FY 1986 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

Compiled by Joyce E. Turner
Management Operations Office

October 1986

(NASA-TM-86575) FY 1986 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS AND PRESENTATIONS (NASA) 72 p

Unclas

MSFC - Form 3190 (Rev. May 1983)
This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 86. 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 NASA Scientific and Technical Information Facility, 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 1986 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA TECHNICAL MEMORANDA</td>
<td>1</td>
</tr>
<tr>
<td>NASA TECHNICAL PAPERS</td>
<td>10</td>
</tr>
<tr>
<td>MSFC CONFERENCE PUBLICATIONS</td>
<td>15</td>
</tr>
<tr>
<td>NASA CONTRACTOR REPORTS</td>
<td>16</td>
</tr>
<tr>
<td>MSFC PAPERS CLEARED FOR PRESENTATION</td>
<td>40</td>
</tr>
</tbody>
</table>

This report presents the findings of mechanical tests performed on five thallium-doped sodium iodide [NaI(Tl)] crystals. These crystals were all in the shape of circular flat plates, 20.0 in. in diameter and 0.5 in. thick. The test setup, testing procedure, and the test data are presented.

The report shows that these large crystals exhibit a high degree of material plasticity, as well as a much higher strength than previously anticipated, on the order of 500 psi. Also revealed from the testing was the fact that crystals with a large number of grain boundaries developed less plasticity, and therefore less permanent deformation, than those with fewer grain boundaries.

This document contains a description of the MSFC/J70 Orbital Atmospheric Density Model, a modified version of the Smithsonian Astrophysical Observatory Jacchia 1970 model. The algorithms describing the MSFC/J70 model are included as well as a listing of the computer program. The 13-month smoothed values of solar flux (F₁₀,₇) and geomagnetic index (Ap), which are required as inputs for the MSFC/J70 model, are also included and discussed.

A test method for telescopes that makes use of a focused ring formed by an annular aperture when using a point source at a finite distance was evaluated theoretically and experimentally. The results show that the concept can be applied to near-normal as well as grazing incidence. It is particularly suited for x-ray telescopes because of their intrinsically narrow annular apertures, and because of the largely reduced diffraction effects.

This report presents a summary of selected atmospheric conditions observed near Space Shuttle STS-51D launch time on April 12, 1985, at Kennedy Space Center Florida. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given in this report. The final atmospheric tape, which consists of wind and thermodynamic parameters versus altitude, for the STS-51D vehicle ascent has been constructed. The STS-51D ascent atmospheric data tape has been constructed by Marshall Space Flight Center’s Atmospheric Sciences Division to provide an internally consistent data set for use in post flight performance assessments.
This report presents a summary of selected atmospheric conditions observed near Space Shuttle STS-51B launch time on April 29, 1985, at Kennedy Space Center, Florida. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of pre-launch Jimsphere measured vertical wind profiles is given in this report. The final atmospheric tape, which consists of wind and thermodynamic parameters versus altitude, for STS-51B vehicle ascent has been constructed. The STS-51B ascent atmospheric data tape has been constructed by Marshall Space Flight Center's Atmospheric Sciences Division to provide an internally consistent data set for use in post flight performance assessments.

This is the last regular formal report of Space Shuttle launched from Kennedy Space Center, Florida. The Atmospheric Effects Branch will maintain atmospheric environment data files for reference on future missions through the first few Vandenberg Air Force Base (VAFB) launches.

A system has been developed specifically for the calibration and development of thermal ion instrumentation. The system is optimized to provide an extended beam (approximately 80 cm^2) with usable current rates, ~1 pA/cm^2, at beam energies as low as 1 eV, with much higher values available with increasing energy. The beam energy spread is typically less than 2 eV/charge, and the average angular divergence is approximately 2.5 deg. A tandem electrostatic and variable geometry magnetic mirror configuration within the ion source optimizes the use of the ionizing electrons, thus decreasing the gas and non-thermal electron throughput to the instrument chamber while improving the current density uniformity. The system is integrated under microcomputer control to allow automatic control and monitoring of the beam energy and composition and the mass- and angle-dependent response of the instrument under test. The data can be transmitted in nearly real-time to the interested investigators for comparison with expected results over existing computer networks. The system is pumped by a combination of carbon vane and cryogenic sorption roughing pumps and ion and liquid helium operating pumps. This allows testing and final calibration of flight instrumentation in an ultraclean environment.
The results of low cycle fatigue testing on turbine blades for use in hydrogen/oxygen rocket engines is covered in this report. Cored blade and cored blades with circulation were tested in the MSFC thermal fatigue tester. Both blade configurations showed significant low cycle fatigue life improvements when compared to baseline solid blades.

The state-of-the-art fabrication techniques for composite materials are such that stringent species-specific acceptance criteria must be generated to assure product reliability. Non-destructive evaluation techniques including computed tomography (CT), x-ray radiography (RT), and ultrasonic scanning (UT) have been investigated and compared to determine their applicability and limitations to graphite epoxy, carbon-carbon, and carbon-phenolic materials. While the techniques appear complementary, CT is shown to provide significant, heretofore unattainable data. Finally, a correlation of NDE techniques to destructive analysis is presented.

Doppler temperatures determined from observations of the atomic oxygen OI 6300 Å line during March 1984 at the University of Alaska/Fairbanks are presented. Temperatures were obtained from Fabry-Perot Interferometer pressure scans using a Fourier transform smoothing and fitting technique; this technique is presented in detail. The temperatures and the spread in the temperatures were consistent from day to day. On the clear nights of March 10-13, the temperatures were 800, 750, 750, and 800 K, respectively, with a spread of ±100 K. These temperatures are compared to the MSIS (84) model atmosphere for similar geomagnetic conditions and found to be in general agreement; they are also consistent with results obtained by other investigators.
capability of this device. The universal joint is a part of manual actuation rods for scientific instruments within the Hubble Space Telescope. It was found that the hex ball will bind slightly during the initial load application. This binding did not affect the function of the universal joint, and the units would "wear-in" after a few additional loading cycles. The torsional yield load was approximately 50 ft-lb, and was consistent among the four test specimens. Also, the torque required to cause complete failure exceeded 80 ft-lb. It is concluded that the hex ball universal joint is suitable for its intended applications.

TM-86535 January 1986

With the ever increasing concern for computer security, users of computer systems are becoming more sensitive to unauthorized access. One of the initial security concerns for the Shuttle Management Information System was the problem of users leaving their workstations unattended while still connected to the system. This common habit was a concern for two reasons: it ties up resources unnecessarily and it opens the way for unauthorized access to the system. The Data General JV/10000 does not come equipped with an automatic time-out option on interactive peripherals. The purpose of this memorandum is to describe a system which monitors process activity on the system and disconnects those users who show no activity for some time quantum.

TM-86536 October 1985

Since the introduction of the Plasma Arc Torch by Linde in 1955 and subsequent to the work at Boeing in the 1960's, significant improvements crucial to success have been made in the Variable Polarity Plasma Arc (VPPA) Process at the Marshall Space Flight Center. This report gives several very important advantages to this process, and it discusses the genesis of PA welding, genesis of VPPA welding, theory of VPPA welding, special equipment requirements, weld property development, results with other aluminum alloys, and the eventual successful VPPA transition to production operations.

Corrosion fatigue studies were conducted on bare, chemical conversion coated, and anodized 2219-T87 aluminum alloy. These tests were performed using a rotating beam machine running at a velocity of 2500 rpm. The corrosive environments tested were distilled water, 100 ppm NaCl, and 3.5 percent NaCl. Results were compared to the endurance limit in air. An evaluation of the effect of protective coatings on corrosion fatigue was made by comparing the fatigue properties of specimens with coatings to those without.

TM-86538 March 1986
Design and Verification Guidelines for Vibroacoustic and Transient Environments. Component Analysis Branch, Systems Dynamics Laboratory. N86-23975

Design and verification guidelines for vibroacoustic and transient environments contain many basic methods that are common throughout the aerospace industry. However, there are some significant differences in methodology between NASA/MSFC and others — both government agencies and contractors. The purpose of this document is to provide the general guidelines used by the Component Analysis Branch, ED23, at MSFC, for the application of the vibroacoustic and transient technology to all launch vehicle and payload components and experiments managed by NASA/MSFC. This document is intended as a tool to be utilized by the MSFC program management and their contractors as a guide for the design and verification of flight hardware.

TM-86539 February 1986

This report addresses the problems associated with overtorque applied to the Booster Separation Motor (BSM) Igniter Adapter high strength [200 KSI (1379 Mpa)] A286 CRES bolts and the threaded holes of the 7075-T73 aluminum alloy BSM cases. Our evaluation included torque, tensile, and stress corrosion tests incorporating the A286 CRES bolts and the 7075-T73 aluminum alloy BSM cases.
The tensile test data includes ultimate tensile load (UTL), Johnson's 2/3 yield load (J2/3YL), proportional limit load (PLL), and total bolt stretch. Torque tension data includes torque, torque induced load, and positive and negative break-away torque.

Stress corrosion test data reflect the overtorque and the resulting torque induced loads sustained by the A286 CRES bolts torqued into a 7075-T73 aluminum alloy forged dome with threaded holes. After 60 days of salt fog exposure, the positive and the negative break-away torques, the subsequent mechanical property tensile test results, and the BSM dome threaded hole axial tensile pullout loads are reported.

An Acoustic Levitation Furnace system is described that was developed for testing the feasibility of containerless fiber pulling experiments. It is possible to levitate very dense materials such as platinum at room temperature. Levitation at elevated temperatures is much more difficult. Samples of dense heavy metal fluoride glass were levitated at 300°C. It is therefore possible that containerless fiber pulling experiments could be performed. Fiber pulling from the melt at 650°C is not possible at unit gravity but could be possible at reduced gravities. The Acoustic Levitation Furnace is described, including engineering parameters and processing information. It is illustrated that a shaped reflector greatly increases the levitation force aiding the levitation of more dense materials.

In the fuel preburner of the Space Shuttle Main Engine, face plate, injector, and baffle erosion have been observed. The observed patterns of erosion suggest that flame attachment to the walls is a contributing factor. To better understand the physical phenomena involved, a portion of the preburner was modeled computationally. The simulated "preburner" had three two-dimensional jets entering a cavity adjacent to a baffle. The computational model employed the Patankar Spalding algorithm with upwind differencing. The turbulence model was a standard k-ε model with wall functions. The effect of incoming boundary conditions on turbulent kinetic energy and dissipation, k and ε, was studied. The results indicate a very strong sensitivity to these boundary conditions over certain ranges of values.
seawater at 0°, 25°, and 80°C for 451 hr was examined. The percent weight gain at 0° and 25°C was low (0.06 to 0.17 percent) and there was no significant change in the flexural properties for these environmental conditions.

At 80°C there was a decrease in the flexural strength of 17 and 20 percent in seawater and deionized water, respectively. This is a comparison to control samples exposed to 80°C heat alone. These decreases were found to be nearly reversible once the samples were dried. Optical microscopy did not reveal cracking of the matrix. The flexural modulus was essentially unaffected by exposure to deionized water and seawater at 80°C.

This report addresses the mesopause-turbopause region (80 to 120 km) of the atmosphere which is frequently used as a boundary between the thermosphere and mesosphere for models of the atmosphere. The initialization of models is important since uncertainties may lead to significant changes in the computations of total density at greater altitudes. In this transition region, the experimental data base for the total gas density and the constituents of smaller abundance is very limited. The turbopause height (hₜ) may vary from 90 to 120 km and no pronounced dependence of hₜ on season, local time, or solar activity is determined.

The importance of atmospheric turbulence is discussed and its important role in the mesosphere and lower atmosphere by influencing the thermal balance of the upper atmosphere, as well as the distribution of different atmospheric constituents, is presented. The number of measurements of turbulence at these altitudes is small. Data from radio meteors, noble gas ratio analysis, and luminescent cloud analysis reveal no definite conclusion or systematic variation of the turbulence region. The heat input by gravity waves is a dominant term in the energy balance equation. Also gravity waves, either directly or through a mechanism of turbulence generation, enhance the mixing ability of the atmosphere. Internal gravity waves produce variations in the density as well as concentration of atomic oxygen.

The uncertainty in the atmospheric density variation, according to Walberg (1985), leads to control system design problems for the AOTV relative to the amount of control authority required to deal with the unpredictable variation in density.
end of the drop tube in the sample catcher. Gases are selectively absorbed into the sample. Upon solidification gas can become less soluble and as a result forms voids within the sample. The general oxidation/reduction characteristics of the gas also affect sample microstructures.

In general, under the more favorable experimental conditions including reducing atmospheric conditions and superheatings, examination of sample microstructures indicates that nucleation has been suppressed. This is indicated by underlying uniform dendrite spacings throughout the sample and with a single dendrite orientation through most of the sample. The samples annealed yielding a few large grains and single or "bi-crystal" samples were commonly formed. This was especially true of samples that were inadvertently greatly superheated. This is in contrast with results from a previous study in which surface oxides were stable and contained numerous sites of nucleation. The number of nucleation events depends upon the surface state of the specimen as determined by the atmosphere and is consistent with theoretical expectations based upon the thermodynamic stability of surface oxide films. Oxide-free specimens are characterized by shiny surfaces, with no observable features under the scanning electron microscope at 5000X.

The Space Processing Applications Rocket Project SPAR X Final Report contains the compilation of the post-flight reports from each of the Principal Investigators (PIs) on the four selected science payloads, in addition to the engineering report as documented by the Marshall Space Flight Center (MSFC). This combined effort also describes pertinent portions of ground-based research leading to the ultimate selection of the flight sample composition, including design, fabrication and testing, all of which are expected to contribute to an improved comprehension of materials processing in space.

The SPAR project was coordinated and managed by MSFC as part of the Microgravity Science and Applications (OSSA) of NASA Headquarters.

This technical memorandum is directed entirely to the payload manifest flown in the tenth of a series of SPAR flights conducted at the White Sands Missile Range (WSMR) and includes the experiments entitled "Containerless Processing Technology," SPAR Experiment 76-20/3; "Directional Solidification of Magnetic Composites," SPAR Experiment 76-22/3; "Comparative Alloy Solidification," SPAR Experiment 76-36/3; and "Foam Copper," SPAR Experiment 77-9/1R.

