ZHANG, S.N.
FISHMAN, G.J.
FINGER, M.H.
GX 339-4. For publication in IAU Circular No. 5915, Cambridge, MA.

HARMON, B.A. ES84
WILSON, C.A.
PACIESAS, W.S.
PENDLETON, G.N.
RUBIN, B.C.
ZHANG, S.N.

HARMON, B.A. ES84
ZHANG, S.N.
FISHMAN, G.J.
WILSON, C.A.
Hard X-Ray Transient. For publication in IAU Circular No. 5890, Cambridge, MA.

HARMON, B.A. ES84
ZHANG, S.N.
PACIESAS, W.S.
GRS 1009-45 (IAU No. 5864). For publication in the IAU Circular, Cambridge, MA.

HARMON, B.A. ES84
ZHANG, S.N.
PACIESAS, W.S.
FISHMAN, G.J.
GRO J1719-24 (IAU No. 5874). For publication in the IAU Circular, Cambridge, MA.

HATHAWAY, D.H. ES82
Nearly Steady Flows in GONG Prototype Data. For publication in the Proceedings of the GONG Meeting, Los Angeles, CA.

HATHAWAY, D.H. ES82
The Solar Dynamo. For publication in EOS, American Geophysical Union, Washington, DC.
HAYASHIDA, K.B. ED52
HILL, S.A.
Sensitivity Study on Material Properties and Their Effects to Hydrocode Simulation Results Using CTH. For presentation at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 27, 1994.

HEATON, A. EO43

HENDERSON, D.O. ES01
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FRAZIER, D.O.

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MOORE, T.E.
DE-1 Observations of the Polar O+ Stream Bulk Parameters and Comparison With a Model of the Centrifugally-Accelerated Polar Wind. For publication in the Journal of Geophysical Research, Washington, DC.

HOLMES, R. EJ22
ZIMMERMAN, F.
McKECHNIE, T.
KROTZ, P.
Enhanced Near Net Shape Ceramic Refractory Composite High Temperature Cartridges by VPS Metallurgical Alloying. For presentation at the National Thermal Spray Conference, Houston, TX, September 1995.

HOLMES, R. EJ22
ZIMMERMAN, F.
McKECHNIE, T.
KROTZ, P.

HOLMES, R. EJ22
McKECHNIE, T.
KROTZ, P.
ET AL.
Near-Net-Shape Forming of Ceramic Refractory Composite High Temperature Cartridges by VPS. For presentation at the National Thermal Spray Conference, Boston, MA, June 20–24, 1994.

HOLMES, S.G. ED33
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HOOD, R.E. ES43
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Simulation of Future Passive Microwave Satellite Instruments Using High Resolution AMPR Aircraft Data. For presentation at the 7th American Meteorological Society Conference on
HOOVER, R. ES52
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WALKER, A.B.C., JR.
BAKER, P.
BARBEE, T., Jr.

HORACK, J.M. ES84
BATSE 1000 Gamma-Ray Burst Perspective.
For publication in Science Magazine, Washington, DC.

HORACK, J.M. ES84
EMSLIE, A.G.

HORACK, J.M. ES84
EMSLIE, A.G.
HARTMANN, D.H.
The Effects of Pure Density Evolution on the Brightness Distribution of Cosmological Gamma-Ray Bursts. For publication in the Astrophysical Journal, Chicago, IL.

HORACK, J.M. ES84
EMSLIE, A.G.
MEEGAN, C.A.

HOWARD, R.T. EB62
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HUBER, F.W.
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Performance Improvement Through Indexing of Turbine Airfoils, Part 1 Experimental Investigation. For presentation at the 40th ASME Exposition, Houston, TX, May 1995.

HUDSON, S.T. ED34
JOHNSON, P.D.
WOOLER, A.

HUDSON, S.T. ED34
BORDFELON, W.J., Jr.
SMITH, A.W.
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Radial and Circumferential Flow Surveys at the Inlet and Exit of the Space Shuttle Main Engine High Pressure Fuel Turbine Model. For presentation at the 32nd Aerospace Sciences Meeting and Exhibit, AIAA, Reno, NV, January 10-13, 1994.

