This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY93. It also includes papers of MSFC contractors.

After being announced in STAR, all of the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

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

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

Since July 1, 1960, when the George C. Marshall Space Flight Center was organized, the reporting of scientific and engineering information has been considered a prime responsibility of the Center. Our credo has been that “research and development work is valuable, but only if its results can be communicated and made understandable to others.”

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

FY 1993 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Category</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA TECHNICAL MEMORANDA</td>
<td>1</td>
</tr>
<tr>
<td>NASA TECHNICAL PAPERS</td>
<td>13</td>
</tr>
<tr>
<td>MSFC CONFERENCE PUBLICATIONS</td>
<td>16</td>
</tr>
<tr>
<td>MSFC REFERENCE PUBLICATIONS</td>
<td>17</td>
</tr>
<tr>
<td>NASA CONTRACTOR REPORTS</td>
<td>18</td>
</tr>
<tr>
<td>MSFC PAPERS CLEARED FOR PRESENTATION</td>
<td>38</td>
</tr>
</tbody>
</table>
Solid Propulsion Integrity Program (SPIP) 48-2

The SPIP 48-2 MNASA motor was test fired in the Solid Propulsion Test Assembly (SPTA) facility on November 6, 1991. The purpose of the SPIP 48-2 test was primarily directed at qualitative comparison of four nonasbestos insulation materials, evaluation of nozzle ablatives and modeling techniques, and the investigation of embedded bondline sensors. Thiokol fabricated the nozzle and cast the cartridges with 88/19 HTPB propellant. Aerojet fabricated the ignition system. In addition, Thiokol installed the propellant cartridge bondline instrumentation. Wyle on-site personnel provided support for assembly and disassembly operation. MSFC personnel performed insulation installation of the materials in the blast tube, designed the tooling required for M&P operations, engineered the motor processing, ran the ballistics, thermal, thermal structural, and thermal radiation analyses, and performed all pre/posttest measurements of the insulation and nozzle components. All test objectives for the firing were at least partially met. The motor case and blast tube structural components showed no heat effects. Nozzle and blast tube insulation materials suffered no significant anomalous erosion. The Wyle "experimental" recession gauge in the insulated blast tube assembly appears to have functioned as designed. The test duration was approximately 28.25 seconds to motor tail-off.

Microbial analysis of air filter debris from Spacelab mission IML-1 was performed via direct plating of rinse waters on a battery of selective and nonselective nutrient agars. Microbial isolates were identified using Minitek and Biolog technologies. Twenty-four types of bacteria were recovered and classified; a similar number of fungal types was observed, but these were not identified. This procedure can provide information about the proportions of organism types present at the time of debris collection.

A comparison of the corrosion protection provided by two amine epoxy primers was made using salt fog, alternate immersion, and total immersion as exposure media. The study is the result of a request to use an unqualified low volatile organic carbon (VOC) primer (AKZO 463-6-78) in place of the current primer (AKZO 463-6-3) because environmental regulations have eliminated use of the current primer in many states. Primed, scribed samples of 2219-T87 and 7075-T73 aluminum were exposed to 5-percent NaCl salt fog and 3.5-percent NaCl alternate immersion for a period of 90 days. In addition, electrode samples immersed in 3.5-percent NaCl were tested using electrochemical impedance spectroscopy (EIS). The EG&G model 368 ac impedance measurement system was used to monitor changing properties of AKZO 463-6-78 and AKZO 463-6-3 primed 2219-T87 aluminum for a period of 30 days. The response of the corroding system to a frequency scan can be modeled in terms of an equivalent circuit consisting of resistors and capacitors in a specific arrangement. Each resistor/capacitor combination represents physical processes taking place within the electrolyte, at the electrolyte/primer surface, within the coating, and at the coating/substrate surface. Values for the resistors and capacitors are assigned following a nonlinear least squares fit of the data to the equivalent circuit. Changes in the values of equivalent circuit parameters during the 30-day exposure allow assessment of the time to and mechanism of coating breakdown.

This report shows that the mechanism of bolt loading for preloaded fasteners can be effectively portrayed through simple spring models and algebraic manipulations. Understanding schematically what is involved in such joints provides insight into the distribution of loads. The equations developed confirm that for both symmetric and nonsymmetric joints the loading plane factor (η) and the
A preliminary design for a weldable truss joint for on-orbit assembly of large space structures is described. The joint was designed for ease of assembly, for structural efficiency, and to allow passage of fluid (for active cooling or other purposes) along the member through the joint. The truss members were assumed to consist of graphite/epoxy tubes to which were bonded 2219-T87 aluminum alloy end fittings for welding on-orbit to truss nodes of the same alloy. A modified form of gas tungsten arc welding was assumed to be the welding process. The joint was designed to withstand the thermal and structural loading associated with a 120-ft diameter tetrahedral truss intended as an aerobrake for a mission to Mars.

Glass fiber has been produced from two lunar soil simulants. These two materials simulate lunar mare soil and lunar highland soil compositions, respectively. Short fibers containing recrystallized areas were produced from the as-received simulants. Doping the highland simulant with 8 weight percent B₂O₃ yielded a material which could be spun continuously. The effects of lunar gravity on glass fiber formation were studied utilizing NASA's KC-135 aircraft. Gravity was found to play a major role in final fiber diameter.


October 1992

A preliminary design for a weldable truss joint for on-orbit assembly of large space structures is described. The joint was designed for ease of assembly, for structural efficiency, and to allow passage of fluid (for active cooling or other purposes) along the member through the joint. The truss members were assumed to consist of graphite/epoxy tubes to which were bonded 2219-T87 aluminum alloy end fittings for welding on-orbit to truss nodes of the same alloy. A modified form of gas tungsten arc welding was assumed to be the welding process. The joint was designed to withstand the thermal and structural loading associated with a 120-ft diameter tetrahedral truss intended as an aerobrake for a mission to Mars.

Glass fiber has been produced from two lunar soil simulants. These two materials simulate lunar mare soil and lunar highland soil compositions, respectively. Short fibers containing recrystallized areas were produced from the as-received simulants. Doping the highland simulant with 8 weight percent B₂O₃ yielded a material which could be spun continuously. The effects of lunar gravity on glass fiber formation were studied utilizing NASA's KC-135 aircraft. Gravity was found to play a major role in final fiber diameter.


October 1992

A preliminary design for a weldable truss joint for on-orbit assembly of large space structures is described. The joint was designed for ease of assembly, for structural efficiency, and to allow passage of fluid (for active cooling or other purposes) along the member through the joint. The truss members were assumed to consist of graphite/epoxy tubes to which were bonded 2219-T87 aluminum alloy end fittings for welding on-orbit to truss nodes of the same alloy. A modified form of gas tungsten arc welding was assumed to be the welding process. The joint was designed to withstand the thermal and structural loading associated with a 120-ft diameter tetrahedral truss intended as an aerobrake for a mission to Mars.

Glass fiber has been produced from two lunar soil simulants. These two materials simulate lunar mare soil and lunar highland soil compositions, respectively. Short fibers containing recrystallized areas were produced from the as-received simulants. Doping the highland simulant with 8 weight percent B₂O₃ yielded a material which could be spun continuously. The effects of lunar gravity on glass fiber formation were studied utilizing NASA's KC-135 aircraft. Gravity was found to play a major role in final fiber diameter.


October 1992

A preliminary design for a weldable truss joint for on-orbit assembly of large space structures is described. The joint was designed for ease of assembly, for structural efficiency, and to allow passage of fluid (for active cooling or other purposes) along the member through the joint. The truss members were assumed to consist of graphite/epoxy tubes to which were bonded 2219-T87 aluminum alloy end fittings for welding on-orbit to truss nodes of the same alloy. A modified form of gas tungsten arc welding was assumed to be the welding process. The joint was designed to withstand the thermal and structural loading associated with a 120-ft diameter tetrahedral truss intended as an aerobrake for a mission to Mars.

Glass fiber has been produced from two lunar soil simulants. These two materials simulate lunar mare soil and lunar highland soil compositions, respectively. Short fibers containing recrystallized areas were produced from the as-received simulants. Doping the highland simulant with 8 weight percent B₂O₃ yielded a material which could be spun continuously. The effects of lunar gravity on glass fiber formation were studied utilizing NASA's KC-135 aircraft. Gravity was found to play a major role in final fiber diameter.


October 1992
A process comparison study was conducted using four different advanced manufacturing techniques to fabricate a composite solid rocket booster systems tunnel cover. Costs and labor hours were tracked to provide the comparison between the processes. A relative structural comparison of the components is also included. The processes utilized included filament winding, pultrusion, automated tape laying, and thermoplastic thermoforming. The hand layup technique is also compared. Of the four advanced processes evaluated, the thermoformed thermoplastic component resulted in the least total cost. The automated tape laying and filament winding techniques closely followed the thermoplastic component in terms of total cost; and, these techniques show the most promise for high quality components and lower production costs. The pultruded component, with its expensive tooling and material requirements, was by far the most expensive process evaluated, although the results obtained would not be representative of large production runs.

The solution of the optimal control problem, even with low order dynamical systems, can usually strain the analytical ability of most engineers. The understanding of this subject matter, therefore, would be greatly enhanced if a software package existed that could simulate simple generic problems. Surprisingly, despite a great abundance of commercially available control software, few, if any, address the part of optimal control in its most generic form. The purpose of this paper is, therefore, to present a simple computer program that will perform simulations of optimal control problems that arise from the first necessary condition and the Pontryagin’s maximum principle.

An automated rendezvous approach has been developed that utilizes advances in technology to reduce real-time/near real-time flight operations support personnel to an acceptable level that is near the minimum without jeopardizing the success of the mission. The on-board flight targeting uses a rule-based system to select the pursuit vehicle phasing orbits and uses precise navigation updates from the pursuit/target spacecraft made possible by the global positioning system receiversprocessors on both spacecraft to adjust the phasing orbits and achieve rendezvous. The ascent-to-orbit targeting for the pursuit vehicle has been successfully decoupled from the on-orbit orbit transfer phasing targeting. Typical launch window data have been developed for the heavy lift launch vehicle and cargo transfer vehicle for a Space Station Freedom rendezvous mission.

The effect of tensile stress on hydrogen diffusion has been determined for Type 303 stainless steel, A286 CRES, and Waspaloy and IN100 nickel-base alloys. It was found that hydrogen diffusion coefficients are not significantly affected by stress, while the hydrogen permeabilities are greatly affected in Type 303 stainless steel and A286 CRES (iron-based alloys), but are affected little in Waspaloy (nickel-base) and not affected at all in IN100 (nickel base).
These observations might be taken as an indication that hydrogen permeabilities are affected by stress in iron-based alloys, but only slightly affected in nickel-based alloys. However, it is too early to make such a generalization based on the study of only these four alloys.

TM-108387
December 1992


X93-10314

A series of tests has been conducted at the NASA Marshall Space Flight Center (MSFC) to evaluate the performance of a predevelopment water recovery system. Potable and urine reclamation systems were integrated with end-use equipment items and successfully operated in open, partially closed, and totally closed modes for a total of 59 days. Significant discoveries were made during this test operation. This test report summarizes the test configuration, events, anomalies, and results pertaining to the system's operation.

TM-108388
December 1992


X93-10313

Mechanical properties were evaluated to determine whether the variable polarity plasma arc (VPPA) welding process produced welds in alloy 718 with equivalent room temperature structural performance to current space shuttle main engine (SSME) weld manufactured by the constant current gas tungsten arc welding (GTAW) process. Welding was performed on 0.25-in alloy 718 plate material purchased in a 1,900 °F solution annealed condition. GTAW was accomplished using nine passes, whereas VPPA welding was accomplished using two passes. Post-welded panels were heat treated to the STA-1 condition. Post-welded specimens had weld beads left intact or machined flush. All mechanical property data and statistical analyses are provided in the accompanying tables. Student t and Weibull analyses are included.

Analyses showed that for flush specimens, the VPPA welding process produces welds with equivalent room temperature structural performance to welds manufactured by the GTAW process. For intact bead specimens, the GTAW process produced welds with better ultimate tensile strength and percent elongation, but it was not possible to distinguish a difference in fatigue life between the two processes.

TM-108389
December 1992


N93-15500

A number of compositions of ceramic oxide high Tc superconductors were elevated for their glass formation ability by means of rapid thermal analysis during quenching, optical, and electron microscopy of the quenched samples, and with subsequent DSC measurements. Correlations between experimental measurements and the methodical composition changes identified the formulations of superconductors that can easily form glass. The superconducting material was first formed as a glass; then, with subsequent devitrification, it was formed into a bulk crystalline superconductor by a series of processing methods.

TM-108390
January 1993


N93-15203

For several years, solar flares have been observed with a variety of instruments confirming that tremendous amounts of energy are locally stored in the solar magnetic field and then rapidly released during the life of the flare. In concert with observations, theorists have attempted to describe the means by which these energetic events occur and evolve. In an attempt to explain the ambiguities regarding hard x-ray emission from flares, two competing theories have emerged and have stood the test of time. One theory describes the flare in terms of nonthermal, electron beam injection into a thick target while the other uses a thermal approach. Both theories provide results which are reasonably consistent with current observations; but to date, none have been able to provide conclusive evidence as to the validity of either model. This is principally due to the short physical time scales and small size scales involved. So far, the averaging effects of observations taken over large time and size scales have tended to mask the differences. Imaging on short time scales...
(i.e., 1 s) and/or small size scales (i.e., 1 arc s) should give definitive answers to these questions. In order to test whether a realistic telescope can indeed discriminate between models, we construct model sources based upon the thermal and the nonthermal models and calculate the emission as a function of time and energy in the range from 10 to 100 keV. In addition, we construct model telescopes representing both the spatial modulation collimator (SMC) and the rotating modulation collimator (RMC) techniques of observation using random photon counting statistics. With these two types of telescopes, we numerically simulate the instrument response to the above two model flares to see if there are distinct x-ray signatures which may be discernible. We find that theoretical descriptions of the primary models of solar flares do indeed predict different hard x-ray signatures for 1-s time scales and at 1- to 5-arc s spatial resolution. However, these distinguishing signatures can best be observed early in the impulsive phase and from a position perpendicular to the plane of the loop. Furthermore, we find that Fourier telescopes with reasonable and currently attainable design characteristics can image these signatures and that given the same sensitive areas and short temporal integration times relative to source evolution (i.e., 1 s), the RMC and the SMC will both provide about the same performance. The ability to image is strongly dependent upon the intensity of the specific loop being observed. Specifically, for 1-s temporal integration times, for 10 keV energy bins, and for complex sources, the intensity threshold is found to be 0.2 photon cm$^{-2}$ s$^{-1}$ keV$^{-1}$ per 4x4-arc s telescope resolution cell at the Earth. For intensities greater than this threshold, clear imaging can be accomplished using our Fourier telescope. However, this is true only for intensities which are within a factor of 10 of the brightest intensity in its immediate vicinity as the dynamic range of the telescope was found to be on the order of 10:1. This limitation has been found to play a role in imaging emission profiles of both models in that weak spatial features are suppressed by brighter ones. Also, we find that the telescope is tolerant to random noise on the detector and that imaging performance is surprisingly resistant to twist (i.e., rotation of the grids with respect to one another) less than 2 arc min in magnitude. Actual fields of view of the telescopes are much less (i.e., 1:4) than the geometric fields of view; however, full Sun coverage is achievable for telescopes using reasonable parameters. In summary, we find that Fourier telescopes are promising approaches for hard x-ray imaging of the Sun and should serve to provide significant insight into the physical processes at work in flares.

TM-108391 January 1993

This report contains the passive recirculation tests on the fuel feedline of the National Launch System (NLS). The majority of testing was performed in February 1992, at the National Institute of Standards and Technology in Boulder, CO. The primary objective was to characterize passive recirculation in the NLS feedline. The objective was met by observing the passive recirculation in a one-fifth scale model of the feedline with clear glass sections. The testing was recorded on video tape and with photographs. A description of the testing apparatus and support equipment is included. The experiment indicates that passive recirculation was occurring; higher angles from the horizontal transfer more heat.

TM-108392 October 1992

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY92. It also includes papers of MSFC contractors. After being announced in STAR, all of the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

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

TM-108393 January 1993
Wildfire and MAMS Data From STORMFEST. G.J. Jedlovec and G.S. Carlson. Space Science Laboratory. N93-19898

Early in 1992, NASA participated in an interagency field program called STORMFEST. The STORM-Fronts Experiment Systems Test (STORMFEST) was designed to test various systems critical to the success of STORM I in a very focused experiment. The field effort focused on winter storms in order to investigate the structure and evolution of fronts and associated mesoscale
phenomena in the central United States. This document describes the data collected from two instruments onboard a NASA ER2 aircraft which was deployed out of Ellington Field in Houston, TX, from February 13 through March 15, 1992, in support of this experiment. The two instruments were the Wildfire (a.k.a. the MODIS-N Airborne Simulator, MAS) and the Multispectral Atmospheric Mapping Sensor (MAMS).

An elastomeric O-ring material is used in the joints of the redesigned solid motors (RSRM's) of the National Space Transportation System (NSTS). The selection of the O-ring material used in the RSRM's was a very thorough process that included efforts by NASA's Marshall Space Flight Center and the Langley Research Center, and the Thiokol Corporation. One of the efforts performed at MSFC was an extensive in-house laboratory test regime to screen potential O-ring materials and ultimately to characterize the elastomeric material that was chosen to be used in the RSRM's. This report summarizes those laboratory tests performed at MSFC.

