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83-08

National Space Science Data Center/
World Data Center A For Rockets and Satellites

Report on Active and Planned Spacecraft and Experiments

August 1983

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World Data Center A for Rockets and Satellites
Code 601
Goddard Space Flight Center
Greenbelt, MD 20771
U.S.A.

Telephone: (301) 344-6695
Telex No.: 89675
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NSSDC/WDC-A-R&S 83-08

REPORT ON ACTIVE AND PLANNED

SPACECRAFT AND EXPERIMENTS

Edited by

Ronald G. Littlefield

National Space Science Data Center

August 1983

National Space Science Data Center (NSSDC)/
World Data Center A for Rockets and Satellites (WDC-A-R&S)
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

N84-11187#

PREFACE

The *Report on Active and Planned Spacecraft and Experiments* provides the professional community with information on current as well as planned spacecraft activity in a broad range of scientific disciplines. All scientific spacecraft that were active at some time during the period June 1, 1981, to May 31, 1983, are included in the active section of this catalog. The performance information for active NASA and NASA-cooperative programs is based, to a large extent, on the project office status reports through May 31, 1983. In addition, The National Space Science Data Center (NSSDC) has made use of information from other sources. Therefore, new data concerning certain spacecraft that were launched after May 31, but before this report went to press, have been included to reflect the latest status. We do not claim our coverage to be complete for this period, but have used all available data to make this report as accurate and up-to-date as possible.

We would like to acknowledge the cooperation of scientific staff members at NSSDC in obtaining information and writing/updating the spacecraft and experiment descriptions for this report. We would like to give particular thanks to Dr. Mary Elsen for her help in proofreading this report and also to Mrs. Dorothy Rosenblatt for her efforts in managing the automated information output on a timely schedule. The cooperation of the project offices and experimenters in supplying current documentation of their spacecraft and experiments is gratefully acknowledged. We are particularly pleased with the many constructive comments and corrections we have received from interested users of this report.

Ronald G. Littlefield

August 1983

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*For a complete listing of the spacecraft and experiments described in these sections, please refer to the Index of Active and Planned Spacecraft and Experiments (Section 4).

1

INTRODUCTION

1. INTRODUCTION

1.1 Purpose

This report provides the professional community with information on current and planned spacecraft activity for a broad range of scientific disciplines. By providing a brief description of each spacecraft and experiment as well as its current status, it is hoped that this document will be useful to many people interested in the scientific, applied, and operational uses of the data collected. Furthermore, for those planning or coordinating future observational programs employing a number of different techniques such as rockets, balloons, aircraft, ships, and buoys, this document can provide some insight into the contributions that may be provided by orbiting instruments.

1.2 Contents

This document includes information concerning active and planned spacecraft and experiments known to the National Space Science Data Center. The information covers a wide range of scientific disciplines: astronomy, earth sciences, meteorology, planetary sciences, aeronomy, particles and fields, solar physics, life sciences, and material sciences. These spacecraft projects represent the efforts and funding of individual countries as well as cooperative arrangements among different countries.

Descriptions of navigational and communications satellites are specifically not included here. Also not given are descriptions of spacecraft that contain only continuous radio beacons used for ionospheric studies. Many of these spacecraft are listed in the *SPACEWARN Bulletin**. No attempt has been made to present information regarding classified spacecraft or experiments.

1.3 Organization

This report is divided into two major parts with descriptive material introducing each section.

The first part of this report, Section 2 - "Descriptions of Active Spacecraft and Experiments " is a listing of descriptions of all scientific spacecraft and experiments that were active at some time during the period June 1, 1981, to May 31, 1983. In addition, new data concerning certain spacecraft that were launched or changed status after May 31, but before this report went

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*The *SPACEWARN Bulletin* is prepared by the World Data Center A for Rockets and Satellites, Code 601, Goddard Space Flight Center, Greenbelt, MD 20771, USA. It is intended to serve as an international communications mechanism for the rapid distribution of information on satellites and space probes. It is published on behalf of the Committee on Space Research (COSPAR) by the International URSIGRAM and World Days Service (IUWDS), a permanent service of the International Scientific Radio Union in association with the International Astronomical Union and the International Union for Geodesy and Geophysics.

to press, have been included to reflect the latest status. The listing is arranged by spacecraft common name and the last name of the principal investigator, lead investigator, or team leader.

The second part, Section 3 - "Descriptions of Planned Spacecraft and Experiments," contains descriptions of the scientific spacecraft and experiments and onboard Space Shuttle experiment packages that were proposed or approved for missions as of May 31, 1983, for which experiments or investigations have been selected and for which NSSDC has at least minimal documentation.

Sections 4 and 5 are indexes to the information presented in Sections 2 and 3. Section 4, "Index of Active and Planned Spacecraft and Experiments," is an alphabetical listing by spacecraft name (or onboard experiment package name, for future Shuttle flights), including both common and alternate names, of all active and planned spacecraft and experiments. This listing serves as an index to the location of spacecraft and experiment descriptions and includes launch dates and current status-of-operation data. Section 5, "Investigator Name Index," is a listing, ordered by last name, of the investigators or team members associated with the experiments and their current affiliations.

These major sections were generated from NSSDC automated files. Other relevant scientific spacecraft without brief descriptions are listed in Appendix A. Special investigators for some missions that could not be presented conveniently in Section 2 or 3 appear in Appendix B. Certain words and phrases used in this report are defined in Appendix C. Appendix D is a comprehensive list of the abbreviations and acronyms used frequently in this document.

1.4 Document Availability

Upon request, NSSDC will provide copies of this report to individuals or organizations resident in the United States. The report is available to persons outside the United States through the World Data Center A for Rockets and Satellites (WDC-A-R&S). The official addresses for requests are printed on the inside front cover.

