NASA TECHNICAL MEMORANDUM

NASA TM 78250

FY 1979 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

Compiled by O. L. White
Management Services Office

October 1979

NASA

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama
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This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 79. 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.

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FOREWORD

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

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

The N number shown for the reports listed are 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 1979 SCIENTIFIC AND TECHNICAL REPORTS,
ARTICLES, PAPERS, AND PRESENTATIONS

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Place, Route in 2-Dimensions (PR2D) is a standard cell automatic layout computer program for generating Large Scale Integrated/Metal Oxide Semiconductor (LSI/MOS) arrays. It is one of the components in the NASA/MSFC Computer Aided Design and Test system (CADAT). The program has been utilized successfully for a number of years in both Government and private sectors but until now had been undocumented. This material describes the compilation, loading, and execution of the program on a Sigma V CP-V operating system located at the NASA/MSFC Electronics and Control Facility. This material is also intended to aid in the conversion and running of the program on other data processing systems.

TM-78186** August 1978

A detailed cost analysis/cost improvement study has been performed on two Department of Energy/National Aeronautics and Space Administration Operational Test Sites to determine actual costs and potential cost improvements of new and retrofit hot-air type solar assisted heating and hot water systems for single family sized structures. This analysis concentrates on the “first-cost” of a system which includes procurement, installation, and integration of a solar assisted heating and hot water system on a new or retrofit basis; it also provides several cost projections which can be used as inputs to payback analyses, depending upon the degree of optimism or future improvements assumed. Cost definitions were developed for five categories of cost, and preliminary estimates were developed for each. The costing methodology, approach, and results together with several candidate low cost designs are described.

TM-78187 August 1978
SRB Materials and Processes Assessment from Laboratory and Ocean Environmental Tests. Prepared from information furnished by Materials and Processes Laboratory and Electronics and Control Laboratory. N78-30165

The Materials and Processes Laboratory at the Marshall Space Flight Center recognized early in the Shuttle Program that material performance on a long-term basis would be critical to the success of the Shuttle and its goal of reusable components. The laboratory instituted, in-house, a comprehensive series of materials tests simulating exposure of the refurbishable components of the propulsion system to expected flight and marine environments. These tests were subsequently expanded to include ocean environment exposure of these laboratory type samples. An Integrated Test Bed of 3.048 m (10 ft) diameter by 2.438 m (8 ft) high was also fabricated in support of this program. The Integrated Test Bed allowed large scale evaluation of principal manufacturing, insulating, cleaning and refurbishment methods.

This report gives the results and an assessment of the series of ocean environment tests that were conducted at Panama City and Kennedy Space Center, Florida, during the Spring and Summers of 1976 and 1977.

TM-78192 September 1978

**See notation page 15.
This document describes a computer program that checks for correctness with the output of the PRF (Place-Route-Fold) against the net list input to the PRF program. Also included are a description of the computer program and an example computer run.

TM-78193 August 1978

An Induced Environment Contamination Monitor for the Space Shuttle. Edited by Edgar R. Miller and Rudolf Decher, Space Sciences Laboratory. N78-32172

The Induced Environment Contamination Monitor (IECM) is a set of ten instruments integrated into a self-contained unit. The IECM is scheduled to fly as part of the Demonstration Flight Instrumentation (DFI) on Shuttle Orbital Flight Tests (OFT) I through 6 and on Spacelabs 1 and 2 as part of the Verification Flight Instrumentation (VFI).

NASA began strong manned mission contamination control efforts for the Skylab mission and, recognizing the possible limiting effects induced contamination might have on sophisticated observational programs planned for the 1980's, committed to an effort to insure that the induced environment would not be a problem.

The purpose of the IECM is to measure the actual environment to determine whether the strict controls placed on the Shuttle system have solved the contamination problem. The IECM will operate during prelaunch, ascent, on-orbit, descent, and postlanding. The on-orbit measurements are molecular return flux, background spectral intensity, molecular deposition, and optical surface effects. During the other mission phases dew point, humidity, aerosol content, and trace gas will be measured as well as optical surface effects and molecular deposition. These measurements will be made with ten separate instruments: Humidity Monitor, Dew Point Hygrometer, Air Sampler, Cascade Impactor, Passive Sample Array, Optical Effects Module, Temperature-Controlled Quartz Crystal Microbalance, Cryogenic Quartz Crystal Microbalance, Camera/Photometer, and Mass Spectrometer. Each instrument is described in detail.

The IECM systems and thermal design are discussed. Preflight and ground operations are presented together with associated ground support equipment. Finally, flight operations and data reduction plans are given.

TM-78194 September 1978

The MSFC Silicon Gate Silicon-On-Sapphire Standard Cell Library. Electronics and Control Laboratory. N79-79569

This document is a pictorial representation of the MSFC Silicon-On-Sapphire Standard Cell Library. The cells are intended to be used with the PR2D (Place, Route in 2 Dimensions) Automatic Layout Computer Program.

TM-78195 June 1977


An experimental investigation (SA21F, TWT 645) was conducted in the MSFC 14-inch TWT to study the roll characteristics of a 0.00548 scale model of the 146-inch Shuttle Solid Rocket Booster. The primary objective of the test was to obtain improved and more accurate rolling moment data on the Solid Rocket Booster by utilizing a sensitive single component roll balance (No. 247). This data will hopefully be useful in determining roll characteristics of the SRB with protuberances consisting of ring stiffeners, separation motors, actuator supports, hold-down posts, and cable systems tunnel.
Data were obtained for a single nose-mounted sting. The angle of attack range consisted of angles from 150° to 190°; roll angles consisted of angles from 0° to 337½° in increments of 22½°; and Mach numbers were 1.46, 1.96, 2.74 and 3.48.

The Department of Energy of the United States of America has initiated a vigorous effort to develop and demonstrate practical uses of solar energy to heat and cool buildings, to process agricultural products, and to provide thermal and electrical energy for industry. One significant part of this effort is the research, development, and demonstration of Rankine cycle machines using fluids heated by solar energy rather than by coal, petroleum, natural gas, or nuclear fuels.

This report describes the AVE VII Experiment and presents tabulated rawinsonde data at 25-mb intervals from the surface to 25 mb for the 24 stations participating in the experiment. Soundings were taken between 0000 GMT May 2 and 1200 GMT May 3, 1978. The methods of data processing and the accuracy are briefly discussed. Selected synoptic charts prepared from the data are presented as well as an example of contact data. A tabulation of adverse weather events that occurred during the AVE VII period, including freezing temperatures, snow, tornadoes, damaging winds, and flooding, is presented.

A brief description is presented of each of the 13 experiments selected to fly aboard Spacelab 2. The experiments were selected in response to an Announcement of Opportunity issued by NASA Headquarters for the second Spacelab mission.

A description of the Sun Chaser hardware and its operation together with results is presented.

This report presents a discussion of photolithography including the wafer carriers, photoresist coater, pre-bake station, mask aligner, photoresist developer, hard bake, and inspection.
Inconel 718 and Incoloy 903 are nickel base, heat resistant alloys that are used extensively for welded Shuttle engine components. The welding associated with these components has revealed solidification cracking characteristics at weld termination points known as “crater cracking.” These crater cracks, if not detected and removed, may cause costly component failure. To better understand this characteristic, welding termination techniques were studied and methods developed to eliminate crater cracks. It was determined that weld termination solidification cracking can be eliminated by controlled decrease of welding current, welding voltage, wire feed, and travel speed.

TM-78202 October 1978

This report describes a large scale microelectronic Computer Aided Design and Test system referred to as CADAT. CADAT consists of a number of computer programs written in FORTRAN that provide the capability to simulate, lay out, analyze, and create the artwork for large scale microelectronics. The function of each software component of the system is described with references to specific documentation for each software component.

TM-78203 October 1978

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 78. It also includes papers of MSFC contractors.

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

TM-78204* December 1978

This report describes static tests and evaluation of nonmetallic materials proposed for use in parachutes for recovery of Solid Rocket Boosters used in the Space Shuttle program. Literature survey and manufacturer and vendor contacts led to the choice of nylon as the fabric most capable of withstanding the extreme loads and environmental conditions during repeated use. The material tests included rupture strength, elongation, abrasion resistance, shrinkage, environmental exposure, and degradation levels. Rinsing and drying procedures were also investigated and a salt-free level for nylon recommended in preparation for reuse. In all possible cases, worst-case conditions were used (e.g., inflation loads, seawater exposure for 3 days per drop-recovery, etc.). From these tests the number of parachute drop-recoveries and reuse cycles may be projected.

Dynamic conditions such as drop tests are being performed by other elements of the Marshall Space Flight Center in conjunction with the Air Force and are still in progress.

Thin films of FeSi₂ and FeSe were studied Mossbauer spectroscopically. Information regarding dangling bond configuration and nature of crystal structure in thin films has been derived. A significant influence of crystalline aluminum substrate on film structure has been observed.


The final report on the MSFC hot air collector consists of the description of the collector, history of development, a history of the materials development and a program summary.

It is well known that one of the major obstacles in widespread application of solar energy is the initial cost of the system required for the utilization of this energy. The major portion of the solar energy system cost is the collector. Since the collector is the "heart" of the system and the most costly subsystem, reducing the cost of producing collectors in large quantities is a major goal. This solar collector is designed for economy and simplicity. In summary, the purpose of this invention is to heat air and/or water cheaply and efficiently through the use of solar energy.


A number of NASA sponsored summer studies and independent university efforts indicated the possibility that large space system material delivery and construction from lunar sources may be of a potential economic and environmental advantage. Presently this potential is under investigation to provide NASA with supplemental information required to arrive at optimum large space system options and programs, for the time period around the turn of the century. This report attempts to provide pertinent and readily usable information on the extraterrestrial processing of materials and manufacturing of components and elements of these planned large space systems from preprocessed lunar materials which are made available at a processing and manufacturing site in space.


A series of operational tests was performed in March 1977, on the Joy longwall shearer located at the Bureau of Mines in Bructon, Pennsylvania. The purpose of these
tests was to determine the transfer function and operational characteristics of the system. These characteristics will be used to generate a simulation model of the longwall shearer used in the development of the closed-loop vertical control system.