This report presents a technique to model viscoelastic material properties with a function of the form of the Prony series. Generally, the method employed to determine the function constants requires assuming values for the exponential constants of the function and then resolving the remaining constants through linear least-squares techniques. The technique presented here allows all the constants to be analytically determined through optimization techniques.

This technique is employed in a computer program named PRONY and makes use of a commercially available optimization tool developed by VMA Engineering, Inc. The PRONY program was utilized to compare the technique against previously determined models for solid rocket motor TP-H1148 propellant and V747-75 Viton fluoroelastomer. In both cases, the optimization technique generated functions that modeled the test data with at least an order of magnitude better correlation. This technique has demonstrated the capability to use small or large data sets and to use data sets that have uniformly or nonuniformly spaced data pairs.

The reduction of experimental data to accurate mathematical models is a vital part of most scientific and engineering research. This technique of regression through optimization can be applied to other mathematical models that are difficult to fit to experimental data through traditional regression techniques.

The International Satellite Land Surface Climatology Project (ISLSCP) was conducted to study the interaction of the atmosphere with the land surface and the research problems associated with the interpretation of satellite data over the Earth's land surface. The experimental objectives of the First ISLSCP Field Experiment (FIFE) were the simultaneous acquisition of satellite, atmospheric, and surface data and to use these data to understand the processes controlling energy/mass exchange at the surface. The experiment site is a 15×15-km area southeast of Manhattan, KS, intersected by Interstate 70 and Kansas Highway 177. The Konza Prairie portion is 5×5 km and is a controlled experiment site consisting primarily of native tall grass prairie vegetation. The remainder of the site is grazing and farmland with trees along creek beds that are scattered over the area. Airborne multispectral imagery from the Multispectral Atmospheric Mapping Sensor (MAMS) was collected over this region on two days during Intensive Field Campaign –1 (IFC-1) to
study the time and space variability of remotely sensed geophysical parameters. These datasets consist of multiple overflights covering about a 60-min period during late morning on June 4, 1987, and shortly after dark on the following day. Image data from each overpass were calibrated and Earth located with respect to each other using aircraft inertial navigation system parameters and ground control points. These were the first MAMS flights made with 10-bit thermal data.

A test has been completed at NASA’s Marshall Space Flight Center (MSFC) to evaluate the performance of a development water recovery system operating in open-loop and closed-loop mode. This test is referred to a Water Recovery Test (WRT) Stage 7. Potable and urine processing assemblies were integrated with end-use equipment and operated for 59 days. The overall integrated configuration of the test system included a single water recovery loop that combined the potable and hygiene water recovery loops utilized in previous WRT testing. Several physical anomalies occurred to the Potable Water Processor (PWP) in relation to the feed pump and the volatile removal assembly. No significant anomalies associated with the urine processor assembly were encountered. Reclaimed potable water routinely met current Space Station Freedom (S.S. Freedom) water quality specifications for physical, chemical, and microbiological constituents with few exceptions. Human test subject volunteers showered and washed with reclaimed potable water for 8 days and tasted reclaimed potable water for 6 days. Subjective feedback from the test subjects indicated that the reclaimed potable water compared favorably with untreated tap water and treated facility water.

This report outlines methods of analysis for the buckling of thin-walled circumferentially and longitudinally stiffened cylindrical shells. Methods of analysis for the various failure modes are presented in one cohesive package. Where applicable, more than one method of analysis for a failure mode is presented along with standard practices. The results of this report are primarily intended for use in launch vehicle design in the elastic range. A Microsoft Excel worksheet with accompanying macros has been developed to automate the analysis procedures. These programs are available by request from the author.

Water recovery test stage 8 was the last in a series of tests that have been conducted at the NASA Marshall Space Flight Center (MSFC) to evaluate the performance of a predevelopment water recovery system. This particular test built upon the results obtained from water recovery test stage 7 by investigating whether system integrity could be maintained without a presterilizer component in the potable water processor. This test report summarizes the test configuration, events, anomalies, and results pertaining to the system’s operation.

This document lists the significant publications and presentations of the Space Science Laboratory during the period January 1 to December 31, 1992. 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 referred professional journals, books, monographs, or conference proceedings. Although many published abstracts are eventually expanded into full papers for publication in scientific and technical journals, they are often sufficiently comprehensive to include the significant
results of the research reported. Therefore, published abstracts are listed separately in a subsection under Open Literature. Questions or requests for additional information about the entries in this report should be directed to Tauna W. Moorehead (ES01; 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-108403 April 1993
N93-25671

This report deals with conducting a probabilistic study of the external tank attach ring (ETA) used as an interface between the external tank attach struts and the solid rocket booster. The idea was to use probabilistic distributions for material, geometric, and load properties, to calculate probabilistic margins of safety, and then to compare results against the deterministic factors of safety that were used in the actual design process. The report describes how this was done and discusses some of the road blocks and data problems that were encountered during the study and provides some conclusions. A further refinement of this study is being considered for future work which would make more direct use of finite element analysis data coupled with Monte Carlo simulation. The basic conclusion herein indicates that the probabilistic margins of safety for the cases analyzed (by use of existing data) appear to support deterministic results and actually indicate higher reliabilities.

TM-108404 April 1993
TSS Tether Cable Meteoroid/Orbital Debris Damage Analysis. K.B. Hayashida and J.H. Robinson. Structures and Dynamics Laboratory.
N93-27023

This report summarizes the damage analysis performed on the tether cable used for the tethered satellite system (TSS), for the damage that could be caused by meteoroid or orbital debris impacts. The TSS consists of a tethered satellite deployer and a tethered satellite. The analytical studies were performed at Marshall Space Flight Center (MSFC) with the results from the following tests: (1) hypervelocity impact tests to determine the “critical” meteoroid particle diameter, i.e., the maximum size of a meteoroid particle which can impact the tether cable without causing “failure”; (2) electrical resistance tests on the damaged and undamaged tether cable to determine if degradation of current flow occurred through the damaged tether cables; and (3) tensile load tests to verify the load carrying capability of the damaged tether cables. Finally, the HULL hydrodynamic computer code was used to simulate the hypervelocity impact of the tether cable by particles at velocities higher than can be tested, to determine the extent of the expected tether damage.

TM-108405 May 1993
X93-10790

The Environmental Control and Life Support System (ECLSS) test program for the development of a regenerative reclamation system for Space Station Freedom (S.S. Freedom) began in 1986 at NASA/Marshall Space Flight Center (MSFC). This report presents microbiological data from the Water Recovery Test (WRT), Stage 4/5 which was conducted from June through July 1991.

WRT Stage 4/5 investigated a dual-loop system with test subjects contributing respiration and perspiration through exercise for potable reclamation, while waste shower, handwash, laundry, oral hygiene, and urine were generated for hygiene reclamation. During WRT Stage 5, test subjects were allowed to taste, but not consume, reclaimed potable water and give subjective opinions of the general palatability. Test subjects were also asked to provide subjective opinions on the quality of reclaimed hygiene water used in showers and handwashes. Reclaimed hygiene water was also used for laundry and urine flush. The Stage 4/5 tests were run concurrently.

TM-108406 June 1993
N93-27251

This report presents the results of the test matrix development for design verification at the component level for the National Launch System (NLS) space transportation main engine (STME) thrust chamber assembly (TCA) components, including injector, combustion chamber, and nozzle. A systematic approach was used in the development of the minimum recommended TCA matrix, resulting in a
The minimum number of hardware units and a minimum number of hot fire tests.

**TM-108407**
June 1993

The Role of Grain Boundaries in Hydrogen Diffusion in Metals at 25 °C. M.D. Danford. Materials and Processes Laboratory. N93-29043

The effect of grain size on hydrogen diffusion at 25 °C has been examined for 4340 steel (body-centered cubic) and for Inconel 718 (face-centered cubic). It has been found that the effect of grain size is important for body-centered cubic structures, but plays a much less important role in face-centered cubic structures. Accurate measurements of hydrogen desorption coefficients during hydrogen desorption show that these are not greatly different for both types of structures.

**TM-108408**
June 1993


Research has been conducted at the Marshall Space Flight Center on the behavior of elastomeric materials after exposure to simulated space environment. Silicone S383 and Viton V747 samples were exposed to thermal vacuum, ultraviolet (UV) radiation, and atomic oxygen and then evaluated for changes in material properties. Characterization of the elastomeric materials included weight, hardness, optical inspection under normal and black light, spectrofluorescence, solar absorptance and emittance, Fourier transform infrared spectroscopy, and permeability. These results indicate a degree of sensitivity to exposure and provide some evidence of UV and atomic oxygen synergism.

**TM-108409**
June 1993

Computerized Atmospheric Trace Contaminant Control Simulation for Manned Spacecraft. J.L. Perry. Structures and Dynamics Laboratory. N93-28977

Buildup of atmospheric trace contaminants in enclosed volumes such as a spacecraft may lead to potentially serious health problems for the crewmembers. For this reason, active control methods must be implemented to minimize the concentration of atmospheric contaminants to levels that are considered safe for prolonged, continuous exposure. Designing hardware to accomplish this has traditionally required extensive testing to characterize and select appropriate control technologies. Data collected since the Apollo project can now be used in a computerized performance simulation to predict the performance and life of contamination control hardware to allow for initial technology screening, performance prediction, and operations and contingency studies to determine the most suitable hardware approach before specific design and testing activities begin. The program, written in FORTRAN 77, provides contaminant removal rate, total mass removed, and per pass efficiency for each control device for discrete time intervals. In addition, projected cabin concentration is provided. Input and output data are manipulated using commercial spreadsheet and data graphing software. These results can then be used in analyzing hardware design parameters such as sizing and flow rate, overall process performance, and program economics. Test performance may also be predicted to aid test design.

**TM-108410**
June 1993


Magnetographs, which measure polarized light, allow solar astronomers to infer the magnetic field intensity on the Sun. The Marshall Space Flight Center (MSFC) Vector Magnetograph is such an imaging instrument. The instrument requires rapid modulation between polarization states to minimize seeing effects. The accuracy of those polarization measurements is dependent on stable modulators with small field-of-view errors. Although these devices are very important in ground-based telescopes, extending the field of view of electro-optical crystals such as KD*P's (potassium di-deuterium phosphate) could encourage the development of these devices for other imaging applications. This report describes the work that was done at MSFC as part of the Center Director’s Discretionary Fund (CDDF) to reduce the field-of-view errors of instruments that use KD*P modulators in their polarimeters.
A study of a special case of symmetric laminated composite cantilever beams is presented. The approach models beams that are tapered both in depth and width and investigates the effect of the ply layup angle and the ply taper on bending and interlaminar shearing stresses. For the determination of stresses and deflections, the beam stiffness matrices are expressed as linear functions of the beam length. Using classical lamination theory (CLT) the stiffness matrices are determined and assembled at strategic locations along the length of the beam. They are then inverted and necessary stiffness parameters are obtained numerically and extracted for determination of design information at each location chosen. Several ply layup configurations are investigated, and design considerations are presented based on the findings. Finally, recommendations for the design of these beams are presented, and a means for anticipating the location of highest stresses is offered.

Alloy 718 billets produced by the squeeze-cast process have been evaluated for use as potential replacements for propulsion engine components which are normally produced from forgings. Alloy 718 billets were produced using various processing conditions. Structural characterizations were performed on "as-cast" billets. As-cast billets were then homogenized and solution treated and aged according to conventional heat-treatment practices for this alloy. Mechanical property evaluations were performed on heat-treated billets.

As-cast macrostructures and microstructures varied with squeeze-cast processing parameters. Mechanical properties varied with squeeze-cast processing parameters and heat treatments. One billet exhibited a defect-free, refined microstructure, with mechanical properties approaching those of wrought alloy 718 bar, confirming the feasibility of squeeze-casting alloy 718. However, further process optimization is required, and further structural and mechanical property improvements are expected with process optimization.

In early 1993, President Clinton mandated that NASA look at lower cost alternatives to Space Station Freedom. He also established an independent advisory committee—the Blue Ribbon Panel—to review the redesign work and evaluate alternatives. Daniel Goldin, NASA Administrator, established a Station Redesign Team that began operating in late March from Crystal City, VA. NASA intercenter teams—one each at Marshall Space Flight Center, Johnson Space Center, and Langley Research Center—provided engineering and other support.
This report summarizes the results of the Option A study done at Marshall Space Flight Center. Two configurations (A-1 and A-2) are covered in this report. Additional data is provided in the briefing package MSFC SRT-001, Final System Review to SRT-002, Space Station Option A Modular Buildup Concept, Volumes 1–5, Revision B, June 10, 1993. In June 1993, President Clinton decided to proceed with a modular concept consistent with Option A, and asked NASA to provide an Implementation Plan by September. All data from the Option A redesign activity was provided to NASA's Transition Team for use in developing the Implementation Plan.

**TM-108416 July 1993**


This report focuses on the development of an operational Rutherford backscattering spectrometry (RBS) system and shows the application of such a system on a space environmental test.

Thin films of aluminum and tantalum were deposited on diamond substrates. These films were anodized and preexposure characterization spectra obtained using RBS and total hemispherical reflectance. The samples were exposed to energetic protons then postexposure characterization spectra was obtained using the same techniques.

Conclusions based on the comparison of pre-exposure and postexposure spectra are presented. RBS comparison spectra show no change in the metal/metal oxide interface, while the comparison reflectance data indicate change. Explanations for this reflectance change are presented in this report.

**TM-108417 July 1993**


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 January to June 1993. The systems that make up the facility are a magnetograph telescope, an H-alpha telescope, a Questar telescope, and a computer code.

**TM-108418 July 1993**

A Study on Strength Evaluations of EDNi/EDCu/NARloy-Z Bonded Joints. J.B. Min and K.L. Spanyer. Structures and Dynamics Laboratory.

Dissimilar material interfaces can be found in many materials and structural bonds such as composite materials, welded parts, inclusion in matrix, bond between metallic and ceramic materials, etc. One of such structural bonds can be seen in the main combustion chamber (MCC) of the space shuttle main engine (SSME). In this study, from a practical sense, the primary concern is to understand the systems response of EDNi/EDCu/NARloy-Z bonded joints using stress values approximated by the finite element method to determine an influence of the variation of structural bond parameters on the bonded joints, and consequently to support a process control for developing defect-free, strong bonded joints of EDNi/EDCu/NARloy-Z in the MCC of the SSME. The results presented in this study could be an appropriate indicator for a good bond of EDNi/EDCu/NARloy-Z layers with the desired thickness of copper deposition in the SSME MCC manufacturing process. Furthermore, the results from this study appear to be applicable to any bonded joints that can be characterized by the parameters and assumptions used in this analysis.

**TM-108419 September 1993**


Microstructural evolution was studied in samples of wrought and vacuum plasma sprayed (VPS) NARloy-Z exposed to temperatures up to 970 °C (1,780 °F) for up to 60 h. Samples were heated in a vacuum furnace, followed by rapid quenching in helium (He) gas at a cooling rate of -166 °C (300 °F) per second. Microstructural analyses were conducted using optical microscopy, scanning electron microscopy (SEM), and electron probe microanalysis (EPMA). In both the wrought and VPS conditions, precipitates rich in silver (Ag) and zirconium (Zr) were present in the matrix and at the grain boundaries even after long exposure to elevated temperatures. Islands rich in oxygen (O₂) and Zr were also observed, as well as incipient melting at the grain boundary triple points. Results indicated
that the alloy cannot be homogenized by heat treatment at elevated temperatures.

**TM-108421**

*September 1993*


A number of promising glass forming compositions of high Tc superconducting Ba-Sr-Ca-Cu-O (BSCCO) materials were evaluated for their glass-ceramic crystallization ability. The BSCCO ceramics belonging to the class of superconductors in the Ba-Sr-Ca-Cu-O system were the focus of this study. By first forming the superconducting material as a glass, subsequent devitrification into the crystalline (glass-ceramic) superconductor can be performed by thermal processing of the glass preform body. Glass formability and phase formation were determined by a variety of methods in another related study. This study focused on the nucleation and crystallization of the materials. Thermal analysis during rapid cooling aids in the evaluation of nucleation and crystallization behavior. Melt viscosity is used to predict glass formation ability.

**TM-4437**

*January 1993*

Space Shuttle Solid Rocket Booster Main Parachute Damage Reduction Team Report. G. Watts. Structures and Dynamics Laboratory.

This report gives the findings of the space shuttle solid rocket booster main parachute damage reduction team. The purpose of the team was to investigate the causes of main parachute deployment damage and to recommend methods to eliminate or substantially reduce the damage. The team concluded that the two primary causes of significant damage during deployment are vent entanglement and contact of the parachutes with the main parachute support structure. As an inexpensive but effective step toward damage reduction, the team recommends modification of the parachute packing procedure to eliminate vent entanglement. As the most effective design change, the team recommends a pilot chute-deployed soft-pack system. Alternative concepts are also recommended that provide a major reduction in damage at a total cost lower than the pilot chute-deployed soft pack.

**TM-4456**

*March 1993*


This document covers research results from the KC–135 Materials Science Program managed by MSFC for the period FY87 through FY89. It follows the previous NASA Technical Memorandum for FY84–86 published in August 1988. This volume contains over 30 reports grouped into eight subject areas covering acceleration levels, space flight hardware, transport and interfacial studies, thermodynamics, containerless processing, welding, melt/crucible interactions, and directional solidification. The KC–135 materials science experiments during FY87–89 accomplished direct science, preparation for space flight experiments, and justification for new experiments in orbit.