Recipients are requested to inform potential users of the availability of this report. Because of continuing costs involved in publishing a document of this size on a periodic basis, NSSDC encourages individuals located at the same organization to share this document.

1.5 Request for Additions/Corrections

NSSDC continually strives to increase the usefulness of this report by improving the spacecraft and experiment descriptions and by including additional spacecraft and experiments as they become known to NSSDC. This report is complete and reasonably accurate concerning NASA and NASA-cooperative programs; however, descriptions of other spacecraft and experiments may be incomplete because of a lack of information available to

NSSDC. It should be noted that the information concerning the planned spacecraft and experiments is frequently general in nature and subject to change.

NSSDC would welcome comments as to errors or omissions in this report. Recommendations regarding the overall contents and organization would be appreciated also. In particular, it is hoped that principal experimenters and project offices will cooperate in bringing such matters to NSSDC's attention.

2

DESCRIPTIONS OF ACTIVE SPACECRAFT AND EXPERIMENTS

2. DESCRIPTIONS OF ACTIVE SPACECRAFT AND EXPERIMENTS

This section contains descriptions of spacecraft and experiments pertinent to this report that were active at some time during the period June 1, 1981, to May 31, 1983. In addition, new data concerning spacecraft or experiments that were launched or changed status after May 31, but before this report went to press, have been included to reflect the latest status. The descriptions are sorted first by spacecraft common name. Within each spacecraft listing, experiments are ordered by the principal investigator's, lead investigator's, or team leader's last name. Explorer spacecraft prelaunch generic names are used as common names; e.g., IMP-J instead of Explorer 50. If the common name, as used by NSSDC, is not known, the reader should refer to his own common name in the Index of Active and Planned Spacecraft and Experiments (Section 4) to obtain the cross reference to the NSSDC common name.

Each spacecraft or experiment entry in this section is composed of two parts, a heading and a brief description. The headings list characteristics of spacecraft and experiments. Many of the terms used in this section are defined in Appendix C.

2.1 Contents of Spacecraft Entries

The heading for each spacecraft description in this section includes a set of initial orbit parameters: orbit type, epoch date, orbit period, apoapsis, periapsis, and inclination for the spacecraft. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft weight, launch date, site, vehicle, spacecraft common and alternate names, NSSDC ID code, sponsoring country and agency, and spacecraft personnel codes. The personnel codes are as follows:

CODE CO (general contact)
CODE MG (program manager)
CODE MM (mission manager)
CODE MO (mission operations manager)
CODE MS (mission scientist)
CODE PC (project coordinator)
CODE PD (project director)
CODE PE (project engineer)
CODE PM (project manager)
CODE PS (project scientist)
CODE SC (program scientist)
CODE TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for the missions of other countries or agencies have been given the same position names. The spacecraft brief description is immediately below each heading.

2.2 Contents of Experiment Entries

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the name and affiliation or location of the principal investigator (PI), lead investigator (LI), or team leader (TL) for the experiment as well as other investigators (OI), team members (TM), deputy team leader (DT), co-investigator (CI), experiment manager (EM), experiment scientist (ES), or general contact (CO) associated with the experiment. The investigators are not listed in any particular order within each experiment. The experiment brief description is immediately below each heading.

The investigative program may include one of the following NASA Headquarters division codes:

CODE EB (Life Sciences)
CODE EC (Communications)
CODE EE (Earth Science & Applications)
CODE EL (Solar System Exploration)
CODE EN (Materials Processing)
CODE EZ (Astrophysics)
CODE RS (Space Systems)

The addition of /CO-OP to any code indicates a cooperative effort between NASA and another agency.

2.3 Active Spacecraft and Experiment Descriptions

A spacecraft is included in the active section of this report if it had a status of "normal" or "partial" and a data acquisition rate of "standard" or "substandard" for any length of time since June 1, 1981. Experiments that meet these same criteria also are included. Scientific experiment packages which are carried entirely onboard the Space Shuttle during this same time period are also included in the active section of this report.

Active spacecraft with only passive experiments such as laser reflectors or those used only in upper atmospheric drag observations are included in Appendix A.

************************** 1976-059A**************************

SPACECRAFT COMMON NAME- 1976-059A
ALTERNATE NAMES- 08916, USAF OPERATIONAL SAT-76

NSSDC ID- 76-059A

LAUNCH DATE- 06/26/76 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/28/76
ORBIT PERIOD- 1436. MIN INCLINATION- 0. DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL
PM - SPACE DIVISION USAF-LAS
PS - W.D. EVANS LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1976-059A, HIGBIE------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 76-059A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.R. HIGBIE LOS ALAMOS NAT LAB
OI - R.D. BELIAN LOS ALAMOS NAT LAB
OI - D.N. BAKER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The Energetic Particle Detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV.

************************** 1977-007A**************************

SPACECRAFT COMMON NAME- 1977-007A
ALTERNATE NAMES- 09803, USAF OPERATIONAL SAT-77

NSSDC ID- 77-007A

LAUNCH DATE- 02/06/77 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/08/77
ORBIT PERIOD- 1436. MIN INCLINATION- 0. DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL
PM - SPACE DIVISION USAF-LAS
PS - W.D. EVANS LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1977-007A, HIGBIE------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 77-007A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.R. HIGBIE LOS ALAMOS NAT LAB
OI - R.D. BELIAN LOS ALAMOS NAT LAB
OI - D.N. BAKER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The Energetic Particle Detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV.