An Experiment to Verify that the Weak Interactions Satisfy the Strong Equivalence Principle. Peter B. Eby. Space Sciences Laboratory. N79-13830

This report proposes the construction of a clock based on the beta decay process to test for any violations by the weak interaction of the strong equivalence principle. The basic idea is to determine whether the weak interaction coupling constant $\beta$ is spatially constant or whether it is a function of gravitational potential $U$. The clock will be constructed by simply counting the beta disintegrations of some suitable source. The total number of counts will be taken as a measure of elapsed time. The accuracy of the clock will be limited by the statistical fluctuations in the number of counts $N$, which is equal to $\sqrt{N}$. Thus, to obtain an accuracy of 1 part in $10^8$ one needs a total number of counts of $10^{12}$, feasible number to actually measure in a few weeks' time. Increasing $N$ gives a corresponding increase in accuracy. It is proposed to use a source based on the electron capture process so as to avoid low energy electron discrimination problems. Solid state and gaseous detectors are being considered. While the accuracy of this type of beta decay clock is much less than clocks based on the electromagnetic interaction; there is a corresponding lack of knowledge of the behavior of $\beta$ as a function of gravitational potential. No predictions from nonmetric theories as to variations in $\beta$ are available as yet, but they may occur at the $U/C^2$ level.


This document describes the three axis low-g accelerometer package designed for use on the Space Processing Application Rocket (SPAR) Program. The package consists of the following major sections: (1) three Kearfott model 2412 accelerometers mounted in an orthogonal triad configuration on a

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The deviations in buffer pH and conductivity which occur near the electrode membranes in continuous-flow electrophoresis were studied in the Beckman charged particle electrophoresis system and the Hannig FF-5 preparative electrophoresis instrument. The nature of the membranes separating the electrode compartments from the electrophoresis chamber, the electric field strength, and the flow rate of electrophoresis buffer were all found to influence the formation of the pH and conductivity gradients. Variations in electrode buffer flow rate and the time of electrophoresis were less important. The results obtained supported the hypothesis that a combination of Donnan membrane effects and the differing ionic mobilities in the electrophoresis buffer was responsible for the formation of the gradients. The significance of the results for the design and stable operation of continuous-flow electrophoresis apparatus is discussed.

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temperature controlled, thermally isolated cube, (2) the accelerometer servoelectronics (printed circuit cards PC-6 through PC-12), and (3) the signal conditioner (printed circuit cards PC-15 and PC-16).

The measurement range is 0±0.031 g with a quantization of $1.1 \times 10^{-7}$ g. The package has been flown successfully on six SPAR launches with the Black Brant booster. These flights provide approximately 300 s of free fall or zero-g environment.

In September 1977, MSFC published a report entitled "25 kW Power Module Preliminary Definition," which depicted a proposed baseline system. Since then, analyses and trades have been performed to improve the original baseline. This report describes a suggested new baseline that incorporates modifications to the September 1977 system.

Measurements have been made of the acoustic fields and levitation forces produced along the axis of a single-axis resonance system. The system consisted of a St. Clair generator and a planar reflector. The levitation force was measured for bodies of various sizes and geometries (i.e., spheres, cylinders, and discs). The force was found to be roughly proportional to the volume of the body until the characteristic body radius reaches $\sim 2/k$ (k = wave number).

The acoustic pressures along the axis were modeled using Huygens' principle and a method of imaging to approximate multiple reflections. The modeled pressures were found to be in reasonable agreement with those measured with a calibrated microphone.
This report presents a discussion of the power processor for an electrical power system for a 25-kW Power Module that could support the Space Shuttle program during the 1980's and 1990's and which could be a stepping stone to future large space power systems. Trades that led to the selection of a microprocessor-controlled power processor are briefly discussed. Emphasis is given to the power processing equipment that uses a microprocessor to provide versatility that allows multiple use and to provide for future growth by reprogramming output voltage to a higher level (to 120 V from 30 V). Efficiency data from a breadboard programmable power processor are presented, and component selection and design considerations are also discussed.


The purpose of this experimental research was to compare Marshall Space Flight Center's electrets with Thiokol's fixed flow air samplers during the Space Shuttle Solid Rocket Booster Demonstration Model-3 static test firing on October 19, 1978, at Thiokol's desert static test site near Brigham City, Utah.

The measurement of rocket exhaust effluents by Thiokol's samplers and MSFC's electrets indicated that the firing of the Solid Rocket Booster had no significant effect on the quality of the air sampled. The highest measurement by Thiokol's samplers was obtained at Plant 3 (site 11) approximately 8 km at a 113-degree heading from the static test stand.

At sites 11, 12, and 5, Thiokol's fixed flow air samplers measured 0.0048, 0.00016, and 0.00012 mg/m³ of Cl. These measurements converted to 0.0016, 0.0008, and 0.0004 ppm, or an average of 0.0009 ppm. Alongside the fixed flow measurements, the electret counts from X-ray spectroscopy were 685, 894, and 719 counts. After background corrections, the counts were 334, 543, and 368, or an average of 415 counts. An additional electret, E20, which was the only measurement device at a site approximately 20 km northeast from the test site where no power was available, obtained 901 counts. After background correction, the count was 550. Equating the average counts of 415 from the electret and 0.0009 ppm from Thiokol's samplers, the 550 counts convert to 0.0011 ppm. Again, there was no measurement of significant rocket exhaust effluents at the test site.

Electrets can be used to obtain measurements in areas where no power is available. Consequently, the electret is a valuable complementary instrument for measuring rocket exhaust effluents in areas where other measuring devices may not be able to assess the contaminants.

Descriptions of Space Processing Applications Rocket (SPAR) Experiments. Edited by R. J. Naumann. Space Sciences Laboratory. N79-16888

This report presents experiment descriptions for all of the Space Processing Applications Rocket experiments, including those flown on previous Space Processing Applications Rocket flights as well as those under development for future flights. The descriptions summarize the experiment objective, rationale, approach, and results or anticipated results.

This report presents a summary of the final results of Contract NAS8-32253 with the Calmac Manufacturing Corporation of Englewood, New Jersey, for the additional development work on their existing rubber tube solar collector and solar operated pump for use with solar heating and cooling systems. It discusses the intended use of the final report, describes the development hardware, lists deliverable end items, deals with problems encountered during fabrication and testing, and includes certification statements of performance.

This report shows that the products developed are marketable and suitable for public use, with limitations.

TM-78220 February 1979
Propellant Grain Dynamics in Aft Attach Ring of Shuttle Solid Rocket Booster. V. Verderaime. Systems Dynamics Laboratory. N79-20263

This report presents an analytical technique for implementing simultaneously the temperature, dynamic strain, real modulus, and frequency properties of solid propellant in an unsymmetrical vibrating ring mode. All dynamic parameters and sources are defined for a free vibrating ring-grain structure with initial displacement and related to a forced vibrating system to determine the change in real modulus. Propellant test data application is discussed.

The technique was developed to determine the aft attach ring stiffness of the Shuttle booster at lift-off.

TM-78221 January 1979

This report presents the results of a study to determine the degree to which the ductility and tensile properties of peaked welds could be enhanced by removing the reinforcing bead and fairing the weld nugget into the adjacent parent metal. The study employed 2219-T87 aluminum alloy plate, tungsten inert gas (TIG) welding, and 2319 filler wire.

The study concluded that significant improvements in peak weld, ultimate strength, and ductility can be obtained through removal and fairing of the weld reinforcing bead. The specimens so treated and tested in this program exhibited ultimate strength improvements of 2 to 3 percent for peak angles of 5.8 to 10 degrees.
and 10 to 22 percent for welds with peak angles of 11.7 to 16.9 degrees. It was also determined that removal of the weld bead enhanced the ability of peaked welds to straighten when exposed to cyclic loading at stress levels above the yield strength.

TM-78222 February 1979

Line-focusing acrylic Fresnel lenses with application potential in the 200 to 370 C range were analytically and experimentally investigated. The measured solar concentration characteristics of a 1.8 by 3.7 m lens and its utilization in a solar collection mode are presented. A measured peak concentration ratio of 62 with 90 percent of the transmitted energy focused into a 5.0 cm width was achieved. A peak concentration of 59 and a 90 percent target width of 4.3 cm were analytically computed. The experimental and analytical lens transmittance was 78 percent and 86 percent, respectively. The lens was also interfaced with a nonevacuated received assembly and operated in a collection mode. With a natural oxide absorber tube coating (alpha/epsilon = 0.79/0.10), the measured collection efficiency ranged from 43 percent to 200 C to 34 percent at 260 C. Efficiency improvements to the 40 to 50 percent range can be achieved with second generation lenses and higher performance absorptive coatings.

TM-78223** March 1979

This document summarizes the final results of contract NAS8-32259 with Owens-Illinois, Toledo, Ohio, for the additional development work on their existing air-cooled solar energy collector subsystem for use with solar heating and cooling systems. It discusses the intended use of the final report, describes the deliverable end items, lists program objectives, relates how they were accomplished, deals with problems encountered during fabrication and testing, and includes a certification statement of performance.

The report shows that the products developed are marketable and suitable for public use.

TM-78224 April 1979

This report presents a discussion of ion implantation including the wafer carriers, mask aligner, hard bake, and loading from a receiving air track into a 10-7 torr vacuum and unloading onto a sending air track.

TM-78225** April 1979

The solar tracking control system ("Sun Chaser") is believed to be an improved method of tracking the Sun in all types of weather conditions. The Sun Chaser will follow the Sun from east to west in clear or cloudy weather, and reset itself to the east position after sundown in readiness for the next sunrise.

The description of the Sun Chaser hardware and its operation together with results is presented.

This report supersedes DOE/NASA TM-78199 in its entirety.

Volume one examines the effects that are produced by three registration and seven compression approaches on Landsat imagery and on results obtained from three classification approaches. The registration, compression, and classification algorithms were selected on the basis that such a group would include most of the different and commonly used approaches. The results of the investigation indicate clear-cut, cost-effective choices for registering, compressing, and classifying multispectral imagery. Volume two is a programmer's user manual containing IBM-360/75 Fortran listings of the algorithms used in the investigation.

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Tensile and compressive strain compatibility testing was performed on as-sprayed samples of the Shuttle Solid Rocket Booster external ablator material, MSA-1. Strain gages on the aluminum substrate were used to monitor strain. Strain compatibility was determined as the percent strain in the substrate at first visual evidence of MSA-1 failure. The 1/8-in. MSA-1, baselined for large areas of the SRB external skin, was characterized by a strain compatibility of 1.5 to 1.8 percent, which far exceeded the yield range of the metal substrate. Thicker MSA-1 applications (1.4 to 3/8 in.) were characterized by a lower level of strain compatibility, which appeared to be a manifestation of application limitations.

This report presents revised ground-level runway wind statistics for the Kennedy Space Center, Florida area. Crosswind, headwind, tailwind, and headwind reversal percentage frequencies are given with respect to month and hour for the Kennedy Space Center Space Shuttle runway. This document supersedes NASA TM-78181 and should be used in place of it.