HUDSON, S.T. ED34
BORDFELON, W.J., Jr.
COLEMAN, H.W. (UAH)

HUNG, R.J. ES42
LEE, C.C.
Effect of Baffles on Gravity Gradient Driving Bubble Imbalance Perturbations in Microgravity. For publication in the Canadian Aeronautics and Space Journal, Ottawa, Ontario, Canada.

HUNG, R.J. ES42
LEE, C.C.
Effect of Baffle on Gravity Gradient Acceleration Excited Slosh Waves in Microgravity. For publication in the Journal of Spacecraft and Rockets, Washington, DC.

HUNG, R.J. ES42
LEE, C.C. (UAH)
Effects of Baffle on Gravity Gradient Acceleration Excited Slosh Waves and Associated Viscous Stress Force Activated Spacecraft Dynamic Fluctuations. For publication in the
HUNG, R.J. ES42
LONG, Y.T.
PAN, H.L.
Sloshing Dynamics Induced Angular Momentum Fluctuations Driven by Jitter Accelerations Associated With Slew Motion in Microgravity. For publication in the Transactions of the Japan Society for Aeronautical and Space Sciences, Tokyo, Japan.

HUNG, R.J. ES42
PAN, H.L.
Orbital Spacecraft Cryogenic Helium Dewar Sloshing Dynamics Driven by Gradient Acceleration Associated With Slew Motion. For publication in the Canadian Aeronautics and Space Journal 1994, Ottawa, Ontario, Canada.

HUNG, R.J. ES42
PAN, H.L.

HUTCHENS, C.F. ED62

HUTCHENS, C.F. ED62
A Description and Comparison of United States and Russian Urine Processing Hardware for Use on the International Space Station. For presentation at the 24th International Conference on Life Support Systems, Friedrichshafen, Germany, June 20–23, 1994.

JACOB, P.K. (IIT Research Institute)
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Acoustic/Overpressure and Selected Unsteady Flow Environments Associated With the Space Shuttle Vehicle. For presentation at the Acoustical and Dynamic Environment of Space Trans-

KNABB, R.D. ES43
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KNIVETON, D.R. ES44
MOTTA, B.C.
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LAFONTAINE, F.J.

The First Wetnet Precipitation Intercomparison Project: Generation of Results. For publication in Remote Sensing Reviews, Reading, United Kingdom.

KOLODZIEJCZAK, J.J. ES65
CAMPBELL, J.W.
ELSNER, R.F.
FAIR, S.
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KOSHT, T.M. ES84
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PACIESAS, W.S.
PARADYS, J.V.
NORRIS, J.P.
ET AL.

Are Soft Gamma Repeaters Rare? New Emission From an Old Source: SGR 1806-20. For publication in Nature, Washington, DC.

KOUVEILOTOU, C. (USRA)
FISHMAN, G.J.
MEEGAN, C.A.
HORACK, J.
PREEECE, R.
BRIGGS, M.S.
PACIESAS, W.S.


KOUVEILOTOU, C. (USRA)
HORACK, J.M.
FISHMAN, G.J.
MEEGAN, C.A.
PACIESAS, W.S.

IAUC 5875: SGR 1806-20. For publication in IAU Circular, Cambridge, MA.

KOUVEILOTOU, C. (USRA)
MEEGAN, C.A.
FISHMAN, G.J.
BHALA, N.P.
BRIGGS, M.S.
ET AL.

Two Classes of Gamma-Ray Bursts. For publication in the Gamma-Ray Burst Workshop 1994 Proceedings, Huntsville, AL.

KUKHTAREV, N. ES74
HENRY, M.
VENKATESWARLY, P.
ABDELDAYEM, H.
FRAZIER, D.O.
Holographic Gratings in Fluorescein-Doped Boric Acid Glass. For publication in the Journal of Optical Society of America, Washington, DC.

KUMAR, G.N. (Sverdrup)
GRiffith, D.O.
FAY, J.F.
MOYLAN, B.D.
SEAFORD, C.M.

KURUVILLA, A.K. (IIT Research Institute)
PANDA, B.
McPHERSON, W.B.
Bhat, B.N.

LADNER, G.C.
SSME. For presentation at Rocketdyne’s Supplier Conference, Westlake Village, CA, May 18, 1994.

LANSING, M.
RUSSELL, S.
NETTLES, A.
McNEILL, S.

LASSITER, J.O.