************************** 1979-053A**************************

SPACECRAFT COMMON NAME- 1979-053A
ALTERNATE NAMES- 11397, USAF OPERATIONAL SAT-79

NSSDC ID- 79-053A

LAUNCH DATE- 06/10/79 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/11/79
ORBIT PERIOD- 1436.5 MIN INCLINATION- 1.9 DEG
PERIAPSIS- 35729. KM ALT APOAPSIS- 35859. KM ALT

PERSONNEL
PM - SPACE DIVISION USAF-LAS
PS - W.D. EVANS LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1979-053A, HIGBIE------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 79-053A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.R. HIGBIE LOS ALAMOS NAT LAB
OI - R.D. BELIAN LOS ALAMOS NAT LAB
OI - D.N. BAKER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The energetic-particle detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals

ranging from 1.2 to 600 MeV. This instrument differed from previous instruments in that it had a fast-time mode for electrons.

*************************** 1981-025A***************************

SPACECRAFT COMMON NAME- 1981-025A
ALTERNATE NAMES- 12339

NSSDC ID- 81-025A

LAUNCH DATE- 03/16/81 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/17/81
ORBIT PERIOD- 1421.2 MIN INCLINATION- 1.9 DEG
PERIAPSIS- 35463. KM ALT APOAPSIS- 35527. KM ALT

PERSONNEL
PM - SPACE DIVISION USAF-LAS
PS - W.D. EVANS LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1981-025A, HIGBIE---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 81-025A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - P.R. HIGBIE LOS ALAMOS NAT LAB
OI - R.D. BELIAN LOS ALAMOS NAT LAB
OI - D.N. BAKER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The energetic-particle detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV. This instrument had a fast-time mode for electrons.

*************************** 1982-019A***************************

SPACECRAFT COMMON NAME- 1982-019A
ALTERNATE NAMES- 13086

NSSDC ID- 82-019A

LAUNCH DATE- 03/06/82 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PERSONNEL
PM - SPACE DIVISION USAF-LAS
PS - W.D. EVANS LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The satellite was placed in a geostationary orbit with some station-changing capabilities. It was spin stabilized at 6 rpm with its spin vector aligned along a radius vector to the earth by an active control system. Real-time particle data were used by selected U.S. agencies for space disturbance monitoring and forecasting.

------- 1982-019A, HIGBIE---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTOR

NSSDC ID- 82-019A-01 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - P.R. HIGBIE LOS ALAMOS NAT LAB
OI - R.D. BELIAN LOS ALAMOS NAT LAB
OI - D.N. BAKER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The energetic-particle detector consisted of four solid-state detector units to measure electron, proton, and alpha-particle populations. The low-energy electron (LEE) unit was made with five separate elements, each with a 5-deg half-angle collimator (HAC); these detectors viewed at 0 deg, plus and minus 30 deg, and plus and minus 60 deg latitude relative to the spacecraft equatorial plane. The LEE measured electrons above seven threshold energies ranging from 30 to 300 keV. The high-energy electron unit consisted of one detector with an 8-deg HAC; fluxes above seven threshold energies ranging from 0.2 to 2.0 MeV were measured. The low-energy proton unit consisted of a single detector with a guard scintillator, a 5-deg HAC, and discriminators for 11 threshold energies ranging from 50 to 500 keV. The high-energy proton (HEP) unit was a three-element telescope with a guard scintillator and a 15-deg HAC that measured protons within 16 energy intervals ranging from 0.3 to 150 MeV. On command, the HEP could measure alpha particles in 16 energy intervals ranging from 1.2 to 600 MeV. This instrument had a fast-time mode for electrons.

*************************** ASTRON***************************

SPACECRAFT COMMON NAME- ASTRON
ALTERNATE NAMES- 13901, AUTOMATIC STATION ASTRON

NSSDC ID- 83-020A

LAUNCH DATE- 03/23/83 WEIGHT- KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/24/83
ORBIT PERIOD- 5860. MIN INCLINATION- 51.5 DEG
PERIAPSIS- 2000. KM ALT APOAPSIS- 200000. KM ALT

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
The automatic astronomical station (ASTRON) carried a UV telescope, X-ray spectrometers, and service systems.

------- ASTRON, UNKNOWN---------------------------------------

INVESTIGATION NAME- ULTRAVIOLET TELESCOPE

NSSDC ID- 83-020A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
SOLAR PHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
No details available.

------- ASTRON, UNKNOWN---------------------------------------

INVESTIGATION NAME- X-RAY SPECTROMETERS

NSSDC ID- 83-020A-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
No details available.

**************************** AUREOL 3**************************

SPACECRAFT COMMON NAME- AUREOL 3
ALTERNATE NAMES- 12848, ARCAD 3
AUREOLE 3, OREOL 3

NSSDC ID- 81-094A

LAUNCH DATE- 09/21/81 WEIGHT- 1000. KG
LAUNCH SITE-
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/22/81
ORBIT PERIOD- 108.2 MIN INCLINATION- 82.6 DEG
PERIAPSIS- 380. KM ALT APOAPSIS- 1920. KM ALT