The use of concentrators to improve the performance of solar arrays in deep space was
tested in a simulated deep space environment. The results of these tests are presented and discussed. Areas of discussion include cell temperature and performance in a low temperature, low illumination environment with and without concentration, concentration ratios, and theoretical analysis versus test results. Tests were conducted on a series/parallel configuration and individual cells.

TM-78231 June 1979
SRB — TPS Spray Nozzle Development for MSA-1 Application. Willibald Peter Prasthofer. Materials and Processes Laboratory. N79-28371

The Materials and Processes Laboratory of the George C. Marshall Space Flight Center has developed a new spray nozzle system for the Marshall Sprayable Ablator (MSA-1) material. In developmental work using a standard automatic spray gun, the spray jet disintegrated before impacting the workpiece and formed an undesirable overspray at the outer zone of the spray pattern. This disintegration of the spray jet was caused primarily by the radically different densities of the 10 ingredients of MSA-1 and design of the nozzle. Improperly sprayed MSA-1 has nonoptimum thermal properties and exhibits debonding of subsequently sprayed MSA-1. Prior to this development, overspray was mechanically scraped off before spraying the next band. Several different devices to suppress overspray were proposed, designed, and tested before developing a nozzle based on the convergent-divergent Laval principle. A nozzle system of this type was first described for the design of steam turbines by Carl Patrick Gustaf de Laval, a Swedish engineer. A significant departure from theory, in our design, is the divergent bell shaped chamber instead of a straight cone as described by de Laval. This MSFC-developed nozzle provided a superior spray pattern, suppressed the overspray to an acceptable level, and produced a homogeneous jet of MSA-1 that adhered well to the substrate. This development provides a substantial cost and time saving by permitting a continuous spray operation.

TM-78232 July 1979
An Evaluation of Grease Type Ball Bearing Lubricants Operating in Various Environments (Status Report No. 4). E. L. McMurtrey. Materials and Processes Laboratory. N79-27515

Because many future spacecraft or space stations will require mechanisms to operate for long periods of time in environments which are adverse to most bearing lubricants, a series of tests is continuing to evaluate 33 grease type lubricants in R-4 size bearings in five different environments for a 1-year period. Four repetitions of each test are made to provide statistical samples. These tests have also been used to select four lubricants for 5 year tests in selected environments with five repetitions of each test for statistical samples. At the present time, 85 test sets have been completed and 22 test sets are underway. Three 5-year tests have already been started in (1) continuous operation and (2) start-stop operation, with both in vacuum at ambient temperatures, and (3) continuous operation at 93.3°C. To date, in the 1 year tests, the best results in all environments have been obtained with a high viscosity index perfluoroalkylpolyether (PFPE) grease.

TM-78233 July 1979
Surface to 90 km Winds for Kennedy Space Center, Florida, and Vandenberg AFB, California. D. L. Johnson and S. C. Brown. Space Sciences Laboratory. N79-28847

This report presents bivariate normal wind statistics for a 90 degree flight azimuth, from 0 through 90 km altitude, for Kennedy Space Center, Florida, and Vandenberg AFB, California. Wind probability distributions and
statistics for any rotation of axes can be computed from the five given parameters \( \bar{u}, \bar{v}, S(u), S(v), \) and \( R(uv) \). This document supersedes NASA TMX-64771 and TMX-64897 and should be used in place of them. There is no intent to automatically change any references to the previous documents in contract scopes of work by the issuance of the 1979 revision of this document.

**TM-78234**  
July 1979  

This volume represents a comprehensive survey of the flight experiments conducted in conjunction with the United States Materials Processing in Space Program. Also included are a brief description of the conditions prevailing in an orbiting spacecraft and the research implications provided by this unique environment. The purpose of this document is to summarize what has been done and what has been learned in order to serve as a background for future experiments. It is assumed that the reader has some knowledge of the physical sciences but no background in spaceflight experimentation or in the materials sciences per se. The document is expected to serve as an introduction to the Materials Processing in Space Program for investigators in many different fields who might wish to use the unique aspects of spaceflight to further their own research efforts.

**TM-78237**  
July 1979  

As a continuing effort, the author updates his previous overview of coronal hole research results (NASA TM X-73317, July 1976) to include annotated abstracts of some 220 papers. This report stresses results for the period 1976-1978.

**TM-78238**  
September 1979  

A user’s manual is provided for program PARACH, a Fortran digital computer program operational on the Univac 1108. A description of the program and operating instructions for it are included. Program PARACH has been extensively used to study the interaction dynamics of a parachute and its payload during terminal descent. Operating instructions, required input data, program options and limitations, and output data are described. Subroutines used in this program are also listed and explained.

**TM-78239**  
July 1979  

This memorandum presents an adaptation of the Air Force ORLA method to a Space Shuttle Scenario. The Air Force designation and abbreviation style for cost equations have been retained. Those equations
having the identical definitions as applied by the Air Force retain identical abbreviations; however, their constants may have been changed to fit the Space Shuttle Scenario. The "vendor repair" cost buildup and many cost equations and methods were originated to suit requirements of this scenario which are not addressed by the Air Force publication. As with the Air Force ORLA, only those costs which discriminate between repair alternates are considered.

TM-78300. May 1979

A discussion is presented which relates to the thermal and packaging problems of space disposal of nuclear waste material. An approach is suggested which solves both of these problems with emphasis on high energy density waste material. A passive cooling concept is presented utilizing conduction rods which penetrate the inner core. Data are presented which illustrate the effectiveness of cooling rods and the limit of their capability. A computerized thermal model is discussed and developed for the cooling concept:

TM-78301 June 1979

This review provides a convenient guide to the expected characteristics of the Space Telescope Observatory for astronomers and physicists. We have tried to provide enough detail so that a professional scientist, observer or theorist, can plan how the observatory may be used to further his observing program or to test theoretical models. Further detail is available in NASA documents that are referenced throughout this report.

TM-78302 June 1978

This technical memorandum describes the Solid Rocket Booster Cost Accounting and Tracking System (SCATS) which is an automatic data processing system designed to keep a running account of the number, description, and estimated cost of Level II, III, and IV changes. Although designed specifically for the Space Shuttle Solid Rocket Booster Program, the ADP system can be used for any other program that has a similar structure for recording, reporting, and summing numbers and costs of changes. The program stores the alpha-numeric designators for changes, government estimated costs, proposed costs, and negotiated value in a MIRADS (Marshall Information Retrieval and Display System) format which permits rapid access, manipulation, and reporting of current change status. Output reports listing all changes, totals of each level, and totals of all levels, can be derived for any calendar interval period.

TM-78303 June 1979

This report supplements NASA TM X-73300, NASA TM X-73393, and NASA TM-78183. These reports are compilations of bibliographies from the principal investigator groups of the Apollo Telescope Mount (Skylab solar observatory facility) that gathered data from May 28, 1973, to February
8, 1974. The analysis of these data is presently under way and is expected to continue for several years.

The publications listed in this report are divided into the following categories: (1) Journal Publications, (2) Journal Publications Submitted, (3) Other Publications, (4) Presentations — National and International Meetings, and (5) Other Presentations. An author index is included together with errata for previous reports.

*Blue cover reports printed at Langley.
**DOE/NASA reports.

For 36 hours during April 1975, an Atmospheric Variability Experiment was conducted. This research effort supported an observational program in which rawinsonde data, radar data, and satellite data were collected from a network of 42 stations east of the Rocky Mountains at intervals of 3 hours. This program presents data with a high degree of time resolution over a spatially and temporally extensive network.

Reduction of the experiment data is intended primarily as a documentation of the checking and processing of the data and should be useful to prospective users. Various flow diagrams of the data processing procedures are described, and a complete summary of the formulas used in the data processing is provided. A wind computation scheme designed to extract as much detailed wind information as possible from the unique experiment data set is discussed in detail. Estimates of the accuracy of the thermodynamic and wind data are presented. Estimates of errors in the thermodynamic and wind data are given together with a discussion of how these errors affect the final processed data.

Analysis of pressure, height, and temperature on constant pressure charts at 3-hour intervals shows that large-scale features with amplitudes only half the values of commonly cited observational uncertainties exhibit space and time continuity. Examination of 3-hour tendencies of important meteorological variables indicates that they typically exceed measurement uncertainties, may often be inadequately represented by interpolation of 12-hour observations, and exhibit appreciable spatial variation. Time cross sections in the lower troposphere constructed from the 3-hour observations reveal features with scales of motion not seen by the meteorologist in routine operations (except for regional 3-hour surface maps); horizontal and temporal scales of motion encompass a major portion of the mesoscale, and vertical scales encompass variations as small as 0.3 km. The detailed wind profile data of the experiment resolve the mesoscale wind structure of the lower stratosphere consistent with the findings of other investigators.

An initial method of analysis of satellite image data is presented. It is based on the application of densitometry techniques whereby the field of density of the satellite image is correlated with the associated meteorological events. This work represents an initial attempt to analyze Synchronous Meteorological Satellite (SMS) images with the densitometry methods in the context of mesoscale phenomena.


Tropospheric flow and lower stratospheric flow as measured by 94 sequences of high-resolution Jimsphere balloon data are presented and discussed. The 70 and 24 sequential series are presented for the Kennedy Space Center, Florida, and Point Mugu, California, areas, respectively. Supplemental data, consisting of the associative temperature profiles and the surface and 200 mb synoptic maps, are also presented. The measurements are discussed relative to both the engineering and disciplinary areas. An initial subjective analysis of mesoscale features observed on some sequences is presented.

This report is concerned with the losses encountered in the propagation of CO₂ laser radiation through the atmosphere, particularly as it applies to the NASA/Marshall Space Flight Center Pulsed Laser Doppler System. As such it addresses three major areas associated with signal loss: molecular absorption, refractive index changes in a turbulent environment, and aerosol absorption and scattering. In particular, the molecular absorption coefficients of carbon dioxide, water vapor, and nitrous oxide are calculated for various laser lines in the region of 10.6 μm as a function of various pressures and temperatures. The current status in the physics of low-energy laser propagation through a turbulent atmosphere is presented together with the analysis and evaluation of the associated heterodyne signal power loss. Finally, aerosol backscatter and extinction coefficients are calculated for various aerosol distributions and the results incorporated into the signal-to-noise ratio equation for the Marshall Space Flight Center system.

Atmospheric environmental guidelines for use in wind turbine generator development are presented. The guidelines are given in the form of design criteria relative to wind speed, wind shear, turbulence, wind direction, ice and snow loading, and other climatological parameters which include rain, hail, thermal effects, abrasive and corrosive effects, and humidity. This report is not a discussion of fundamental concepts or theories, but a presentation of design criteria in an engineering format which can be directly input to wind turbine generator design computations.