LEE, J.A.

LEE, J.A. (Sverdrup)
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MAJKOWSKI, P. (Foster-Miller, Inc.)
Casting of Weldable Graphite/Magnesium Metal Matrix Composites With Built-In Inserts. For presentation at the Technology 2003 Conference, Anaheim, CA, December 7–9, 1993.

LEE, S.
SALAMON, N.J.
SULLIVAN, R.M.

LIM, K.
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KEELING, K.
GILLILAND, G.L.
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FUKER, F.
CARTER, D.C.
A Three-Dimensional Structure of Glutathione S-Transferase of Schistosoma Japonicum Fused With a Conserved Neutralizing Epitope on gp41 of Human Immunodeficiency Virus Type 1. For publication in Protein Science, Seattle, WA.

LIN, J.
HORWITZ, J.L.
GALLAGHER, D.
POLLOCK, C.J.

LITTLE, S.
KEEZER, D.
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Reinvestment Assistance in Microelectronics Program (RAMP). For presentation at the 1994 Government Microcircuit Applications
LUVALL, J.C. ES42


LUVALL, J.C. ES42

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LUVALL, J.C. ES42

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NUNES, A.C., Jr.

Effect of Weld Gases on Melt Zone Size in VPPA Welding of Al 2219. For publication in Welding Journal, Miami, FL.
MAZURUK, K. ES75
GILLIES, D.C.
LEHOCZKY, S.L.
Fluctuations of Thermal Conductivity and Morphological Stability. For publication in the Journal of Crystal Growth.

MAZURUK, K. ES75
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LEHOCZKY, S.L.
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Viscosities of Molten HgTe and Hg$_{0.8}$Cd$_{0.2}$Te. For publication in the Journal of Applied Physics, Argonne, IL.

McCOLLUM, M.B. EL54
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McPHERSON, W.B. EH23
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McPHERSON, W.B. EH23
VESELY, E.J., JR.
Influence of Strain Rate on Tensile Properties in High-Pressure Hydrogen. For presentation at the International Symposium on Artificial Intelligence, Robotics, and Automation for Space, Pasadena, CA, October 18–20, 1994.

MEHTA, G. (Martin Marietta)
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MOORE, R.L. ES52
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The Turbulent Reconnection Wall in a Large Solar Flare. For publication in the Astrophysical Journal, Chicago, IL.

MOORE, R.L. ES52
LAROSA, T.N.

MOORE, T.E. ES83
The Geopause Region. For publication in Reviews of Geophysics, Washington, DC.

MOORE, T.E. ES53
CHAPPELL, C.R.
CHANDLER, M.O.
FIELDS, S.A.
POLLOCK, C.J.
ET AL.
The Thermal Ion Dynamics Experiment and Plasma Source Instrument. For publication in Space Science Reviews, New York, NY.

MOORE, T.E. ES83
DELCOURT, D.C.

MOORE, T.E. ES53
FOK, M.-C.
PEREZ, J.D.
KEADY, J.P.
Microphysics From Global Images. For presentation at the Fall Meeting of the American Geophysical Union, San Francisco, CA, December 5–9, 1994.

MOORE, T.E. ES83
GILES, B.L.
DELCOURT, D.C.
Particle Transport From the Low-Latitude Boundary Layer. For presentation at the Fall Meeting of the American Geophysical Union, San Francisco, CA, December 5–9, 1994.

MOYLAN, B. (Sverdrup) ED33
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MEEGAN, C.A.


NERNEY, S. ES82
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MUSIELAK, Z.E.

Limits to Extensions of Burgers Equation. For publication in Quarterly of Applied Mathematics, Providence, RI.

NERNEY, S. (University of Maryland)
SCHMAHL, E.J. (UAH)
MUSIELAK, Z.E.

Analytic Solutions of the Vector Burgers' Equation. For publication in Quarterly of Applied Mathematics, Providence, RI.

NERNEY, S. ES82
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NERNEY, S. ES52
SUSS, S.T.


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GORACKE, B.D.
LEVACKE, D.J.H.


NOEVER, D.A. ES76


NOEVER, D.A. ES76

Polarized Nuclei in a Simple Mirror Fusion Reactor. For publication in Fusion Technology, University of Illinois Press.