PERSONNEL
PM - M.G. CHARLES CESR
PS - Y.I. GALPERIN IKI
PS - H. REME CESR

BRIEF DESCRIPTION
Oreol 3 was a Soviet satellite that was part of the Intercosmos Series, subset AUOS-T (automatic universal orbital station terrestrial studies). The spacecraft was launched September 21, 1981, in a near-polar orbit. The center portion of the spacecraft was a pressurized cylinder 1.6 m in diameter and 2.7 m in height. Extending from the central body and deployed after launch were the telemetry and command antennas, the solar panels, and six booms holding various sensors away from the spacecraft. Magnetic torquing and gravity gradient were utilized to achieve three-axis stabilization. The Z axis of the spacecraft was aimed toward the center of the earth, the X axis was the direction of the spacecraft velocity vector. Both passive and active thermal control were used. Eight solar panels and 28-V batteries provided a maximum power of 250 W, and an average power of 50 W. The spacecraft carried a total of 12 experiments (4 from the USSR, 7 from France, and 1 done jointly by France and the USSR). The overall objectives were to provide some answers to the numerous questions related to magnetosphere-ionosphere coupling at high latitudes. The phenomena of interest included aurorae, magnetospheric substorms, origin and transport of plasmas, associated energies, electric currents, and electric fields. The experiments planned to meet these objectives included measurements of ambient electron density, electron temperature, and plasma velocity; of charged particles over the range 0.1 eV to 255 keV, plus electrons with energies above 40 keV and protons with energies above 500 keV; of dc electric and magnetic fields (0 to 10 Hz); of ELF and VLF waves in the range 0.01 to 16 kHz; of electric fields at frequencies from 0.1 to 16 MHz; and of auroral photometry at 4278 A, 4861 A, and 6300 A. Commands were either carried out in real time or stored on a weekly basis. Two instruments were used for on-board processing of experimental data. The correlometer provided cross-correlation and autocorrelation data for the measurement from either the four Kukushka detectors (81-094A-01) or two Kukushka and two Pietstchanka (81-094A-02) detectors. The ONTCH-2ME instrument provided on-board processing of the data from the ISO F (81-094A-09) and ISO M (81-094A-10) experiments. Two telemetry systems were used, a direct read-out system used over French telemetry stations and a delayed read-out system that used tape-recording and play back over the Soviet telemetry stations. The routine scheduling of operations for the French experiments was initiated weekly (on Fridays), 24 days in advance. It was coordinated through the French Centre d'Operations Specialise ARCAD 3 (COS A3) and forwarded to the Institute for Space Research (IKI), Moscow, where it was merged with the input from the Russian experimenters. It was then returned to France for concurrence and returned to IKI Moscow 11 days prior to the beginning of operations. The schedule was then finalized and distributed 5 days prior to the beginning of operations.

------- AUREOL 3, BEGHIN---------------------------------------

INVESTIGATION NAME- ISOPROBE (RADIO-FREQUENCY PROBE)

NSSDC ID- 81-094A-08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
IONOSPHERES AND RADIO PHYSICS
SPACE PLASMAS

PERSONNEL
PI - C. BEGHIN CNRS, CTR FOR SPECTROM

BRIEF DESCRIPTION
The Isoprobe (Interferometer Self-Oscillating Probe) experiment was basically a system of radio-frequency probes that was designed to provide ambient electron density, electron temperature and plasma velocity. The experiment used two identical probes, ISO 1 and ISO 2, mounted at different angles with respect to the spacecraft velocity vector. The difference between the data from ISO 1 and ISO 2 was used to determine the velocity of the plasma. Each probe consisted of five elements immersed in the plasma. Three elements could be connected to an rf generator, and the other two elements operated as receivers. The probes measured as a function of frequency (100 kHz to 15 MHz) the current flowing between the various "transmit-receive" pairs of elements. The current exhibited a sharp maximum at the upper hybrid frequency from which the electron density could be calculated. A sharp minimum in the current that was a function of Debye length provided a measurement of the electron temperature.

------- AUREOL 3, BERTHELIER-----------------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER (DYCTION)

NSSDC ID- 81-094A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - J.J. BERTHELIER CNRS-LGE

BRIEF DESCRIPTION
The Spectrometer DYCTION (dynamic-composition and temperature of ions) provided the total density, temperature and velocity of thermal ions. The major ions (H+, and He+ and O+) were measured simultaneously 70% of the time, and the minor ions were measured 20% of the time. These measurements were made in the direction of the satellite velocity vector. The remaining 10% of observation time was used to provide a rough sweep of suprathermal ions at incidence angles ranging from +30 deg to -30 deg in the horizontal plane of the satellite and ranging from +60 deg to -60 deg in the vertical plane of the satellite.

------- AUREOL 3, BERTHELIER-----------------------------------

INVESTIGATION NAME- ISO F (ELECTRIC FIELD PROBE)

NSSDC ID- 81-094A-09 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - J.J. BERTHELIER CNRS-LGE
OI - O.A. MOLCHANOV IZMIRAN

BRIEF DESCRIPTION
The ISO F experiment consisted of four spherical Langmuir probes used to measure the three components of the electric field at frequencies between 0 and 10 Hz, two electric components at frequencies between 10 Hz and 16 kHz, and two components at frequencies from 0.1 to 10 MHz.

------- AUREOL 3, BERTHELIER-----------------------------------

INVESTIGATION NAME- TRAC (FLUXGATE MAGNETOMETER)

NSSDC ID- 81-094A-11 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - J.J. BERTHELIER CNRS-LGE
OI - Y.I. GALPERIN IKI

BRIEF DESCRIPTION
The TRAC experiment used a three-axis fluxgate magnetometer to measure slow fluctuations (0 to 10 Hz) of the local magnetic field. The instrument has a resolution of 13 nT.

------- AUREOL 3, BOSQUED--------------------------------------

INVESTIGATION NAME- TBE SOFT PARTICLE SPECTROMETERS

NSSDC ID- 81-094A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - J.M. BOSQUED PAUL SABATIER U
OI - H. REME CESR

BRIEF DESCRIPTION

The TBE (Very Low Energy) spectrometers were part of the Spectro package. The TBE 01 spectrometer measured electrons and protons in the energy range 10 eV to 1 keV, incident at an angle of 20 deg with respect to the Z axis of the satellite. The TBE 02 spectrometer measured electrons and protons in the energy range 10 eV to 10 keV, incident at an angle of 160 deg with respect to the Z axis of the satellite. Both instruments utilized electrostatic analyzers to select the energy steps.