A summary section in each chapter provides a range of recommended design values for a general purpose, “off-the-shelf-type” wind turbine generator which could be sited in most any region of the United States. Following these summarized design values, detailed computational procedures and working data are provided which allow the designer to establish his own design values if desired. Thus, guidelines are also provided for developing specialized wind turbine generators or for designing wind turbine generators which are to be used in a specific region of the United States.

Atmospheric environmental guidelines were utilized. By then, the satellite Landsat-I had obtained imagery of most of Europe. Using theme extraction techniques, the map was completed in draft form and portions of it displayed at the 23rd International Geographical Congress in Moscow during July 1976. Printing of the completed map was accomplished in May 1978.
A comprehensive standard land-use classification system was established in 1949. A goal of world mapping at a scale of 1:1 million was also set, but remains far from realization. The advent of satellite data makes achievement possible, but only if some compromises are made in the classification system. It is now realistic to map land resources of large areas and regions undergoing rapid change. This is especially important in developing areas of the world.

TP-1383 December 1978

This report presents the mechanical properties, including fracture toughness, and stress corrosion properties of four types of 2219-T852 aluminum alloy hand forgings. Weight of the forgings varied between 450 and 3500 lb at the time of heat treatment and dimensions exceeded the maximum covered in existing specifications. Dimensions ranged from approximately 5\% to approximately 16\% thick, 10\% to 29\% wide and 33 to 115\% long at heat treatment. The forgings were destructively tested to develop reliable mechanical property data to replace estimates employed in the design of the Space Shuttle Solid Rocket Booster (SRB) and to establish minimum guaranteed properties for structural refinement and for entry into specification revisions. The report summarizes data required from the forgers and from the SRB Structures contractor. Specific technical requirements for testing were defined; testing was coordinated; and results were organized, analyzed and evaluated by the Materials and Processes Laboratory of the George C. Marshall Space Flight Center.

TP-1384 December 1978

A series of parametric wind tunnel tests was conducted to provide a base for developing a simulation of afterbody/base aerodynamics for multibody/multibase rocket-powered vehicles (such as Space Shuttle) which use unheated air as the simulant in development wind tunnel tests. The tests described herein were parameterized on external configuration, nozzle internal configuration, base geometry, propulsion gas type (air, CF\textsubscript{3}, solid propellant exhausts), and freestream Mach number (0.5 to 3.5). These tests were conducted over a 4-year period in the MSFC 14-Inch Trisonic, AEDC-PWT-4T, and Ames 11-Foot wind tunnels. Presented in this report are the data and pertinent reference information necessary to perform an analysis which would lead to a simulation procedure. The type of data obtained during the tests described herein include model base, afterbody, and nozzle internal surface static pressure distributions, model chamber pressure and temperature, and freestream conditions. Also included is a brief description of simulation procedures that have been used by the Space Shuttle program.

TP-1389 January 1979

This report presents basic design values of significant wind criteria, in graphical format,
This study investigated seven aerospace firms to determine if a relationship existed among management systems, organizational climate, and organization performance. Positive relationships were found between each of these variables, but a statistically significant relationship existed only between the management system and organizational climate. The direction and amount of communication and the degree of decentralized decision-making, elements of the management system, also had a statistically significant relationship with organization performance.
CR-3041 August 1978

CR-3051 September 1978

CR-3052 September 1978
Investigations of Simulated Aircraft Flight through Thunderstorm Outflows. Walter Frost and Bill Crosby. NAS8-32217. FWG Associates, Inc.  N78-32037

CR-3073 December 1978

CR-3076 December 1978

CR-3084 December 1978
Studies of Vorticity Imbalance and Stability, Moisture Budget, Atmospheric Energetics, and Gradients of Meteorological Parameters During AVE III. Edited by James R. Scoggins. NAS8-31773. Department of Meteorology, Texas A&M University.  N79-14676

CR-3085 December 1978

CR-3095 January 1979

CR-3129 April 1979

CR-3150 June 1979
Differences between Measured and Linearly Interpolated Synoptic Variables over a 12-h Period during AVE IV. Leonard R. Dupuis and James R. Scoggins. NAS8-31773. Department of Meteorology, Texas A&M University.  N79-25670

CR-3158 July 1979

CR-3166 August 1979

CR-150812** July 1978

**See notation page 42.
CR-150813** October 1978

CR-150814** August 7, 1978

CR-150815 August 1978

CR-150816 August 1978

CR-150817 August 1978

CR-150818** November 1978

CR-150819** June 6, 1978
Thermal Performance Evaluation of the Calmac (Liquid) Solar Collector. NAS8-32036. IBM. N79-10521

CR-150820** October 9, 1978
SIMS Prototype System 4 Performance Test Report. NAS8-32036. IBM. N79-13499

CR-150821 June 1978
Transistor Step Stress Testing Program, Final Report. NAS8-31944. DCA Reliability Laboratory. N78-33341

CR-150822 August 1978

CR-150823 July 1978
Updating of Adapt Predictions of Sunspot Activity, Final Report. NAS8-32851. Adapt Service Corp. N78-34024

CR-150824 August 7, 1978

CR-150825 June 12, 1978
Trends and Techniques for Space Base Electronics, Quarterly Report. NAS8-26749. Mississippi State University. N78-79568

CR-150826 September 1978

CR-150827 September 19-21, 1978
Satellite Power System (SPS) Concept Definition Study (Exhibit C) Midterm

CR-150828** April 1978

CR-150829** July 1978

CR-150830* October 1978

CR-150831 September 1978

CR-150832 September 15, 1978

CR-150833 June 1978
Load and Dynamic Assessment of B-52B-008 Carrier Aircraft for Finned Configuration 1 Space Shuttle Solid Rocket Booster Decelerator Subsystem Drop Test Vehicle, Volume I - Summary. NAS8-31805. Boeing Co.

CR-150834 June 1978
Load and Dynamic Assessment of B-52B-008 Carrier Aircraft for Finned Configuration 1 Space Shuttle Solid Rocket Booster Decelerator Subsystem Drop Test Vehicle, Volume II, Airplane Flutter and Load Analysis Results. NAS8-31805

CR-150835 June 1978
Load and Dynamic Assessment of B-52B-008 Carrier Aircraft for Finned Configuration 1 Space Shuttle Solid Rocket Booster Decelerator Subsystem Drop Test Vehicle - Volume III, Pylon Load Data Method 1. NAS8-31805. Boeing Co.

CR-150836 June 1978
Load and Dynamic Assessment of B-52B-008 Carrier Aircraft for Finned Configuration 1 Space Shuttle Solid Rocket Booster Decelerator Subsystem Drop Test Vehicle, Volume IV, Pylon Load Data Method 2. NAS8-31805. Boeing Co.

CR-150837* July 31, 1978

CR-150838 August 31, 1978

CR-150839** November 1978

CR-150840** November 1978

*See notation page 42
CR-150841** November 1978  
N79-13500

CR-150842** November 1978  
N79-13492

CR-150843 October 13, 1978  
Orbital Transfer Vehicle (OTV) — Bimonthly Progress Report No. 2. NAS8-32996. Rockwell International Rocketdyne Division.

CR-150844 August 1978  
N79-11316

CR-150845 November 1978  
N79-10093

CR-150846 November 1, 1978  
N79-12744

CR-150847 November 1978  
N79-10090

CR-150848 October 1978  
N79-14103

CR-150849** October 1977  
Passive Thermosyphon Solar Heating and Cooling Module with Supplementary Heating, Quarterly Reports. NAS8-23360. Sigma Research, Inc.  
N79-15402

CR-150850** December 1978  
Prototype Solar Heating and Cooling Systems Including Potable Hot Water, Quarterly Reports. NAS8-32249. Solaron Corp.  
N79-13498

CR-150851** October 1978  
N79-13491

CR-150852** December 1978  
Libbey-Owens-Ford Solar Collector Static Load Test. NAS8-32036. IBM Federal System Division.  
N79-13494

CR-150853** December 1978  
N79-15409

CR-150854** October 1978  
N79-13495

CR-150855 October 20, 1978  
B-52B-008/DTV (Drop Test Vehicle) Configuration I (with and without fins) Flight Test Results — Captive Flight and Drop Test Missions. NAS8-31805. Boeing Co.  
N79-12065
CR-150856** December 1978
Solar Hot Water System Installed at
Anderson, South Carolina. DOE Con-
tract 77-G-01-1663. Solar Designs, Inc.
N79-15405

CR-150857** December 1978
Thermal Performance Evaluation of the
Solargenics Solar Collector at Outdoor
Conditions. NAS8-32036. N79-15401

CR-150858** December 1978
Preliminary Design Package for Proto-
type Solar Heating Program. NAS8-
32093. Honeywell, Inc. N79-14557

CR-150859** December 1978
Design and Installation Package for Solar
Heating and Cooling System. NAS8-
32248. Solar Engr. and Manufacturing
Co. N79-14556

CR-150860** December 1978
Qualification Test and Analysis Report,
Solar Collectors. NAS8-32259. Owens-
Illinois, Inc. N79-16360

CR-150861** December 1978
Prototype Solar Heating and Cooling
Systems Including Potable Hot Water,
Quarterly Report. NAS8-32249. Solar
Corporation. N79-16372

CR-150862 October 26, 1978
Microcomputer Technology Applica-
tions: Charger and Regulator Software
for a Breadboard Programmable Power
Processor, Final Report. NAS8-32896.
Green Research. N79-12773

CR-150863 October 1978
Advanced Designs for Fluid Flow
Visualization, Final Report. NAS8-
31173. Science Applications, Inc.
N79-12365

CR-150864 December 1978
A Study of Digital Holographic Filter
Generation Phase II: Digital Data Com-
munication Systems, Final Report,
Volume I. NAS8-31373. Mississippi State
University. N79-12419

CR-150865 December 1978
A Study of Data Technology Develop-
ments in the 1980-1985 Time Frame, Final
Report, Volume II. NAS8-31373.
Mississippi State University. N79-12774

CR-150866 December 1978
Applying NASA Remote Sensing Data to
Geologically Related Regional Planning
NAS8-32034. University of Tennessee.
N79-17289

CR-150867** December 1978
Installation Package for Hyde Memorial
Observatory, Lincoln Nebraska. NAS8-
32247. Solar Engineering and Equipment
Co., Inc. N79-16373

CR-150868** December 1978
Design Data Brochure for the Owens-
Illinois Sunpak™ Air-Cooled Solar
Collector. NAS8-32259. Owens-Illinois.
N79-15404

CR-150869** December 1978
Final System Instrumentation Design
Package for Decade 80 Solar House.
NAS8-32244. Copper Development Assn.
N79-19455

CR-150870** December 1978
Solar Heating and Hot Water System
Installed at Listerhill, Alabama. DOE

CR-150871** December 1978
Preliminary Design Package for Residen-
tial Heating Cooling System — Rankine
Air Conditioner Redesign. NAS8-32093. Honeywell Inc. N79-19453

CR-150872** January 1979

CR-150873** October 1979

CR-150874** January 1979

CR-150875** January 1979

CR-150876** January 1979

CR-150877 November 8, 1978

CR-150878 December 22, 1978

CR-150879 November 30, 1978

CR-150880 December 23, 1978

CR-150881 December 4, 1978
Manufacturing Process Applications Team (MATEAM). NAS8-32229. IIIT Research Institute. N79-73629

CR-150882 June 1977

CR-150883 November 30, 1978

CR-150884 August 1978

CR-150885 November 1978
CR-150886 October 10, 1978

CR-150887 November 7, 1978
   N79-16354

CR-150888 August 16, 1978
   N79-16022

CR-150889 July 28, 1978
   N79-16055

CR-150890 June 1978
   N79-19065

CR-150891 April 1978
   N79-19066

CR-150892 June 1978
   N79-19067
Flow Channel Depths. NAS8-32036. IBM Corp.  