Well-organized and structured efforts of considerable magnitude involving NASA, industry, and academia have explored and defined the engineering and technological requirements of the use of tethers in space and have discovered their broad range of operational and economic benefits. The results of these efforts have produced a family of extremely promising candidate applications. The extensive efforts now in progress are gaining momentum and a series of flight demonstrations are being planned and can be expected to take place in a few years. This report provides an analysis and a review of NASA's second major workshop on Applications of Tethers in Space held in October 15-17, 1985, in Venice, Italy. It provides a summary of an up-to-date assessment and recommendations by the NASA Tether Applications in Space Program Planning Group, consisting of representatives of seven NASA Centers and responsible for tethers applications program planning implementation as recommended by the workshop panels.

This is a post flight evaluation of the Solar Array Flight Experiment's (SAFE) deployment dynamics that explains the encountered resonances.
A system level failure could occur if the Hubble Space Telescope’s (ST) capability to operate as a facility on-orbit is critically reduced or when a significant reduction in the quality of science data is registered. Failure could occur if a meteoroid/debris impact damages a component of a major support subsystem or if a meteoroid/debris penetration causes straylight contamination in the light shield, forward shell, aft shroud, or through the aperture door.

The ST was analyzed to find the probability of no critical penetration. A straylight leakage repair technique was recommended for the aft shroud, the region found most likely to be critically penetrated.

Filament wound graphite/epoxy samples were immersed in seawater, deionized water, and toluene at room temperature and 80°C for 5, 15, and 43 days, and in methanol at room temperature for 15 and 43 days. The percent weight gains and short beam shear strengths were determined after environmental exposure. Samples immersed in deionized water and seawater had higher percent weight gains than those immersed in toluene at room temperature and 80°C. The percent weight gains for samples immersed in methanol at room temperature were comparable to those of deionized water and seawater immersed samples. A comparison of percent decreases in short beam shear strengths could not be made due to a large scatter in data. This may indicate defects in samples due to machining or variations in material properties due to processing.

This research was sponsored by the Center Director’s Discretionary Fund Project (No. 84-5, “Effects of External Environments on the Failure Mode and Mechanical Properties of an Epoxy and Graphite/ Epoxy Composite System”).

This report describes a digital imaging photometry system developed in the Space Science Laboratory at the Marshall Space Flight Center as part of the Center Director’s Discretionary Fund (CDDF). The photometric system used for cometary data acquisition is based on an intensified secondary electron conduction (ISEC) vidicon coupled to a versatile data acquisition system which allows real-time interactive operation. Field tests on the Orion and Rosette nebulae indicate a limiting magnitude of approximately $m_v = 14$ over the 42 arcmin field-of-view. Observations were conducted of Comet Giacobini-Zinner in August 1985. The resulting data are discussed in relation to the capabilities of the digital analysis system. The development program concluded on August 31, 1985.

The ice nucleus activity of exhaust particles generated from combustion of Space Shuttle propellant in small rocket motors has been measured. The activity at -20°C was substantially lower than that of aerosols generated by unpressurized combustion of propellant samples in previous studies. The activity decays rapidly with time and is decreased further in the presence of moist air. These tests corroborate the low effectivity ice nucleus measurement results obtained in the exhaust ground cloud of the Space Shuttle. Such low ice nucleus activity implies that Space Shuttle induced inadvertent weather modification via an ice phase process is extremely unlikely.

This handbook is intended to provide a ready reference for many of the solid and liquid lubricants used in the space industry. Lubricants and lubricant properties are arranged systematically so that designers, engineers, and maintenance personnel in the space industry can conveniently locate data needed for their work.

This handbook is divided into two major parts (A and B). Part A is a compilation of solid lubricant suppliers information on chemical and physical property data of more than 250 solid lubricants, bonded solid lubricants, dispersions and composites. Part B is a compilation of chemical and physical property data of more than 250 liquid lubricants, greases, oils, compounds, and fluids. The listed materials cover a broad spectrum from manufacturing and ground support to hardware applications of spacecraft.

TM-86557 July 1986

This report presents an assessment of case growth for two D6AC steel SRM case segments with multiple flight use and a comparison of these two cases with two new cases. Dimensional changes in the sealing diameter areas were recorded for the used cases and after each hydroprooﬁng of the new cases.

TM-86559 August 1986
Viewport Concept for Space Station Modules. Freddie Douglas, III. Structures and Propulsion Laboratory.

This report addresses the generic design of a 20-in. diameter viewport for the space station modules. It should possess the capabilities of meteoroid/debris protection (with no metallic cover), redundancies in its meteoroid/debris protection, and pressure sealing systems. In addition, it should provide ease of change out for maintenance or repair. The design does not take into account the bumper-shield effect of the outermost panes in the meteoroid/debris analysis.

TM-86561 August 1986

The design of the Space Shuttle vehicle configuration requires that the SRMs produce thrust within tightly-controlled limits. These limits provide assurance that Shuttle ascent performance goals will be achieved within the vehicle flight load constraints. The SRM’s will initially describe the excellent performance reproducibility of the 24 SRMs during the first 12 flights [STS-8 through STS-26 (Mission 51-F)] using the HPM SRM. Secondly, this report will describe the transient phenomena which interrupted the reproducibility in the first 20 sec of flight for four flights (Missions 51-I/J and 61-A/B). The cause of this 20 sec phenomena is postulated to be a change in the crystal shape of the ammonium perchlorate used in the propellant. This shape change coincided with the performance shift on these four flights. The ballistic effect of the crystal shape change is manifested as a change to the generic “HUMP” or “BARF” curve of the Shuttle SRM thrust/pressure-time curve. As the crystal shape change was corrected by the vendor, the performance produced by the Shuttle SRM returned to normal.
A general methodology for simulating particle impingements on orbiting spacecraft is developed. Major steps in the modeling process are presented as (1) modeling objective, (2) construction of the spacecraft geometrical model, (3) simulation of the particles in the space environment, (4) particle impact and subsequent events of interest, and (5) results of the simulation.

A simulation of the expected meteoroid impingements on the Hubble Space Telescope and the resulting angular momentum transfers which can cause telescope pointing disturbances is given to illustrate these methods.

This report documents the hydroburst test of the aft portion of the PAM-D exit cone. The test fixture, test instrumentation, and test procedure are described in detail. The hydrostatic pressure required to buckle the cone was recorded at 9.75 psi.

Meanwhile, the PAM-D exit cone was modeled using the finite element method and a theoretical buckling pressure (8.76 psi) was predicted using the SPAR finite element code. This report discussed the modeling technique which was employed.

By comparing the theoretical to predicted critical pressures, this report verifies the modeling technique and calculates a material knockdown factor for the carbon-carbon exit cone.

An investigation to determine the sensitivity of the Space Shuttle base and forebody aerodynamics to the size and shape of various solid plume simulators was conducted. Families of cones of varying angle and base diameter, at various axial positions behind a Space Shuttle launch vehicle model, were wind tunnel tested. This parametric evaluation yielded base pressure and force coefficient data which indicated that solid plume simulators are an inexpensive, quick method of approximating the effect of engine exhaust plumes on the base and forebody aerodynamics of future, complex multibody launch vehicles.

This report presents the analyses and testing performed by NASA in support of an expanded and improved nozzle design data base for use by the U.S. solid rocket motor industry. A production nozzle with a history of one ground failure and two flight failures was selected for analyses and testing.

The stress analysis was performed with the Champion computer code developed by the U.S. Navy. Several improvements were made to the code. Strain predictions were made and compared to test data.

Two short duration motor firings were conducted with highly instrumented nozzles. The first nozzle had 58 thermocouples, 66 strain gages, and 8 bondline pressure measurements. The second nozzle had 59 thermocouples, 68 strain measurements, and 8 bondline pressure measurements. Most of this instrumentation was on the nonmetallic parts, and provided significantly more thermal and strain data on the nonmetallic components of a nozzle than has been accumulated in a solid rocket motor test to date.
The purpose of this research was to develop a database of paired detailed wind profiles for use in evaluating Shuttle Transportation System (STS) ascent capability. Since launch decision is based on a wind measured about 3.5 hr before launch, a data base of paired detailed profiles is needed. Method and technique on the reduction process and analysis is also presented. Guidelines used in selecting the pairs of profiles were established to insure a valid and representative data base. \( \omega_u \) values for 3.5 hr at 12 km altitude show 8 percent increase from the transition case to the winter case and 18 percent decrease from the transition case to the summer case. \( \omega_v \) values for 3.5 hr at 12 km altitude shows 12 percent increase from the transition case to the winter case and 17 percent decrease from the transition case to the summer case. A special feature of the 7- and 10.5-hr cases is that \( \omega_v \) increases by as much as 30 percent from the transition to the winter profiles. This large increase does not appear in the \( \omega_u \) data. Comparisons of the calculated values of 3.5-hr standard deviations of \( u \) and \( v \) with actual component deviations measured during Space Shuttle launch conditions confirm that the statistical values are representative.

TP-2574
Reverification of Techroll Seal Used in the IUS Nozzle. R. L. Porter. Structures and Propulsion Laboratory.

The Inertial Upper Stage (IUS) uses a Techroll Seal in the nozzle design of each of its two solid rocket motors. As a result of the small solid rocket motor (SRM-2) anomaly of the STS-6 space shuttle flight, additional seal testing, motor firings, and structural analyses have been conducted. This paper begins with a background of the nozzle configuration, followed by a description of the design features of the Techroll Seal, and concludes with the post-flight seal testing, motor firings, structural analyses, and design changes. Although the Techroll Seal, which is constructed of two plies of Kevlar sandwiched between layers of neoprene, was designed and qualified prior to flight, a significant amount of highly instrumented testing and analysis has been accomplished since the flight anomaly. The additional analysis and testing shows the significant effects of the nozzle gimbal angle and the increase in seal temperature due to gas leakage and pyrolysis gas. It was learned that the critical design condition for the seal occurs much later in the motor burn than at the time of maximum chamber and seal pressure, as concluded in the original design analyses.

TP-2575
Graphical Techniques to Assist in Pointing and Control Studies of Orbiting Spacecraft. Leonard W. Howell and Joseph H. Ruf. Systems Dynamics Laboratory.

Computer generated graphics are developed to assist in the modeling and assessment of pointing and control systems of orbiting spacecraft.

Three-dimensional diagrams are constructed of the Earth and of geometrical models which resemble the spacecraft of interest. Orbital positioning of the spacecraft model relative to the Earth and the orbital ground track are then displayed. A star data base is also available which may be used for telescope pointing and star tracker field-of-views to visually assist in spacecraft pointing and control studies.

A geometrical model of the Hubble Space Telescope (HST) is constructed and placed in Earth orbit to demonstrate the use of these programs. Simulated star patterns are then displayed corresponding to the primary mirror's FOV and the telescope's star trackers for various telescope orientations with respect to the celestial sphere.

TP-2576

The microgravity environment of an orbiting vehicle permits crystal growth experiments in the presence of greatly reduced buoyant convection in the liquid melt. Crystals grown in ground-based laboratories do not achieve their potential properties because of dopant variations caused by flow in the melt. The floating zone crystal growing system is widely used to produce crystals of silicon and other materials. However, in this system the temperature gradient on the free sidewall surface of the melt is the source of a thermocapillary flow which does not disappear in the low-gravity environment.

Smith and Greenspan theoretically examined the idea of using a uniform rotation of the floating zone system to confine the thermocapillary flow to the melt.
sidewall leaving the interior of the melt passive. These workers considered a cylinder of fluid with an axial temperature gradient imposed on the cylindrical sidewall. They considered a half zone and examined the linearized, axisymmetric flow in the absence of crystal growth. They found that rotation does confine the linear thermocapillary flow.

In this paper the simplified model of Smith and Greenspan is extended to a full zone and both linear and non-linear thermocapillary flows are studied theoretically. Analytical and numerical methods are used for the linear flows and numerical methods for the nonlinear flows. It was found that the linear flows in the full zone have more complicated and thicker boundary layer structures than in the half zone, and that these flows are also confined by the rotation. However, for the simplified model considered and for realistic values for silicon, the thermocapillary flow is not linear. The nonlinear flows were examined by first computing a weakly nonlinear flow and then computing the fully nonlinear flow. The weakly nonlinear flow is steady, has less boundary layer character, and penetrates more deeply into the interior than the linear flow but still shows some rotational confinement. The fully nonlinear flow is strong and unsteady (a weak oscillation is present) and it penetrates the interior. Some non-rotating flow results are also presented.

Since silicon has a large value of thermal conductivity, one would expect the temperature fields to be determined by conduction alone. This is true for the linear and weakly nonlinear flows, but for the stronger nonlinear flow the results show that temperature advection is also important. Thus, this work reveals that for the nonlinear flow, a radiative sidewall boundary condition would be an improvement over the specified temperature boundary condition used in this paper and previously by others. Such a boundary condition would weaken the sidewall axial temperature gradient and hence the thermocapillary flow allowing the confining effect of rotation to play a stronger role. Hence, uniform rotation may still be a means of confining the flow and the results obtained define the procedure to be used to examine this hypothesis.

A systems approach was adopted to study the pocketing phenomena on a solid rocket nozzle liner. The classical thermoelastic analysis was used to identify marginally strained regions on the composite liner erosion surface and at a depth coincident with the peak value of the across ply coefficient of thermal expansion. A failure criterion was introduced which included a thermal term and permitted failure assessment over the charred liner. The method was verified by satisfactory application to a reported related experiment. Liner pocketing mechanism was attributed to very localized material degradation caused during manufacturing process either by reduction of fiber strength and/or by concentration of resin volume fraction. Pocketing scenario over the degraded material was constructed with supporting formulation to predict size of fissures with respect to degraded material size and location in the liner and with burn time. Sensitivities of liner material parameters were determined to influence test programs designed to update mechanical data base of carbon cloth phenolic over the char temperature range.