------- AUREOL 3, BOSQUED---------------------------------------

INVESTIGATION NAME- ROBE SOFT PARTICLE SPECTROMETER

NSSDC ID- 81-094A-05

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - J.M.	BOSQUED	PAUL SABATIER U
OI - H.	REME	CESR

BRIEF DESCRIPTION

The ROBE Soft Particle Spectrometer was part of the Spectro package. It measured electrons and protons in the 250 eV to 20 keV range incident at two fixed angles (0 and 90 deg with respect to the Z axis of the spacecraft) and also at seven intermediate angles. A choice of the number of energy steps (8, 16, or 64) and of incidence angles (3, 8, or 9) was available by command.

------- AUREOL 3, BOSQUED---------------------------------------

INVESTIGATION NAME- ENERGETIC SPECTROMETER (ION)

NSSDC ID- 81-094A-06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL

PI - J.M.	BOSQUED	PAUL SABATIER U
OI - H.	REME	CESR

BRIEF DESCRIPTION

The Energetic Ion Spectrometer experiment was part of the Spectro package. It consisted of two identical spectrometers, Ion 01 and Ion 02, that could detect ions in the range 1 to 32 u. A choice of two modes of operation was available by command, a thermal mode (5 to 150 eV/Q) and a suprathermal mode (150 eV/Q to 50 keV/Q). Ion 01 and Ion 02 were oriented at angles of 60 deg and 120 deg respectively with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN--------------------------------------

INVESTIGATION NAME- KUKUSHKA SOFT PARTICLE SPECTROMETER

NSSDC ID- 81-094A-01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - Y.I.	GALPERIN	IKI
OI - R.A.	KOVRAZHKIN	IKI

BRIEF DESCRIPTION

The Kukushka spectrometer consisted of two proton detectors and two electron detectors using electrostatic analyzers to measure energies in the energy range from 50 eV to 15 keV. These detectors were aimed at an angle of 75 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN--------------------------------------

INVESTIGATION NAME- PIETSTCHANKA PARTICLE SPECTROMETER

NSSDC ID- 81-094A-02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - Y.I.	GALPERIN	IKI
OI - R.A.	KOVRAZHKIN	IKI

BRIEF DESCRIPTION

The Pietstchanka spectrometer measured electrons and protons in the energy range 40 keV to 255 keV. This intermediate energy range was measured in five energy bands. This spectrometer was aimed at an angle of 30 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GALPERIN--------------------------------------

INVESTIGATION NAME- FON ENERGETIC PARTICLE DETECTOR

NSSDC ID- 81-094A-03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - Y.I.	GALPERIN	IKI
OI - R.A.	KOVRAZHKIN	IKI

BRIEF DESCRIPTION

The FON detector consisted of two Geiger counters that measured electrons with energies greater than 40 keV and protons with energies greater than 500 keV, and that were aimed at 20 and 90 deg with respect to the Z axis of the spacecraft.

------- AUREOL 3, GLASYSHEV-------------------------------------

INVESTIGATION NAME- ALTAIR (AURORAL PHOTOMETRY)

NSSDC ID- 81-094A-12

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - V.A.	GLASYSHEV	IKI
OI - T.	MULIARCHIK	IKI

BRIEF DESCRIPTION

The ALTAIR experiment used three photometers (ALTAIR 1, 2, and 3) to measure auroral emissions at 4861 A, 4278 A and 6300 A. The instruments had a viewing angle of 2 deg, and they were aimed at an angle of 160 deg with respect to the Z axis of the spacecraft. A fourth photometer (ALTAIR 4) with a 1-deg field of view, and aimed at 28 deg with respect to the Z axis, was used for attitude determination.

------- AUREOL 3, LEFEUVRE--------------------------------------

INVESTIGATION NAME- ISO M (MAGNETIC FIELD PROBE)

NSSDC ID- 81-094A-10

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - F.	LEFEUVRE	CNRS, CTR FOR SPECTROM
OI - O.A.	MOLCHANOV	IZMIRAN

BRIEF DESCRIPTION

The ISO M experiment measured the three components of the magnetic field at frequencies between 10 Hz and 16 kHz.

****************************** BHASKARA **************************

SPACECRAFT COMMON NAME- BHASKARA
ALTERNATE NAMES- SEO, 11392

NSSDC ID- 79-051A

LAUNCH DATE- 06/07/79 WEIGHT- 444. KG
LAUNCH SITE- KAPUSTIN YAR, U.S.S.R.
LAUNCH VEHICLE- INTRCOS

SPONSORING COUNTRY/AGENCY

INDIA	ISRO
U.S.S.R.	INTERCOS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/07/79
ORBIT PERIOD- 95.2 MIN	INCLINATION- 50.7 DEG
PERIAPSIS- 512. KM ALT	APOAPSIS- 557. KM ALT

PERSONNEL
MG - U.R. RAO — ISRO SATELLITE CENTER
PD - K. KASTURIRANGAN — ISRO SATELLITE CENTER
PS - O.P.N.CALLA — SPACE APPLICATIONS CTR
PS - G. JOSEPH — SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
Bhaskara, the second Indian satellite, was launched as part of the satellite-for-earth-observations (SEO) program. It was placed in orbit by a Soviet vehicle launched from a cosmodrome in the U.S.S.R. The main objectives were to conduct earth observation experiments for applications related to hydrology, forestry, and geology using a two-band TV camera system, and to conduct ocean-surface studies using a two-frequency satellite microwave radiometer (SAMIR) system. Secondary objectives were to test engineering and data processing systems, to collect limited meteorological data from remote platforms, and to conduct scientific investigations in X-ray astronomy. Bhaskara was a 26-faced quasi-spherical polyhedron. It had a height of 1.66 m, and a diameter of 1.55 m. The satellite was named after the two "Bhaskaracharyas" astronomer-mathematicians of ancient India.