CR-150901* September 11, 1978  
N79-74086

CR-150902 January 1, 1979  

CR-150903 January 1978  
N79-16069

CR-150904 December 10, 1978  
N79-16328

CR-150905 January 5, 1979  
N79-16886

CR-150906* November 22, 1978  
Evaluation of Shuttle Turbopump Bearings. NAS8-32987. Battelle Columbus Labs.  
N79-18321

CR-150907 December 1978  
N79-16482

CR-150908 October 1, 1978  
N79-16664

CR-150909 December 22, 1978  
N79-16104

CR-150910 December 6, 1978  
Ball Bearing Heat Analysis Program (BABHAP). NAS8-31904. Wyle Laboratories.  
N79-17218

CR-150911 December 1978  
N79-73701

CR-150912 February 1, 1979  
N79-16552

CR-150913 January 8, 1979  
N79-73679

CR-150914 December 1978  
Diode Step Stress Program, Final Report for JANTX1N981B. NAS8-31944. DCA Reliability Laboratory.  
N79-17251
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-161091 December 1978
Diode Step Stress Program, Final Report for JANTXIN56I4, NAS8-31944. DCA Reliability Laboratory. N79-17250

CR-161092 January 1979

CR-161093** January 1979

CR-161094** February 1979

CR-161095 January 1, 1979

CR-161096 March 24, 1978

CR-161097 January 1, 1979
King II 2519 ATM Residual Gyros Reestablishing 5 Year Life Requirements. NAS8-32837. Singer Co. N79-17194

CR-161098 January 25, 1978

CR-161099 May 1978

CR-161100 December 1978

CR-161101 January 31, 1979

CR-161102 January 31, 1979

CR-161103 January 31, 1979

CR-161104** February 1979

CR-161105 August 31, 1973
CR-161106  August 31, 1973
N79-74138

CR-161107  August 31, 1973
N79-74139

CR-161108  June 15, 1975
Sunfall Monitor Operating Procedures. NAS8-31309. IBM Federal Systems Division.
N79-74140

CR-161109*  September 1978

CR-161110  January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N5420. NAS8-31944. DCA Reliability Laboratory.
N79-18254

CR-161111  January 1979
N79-18251

CR-161112  January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N759A. NAS8-31944. DCA Reliability Laboratory.
N79-18252

CR-161113  January 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N2945A. NAS8-31944. DCA Reliability Laboratory.
N79-18253

CR-161114  January 1979
Design, Fabrication and Delivery of a Prototype Saturator for ACPL, Final Report. NAS8-31776. Desert Research Institute, University of Nevada.
N79-17885

CR-161115  July 1, 1978
N79-18511

CR-161116  February 1979
N79-18195

CR-161117  January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N5554. NAS8-31944. DCA Reliability Laboratory.
N79-18196

CR-161118  February 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N5550. NAS8-31944. DCA Reliability Laboratory.
N79-18197

CR-161119  February 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N937B. NAS8-31944. DCA Reliability Laboratory.
N79-18198

CR-161120  February 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N972B. NAS8-31944. DCA Reliability Laboratory.
N79-18199

CR-161121  January 1979
Transistor Step Stress Testing Program,
Final Report for JANTX 2N4856. NAS8-31944. DCA Reliability Laboratory.

CR-161122 February 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N3637. NAS8-31944. DCA Reliability Laboratory.

CR-161123 February 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5622. NAS8-31944. DCA Reliability Laboratory.

CR-161124 February 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N2920. NAS8-31944. DCA Reliability Laboratory.

CR-161125 February 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N4150. NAS8-31944. DCA Reliability Laboratory.

CR-161126 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5619. NAS8-31944. DCA Reliability Laboratory.

CR-161127 January 1979

CR-161128 February 1979
Diode Step Stress Testing Program, Final Report for JANTX IN4570A. NAS8-31944. DCA Reliability Laboratory.

CR-161129 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5552. NAS8-31944. DCA Reliability Laboratory.

CR-161130 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN2970B. NAS8-31944. DCA Reliability Laboratory.

CR-161131 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5415. NAS8-31944. DCA Reliability Laboratory.

CR-161132 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5615. NAS8-31944. DCA Reliability Laboratory.

CR-161133 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN1202A. NAS8-31944. DCA Reliability Laboratory.

CR-161134 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN466A. NAS8-31944. DCA Reliability Laboratory.

CR-161135 January 1979
Diode Step Stress Testing Program, Final Report for JANTX IN5417. NAS8-31944. DCA Reliability Laboratory.

CR-161136 January 1979
Transistor Step Stress Testing Program,
Final Report for JANTX 2N2605. NAS8-31944. DCA Reliability Laboratory. 
N79-18215

CR-161137 January 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N2060. NAS8-31944. DCA Reliability Laboratory. 
N79-18216

CR-161138 January 1979
N79-18218

CR-161139 January 1979
Transistor Step Stress Testing Program, Final Report for JANTX 2N2060. NAS8-31944. DCA Reliability Laboratory. 
N79-18216

CR-161140 January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N5623. NAS8-31944. DCA Reliability Laboratory. 
N79-18219

CR-161141 January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N3893. NAS8-31944. DCA Reliability Laboratory. 
N79-18220

CR-161142 January 1979
Diode Step Stress Testing Program, Final Report for JANTX 1N649-1. NAS8-31944. DCA Reliability Laboratory. 
N79-18221

CR-161143 August 1, 1978
N79-17887

CR-161144 September 30, 1978
N79-17888

CR-161145 January 27, 1979
N79-17889

CR-161146 January 27, 1979
N79-17890

CR-161147 January 27, 1979
N79-17891

CR-161148 January 27, 1979
N79-17892

CR-161149 January 27, 1979
N79-17893

CR-161150 January 27, 1979
25kW Power Module Evolution Study,
## NASA CONTRACTOR REPORTS
(Abstrac.ts for these reports may be obtained from STAR)

<p>| CR-161151** | March 1979 | Design Package for Programmable Controller and Hydronic Subsystem. NAS8-32257. Sunkeeper Control Corp. | N79-21619 |</p>
<table>
<thead>
<tr>
<th>Contract Number</th>
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<th>Author(s)</th>
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<td>Air Solar Collector.</td>
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<td>Post Heat Treatment Effects on Double Layer Metal Structures for VLSI</td>
<td>Mississippi State University.</td>
<td>N79-75342</td>
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<td>Applications, Special Report.</td>
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<td>Techniques, Final Report.</td>
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</tr>
</tbody>
</table>
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)

CR-161180 September 1978
NAS8-32916. Martin Marietta Corp.
N79-75325

CR-161181 February 1979
N79-74886

CR-161182 February 17, 1979
25 kW Power Module Evolution Study. Executive Summary. NAS8-32928. Lockheed Missiles and Space Co.
N79-20219

CR-161183 December 8, 1978
Optical Surface Damage from Reentrant Gases on S'IS. Final Report. NAS8-32483. Athens State College.
N79-20859

CR-161184 February 18, 1979
N79-20159

CR-161185 December 15, 1978
N79-21551

CR-161186 March 1979
N79-21552

CR-161187 December 1978
N79-20169

CR-161188 December 1978
N79-20170

CR-161189** April 1979

CR-161190** April 1979
Installation Package for the Solaron Solar Subsystems. NAS8-32249. Solaron Corp.
N79-23491

CR-161191** April 1979
N79-24438

CR-161192** April 1979
System Design Package for a Solar Heating and Cooling System Installed at Akron, Ohio. NAS8-32249. N79-23490

CR-161193 March 15, 1979
N79-20889

CR-161194 December 1977
N79-20174

CR-161195 August 31, 1978
Solidification (Crystal Growth) in the
NASA CONTRACTOR REPORTS
(Abstracts for these reports may be obtained from STAR)


CR-161196 February 1979

CR-161197 December 1978
Results of a Test in the MSFC 14-Inch Wind Tunnel to Determine the Space Shuttle Launch Vehicle Attach Structure Aerodynamics and the Effects of Mold Line Changes, Instrumentation Leads and Tunnel Flow Angularity on the Launch Vehicle Aerodynamics. NAS8-32530. Lockheed Missiles and Space Co. X79-10041

CR-161198 February 1979

CR-161199 January 1978

CR-161202** April 1979

CR-161203** April 1979

CR-161204** April 1979

CR-161205 December 12, 1978

CR-161206 January 1979
NASA/IITRI Manufacturing Process Applications Team (MATeam). NAS8-32229. Research Institute. X79-10053

CR-161207 December 1978

CR-161208 April 6, 1979

CR-161209 February 1979

CR-161210 March 30, 1979

CR-161211 March 27, 1979
CR-161212 April 9, 1979

CR-161213* February 27, 1979

CR-161214 March 1979

CR-161215 March 1979

CR-161216 March 1979

CR-161217 April 1979

CR-161218 March 1979

CR-161219 March 1979

CR-161220 March 1979

CR-161221 March 1979

CR-161222 March 1979

CR-161223 March 1979

CR-161224 April 1979
CR-161225 1979

CR-161226 April 1979

CR-161227 April 1979

CR-161228** May 1979

CR-161229** May 1979

CR-161230** May 1979


CR-161232 April 1979
Swath Width Study, Final Report, A Simulation Assessment of Costs and Benefits of a Sensor System for Agri-