NOEVER, D.A. ES76

NOEVER, D.A.  ES76
Visual Detection of Polarized Light. For publication in Rev. of Scientific Instr., Los Alamos National Laboratories, Los Alamos, NM.

NOEVER, D.A.  ES76
BASKARAN, S.

NOEVER, D.  ES76
BASKARAN, S.

NOEVER, D.A.  ES76
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SCHUSTER, P.
Takeover Times for Genetic Fusion. For publication in Physical Review Letters, Ridge, NY.

NOEVER, D.A.  ES76
BASKARAN, S.
SCHUSTER, P.

NOEVER, D.A.  ES76
CRONISE, R.J.
Existence Test for Thermocapillary Convection at Solid-Liquid Interfaces. For publication in Microgravity Science and Technology, European Space Agency, Bremen, Germany.

NOEVER, D.A.  ES76
CRONISE, R.J.
Weightless Bubble Lattices: A Case of Froth Wicking. For publication in Physics of Fluids, American Institute of Physics, New York, NY.

NOEVER, D.A.  ES76
CRONISE, R.J.

NOEVER, D.A.  ES76
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MATSOS, H.C.
CRONISE, R.J.
LOOGER, L.L.
RELWANI, R.A.
JOHNSON, J.U.
Computerized In Vitro Test for Chemical Toxicity Based on Tetrahymena Swimming Patterns. For publication in Chemosphere, Pergammon Press, United Kingdom.

NOEVER, D.A.  ES76
MATSOS, H.C.
CRONISE, R.J.
LOOGER, L.L.
RELWANI, R.A.
JOHNSON, J.U.  (Alabama A&M University)
Computerized In Vitro Test for Chemical Toxicity Based on Tetrahymena Swimming Patterns. For presentation at Technology 2003, Anaheim, CA, December 7–9, 1993.

NOEVER, D.A.  ES76
NIKORA, V.I.
Rarefied Solids. For publication in Microgravity Science and Technology, Bremen, Germany.

OBENHUBER, D.C.  EH32
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O'DELL, S.L.  ES65
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Nondestructive Test Methods for the Inspection of Ceramic Rolling Elements. For presentation...

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Solution-State Photo-Deposition of Thin Polydiacetylene Films That Exhibit Outstanding Third-Order Optical Nonlinearity. For publication in Science, Washington, DC.

PALOSZ, W. ES75
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PALOSZ, W. ES75
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LEHOCZKY, S.L.

PANGIA, M.J. ES53
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The Kappa Distribution Derived From a Variational Principle for a Plasma. For presentation at the APS/AAPT 1994 April Meeting, Crystal City, VA, April 14, 1994.

PATTERSON, A.F. ED12
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Preferential Heating of Light Ions During an Ionospheric AR+ Injection Experiment. For publication in the Journal of Geophysical Research, Washington, DC.

PORTER, J. ES52
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SHIMIZU, T.
TSUNETA, S.
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Microflaring at the Feet of Large Active Region Loops. For publication in the Proceedings From Meeting at the National Astronomical Observatory, Kofu, Japan, September 5–10, 1994.

POWERS, W.T. EB22
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WILSON, R.B.
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QUATTROCHI, D.A. ES42

QUATTROCHI, D.A. ES44
GIS Functionality for Geographic Analysis. For publication in the 1995 International GIS Sourcebook, Fort Collins, CO.

QUATTROCHI, D.A. ES42
GOEL, N.S.

QUATTROCHI, D.A. ES42
LUVALL, J.C.

RAIKAR, G.N. (UAH)
GREGORY, J.C.
PETERS, P.N.
A Multitechnique Analysis of Copper Samples Exposed to the Space Environment on Long Duration Exposure Facility. For publication in Applied Surface Science, Amsterdam, The Netherlands.

RAMSEY, B.D. ES65
AUSTIN, R.A.
X-Ray Detectors Probe Energetic Processes in Our Universe. For publication in Laser Focus World, Westford, MA.

RAMSEY, B.D. ES84
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Radio Imaging of the Magnetosphere. For publication in the Journal of Geophysical Research, Washington, DC.

RHODES, P.H. ES76
SNEYDER, R.S.

RINCON, C.D.
ARROWOOD, R.
NUNES, A.C., JR.
Plastic Flow, Strain-Hardening, and Strength of Butt Welds in 2219-T87 Aluminum. For publication in the Welding Journal, Miami, FL.