------- BHASKARA, CALLA --

INVESTIGATION NAME- SATELLITE MICROWAVE RADIOMETER (SAMIR)

NSSDC ID- 79-051A-01 — INVESTIGATIVE PROGRAM: APPLICATIONS

INVESTIGATION DISCIPLINE(S): EARTH RESOURCES SURVEY

PERSONNEL
PI - O.P.N.CALLA — SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct studies over the Indian subcontinent and surrounding seas using a 19- and 22-GHz microwave radiometric system.

*************************** BHASKARA 2 ***********************

SPACECRAFT COMMON NAME- BHASKARA 2
ALTERNATE NAMES- 12968, SAT. FOR EARTH OBS.-2
SEO-2

NSSDC ID- 81-115A

LAUNCH DATE- 11/20/81 — WEIGHT- 444. KG
LAUNCH SITE- KAPUSTIN YAR, U.S.S.R.
LAUNCH VEHICLE- C-1

SPONSORING COUNTRY/AGENCY
INDIA — ISRO

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 11/20/81
ORBIT PERIOD- 95.2 MIN	INCLINATION- 50.6 DEG
PERIAPSIS- 520. KM ALT	APOAPSIS- 542. KM ALT

PERSONNEL
MG - U.R. RAO — ISRO SATELLITE CENTER
PD - K. KASTURIRANGAN — ISRO SATELLITE CENTER
PS - O.P.N.CALLA — SPACE APPLICATIONS CTR
PS - G. JOSEPH — SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
Bhaskara 2, the Indian satellite, was launched as part of the satellite-for-earth-observations (SEO) program. It was placed in orbit by a Soviet vehicle launched from a cosmodrome in the U.S.S.R. The main objectives were to conduct earth observation experiments for applications related to hydrology, forestry, and geology using a two-TV-camera system, and to conduct ocean-surface studies using a three-frequency satellite microwave radiometer (SAMIR) system. Secondary objectives were to test engineering and data processing systems, and to collect limited meteorological data from remote platforms. Bhaskara 2 was a 26-faced quasi-spherical polyhedron. It had a height of 1.66 m, and a diameter of 1.55 m. The satellite was named after the two "Bhaskaracharyas", astronomer-mathematicians of ancient India.

------- BHASKARA 2, BHANDARI ----------------------------------

INVESTIGATION NAME- THERMAL CONTROL COATING

NSSDC ID- 81-115A-04 — INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S): TECHNOLOGY

PERSONNEL
PI - D.R. BHANDARI — ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation studied an indigenously developed thermal control coating for use in space.

------- BHASKARA 2, CALLA --

INVESTIGATION NAME- SATELLITE MICROWAVE RADIOMETER (SAMIR)

NSSDC ID- 81-115A-02 — INVESTIGATIVE PROGRAM: APPLICATIONS

INVESTIGATION DISCIPLINE(S): METEOROLOGY, OCEANOGRAPHY

PERSONNEL
PI - O.P.N.CALLA — SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct studies over the Indian subcontinent and surrounding seas using a 19.35-, 22.235- and 31.0-GHz microwave radiometric system. The system monitored the changes in microwave radiation from the sea surface, yielding information on the sea state and the sea surface temperature.

------- BHASKARA 2, JOSEPH ---------------------------------------

INVESTIGATION NAME- DUAL TV CAMERA

NSSDC ID- 81-115A-01 — INVESTIGATIVE PROGRAM: APPLICATIONS

INVESTIGATION DISCIPLINE(S): EARTH RESOURCES SURVEY

PERSONNEL
PI - G. JOSEPH — SPACE APPLICATIONS CTR

BRIEF DESCRIPTION
The objectives of this investigation were to conduct earth observation studies for applications related to hydrology, forestry, and geology using two television cameras operating in visible (0.54-0.66 micrometer) and near-infrared (0.75-0.85 micrometer) wavelengths. Each picture frame had an area of 325 x 325 km, with a resolution of 1 km.

------- BHASKARA 2, KAMAT --

INVESTIGATION NAME- DATA COLLECTION PLATFORM

NSSDC ID- 81-115A-05 — INVESTIGATIVE PROGRAM: APPLICATIONS

INVESTIGATION DISCIPLINE(S): METEOROLOGY, COMMUNICATIONS

PERSONNEL
PI - D.S. KAMAT — SPACE APPLICATIONS CTR
OI - S. PAL — ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation was designed to collect meteorological data from remotely located platforms.

------- BHASKARA 2, MATHUR ---------------------------------------

INVESTIGATION NAME- SOLAR CELL

NSSDC ID- 81-115A-03 — INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S): TECHNOLOGY

PERSONNEL
PI - R.S. MATHUR — ISRO SATELLITE CENTER

BRIEF DESCRIPTION
This investigation studied indigenously developed solar cells for use in space.

*************************** COS-B ****************************

SPACECRAFT COMMON NAME- COS-B
ALTERNATE NAMES- COSMIC RAY SATELLITE-B, PL-741B

NSSDC ID- 75-072A

LAUNCH DATE- 08/09/75 — WEIGHT- 277.5 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL — ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 08/12/75
ORBIT PERIOD- 2227.0 MIN	INCLINATION- 90.13 DEG
PERIAPSIS- 339.6 KM ALT	APOAPSIS- 99876. KM ALT