CR-161233 February 1979

CR-161234 June 1979

CR-161235** May 16, 1979

CR-161236** June 1979

CR-161237** June 1979

CR-161238** June 1979

CR-161239 May 29, 1979
CR-161240  May 1979

CR-161241  May 1979

CR-161242  

CR-161243  April 30, 1979

CR-161244  May 1979
Development of Stable Low-Electroosmotic Mobility Coatings, Final Report. NAS8-32406. Lehigh University. N79-25180

CR-161245  May 18, 1979
Manufacturing Process Applications Team (MATeam), Quarterly Status Report No. 1 for 1979. NAS8-32229. IIT Research Institute. X79-75357

CR-161246  May 1979

CR-161247  January 31, 1979

CR-161248  November 1978

CR-161249  April 30, 1979

CR-161250  June 5, 1979

CR-161251  June 14, 1979

CR-161252  April 20, 1979

CR-161253**  July 1979

CR-161254*  June 1979
Subscale Solid Motor Nozzle Tests —
Phase IV — and Nozzle Materials Screening and Thermal Characterization — Phase V. NAS8-30264. Acurex Corp./Aerotherm. N79-29226

CR-161255 June 1979

CR-161256 December 1973

CR-161257 December 1973

CR-161258 December 1973

CR-161259 August 18, 1977

CR-161260 August 18, 1977

CR-161261 August 18, 1977

CR-161262 July 14, 1978

CR-161263 March 31, 1978

CR-161264 November 15, 1978

CR-161265 February 1979

CR-161266 February 1978

CR-161267 June 1979

CR-161268 1979

CR-161269 1979

CR-161270 June 1979
Trends and Techniques for Space Base
Electronics, Final Report. NAS-26749. Mississippi State University. N79-78782

CR-161271** July 1979

CR-161272** August 1979

CR-161273** August 1979

CR-161274 May 15, 1979

CR-161275 May 15, 1979

CR-161276 June 1978

CR-161277 September 1978

CR-161278 December 1978

CR-161279 March 1979

CR-161280 1979

CR-161281 December 1978

CR-161282 June 1979

CR-161283 June 1979

CR-161284 July 1979
AXAF Optical Technology Analysis, Final Report. NAS-33158. TAI Corp. N79-30008

CR-161286 March 15, 1979

CR-161287 March 15, 1979

CR-161288 October 27, 1978

CR-161289* July 26, 1979

CR-161290** August 1979

CR-161291* July 26, 1979

CR-161292* August 10, 1979

CR-161293* September 1979
Extraterrestrial Processing and Manufacturing of Large Space Systems. NAS8-32925. Massachusetts Institute of Technology.

CR-161294* September 14, 1979

CR-161295* September 14, 1979

CR-161296 June 1979

CR-161297 June 29, 1979

CR-161298 June 29, 1979

CR-161299 April 1979
Evaluation of Candidate Metals in a Simulated Space Shuttle Main Engine Environment for Application as Turbine Blade Dampers. NAS8-33102. Princeton University.

CR-161300 June 30, 1979
Design, Fabrication and Installation of

CR-161301 July 17, 1979

CR-161302 June 30, 1979

CR-161303 June 29, 1979

CR-161304 August 1979

*White cover reports published at MSFC.
**DOE/NASA reports.
ANDERSON, B. J.  
Desert Research Institute  
Influence of Environmental Saturation  
and Electric Field on Growth and Evaporation of Epitaxial Ice Crystals. For publication in the Journal of Crystal Growth.

ARTHUR, CARLENE W.  
Digital Techniques for UFL Wave Polarization Analysis. For presentation at the URSI XIX General Assembly to be held at Helsinki, Finland on August 2-9, 1978.

ARTHUR, C. W.  
University of California at Los Angeles  
The Statistical Character of Pc 4 Magnetic Pulsations at Synchronous Orbit. For publication in the Journal of Geophysical Research.

ASKINS, BARBARA S.  
The Effect of Reduced Scatter of Radiographic Information. Content and Patient Exposure. For publication in Medical Physics.

ASKINS, BARBARA S.  

BALENTINE, ROBERT C.  

BAUGHER, CHARLES R.  
On the Properties of Thermal Ions in the Magnetosphere. For presentation at the Spring Meeting of the American Geophysical Union to be held in Washington, D.C. on May 29-June 1, 1979.

BILBRO, J. W.  
Raytheon Co.  
Pulsed Laser Doppler Measurements of Wind Shear. For publication in the Bulletin of the American Meteorological Society.

BROUSSARD, P. H.  
Automated Guidance and Control for a Longwall Shearer. For presentation at the AIME Annual Meeting to be held in New Orleans, Louisiana on February 19-22, 1979.

BUCHANAN, H.  
GALABOFF, Z.  
Dynamics of Uncontrolled Skylab. For presentation at the 18th AIAA Aerospace Sciences Meeting to be held in Pasadena, California on January 14-16, 1980.
HEELIS, R. A.
University of Texas at Dallas

CALVERT, JOHN A. EP34
A Polarimeter for the High Resolution Ultraviolet Spectrometer/Polarimeter For presentation at the 14th Aerospace Mechanisms Symposium to be held at Langley Research Center, Hampton, Virginia on May 1-2, 1980.

CAMP, DENNIS W. ES82
FROST, WALTER Federal Aviation Administration Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems. For publication in the Bulletin of the American Meteorological Society.

CAREY, WILLIAM T. PS06

CASH, MITCHELL FA31
Hardware Problems in Solar Heating and Cooling Systems — An Update. For presentation at the 1979 International Solar Energy Society Congress to be held at Atlanta, Georgia on May 28-June 1, 1979.

CASH, MITCHELL FA32
ELKIN, ROBERT F. EL55
The Effects of Air Leaks on Solar Air Heating Systems. For presentation at the 1979 International Solar Energy Society Congress to be held at Atlanta, Georgia on May 28-June 1, 1979.

CERNY, OTTO F. EG13
Product Assurance During Manufacturing and Testing of the Solid Rocket Motor for the NASA Space Shuttle. For presentation at the 28th Space Travel Congress of the Hermann Oberth Society to be held in Salzburg, Austria on June 21-26, 1979.

CHAPPELL, CHARLES R. ES53
The Earth's Plasmasphere. For presentation at the International Workshop on Selected Topics of the Magnetospheric Physics to be held at the International House of Japan, Tokyo on March 13-16, 1979.

COFIELD, KESTER L., JR. NA51
The Space Transportation System — An Opportunity for Black Participation in Space. For presentation at "Technology in the Black Community National Technical Association" to be held in Pittsburgh, PA on August 1-4, 1979.

COSTES, NICHOLAS C. ES81
The Potential for In-Space Research on Soil Behavior Under Earthquake Excitation. For presentation at the U. S. National Conference on Earthquake Engineering — 1977 to be held at Sanford, California on August 22-24, 1979.

CRAFT, HARRY G., JR. JA12
A Review of Spacelab Mission Management Approach. For presentation at the 1979 Annual Meeting of the American Astronautical Society to be held at Los Angeles, California on October 29-November 1, 1979.
CRAVEN, P. D. ES51
REASONER, D. L. ES51
CHAPPELL, C. R. ES51

Observations of Hydrogen and Oxygen Plasmas Near Synchronous Orbit. For presentation at the 1979 Fall National Meeting of the American Geophysical Union to be held at San Francisco, California on December 3-7, 1979.

CURRIE, JAMES R. EC24

Multichannel Temperature Controller for Hot Air Solar Heating. For presentation at the Institute of Environmental Sciences Meeting to be held at Seattle, Washington on April 29-May 2, 1979.

DUTHIE, J. G. ES62
McMILLAN, R. S. ES62

Search for Optical Bursts from Cyg X-1. For publication in the Bulletin of the AAS.

DUTHIE, J. G. ES62
McMILLAN, R. S. ES62

An Upper Limit on Ultraviolet Shot Noise from Cygnus X-1. For publication in the Astrophysical Journal.

EBY, PETER ES63

Gyro Precession and Mach's Principle. For publication in General Relativity and Gravitation (Bern, Switzerland).

EDWARDS, T. R. ES64

Two-Dimensional Convolute Integers for Optical Image Data Processing. For presentation at the MIRADCOM Workshop to be held in Huntsville, Alabama on November 19, 1979.

EDWARDS, THOMAS R. ES64

Linear Modeling on a Nova with Graphics and Utilizing $T T 0 1 / T T T 1 1$. For presentation at the Sixth Annual Conference of the Data General Users Group to be held in New Orleans, Louisiana on December 4-7, 1979.

EHL, JAMES H. EH41
IRVINE, CHARLES N. EH44
WILLIAMS, JAMES R. EH41

Beam Builder for Space Fabrication. For presentation at the SAMPE Conference to be held in San Francisco, California on May 8-10, 1979.

ELKIN, ROBERT EL55

The Effect of Air Leaks on Solar Air Heating Systems. For presentation at the 1979 International Solar Energy Society Congress to be held in Atlanta, Georgia on May 28-June 1, 1979.

EULER, H. C. ES81
LUNDQUIST, C. A. ES01
VAUGHAN, W. W. ES81


FELIX, A. RICHARD ED35

Dryer Aging Problems in a 500 psi Air Supply System. For presentation at the 51st Meeting of the Supersonic Tunnel Association to be held in Valencia, California on April 10-11, 1979.

FICHTL, GEORGE H. ES82
FOWLIS, WILLIAM W. ES82
BROOME, BARRY G.

Aerojet Electrosystems Co. The Geophysical Fluid Flow Experiment. For presentation at the SPIE Huntsville Electro-Optical Technical Symposium to be held in Huntsville, Alabama on May 22-25, 1979.
FICHTL, GEORGE H. ES82
FOWLIS, WILLIAM W. ES82
HART, JOHN E. University of Colorado
TOOMRE, JURI University of Colorado
GILMAN, PETER A. National Center for Atmospheric Research

Spherical Convection Experiments in Space. For presentation at the Conference on Comparative Fluid Dynamics to be held in Annapolis, Maryland on June 11-13, 1979.

FIELD, E. L. TA31

Space Telescope — A Long-Life Free-flier. For presentation at the 1979 Annual Meeting of American Astronautical Society to be held in Los Angeles, California on October 29-November 1, 1979.

FIELDS, STANLEY A. ES53

Polar-Cap Electron Acceleration Regions. For presentation at the Spring Meeting of the American Geophysical Union to be held in Washington, D. C. on May 29-June 1, 1979.

FISHMAN, G. J. ES61


FISHMAN, G. J. ES62

HEAO-1 Observations. For publication in the IAU Circular 3206.