ROBERTS, F.E.
Relation of Processing Parameters to Tensile Strength and Surface Finish in Materials for Fused Deposition Modeling and Stereolithography. For presentation at the American Ceramic Society 96 Annual Meeting and Exposition, Indianapolis, IN, April 24–27, 1994.

ROBERTSON, F.R.
McCaul, W.E.

ROBINSON, J.H.
NOLEN, A.M.

ROGERS, J.
DOWNEY, J.
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Coarsening of Three-Dimensional Droplets by Two-Dimensional Diffusion, Part I—Experiment. For publication in the Journal of Electronic Materials, Lexington, MA.

Preparation of N-(4-Nitrophenyl)-N-Methylaminoacetonitrile (NPAN) Derivatives for Nonlinear Optics. For presentation at the Society for Advancement of Chicanos and Native Americans in Science (SACNAS), Chicago, IL.

ROTHERMEL, J.
HARDESTY, R.M.
MENZIES, R.T.
Characterizing Subgrid Scale Processes and Assessing Satellite Doppler Wind Lidar With MACAWS. For presentation at the Sixth Symposium on Global Change Studies, Dallas, TX, January 15–20, 1995.

RUBIN, B.C.
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PARADIJS, J.V.
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PACIESAS, W.S.
(UAH)

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Small Expendable Deployer System First Flight (SEDS-1) Features and Dynamics During Deployment. For presentation at the International Round Table on Tethers in Space, Noordwijk, The Netherlands, September 28–30, 1994.

RUSSELL, C.K.

RYAN, R.S.
RYAN, R.S. 
GROSS, L.A. 
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SCARBRO, H.D. (UAH)
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MOORE, T.E.
Centrifugal Acceleration of the Polar Wing. For publication in the Journal of Geophysical Research, Washington, DC.

SCHILLER, S.
LUVALL, J.
A Portable Ground-Based Atmospheric Monitoring System (PGAMS) for the Calibration and Validation of Atmospheric Correction Algorithms Applied to Satellite Images. For presentation at the International Society of Optical Engineering (SPIE), Orlando, FL, April 4–8, 1994.

SCHMIDT, G.R.
NADARAJAH, A. (UAH)
CHUNG, T.J.
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SCHRAMM, F.
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WINFONG, T.L.
Application of 50 MHz Doppler Radar Wind Profiler to Launch Operations at Kennedy Space Center and Cape Canaveral Air Station. For presentation at the AMS Conference on Weather Analysis and Forecasting, Dallas, TX, January 15–20, 1995.

SHA, Y.-G.
SU, C.-H.
PALOSZ, W.
VOLZ, M.P.
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LEHOCZKY, S.L.

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KELLEY, J.F.

SHEALY, D.L.
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HOOVER, R.B.

SHELL, M.Q. COLLIER, M.D.
Adaptation of Control Center Software to Commercial Real-Time Display Applications. For presentation at the Dual Use Space Technology Transfer Conference and Exhibition, Houston, TX, February 1-4, 1994.

Lasing and Fluorescence From BIS-MSB-Dye-Doped Polystyrene Microspheres. For presentation at the 1993 OSA, Toronto, Canada, October 3-8, 1993.

SIBILLE, L. PUSEY, M.
Investigation of Nucleating Lysozyme Solutions. For publication in Acta Crystallographica D, Munksgaard, Noerre Soegade 35, DK-1370, Copenhagen, Denmark.


SILVER, E. ZIOCK, R. DWYER, J. KAARET, P. NOVICK, R. ELSNER, R. ET AL.

SINGH, J. JERMAN, G. POORMAN, R. BHAT, B.

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SMELTZER, S.S., III LAWSON, S.W.
Composite Redesign of Obstetrical Forceps. For presentation at the Fourth National Technology Transfer Conference (Technology 2003), Anaheim, CA, December 7-9, 1993.

SNYDER, R.S. RHODES, P.H.
The NASA Electrophoresis Program. For presentation at the International Aerospace Congress, Moscow, Russia, August 15-19, 1994.

SPANN, J.F. KEFFER, C.E. ZUKIC, M.
A Vacuum Ultraviolet Spectrophotometric System. For publication in Applied Optics, Washington, DC.