TP-2577 March 1986
Pocketing Mechanics of SRM Nozzle Liner.
Vincent S. Verderaime. Systems Dynamics Laboratory. N86-23974

TP-2598 May 1986

The purpose of the Solar Array Flight Dynamic Experiment (SAFDE) is to demonstrate the feasibility of on-orbit measurement and ground processing of large space structures dynamic characteristics. Test definition or verification provides the dynamic characteristic accuracy required for control systems use. An illumination/measurement system was developed to fly on space shuttle flight STS-41D. The system was designed to dynamically evaluate a large solar array called the Solar Array Flight Experiment (SAFE) that had been scheduled for this flight. The SAFDE system consisted of a set of laser diode illuminators, retroreflective targets, an “intelligent” star tracker receiver and the associated equipment to power, condition, and record the results. In six tests on STS-41D, data was successfully acquired from 18 retroreflector targets and ground processed, post flight, to define the solar array’s dynamic characteristic. The flight experiment proved the viability of on-orbit test definition of large space structures dynamic characteristics. Future large space structures controllability should be greatly enhanced by this capability.
TP-2603 May 1986

Throughout the aerospace industry, large variations of 50 percent (6 dB) or more are continually noted for linear shaped charge (LSC) generated shock response spectra (SRS) from flight data (from the exact same location on different flights) and from plate tests (side by side measurements on the same test). A research program was developed to investigate causes of these large SRS variations. A series of ball drop calibration tests to verify calibration of accelerometers and a series of plate tests to investigate charge and assembly variables were performed. The resulting data were analyzed to determine if and to what degree manufacturing and assembly variables, distance from the shock source, data acquisition instrumentation, and shock energy propagation affect the SRS. LSC variables consisted of coreload, standoff, and apex angle. The assembly variable was the torque on the LSC holder. Other variables were distance from source of accelerometers, accelerometer mounting methods, and joint effects. Results indicated that LSC variables did not affect SRS as long as the plate was severed. Accelerometers mounted on mounting blocks showed significantly lower levels above 5000 Hz. Lap joints did not affect SRS levels. The test plate was mounted in an almost free-free state; therefore, distance from the source did not affect the SRS either. Several varieties and brands of accelerometers were used – all varieties except one demonstrated very large variations in SRS. One accelerometer gave very good repeatable results throughout the program. Instrumentation is the cause of the large variations in SRS. SRS from the same source are indeed repeatable.

TP-2620 July 1986

Numerical modeling has been performed of the fluid dynamics in a prototypical physical vapor transport crystal growing situation. Cases with and without gravity have been computed. Dependence of the flows upon the dimensionless parameters aspect ratio and Peclet, Rayleigh, and Schmidt numbers is demonstrated to a greater extent than in previous works. Most notably, it is shown that the effects of thermally-induced buoyant convection upon the mass flux on the growth interface crucially depend upon the temperature boundary conditions on the sidewall (e.g., whether adiabatic or of a fixed profile, and in the latter case the results depend upon the shape of the profile assumed).

TP-2634 September 1986

This report presents the mechanical properties and the stress corrosion resistance of triple melted
[vacuum induction melted (VIM), electro-slag remelted (ESR), and vacuum arc remelted (VAR)], solution treated, work strengthened and direct double aged Inconel 718 alloy bars [4.00 in. (10.16 cm) and 5.75 in. (14.60 cm) diameter] processed by Wyman Gordon.

Tensile, charpy v-notched impact, and compact tension specimens were tested at ambient temperature in both the longitudinal and transverse directions. Longitudinal tensile and yield strengths in excess of 220 ksi (1516.85 MPa) and 200 ksi (1378.00 MPa) respectively, were realized at ambient temperature.

Additional charpy impact and compact tension tests were performed at -100°F (-73°C). Longitudinal charpy impact strength equalled or exceeded 12.0 ft-lbs (16.3 Joules) at ambient and at -100°F (-73°C) while longitudinal (LC) compact tension fracture toughness strength remained above 79 ksi √in. (86.80 MPa √m) at ambient and at -100°F (-73°C) temperatures.

No failures occurred in the longitudinal or transverse tensile specimens stressed to 75 and 100 percent of their respective yield strengths and exposed to a salt fog environment for 180 days. Tensile tests performed after the stress corrosion test indicated no mechanical property degradation.

TP-2636 September 1986
The Variation of Corrosion Potential With Time for Coated Metal Surfaces. Merlin D. Danford and Ward W. Knockemus. Materials and Processes Laboratory. N86-30837

The variation of corrosion potential (ECORR) with time has been measured for 4130 steel coated with a preservative compound and for primer coated 2219-T87 aluminum. The data for coated steel samples show a great deal of scatter, and a smoothing procedure has been developed to enable proper interpretation of the data. The ECORR-time curves for coated steel exhibit a maximum, in agreement with the results of previous studies, where the data were the average of those for a large number of samples, while the present data were obtained from a single sample. In contrast, the ECORR-time curves for primer coated 2219-T87 aluminum samples show no significant variations, although considerable activity is indicated by the resistance-time and corrosion rate-time curves.
NASA CONFERENCE PUBLICATIONS

CP-2410 January 1986
Current Scientific Issues in Large Scale Atmospheric Dynamics. Compiled by Timothy L. Miller. Systems Dynamics Laboratory.
N86-24082

CP-2411 January 1986

CP-2421 April 1986

CP- August 1986

CP- August 1986
CR-3957 February 1986

CR-3959 February 1986

CR-3960 February 1986

CR-3961 February 1986

CR-3962 March 1986

CR-3969 March 1986

CR-3971 April 1986

CR-3981 May 1986

CR-3990 June 1986

CR-3993 September 1986

CR-4011 September 1986

CR-4022 October 1986

CR-4025 October 1986

CR-178514 August 1985
Techniques for Fatigue Life Predictions from Measured Strains. NAS8-34971. Failure Analysis Associates.

CR-178515 August 1985
### NASA CONTRACTOR REPORTS

(Abstracts for these reports may be obtained from STAR)

<table>
<thead>
<tr>
<th>Report Number</th>
<th>Date</th>
<th>Title</th>
<th>Details</th>
</tr>
</thead>
</table>
CR-178534  August 6, 1985  
Space Station Body Mounted Radiator Systems, Progress Report No. 3. NAS8-36402. LTV Aerospace and Defense.  
X86-90086

CR-178535  August 15, 1985  
X86-90093

CR-178536  August 1985  
N86-12551

CR-178537  October 1985  
N86-16586

CR-178538  October 1985  
N86-16587

CR-178539  September 1, 1985  
X86-90106

CR-178540  October 17, 1985  
Protein Crystal Growth Results from Shuttle Flight 51-F. NAS8-36611. University of Alabama at Birmingham.  
N86-16875

CR-178541  May 1983  
A 8.45 GHz FET Amplifier. NAS8-34545. Massachusetts Institute of Technology.  
N86-71114

CR-178542  August 15, 1985  
X86-90094

CR-178543  September 16, 1985  
X86-90099

CR-178544  August 15, 1985  
N86-14206

CR-178545  August 1, 1985  
X86-90090

CR-178546  October 1, 1985  
X86-90103

CR-178547  July 1985  
N86-90154

CR-178548  August 1985  
X86-10160

CR-178549  August 1985  
X86-10159

CR-178550  September 1985  
X86-71471

CR-178551  August 1985  
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-178552 October 1, 1985
Simulation of Solidification in a Bridgman Cell. NAS8-35331. Continuum, Inc. X86-90102

CR-178553 October 14, 1985
Dynamics and Energetic of the South Pacific Convergence Zone During FGGE SOP-1. NAS8-35187. Purdue University. X86-90112

CR-178554 October 15, 1985
Utilization of Satellite Cloud Information to Diagnose The Energy State and Transformations in Extratropical Cyclones. NAS8-34009. Purdue University. X86-90135

CR-178555 October 3, 1985

CR-178556 October 1985

CR-178557 September 13, 1985

CR-178558 August 31, 1985
Refurbishment of Three Axis Attitude Motion Simulator for Period Ending August 31, 1985. NAS8-36409. Sperry Corp. N86-90292

CR-178559 July 22, 1985

CR-178560 August 30, 1985
Space Station Common Module Audio Distribution System Laboratory Demonstration. NAS8-36430. Hughes Aircraft Corp. X86-90097

CR-178561 September 1985
Space Station Thermal Storage Refrigeration System Research and Development. NAS8-36401. Lockheed Missiles and Space Company.

CR-178562 October 2, 1985
Advanced SSME Turbine Disk Processing for Hydrogen Resistance. NAS8-35669. Wyman-Gordon Company. X86-71441

CR-178563 September 1985

CR-178564 August 10, 1985

CR-178565 October 11, 1985
Latest Flight Profile and Software Change and Assess Their Effect ET Heat Loads. NAS8-36196. Dynetics, Inc. X86-71650

CR-178566 September 12, 1985
Mechanical Properties of Various Alloys in Hydrogen. NAS8-36040. Pratt and Whitney Aircraft Group. X86-71482

CR-178567 August 30, 1985
Space Shuttle Propulsion Estimation Development Verification. NAS8-36152. Rogers Engineering and Associates. X86-72008

CR-178568 September 30, 1985
Space Shuttle Propulsion Estimation Development Verification. NAS8-36152. Rogers Engineering and Associates. X86-72009

CR-178569 September 10, 1985
SRB Reentry Thermal Environments. NAS8-36476. Remtech Inc. X86-90098

CR-178570 September 16, 1985
CR-178571  May 1985
Design, Performance Investigation, and Delivery of a Miniaturized Cassegrainian Concentrator Solar Array. NAS8-36535. TRW Space and Technology Group. N86-16726

CR-178572  October 10, 1985
Development of a Shuttle Plume Radiation Heating Indicator, Progress Report. NAS8-35671. Remtech Inc. X86-71440

CR-178573  October 15, 1985

CR-178574  August 14, 1985

CR-178575  August 31, 1985

CR-178576  September 1985

CR-178577  October 9, 1985
Space Station Body Mounted Radiator Systems. NAS8-36402. LTV Aerospace and Defense Company. X86-71976

CR-178578  June 1985
Space Station Natural Environment Design Criteria Studies. NAS8-36400. Universities Space Research Association. X86-90085

CR-178579  October 1985

CR-178580  October 24, 1985
Space Station Common Module Audio Distribution System Laboratory Demonstration. NAS8-36430. Hughes Aircraft Company. N86-90323

CR-178581  September 9, 1985

CR-178582  September 6, 1985

CR-178583  October 4, 1985

CR-178584  August 31, 1985
Space Station Common Module System Network Topology and Hardware Development Program. NAS8-36583. Martin Marietta Corp. N86-90324

CR-178585  July 31, 1985
Space Station Common Module Power System Network Topology and Hardware Development Program. NAS8-36583. Martin Marietta Corp. N86-90284

CR-178586  August 1985
Space Station Protective Coating Development Combined Monthly Technical Progress Report for Periods 6-10-85 to 7-10-85 and 7-10-85 to 8-10-85. NAS8-36586. Boeing Aerospace Company. X86-71974

CR-178587  April 1985
Space Station Common Module Power System Network Topology and Hardware Development. NAS8-36583. Martin Marietta Corp. N86-18348

CR-178588  August 19, 1985
CR-178589  October 4, 1985

CR-178590  September 27, 1985

CR-178591  October 10, 1985
SRB Reentry Thermal Environments. NAS8-36476. Remtech, Inc. X86-71451

CR-178592  September 1985

CR-178593  August 9, 1985
Main Chamber Combustion and Cooling Technology Study. NAS8-36167. Aerojet Tech-Systems Company. N86-90282

CR-178594  September 6, 1985
Main Chamber Combustion and Cooling Technology Study. NAS8-36167. Aerojet Tech-Systems Company. N86-90291

CR-178595  September 13, 1985
Augmented Flexible Body Dynamics Analysis Program. NAS8-34588. Honeywell Corp. N86-90302

CR-178596  October 11, 1985
Augmented Flexible Body Dynamics Analysis Program. NAS8-34588. Honeywell Inc. N86-90305

CR-178597  August 1985

CR-178598  September 30, 1985
Internal Rotor Friction. NAS8-35601. Mechanical Technology Incorporated. X86-90013

CR-178599  January 1981

CR-178600  September 4, 1985

CR-178601  October 10, 1985

CR-178602  August 1985

CR-178603  September 30, 1985

CR-178604  May 1985

CR-178605  July 1985

CR-178606  September 10, 1985
Development of a Shuttle Plume Radiation Heating Indicator. NAS8-35671. Remtech Inc. N86-19336

CR-178607  October 1985
Analytical Investigation of the Dynamics of Tethered Constellations in Earth Orbit (Phase II). NAS8-36606. Smithsonian Institution. N86-19336
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-178608 November 1985

CR-178609 September 1985

CR-178610 November 18, 1982
Mass Property Generator for Augmented Flexible Bodies Via NASTRAN. NAS8-34752. Sperry Rand Corp. N86-70664

CR-178611 September 8, 1985

CR-178612 October 31, 1985

CR-178613 October 23, 1985

CR-178614 September 6, 1985

CR-178615 September 30, 1985
Space Station Common Module Power System Network Topology and Hardware Program. NAS8-36583. Martin Marietta Corp. N86-90325

CR-178616 October 12, 1985
Mechanical Properties of Various Alloys in Hydrogen. NAS8-36040. Pratt and Whitney. X86-71483

CR-178617 September 6, 1985
Progress Report for the Month of August on Contract NAS8-35836. MTS Systems Corp. X86-71565

CR-178618 October 10, 1985
Progress Report for the Month of September 1985 on Contract NAS8-35836. MTS Systems Corp. X86-73782

CR-178619 October 1985

CR-178620 September 6, 1985
Space Station Electro-Optical Sensor Assembly. NAS8-36627. Ball Aerospace Systems Division. X86-90117

CR-178621 September 19, 1985

CR-178622 October 25, 1985

CR-178623 August 23, 1985

CR-178624 September 23, 1985
Development of a Coaxial Viewer and Vision System for Gas Tungsten Arc Welding. NAS8-35595. Ohio State University. X86-90104

CR-178625 October 1985
Advanced 3-D Viscous SSME Turbine Rotor Stator CFD Algorithms. NAS8-36486. Mississippi State University. X86-71443
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-178626 October 21, 1985

CR-178627 June 1985

CR-178628 April 1985

CR-178629 November 1985

CR-178630 November 4, 1985

CR-178631 November 8, 1985

CR-178632 October 26, 1985

CR-178633 January 1986

CR-178634 September 6, 1985

CR-178635 March 1980

CR-178636 December 1978
Locomotive Truck Characterization Technical Proposal. NAS8-29882. Martin Marietta Corp. N86-70743

CR-178637 August 1985

CR-178638 February 1985

CR-178639 March 1982
Solid Rocket Motor Internal Ballistic Performance Variations – Volume 1. NAS8-33886. Auburn University. X86-10041

CR-178640 June 1984

CR-178641 October 1985

CR-178642 November 1985

CR-178643 October 21, 1985
Orbital Equipment Transfer Techniques Progress Report During the Month of September. NAS8-36629. Essex Corp. N86-90344

CR-178644 November 6, 1986
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-178645 November 12, 1985
Space Station Body Mounted Radiator Systems
Progress Report No. 6. NAS8-36402. Aerospace
and Defense Vought Missiles and Advanced
Programs Division. X86-71452

CR-178646 November 8, 1985
Advanced Planar Array Development for Space
Station, Monthly Progress Report No. 4, October
1985. NAS8-36419. Lockheed Missiles and
Space Corp. N86-90359

CR-178647 October 18, 1985
Advanced Planar Array Development for Space
Station, Monthly Progress Report No. 3, August-
September 1985. NAS8-36419. Lockheed Mis-
siles and Space Corp. N86-90341

CR-178648 November 1985
Refurbishment of Three Axis Attitude Motion
Simulator Monthly Activity Report of Contract
NAS8-36409, No. 3, Period Ending October 31,
1985. Sperry Corp. N86-90338

CR-178649 October 31, 1985
Space Station Common Module Power System
Network Topology and Hardware Development
Program, Progress Report for October 1 -
October 31, 1985. NAS8-36583. Martin
Marietta Corp. N86-90343

CR-178650 October 1985
Space Station Electro-Optical Sensor Assembly
Monthly Progress Report for Period Ending
September 30, 1985. NAS8-36627. Ball
Aerospace System Division.