FISHMAN, GERALD J. ES62

The Marshall Program in Gamma Ray Burst Astronomy. For presentation at the Toulouse Symposium and Workshop on Cosmic Gamma Ray Bursts to be held in Toulouse, France on November 26-29, 1979.

FISHMAN, GERALD J. ES62


FOUNTAIN, J. A. ES64
WEST, E. A. ES64
HORAI, K. Columbia University
WINKLER, J. L. Lockheed Electronic Corp.
KEIHM, S. J. Columbia University
LANGSETH, M. G. Columbia University


*Also for publication in the Philosophical Transactions of the Royal Society of London (England).

FOWLIS, WILLIAM W. ES82


FOWLIS, W. W. ES82
GEISLER, J. E. University of Miami


FOWLIS, WILLIAM W. ES82
GEISLER, JOHN E. University of Miami
GIERE, AL. NASA/MSFC—USRA

Theoretical Studies of Baroclinic Instability for a Spherical Model Experiment for Spacelab. For presentation at
the Conference on Comparative Fluid Dynamics to be held in Annapolis, Maryland on June 11-13, 1979.

FROST, WALTER
University of Tennessee Space Institute

BURTON, HARRY L.
Federal Aviation Administration

CAMP, DENNIS ES82

CONNOLLY, JOHN W.
National Oceanic and Atmospheric Administration

ENDERS, JOHN E. NASA Headquarters

SOWAR, JOSEPH F.
Federal Aviation Administration

Summary of Second Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems. For publication by the American Meteorological Society.

GHOSH, P. MSFC-NAS-NRC

LAMB, F. K. University of Illinois at Urbana-Champaign & CIT


GLAESE, JOHN R. ED12
KENNEL, HANS F. ED12
Torque Equilibrium Attitude Control for Skylab Reentry. For presentation at the AAS Rocky Mountain Guidance and Control Conference to be held at Keystone, Colorado on February 17-21, 1980.

GRINER, DONALD B. EC32
BRDF Measurements of Stray Light Suppression Coatings for ST. For presentation at the SPIE Electro-Optical Technical Symposium and Workshop to be held at the Von Braun Civic Center, Huntsville, Alabama on May 22-25, 1979.

GRINER, DONALD B. EC32
A Scanner to Measure BRDF of Black Coatings. For presentation at the 14th Aerospace Mechanisms Symposium to be held at Langley Research Center, Hampton, Virginia on May 1-2, 1980.

GUYNES, BARRY V. FA33
Economic Considerations in Solar Construction. For presentation at the Plant Engineering and Maintenance Conference/Southwest to be held in Houston, Texas on November 14-16, 1978.

HAGEN, WILLIAM A. FA33
Harvesting the Puerto Rican Sun. For presentation at the 1979 International Solar Energy Society Congress to be held at Atlanta, Georgia on May 28-June 1, 1979.

HALL, STEPHEN PD24
Simulating the Assembly of Large Space Structures. For presentation at the 1979 Annual Meeting of the American Astronautical Society “Space Shuttle: Dawn of an Era” to be held in Los Angeles, California on October 19-November 1, 1979.

HAMITER, LEON EC43
Failure Causes and Reliability Improvements in Metallized Polycarbonate Capacitors. For presentation at the Advanced Techniques in Failure Analysis Symposium to be held in Los Angeles, California on October 8-11, 1979.

HILL, KELLY ES84
WILSON, GREGORY S.
USRA Visiting Scientist at MSFC

TURNER, ROBERT E. ES84
NASA's Participation in the AVESESAME '79 Program. For publication in the Bulletin of the American Meteorological Society.
HUETER, UWE
Thermal/Environmental Control and Life Support Systems Requirements for Future Space Applications. For presentation at the International Symposium on Spacecraft Thermal and Environmental Control System to be held at Munich, Germany on October 10-12, 1978.

HUNG, R. J.
University of Alabama in Huntsville

SMITH, R. E.
Gravity Waves, Tornadic Storms and Coupling Between Lower and Upper Atmospheres. For presentation at the XVII IUGG Meeting to be held in Canberra, Australia.

HUNG, R. J.
University of Alabama in Huntsville

SMITH, R. E.
Study of GOES Infrared Digital Data of an Isolated Tornadic Storm on May 29, 1977. For presentation at the XVII IUGG Meeting to be held in Canberra, Australia on December 3-15, 1979.

HUNG, R. J.
University of Alabama in Huntsville

SMITH, R. E.
Dynamics of Severe Storms Through the Study of Thermospheric-Tropospheric Coupling. For publication in the Journal of Geomagnetism and Geoelectricity.

HYUN, JAE MIN
ES82—NRC Research Associate

KIM, MOON-UHN
Korea Advanced Institute of Science
The Effect of the Nonuniform Wind Shear on the Intensification and Reflection of Mountain Waves. For publication in the Journal of Atmospheric Science.

JEAN, O. C.
NA01

LEE, THOMAS J.
NA01

JOHNSON, GORDON M.
McDonnell Douglas Astronautics Co.

HAMILTER, LEON
EC43

VILLELLA, FELMINIO
EC43

Factors Influencing Microcircuit Package Reliability. For presentation at the Advanced Techniques in Failure Analysis Symposium - 1978, IEEE to be held in Los Angeles, California on November 6-9, 1978.

JOHNSON, J. DWIGHT
EE01

KERSTEN, LEENDERT
Univ. of Nebraska

Triple-Axis Common-Pivot Arm Wrist Device for Manipulative Applications. For presentation at the 14th Aerospace Mechanisms Symposium to be held at Langley Research Center, Hampton, Virginia on May 1-2, 1980.

JONES, CLYDE S., JR.
EC24

MICHON, GERALD
General Electric
The Charge Injection Device as a Candidate Sensor for Stellar Tracking. For presentation at the SPIE Huntsville Electro Optical Technical Symposium and Workshop to be held at the Von Braun Civic Center, Huntsville, Alabama on May 22-25, 1979.

KROES, R. L. ES74
LAL, R. B.

KROSS, D. A. ED22
Space Shuttle Solid Rocket Booster Decelerator Subsystem Rocket Sled Test Program. For presentation at the AIAA 6th Aerodynamic Decelerator Conference to be held at Houston, Texas on March 5-7, 1979.

LAUE, JAY H. PS01
Briefing Material on “Shuttle/Tethered Satellite System (TSS). For presentation at the SAE Aerospace Control and Guidance Systems Meeting to be held in Englewood, Colorado on March 7-9, 1979.

LINDSTROM, ROBERT E. SA01
Space Shuttle Main Engine, External Tank and Solid Rocket Booster Status. For presentation at the Sixteenth Space Congress to be held in Cocoa Beach, Florida on April 25-27, 1979.

LOGAN, EARL Arizona State Univ.
CHANGE, JINGFA E.
Arizona State Univ.
ALEXANDER, MARGARET B. ES82
CAMP, DENNIS W. ES82


LOMINICK, JAMES EC25
Design of the Space Shuttle SR B Thrust Vector Control Servoactuator. For presentation at the 14th Aerospace Mechanisms Symposium to be held at Langley Research Center, Hampton, Virginia on May 1-2, 1980.

LUNDQUIST, C. ES01
DECHER, R. ES61
SMARR, L.
Smithsonian Astrophysical Observatory

VESSOT, R.
Smithsonian Astrophysical Observatory
A Satellite Experiment for Testing Relativistic Gravity Using Multiple Time-Correlated Doppler Signals. For presentation at the AAS Meeting to be held in Stanford, California on February 28-March 2, 1979 and for publication in the Bulletin of the AAS.

McC OOL, ALEX A. EP01
VERBLE, A. J. EP31
POTTER, JACK H. EP33

McDONOUGH, G. F. EE01
Potential Earthquake Research at MSFC. For presentation at the University of Alabama in Huntsville, Dept. of Mechanical Engineering Colloquium to
be held in Huntsville, Alabama on March 30, 1979.

MAURER, ALICE CHENault ES73
Innovations in the Therapy of Diabetes.
For publication in American Scientist.

MEEGAN, C. A. ES62
FISHMAN, G. J. ES62
HAYMES, R. C. Rice University

MEEGAN, CHARLES ES62
FISHMAN, G. J. ES62
HAYMES, R. C. Rice University
A Search for Low Energy Gamma Rays from CG 195+4.

MEEGAN, CHARLES A. ES62
HAYMES, R. C. Rice University

MITCHELL, WALTER T. EE21
Space Shuttle Main Engine Digital Controller. For presentation at the AGARD (Advisory Group for Aerospace Research and Development) Meeting to be held in Cologne, West Germany on October 1-5, 1979.

MORGAN, SAMUEL H., JR. PS02
WU, S. T. UAH
Solar-Terrestrial Research in the Shuttle Age. For presentation at the AIAA Seminar "Shuttle to the Next Space Age" to be held in Huntsville, Alabama on July 18-19, 1979.

MORGAN, SAMUEL H., JR. PS02
Z³ Contribution to Energy Loss of Heavy Charged Particles. For publication in Physical Review.

MURPHY, JAMES T. PA01
Orbital Transfer Vehicle Requirements and Concepts. For presentation at the XXXth International Astronautical Federation (IAF) Congress to be held in Munich, Germany on September 16-23, 1979.

NAKAGAWA, Y. ES51

NAKAGAWA, Y. ES51
TANDBERG-HANSSEN, E. ES51
WU, S. T. UAH
KAN, L. C. UAH

NAKAGAWA, Y. ES51
WU, S. T. UAH
HAN, S. M. UAH
Dynamics of Coronal Transients: A Non-Planar Two-Dimensional MHD Model For presentation at the IAU Symposium No. 91 to be held in Cambridge, Massachusetts on August 27-31, 1979.

NAUMANN, ROBERT J. ES71
TAEUSCH, DAVID R.
Univ. of Michigan
Rationale and Implications of the Users Requirements on the Induced Atmospheric Environment of the Shuttle/Spacelab. For publication in the Journal of Spacecraft and Rockets.

NEIN, MAX E. PS02
BUTLER, JOHN M., JR. PS02
Mission Requirements and Design Concepts for Space Platforms. For presentation at the NASA/AIAA Joint Confer-
ence on Advanced Technology for Future Space Systems to be held in Hampton, Virginia on May 10, 1979.

O’DELL, C. R.

O’DELL, C. R. 
FOUNTAIN, W. F. 
GARY, G. A. 

O’DELL, C. R. 
SWAMY, K. S. KRISHNA 
Tata Institute of Fundamental Research, Bombay, India 
Statistical Equilibrium in Comet C2 Molecules. For presentation at the XVII General Assembly, International Astronomical Union to be held in Montreal; Canada on August 19-23, 1979.

ORAN, W. A. 
BERGE, L. H. 
PARKER, H. W. 