**TM-4517**

*August 1993*

Spacelab J Experiment Descriptions. T.Y. Miller, Editor. Space Science Laboratory.

This document contains brief descriptions of the experiment investigations for the Spacelab J Mission which was launched from the Kennedy Space Center aboard the *Endeavor* in September 1992.
This work was performed to determine the tensile properties of cast, hot isostatic pressed (HIP'ed), and annealed titanium alloys, Ti-6Al-4V ELI and Ti-5Al-2.5Sn ELI, that are candidate materials for the space transportation main engine (STME) liquid hydrogen turbopump impeller. Samples of the cast alloys were HIP'ed, annealed, and machined into tensile specimens. The specimens were tested in air at ambient temperature (70 °F) and also at -423 °F in liquid hydrogen. The Ti-6Al-4V alloy had an average ultimate strength of 129.1 ksi at 70 °F and 212.2 ksi at -423 °F. The Ti-5Al-2.5Sn alloy had an average ultimate strength of 108.4 ksi at 70 °F and 185.0 ksi at -423 °F. The ductility, as measured by reduction of area, for the Ti-6Al-4V averaged 15.2 percent at 70 °F and 8.7 percent at -423 °F, whereas for the Ti-5Al-2.5Sn alloy average reduction of area was 24.6 percent at 70 °F and 11.7 percent at -423 °F.

A preloading device was used to examine the effects of compressive prestress on the compression-after-impact (CAI) strength of 16-ply, quasi-isotropic carbon epoxy test coupons. T300/934 material was evaluated at preloads from 200 to 4,000 lb at impact energies from 1 to 9 joules. IM7/8551-7 material was evaluated at preloads from 4,000 to 10,000 lb at impact energies from 4 to 16 joules. Advanced design of experiments methodology was used to design and evaluate the test matrices. The results showed that no statistically significant change in CAI strength could be contributed to the amount of compressive preload applied to the specimen.

In this study, we provide an overview of reliability growth literature over the past 25 years. This includes a thorough literature review of different areas of the application of reliability growth such as design, prediction, tracking/management, and demonstration. Various reliability growth models use different bases on how they characterize growth. Different models are discussed in this report. Also, this report addresses the use of reliability growth models to NASA applications. This includes the application of these models to the space shuttle main engine. For potential NASA applications, we classify growth models in two groups. These groups are characterized in this report.

For the interval December 1978 to April 1991, the value of the mean total solar irradiance, as measured by the Nimbus-7 Earth Radiation Budget Experiment channel 10C, was 1,372.02 Wm⁻², having a standard deviation of 0.65 Wm⁻², a coefficient of variation (mean divided by the standard deviation) of 0.047 percent, and a normal deviate z (a measure of the randomness of the data) of -8.019 (inferring a highly significant nonrandom variation in the solar irradiance measurements, presumably related to the action of the solar cycle). Comparison of the 12-month moving average (also called the 13-month running mean) of solar irradiance to those of the usual descriptors of the solar cycle (i.e., sunspot number, 10.7-cm solar radio flux, and total corrected sunspot area) suggests possibly significant temporal differences. For example, solar irradiance is found to have been greatest on or before mid 1979 (leading solar maximum for cycle 21), lowest in early 1987 (lagging solar minimum for cycle 22), and was rising again through late 1990 (thus, lagging solar maximum for cycle 22), having last reported values below those that were seen in 1979 (even though cycles 21 and 22 were of comparable strength). Presuming a genuine correlation between solar irradiance and the solar cycle (in particular, sunspot number) one infers that the correlation is weak (having a coefficient of correlation r < 0.84) and that major excursions (both as "excesses" and "deficits") have occurred (about every 2 to 3 years, perhaps suggesting a pulsating Sun).
Verderaime. Structures and Dynamics Laboratory. N93-18141

As emphasis shifts from optimum-performance aerospace systems to least life-cycle costs, systems designs must seek, adapt, and innovate cost improvement techniques in design through operations. The systems design process of concept, definition, and design was assessed for the types and flow of total quality management techniques that may be applicable in a launch vehicle systems design analysis. Techniques discussed are task ordering, quality leverage, concurrent engineering, Pareto’s principle, robustness, quality function deployment, criteria, and others. These cost-oriented techniques are as applicable to aerospace systems design analysis as to any large commercial system.

TP-3327 January 1993
Hypersonic Rarefied Wake Characterization.
E.B. Brewer. Structures and Dynamics Laboratory. N93-18604

Results of a numerical study using the direct simulation Monte Carlo (DSMC) method are presented for hypersonic rarefied flow over an aeroassisted space transfer vehicle (ASTV). The emphasis of the study is the characterization of the near wake region which includes the ASTV payload. The study covered the transitional flow regime from near continuum to free molecular. Calculations show that the character of the near wake is significantly affected by the presence of the payload. Flow separation occurs when an afterbody is present throughout the transitional flow regime. In contrast, when no afterbody is present, no separation is observed until the flow approaches continuum.

TP-3332 March 1993
Characterizing the Uncertainty in Holddown Post Load Measurements. J.A. Richardson and J.S. Townsend. Structures and Dynamics Laboratory. N93-23721

In order to understand unexpectedly erratic load measurements in the launch-pad supports for the space shuttle, the sensitivities of the load cells in the supports were analyzed using simple probabilistic techniques. NASA engineers use the loads in the shuttle’s supports to calculate critical stresses in the shuttle vehicle just before lift-off. The support loads are measured with “load cells” which are actually structural components of the mobile launch platform which have been instrumented with strain gauges. Although these load cells adequately measure vertical loads, the horizontal load measurements have been erratic. The load measurements were simulated in this study using Monte Carlo simulation procedures. The simulation studies showed that the support loads are sensitive to small deviations in strain and calibration. In their current configuration, the load cells will not measure loads with sufficient accuracy to reliably calculate stresses in the shuttle vehicle. A simplified model of the holddown post (HDP) load measurement system was used to study the effect on load measurement accuracy for several factors, including load point deviations, gauge heights, and HDP geometry.

TP-3336 March 1993
Robustness. R. Ryan. Structures and Dynamics Laboratory. N93-22458

Robustness is a buzz word common to all newly proposed space systems design as well as many new commercial products. The image that one conjures up when the word appears is a “Paul Bunyan” (lumberjack design), strong and hearty; healthy with margins in all aspects of the design. In actuality, robustness is much broader in scope than margins, including such factors as simplicity, redundancy, desensitization to parameter variations, control of parameter variations (environment fluctuation), and operational approaches. These must be traded with concepts, materials, and fabrication approaches against the criteria of performance, cost, and reliability. This includes manufacturing, assembly, processing, checkout, and operations. The design engineer or project chief is faced with finding ways and means to inculcate robustness into an operational design. First, however, he must be sure he understands the definition and goals of robustness. This paper will deal with these issues as well as the need for the requirement for robustness.

TP-3347 May 1993

The tethered satellite system (TSS) was envisioned as a means of extending a satellite from its base (space shuttle, space station, space platform) into a lower or higher altitude in order to more efficiently acquire data and perform science experiments. This is accomplished by attaching the
satellite to a tether, deploying it, then reeling it in. When its mission is completed, the satellite can be returned to its base for reuse. If the tether contains a conductor, it can also be used as a means to generate and flow current to and from the satellite to the base. When current is flowed, the tether interacts with the Earth’s magnetic field, deflecting the tether. When the current flows in one direction, the system becomes a propulsive system that can be used to boost the orbiting system. In the other direction, it is a power generating system. Pulsing the current sets up a dynamic oscillation in the tether, which can upset the satellite attitude and preclude docking. A basic problem occurs around 400-m tether length, during satellite retrieval, when the satellite’s pendulous (rotational) mode gets in resonance with the first lateral tether string mode. The problem’s magnitude is determined by the amount of skiprope present coming into this resonance condition. This paper deals with the tethered satellite, its dynamic phenomena, and how the resulting problems were solved for the first tethered satellite mission (TSS-1). Proposals for improvements for future tethered satellite missions are included. Results from the first tethered satellite flight are summarized.

TP-3376
May 1993
Stress Corrosion Evaluation of HP 9Ni-4Co-0.30C Steel Plate Welds. P.D. Torres. Materials and Processes Laboratory.

A stress corrosion cracking (SCC) investigation was conducted on HP 9Ni-4Co-0.30C steel plate welds (welded by using straight polarity plasma arc and HP 9Ni-4Co-0.20C weld wire) since this material is being considered for use in the Advanced Solid Rocket Motor (ASRM) program. Prior to the welding, the material was double tempered at 538 °C (1,000 °F). After welding, only part of the material was stress relieved at 510 °C (950 °F) for 3 h. Round tensile specimens obtained from nonstress-relieved material were tested in 100-percent relative humidity at 38 °C (100 °F), in 3.5-percent NaCl alternate immersion, and in 5-percent salt spray at 35 °C (95 °F). Specimens obtained from stress-relieved material were tested in alternate immersion. The stress levels were 50, 75, and 90 percent of the corresponding 0.2-percent yield strength (YS).

All the nonstress-relieved specimens exposed to salt spray and alternate immersion failed. Stress-relieved specimens (exposed to alternate immersion) failed at 75 and 90 percent of YS. No failures occurred at 50 percent of YS in the stress-relieved specimens which indicates a beneficial effect of the stress relief on the SCC resistance of these welds. The stress relief also had a positive effect on the mechanical properties of the welds (the most important being an increase of 21 percent on the YS).

Under the conditions of these tests, the straight polarity plasma arc welded HP 9Ni-4Co-0.30C steel plate was found highly susceptible to SCC in the nonstress-relieved condition. This susceptibility to SCC was reduced by stress relieving.

TP-3410
September 1993
Structural Design/Margin Assessment. R.S. Ryan. Structures and Dynamics Laboratory.

Determining structural design inputs and the structural margins following design completion are some of the major activities in space exploration. The end result is a statement of these margins as stability, safety factors on ultimate and yield stresses, fracture limits (fracture control), fatigue lifetime, reuse criteria, operational criteria and procedures, stability factors, deflections, clearance, handling criteria, etc. The process is normally called a load cycle and is time consuming, very complex, and involves much more than structures. The key to successful structural design is the proper implementation of the process. It depends on many factors: leadership and management of the process, adequate analysis and testing tools, data basing, communications, people skills, and training. This report deals with this process and the various factors involved.

TP-3413
September 1993

This report gives the results of an electrical power system fault study which has been conducted over the last 2 and one-half years. First, the results of the literature search into electrical power system faults in space and terrestrial power system applications are reported. A description of the intended implementations of the power system faults into the Large Autonomous Spacecraft Electrical Power System (LASEPS) breadboard is then presented. Then the actual implementation of the faults into the breadboard is discussed along with a discussion describing the LASEPS breadboard. Finally, the results of the injected faults and breadboard failures are discussed.
CP-3182 November 1992
X93-10232

CP-3184 January 1993
N93-20067

CP-3192 May 1993
N93-20490

CP-3213 May 1993
Electrical Actuation Technology Bridging. M. Hammond and J. Sharkey, Compilers.

CP-3221 July 1993
Eleventh Workshop for Computational Fluid Dynamic Applications in Rocket Propulsion—Part I and Part II. R.W. Williams, Compiler.

CP-3227 August 1993
CR-4474 November 1992

CR-4483 January 1993

CR-4486 January 1993

CR-4498 March 1993

CR-4503 March 1993

CR-4529 July 1993

CR-4529 July 1993

CR-4529 July 1993

CR-4537 July 1993

CR-184386 October 1992
Glass Sample Characterization—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-70146

CR-184387 August 1990
Cryogenic Gyroscope and Space Helium Dewar Systems Research. NAS8-36955. The University of Alabama in Huntsville.

CR-184388 December 1989

CR-184389 September 1989

CR-184390 February 23, 1990

CR-184391 October 1992
Establishing Laboratory Standards for Biological Flight Experiments—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-70158

CR-184392 December 12, 1989
Spectrometer DPU—Final Report. NAS8-36955. The University of Alabama in Huntsville.

CR-184393 January 1989
Final Report for NAS8-36955, D.O. 15 for the Period 10-12-88 Through 10-11-88. NAS8-36955. The University of Alabama in Huntsville.
|------------|------------------|--------------------------------------------------------------------------------------------------|------------|-----------------|--------------------------------------------------------------------------------------------------|

NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)
NASA CONTRACTOR REPORTS

(Abstracts for these reports may be obtained from STAR)

CR-184413

CR-184414

CR-184415

CR-184416

CR-184417

CR-184418
Recycled Potable Water—Final Report, 02-01-90 to 06-30-90. NAS8-36955. The University of Alabama in Huntsville. N93-70143

CR-184419

CR-184420

CR-184421

CR-184422

CR-184423
Development of a Model for Predicting NASA/MSFC Program Success—Final Report, 05-01-90 to 05-30-90. NAS8-36955. The University of Alabama in Huntsville. N93-12542

CR-184424

CR-184425

CR-184426
High Temperature Superconductor Materials and Applications—Final Report, 12-11-89 to 7-10-90. NAS8-36955. The University of Alabama in Huntsville. N93-12396

CR-184427

CR-184428

CR-184429
ECLSS Medical Support Activities—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-12427

CR-184430

CR-184431
Contamination Analysis of SSF Candidate Materials—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-12894
CR-184432 July 18, 1991

CR-184433 August 5, 1991

CR-184434 August 1991

CR-184435 October 1992

CR-184436 March 1991

CR-184437 January 11, 1991

CR-184438 April 30, 1991


CR-184440 July 11, 1991

CR-184441 November 1991

CR-184442 April 1992
FNAS Modify Matric and Transparent Experiments—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-13311

CR-184443 March 1991

CR-184444 July 1991

CR-184445 April 1992

CR-184446 July 1991

CR-184447 April 24, 1992

CR-184448 June 1992

CR-184449 March 1992
Briefing Notes on Propulsion Stability Codes ADMIT, NYQUIST, and SSFREQ—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-12874
NASA CONTRACTOR REPORTS
(AAbstracts for these reports may be obtained from STAR)

CR-184450 June 1992

CR-184451 June 1992

CR-184452 June 1992

CR-184453 June 1992

CR-184454 March 1992
Water Window Imaging X-Ray Microscope Alignment and MSSTA Film Splicing—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-70159

CR-184455 July 1992

CR-184456 August 24, 1992

CR-184457 March 31, 1989

CR-184458 March 31, 1989

CR-184459 March 31, 1989

CR-184460 July 31, 1992

CR-184461 July 1992

CR-184462 July 1992

CR-184463 October 1992
FNAS Inversion Techniques—Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-12675

CR-184464 September 9, 1992

CR-184465 August 1992
Vacuum Chamber Translation/Positioning Mechanism and Welding Power Supply Controller, Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-12196

CR-184466 September 1981

CR-184467 September 1981
NASA CONTRACTOR REPORTS
(Abstr allowing for these reports may be obtained from STAR)

NAS8-33527. General Dynamics and Comsat.
   N93-70365

CR-184468 June 24, 1992
Improved Pulsed Discharge TF Laser—Final
Report. NAS8-38484. Q Source. X93-36079

CR-184469 January 1991
Gas Permeability of FM 5055 Carbon Phenolic
Composite (Pre-Avtec Shutdown)—Final
X93-10088

CR-184470 September 8, 1992
Assessment of the Present NASA Optical
Metrology Capabilities and Recommendations
for Establishing an In-House NASA Optical
Metrology Group. H-13027D. N92-34142

CR-184471 January 1992
Cycle 0 (CY1991) NLS Trade Studies and
Analyses Report Book I—Structures and Core
Vehicle Final Report. NAS8-37143. Martin
Marietta.
N93-16682

CR-184472 January 1992
Cycle 0 (CY1991) NLS Trade Studies and
Analyses Report Book II—Part 1 Avionics and
Systems Final Report. NAS8-37143. Martin
Marietta.
N93-23176

CR-184473 July 1990
Manned Mars System Study (Mars Transporta-
tion and Facility Infrastructure Study) Volume I,
NASA Marshall Space Flight Center Final
N93-12442

CR-184474 July 1990
Manned Mars System Study (Mars Transporta-
tion and Facility Infrastructure Study) Volume II,
NASA Marshall Space Flight Center Final
N93-12443

CR-184475 July 24, 1992
System for Anomaly and Failure Detection
(SAFD) System Development—Final Report.
NAS8-40000. Rockwell International.
N93-17856

CR-184476 July 1992
A Dynamic Study of Fragmentation and Energy
Loss During High Velocity Impact—Final

CR-184477 August 4, 1992
Instruction Manual for UTEP Weld Gas Hydro-
gen Detector. NAS8-38662. University of Texas
at El Paso.
N93-18034

CR-184478 September 1990
Liquid Rocket Booster (LRB) for the Space
Transportation System (STS) Systems Study
N93-18859

CR-184479 December 1990
Liquid Rocket Booster (LRB) For the Space
Transportation System (STS) Systems Study

CR-184480 February 1991
Liquid Rocket Booster (LRB) for the Space
Transportation System (STS) Systems Study