CR-178651 November 1985
Space Station Electro-Optical Sensor Assembly
Monthly Progress Report for Period Ending
October 31, 1985. NAS8-36627. Ball Aerospace
Systems Division. X86-71454

CR-178652 August 1985
Space Station Electro-Optical Sensor Assembly
Monthly Progress Report for Period Ending July
31, 1985. NAS8-36627. Ball Aerospace Systems
Division. X86-71453

CR-178653 October 10, 1985
Space Station Data Management Network
Components. NAS8-36411. Cybex Corp.
N86-90309

CR-178654 November 11, 1985
Space Station Data Management Network
Components. NAS8-36411. Cybex Corp.
N86-90349

CR-178655 September 1985
Development of Structural Dynamic Analysis
Tools, Monthly Progress Report No. 2, August
Boeing Aerospace Company. X86-71569

CR-178656 September 1985
Space Station Rotary Joint Mechanism Test Bed
Progress Report No. 3. NAS8-36585. Campbell
Engineering Corp. X86-90131

CR-178657 October 1985
Space Station Rotary Joint Mechanism Test Bed
Progress Report No. 4. NAS8-36585. Campbell
Engineering Corp. X86-90132

CR-178658 November 15, 1985
Space Station Propulsion Technology Monthly
Status Report No. 5, September 28, 1985 -
November 1, 1985. NAS8-36418. Rockwell
International Corp. X86-72011

CR-178659 October 11, 1985
Space Station Propulsion Technology, Monthly
Status Report 4, August 31, 1985 - September
27, 1985. NAS8-36418. Rockwell International
Corp. X86-10251

CR-178660 November 5, 1985
Monthly Report on NAS8-36182. Texas A&M
University. N86-90335

CR-178661 August 30, 1985
Texas A&M University. N86-90354

CR-178662 July 26, 1985
Progress Report on Contract NAS8-36182 for
Table of Contents

CR-178663 June 27, 1985

CR-178664 November 15, 1985

CR-178665 October 10, 1985
Design, Fabrication, Testing, and Delivery of a Manipulator Foot Restraint, Work Completed During the Month of September. NAS8-36366. Essex Corp. N86-90337

CR-178666 October 1985

CR-178667 October 11, 1985

CR-178668 September 10, 1985

CR-178669 September 1985

CR-178670 September 6, 1985

CR-178671 October 31, 1985
Space Shuttle Propulsion Estimation Development Verification Progress Report. NAS8-36152, Rogers Engineering Associates. X86-72010

CR-178672 November 12, 1985

CR-178673 November 15, 1985

CR-178674 September 3, 1985

CR-178675 October 1, 1985

CR-178676 November 13, 1985

CR-178677 January 1986
Definition Phase for Thermal Ion Dynamics Experiment for Open. NAS8-34910. Michigan University. N86-20098

CR-178678 October 1985

CR-178679 October 21, 1985
Progress Report for September on Contract NAS8-36125. Stanford University. X86-73166

CR-178680 November 30, 1985
Progress Report for the Month of October 1985 on NAS8-36125. Stanford University. X86-72433
CR-178681 November 1985
N86-90342

CR-178682 November 18, 1985
X86-73070

CR-178683 November 18, 1985
X86-73792

CR-178684 November 18, 1985
X86-73793

CR-178685 November 18, 1985
X86-73794

CR-178686 November 18, 1985
X86-72362

CR-178687 September 13, 1985
N86-20782

CR-178688 October 1985
N86-13138

CR-178689 September 1985
N86-20435

CR-178690 September 16, 1985
X86-90116

CR-178691 August 30, 1985
N86-90306

CR-178692 September 23, 1985
N86-90299

CR-178693 November 7, 1985
X86-90134

CR-178694 November 12, 1985
X86-72023

CR-178695 November 8, 1985
X86-72477

CR-178696 November 14, 1985
X86-72481

CR-178697 November 1985
N86-90348

CR-178698 October 8, 1985
CR-178699
CR-178700
CR-178701
CR-178702
CR-178703
CR-178704
CR-178705
CR-178706
CR-178707
CR-178708
CR-178709
CR-178710
CR-178711
CR-178712
CR-178713
CR-178714
CR-178715
CR-178716
CR-178717

November 13, 1985
October 9, 1985
October 8, 1985
October 1985
November 8, 1985
December 5, 1985
January 7, 1986
August 1984
December 5, 1985
December 10, 1985
November 1, 1985
January 1986
December 1985
June 15, 1985
December 31, 1985
December 1985
March 1986
October 21, 1985
December 16, 1985


Eutectic Solidification Study. NAS8-34887. Clarkson College of Technology.
Research Reports – 1985 NASA/ASEE Summer Faculty Fellowship Program. NGT 01-008-021.

Visiting Scientist Program in X-Ray Astronomy.
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

X86-90210

CR-178718 December 1985
X86-90206

CR-178719 October 10, 1985

CR-178720 September 10, 1985
Design, Fabrication, Testing, and Delivery of a Manipulator Foot Restraint. NAS8-36366. Essex Corp.

CR-178721 December 3, 1985

CR-178722 October 1985

CR-178723 October 31, 1985

CR-178724 September 13, 1985
X86-90216

CR-178725 December 1985

CR-178726 February 1986
Space Station ECLSS Integration Analysis, Space Station Trasys Model for Body Mounted Radiator Study. NAS8-36407. McDonnell Douglas.
X86-10155

CR-178727 March 1986

CR-178728 October 10, 1985
Pulsed Doppler Lidar Airborne Scanner. NAS8-33120. Raytheon. N86-20781

CR-178729 May 30, 1980

CR-178730 December 1985
Sample Selection and Testing of Separation Processes. NAS8-35593. Huntsville Hospital.

CR-178731 December 31, 1985
Development of Acceptance Criteria for Batches of Silane Primer for External Tank Thermal Protection System Bonding Applications. NAS8-35818. Springborn Laboratories. X86-10241

CR-178732 February 18, 1986

CR-178733 January 1986
Drop Tube Technical Tasks - Final Report. NAS8-35665. The University of Alabama in Huntsville.

CR-178734 August 1985

CR-178735 January 7, 1986

CR-178736 September 1985
Analysis of Data from NASA B-57B Gust Gradient Program, Final Report. NAS8-36177
and NAS8-35347. The University of Tennessee
Space Institute.

CR-178737  January 1986
Evaluation of Tailored Single Crystal Airfoils,
Fourth Quarterly Progress Report May 10, 1985 -
December 31, 1985. NAS8-35915. Williams
International Corp.

CR-178738  January 31, 1986
Emergency Management Computer-Aided
Trainer (EMCAT). NAS8-35815. Essex Corp.

CR-178739  August 1985
Turbomachinery Incipient Failure Detection
Indicators and Analysis. NAS8-34683. Shaker
Research Corp.

CR-178740  November 1985
Performance Predictions for an SSME Configura-
tion with an Enlarged Throat. NAS8-35931.
Software and Engineering Associates, Inc.

CR-178741  January 1986
Drop Tube Technical Tasks, Final Report.
NAS8-35665. University of Alabama in
Huntsville.

CR-178742  February 20, 1986
Ancillary Foam Investigations, Mission Task
001017 Final Report - FY85. NAS8-33708.
Martin Marietta Michoud Aerospace.

CR-178743  January 16, 1986
Glass Fiber Pulling in Low Gravity. NAS8-
35978. University of Alabama in Huntsville.

CR-178744  March 1986
Scientific Support for Space Telescope Progress
Report for June, July, August, September,
October, and November 1985. NAS8-36672.
Universities Space Research Association.

CR-178745  April 1986
On the Determination of the Origin of Linear
Anomaly in the Macrostructure of VPPA Welded
2219-T87 Aluminum Alloy - Preliminary

CR-178746  January 6, 1986
Space Shuttle Main Engine (SSME) LOX Turbo-
pump Pump-End Bearing Analysis Final Report.
NAS8-36183. SRS Technologies Inc.

CR-178747  November 1985
Bearing Tester Data Compilation Analysis, and
Reporting and Bearing Math Modeling, Monthly
Systems Technology Division.

CR-178748  January 1986
Bearing Tester Data Compilation Analysis and
Reporting and Bearing Math Modeling Annual
Report. NAS8-36183. SRS Technologies.

CR-178749  December 1985
Bearing Tester Data Compilation Analysis, and
Reporting and Bearing Math Modeling, Monthly
Progress Report for November 1985. NAS8-
36183. SRS Technologies.

CR-178750  February 22, 1986
The System Integration and Verification Testing
of an Orbital Maneuvering Vehicle for an Air
Bearing Floor. NAS8-35636. Essex Corp.

CR-178751  December 30, 1985
Atomization and Mixing Study. NAS8-34504.
Rockwell International.

CR-178752  August 20, 1985
Interchangeable End Effector Tools Utilized on
the PFMA, Task Two Final Report. NAS8-
36307. SRS Technologies.

CR-178753  October 31, 1985
High-Performance Deployable Structures for the
Support of High Concentration Ratio Solar Array
Modules, Final Report. NAS8-36043. Astro
Aerospace Corp.

CR-178754  February 1986
Analytical Investigation of the Dynamics of
Tethered Constellations in Earth Orbit (Phase II)
CR-178755
March 31, 1986

CR-178756
December 1985
The Investigation of Tethered Satellite System Dynamics. NAS8-36160. Smithsonian Institution. N86-90548

CR-178757
October 1985

CR-178758
January 7, 1986

CR-178759
December 10, 1985

CR-178760
December 4, 1985

CR-178761
December 10, 1985

CR-178762
December 11, 1985

CR-178763
December 12, 1985

CR-178764
November 1985

CR-178765
December 6, 1985

CR-178766
November 29, 1985

CR-178767
January 1, 1986

CR-178768
December 1985

CR-178769
November 1985

CR-178770
November 1, 1985
Integrated Wall Design and Penetration Damage Control, Monthly Progress Report No. 5 Covering October 1 to 31, 1985. NAS8-36426. Boeing Aerospace Corp. X86-90196
NASA CONTRACTOR REPORTS
(abstracts for these reports may be obtained from STAR)

CR-178771 January 6, 1986

CR-178772 January 7, 1986
Improved LOX/GOX Compatible Reinforced Cage Material. NAS8-36041. TRW Electronics and Defense. X86-90224

CR-178773 December 10, 1985

CR-178774 September 16, 1985
SRM Nozzle Instrumentation and Model Validation Study. NAS8-36290. Morton Thiokol, Inc. X86-90202

CR-178775 March 1986
Growth of GaAs Crystals from the Melt in a Partially Confined Configuration. NAS8-36604. Massachusetts Institute of Technology. X86-90523

CR-178776 December 11, 1985
SRM Nozzle Instrumentation and Model Validation Study. NAS8-36290. Morton Thiokol, Inc. X86-90209

CR-178777 December 2, 1985

CR-178778 November 30, 1985
Space Shuttle Propulsion Estimation Development Verification. NAS8-36162. Rogers Engineering and Associates. X86-74222

CR-178779 November 25, 1985
Software Development to Support Sensor Control of Robot Arc Welding. NAS8-36460. Clemson University. X86-74310

CR-178780 December 18, 1985
Software Development to Support Sensor Control of Robot Arc Welding. NAS8-36460. Clemson University. X86-74311

CR-178781 December 6, 1985
Progress Report for the Month of November 1985 on Contract NAS8-35836. MTS Systems Corp. X86-74279

CR-178782 December 1985
Development of a Coaxial Viewer and Vision System for Gas Tungsten Arc Welding. NAS8-35595. Ohio State University. X86-90220

CR-178783 December 9, 1985

CR-178784 November 1985

CR-178785 December 5, 1985

CR-178786 December 18, 1985

CR-178787 November 1985

CR-178788 September 1985
Space Station Protective Coatings Development for the Periods 8-10-85 to 9-10-85 and 9-10-85 to 10-10-85. NAS8-36586. Boeing Aerospace Company. X86-90200

CR-178789 March 1986
The Investigation of Tethered Satellite System
CR-178790
November 1985

CR-178791
April 1986
Operational Procedures and Specifications Document for the National Drop Tube Facility. NAS8-34530. University of Alabama in Huntsville. X86-10395

CR-178792
December 10, 1985
Space Station Long-Term Lubrication Analysis. NAS8-36655. Battelle Columbus Division and SRS Technologies. X86-90212

CR-178793
January 10, 1986
Space Station Long-Term Lubrication Analysis, December 1 through December 31, 1985. NAS8-36655. Battelle Columbus Division. X86-90225

CR-178794
September 12, 1985

CR-178795
November 13, 1985

CR-178796
August 16, 1985

CR-178797
May 9, 1985
Space Station ECLSS Integration Analysis Space Station Body Mounted Radiator Model. NAS8-36407. McDonnell Douglas. X86-10259

CR-178798
December 1985

CR-178799
January 1986

CR-178800
January 31, 1986

CR-178801
February 1986
SSME Seal Test Program: Test Results for Sawtooth Pattern Damper Seal. NAS8-35824. Texas A&M University. N86-23940

CR-178802
January 1986

CR-178803
February 28, 1986

CR-178804
February 26, 1986

CR-178805
February 26, 1985

CR-178806
February 26, 1986
CR-178807  February 1986

CR-178808  January 1986

CR-178809  January 1986

CR-178810  January 1986

CR-178811  January 1986
A Data Base and Analysis Program for Shuttle Main Engine Dynamic Pressure Measurements, Appendix D Final Report. NAS8-34343. Wyle Laboratories. N86-23637

CR-178812  January 1986

CR-178813  January 1986
A Data Base and Analysis Program for Shuttle Main Engine Dynamic Pressure Measurements, Appendix F Final Report. NAS8-34343. Wyle Laboratories. N86-23639

CR-178814  December 12, 1985

CR-178815  April 1986

CR-178816  March 1986

CR-178817  April 1986

CR-178818  March 1986

CR-178819  December 1985

CR-178820  December 1984

CR-178821  December 1984

CR-178822  December 1984
NASA CONTRACTOR REPORTS
(abstracts for these reports may be obtained from STAR)

CR-178823 November 11, 1985
X86-74669

CR-178824 December 12, 1985
X86-74671

CR-178825 February 1986
N86-90531

CR-178826 December 15, 1977
NASA Standard Spacecraft Computer II (NSSC-II), Principles of Operation. NAS8-32808. IBM.