ORAN, W. A. 
WITHEROW, W. K. 
ROSS, R. B. 
RUSH, J. E. 
Some Limitations on Processing Materials in Acoustic Levitation Devices For presentation at the IEEE Symposium on Ultrasonics to be held in New Orleans, Louisiana on September 26-28, 1979 and for publication in the IEEE Transactions on Ultrasonics.

PATTERSON, W. C. 
MOSS, J. D. 
HOPSON, G. D. 
Thermal Integration of Spacelab Experiments. For presentation at the International Symposium on Spacecraft Thermal and Environmental Control Systems to be held at Munich, Germany on October 1-4, 1978.

POWELL, LUTHER E. 
RAY, C. D. 
LITTLES, J. W. 
BLAIR, J. L. 
Design and Development of a Trace Contaminant Removal Canister for Spacelab. For presentation at the 9th Intersociety Conference on Environmental Systems to be held in San Francisco, California on July 10, 1979.

REASONER, D. L. 
CRAVEN, P. D. 
CHAPPELL, C. R. 
Observations of Spacecraft — Plasma Interactions Near Synchronous Orbit. For presentation at the 1979 Fall National Meeting of the American Geophysical Union to be held at San Francisco, California on December 3-7, 1979.

RICHARDSON, WILLIAM F. 
MASSEY, JOHN W. 
System Characteristics and Operational Data of Installed Solar-Powered Rankine Cycle Driven Cooling Systems. For presentation at the Solar Heating and
Cooling Systems Operational Results Conference to be held in Colorado Springs, Colorado on November 27-30, 1979.

RIVES, J. M.  
JEAN, O. C.  
Spacelab Payload Data Acquisition and Communications. For publication in Signal magazine.

ROBINSON, GLENN A.  
LDEF Transverse Flat Plate Heat Pipe Experiment. For presentation at the AIAA Thermophysics Conference to be held in Orlando, Florida on June 3-9, 1979.

RUPP, CHARLES C.  
GRESHAM, LENNOR  
Mississippi State University Effect of Tether Attachment on Shuttle Tethered Satellite System Dynamics. For presentation at the Annual Rocky Mountain Guidance and Control Conference to be held at Keystone Village, Colorado on February 24-28, 1979.

RUPP, C. C.  
GRESHAM, LENNOR L.  
Mississippi State University Investigating the Attitude Control of the Shuttle/Tethered Satellite System. For presentation at the Annual Southeastern Symposium on System Theory to be held at Clemson University, South Carolina on March 12-13, 1979.

RUTLAND, CARY H.  
Flight Development Tests for Large and Deployable Antennas. For presentation at the 1979 Annual Meeting of the American Astronautical Society “Space Shuttle: Dawn of an Era” to be held in Los Angeles, California on October 29-November 1, 1979.

SAX, ROBERT I.  
NOAA

KELLER, VERNON W.  
ES83


SCALZI, JOHN B  
NSF

McDONOUGH, G. F., JR.  
EE01

The NASA/MSFC Experimental Facilities at Huntsville, Alabama. For presentation at the 11th Joint Meeting of the Panel on Wind and Seismic Effects (UJNR) to be held at Tsukuba City, Japan on September 3-7, 1979.

SCHUTZENHOFER, L.  
JONES, J.  
JEWELL, R.  
ED21

Mechanism Associated with the Space Shuttle Main Engine Oxidizer Valve/Duct System Anomalous High Amplitude Discrete Acoustical Excitation. For presentation at the 14th Aerospace Mechanisms Symposium to be held at Langley Research Center, Hampton, Virginia on May 1-2, 1980.

SCHUTZENHOFER, L. A.  
JONES, J. H.  
ED23

Elimination of a Discrete Frequency Acoustical Buzz Phenomenon Associated with the Space Shuttle Main Engine Oxidizer Valve/Duct System. For presentation at the 50th Shock and Vibration Symposium to be held in Colorado Springs, Colorado on October 16-18, 1979.

SCHWINGHAMER, ROBERT J.  
EH01

SETTLE, GRAY L. EF35

SEYMOUR, DAVID ED33
GREENWOOD, TERRY ED33
SMITH, S.
Lockheed Missiles & Space Co., Inc.
Development of a Shear Layer Mixing Model for Large Solid Rocket Motors. For presentation at the JANNAF 11th Plume Technology Meeting to be held at Huntsville, Alabama on May 8-10, 1979.

SHACKELFORD, BENJAMIN W. EP25
CAVENY, LEONARD H. Princeton Univ.
KUO, KENNETH K. Penn State Univ.
Ignition Transients of the Space Shuttle SRM. For publication in the Proceedings of the 1979 JANNAF Propulsion Meeting which was held in Anaheim, California on March 5-8, 1979.

SHIPMAN, DAVID L. EL12
Payload Specialist Training Scheduler (PACTS). For presentation at the AIIE Annual Institute Conference to be held in Atlanta, Georgia on May 11-14, 1980.

SMITH, J. B., JR. et al. ES52
Vector Magnetic Measurements of an Active Region. For presentation at the 154th Meeting of the American Astronomical Society to be held June 11-14, 1979.

SMITH, R. E. ES81
HUNG, R. J. UAH
PHAN, T. UAH

SMITH, R. E. ES81
HUNG, R. J. UAH
PHAN, T. UAH
Coupling of Ionosphere and Troposphere During the Occurrence of Isolated Tornadoes on November 20, 1973. For publication in the Journal of Geophysical Research.

SMITH, R. E. ES81
HUNG, R. J. UAH
PHAN, T. UAH

SNODDY, WILLIAM C. PS01
NEIN, MAX E. PS01
Space Platforms — An Evolutionary Approach for Long Duration Space Science and Applications Missions. For presentation at the 1979 Annual Meeting of the American Astronautical Society to be held in Los Angeles, California on October 29-November 2, 1979.

STEELY, SIDNEY L.
FWG Associates, Inc.
FROST, WALTER
University of Tennessee Space Institute
CAMP, DENNIS W. ES82
Statistical Analysis of Atmospheric Flow About a Simulated Block Building. For presentation at the 5th International Wind Engineering Conference to be held at Fort Collins, Colorado in July 1979.
STERRETT, JAMES B. ET01
Large Scale Vibration Testing of Engineering Structures. For presentation at the U. S. National Conference on Earthquake Engineering to be held at Sanford, California on August 22-24, 1979.

STEWART, RODNEY D. EL02
Format and Content of Cost Information Required in Proposals. For presentation at the Second Annual Conference of the National Estimating Society to be held in Los Angeles, California on June 18-19, 1980.

TANDBERG-HANSSEN, E. ES51
Ejection of Mass from the Sun. For presentation at the Indo-U. S. Workshop on Solar-Terrestrial Physics to be held in Udaipur, India on June 12-16, 1979.

TANDBERG-HANSSEN, EINAR ES51

TANDBERG-HANSSEN, E. HENZE, W. ES51
Teledyne Brown Engineering Polarimetry with the SSM Ultraviolet Spectrometer and Polarimeter. For presentation at the Workshop on Flare Research and Solar Maximum Mission to be held at Ann Arbor, Michigan on November 13-16, 1978.

TEUBER, D. L. ES51
A Unifying Analytic Method for Solar Flare Data, Sunspot Numbers, and a Stellar Observation. For publication in Solar Physics (Holland).

URBAN, E. W. ES63
KATZ, L. ES63
HENDRICKS, J. B. UAH
KARR, G. R. UAH
The Spacelab 2 Infrared Telescope Cryogenic System. For presentation at the Electro-Optical Technical Symposium and Workshop to be held in Huntsville, Alabama on May 22-25, 1979.

URBAN, EUGENE ES63
KATZ, LESTER ES63
HENDRICKS, J. UAH
KARR, G. UAH
Cryogenic Helium II Systems for Space Applications. For presentation at the International Symposium on Spacecraft Thermal and Environmental Control Systems to be held at Munich, Germany on October 10-12, 1978.

VAN RENSSELAER, FRANK FA51
ROHRBAUGH, DAVID J.
Boeing Aerospace Co.
The Inertial Upper Stage — Workhorse of the Future. For presentation at the Thirtieth International Astronautical Federation Congress to be held in Munich, Germany on September 16-23, 1979.

VAUGHAN, O. H. ES83
HUNG, R. J. UAH
LIAW, G. S. UAH
Aerosol Particles and the Formation of Advection Fog. For publication in the Journal Research Atmospheric (France).

VAUGHAN, O. H. ES83
VONNEGUT, BERNARD
State University of New York at Albany

54
Thunderstorm and Lightning Observations from Space Shuttle. For publication in the Bulletin of the American Meteorological Society and for presentation at the IEE/AIAA Conference on Space Instrumentation for Atmospheric Observation to be held in El Paso, Texas on April 3-5, 1979.

VAUGHAN, WILLIAM W. ES81
Lightning and Space Observations Potential. For publication in the AIAA Alabama Section Explorer periodical.

VINZ, FRANK L. EF41
Simulation for Development of Free-Flying Service Vehicles. For presentation at the 1979 Annual Meeting of the AAS to be held in Los Angeles, California on October 29-November 1, 1979.

VON TIESENHAUSEN, GEORG F. PS01
Nonterrestrial Processing and Manufacturing of Large Space Systems. For presentation at the 24th National Symposium of the Society for the Advancement of Material and Process Engineering to be held in San Francisco, California on May 8-10, 1979.

WARMBROD, JOHN D. ED33
Design and Development of the Thermal; Protection System for the External Tank For presentation at the AIAA 12th Fluid and Plasma Dynamics Conference to be held in Williamsburg, Virginia on July 23-25, 1979.

WATTERS, H. H. EL15
STOKES, J. W. EL15
Construction in Space. For publication in Astronautics and Astronautics Journal.

WEISSKOPF, M. C. ES61
The Search for, and Study of, Black Holes in the Galaxy. For publication in the Proceedings of the NASA Compact Objects Workshop which was held in Washington, D. C. on April 20-21, 1979.

VAUGHAN, WILLIAM W. ES81
Lightning and Space Observations Potential. For publication in the AIAA Alabama Section Explorer periodical.

VINZ, FRANK L. EF41
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Experiment (TCSE). For presentation at the AIAA 14th Thermophysics Conference to be held at Orlando, Florida on June 4-6, 1979.

WILKES, D. R. ES64
HARADA, Y. IIT Research Institute
Inorganic Zn$_2$TiO$_4$ Thermal Control Coatings. For presentation at the 24th National SAMPE Symposium to be held in San Francisco, California on May 8-10, 1979.

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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.

J. T. SHEPHERD
Director, Administration and Program Support