PERSONNEL

PM - G.	ALTMANN	ESA-ESTEC
PS - K.	BENNETT	ESA-ESTEC

BRIEF DESCRIPTION

The COS-B scientific satellite was developed by the European Space Agency (ESA) to study extraterrestrial gamma radiation in the 25-MeV to 1-GeV energy range from a highly elliptical orbit of roughly 100,000-km apogee, 350-km perigee, and near-polar inclination. NASA provided, on a fully reimbursable basis, the Delta launch vehicle and the associated launch services. The COS-B spacecraft was cylindrical with a diameter of 140 cm and a height of 121 cm. Four monopole antennas, protruding 51.2 cm below the bottom of the cylindrical body, gave the spacecraft a total effective height of 172.2 cm. The spacecraft obtained orientation of its angular momentum vector with respect to inertial space using data from an earth albedo sensor and a solar sensor. Spacecraft attitude was adjusted by a nitrogen cold-gas attitude control system (ACS). The ACS included two spin-rate-adjust nozzles to maintain the spin rate at 10 rpm and two precession nozzles to adjust the momentum vector. The spacecraft had a pcm/psk/pm telemetry system with 6.5-W real-time-only transmitter providing a switchable bit rate of 160 and 320 bps and a pcm/psk/pm, up-link/down-link, range-tone command system. Power was supplied by 9480 solar cells mounted on 12 subpanels on the cylindrical body of the spacecraft. Communications, command, and control of the COS-B satellite in orbit were provided by the ESA Estrack network. The spacecraft enclosed a gamma-ray astronomy experiment described under "COS-B Caravane Collaboration" below. Members of the university and research groups who implemented this satellite are listed, with their affiliations, in Appendix B.

------- COS-B, CARAVANE COLLABOR.-------------------------------

INVESTIGATION NAME- GAMMA-RAY ASTRONOMY SPARK CHAMBER EXPERIMENT (25 - 1000 MEV)

NSSDC ID- 75-072A-01 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) GAMMA-RAY ASTRONOMY

PERSONNEL

PI -	CARAVANE COLLABOR.	SEE APPENDIX B2

BRIEF DESCRIPTION

This experiment used a 16-deck spark chamber to perform gamma-ray astronomy in the 25- to 10,000-MeV energy interval. The mission goals were as follows: (1) to study the angular structure of the so-called line source of radiation in the galactic plane, (2) to examine identified point sources and to investigate other celestial objects, which might be expected to emit gamma rays (e.g., supernova remnants, quasars, novae, etc.), (3) to measure the intensity of the isotropic radiation from high galactic latitudes, (4) to ascertain the energy spectra of radiation from all observed sources, (5) to search for long-term variations in the strength of sources, and (6) to search for short-period pulsations from sources already known to be pulsars at other wavelengths and to detect gamma-ray bursts. The instrument contained the following key elements (top to bottom): (1) anticoincidence scintillation dome, (2) 16-deck spark chamber (SC), (3) triggering telescope (TT), (4) energy calorimeter (EC), and (5) cascade-particle plastic scintillator counter (CPPS). The anticoincidence counter was a dome of scintillation plastic, 10 mm thick, viewed by nine photomultiplier tubes (PMTs). It detected the entry of charged particles and inhibited the triggering of the SC. The SC had 16 decks, each composed of a pair of orthogonal grids of 192 parallel wires. The top 12 decks were interleaved with tungsten plates and the lower 4 decks with molybdenum plates. The SC was filled with neon at 12 atm, plus a small percentage of ethane. Upon conversion of a gamma ray into an electron-positron pair (e-p), an 8-kV voltage pulse was applied across the decks causing spark discharge along the ionization tracks of the pair from which the arrival direction of the gamma ray could be determined. The recharge time of the SC high voltage was 0.1 s. The TT consisted of three elements: a 4-mm-thick scintillation counter (B1) able to identify events in which an e-p pair left the SC, a Cerenkov counter (CC) of 30-mm-thick plexiglass that was sensitive to relativistic particles moving in a downward direction, and a second scintillator (B2) 10 mm thick. The primary objectives of the TT were to define the FOV, to detect the downward-moving electrons, and to provide the fast trigger to discharge the SC. It was possible to restrict the FOV of the instrument by the division of the CC and B2 counters into quadrants, which were viewed by PMTs outside the FOV. The PMT outputs were pulse-height analyzed to provide information on the numbers of particles leaving the SC and entering the EC. The EC unit was a single crystal of cesium iodide, 4.5 radiation lengths thick, in which the e-p pair initiated an electron-photon cascade that was completely absorbed at low energies. At higher energies, the cascade penetrated to the final plastic scintillator counter, CPPS. The output of the CPPS was analyzed to measure the number of particles escaping. Information from the TT counters and from the SC provided a measure of the energy lost by scattering or absorption. This quantity was added to the calorimeter signal to derive the energy of the incident gamma ray. The anticoincidence dome was instrumented to detect gamma-ray bursts, and a small 80-sq cm argon-filled proportional counter sensitive to X-rays between 2 and 12 keV viewed parallel to the axis of the main gamma-ray instrument to provide contemporary X-ray data on axially located sources.

*************************** DMSP 5D-1/F3*********************

SPACECRAFT COMMON NAME- DMSP 5D-1/F3
ALTERNATE NAMES- DMSP 14537, DMSP BLOCK 5D-1
DMSP5D1, DMSP-F3

NSSDC ID- 78-042A

LAUNCH DATE- 05/01/78	WEIGHT- 450. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES	
LAUNCH VEHICLE- THOR	

SPONSORING COUNTRY/AGENCY

UNITED STATES	DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 05/02/78
ORBIT PERIOD- 96.89 MIN	INCLINATION- 97.6 DEG
PERIAPSIS- 564. KM ALT	APOAPSIS- 653. KM ALT