CR-184481 September 1992
Study of Basic Physical Processes in Liquid
Rocket Engines February 23, 1990 to February
21, 1992, Final Report. NAS8-36955. The Uni-
versity of Alabama in Huntsville.
N93-16722

CR-184482 September 30, 1992
NAS8-38609. The University of Alabama in
Huntsville.
N93-15916

CR-184483 October 20, 1992
NAS8-38609. The University of Alabama in
Huntsville.
N93-14793

CR-184484 September 30, 1992
Definition and Preliminary Design of the Laser
Atmospheric Wind Sounder (LAWS) Phase II
NAS8-37589. GE Astro Space.
N93-16751

CR-184485 September 30, 1992
Definition and Preliminary Design of the Laser
Atmospheric Wind Sounder (LAWS) Phase II
Final Report, Volume II. NAS8-37589. GE
Astro Space.
N93-16623
CR-184486  June 1992

CR-184487  October 22, 1992

CR-184488  April 1991

CR-184489  April 1991

CR-184490  April 1991

CR-184491  April 1991

CR-184492  September 1, 1992

CR-184493  August 1989

CR-184494  June 1992

CR-184495  August 4, 1992

CR-184496  August 1989

CR-184497  September 12, 1991

CR-184498  November 1992
Fiber Pulling Apparatus Modification—Final Report. NAS8-38609. The University of Alabama in Huntsville. X93-14763

CR-184499  October 6, 1992

CR-184500  September 1992

CR-184501  September 1992
Endoscopic Measurements Using a Panoramic Annular Lens, Final Report. NAS8-36955. The University of Alabama in Huntsville. N93-16453

CR-184502  September 18, 1992

CR-184503  October 1992

CR-184504  December 1992
CR-184505 December 1992

CR-184506 September 1992

CR-192413 August 1992
IRD Dropout Study Final Report. NAS8-39077. SRS Technologies. N93-16381

CR-192414 October 21, 1992

CR-192415 September 1992

CR-192416 November 1992

CR-192417 October 1992

CR-192418 April 27, 1992

CR-192419 October 20, 1992

CR-192420 November 10, 1992

CR-192421 January 1993

CR-192422 November 1, 1992
Materials Surface Contamination Analysis—Final Report. NAS8-38609. The University of Alabama in Huntsville. N93-17000

CR-192423 January 1993
FNAS Gamma Ray Observatory. NAS8-38609. The University of Alabama in Huntsville. N93-16944

CR-192424 October 21, 1992

CR-192425 September 1992

CR-192426 October 1992
Compiling Knowledge-Based Systems to ADA—Final Report. NAS8-38488. IntelliCorp, Inc. N93-36287

CR-192427 December 1992

CR-192428 June 1992

CR-192429 November 1992
|-----------|----------------|-------------------------------------------------------------------------|
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-192450 October 1992

CR-192451 January 15, 1993

CR-192452 January 1992

CR-192453 July 20, 1992

CR-192454 September 13, 1991

CR-192455 November 1992

CR-192456 October 19, 1989

CR-192457 November 1992

CR-192458 January 20, 1993

CR-192459 October 1991

CR-192460 January 15, 1993

CR-192461 December 1991
Computational Models for the Forebody Flowfield and Base Flowfield/Free Stream Interaction Region—Appendix 4. NAS8-38141. Remtech. X93-10688

CR-192462 December 1992
MSFC Three Point Docking Mechanism Design Review. NAS8-36641. Grumman Aerospace Corp. N93-22013

CR-192463 February 1993

CR-192464 January 29, 1993

CR-192465 December 31, 1992

CR-192466 September 1992

CR-192467 January 1993
Vacuum Chamber and Adapters for Shearography and Holography—Final Report. NAS8-38609. The University of Alabama in Huntsville.

CR-192468 December 21, 1992

CR-192469 March 1993
NAS8-38609. The University of Alabama in Huntsville.

CR-192470

CR-192471

CR-192472

CR-192473

CR-192474

CR-192475

CR-192476

CR-192477

CR-192478

CR-192479

CR-192480

CR-192481

CR-192482

CR-192483

CR-192484

CR-192485

CR-192486
CR-192487 February 1993

CR-192488 February 15, 1991

CR-192489 February 15, 1991

CR-192490 March 8, 1991

CR-192491 March 8, 1991

CR-192492 March 8, 1991

CR-192493 March 8, 1991

CR-192494 March 8, 1991

CR-192495 March 1991

CR-192496 March 1993

CR-192497 December 1992

CR-192498 July 1992

CR-192499 April 1993
Calculation of Surface Pressure-Fluctuations Based on Time-Averaged Turbulent Flow Computations, Phase II Final Report, Volume I, Summary of Results. NAS8-38969. Engineering Analysis, Inc. X93-36331

CR-192500 April 1993

CR-192501 April 1993

CR-192520 February 26, 1993

CR-192521 January 1993
Fantastic Code an In-Depth Assessment—Revised—Final Report. NAS8-37801. Hercules Industry Team. X93-10856

CR-192522 February 26, 1993

CR-192523 April 23, 1993

CR-192524 April 1, 1991

CR-192525 April 1, 1991

CR-192526 April 1, 1991

CR-192527 April 1, 1991

CR-192528 April 1, 1991

CR-192529 March 1, 1991

CR-192530 September 24, 1992

CR-192531 February 1993

CR-192532 December 1992

CR-192533 May 1992

CR-192534 May 1992

CR-192535 May 1992

CR-192536 April 30, 1993
CR-192537  August 1992
X93-10855

CR-192538  March 1993
X93-10849

CR-192539  March 1993
X93-10861

CR-192540  August 1990
X93-10854

CR-192541  April 1992
X93-10852

CR-192542  March 1993
X93-10853

CR-192543  February 1993
X93-10862

CR-192544  September 1992
X93-10851

CR-192545  April 1993
N93-28325

CR-192546  September 1990

CR-192547  April 14, 1993
N93-26948

CR-192548  August 24, 1992
N93-71158

CR-192549  April 1993
N93-27593

CR-192550  May 14, 1993
N93-27146

CR-192551  April 24, 1993

CR-192552  March 1993
N93-24473

CR-192553  April 1993
N93-29030

CR-192554  April 30, 1993
N93-29029

CR-192555  May 1993
N93-27029
CR-192556 April 1993
N93-28558

CR-192557 April 1993
N93-27592

CR-192558 April 1993
N93-28321

CR-192559 May 1993
Final Postflight Hardware Evaluation Report 360T026 (RSRM-26, STS-47)—Final Report. NAS8-38100 Thiokol

CR-192560 June 1993
Hot Hydrogen Testing of Refractory Metals and Ceramics—Final Report 02-24-92 to 02-23-93. NAS8-39131 Auburn University N93-27484

CR-192561 May 31, 1993
Advanced Earth-To-Orbit Propulsion Technology Information Dissemination and Research—Final Report. NAS8-36955 The University of Alabama in Huntsville N93-28680

CR-192562 March 1993

CR-192563 March 1993

CR-192564 March 1993

CR-192565 March 1993

CR-192566 March 1993

CR-192567 April 21, 1993

CR-192568 July 1993
Microbiological Test Results Using Three Urine Pretreatment Regimes With 316L Stainless Steel. NAS8-37814. Sverdrup Technology, Inc. N94-10360

CR-192569 July 1993

CR-192570 July 1993

CR-192571 July 1993
Optimization of 15 Parameters Influencing the Long-Term Survival of Bacteria in Aquatic Systems. NAS8-37814. Sverdrup Technology, Inc. N93-32365

CR-192572 April 1993
Property Changes Induced by the Space Environment in Composite Materials on LDEF: Solar Array Materials Passive LDEF Experiment
A0171 (SAMPLE)—Final Report. NAS8-38978. Camber Corp.

CR-192573 April 1993

CR-192574 June 1993
Software to Model AXAF Image Quality—Final Report 05-01-92 to 06-29-93. NAS8-38609. The University of Alabama in Huntsville. N93-31637

CR-192575 July 1993
Microbiological and Corrosion Analysis of Three Urine Pretreatment Regimes With Titanium 6Al-4V. NAS8-37814. Sverdrup Technology, Inc. N93-32356

CR-192576 June 7, 1993

CR-192577 January 15, 1993

CR-192578 May 14, 1993

CR-192579 April 1993

CR-192580 March 1993

CR-192581 April 1993

CR-192582 May 1993

CR-192583 May 1993

CR-192584 June 1993

CR-192585 May 1993

CR-192586 June 1993

CR-192587 June 11, 1993

CR-192588 June 30, 1993

CR-192589 June 30, 1993

CR-192590 June 24, 1993

CR-192591 March 1993

CR-192592 June 1993
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-192593  July 1993
Enhancements to the Engine Data Interpretation System (EDIS) Final Report April 16, 1992 to
April 15, 1993. NAS8-38609. The University of
Alabama in Huntsville. N94-10815

CR-192594  May 1993
Danbury Optical Systems, Inc.

CR-192595  May 7, 1993
Systems Analysis on Laser Beamed Power—
H-11986D. The Sirius Group.

CR-192596  April 1992
Fiber Optical Strain Gauge Mechanical Design—Final Report. NAS8-37801. Hercules
Aerospace Co. X93-10876

CR-192597  May 1993
Derivation of One-Dimensional Axisymmetric Force Equilibrium Equations Via the Galerkin
Method—Final Report. NAS8-37801. Hercules
Aerospace Co. X93-10871

CR-192598  May 1993
NAS8-38609. The University of Alabama in
Huntsville.

CR-192599  November 1984
Space Station Automation Study—Satellite Servicing Final Briefing at NASA/Johnson
Space Center, November 27–28, 1984. NAS8-35081. TRW. N93-72717

CR-192600  July 1993

CR-192601  January 1993
Generalized Failure Criterion for Low Modulus Laminated Carbon-Carbon. NAS8-38480. PDA
Engineering.

CR-192602  May 1991
Lunar Campsite Concept Space Transfer Concepts and Analysis for Exploration Missions.
NAS8-37857. Boeing. N94-10144

CR-192603  July 28, 1993

CR-192604  March 1993

CR-192605  April 1992
Thermo-Chemical-Structural Analysis of RSRM Nozzle Cowl Ring and Exit Cone—Final Report. NAS8-37801. Hercules Aerospace Co. X93-10874

CR-192606  June 1993
Derivation of One-Dimensional Axisymmetric Force Equilibrium Equations Via the Galerkin
Method Revision No. 1—Final Report. NAS8-37801. Hercules Aerospace Co. X93-10873

CR-192607  March 1993

CR-192608  January 1993

CR-192609  April 20, 1993

CR-192610  May 1993

CR-192611  August 7, 1993

CR-192612  July 15, 1993

35
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-192613  July 31, 1993
Preliminary Definition Phase Final Report 02-
03-93 to 07-31-93, Temperature Dependence of
Diffusivities. NAS8-39716. The University of
Alabama in Huntsville.

CR-193823  April 19, 1993
Melt Spinning Study—Final Report. NAS8-
38609. The University of Alabama in
Huntsville.

CR-193824  March 8, 1993
Advanced Electric Motor Technology Flux
Mapping—Final Report. NAS8-38609. The
University of Alabama in Huntsville.

CR-193825  December 1991
BALLIST—A Computer Program to Empirically
Predict the Bumper Thickness Required to
Prevent Perforation of the Space Station by
Orbital Debris, Supplemental Final Report.
NAS8-38555. The University of Alabama.

CR-193826  September 1993
Partial Analysis of LDEF Experiment A-0114—
Final Report for May 20, 1985 to November 19,
1991. NAS8-36645. The University of Alabama in
Huntsville.

CR-193827  July 1992
Advanced Protein Crystal Growth Programmatic
Sensitivity Study Final Report. NAS8-39352.
Fairchild Space.

CR-193828  April 30, 1993
Shuttle PRCS Plume Contamination Analysis
for Astro-2 Mission—Final Report February 24,
1993 to April 30, 1993. H-18069D. The University of
Alabama in Huntsville.

CR-193829  June 18, 1992
Final Report of Work Completed Under NAS8-
36479. NAS8-36479. The University of
Alabama in Huntsville.

CR-193830  March 1993
STS-55 Pad Abort 3-22-93 Engine 2011
Oxidizer Preburner Augmented Spark Igniter
Check Valve Leak—Final Report. NAS8-40000.
Rockwell International.

CR-193831  May 1993
Experimental Investigation of Turbine Disk
Cavity Aerodynamics and Heat Transfer—Final

CR-193832  July 1993
Investigation of the Feasibility of Optical Diag-
nostic Measurements at the Exit of the SSME—

CR-193833  April 8, 1993
Lifetime Prediction of Materials Exposed to the
Natural Space Environment 4/9/92 to 4/8/93,

CR-193834  August 23, 1993
Crystal Growth of ZnSe and Related Ternary
Compound Semiconductors by Physical Vapor
Transport—Final Report. NAS8-39718. Univer-
sities Space Research Association.

CR-193835  August 28, 1993
Reduce Fluid Experiment System Flight Data
From IML-1—Final Report. NAS8-38609. The
University of Alabama in Huntsville.

CR-193836  August 30, 1991
Avionics—Enabled Operations Improvements
Study Infrastructure Study TD009 Final Task
Report. NAS8-37588. General Dynamics.

CR-193837  July 1993
Synchrotron/Crystal Sample Preparation—Final
Report. NAS8-38609. The University of
Alabama in Huntsville.

CR-193838  August 12, 1993
Visualization of Solidification Front Phenom-
ena—Final Report. NAS8-38609. The University of
Alabama in Huntsville.

CR-193839  August 30, 1993
Design of Power Electronics for TVC EMA
Systems—Final Report. NAS8-39131. Auburn
University.

CR-193840  August 1993
Laser Power Beaming System Analyses—Final
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-193841
February 1993
Space Station Thermal Storage/Refrigeration
System Research and Development—Final
Report. NAS8-36401. Lockheed Missiles and
Space Co., Inc.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abeldayem, H.</td>
<td>ES74</td>
<td>Novel Phenomenon of Beam Fanning in Organic Solutions and Thin Films. For publication in Optical Society of America, Washington, DC.</td>
</tr>
<tr>
<td>Shields, A.W.</td>
<td>ES74</td>
<td>Nonlinear Optical Parameters of 7’, 7’-Dicyano-7’-APt-B-Carotene in Hexane by Self-Action Techniques. For publication in Optics Communications, The Netherlands.</td>
</tr>
</tbody>
</table>


BHAT, B. McPHERSON, B. CHEN, P. (IIT Research Inst.) KURUVILLA, A.K. PANDA, B.

Synthesis and Characterization of Various Schiff's Bases for Nonlinear Optical Applications. For publication in The Journal of Chemical Physics, Chicago, IL.

BHAT, P.N. FISHMAN, G.J. MEEGAN, C.A. WILSON, R.B. PACIESAS, W.S. (UAH)

BHAT, N.P. FISHMAN, G.J. MEEGAN, C.A. WILSON, R.B. ET AL.
Spectral Evolution of a Sub-Class of Gamma Ray Bursts Observed by BATSE. For publication in the Astrophysical Journal, Tucson, AZ.

BHAT, P.N. FISHMAN, G.J. MEEGAN, C.A. WILSON, R.B. KOUVEELIOTOU, C. PACIESAS, W.S.
Spectral Evolution of a Sub-Class of Gamma Ray Bursts. For presentation at the Gamma Ray Burst Workshop, Huntsville, AL, October 20–22, 1993.

BHAT, P.N. FISHMAN, G.J. MEEGAN, C.A.
WILSON, R.B. PACIESAS, W.S.
Morphological Study of Short Gamma Ray Bursts. For presentation at the Gamma Ray Burst Workshop, Huntsville, AL, October 20–22, 1993.

Photoluminescence of Vapor and Solution Grown ZnTe Single Crystals. For presentation at the Sixth International Conference on II-VI Compounds and Related Optoelectronic Materials, Newport, RI, September 13–17, 1993.

BOECK, W.L. VAUGHAN, O.H., Jr. VONNEGUT, B. BROOK, M. McKUNE, J. BLAKESLEE, R.
Observations of Lightning in the Stratosphere. For publication in the Journal of Geophysical Research, Washington, DC.

BOGART, R.S. (Stanford University) HILL, F. (National Solar Observatory) TOUSSAINT, R. HATHAWAY, D.H. DUVALL, T.L., Jr. (GSFC)
Artificial Data for Testing Helioseismology Algorithms. For publication in the Proceedings

BOOKOUT, P.S. ED26

BOOKOUT, P.S. ED26

BORDELOM, W.J., Jr. ED35
KAUFFMAN, W.J., Jr.
HEAMAN, J.P.

BREWER, J.C. EB74
WHITT, T.H.
A Study of the Effects of Reconditioning on Nickel-Hydrogen Cells. For presentation at IECEC, Atlanta, GA, August 8–13, 1993, and for publication in the proceedings.

BREWER, J.C. EB74
WHITT, T.H.

BRIGGS, M.S. (UAH)
PACIESAS, W.S.
PENDLETON, G.N.
WILSON, R.B.
BANK, D.I. (UCSD)
GRUBER, D.E.
MATTESON, J.L.

BRUNTY, J. ED22
CHRISTENSEN, E. (Sverdrup)
CLARK, K.
FRADY, G.
RAYBURN, J.

SALAS, R.

BUKLEY, A.P. ED12
JOHNSON, C.D. (UAH)

BYRD, T.D. EP52
ISE, M.R.
FOSTER, J.W.