CR-178827 July 15, 1975
NASA Standard Spacecraft Computer II (NSSC-II), Assembler Language. NAS8-32808. IBM.

CR-178828 February 7, 1986
N86-24719

CR-178829 February 1986
X86-90192

CR-178830 April 7, 1986
X86-90191

CR-178831 January 15, 1986
Utilization of Satellite Cloud Information to Diagnose the Energy State and Transformations in Extratropical Cyclones. NAS8-34009. Purdue Research Foundation.
N86-90575

CR-178832 October 1985
X86-10368

CR-178833 January 1979
Solid-Propellant Rocket Motor Internal Ballistics Performance Variation Analysis (Phase Four). Auburn University.
X86-10358

CR-178834 January 1980
Solid-Propellant Rocket Motor Internal Ballistics Performance Variation Analysis (Phase Five). Auburn University.
X86-10353

CR-178835 April 1986
N86-24720

CR-178836 April 1986
Hall Station and Camera System Operation and Maintenance Manual. NAS8-36646. The University of Dayton.
N86-24966

CR-178837 April 11, 1986
N86-25121

CR-178838 May 1, 1986
Simulation of Mercury Cadmium Telluride Crystal Growth. NAS8-36483. Continuum, Inc.

CR-178839 April 1964

CR-178840 September 1965

CR-178841 September 1965
CR-178842 March 1966

CR-178843 June 1965

CR-178844 April 1986

CR-178845 March 1986
Failure Control Techniques for the SSME - Phase I. NAS8-36305. Rockwell International. N86-29900

CR-178846 March 1986
Analytical Investigations of the Dynamics of Tethered Constellations in Earth Orbit, Phase II. NAS8-36606. Smithsonian Institution. N86-28114

CR-178847 April 14, 1986

CR-178848 April 1986
Space Plasma Research. NAS8-33982. The University of Alabama in Huntsville.

CR-178849 May 1986

CR-178850 August 1985
Hardware Test Program for Evaluation of Baseline Range/Range Rate Sensor Concept Phase I Program. NAS8-36144. Allied Bendix Aerospace.

CR-178851 February 1986
Signal Detection Techniques for Diagnostic Monitoring of Space Shuttle Main Engine Turbomachinery. NAS8-34961. Wyle Laboratories. N86-27417

CR-178852 March 1986
Adaptive Rigid Body Control for an Evolving Space Station, Progress Report March 1986. NAS8-36422. Ford Aerospace and Communications Corp. X86-90253

CR-178853 April 18, 1986

CR-178854 March 1986

CR-178855 August 10, 1985

CR-178856 August 1985

CR-178857 September 10, 1985

CR-178858 September 1985

CR-178859 March 1986
CR-178860  July 1986
Ostwald Ripening Theory - Final Report. NAS8-35986. The University of Alabama in Huntsville. N86-27432

CR-178861  July 1986
Creation of the Selection List for the Experiment Scheduling Program (ESP) - Final Report. NAS8-35972. Texas A&M University. N86-28004

CR-178862  August 26, 1985
Concentration Dependence of the Interdiffusion Coefficient, Quarterly Report. NAS8-35986. The University of Alabama in Huntsville. N86-27433

CR-178863  July 1986
Ostwald Ripening Theory. NAS8-35986. The University of Alabama in Huntsville.

CR-178864  July 1986

CR-178865  May 8, 1986

CR-178866  July 1986

CR-178867  March 7, 1986
Orbital Transfer Vehicle Concept Definition and System Analysis Study. NAS8-36108. Martin Marietta Corp.

CR-178868  March 7, 1986

CR-178869  May 1986

CR-178870  April 1986

CR-178871  August 1986

CR-178872  January 10, 1985
Properties of Large Nearly Perfect Crystals at Very Low Temperatures. NAG-8015. University of Maryland. X86-10371

CR-178873  April 1986

CR-178874  June 1986

CR-178875  June 20, 1986

CR-178876  September 12, 1985

CR-178877  October 10, 1985

CR-178878  October 22, 1985
Co-ops Program Preliminary Work Breakdown
<table>
<thead>
<tr>
<th>Contract Number</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NASA8-36600. Lockheed-Georgia Company.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-36600. Lockheed-Georgia Company.</td>
</tr>
<tr>
<td>CR-178881</td>
<td>December 1985</td>
<td>Co-ops Program Fifth Monthly Activity Report, November 1985 (Study of a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carbon Dioxide Observational Platform System). NASA8-36600. Lockheed-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Georgia Company. X86-76368</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-36655. Battelle Columbus Division and SRS Technologies.</td>
</tr>
<tr>
<td>CR-178883</td>
<td>August 1986</td>
<td>Bearing Tester Data Compilation Analysis, and Reporting and Bearing Math</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modeling. NASA8-36183. SRS Technologies.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-36401. Lockheed. X86-76434</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Airesearch Manufacturing Company. N86-30864</td>
</tr>
<tr>
<td>CR-178886</td>
<td>February 1986</td>
<td>Relativity Explorer, Quarterly Progress Report. NASA8-33809. University of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alabama in Huntsville. X86-76115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-36476. Remtech, Inc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-36290. Morton Thiokol, Inc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thiokol, Inc.</td>
</tr>
<tr>
<td>CR-178890</td>
<td>June 1986</td>
<td>System Analysis for the Huntsville Operation Support Center Distributed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer System. NASA8-34906. Mississippi State University. N86-32232</td>
</tr>
<tr>
<td></td>
<td></td>
<td>that Constitute the “Throat” of the Solid Rocket Booster (First Annual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor Report). NASA8-36299. Alabama Agricultural and Mechanical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA1-11735. General Dynamics Convair Division.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N86-72326</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASA8-35510. Continuum, Inc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N86-31654</td>
</tr>
<tr>
<td>CR-178894</td>
<td>May 1986</td>
<td>Ascent Trajectory Dispersion Analysis for WTR Heads-Up Space Shuttle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N86-31631</td>
</tr>
<tr>
<td>CR-178897</td>
<td>May 1986</td>
<td>Space Station Propulsion Technology First</td>
</tr>
</tbody>
</table>
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)


CR-178898 July 1986
Space Plasma Research April - June 1986, Quarterly Progress Report. NAS8-33982. The University of Alabama in Huntsville. N86-32289

CR-178899 June 1986

CR-178900 July 1986

CR-178901 July 1986

CR-178902 May 1, 1986

CR-178903 February 1985

CR-178904 March 1985

CR-178905 May 1985

CR-178906 June 31, 1986
Space Transportation Booster Engine (STBE) Configuration Study First Quarterly Review. NAS8-36856. Rockwell International Corp.

CR-178907 June 13, 1986
Space Transportation Main Engine (STME) Configuration Study Plan (DR-1). NAS8-36869. Rockwell International Corp.

CR-178908 June 3, 1986

CR-178909 June 3, 1986

CR-178910 May 20, 1986

CR-178911 September 1986

CR-178912 February 1986

CR-178913 February 1986

CR-178914 May 6, 1986
Space Station Structures Development. NAS8-36421. Rockwell International.
<table>
<thead>
<tr>
<th>Report Number</th>
<th>Date</th>
<th>Title</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-178915</td>
<td>April 1986</td>
<td>Space Station Protective Coatings Development</td>
<td>NASA Contract NAS8-36586</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Boeing Aerospace Company</td>
</tr>
<tr>
<td>CR-178916</td>
<td>April 30, 1986</td>
<td>The Relationship of Storm Severity to Directionally Resolved Radio Emissions - Final Report</td>
<td>Southwest Research Institute</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N86-32601</td>
</tr>
<tr>
<td>CR-178918</td>
<td>May 15, 1986</td>
<td>Studies and Analyses of Space Shuttle Main Engine, Progress Report for April 1986.</td>
<td>Battelle Columbus Division</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Institution</td>
<td>Title</td>
<td>Conference/Meeting/Workshop</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>WOLLKIND, D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEKERKA, R.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTER, WENDY S.</td>
<td>EH22</td>
<td>Effects of Magnetic Field on the Solidification of MAR-M246(Hf).</td>
<td>For presentation at NASA Solidification Macrosegregation Workshop, Cleveland, Ohio, September 17, 1986.</td>
</tr>
<tr>
<td>BAO, J. J.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td>NASA/NRC/ES52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUESS, S. T.</td>
<td>NRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUESS, S. T.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANDREWS, J. B.</td>
<td>ES74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TURPEN, N.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROBINSON, M. B.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td>ES52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAO, J. J.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WU, S. T.</td>
<td>(UAH)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALTER, WENDY S.</td>
<td>EH22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUESS, S. T.</td>
<td>NRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOORE, R.</td>
<td>ES52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUESS, S. T.</td>
<td>ES52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN, C.-H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUESS, S. T.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANDREWS, R. N.</td>
<td>ES75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SZOFRAN, F. R.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COBB, S. D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEHOCZKY, S. L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERRY, G. E.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARNETT, CARL D.</td>
<td>PF19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATKINS, HARRY L.</td>
<td>PS05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATKINS, HARRY L.</td>
<td>PS05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAGDIGIAN, R.</td>
<td>EL84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUTNAM, D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MORASKO, G.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAGDIGIAN, R.</td>
<td>EL84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUTNAM, D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MORASKO, G.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAGDIGIAN, R.</td>
<td>EL84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUTNAM, D.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MORASKO, G.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BAILEY, C. R. EP23

BENTON, E. V.
FRANK, A. L.
PARNELL, T. A. ES62
WATTS, J. W., JR. ES62

BHAT, BILIYAR EH23

BHAT, BILIYAR EI123

BILBRO, JAMES ED23
DiMARZIO, C.
FITZJARRALD, D.
JOHNSON, S.
JONES, W.
Airborne Doppler Lidar Measurements. For publication in Applied Optics.

BLAKESLEE, R. J. ED43

BLAKESLEE, R. J. ED43

BOARDSEN, S. ES51
GURNETT, D.
CHAPPELL, C. R.
GREEN, J.

BRAMON, CHRISTOPHER J. EH44
SULLIVAN, KENNETH W.

BROADFOOT, A. L. ES01
DESSLER, A. J., et al.
Ultraviolet Spectrometer Observations of Uranus. For publication in Science, New York, NY.

BRODOWSKI, ROBERT A. EP24

BRONEZ, M. A. EL15
CLARKE, M. M.
QUINN, ALBERTA, W.

BROWN, NORMAN PD22

BRYANT, MELVIN A., III SAS5
SSME Manufacturing – Main Combustion Chamber. For presentation to the Society of Automotive Engineers, Huntsville, AL, June 16-18, 1986.
BURKA, JAMES A.  

BURNETT, T. H.  
PARNELL, T. A.  
WATTS, J. W., et al.  

BURNETT, T. H.  
PARNELL, T. A., et al.  

BURKA, JAMES A.  

BURNETT, T. H.  
PARNELL, T. A.  
WATTS, J. W., et al.  

BURNETT, T. H.  
PARNELL, T. A., et al.  

BURNETT, T. H.  
PARNELL, T. A., et al.  

BURNETT, T. H.  
PARNELL, T. A., et al.  

CARRASQUILLO, EDGAR J.  

CARRUTH, M. R., JR.  
Surface Voltage Gradient Role in Electron Collection Through Slits in Dielectric. For publication in the Journal of Spacecraft and Rockets, New York, NY.

CARTER, DANIEL C.  

CHANDLER, M. O.  
WAITE, J. H., et al.  
A Comparison of Theoretical Results to the Voyager/Uranus Observations. For presentation at the Magnetosphere of the Outer Planets Conference, Iowa City, IA, September 1-6, 1986.

CHANDLER, M. O.  
WAITE, J. H., JR.  
YELLE, R. V.  
SANDEL, B. R.  

CHANDLER, M. O.  
WAITE, J. H., JR.  
YELLE, R. V.  
SANDEL, B. R.  

CAMPINS, H.  
TELESCO, C. M.  
DECHER, R.  
MOZURKEWICH, D.  
THRONSON, H. A., JR.  
Ground-Based Infrared Imaging of Comet Giacobini-Zinner: The Distribution of Dust During the ICE Flyby. For publication in Geophysical Research Letters, Washington, D.C.
CHAPPELL, C. R. ES51

CHAPPELL, C. R. ES51

CHAPPELL, C. R. ES51

CHAPPELL, C. R. ES51
MOORE, T. E.
WAITE, J. H., JR.

CHASSAY, ROGER P. JA61

CHEN, C. P. NRC/ED42

CHEN, C. P. NRC/ED42

CHEN, C. P. NRC/ED42

CHEN, Y. S. ED42
SANDBORN, V. A.
Computational and Experimental Study of Turbulent Flows in 180 Degree Bends. For presentation and publication at the AIAA/ASME/SAE/ASEE 22nd Joint Propulsion Conference, Huntsville, AL, June 16-18, 1986.

CHEN, Y. S. ED42
Applications of a New Wall Function to Turbulent Flow Computations. For presentation at the AIAA 24th Aerospace Science Meeting, Reno, NV, January 6-8, 1986.

CHEN, Y. S. ED42
CAMPBELL, C. WARREN
SANDBORN, V. A.

CHENG, C.-C. ES01
TANDBERG-HANSSEN, E. A.

CHRISTIAN, H. J. ED43

CHRISTIAN, H. J. ED43

CHUNG, T. J. EP25
CIKANEK, HARRY A., III

CLARKE, J., et al.