SPANN, J.F. The Ultraviolet Imager. For presentation at the Colloquium to Physics Department, University of Arkansas, Fayetteville, AR, November 19, 1993.

SPENCER, R. HOOD, R.
LAFONTAINE, F.
SMITH, E.
PLATT, R.
GALLIANO, J.
GRiffin, V.
LOBL, E.
High Resolution Imaging of Rain Systems With the Advanced Microwave Precipitation Radiometer. For publication in the Journal of Atmospheric and Oceanic Technology, Boston, MA.

SPENCER, R.W.
GRiffin, V.L.
Research Opportunities With the Pathfinder MSU Daily Temperature Data Sets. For presentation at the Seventh AMS Satellite Conference, Monterey, CA, June 6-10, 1994.

SPENCER, R.W.
GRiffin, V.L.

SPENCER, S.
CLAR, D.
PARNELL, T.A.
The Design and Analysis of the Thermal Control System for the JACEE High Altitude Long Duration Balloon Flight. For presentation at the 30th COSPAR Scientific Assembly, Hamburg, Germany, July 11-21, 1994.

SPRINGER, A.M.
Project Adam: The Army’s Man in Space Program. For publication in Quest Magazine, Grand Rapids, MI.

SPRINGER, A.M.

SPRINGER, A.M.
Experimental Investigation of Plume Induced Flow Separation for the National Launch System (NLS) 1 1/2 Stage Launch Vehicle. For presentation at the 32nd Aerospace Sciences Meeting, Reno, NV, January 10-13, 1994.
STONE, N.H. ES83
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SUHELINGER, E. ES01
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WEISSKOPF, M.
Rontgenstrahlen Aus Dem Universum (X-Rays From the Universe). For publication in Forschung mit Rontgestrahlen, Heidelberg, Germany.

SUHEL, S.T. ES52
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Solar Wind Eddies and the Heliospheric Current Sheet. For publication in the Journal of Geophysical Research, Chicago, IL.

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Coronal Bright Points and High Speed/High Latitude Solar Wind Streams. For presentation at the 1994 Fall AGU Meeting, San Francisco, CA, December 5–9, 1994.

SUHEL, S.T. ES82
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Magnetohydrodynamic Simulation of a Streamer Beside a Realistic Coronal Hole. For publication in the Space Science Review, The Netherlands.

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The Effect of Water on Thermal Stresses in Polymer Composites. For publication in the Journal of Applied Mechanics.

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Statistical Uncertainties in Temperature Diagnostics for Hot Coronal Plasma Using the ASCA SIS. For publication the Astrophysical Journal, Chicago, IL.

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10- to 20-micron Detections of (2060) Chiron. For publication in the IAU Circular No. 5898, Cambridge, MA.

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Thermospheric and Mesospheric Nitric Oxide Measured by the Imaging Spectrometric Observatory From ATLAS-1 and Spacelab 1. For publication and presentation at the American Geophysical Union, Baltimore, MD, May 23–27, 1994.

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The N2 Lyman Birge Hopfield Dayglow From ATLAS-1. For publication in the Journal of Geophysical Research.

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Neural Net Controller for Inlet Pressure Control of Rocket Engine Testing. For presentation at the CLIPS 1994 Conference, Houston, TX, September 12–14, 1994.

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Field Response of Ultra-Thin Type II Superconducting Transmission Lines. For publication in IEEE Transactions of Applied Superconductivity, New York, NY.

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ROSAT Observations of the Jupiter Aurora. For publication in the Journal of Geophysical Research, Washington, DC.

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Quantitative Analysis of Manned Spacecraft Crew Survivability From Orbital Debris Penetration. For presentation at the AIAA Space Programs and Technologies Conference, Huntsville, AL, September 27–29, 1994.

WILSON, R.M. ES82
On the Relationship Between Sunspot Number and the Flare Index. For publication in Solar Physics, Tucson, AZ.

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Three Saturn V's on Display Teach Lessons in Space History. For publication in Quest, the History of Space Flight Magazine, Grand Rapids, MI.

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Earth Occultation All-Sky Imaging With BATSE/CGRO. For presentation at the Colloquium, University of Southampton, United Kingdom, September 22–23, 1994.

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