CAMPBELL, J. ES65

CAMPBELL, J.W. ES65
HOOVER, R.B.
BAKER, P.C. (Baker Consulting)

CANDIDI, M. (Instituto Fisica Spazio Internationalio)
DOBROWOLNY, M.
STONE, N.H. ES53

CAO, C. ES42
LAM, N.
QUATTROCHI, D.
Detecting the Scale and Resolution Effects in Remote Sensing and GIS. For presentation at the Annual Meeting of the American Society for

CARDELINO, B.  MOORE, C.

CARLSON, G.S.  JEDLOVEC, G.J.

CARRUTH, M.R., Jr.

CARTER, D.C.
Structure of Serum Albumin. For publication in Advances in Protein Chemistry, Lipoproteins, Apolipoproteins, and Lipases, Orlando, FL.

CARTER, D.C.
Structures, Chemistry and Microgravity Results of Human Serum Albumin. For presentation at Protein Crystal Growth in Microgravity, Panama City, FL, April 23–26, 1993.

CARTER, D.L.
BAGDIGIAN, R.M.

CHANDLER, K.
CLAVERT, B.

CHASE, T.J.
Wear Modes Active in Angular Contact Ball Bearings Operating in Liquid Oxygen Environment of the Space Shuttle Turbopumps. For publication in Lubrication Engineering (STLE), Park Ridge, IL, March 1993.

CHASSAY, R.P.
BROACH, T.M.

CHEN, P.S.
SANDERS, J.H.
LIAW, Y.K.
ZIMMERMAN, F.R.

CHOU, S.-H.

CHOW, A.S.
MO, J.D.

CHRISTIAN, H.J. ES43

CLARK, R. ES74
PENN, B.
CARDELINO, B.
ET AL.

CLAYTON, J.L. ED64

CLAYTON, J.P. (Remtech)
TINKER, M.L. ED26
Characterization and Modeling of an Advanced Flexible Thermal Protection Material for Space Applications. For publication in the Journal of Spacecraft and Rockets.

COHEN, C. ES42
A Comparison of Two Cumulis Parameterizations in Mesoscale Numerical Simulations of Moving Cloud Lines. For publication in the Monthly Weather Review, Boston, MA.

COLE, H. EB52

COMFORT, R.H. (UAH)
CRAVEN, P.D.
GALLAGHER, D.L.
WEST, R.L.
CHAPPELL, C.R.
The Relation of Satellite Potential to Ambient Plasma Density From Observations by the GEOS-2 and DE-1 Spacecraft. For presentation at The Dusty Plasma Workshop, Huntsville, AL, March 22–24, 1993.

COMFORT, R.H. (UAH)
CRAVEN, P.D.
GALLAGHER, D.L.
CHAPPELL, C.R.

COOK, S. PD24

COOPER, A. EB22
POWERS, W.T.
WALLACE, T.L.

COWAN, J.R. EP65
WEIR, R.A.

CRAFT, H.G., Jr. JA01

CRAFT, H.G., Jr. JA01
Spacelab Program’s Scientific Benefits to Mankind. For presentation at the 44th International Astronautical Congress, Graz, Austria, October 16–22, 1993.

CROSS, J.H., II (Auburn University)
SHACKELFORD, K. EB42

CROSSON, W.L. ES44/(USRA)
SMITH, E.A.
COOPER, H.J.
Impact of Satellite Remote Sensing of Slow Canopy Variables on Performance of a Hybrid
Biosphere Model. For publication in the Journal of Geophysical Research, Washington, DC.

CUTTEN, D.R. (UAH)
PEUSCHEL, R. (MRC)
ROTHERMEL, J. ES43
CLARKE, A.D. (University of Hawaii)
BOWDLE, D.A. ES43
Comparison of Measured and Modeled Scattering Parameters for Tropospheric Aerosols. For presentation at the 12th Annual Meeting of American Association for Aerosol Research, Oak Brook, IL, October 11–15, 1993.

DELCAS, L.J. (UAB)
CARTER, D.C. ES76
ET AL.
Recent Results and New Hardware Developments for Protein Crystal Growth in Microgravity. For publication in the Journal of Crystal Growth, Amsterdam, Netherlands.

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

DERRICKSON, J.H. ES62
EBY, P.B.
MOON, K.H. (USRA)
PARNELL, T.A.
KING, D.T. (University of Tennessee)
GREGORY, J.C. (UAH)
Takahashi, Y.
OGATA, T. (University of Tokyo)
Direct Production of Electron-Positron Pairs by Relativistic Oxygen and Sulfur Ions in Nuclear Emulsion. For publication in Physical Review Letters, Ridge, NY.

DESANCTIS, C.E. PS02
Small to Intermediate Satellites for Future Space Physics Missions. For presentation at SPIE’s Orlando ’93 Symposium, Orlando, FL, April 12–16, 1993.
DUFFY, J.B. (Rockwell)  
LEHNER, J.W.  
PANNELL, B.  
Evaluation of the National Launch System as a Booster for the PLS. For publication in the Journal of Spacecraft and Rockets, Blacksburg, VA, Spring 1993.

DUGAL-WHITEHEAD, N.R.  

DUNKIN, M.B. (Southern Research Inst.)  
OHLER, H.C.  
KOENIG, J.R.  
CLINTON, R.G.  
GOLDE, R.P. (Thiokol)  

EAGLES, D.M.  
A Conjectured Explanation for Room-Temperature Superconductivity in Narrow Channels in Oxidized Polypropylene. For publication in the Journal of Superconductivity, Eugene, OR.

EAGLES, D.M.  
Analysis of Resistance Data on a Good Ceramic Sample of YBa2Cu3O7-x. For publication in the Japanese Journal of Applied Physics, Tokyo, Japan.

EAGLES, D.M.  
Specific Heats and Thermodynamic Critical Fields in Zn-Doped YBa2Cu3O7-x According to an Induced-Pairing Model. For publication in Physics C, Amsterdam, The Netherlands.

EBY, P.B.  
Electron and Positron Emission Angle Distributions in Pair Production by Relativistic Heavy Ions. For publication in Nuclear Instruments and Methods in Physics Research, Section B, Argonne, Ill.

ELLIS, J.M.  

ELLIS, J.M.  

EMRICH, W.J., Jr.  

EMRICH, W.J., Jr.  

ENGELHAUPT, D. (UAH)  
ROOD, R.W.  

EVANS, S.W.  
DUKEMAN, G.A.  
Examination of a Practical Aerobraking Guidance Algorithm. For publication in the Journal of Guidance, Control, and Dynamics, Fairfax Station, VA.

EVANS, S.W.  
DUKEMAN, G.A.  

EVANS, S.W.  

FAWCETT, S.C.  
ROOD, R.W.

FAWCETT, S. ROOD, R.W.

Production of X-Ray Optics by Diamond Turning and Replication Techniques. For presentation at the ASPE Annual Meeting, Seattle, WA, November 7-12, 1993.

FAWCETT, S.C. DRUEDING, T.W. (Boston University) BIFANO, T.G.
Neutral Ion Figuring of CVD SiC. For publication in Optical Engineering.

FAY, J.F. (Sverdrup) HENGEN, J.E. (ED33)

FAZAH, M.M. LAK, T. (Rockwell) NGUYEN, H. WOOD, C.C. (European Space Agency)


FEKEL, F.C. BROWNING, J.C. (Tennessee State University) HENRY, G. MORTON, M.D. (Vanderbilt University) HALL, D.S. (Boeing)
Chromospherically Active Stars. X. Spectroscopy and Photometry of HD 212280. For publication in the Astronomical Journal, Woodbury, NY.

Retrieval of Thermospheric Atomic Oxygen, Nitrogen and Temperature From the 732 NM Emission Measured by the ISO on ATLAS 1. For publication in Geophysical Research Letters, Washington, DC.

FICHTL, G.H. (UAH) GALLOWAY, P.N. (Teledyne Brown)
TWICHELL, W.B.

FINCKENOR, J. ROGERS, P. OTTE, N. (ED52)

FINCKENOR, M.M. (EH15) LINTON, R.C. KAMENETZKY, R.R. VAUGHN, J.A.


FINESCHI, S. (Harvard-Smithsonian)
HOOVER, R.B. ES52
ZUKIC, M. (UAH)
KIM, J.
WALKER, A.B.C., Jr. (Stanford University)
BAKER, P.C. (Baker Consulting)

FISH, J.E. (Sverdrup)
SIMS, J.A.
HUGHES, M. EP75
A Practical Approach to Determining the Uncertainty of a Pressure Measurement System. For presentation at the 39th International Instrumentation Symposium (ISA), Albuquerque, NM, May 2–6, 1993.

FISHER, M.F. EP56
FOX, E.C.

FISHMAN, G.J. ES66

FISHMAN, G.J. ES66
MEEGAN, C.A.
WILSON, R.B.
BROCK, M.N.
HORACK, J.M.
KOUVELIOTOU, C. (USRA)
HOWARD, S.
PACIESAS, W.S. (UAH)
BRIGGS, M.S.
PENDLETON, G.N.
ET AL.
The First BATSE Gamma-Ray Burst Catalog. For publication in the Ap. J. Supplement Series, Tucson, AZ.

FISHER, M.F. EP56
FOX, E.C.

FISHER, M.F. EP56
FOX, E.C.

FISHMAN, G.J. ES66

FISHMAN, G.J. ES66
MEEGAN, C.A.
WILSON, R.B.
BROCK, M.N.
HORACK, J.M.
KOUVELIOTOU, C. (USRA)
HOWARD, S.
PACIESAS, W.S. (UAH)
BRIGGS, M.S.
PENDLETON, G.N.
ET AL.
The First BATSE Gamma-Ray Burst Catalog. For publication in the Ap. J. Supplement Series, Tucson, AZ.

FISHMAN, G.J. ES62
The BATSE Experiment on the Compton Gamma Ray Observatory. For presentation at the 30th Space Congress, Cocoa Beach, FL, April 1993.

FISHMAN, G.J. ES62
Observations From the BATSE Experiment on the Compton Gamma Ray Observatory. For publication in World Space Congress (COSPAR), Washington, DC, August 28–September 5, 1992.

FITZJARRALD, D. ES42
ROBERTSON, F.
BARRON, E. (Pennsylvania State University)
THOMPSON, S.
(National Center for Atmospheric Research)
POLLARD, D.

FONTENLA, J. (UAH)
SCHMIEIDER, B. (Observatoire de Paris)
SIMNETT, G. (UAH)
TANDBERG-HANSSEN, E. ES01
Time Evolution of a Mini-Flare as Seen in Ha, UV Lines, and X Rays. For publication in Astronomy and Astrophysics, Meudon, France.

FORSYTHE, E. (USRA)
PUSEY, M. ES76
Observations on Effects of Temperature and Precipitant Concentration on Lysozyme Face Growth Rates. For presentation at Protein Crystal Growth in Microgravity, Panama City Beach, FL, April 23–26, 1993.

FORSYTHE, E. (USRA)
PUSEY, M. ES76
Observations on Effects of Temperature and Precipitant Concentration on Lysozyme Face Growth Rates. For presentation at the Fifth International Conference on Crystallization of Biological Macromolecules, San Diego, CA, August 8–13, 1993.

FRAZIER, D.O.
WITHEROW, W.K.
GLICKSMAN, M.E.
FRAZIER, D.O.
WITHEROW, W.K.
FACEMIRE, B.R.
DOWNEY, J.P.
ROGERS, J.R.

FULTON, M.A.
RAMSEY, B.D.
KOLODZIEJCZAK, J.J. (Hughes Corp.)

GADDIS, S.W.
Experimental Study of Three Exit Pressure Distortions on Turbine Performance. For presentation at the 29th Joint Propulsion Conference and Exhibit, Monterey, CA, June 28–July 1, 1993.

GAFFNEY, N.I. (University of Texas)
LESTER, D.F.
TELESCO, C.M.

GALDOS, J.I. (Mayflower Communications Co.)
UPADHYAY, T.N.
DEATON, A.W.
LOMAS, J.M.

GALLAGHER, D.

GANGL, B.
FREESTONE, T.
SIMS, H.

GARY, G.A.
RABIN, D. (National Solar Observatory)

GEHRELS, N.
FICTHEL, C.E.
FISHMAN, G.J.
KURFESS, J.D.
SCHONFELDER, V.
The Compton Gamma Ray Observatory. For publication in Scientific American, New York, NY.

GENGE, G.G.
GU, A.

GERRISH, H.P., Jr.
DOUGHTY, G.E.

GHAFFARIAN, B. (Sverdrup)
CUMMINGS, R.

GILES, B.L.
CHAPPELL, C.R.
MOORE, T.E.
COMFORT, R.H. (UAH)
WAITE, J.H., Jr. (Southwest Research Institute)
Statistical Survey of Pitch Angle Distributions in Core (0–50 eV) Ions From Dynamics Explorer-1: Outflow in the Auroral Zone, Polar
Cap, and Cusp. For publication in the Journal of Geophysical Research, Washington, DC.

GILLIES, D.C. ES75
LARSON, D.J. (Gruumman)
LEHOCZKY, S.L. ES75
SZOFRAN, F.R. ET AL.

GOLDBERG, B.E. EP12
COOK, J.R.

GOLDE, R.P. (Thiokol) CLINTON, R.G. EE51

GOODMAN, S.J. ES42
CHRISTIAN, H.J. SCHARFEN, G.

GOODMAN, S.J. ES42
LAFONTAINE, F.J. HUFFMAN, G.J. (USRA) ADLER, R.F. (GSFC)

GOODMAN, S. RAGHAVAN, R. (USRA)

GOODMAN, S.J. CROSSON, W.L. LAYMON, C.A. DUCHON, C.A.

GORDON, S. (Nichols Research) NUNES, A.C., Jr. ED32

GRAHAM, J.B. PD22
Parametric Study of Shroud Design on Launch Vehicle Performance. For publication in the Journal of Spacecraft and Rockets, Blacksburg, VA.

GRIFFIN, L.W. ED32
HUBER, F.W.

GRIFFIN, L.W. ROWEY, R.J. (Pratt & Whitney) ED32

GUFFIN, T. EO43
ONKEN, J.

GUITEPER, S.M. ES53
MOORE, T.E.
GURULE-LEYBA, S.  
COLLINS, J.  
MASCARENAS, M.  
PENN, B.  
CLARK, R.D.  
Preparation of 4-Nitroanilines Containing Heterocyclic Amines. For presentation at the Science and Technology Alliance Materials Conference 93, Greensboro, NC, October 27–29, 1993.

HAGYARD, M.J.  
HAGYARD, M.J.  
WEST, E.A.  
SMITH, J.E.  
KENNY, E.G. (Boeing)  

HAKKILA, J. (Mankato State University)  
MEEGAN, C.A.  
PENDLETON, G.N. (UAH)  
FISHMAN, G.J.  
WILSON, R.B.  
ET AL.  
Constraints on Galactic Distributions of Gamma-Ray Burst Sources from BATSE observations. For publication in the Astrophysical Journal, Tucson, AZ.

HALE, J.P., II  
HALE, J.P., II  
HALE, J.P., II  
HALE, J.P., II  
HARM-BATTISTA, G. (Sverdrup)  
HUNT, G.  
FRANCK, C.  

HARMON, B.A.  
HARMON, B.A.  
HARMON, B.A.  
HARMON, B.A.  
FISHMAN, G.J.  
PACIESAS, W.S. (UAH)  
BRIGGS, M.S.  
GRO JO422+32. For publication in IAU Circular, Cambridge, MA.

HARMON, B.A.  
FISHMAN, G.J.  
PACIESAS, W.S. (UAH)  
LING, J.C. (JPL)
WHEATON, W.A.
CYGNUS X-1. For publication in the IAU Circular, Cambridge, MA.

HARMON, B.A.
FINGER, M.H.
KOUVELIOTOU, C. (USRA)
PACIESAS, W.S. (UAH)

HARMON, B.A.
FISHMAN, G.J.
PACIESAS, W.S. (UAH)
GRO JO422+32 Circular No. 5685. For publication in the IAU Circular, Cambridge, MA.

HARMON, B.A.
FISHMAN, G.J.
PACIESAS, W.S.
FINGER, M.
GX 339–4 Circular No. 5647. For publication in the IAU Circular, Cambridge, MA.

HARMON, B.A.
WILSON, C.A.
FINGER, M.H. (Computer Sciences Corp.)
BROCK, M.N.
WILSON, R.B.
FISHMAN, G.J.
RUBIN, B.C. (USRA)
MEEGAN, C.A.
PACIESAS, W.S. (UAH)
PENDLETON, G.N.

HARMON, B.A.
FISHMAN, G.J.
PARNELL, T.A.
LAIRD, C.E. (Eastern Kentucky University)

HARMON, B.A.
WILSON, R.B.
FISHMAN, G.J.
MEEGAN, C.A.
ET AL.

HARMON, B.A.
PACIESAS, W.S.
FISHMAN, G.J.
GRS1915+105. For publication in the IAU Circular, Cambridge, MA.

HARTFIELD, R.J., Jr. (Auburn University)
ESKRIDGE, R.

HASTINGS, L.J.
SCHMIDT, G.R.

HATHAWAY, D.H.
Revealing the Solar Interior. For publication in Astronomy Magazine, Waukesha, WI.

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

HATHAWAY, D.H.
WILSON, R.M.
REICHMANN, E.J.
The Shape of the Sunspot Cycle. For publication in Solar Physics, The Netherlands.