CLAUER, C. R.
Examination of Three Different Configurations of the Dayside Polar Cleft: Preliminary Results. For presentation at the Spring AGU Meeting, Baltimore, MD, May 19-23, 1986.

COBB, S. D.
ANDREWS, R. N.
SZOFRAN, F. R.
LEHOCZKY, S. L.
Characterization of Directionally Solidified Hg1.3Zn0.7Se. For presentation at the 1986 Fall Meeting of the Metallurgical Society, Orlando, FL, October 5-9, 1986.

COLLINS, MARCIA R.
The Effect of Electrical Discharge Machining on the Fatigue Life of Inconel 718 Alloy. For presentation at the 1986 TMS Fall Meeting TMS-Metallurgical Society, Orlando, FL, October 7, 1986.

COMFORT, R. H.

COMFORT, R. H.
NEWBERRY, I. T.
CHAPPELL, C. R.

COOK, JERRY R.
Space Station O2/H2 Thruster Test: Rocketdyne 25 lbf Prototype. For presentation at the ITEA Symposium, Huntsville, AL, September 30-October 2, 1986.

COSTES, N. C.
FRENCH, K. W.
JANOO, V. C.
PARKER, J. K.
STURE, S.

CRAVEN, P. D.
OLSEN, R. C.
GENNELL, J.
CROLEY, D.
AGGSON, T.
Potential Modulations on the SCATHA Spacecraft. For publication in the Journal of Spacecraft and Rockets, Gainsville, VA.

CRAVEN, P. D.
CHAPPELL, C. R.

CURRELLI, P. A
KAUKLER, W. F.
The Effects of Gravity Level During Directional Solidification on the Microstructure of Hypermonotectic Al-In-Sn Alloys. For publication in Metallurgical Transactions, Pittsburgh, PA.

CURRELLI, P. A.
CURRERI, P. A. ES72
VAN ALSTINE, J. M.
BROOKS, D. E.
BAMBERGER, S.
SNYDER, R. S.
On the Stability of High Volume Fraction Immiscible Dispersions in Low Gravity. For publication in Metallurgical Transactions, Pittsburgh, PA.

CURRERI, P. A. ES72

DAILEY, C. C. ES65
REILY, J. C.
WEISSKOPF, M. C.
WYMAN, C. L.
GLENN, P.
SLOMAT, A.
McKINNON, P. J.
MURRAY, S. S.
et al.
Correspondence Between AXAF TMA X-Ray Performance and Models Based Upon Mechanical and Visible Light Measurements. For publication by SPIE, Bellingham, WA.

DANFORD, M. D. EH24

DANFORD, M. D. EH24

DANFORD, M. D. EH24

DARBO, WESLEY ES65
Twin Primes. For publication in The Mathematical Log, Norman, OK.

DARWIN, CHARLES R. PF20
Space Launch Systems – New Benefiting Opportunities. For presentation at the Thirty-Seventh IAF Congress, Innsbruck, Austria, October 4-11, 1986.

DARWIN, CHARLES R. PF20
Status of Space Transportation. For publication in Aerospace America.

DESSLER, A. J. ES01
Planetary Magnetospheres. For presentation at the International Symposium on Space Physics, Beijing, China, November 10-14, 1986.

DESSLER, A. J. ES01

DESSLER, A. J. ES01

DESSLER, A. J. ES01
A Turbulent Interface. For publication in the Geophysical Research Letters, Washington, D.C.

DESSLER, A. J. ES01
1986 – A Vintage Year for Space Science. For publication in Science, Washington, D.C.

DESSLER, A. J. ES01
Editorial, APL Rides a Barium Comet. For publication in Johns Hopkins Magazine, Baltimore, MD.

DODGE, JAMES FD43
ARNOLD, JAMES
WILSON, GREGORY
EVANS, JAMES
FUJITA, TED
The Cooperative Huntsville Meteorological
Experiment (COHMEX). For publication in the American Meteorological Society Bulletin, Boston, MA.

DOLAR, FRED J. **EH14**
MSFC Cryogenic Turbopump Bearing Tester Results and Analysis. For presentation at the AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Huntsville, AL, June 16-18, 1986.

DOLAN, FRED J. **EH14**

DOWDY, JAMES F. **ES52**
RABIN, DOUGLAS (NSO)
MOORE, RONALD L.
On the Magnetic Structure of the Quiet Transition Region. For publication in Solar Physics, The Netherlands.

DOZIER, JAN D. **EP42**
HACKETT, ROBERT M.

EBY, P. B. **ES63**
SUNG, C. C.
Comparison of Exact and Approximate Formulae for the Mott Correction to Energy Loss of Relativistic Heavy Ions. For publication in Physical Review A, Upton, Long Island, NY.

ELSNER, R. F. **ES65**
WEISSKOPF, M. C.

ELSNER, R. F. **ES65**
WEISSKOPF, M. C.
DARBRO, W.
RAMSEY, B. D.
WILLIAMS, A. C.
SUTHERLAND, P. G.
Observations of Quasi-Periodic Oscillations from GX 5-1 and CYG X-2 with the Einstein (HEAO-2) Observatory. For publication in Astrophysical Journal (Letters), Chicago, IL.

EMSLIE, A. GORDON **UAH**
MACHADO, MARCOS E. **NRC/ESS2**

EOFF, WILLIAM L. **TA51**

ESKRIDGE, RICHARD H. **EP26**

ETHRIDGE, E. C. **ES74**
CURRERI, P. A.
PLINE, D.
Heterogeneous Nucleation and Glass Formation Studies of 56Ga₂O₃-44CaO. For publication in the Journal of the American Ceramic Society, Columbus, OH.

EUDY, ROBERT G. **KA41**

FACEMIRE, BARBARA R. **ES75**
FRAZIER, DONALD O.

FEREBEE, ROBIN C. **ED23**
FERNANDEZ, KEN

FERNANDEZ, KEN
COOK, GEORGE
Vanderbilt Univ.

FERNANDEZ, KEN
COOK, GEORGE

FERNANDEZ, KEN
COOK, GEORGE

FICHTL, GEORGE H.
Spacelab 3: Research in Microgravity. For publication in Science Magazine.

FICHTL, GEORGE H.
SMITH, STEVE
USRA

FISHMAN, G. J.
PACIESAS, W. S.
GREGORY, J. C.

FISHMAN, G. J.
MEEGAN, C. A.
WILSON, R. B.
PACIESAS, W. S.
Observation of a Strong Gamma Ray Burst on Spacelab 2. For presentation at the COSPAR 26th Meeting, Toulouse, France, June 30-July 12, 1986.

FITZJARRALD, D. E.

FOUNTAIN, JAMES A.

FOWLIS, W. W.
A Comparison of the Reduction of Convection by a Magnetic Field and A Microgravity Environment. For publication in Advances in the Astronautical Sciences, Boulder, CO.

FOWLIS, W. W.
OWEN, R. B.
WITHROW, W. K.
Review of the Book Flow Visualization III. For publication in the Bulletin of the American Meteorological Society, Boston, MA.

FOWLIS, W. W.
BAIRD, J. K.

FOWLIS, W. W.
IATHAWAY, D. H.
FRANKLIN, D. B. 

FREEMAN, MICHAEL S. 

FREEMAN, MICHAEL S. 
HOOPER, JAMES W. 

GALABOFF, ZACHARY J. 
Validation of TSS SES Simulation. For presentation at the Tether Dynamics Simulation Workshop, Arlington, VA, September 16, 1986.

GARY, G. A. 
MOORE, R. L. 
HAGYARD, M. J. 
Non-Potential Features Observed in the Magnetic Field of an Active Region. For publication in the Astrophysical Journal, Chicago, IL.

GARY, GILMER A., et al. 

GILES, B. L. 
CHAPPELL, C. R. 
WAITE, J. H., JR. 
MOORE, T. E. 
HORWITZ, J. L. 
The Auroral Ion Fountain: MLT, L-Shell and Magnetic Activity Dependences. For publication in EOS, American Geophysical Union, Washington, D.C.

GILES, B. L. 

GOERTZ, C. K. 
DESSLER, A. J. 

GOLDBERG, BENJAMINE. 

GOMBOSI, T. I. 
CRAVENS, T. E. 
NAGY, A. F. 
WAITE, J. H., JR. 
Unsteady O+ Flow in the Polar Ionosphere. For presentation at the 5th Scientific Assembly of International Association of Geomagnetism and Aeronomy, Prague, Czechoslovakia, August 5-17, 1985.

GREENBERG, H. S. (RI) 
ENGLER, E. E. 

GREENE, JOHN B. 
OWEN, JAMES W. 

GREENE, MICHAEL 
LORENZONI, ANDREA 
RUPP, CHARLES 
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEE, YOUNG C.</td>
<td>ED33</td>
<td></td>
</tr>
<tr>
<td>BENDER, ROBERT L.</td>
<td>Remtech, Inc.</td>
<td></td>
</tr>
<tr>
<td>ENGEL, CARL D.</td>
<td>Remtech, Inc.</td>
<td></td>
</tr>
<tr>
<td>SHUTTLE MISSION 51-L-R-SRB LEAK PLUME ANALYSIS</td>
<td></td>
<td>A Laboratory Model of Planetary and Stellar Convection. For publication in Science, Washington, D.C.</td>
</tr>
<tr>
<td>GREGORY, J. C.</td>
<td>ES63</td>
<td>Free Molecular Drag and Lift Deduced from Shuttle Flight Experiment. For presentation and publication at the Rarefied Gas Dynamics 15 Conference, Grando, Italy, July 16, 1986.</td>
</tr>
<tr>
<td>KARR, G. R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PETERS, P. N.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAYASHI, T.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARNELL, T. A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAKAHASHI, Y.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HALL, GERALD E.</td>
<td>JA53</td>
<td></td>
</tr>
<tr>
<td>HARRINGTON, M. M.</td>
<td>TA41</td>
<td></td>
</tr>
<tr>
<td>HART, J.</td>
<td>ES73</td>
<td></td>
</tr>
<tr>
<td>TOOMRE, J.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEANE, A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HURLBURT, N.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLATZMAIER, G.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FICHTL, G.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LESLIE, F.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOWLIS, W.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOMMerville, Richard C. J.</td>
<td>Univ. of California</td>
<td></td>
</tr>
<tr>
<td>HAYASHI, T.</td>
<td>ES65</td>
<td></td>
</tr>
<tr>
<td>NOMOTO, K.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAKAHASHI, Y.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIYAJI, S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARNELL, T. A.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HENDERSON, ARTHUR J.</td>
<td>EH22</td>
<td>Project Explorer’s Unique Experiments: Getaway Special No. 007. For presentation at the 1985 GAS Experimenter Symposium, GSFC, Greenbelt, MD, October 8-9, 1985.</td>
</tr>
<tr>
<td>HERNANDEZ, A. M.</td>
<td>ES52</td>
<td></td>
</tr>
<tr>
<td>MACHADO, M. E.</td>
<td>(NRC)</td>
<td></td>
</tr>
<tr>
<td>VILMER, N.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRGGTET, G.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HERREN, G. J. ES73
SHAFTER, S. G.
VAN ALSTINE, J.
HARRIS, J. M.
SNYDER, R. S.

Control of Electroosmosis in Coated Quartz Capillaries. For publication in the Journal of Colloid and Interface Science, New York, NY.

HESTER, T. R. Martin Marietta ANDERSON, A. E. EB41


HICKEY, MICHAEL P. ED44


HILL, T. W. ES01
DESSLER, A. J.


HINMAN, ELAINE M. EB24


HINMAN, ELAINE M. EB24
YORCHAK, JOHN P.

Teleoperation of Space-Based Manipulators. For presentation at the Human Factors Association of Canada 19th Annual Meeting, Vancouver, British Columbia, Canada, August 22-23, 1986.

HOLMES, C. BASD
WOLFSON, R. Aerospace
HARDAGE, J. FA21


HOOVER, RICHARD B. ES52

The Spectral Slicing X-Ray Telescope. For publication in Optical Engineering, Tucson, AZ.

HOOVER, RICHARD B. ES52


HOOVER, RICHARD B. ES52

Photographic Film As a Detector for Solar X-Ray/XUV Astronomical Applications. For publication in Solar Physics, The Netherlands.

HORWITZ, J. L. ES53
BRACE, L. H.
COMFORT, R. H.

CHAPPELL, C. R.


HORWITZ, J. L. ES53
COMFORT, R. H.

CHAPPELL, C. R.

Plasmasphere and Plasmapause Characteristics as Measured by DE-1. For presentation at the XXVI COSPAR Workshop, Toulouse, France, June 30-July 12, 1986.

HORWITZ, J. L. ES53

The Tail Ion Spectrometer Effect: Theory and Observations. For presentation at the XXVI COSPAR Workshop, Toulouse, France, June 30-July 12, 1986.

HOWELL, LEONARD W., JR. ED12

A Stochastic Model for Particle Impingements on Orbiting Spacecraft. For publication in The Journal of the Astronautical Sciences, Fairfax, VA.

HUMPHRIES, WILLIAM R. EL84
SOSNAY, RICHARD G. Martin Marietta Denver

HUMPHRIES, W. R. EL84
REUTER, J. L.
SCHUNK, R. G.


HUMPHRIES, W. R. EL84
RAY, C. D.


HUNG, R. J. ED42
CHIU, Y. N.
LESLIE, FRED W.


HUNG, R. J. UAH
LIU, J. M. UAH
SMITH, R. E. ED41


HWANG, K. S. ES53
STONE, N. H.
WRIGHT, K. H., JR.
SAMIR, U.


HWANG, K. S. ES53
STONE, N. H.
WRIGHT, K. H., JR.
SAMIR, U.

Theoretical Investigation of Broadband Electrostatic Noise Associated with Secondary Ion Streams Near the Shuttle Orbiter. For publication in the Journal of Geophysical Research, Washington, D.C.

HWANG, K. S. ES53
STONE, N. H.
WRIGHT, K. H., JR.
SAMIR, U.

A Parametric Study of Broadband Electrostatic Waves Near the Shuttle Orbiter. For publication in Planetary and Space Science, Elmsford, NY.

ISHIMOTO, M. ES55
TORR, M. R.

Energetic He⁺ Precipitation in a Mid-Latitude Aurora. For publication in the Journal of Geophysical Research, Washington, D.C.

IWAN, J. ES72
ALEXANDER, D.
LUNDQUIST, CHARLES A.

Residual Motions Caused by Micro-Gravitational Accelerations. For publication by the Journal of the Astronautical Sciences, VA.

JEDLOVEC, GARY J. ED43
WILSON, GREGORY S.


JEDLOVEC, GARY J. ED44
MENZEL, W. PAUL
WILSON, GREGORY S.

ATKINSON, ROBERT J.


JEWELL, R. E. ED21


JOHNSON, GARY W. PF20

Recovery Technology for Unmanned Launch Vehicles. For presentation at the 23rd Space Congress, Cocoa Beach, FL, April 22-25, 1986.
JOLLY, W. D.  
KNADLER, J. M., III  

JONES, CLYDE S.  
WATSON, J. KEVIN  
TODD, DOUG M.  
Use of Voice Recognition for Control of a Robotic Welding Workcell. For presentation at the International Conference on Systems, Man, and Cybernetics, Atlanta, GA, October 14-17, 1986.

JONES, CLYDE S.  
GANGL, KENNETH J.  

JONES, LEE W.  

KARR, L. J.  
SHAFER, S. J.  
HARRIS, J. M  
VAN ALSTINE, J.  
SNYDER, R. S.  
Immuno-Affinity Partition of Cells in Aqueous Polymer Two-Phase Systems. For publication in the Journal of Chromatography.

KIRKWOOD, NANCY  
WEEKS, DAVID J.  

KULPA, VYGANTAS P.  

LEE, J. E.  
McCAY, M. H  
CURRERI, P. A.  
The Effect of Gravity Level on the Average Primary Dendritic Spacing of a Directionally Solidified Superalloy. For publication in Metallurgical Transactions, Warrandale, PA.

LESLE, FRED  
GANS, R. F.  

LESTER, ROY C.  
CAHILL, L. J.  
PERSON, A.  
WAITE, J. H., JR.  

LITTLE, SALLY A.  
WAITE, J. H., JR.  
MOORE, T. E.  

LOCKWOOD, M.  
WAITE, J. H., JR.  
MOORE, T. E.  
Injection of Solar Wind and Ionospheric Ions at the Cusp. For presentation at the M.I.S.T. (UK) Conference, Edinburgh, United Kingdom, April 7, 1986.

LOVATO, FRANK  
LUNDQUIST, CHARLES A. UAH
SNODDY, WILLIAM C. PA01
   Commercial Use of Space – Status and Prospects.
   For presentation at the 1985 Winter National
   Design Engineering Show and Conference,

McCAY, T. DWAYNE EP26
DEXTER, CAROL E.
   Space Shuttle Main Engine Fuel Preburner
   Augmented – Spark Igniter Backflow Analysis.
   For presentation at the AIAA/ASME/SAE/ASEE
   Joint Propulsion Conference, Huntsville, AL,
   June 16-18, 1986.

McCONNAUGHEY, HELEN V. ED31
   Highlights of the SSME Computational Fluid
   Dynamics (CFD) Fourth Working Group Meet-
   ing. For presentation and publication at the 1986
   Conference on Advanced Earth-to-Orbit Tech-

McCARTY, JOHN P.
McCAY, T. DWAYNE EP01
   Advances in High Chamber Pressure Propulsion.
   For presentation at the 37th IAF Congress,
   Innsbruck, Austria, October 4-11, 1986.

McNIDER, RICHARD T. ED43
KALB, MICHAEL W.
JEDLOVEC, GARY J.
WILSON, GREGORY S.
   Boundary Layer Initiation of Convection, April
   24, 1982: Part I – Evolution of Mesoscale Struc-
   ture. For publication in Monthly Weather
   Review.

McPHERSON, W. B. EH23
   Development of a Hydrogen Resistant Alloy for
   Advanced Propulsion Systems. For presentation
   at the AIAA 22nd Joint Propulsion Conference,
   Huntsville, AL, June 16, 1986.

MacLEAN, LAURA ED44
MEYER, PAUL
HICKEY, JOHN (ACI)
KARITANI, SHOGO (ACI)
PARKER, KAREN (NTI)
PAYNE, KAREN (NTI)
   Interactive Information Processing for NASA’s
   Atmospheric Sciences Division. For presentation
   at the International Conference on Interactive
   Information and Processing Systems for
   Meteorology, Oceanography and Hydrology,
   Miami Beach, FL, January 12-17, 1986.

MACHADO, MARCOS E. ES52
   Chromospheric Flare Models. For publication in
   the Proceedings of NSO Summer Meeting on the
   Physics of Low Temperature Flares, Sacramento
   Peak, Obs., NM, August 1985.

MACHADO, MARCOS E. ES52
   White Light Flares and Atmospheric Modeling.
   For publication in the Proceedings of NSO
   Summer Meeting on the Physics of Low
   Temperature Flares, Sacramento Peak Observa-
   tory, NM, August 1985.

MACHADO, MARCOS E. ES52
   Symposium Summary. For publication in the
   Proceedings of the NSO/SMM Summer Meeting,
   Sunspot, New Mexico, August 1985.

MALHERBE, J. M. ES01
SCHMIEDER, B.
MEIN, P.
TANDBERG-HANSSEN, E. A.
   Dynamics of Solar Filaments V. Oscillations in
   Ha and the CIV, 1548 A Line. For publication in
   Astronomy and Astrophysics, Meudon, France.

MEEGAN, C. A. ES62
FISHMAN, G. J.
WILSON, R. B.
PACIESAS, W. S.
   Observation of Gamma Ray Burst from Spacelab
   2. For presentation at the 167th Meeting of the
   American Astronomical Society, Houston, TX,
   January 5-9, 1986.
MENZEL, W. PAUL                  ED44
JEDLOVEC, GARY                     
WILSON, GREGORY


MICKELBOROUGH, MARTHA             AD01


MILLER, E. R.                     ES61
CARIGNAN, G. R.                Univ. of Michigan

The Shuttle Induced Background: Gaseous Constituents. For presentation and publication at the XII – Contamination Environment of the Space Shuttle for Astronomical Observations; 26th Plenary COSPAR Meeting, Toulouse, France, June 30-July 12, 1986.

MILLER, TIMOTHY L.              ED42


MITCHELL, ROYCE E.                TA81


MITCHELL, ROYCE E.                TA81
FLANAGAN, GERALD


MIYAJI, S.                       ES65
NOMOTO, K.


MOK, EVA Y.                       (RI)
CLARKE, MARGARET M.              (RI)
QUINN, ALBERTA W.                EL15


MONKS, R. F.                       EP13
MOREL, D. E.                      Harris Corp.
JACKSON, J.                      MCI
GODDARD, D.                      MSFC
ENGLER, E. E.


MOOKHERJI, T.                   ES71
NAUMANN, ROBERT J.
VLASSE, MARCUS


MOORE, CARLETON J.              ED22

MSFC Space Station Structural Dynamics Test Philosophy. For presentation at the Workshop on Measurement and Characterization of Acceleration Environment on the Space Shuttle and Space Station, Guntersville, AL, August 12-14, 1986.

MOORE, D. R.                   EH23
DRINAN, D. T.
HODO, J. D.

Development of a Computer-Controlled Technique to Determine Crack Growth Rate in Controlled Environments with Crack Opening Displacement. For presentation at the Advanced Earth-To-Orbit Propulsion Technology Conference, MSFC, AL, May 14, 1986.

MOORE, RONALD L., et al.         ES52

MOORE, R. L. ES52

MOORE, RONALD ES52
BOHLIN, DAVID NASA Headquarters

MOORE, T. E. ES53
POLLOCK, C. J.
ARNOLDY, R. L.
KINTNER, P. M.

MOORE, T. E. ES53

MOORE, T. E. ES53
POLLOCK, C. J.
ARNOLDY, R. L.
KINTNER, P. M.
Preferential O+ Heating in the Topside Ionosphere. For publication in Geophysical Research Letters, Washington, D.C.

MUKERJEE, T. ED42
PRZEKWAS, A. J.
HOLLAND, R. L.
COSTES, N. C.

NAUMANN, ROBERT J. ES71
Physical Behaviour of Fluids and Particles in Microgravity. For presentation at the FASEB Summer Research Conference, Copper Mt., CO, July 26-August 1, 1986.

NAUMANN, ROBERT J. ES71

NAUMANN, ROBERT J. ES71
Research Opportunities in Space. For presentation at the Pathways to Space Experimentation Workshop, Orlando, FL, June 17-19, 1986.

NAUMANN, ROBERT J. ES71

NEIGHBORS, ALICE K. PF16

NESMAN, TOMAS E. ED24
Signal Analysis Techniques in Structural Dynamics. For presentation at the Workshop on Measurement and Characterization of Acceleration Environment on the Space Shuttle and Space Station, Guntersville, AL, August 12-14, 1986.

NICOLAS, DAVID P. EB13
TAYLOR, C. D.
WADE, T. E.

ODOM, JAMES B. TA01
MITCHELL, ROYCE E. TA81

OLSEN, R. C. ES53
CHAPPELL, C. R.

OLSEN, R. EL15
GUINAN, D. Grumman
QUINN, A. EL15

OLSEN, R. C. ES51
CHAPPELL, C. R.
Conical Ion Distributions Near One Earth Radius. For presentation at the XXVI COSPAR Workshop, Toulouse, France, June 30-July 12, 1986.

OLSEN, R. C. ES53
SHAWHAN, S. D.
GALLAGHER, D. L.
GREEN, J. L.
CHAPPELL, C. R.
ANDERSON, R. R.

OWEN, ROBERT B. ES73
KROES, ROGER L.
WITHEROW, WILLIAM K.
Results and Further Experiments Using Spacelab Holography. For publication in Optics Letters, Washington, DC.

OWEN, ROBERT B. ES73
Research in Materials Processing Using a Low Gravity Simulation Aircraft. For publication in the University of Colorado Low-Gravity Science Seminar Proceedings, Boulder, CO.

OWEN, R. B. ES73
GIARRATANO, P. J.
ARP, V. D.

OWEN, R. B. ES73
BROOM, B. H.
SNYDER, R. S.
DANIEL, R.
Liquid Drop Stability for Protein Crystal Growth in Microgravity Simulated on the KC-135 Aircraft. For publication by Aviation, Space and Environmental Medicine, San Antonio, TX.

OWENS, J. K. ES55
TORR, M. R.
TORR, D. G.
The Dayglow Spectrum at 150 km. For presentation at the Fall Meeting, 1986 American Geophysical Union, San Francisco, CA, December 8-12, 1986.

OWENS, J. K. ES55
TORR, MARSHA R.
TORR, D. G.

OWENS, S. F. ED42
MUKERJEE, T.
SINGHAL, A. K.
PRZEKWAS, A. J.
GLYNN, D. R.
COSTES, N. C.
Numerical Analysis of Flow in the Hot Gas Manifold of the Space Shuttle Main Engine. For publication in the AIAA Journal of Spacecraft and Rockets.
MSFC PAPERS CLEARED FOR PRESENTATION
(Available only from authors. Dates are presentation dates.)

OWENS, S. F. ED42
MUKERJEE, T.
SINGHAL, A. K.
PRZEKWAS, A. J.
GLYNN, D. R.
COSTES, N. C.

PABLO, J. D. ES52
MACHADO, MARCOS E. (NAS/MSFC)

PARKER, JOE R. PD11
MORGAN, SAMUEL H.

PARNELL, T. A. ES65
MIYAJI, S.
TAKAHASHI, Y.

PETERS, P. N. ES63
GREGORY, J. C.
KARR, G. R.

PETERS, P. N. ES63
SWANN, J. T.
GREGORY, J. C.
Effects on Optical Systems from Interactions with Oxygen Atoms in Low Earth Orbits. For publication in Applied Optics, Newton Highlands, MA.

PETERS, P. N. ES63
GREGORY, J. C.
SISK, R. C.
Oxygen Atom Velocity Distributions as Viewed from a Spacecraft and Their Use to Determine Thermospheric Temperatures. For publication in Geophysical Research Letters, Washington, D.C.

PETERNER, W. K. ES53
MOORE, T. E.
SHELLY, E. G.
WAITE, J. H., JR.
BOARDSEN, S. A.
GURNETT, D. A.
Observations of Transverse Ion Energization on Auroral Field Lines from Dynamics Explorer-1. For presentation at the Fall Meeting of the American Geophysical Union, San Francisco, CA, December 9-13, 1985.

PORTER, J. G. ES52
REICHMANN, E. J.
MOORE, R. J.
HARVEY, K. L.
SPRC
Associations of Compact C IV Events, He I 10830 Å Dark Points, and Magnetic Structures. For presentation at the 167th Meeting of the American Astronomical Society, Houston, TX, January 5-9, 1986.

PORTER, JASON G. ES52
GEBBIE, KATHARINE B.
NOVEMBER, LAURENCE J.

POTEET, WADE M. ES73
OWEN, ROBERT B.
A Compact Field Color Schlieren System for Use in Microgravity Materials Processing. For publication in Optical Engineering, Bellingham, WA.
POWELL, LUTHER E.  KA01
GOSS, ROBERT
SPENCER, RICHARD  Martin
NASA’s Robotic Servicing Role for Space Station. For presentation at the Thirty-Seventh IAF Congress, Innsbruck, Austria, October 7, 1986.

POWELL, LUTHER E.  KA01

POWELL, LUTHER E.  KA01
NASA’s Robotic Servicing Role for Space Station. For presentation at the Thirty-Seventh IAF Congress, Innsbruck, Austria, October 4-11, 1986.

POWELL, LUTHER E.  KA01
STEIBBINS, JERRY  Boeing
Logistics Resupply Scenario for the Space Station. For presentation at the Thirty-Seventh IAF Congress, Innsbruck, Austria, October 7, 1986.

PRAKASH, C.  ED42
SINGHAL, A.
SCHAFFER, C. F.

PUSEY, MARC L.  ES73
An Apparatus for Protein Crystal Growth Studies. For publication in Analytical Biochemistry, San Diego, CA.

PUSEY, MARC L.  ES73
SNDYER, ROBERT S.
NAUMANN, ROBERT J.
Protein Crystal Growth: Growth Kinetics for Tetragonal Lysozyme Crystals. For publication in the Journal of Biological Chemistry, U.S.A.

PUSEY, MARC L.  ES73
NAUMANN, ROBERT J.

QUINN, ALBERTA W.  EL15
THOMPSON, WILLIAM M.

QUINN, ALBERTA  EL15
OLSEN, ROY E.  Grumman

QUINN, ALBERTA  EL15
CLARK, M.  Rockwell
THOMPSON, W.  NSA
SHIELDS, N.  Essex

RAMSEY, B.  ES65
WEISSKOPF, M. C.