HATHAWAY, D.H.

HE, X.M.
HOLOWACHUK, E.W. (Bassett Hospital)
NORTON, E.J.
TWIGG, P.D.
CARTER, D.C.

ES76
Three-Dimensional Structure of Horse Serum Albumin at 2.7 Å. For publication in FEBS, Elsevier, Amsterdam, The Netherlands.


HO, J.X. (ES76) RUKER, F. KEELING, K. CARTER, D.C. Structure of FAB Fragment of 3D6 Monoclonal Antibody IgG and Its Binding to a Fragment of GP–41 of HIV Virus Type I. For presentation at the 16th International Conference of IUCR, Beijing, China, August 21–29, 1993.


presentation at the TMS Annual Conference, Denver, CO, February 1993.

HOOVER, R.B. ES52
SHEALY, D.L. (UAB)
GORE, D.
WALKER, A.B.C., Jr. (Stanford University)
BAKER, P.C. (Baker Consulting)
BARBEE, T.W., Jr. (Lawrence Livermore National Laboratory)


HOOVER, R.B. ES52
WALKER, A.B.C., Jr. (Stanford University)
FINESCHI, S. (Harvard-Smithsonian)
BAKER, P.C. (Baker Consulting)
KIM, J. (UAH)
ZUKIC, M.


HOPSON, G.D. KA01

Maintainable Design for Space Station Freedom. For presentation at the 44th International Astronautical Congress, Graz, Austria, October 16–22, 1993.

HORACK, J.M. ES66
KOSHUT, T.M. (UAH)
MALLOZZI, R.S.
STOREY, S.D. ES66
EMSLIE, A.G. (UAH)


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


HORACK, J.M. ES66
MEEGAN, C.A.
FISHMAN, G.J.
WILSON, R.B.
PACIESAS, W.S. (UAH)
EMSLIE, A.G.
PENDLETON, G.N.
BROCK, M.N. ES62

Effects of Location Uncertainties on the Observed Distribution of Gamma-Ray Bursts Detected by BATSE. For publication in The Astrophysical Journal, Tucson, AZ.

HORACK, J.M. ES64
HARMON, B.A.
FISHMAN, G.J.
MEEGAN, C.A.
WILSON, R.B.
PACIESAS, W.S. (UAH)


HOWARD, S. (USRA)
FINGER, M. (Computer Science Corp.)
MEEGAN, C.A. ES66
FISHMAN, G.J.
WILSON, R.B.
PACIESAS, W.S. (UAH)
GIBBY, L. (Boeing)

Search for Correlations of BATSE Gamma-Ray Bursts With Known Objects. For publication in Nature, Washington, DC.

HOWARD, S. ES62
FISHMAN, G.J.
MEEGAN, C.A.
WILSON, R.B.
PACIESAS, W.S.

HOWARD, S. ES66
KEEL, W.C. (University of Alabama)
BYRDI, G.
BURKEY, J.

HUDSON, S.T. ED35
HEAMAN, J.P.
DUNN, M.G. (Calspan)
Pressure Measurements on the First Stage Blades of the Space Shuttle Main Engine High Pressure Fuel Turbine Model. For presentation at the 29th Joint Propulsion Conference and Exhibit, Monterey, CA, June 28–July 1, 1993.

HUETER, U. PT21

HUFF, T.L. (Sverdrup)
DANFORD, M.D. EH24
WALSH, D.W. (California Polytechnic Institute)
RODGERS, E.B. EH32

HULKA, J.J. EP53
HUTT, J.

HUNG, R.J. ES42
LEE, C.C.
Effect of the Baffle on the Spacecraft Fluid Propellant Viscous Stress and Moment Fluctuations. For publication in the Journal of Aerospace Engineering, United Kingdom.

HUTT, J. EP56
ROCKER, M.

HUTT, J. EP13
ROBERTSON, T.
JAGGI, S.  
QUATTROCHI, D.A.  
LAM, N. S.-N.  

JAGGI, S. (Lockheed)  
BASKIN, R.L. (U.S. Geological Survey)  
QUATTROCHI, D.A.  

JAMES, B.  
JOHNSON, D.  
TYREE, L. (Sciences and Technology Corp.)  

JAMES, M.W.  
HOOD, R.E.  
SPENCER, R.W.  

JARZEMBSKI, M.A.  
SRIVASTAVE, V.  
Single Particle Calibration of Continuous Wave Doppler Lidars for Aerosol Backscatter Measurements. For presentation at the 12th Annual Meeting of the American Association for Aerosol Research, Oak Brook, IL, October 11–15, 1993.

JOHNSON, C.L.  
HERRMANN, M.C.  

JOHNSON, C.L.  
HERRMANN, M.C.  
The Inner Magnetosphere Imager Mission. For presentation at SPIE’s Orlando ‘93 Symposium, Orlando, FL., April 12–16, 1993.

JOHNSON, L.  
HERRMANN, M.  

JOHNSON, D.L.  
HILL, C.K.  
TYREE, L.W. (Science and Technology Corp.)  

JOHNSON, D.L.  
HILL, C.K.  
VAUGHAN, W.W. (UAH)  
BROWN, S.C. (USRA)  
BATTS, G.W. (New Technology, Inc.)  
Natural Environment Requirements Definition and Significance for Aerospace Plane Development. For presentation at the Fifth AIAA International Aerospace Planes and Technologies Conference, Munich, Germany, November 30–December 3, 1993.

JOHNSON, D.L.  

JOHNSTON, L.M.  
PERKINS, L.A.  
DENNISTON, C.L.  
PRICE, J.M.  
Advanced Main Combustion Chamber Structural Jacket Strength Analysis. For presentation at the 34th SDM Conference on AIAA/ASME/ASCE/AHS/ASC, LaJolla, CA, April 19–21, 1993.

JOHNSTON, L.  
Mitigation of Adverse Environmental Effects on Lunar-Based Astronomical Instruments. For presentation at the ISU ‘93 Alumni Conference, Huntsville, AL, August 6, 1993.
JONES, W.D. EB52

JOY, M. ES65
PRESTWICH, A.H.

JUNG, Y.-D. ES65
Screening Modifications on Trajectory of Projectile Electron in Electron-Ion Excitation in Dense Plasmas. For publication in The Astrophysical Journal, Tucson, AZ.

JUNG, Y.-D. ES65

JUNG, Y.-D. ES65
Thermal and Nonthermal Electron-Ion Bremsstrahlung Spectrum From High-Temperature Plasmas. For publication in Physics of Fluids B: Plasma Physics, Princeton, NJ.

JUNG, Y.-D. ES65

JUNG, Y.-D. ES65
Screening Effects on the Nonrelativistic Electron-Atom Bremsstrahlung Radiation Using Analytic Thomas-Fermi Model. For publication in Radiation Physics and Chemistry, Gaithersburg, MD.

KAMENETZKY, R.R. EH15
LINTON, R.C.
FINCKENOR, M.M.
VAUGHN, J.A.
WHITAKER, A.F.

KARIMI, M. (University of Pennsylvania)
VIDALI, G. (Syracuse University)
DALINS, I. EH22

KAVAYA, M.J. EB54

KEFFER, C.E. (UAH)
TORR, M.R. ES51
ZUKIC, M. (UAH)
SPANN, J.F. ES51
TORR, D.G. (UAH)
KIM, J. (UAH)
Radiation Damage Effects in Far Ultraviolet Filters and Substrates. For publication in Applied Optics, Washington, DC.

KELLER, V. PS02
BREAZEALE, L.
PERKINSON, D.
KINARD, W.H. (LaRC)
An LDEF Follow-On Spacecraft Concept. For presentation at the Third LDEF Post-Retrieval Symposium, Williamsburg, VA, November 8–12, 1993.

KELLOGG, E. (Harvard/Smithsonian)
CHARTAS, G.
GRASSLE, D.
HUGHES, J.P.
VAN SPEYBROECK, L.
ZHAO, P.
WEISSKOPF, M.C. ES65
ELSNER, R.F.
O’DELL, S.L.
The X-Ray Reflectivity of the AXAF VETA-I Optics. For publication in SPIE’s Multilayer and Grazing Incidence X-Ray/EUV Optics for Astronomy and Projection Lithography, San Diego, CA.

KIM, S. (Sverdrup)
TRINH, H.P. EP53
Design Study of an Advanced Gas Generator. For presentation at the 29th AIAA/SAE/ASME/

KNACKE, R.F. (Pennsylvania State University) FAJARDO-ACOSTA, S.B. (University of Stony Brook)
TELESIO, C.M. ES63 HACKWELL, J.A. (Aerospace Corp.)
LYNCH, D.K.
RUSSELL, R.W.
The Silicates in β Pictoris. For publication in The Astrophysical Journal, Tucson, AZ.

KNOX, E.C. (Remtech)
JAIN, A.C.
SEAFO RD, C.M. ED33

KOCZOR, R.J. ES41

KOELBI, M.E. EP62

KOELBI, M.E. EP62

KOENIG, J.R. (Southern Research Institute)
CLINTON, R.G. EH34
CANFIELD, A.R. (Thiokol)
PINOLI, P. (Lockheed)

KOSHAK, W.J. ES43
KRIDER, E.P. (University of Arizona)
Inference of Lightning Charges Based on a Multipole Expansion Model. For presentation at the Conference on Atmospheric Electricity, St. Louis, MO, October 4–8, 1993.

KOSKIEL, W.J. ES43
SOLAKIEWICZ, R.J.
PHANORD, D.D.
BLAKESLEE, R.J.
A Diffusion Model for Lightning Radiative Transfer. For publication in the JGR Atmospheres, Washington, DC.

KOSKIEL, W.J. ES43
BAILEY, J.C.
CHRISTIAN, H.J.

KOSKIEL, W.J. ES43
SOLAKIEWICZ, R.J.
PHANORD, D.D.
BLAKESLEE, R.J.

KOSKIEL, W.J. ES43
KRIDER, E.P. (University of Arizona)

KOSKIEL, W.J. ES43
BAILEY, J.C.
CHRISTIAN, H.J.

KOSKIEL, T.M. (UAH)
PACIESAS, W.S.
PENDLETON, G.N.
BROCK, M.N. ES66

KOSKIEL, T.M. (UAH)
PACIESAS, W.S.
PENDLETON, G.N.
BRIGGS, M.S.
PREECE, R.D. ES66

KOSHUT, T.M. (UAH)
KOUVELIOTOU, C. ES66
PACIESAS, W.S. (UAH)
PENDLETON, G.N.
BRIGGS, M.S.
PREECE, R.D. ES66

KOUVELIOTOU, C. (USRA)
PREECE, R. ES66
GHAT, N.
FISHMAN, G.J.
BRIGGS, M.S.
ET AL.

KOUVELIOTOU, C. (USRA)
MEEGAN, C.A. ES66
FISHMAN, G.J.
BHAT, N.P.
PACIESAS, W.S. (UAH)
PENDLETON, G.N.
ET AL.

KOUVELIOTOU, C. ES66

KOUVELIOTOU, C. (USRA)
FINGER, M.H. ES64
FISHMAN, G.J.
MEEGAN, C.A.
WILSON, R.B.
PACIESAS, W.S. (UAH)
MINAMITANI, T.
PARADIJS, J.V.
(Amsterdam Astronomical Institute)

Detection of Quasi-Periodic Oscillations (QPO) From CYG X–1 and GRO JO422+32. For publication in the Proceedings of Compton Observatory Symposium, St. Louis, MO, October 15–17, 1992.

KROEHL, H.W. ES42
SCHARFEN, G.R.
ARRANCE, E.S.
GOODMAN, S.J.

KROGULEC, M. (UAH)
MUSIELAK, Z.E.
SUSS, S.T.
MOORE, R.L.
NERNEY, S.F.

KUMAR, G.N. (Sverdrup)
GRIFFITH, D.O.
PRENDERGAST, M.J.
SEAFORD, C.M. ED33

KUMAR, G.N. (Sverdrup)
GRIFFITH, D.
FAY, J.
SEAFORD, C.M. ED33
KUMAR, G.N. (Sverdrup)
GRIFFITH, D.O.
PRENDERGAST, M.J.
SEAFORD, C.M. ED33

KUMAR, G.N. (Sverdrup)
MOYLAN, B.E.
GRIFFITH, D.O., II
SEAFORD, C.M. ED33

KUMAR, G. (Sverdrup)
GRIFFITH, D.O.
WARSII, S.A.
SEAFORD, C.M. ED33

KUO, F. ED14

KURUVILLA, A.K. (IIT Research Institute)
PANDA, B.
BHAT, B.N. EH23

KURUVILLA, A.K. (IIT Research Institute)
PANDA, B.
BHAT, B.N. EH23
Correlation Between Hydrogen Environment Embrittlement and Electron-to-Atom Ratio in Incoloy 903 Type Alloys. For publication in Metallurgical Transactions, Warrendale, PA.

LANDERS, J.C. CP21

LANDERS, L.C. (Lockheed)
BOOTH, D.W.
STANLEY, C.B.
RICKS, D.W. EE73

LAPENTA, W.M. ES42
PERKEY, D.J. (Drexel University)
KRIETZBERG, C.W.
The Role of the Sea-Surface Temperature Distribution on Explosive Cyclogenesis Observed During Erica. For presentation at the Cyclone Workshop, Val-Morin, Quebec, Canada, October 12–16, 1992.

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

LAROSA, T.N. ES52
SHORE, S.N. (GSFC)
MOORE, R.L. ES52

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

LAROSA, T.N. ES52
MAGNANI, L. (University of Georgia)
SHORE, S.
The Observation of Coherent Velocity Structures in a Translucent Molecular Cloud and Implications for Turbulence. For presentation at

LARSON, D.J., Jr. (Grumman)
SILBERSTEIN, R.P.
DiMARZIO, D.
CARLSON, F.C. (Clarkson University)
GILLIES, D.
LONG, G. (NIST)


LASSITER, J.O. ED74
RICE, S.C. (Logicon Control Dynamics, Inc.)


LEDBETTER, F.E., III EH33
BOWER, M.V. (UAH)


LEE, J.E. EE83
JEWETT, R.P. (Rocketdyne)
MOORE, D.R. EE83
MURPHY, A.R. (Rockwell)
HORN, R.M. (Aerojet)
FUNKHouser, M.E. (Pratt and Whitney)

STME Database Standardization. For presentation at the Fourth International Symposium on Computerization and Use of Materials Property Data, Gaithersburg, MD, October 6–8, 1993.

LEHOczKYS, S.L. ES75
SZOFRAN, F.R.
GILLIES, D.C.
COBB, S.D.
SU, C.-H. (USRA)
SHA, Y.-G. (UA)

Bulk Growth of II-VI Semiconducting Compounds. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SZOFRAN, F.R.
GILLIES, D.C.
COBB, S.D.
SU, C.-H. (USRA)
SHA, Y.-G. (UA)

Growth of HgZnTe in Microgravity by Directional Solidification I. Ground Based Research. For presentation at the International Symposium on Microgravity Science and Application, Beijing, China, May 10–12, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the International Symposium on Microgravity Science and Application, Beijing, China, May 10–12, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

LEHOczKYS, S.L. ES75
SU, C.-H. (USRA)
SZOFRAN, F.R.
GILLIES, D.C.
SHA, Y.-G. (USRA)

Growth of HgZnTe in Microgravity by Directional Solidification II. Flight Experiment. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.
LESTER, D.F. (University of Texas)
GAFFNEY, N.I.
TELESCO, C.M.


LI, W.-G. (University of Western Ontario)
ZENG, X.-C.


LIGHTFOOT, R.
GAUTNEY, T.


LINDNER, J.
GILBERT, J.A. (UAH)


LINTON, R.C.
FINCKENOR, M.M.
KAMENETZKY, R.R.
VAUGHN, J.A.
WHITAKER, A.F.
DEHAYE, R.F.


LINTON, R.C.
KAMENETZKY, R.R.


LIVINGSTON, J.M.


LORANC, M.
ST.-MAURICE, J.-P. (University of Western Ontario)

A Time-Dependent Gyro-Kinetic Model of Thermal Ion Upflows Generated by Ion-Neutral Frictional Heating in the High-Latitude F Region. For publication in the Journal of Geophysical Research, Washington, DC.

LU, H.-L. (IGCRE)
MILLER, T.L.


LU, H.-L. (IGCRE)
MILLER, T.L.


LUVALL, J.C.


LUZ, P.L.

Structural Design and Mitigation of Mirror Deformations in Lunar-Based Telescopes. For publication in the Journal of Spacecraft and Rockets, Blacksburg, VA.

LUZ, P.L.

Structural Design and Mitigation of Mirror Deformations in Lunar-Based Telescopes. For presentation at AIAA Space Programs and Technologies Conference and Exhibits, Huntsville, AL, September 21–23, 1993.
MACARI-PASQUALINO, E.J.  
(University of Puerto Rico) 
LAYMON, C.A.  
(USRA) 
COSTES, N.C.  
ES42 
Hydrologic Field Instrumentation for a Small-Scale Experiment With Implications for Rain-Induced Slope Stability Analyses. For presentation at the First Brazilian Conference on Slope Stability, Rio De Janeiro, Brazil, May 15, 1993.

MACARI-PASQUALINO, E.J.  
(University of Puerto Rico) 
COSTES, N.C.  
PARKER, J.K.  
(University of Alabama) 

MACHADO, M.E.  
EMSLIE, A.G.  
ONG, K.K.  
FISHMAN, G.J.  
PACIESAS, W.S.  
(UAH)  

MACHADO, R.S.  
PENDLETON, G.N.  
PACIESAS, W.S.  
BRIGGS, M.S.  

MACHADO, R.S.  
PACIESAS, W.S.  
PENDLETON, G.N.  
HARMON, B.A.  
WILSON, C.A.  
ZHANG, S.S.  

MARTINEZ, A.  
PENN, B.  
CLARK, R.D.  

McCABER, R.O.  
FRAZIER, J.  
NEIN, M.  

McCABER, J.W.  
PD32 

McCABER, J.W.  
PD32 
Lunar Based Telescope Requirements and Their Influence on Landing Site Selection. For presentation at the AIAA Space Programs and Technologies Conference and Exhibit, Huntsville, AL, September 21–23, 1993.

McCABER, E.W., Jr.  
BOWDLE, D.A.  
CUTTEN, D.R.  
MENZIES, R.T.  
SPINHRINE, J.D.  

McCONNAUGHEY, H.V.  
EP01 
Test Results From the Space Shuttle Main Engine Technology Test-Bed. For presentation at the 31st Aerospace Sciences Meeting, Reno, NV, January 11–14, 1993.

McCONNAUGHEY, P.K.  
GARCIA, R.  
GRIFFIN, L.A.  
RUF, J.A.  
Computational Fluid Dynamics (CFD) Applications in Rocket Propulsion Analysis and Design.
For presentation at the Fifth Annual Symposium on Space Propulsion, University Park, PA, September 8-9, 1993.

McDONOUGH, G.F. EA01

McGILL, P.B. EH23
MOUNT, A.R.
Effectiveness of Metal Matrix and Ceramic Matrix Composites as Orbital Debris Shield Materials. For presentation at the AIAA, Space Programs and Technologies Conference, Huntsville, AL, March 24-26, 1992.

McKECHNIE, T. (Rockwell) EH25
KROTZ, P.
LIAW, Y.
ZIMMERMAN, F.
HOLMES, R.

McKECHNIE, T.N. (Rockwell) EH42
KROTZ, P.
LIAW, Y.K.
ZIMMERMAN, F.
POORMAN, R.
HOLMES, R.

McKECHNIE, T.N. (Rockwell) EH42
LIAW, Y.K.
ZIMMERMAN, F.
POORMAN, R.

McPHerson, W.B. EH23
BHAT, B.N.
VESELY, E.J., Jr. (IIT Research Institute)
JACOBS, R.K.


McQUEen, D.H., Jr. EP44

MEDINA, E.A. (Ohio University) ES62
IRWIN, R.D.
MItCHELL, J.R.
BUKLEY, A.P. ED12

MEEGAN, C.A. ES66
FISHMAN, G.J.
WILSON, R.B.
PACIESAS, W.S.
ET AL.
Gamma Ray Bursts. For publication in IAU Telegrams, Cambridge, MA.

MEEGAN, C.A. ES66
The Burst and Transient Source Experiment. For presentation at the AIAA Conference, Huntsville, AL, September 21, 1993.

MELENDEZ-ALVIRA, D.J. (NAS/NRC) ES55
BURNSIDE, R.G. (Arecibo Observatory)
WALKER, J.C.G.
Modeling the Arecibo Nighttime F2 Layer II. Ionospheric Gradients. For publication in the Journal of Geophysical Research, Washington, DC.

MELENDEZ-ALVIRA, D.J. ES55/(NRC)
TORR, D.G.
RICHARDS, P.G.
SWIFT, W.R.
TORR, M.R.
Enhanced Thermal Electron Production of O(1D) Due to Photoelectron Trapping. For publication in the Journal of Geophysical Research, Washington, DC.

MELENDEZ-ALVIRA, D.J. ES55/(NRC)
TORR, D.G.
RICHARDS, P.G.
SWIFT, W.R.
TORR, M.R.
RASSOUL, H.
Sensitivity of the 6300 Å Twilight Airglow to Neutral Composition. For publication in the Journal of Geophysical Research, Washington, DC.

MILLER, T.L.
LESLIE, F.W.

MILLER, T.L.
LU, H.-I.
BUTLER, K.
Multiple Solutions in a Rotating Annulus Flow Model. For presentation at the Ninth Conference on Atmospheric and Oceanic Waves and Stability, San Antonio, TX, May 10–14, 1993.

MILTON, M.E.
TYLER, T.R.

MIN, J.B.
BASS, J.M. (Computational Mechanics Co.)
SPRADLEY, L.W. (Adaptive Research Corp.)

MITCHELL, R.E.

MOG, R.A. (SAIC)
HELBIA, M.J. (UAH)
ROBINSON, J.H.
ED52

MOLL, J.H. (Crucible Research)
CHIN, H.A. (Pratt and Whitney)
GENTZ, S.J.
Improved 440C Bearing by P/M Processing. For presentation at the ASM Materials Conference, Pittsburgh, PA, October 17–21, 1993.

MONTGOMERY, E.E., IV
PS04

MOORE, C.E.
CARDELINO, B.H. (Atlanta University)
PENN, B.
BALLARD, J. (New Mexico Highlands University)
SANGHADASA, M. (UAH)
BARR, T.A., Jr.
FRAZIER, D.O.
ED74
Clarification of the Static Second-Order Polarizabilities of (2,4)-Dinitro Substituted Benzenes. For publication by the American Chemical Society, Washington, DC.

MOORE, R.L.
ROUMELIOTIS, G. (Stanford University)
LAROSA, T.N.

MOORE, T.E.
DELcourt, D.C.
GILES, B.L.
POLLOCK, C.J.
ES53
The Ionosphere as a Source of Magnetospheric Plasma. For presentation at the Seventh Scientific Assembly, IAGA, Buenos Aires, Argentina, August 16–21, 1993.

MOORE, T.E.
DELcourt, D.C.
Large Scale Structure of Magnetospheric Plasmas. For presentation at the Seventh Scientific Assembly, IAGA, Buenos Aires, Argentina, August 16–21, 1993.

MOYLAN, B. (Sverdrup)
SULYMA, P.
ED33
Nusselt Number Correlations for Solid Rocket Motor Environments. For presentation at the
NERNEY, S. ES52
SUESS, S.T.

NISHIMUTA, E.L. PD23
ROBERTS, W.T.

NIXON, R.F. PT31
GORACKE, B.D. (Rockwell)
LEVACK, D.J.H.
The F-1A and the SSME: A Route to the Future. For presentation at the AIAA Space Programs and Technical Conference, Huntsville, AL, September 15–21, 1993.

NOCI, G. (Università di Firenze, Italy)
POLETTO, G. (Osservatorio Astrofisico di Arcetri)
SUESS, S.T.
WANG, A.-H.
WU, S.T.
Predicting Ly-α Intensities in Coronal Streamers. For publication in the Proceedings of the SOHO Workshop, Annapolis, MD, August 1992.

NOEVER, D.A. ES76
Himalayan Sandpiles. For publication in Physical Review, Ridge, NY.

NOEVER, D.A. ES76
Spiral Moiré Patterns: A New Analogy for Fractal Holography. For publication in the Journal of the Physical Society of Japan, Tokyo, Japan.

NOEVER, D.A. ES76

NOEVER, D.A. ES76
Foam Fractionation of Particles in Low Gravity. For publication in the AIAA Journal of Spacecraft and Rockets, Blacksburg, VA.

NOEVER, D.A. ES76
Scaling Laws for Buckling Instability in Monolayer Networks. For publication in Physical Review Letters, New York, NY.
NOEVER, D.A. ES76
Double-Angled Wall Design for Enhancing Solar Pond Performance. For publication in Solar Energy, Madison, WI.

NOEVER, D.A. ES76
MATSOSS, H.C.
LOOGER, L.L.
JONES, M.M. (Vanderbilt University)
SINGH, P.K.
Organic Chelation of Cadmium Using PDMS: A Bioconvective Test for Protective Effects. For publication in the Journal of Environmental Science and Health, Baton Rouge, LA.

NUNES, A.C., Jr. EH23

NUNES, A.C., Jr. EH42

NURRE, G.S. ED12
NELSON, J.D.
BRADLEY, A.J.

OBENHUBER, D.C. (Sverdrup) ED32
RODGERS, E.B.

OBENHUBER, D.C. (Sverdrup) ED32
RODGERS, E.B.
The Development of a Defined Microbial Community in a Materially Closed Ecosystem. For presentation at the American Society for Microbiology, 93rd General Meeting, Atlanta, GA, May 16–20, 1993.

O'KEEFE, E. Boeing ED33
COUNTER, D.

Noise Control for Space Station Freedom. For publication in Sound and Vibration Magazine, Bay Village, OH.

O'LEARY, J.D. (Perkin Elmer)
PYLE, B.H. (Montana State University)
SNYDER, G. (GS&C, Inc.)
ROMAN, M.C. ED62

OLSEN, G.D. ED52
NOLEN, A.M.
Advanced Shield Design for Space Station Freedom. For presentation at the 1992 Hyper-velocity Impact Symposium, Austin, TX, November 17–19, 1992.

O'NEIL, D.A. PT31
EARLEY, S.M. (Martin Marietta)

PACIESAS, W.S. (UAH)
BRIGGS, M.S.
PENDLETON, G.N.
HARMON, B.A.
WILSON, C.A.
ZHANG, S.N.
LING, J.C. (JPL)
SKELTON, R.T.
WHEATON, W.A.

PACIESAS, W.S. (UAH)
MALLOZZI, R.S.
PENDLETON, G.N.
HARMON, B.A.
WILSON, C.A.
ZHANG, S.N.
LING, J.C. (JPL)
SKELETON, R.T.
WHEATON, W.A.

PACIESAS, W.S. (UAH)
HARMON, B.A.
BRIGGS, M.S.
FINGER, M.H. ET AL.

PACIESAS, W.S. (UAH)
PENDLETON, G.N.
BRIGGS, M.S.
HARMON, B.A.
FISHMAN, G.J.
MEEGAN, C.A.
WILSON, R.B.
ET AL.

PADAVALA, S. (Texas A&M University)
PALAZZOLO, A.B. (Texas A&M University)
VALLELY, P.
RYAN, S.

PALEY, M.S.
FRAZIER, D.O.
McMANUS, S.P. (UAH)
ZUTAUT, S.E.
SANGHADASA, M.
Diacetylene and Polydiacetylene Derivatives of 2-Methyl-4-Nitroaniline for Second-Harmonic Generation. For publication in the Journal of American Chemical Society, Austin, TX.

PARADIJS, J.V.
TELESCO, C.M.
KOVELIOTOU, C.
FISHMAN, G.J.
10 \mu m Observations of the Hard X-Ray Transient GRO J0422+32. For publication in the Astrophysical Journal Letters, Cambridge, MA.

PEARSON, S.D.
McCULLUM, M.B.

PENDLETON, G.N. (UAH)
PACIESAS, W.S.
BRIGGS, M.S.
HARMON, B.A.
WILSON, C.A.
FISHMAN, G.J.
MEEGAN, R.B.
Channel to Energy Calibration Results for the BATSE Large Area Detectors. For presentation at the Second Compton Symposium, College Park, MD, September 20–22, 1993.

PENDLETON, G.N.
PACIESAS, W.S.
BRIGGS, M.S.
ET AL.

PENDLETON, G.N. (UAH)
PACIESAS, W.S.
BRIGGS, M.S.
MALLOZZI, R.S.
KOSHUT, T.M.
FISHMAN, G.J.
MEEGAN, C.A.
Continuum Spectral Characteristics of Bursts Measured With the BATSE Large Area Detectors. For presentation at the Gamma-Ray Burst Workshop 1993, Huntsville, AL, October 20–22, 1993.

PENDLETON, G.N. (UAH)
BRIGGS, M.S.
BRAINERD, J.J.
BROCK, M.N.
FISHMAN, G.J.
MEEGAN, C.A.
HAKKILA, J.
Assessment of Systematic Effects on Angular Correlations in the BATSE Burst Location Data. For presentation at the Gamma-Ray Burst Workshop 1993, Huntsville, AL, October 20–22, 1993.

PERKINS, I.A.
JOHNSTON, L.
DENNISTON, C.

---

Note: The document contains a list of authors and their affiliations along with their contributions to various scientific papers and presentations. The text is formatted with proper citation and publication details.
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

CZEKALSKI, B.E. (Intergraph)
Finite Element Analysis of a Composite Artificial Ankle. For presentation at The Third National Technology Transfer Conference, Baltimore, MD, December 8, 1992.

PETERS, P.M.
WHITEHOUSE, P.L.
GREGORY, J.C. (UAH)
Measurments of the Long Duration Exposure Facility Attitude. For publication in Rarefied Gas Dynamics (AIAA Book), New York, NY.

PETERS, P.N.
BROWN, Y.
GREGORY, J.C. (UAH)

PHILLIPS, M.E.
SELMARTEN, J.D. (Teledyne Brown)

PIZZANO, F.
PUTCHA, C.S. (California State University)
HERDA, D.A.
BUSH, D.R.
STATUM, D.M. (PRC)
ANDING, B.J. (USBI)

PLACHTA, D.W. (LeRC)
TUCKER, S.
HOFFMAN, D.J. (LeRC)

PORTER, J.G.
FONTENLA, J.M.
SIMNETT, G.M. (UAB)
Simultaneous UV and X-Ray Observations of Solar Microflares. For publication in the Astrophysical Journal, Chicago, IL.

PORTER, J.G.
FONTENLA, J.M.
SIMNETT, G.M. (UAB)

PORTER, J.G.
Microflares. For publication in Scientific Results From the Solar Maximum Mission, New York, NY.

POWERS, W.T.
COOPER, A.E.
WALLACE, T.L.

POWERS, W.T.
COOPER, A.E.
WALLACE, T.L.

PREECE, R.D.
KOUVELIOTOU, C.
BROCK, M.N.
BRIGGS, M.S. (UAH)

PUSEY, M.L.
A Computer Controlled Microscopy System for Following Protein Crystal Face Growth Rates. For publication in Review of Science Instructions, New York, NY.
QUATTROCHI, D.A. ES42

QUATTROCHI, D.A. ES42

QUATTROCHI, D.A. ES42
RIDD, M.K.

QUATTROCHI, D.A. ES42

RAGHAVAN, R. ES44
CHANDRASEKAR, V. (Colorado State University)
CAYLOR, L.J. (Colorado State University)

RAGHAVAN, R. ES44
CHANDRASEKAR, V.

RAGHAVAN, R. (USRA)
GOODMAN, S. ES42

RAGHAVAN, R. (USRA)
GOODMAN, S. ES42

RAIKAR, G.N. (UAH)
GREGORY, J.C.
WEIMER, J.J.
YOUNG, P.R. (LaRC)
PETERS, P. ES63

RAMACHANDRAN, N. (USRA)
BAUGHER, C. ES71
ROGERS, M. (UAH)

RAMACHANDRAN, N. ED35
SMITH, A.
McDANIELS, D.
VU, B.

Crystal Growth and Investigation of Efficient Nonlinear Optical Materials in the Mixed (2,4-Dinitrophenyl)-L-Alanine (DPA) and 2-Methyl-4-Nitroaniline (MNA) System. For publication in the Journal of Applied Physics, Argonne, Ill.

RATCLIFF, M.L. (CFD Research Corp.) ATHAVALE, M.M. THOMAS, M.E. WILLIAMS, R.W.

RAY, P.S. CT01
Some Aspects of Safety and Survival of the Space Station Freedom. For presentation at the International Foundation for Industrial Ergonomics and Safety Research Annual Conference, Copenhagen, Denmark, June 8–10, 1993.

REDDY, B.R. (Alabama A&M University) NASH-STEVENSON, S. VENKATESWARLU, P.
Energy Upconversion of LaF₃Ho₃⁺. For presentation at the Ninth Interdisciplinary Laser Science Conference and JOSA B, Toronto, Canada, October 3–8, 1993.

ROBERTS, W.T. PS02

ROBERTSON, F.R. ES42

POLLARD, D.

ROBERTSON, F.R. ES42
Large Scale Structure of Water Vapor and Condensate Over the TOGA-COARE Region. For presentation at the American Meteorological Society Annual Meeting, Nashville, TN, January 23–28, 1994.

ROBINSON, M.B. ES75
BAYUZICK, R.J. (Vanderbilt University) HOFMEISTER, W.H.
Solidification Velocity Measurement in an Undercooled Falling Drop. For publication in ACTA Metallurgica, Elmsford, NY.

ROGERS, J. ES74
DOWNEY, J.P.
WITHEROW, W.K. FACCMIRE, B.R. FRAZIER, D.O.

ROGERS, J.R. ES74
DOWNEY, J.P.
WITHEROW, W.K. FACCMIRE, B.R. FRAZIER, D.O.
ROGERS, J.R. ES74
DOWNEY, J.P.
WITHEROW, W.K.
FACEMIRE, B.R.
FRAZIER, D.O.

ROGERS, J.R. ES75
Engineering in the Space Science Program at NASA. For publication in Colorado Society of Women Engineers, Denver, CO.

ROMAN, M.C. ED62
MINTON, S.A.

ROMAN, M.C. ED62
WILSON, M.E.
ATKINSON, C.
GAUTHIER, J.J.