RAMSEY, B. D.  ES65
WEISSKOPF, M. C.

RAMSEY, B. D.  ES65
WEISSKOPF, M. C.
ELSNER, R. F.
A Fluorescent Gated Proportional Counter for X-Ray Astronomy. For publication in the SPIE Proceedings, Cannes, France.
RAMSEY, B. WEISSKOPF, M. C.
ELSNER, R. F.

RAMSEY, B.

RAO, D. STRUCK, H. G.

RAY, JOHN R. SMALLEY, LARRY L.

RAY, JOHN R. SMALLEY, LARRY L.

RAY, JOHN R. SMALLEY, LARRY L.

RAY, W. L. POLICELLI, F. J.
ITCHKAWICH, T. J.
Improved Large Diameter Pressure Seal Using the Seal Capture Device. For presentation at the AIAA Conference, Huntsville, AL, June 16-18, 1986.

REASONER, D. L. BUSH, R. I.
Ambient Ion Perturbations/Induced by an Electron Gun on the Orbiter. For presentation to the 1986 Fall Meeting American Geophysical Union, San Francisco, CA, December 8-12, 1986.

REINLEITNER, L. A. GALLAGHER, D. L. GURNETT, D. A.
Ion Cyclotron Resonance with Thermal Helium Near the Plasmapause. For presentation at the AGU Spring Meeting, Baltimore, MD, May 19-23, 1986.

REISS, D. A. KROES, R. L.
ANDERSON, E. E.
Growth Kinetics of the (001) Face of TGS Below the Ferroelectric Transition Temperature. For publication in the Journal of Crystal Growth, Amsterdam.

REYNOLDS, NATHANIEL D. MILLER, TIMOTHY L.
Almost Symmetric Instability at Unit Prandtl Number. For publication in the Journal of the Atmospheric Sciences, Boston, MA.

RHODES, PERCY H. SNYDER, ROBERT S.
Sample Band Spreading Phenomena in Ground and Space-Based Electrophoretic Separators. For publication in Electrophoresis, Springer-Verlag: West Germany.

ROBERTS, W. T. DABBS, J. R.

ROBERTS, WILLIAM T.

ROBERTSON, FRANKLIN R. ED43
RUPP, CHARLES C.  

RUTLEDGE, WILLIAM S.  

RYAN, RICHARD M.  
GROSS, LOREN A.  

SANDLIN, A. C.  
ANDREWS, J. B.  
CURRERI, P.  

SCHRAMM, HARRY F.  
The Evolution of Bar Coding in NASA. For presentation at the SCAN-TECH'85 Meeting, Baltimore, MD, December 2-6, 1985.

SCHWANIGER, ARTHUR J.  
Low G Measurements by NASA. For presentation at the Measurement and Characterization of the Acceleration Environment on the Shuttle and Space Station, Guntersville, AL, August 12, 1986.

SCHWARTZ, D. A.  
McKINNON, J.  
mMURRAY, S. S.  
PRIMINI, F. A.  
VAN SPEYBROECK, L. P.  
ZOMBECK, M. V.  
REILY, J. C.  
WEISSKOPF, M. C.  
X-Ray Testing of the AXAF Technology Mirror Assembly (TMA) Mirror. For publication in the Proceedings of SPIE, Willingham, WA.

SCHWINGHAMER, R. J.  

SHEALY, DAVID L.  
HOOVER, RICHARD B.  
GABARDI, D. R.  

SISSON, JAMES M.  

SMALLEY, LARRY L.  
SMALLEY, LARRY L. ES65
Geometrization of Spin. For presentation at the Meeting of the American Physical Society, Williamsburg, VA, November 20-22, 1986.

SMALLEY, LARRY L. ES65
Is There A Connection Between Nonmetricity and the Large Numbers Hypothesis? For publication in Essays in Gravity Competition, Gravity Research Foundation, Gloucester, MA.

FENNELLY, A. J. ES65
An Interpretation of Orbital Residuals in Earth Satellites as Evidence for Macroscopic Nonmetricity in Gravitation. For publication in Physical Review Letters, Ridge, NY.

SMALLEY, LARRY L. ES65
Discrete Dirac Equation on a Finite Half-Integer Lattice. For publication in IL Nuovo Cimento, Bologna, Italy.

SMALLEY, LARRY L. ES65

SMITH, ROBERT E. ED41
NASA/MSFC Global Reference Atmosphere Model ’86. For presentation at the 26th Plenary Meeting of COSPAR, Toulouse, France, June 30-July 12, 1986.

SNODDy, WILLIAM C. PA01

SNODDy, WILLIAM C. PA01

SNODDy, WILLIAM C. PA01
Morgan, Dr. Samuel H., JR.

SNODDy, WILLIAM C. PA01
GALLOWAY, WILLIAM E. PA14
YOUNG, ARCHIE PD32

SNYDER, ROBERT ES73
NAUMANN, ROBERT ES71
HERREN, BLAIR ES73
CARTER, DAN ES73
DELUCAS, LAWRENCE J., et al.

SNYDER, ROBERTS ES73

SRINIVAS, R. TBE
DABBs, J. R. PS02
HOWELL, J. T. PD11
System Concept for the Pinhole/Oculter Facility Payload. For presentation at the 37th International Astronautical Federation Congress, Innsbruck, Austria, October 4-11, 1986.

STEFANESCU, D. ES72
CURRERRI, P.
FISKE, M.
Microstructural Variations Induced by Gravity Level During Directional Solidification of Near-Eutectic Iron-Carbon Type Alloy. For publication in Metallurgical Transactions, Pittsburgh, PA.

STEFANESCU, D. M. ES74
FISKE, M. R.
CURRERRI, P. A.
STONE, N. H. ES51
A Scientific Overview of the First TSS Mission.

SU, CHING-HUA ES72

SU, CHING-HUA ES72
Heat Capacity, Enthalpy of Mixing, and Thermal Conductivity of Hg$_1-x$Cd$_x$Te Pseudobinary Melts. For publication in the Journal of Crystal Growth, Amsterdam.

SU, CHING-HUA ES72
LEHOCZKY, S. L.
SZOFRAN, F. R.
A Method to Eliminate Wetting During the Homogenization of HgCdTe. For publication in the Journal of Applied Physics, New York.

SUESS, STEVEN T. ES52
Magnetic Clouds and the Pinch Effect. For presentation at the American Geophysical Union Fall Annual Meeting, San Francisco, CA, December 8-12, 1986.

SUESS, STEVEN T., et al. ES52

SWENSON, G. R. ES63
MENDE, S. B.
CLIFTON, K. S.

SZOFRAN, F. R. ES72
LEHOCZKY, S. L.

TAKAHASHI, YOSHIYUKI ES65
MIYAJI, SHIGEKI
PARNELL, THOMAS A.
WEISSKOPF, MARTIN C.

TAKAHASHI, YOSHIYUKI ES63

TAYLOR, KENNETH R. PS05
Opportunities for Commercial Participation in Microgravity Material Processing. For presentation to the Twenty-Third Space Congress, Canaveral Council of Technical Societies, Cocoa Beach, FL, April 22-25, 1986.

TAYLOR, ROY A. EH15

TELESCO, C. M. ES63

TELESCO, C. M., et al. ES63

TELESCO, C. M. ES63
DECHER, R.
WOLSTENCROFT, R. D.
THOM, ROBERT L. EH14

THOM, R. L. EH14
DOLAN, F. J.

THOMAS, LAWRENCE D. EL83

THOMPSON, R. G. EH42
NUNES, A. C.
CALLAGHAN, M. L.

THOMSON, J. PA01

THRONSON, H. A., JR. ES63
TELESCO, C. M., et al.
Star Formation in the Magellanic Irregular Galaxy NGC 4449. For publication in the Astrophysical Journal, Chicago, IL.

THRONSON, HARLEY A., JR. ES63
TELESCO, C. M.
Star Formation in Active Dwarf Galaxies. For publication in Astrophysical Journal, Chicago, IL.

TORR, MARSHA R. ES55
KANTANEN, R. O.

TORR, D. G.
ERWIN, E.
TORR, D. G.

TORR, MARSHA R. ES55
TORR, D. G.
Mesospheric NO from Spacelab 1. For presentation to the 1986 Fall Meeting American Geophysical Union, San Francisco, CA, December 8-12, 1986.

TORR, MARSHAL R. ES55
TORR, D. G.
OWENS, J. K.
The Optical Environment of the Spacelab 1 Mission. For publication in the AIAA Journal of Spacecraft and Rockets, New York, NY.

URBAN, EUGENE W. ES63
LADNER, DAN R.
SPIELMAKER, R.
Performance of the Superfluid Helium Dewar of...
the Infrared Telescope During the Spacelab 2 Mission. For presentation at the Space Cryogenics Workshop, ESTEC, Nordwijk, Holland, April 28-29, 1986.

URBAN, EUGENE, W. ES63
LADNER, DAN R.

URBAN, EUGENE W. ES63

URBAN, EUGENE W. ES63
LADNER, DAN R.

VAN ALSTINE, J.
BOYCE, J.
HARRIS, J. M.
BROOKS, D. E.
BAMBERGER, S.
Snyder, R. S.

VANDERHOFF, J. W. ES73
The First Products Made in Space: Monodisperse Latex Particles. For presentation at the Sixth European Symposium on Materials Science in Microgravity, Bordeaux, France, December 2-5, 1986.

VANDERHOFF, J. W. ES73
KORNFIELD, DALE, et al.
Preparation of Large-Particle-Size Monodisperse Latexes in Space. For presentation at the Emulsion Polymerization Symposium, American Chemical Society Spring National Meeting, New York, NY, April 1, 1986.

VINZ, FRANK L. EB44

VINZ, FRANK L. EB44
FERNANDEZ, KENNETH EB44

VLASSE, M. ES72
KOETZLE, T. F.
The Crystal and Molecular Structure of an Asymmetric Diacetylene Monomer, 1-(4'-dimethylaminobenzoyloxy)-6-(3'-, 5'"
VON TIESENHAUSEN, GEORG PS01
Tether Transportation. For presentation at the Applications of Tethers in Space Workshop, Venice, Italy, October 15-17, 1985.

WAITE, J. H., JR. ES53
CRAVENS, T. E.
CLARKE, J. T.
HORANYI, M.

WAITE, J. H., JR. ES53
CRAVENS, T. E.
CLARKE, J. T.
HORANYI, M.
Jovian Aurorae: Ion or Electron Precipitation? For presentation at the Magnetospheres of the Outer Planets Conference, Iowa City, IA, September 1-6, 1986.
WAITE, J. H., JR. ES53
LOCKWOOD, M.
MOORE, T. E.
CHANDLER, M. O.
CHAPPELL, C. R.
The Geomagnetic Mass Spectrometer. For presentation at the Fifth Scientific Assembly Symposium, Oxfordshire, England, August 4-5, 1985, and at the IAGA Meeting in Prague, Czechoslovakia, August 5-17, 1985.

WAITE, J. H., JR. ES53
The Ionospheres of Jupiter and Saturn: A Current Perspective. For presentation at the IAGA Meeting, Fifth Scientific Assembly, Prague, Czechoslovakia, August 5-17, 1985.

WAITE, J. H., JR. ES53
PETerson, W. K.
MOORE, T. E.
SHELLEY, E. G.

WEBB, D. F. ES52
HOLMAN, G. D.
DAVIS, J. M., et al.

WEISSKOPF, M. C. ES65
Advanced X-Ray Astrophysics Facility (AXAF). For presentation and publication at the XXXVIIth International Astronautical Congress, Innsbruck, Austria, and publication in Proceedings of IAF, October 4-11, 1986.

WEISSKOPF, M. C. ES65
MIYAJI, S.
HASHIMOTO, M.
NOMOTO, K.
Takahashi, Y.
Calcium Overabundance in Type-II Supernova Remnant. For publication in the Bulletin of the American Physical Society, New York, NY.

WEISSKOPF, M. C. ES65
LINSKY, J. L.

WEISSKOPF, M. C. ES65
LINSKY, J. L.

WEISSKOPF, M. C. ES65
ELSNER, R. F.
DARBRO, W.
MIYAJI, S.
RAMSEY, B.
WILLIAMS, A. C.
SUTHERLAND, P. G.
GRINDLAY, J. E.
Observations of Quasi-Periodic Oscillations from GS5-1 with the Einstein (HEAO-2) Observatory. For publication in the Bulletin AAS and for presentation to the American Astronomical Society, Houston, TX, January 5-9, 1986.

WEISSKOPF, M. C. ES65
The Advanced X-ray Astrophysics Facility (AXAF): An Overview. For presentation to the American Astronomical Society, Houston, TX, January 5-9, 1986, and for publication in the Bulletin AAS.

WEST, E. A. ES52

WHITAKER, ANN F. EH12
WIEGMANN, B. M.  

WILLIAMS, A. C.  
APPARAO, K. M. V.  
WEISSKOPF, M. C.  
On the Variability of the Pulsed Fraction in X-Ray Pulsing Binaries. For publication in the Astrophysical Journal, Chicago, IL.

WILLIAMS, A. C.  

WILLIAMS, A. C.  

WILLIAMS, A. C.  

WILSON, ROBERT M.  

WILSON, ROBERT M.  

WILSON, ROBERT M.  
HOLDNER, ERNEST  

WILSON, ROBERT M.  

WINKLER, CARLE.  

WITHEROW, WILLIAM K.  
Reconstruction Techniques of Holograms for Spacelab 3. For publication in the Journal of Applied Optics, Newton, Highlands, MA.

WITHEROW, WILLIAM K.  
Reconstruction of Holograms from the Fluid Experiment System on Spacelab 3. For presentation at the Aerospace Optics Workshop, Huntsville, Alabama, October 28, 1985.

WOJTALIK, FRED S.  
Hubble Space Telescope Systems Engineering. For presentation to the International Federation of Automatic Control (IFAC), Munich, Germany, July 26-31, 1986.

WRIGHT, K. H., JR.  
STONE, N. H.  
HWANG, K. S.  
SAMIR, U.  

WU, M. K.  
ASHBURN, J. R.  
TORNG, C. J.  
CURREN, P. A.  
CHU, C. W.  
WU, M. K.  
ASHBURN, J. R.  
CURRERI, P. A.  
KAUKLER, W. F.  


APPROVAL

FY 1986 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 Atomic Energy Commission 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, Administrative Operations Office