ROMERO, E. ES74
PENN, B.
CLARK, R.D.

ROSENBERGER, T. ES76
CRONISE, R.C.
VAN ALSTINE, J.M.
(UAH)

ROSENTHAL, M. TA61

ROTHERMEL, J. ES43
HARDESTY, R.M.
MENZIES, R.T.

RUBIN, B.C. ES66
HARMON, B.A.
FINGER, M.H.
MEEGAN, C.A.
FISHMAN, G.J.
ET AL.
Modeling the Gamma-Ray Background on BATSE. For presentation at the Second Compton Symposium, College Park, MD, September 20–22, 1993.

RUFF, T.E. (Boeing) PT41
VAS, I.E.
WOODCOCK, G.R.
ADAMS, A.

RUFF, T.E. (Boeing) PT41
VAS, I.E.
WOODCOCK, G.R.
ADAMS, A.M.

RUPP, C.C. PS04
WEBSTER, W. (GSFC)
SEDS-2 Mission Plans. For presentation at the AIAA Space Programs and Technology Conference, Huntsville, AL, September 23, 1993.

RYAN, R. ED01
Robustness. For publication in (AIAA) Journal of Spacecraft and Rockets, Blacksburg, VA.
RYAN, R.  

RYAN, R.S.  
TOWNSEND, J.S.  

RYAN, R.S.  
JEWELL, R.E.  

RYAN, R.  
VERDRAIME, V.  

SAFIE, F.M.  

SAMI R, U.  
WRIGHT, K.H.  
STONE, N.H.  
REASONER, D.L.  

SANDERS, J.H.  
CHEN, P.S.  
GEN T Z, S.J.  
PARR, R.A.  

SANDERS, J.H.  
JERMAN, G.A.  
Failure Analysis of a Space Shuttle Solid Rocket Booster APU Fuel Isolation Valve. For publication in ASM: Handbook of Case Histories in Failure Analysis, Volume II.

SAUCIER, S.P.  

SCHMIEDER, B.  
HAGYARD, M.J.  
AI, G.  
HONGQI, Z.  
ET AL.  

SHA, Y.-G.  
SU, C.-H.  
SZOFRAN, F.R.  
Thermodynamic Analysis and Mass Flux of the HgZnTe-HgI2 Chemical Vapor Transport System. For publication in the Journal of Crystal Growth, Amsterdam, The Netherlands.

SHARKEY, J.P.  
NURRE, G.S.  
BEALS, G.A.  
NELSON, J.D.  

SHARKEY, J.P.  
POLITES, M.E.  
LIGHTSEY, W.D.  
NURRE, G.S.  

SINGH, J.  
SINGH, J.   EH25
BHAT, B.N. 
POORMAN, R. 
KAR, A.  (University of Illinois)
MAZUMDER, J.

SISK, R.C.  ES63
HELTON, A.J.
   Scanning Instrumentation for Measuring Magnetic Field Trapping in High Tc Superconductors. For publication in Review of Scientific Instruments, Argonne, IL.

SMITH, A.W.  ED36
HEAMAN, J.P.
YEH, Y.P.  (Engineering Research Corp.)
RAMACHANDRAN, N.

SMITH, A.W.  ED36
HEAMAN, J.P.
YEH, Y.P.  (Engineering Research Corp.)
RAMACHANDRAN, N.

SNOODDY, W.C.  PA01
NEIN, M.E.
   Design Considerations and Strategies for Lunar Based Observatories. For presentation at the 44th International Astronautical Congress, Graz, Austria, October 16–22, 1993.

SNYDER, R.S.  ES71

SNYDER, R.S.  ES71
MILLER, T.Y.

SNYDER, R.S.  ES71
ROBERTSON, F.R.

SOHN, B.J.  ES42
KOSHAH, W.J.
PHANORD, D.D.

SPENCER, R.W.  ES43
   Global Oceanic Precipitation From the MSU During 1979–91 and Comparisons to Other Climatologies. For publication in J. Climate, Boston, MA.

SPENCER, R.W.  ES43
CHRISTY, J.R.  (UAH)
   Precision Lower Stratospheric Temperature Monitoring With the MSU: Technique, Validation, and Results 1979–1991. For publication in the Journal of Climate, Boston, MA.

73


Fore Pressure Related Phenomena and Their Relationship to Performance. For presentation at the Annual JANNAF RNTS Meeting, Sunnyvale, CA, December 8–10, 1992.

Results of a 19B Cowl Post-Flight Study. For presentation at the Annual JANNAF RNTS Meeting, Sunnyvale, CA, December 8–10, 1992.

STOKES, J.W.  

STOLLBERG, M.T.  
PACIESAS, W.S.  
FINGER, M.H.  
FISHMAN, G.J.  
WILSON, R.B.  
MEEGAN, C.A.  
HARMON, B.A.  
WILSON-HODGE, C.A.  

STOLLBERG, M.T.  
PACIESAS, W.S.  
FINGER, M.H.  
FISHMAN, G.J.  
WILSON, R.B.  
MEEGAN, C.A.  
WILSON, A.  
FISHMAN, G.J.  
MEEGAN, C.A.  
WILSON-HODGE, C.A.  

STONE, N.H.  

STONE, N.H.  
CANDIDI, M. (Italian CNR/IFSI)  
The Future of Long Tethers in Space: An Initial Assessment of TSS-1. For publication in Aerospace America, Washington, DC.

STONE, N.H.  
WRIGHT, K.H., Jr.  
WINNINGHAM, J.D.  
(BSouthwest Research Institute)  
BIARD, J.  
GURGILO, C.  
A Technical Description of the TSS-1 ROPE Investigation. For publication in Nuevo Cimento, Frascati, Italy.

STRASSMEIER, K.G. (Institut fur Astronomie)  
HALL, D.S. (Vanderbilt University)  
FEKEL, F.C.  
SCHHECK, M. (Institut fur Astronomie)  
A Catalog of Chromospherically Active Binary Stars. For publication in Astronomy and Astrophysics Supplement Series, France.

SU, C.-H.  
SHA, Y.-G.  
VOLZ, M.P.  
GILLIES, D.C.  
SZOFRAN, F.R.  
LEHOCZKY, S.L.  
WANG, J.C.  

SUCESS, S.T.  
NERNEY, S.  
The Termination Shock and the Heliosheath. For presentation at the Cosmic Winds and Heliosphere Meeting, Tucson, AZ, October 18–22, 1993.

SUCESS, S.T.  
NERNEY, S.  
The Polar Heliospheric Magnetic Field. For publication in Geophysical Research Letters, Washington, DC.

SUCESS, S.T.  
McCOMAS, D.J.  
BAME, S.J.  
GOLDSTEIN, B.E.  
BALOGHI, A.  
SMITH, E.J.  
NELLIGAN, T.
MOONEY, P.

SULLIVAN, R.M.
On the Constitutive Relations for the High-Temperature, Nonlinear Expansion of Polymeric Composites. For presentation at the ASME Summer Applied Mechanics Meeting, Charlottesville, VA, June 6–9, 1993.

SULLIVAN, R.

SUMMERS, M.T. (Pratt and Whitney)
RUSSELL, S.S. EH13

SWARTZ, D.A.
CLOCCHIATTI, A. (University of Texas)
BENJAMIN, R.
LESTER, D.F.
WHEELER, J.C.
SN 1993J: Spectroscopic Link to Type Ibc Supernovae. For publication in Nature, Washington, DC.

SWARTZ, D.A.
SULKANEN, M.E.

SZOFRAN, F.R.

TAYLOR, K.R.
WATKINS, J.R.
GALLOWAY, P.N.
Space Commercial (Spacecom) Data Base Overview. For presentation at the 30th Space Congress, Cocoa Beach, FL, April 27–30, 1993.

TAYLOR, W.E.
TA91
AXAF-S; A Pathfinder Project for MSFC Product Development. For presentation at the MSFC/Contractor Quality and Productivity Partnership June 1993 Workshop/MDAC, Huntsville, AL, June 23–24, 1993.

TAYLOR, W.E.
WINKLER, C.E.

TELESFO, C.M.
ES63

TELESCO, C.M.
ES63
Galaxies in the Infrared (Chapter Only). For publication in Infrared Astronomy, Cambridge, United Kingdom.

TELESCO, C.M.
DRESSEL, L.L. (Allied Research)
WOLSTENCROFT, R.D. (Royal Observatory)

TELESCO, C.
PINA, R. (UCSD)
FAJARDO, S. (SUNY)
KOUVELIOTOU, C.
VAN PARADIJS, J. (University of Amsterdam)
IAUC for GRO JO422+32. For publication in Central Bureau for Astronomical Telegrams, Smithsonian Astrophysical Observatory, Cambridge, MA.

TENNANT, A.F.
WU, K.
WICKRAMASINGHE, D.T.
(Australian National University.)
ROSAT Observation of the Eclipsing AM HER System WW HOR. For publication in the
Annuals of Israel Physics Society, Jerusalem, Israel.

THOM, R. MOORE, L. SPROUL, W.D. (Northwestern University) CHANG, T.P.

THOMAS, L.D. EJ13

THOMAS, L.D. EJ13
COHEN, B. (Boeing) YOUNG, J. (Boeing)

THYEN, C. (University of Minnesota)
ADAMS, M. ES52

TINKER, M.L. ED26
Modeling of Nonlinear Vibration Isolators Using the Advanced Continuous Simulation Language. For presentation at the Southeastern Simulation 1993 Conference, Huntsville, AL, October 18–19, 1993.

TINKER, M.L. ED26

TINKER, M.L. ED26
CUTCHINS, M.A. (Auburn University)
Damping Phenomena in a Wire Rope Vibration Isolation System. For publication in the Journal of Sound and Vibration.

TINKER, M.L. ED26
CUTCHINS, M.A. (Auburn University)
Instabilities in a Nonlinear Model of a Wire Rope Damper. For publication in the Journal of Sound and Vibration.

TORR, D.G. (UAH)
TORR, M.R. ES55
OWENS, J.K. (UAH)
CHANG, T.

TORR, D.G. (UAH)
TORR, M.R. JA01
RICHARDS, P.G.
FENNELLY, J.A.
MORGAN, M.F.
OWENS, J.K. ES55

TORR, D.G. (UAH)
TORR, M.R. ES55
FENNELLY, J.A. (UAH)
OWENS, J.K. ES55
RICHARDS, P.G. (UAH)
Objectives and Preliminary Results From the Imaging Spectrometric Observatory Flown on ATLAS 1. For publication in the Proceedings of Chapman Conference on the Upper Mesosphere and Lower Thermosphere, Washington, DC.

TORR, D.G. (UAH)
TORR, M.R. ES51
RICHARDS, P.G. (UAH)
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

TORR, M.R. ES51
TORR, D.G. (UAH)

TOWNSEND, J.S. ED22
RICHARDSON, J.A. (UAH)

TUCKER, D.S. EH34
GENT, T.

TUCKER, P.K. ED32
WARSI, S.A.

TUCKER, P.K. ED32
UPADHYAY, T. (Mayflower Communications)
GALDOS, J.I.
RHODEHAMEL, H.W.
DEATON, A.W.
LOMAS, J.

VAUGHAN, O.H., Jr. ES43
NASA Shuttle Lightning Research: Observations of Nocturnal Thunderstorms and Lightning Displays as Seen During Recent Space Shuttle Missions. For presentation at the Conference on Atmospheric Electricity, St. Louis, MO, October 4–10, 1993.

VAUGHAN, O.H., Jr. ES43

VAUGHAN, O.H., Jr. ES43

VAUGHAN, W.W. (UAH)
ANDERSON, B.J. ES44

VAUGHAN, W.W. (UAH)
JOHNSON, D.L. ES44
Meteorological Satellites—The Very Early Years. For publication in STORM Magazine, USA.

VAUGHAN, W.W. (UAH)
ANDERSON, B.J. ES44
Environmental Effects Consideration: A Case Study—Lessons Learned. For presentation at the
VAUGHN, J.A.  
LINTON, R.C.  
KAMENETZKY, R.R.  
FINCKENOR, M.M.

VICKERS, J.H.  
SHARPE, M.H.

VICKROY, S.C.  (Boeing)
HAMILTON, G.S.  

VIKRAM, C.S.  (UAH)
WITHEROW, W.K.  
TROLINGER, J.D.

VIVEKANANDAN, J.  
RAGHAVAN, R.  
BRINGI, V.N.  (Colorado State University)

VOLZ, M.P.  
SHA, Y.-G.  (USRA)
LEHOCZKY, S.L.
Compositional Distributions and Electrical Properties of Hg_{1-x}Cd_{x}Te Grown by CVT. For presentation at the Ninth American Conference on Crystal Growth, Baltimore, MD, August 1–6, 1993.

WAITES, H.B.  
ED12
The Genesis of a Multidiscipline Control Program. For presentation at the IEEE Control System Society, Huntsville, AL, April 29, 1993.

WALKER, A.B.C., Jr.  (Stanford University)
TIMOTHY, J.G.
HOOVER, R.B.  
BARBEE, T.W., Jr.
(Stanford University)
BARBEE, T.W., Jr.  
(Lawrence Livermore National Laboratory)  
Performance of the Multilayer Coated Mirrors for the Multi Spectral Solar Telescope Array.  
For presentation at the SPIE '93 Conference, San Diego, CA, July 12–16, 1993.

WALKER, A.B.C., Jr.  
(Stanford University)  

WALKER, S.T.  
ALEXANDER, R.A.  

WANG, J.-C.  
(Alabama A&M)  
WATRING, D.  
LEHOCZKY, S.L.  
SZOFRAN, F.  

WANG, S.  
FITZJARRALD, D.  

WANG, S.  
(USRA)  
Modeling Marine Boundary Layer Clouds With A Two-Layer Model: A One-Dimensional Simulation. For publication in the Journal of Atmospheric Sciences, Boston, MA.

WANG, S.  
(USRA)  
WANG, Q.  
Drizzle Effects on the Turbulence Structure of the Marine Boundary Layer: A Model Sensitiv-


WEISSKOPF, M.C. ES65
AUSTIN, R.A. (Hughes Corp.)
DIETZ, K.L. ES65
KOLODZIEJCZAK, J. (Hughes Corp.)
RAMSEY, B.D. ES65


WIEMSKOPF, M.C. ES65


WIESSKOPF, M.C. ES65


WESTRA, D.G. ED63

WILLIAMSEN, J. ED52

PROTECTING SPACECRAFT FROM THE ORBITAL DEBRIS ENVIRONMENT. For presentation at the International Space University, Huntsville, AL, August 10–11, 1993.

WILLOWBY, D.G EB12

ALEXANDER, D.

EDGE, T.

HERREN, K.

Response of Silicon Solar Cell to Pulsed Laser Illumination. For presentation at SPRAT XII, Cleveland, OH, October 20–22, 1992.

WILSON, C.A. ES66
HARMON, B.A.

WILSON, R.B.

FISHMAN, G.J.


WILSON, C.A. ES62
FINGER, M.H. (CGRO)
GRUNSFELD, J.M. (Caltech)
PRINCE, T.A.
HARMON, B.A.
WILSON, R.B.
FISHMAN, G.J.
ET AL.

BATSE Observations of GRS0834-430. For presentation at the Compton Observatory Symposium, Washington University, St. Louis, MO, October 15–17, 1992.

WILSON, M.E. (Boeing)
ROMAN, M.C. ED62
BEJ, A.K. (UAH)

GAUTHIER, J.J.


WILSON, R.B. ES66
HARMON, B.A.
FISHMAN, G.J.
FINGER, M.H.
PRINCE, T.A.
ET AL.


WILSON, R.B.
FINGER, M.H.
GIBBY, L.
FISHMAN, G.J.

A 0535+26. For publication in the IAU Circular, Cambridge, MA.

WILSON, R.B.
FINGER, M.H.
BILDSTEN, L. (Caltech)


WILSON, R.M.
FINGER, M.H.
BILDSTEN, L. (Caltech)


WINGARD, C.D.
PATTERSON, W.J.


WINKLER, C.E.
CUMINGS, N.P.
TALLEY, D.H.
RANDOLPH, J.L.


WU, S.T.
WENG, F.S.
HAGYARD, M.J.
GARY, G.A.


YOUNG, A.C.
MULQUEEN, J.A.
NISHIMUTA, E.L.
EMRICH, W.J.


ZHANG, S.N.
FISHMAN, G.J.
HARMON, B.A.
PACIESAS, W.S. (UAH)
RUBIN, B.C.
MEEGAN, C.A.
WILSON, R.B.
FINGER, M.H.

BATSE Images From Galactic Center Region. For presentation at the Second Compton Symposium, College Park, MD, September 20-22, 1993.

ZHANG, S.N.
FISHMAN, G.J.
HARMON, B.A.
PACIESAS, W.S. (UAH)
RUBIN, B.C.
MEEGAN, C.A.
WILSON, R.B.
FINGER, M.H.


ZWIENER, J.M.
COSTON, J.E., Jr.
WILKES, D.R. (Arizona Tech)
MILLER, E.R.
MELL, R.J.

Whisker/Cone Growth on the Thermal Control Surfaces Experiment #S0069. For presentation at the Third LDEF Post-Retrieval Symposium, Williamsburg, VA, November 8-12, 1993.
APPROVAL

FY 1993 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

Compiled by Joyce E. Turner

The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

C.D. BEAN
Director
Human Resources and Administrative Support