PERSONNEL

MG - J.	RIVERS	USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSD 5D-1/F3 was one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objectives of this program were to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consisted of two satellites in sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 5.4-m-long spacecraft was separated into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure (including the third-stage motor and hydrazine reaction control system); and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization was controlled by a combination flywheel and magnetic control coil system so sensors could be maintained in the desired "earth-looking" mode. One feature was the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allowed automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, was the primary data acquisition system that provided real-time or stored, multi-orbit, day-and-night visual and infrared imagery of clouds, and provided with the data calibration, timing, and other auxiliary signals to the spacecraft for digital transmission to the ground. A supplementary meterological sensor, the special sensor H (SSH), a step-scanning radiometer, was the infrared temperature-humidity-ozone sounder. Either recorded or real-time data were transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data were read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data were read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-1/F3, AFGWC STAFF-------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 78-042A-01 INVESTIGATIVE PROGRAM OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S) METEOROLOGY

PERSONNEL

PI -	AFGWC STAFF	GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The Operational Linescan System (OLS) was the primary experiment on the DMSP 5D-1/F3 spacecraft. The purpose of this experiment was to provide global, day/night observations of cloudcover and measurements of cloud temperature to support Department of Defense requirements for operational weather analysis and forecasting. The OLS employed a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which resulted in near-constant resolution throughout the sensor field of view. The radiometer operated in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (8 to 13 micrometers). The radiometer produced, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data with a resolution of 2.8 km. Each of three onboard recorders had a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment was programmed so that LF and TS data were obtained at night. The infrared data (TF and TS) covered a temperature range of 210 to 310 deg K with an accuracy of 1 deg K. The LS data mode provided visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusted the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D. A. Nichols, "Primary optical subsystems for DMSP," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-1/F3, SHRUM------------------------------------

INVESTIGATION NAME- GAMMA-RAY DETECTOR (SSB)

NSSDC ID- 78-042A-04　　INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY

PERSONNEL
PI - J. SHRUM　　USAF TECH APPL CTR

BRIEF DESCRIPTION

The instrument consisted of a four-detector array of cesium iodide scintillators and photomultiplier tubes, each surrounded by a tantalum ring shield to provide a directional system. Each detector was positioned so that its most sensitive direction faced 30 deg from the vertical. Pulse-height discriminators were used to provide gamma-ray energy loss thresholds of 0.06, 0.15, and 0.375 MeV. Gamma rays produced in the atmosphere by cosmic rays, precipitating electrons, and other means could be monitored with this instrument.

**************************** DMSP 5D-2/F6 *********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F6
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F6
DMSP 5D-2/S6, 13736

NSSDC ID- 82-118A

LAUNCH DATE- 12/21/82　　WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES　　DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC　　EPOCH DATE- 12/22/82
ORBIT PERIOD- 101.4 MIN　　INCLINATION- 98.7 DEG
PERIAPSIS- 817. KM ALT　　APOAPSIS- 839. KM ALT

PERSONNEL
MG - J. RIVERS　　USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSP 5D-2/F6 was one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program was to provide global visual and infrared cloud cover data and specialized environmental data to support Department of Defense requirements for operational weather analysis and forecasting. Operationally, the program consisted of two satellites in planned 830-km sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 6.4-m-long spacecraft was divided into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure (RSS) containing the spent third-stage rocket motor, and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization was controlled by a combination flywheel and magnetic control coil system so sensors were maintained in the desired "earth-looking" mode. One feature was the precision-pointing accuracy of the primary imager to 0.01 deg, provided by a star sensor and an updated ephemeris navigation system. This allowed automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, was the primary data acquisition system that provided real-time or stored multi-orbit day-and-night visual and infrared imagery. A supplementary sensor package contained four special sensors: (1) special sensor H-2 (SSH-2), an infrared temperature/humidity sounder, (2) special sensor B/A (SSB/A), a scanning X-ray spectrometer, (3) special sensor I/E (SSI/E), an ionospheric plasma monitor, and (4) special sensor J/4 (SSJ/4), a precipitating electron/ion spectrometer. Either recorded or real-time data were transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data were read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data were read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F6, AFGWC STAFF------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- 82-118A-01　　INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF　　GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The Operational Linescan System (OLS) was the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment was to provide global, day/night cloudcover observations and cloud temperature measurements. The OLS employed a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which resulted in near-constant resolution throughout the sensor field of view. The radiometer operated in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produced, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data with a resolution of 2.8 km. There were four onboard recorders, each had a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment was programmed so that LF and TS data were obtained at night. The infrared data (TF and TS) covered a temperature range of 190 to 310 deg K with an accuracy of 1 deg K. The LS data mode provided visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusted the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F6, AFGWC STAFF------------------------------

INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER
(SSH-2)

NSSDC ID- 82-118A-02　　INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF　　GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The objective of this experiment was to obtain vertical temperature and water vapor profiles of the atmosphere to support Department of Defense requirements in operational weather analysis and forecasting. The SSH-2 was a 16-channel sensor with one channel (800 cm-1) in the atmospheric window, one channel (835 cm-1) in the 12-micrometer atmospheric window, six channels (747, 725, 708, 695, 676, 668.5 cm-1) in the 15-micrometer CO2 absorption band, and eight channels (535, 408.5, 441.5, 420, 374, 397.5, 355, 353.5 cm-1) in the 22- to 30-micrometer rotational water vapor absorption band. The experiment consisted of an optical system, detector and associated electronics, and a scanning mirror. The scanning mirror was stepped across the satellite subtrack, allowing the SSH-2 to view 25 separate columns of the atmosphere every 32 s over a cross track ground swath of 2000 km. While the scanning mirror was stopped at a scene station, the channel filters were sequenced through the field of view. The surface resolution was approximately 39 km at nadir. The radiance data were transformed into temperature and water vapor profiles by a mathematical inversion technique.

------- DMSP 5D-2/F6, KOLASINSKY--------------------------------

INVESTIGATION NAME- SCANNING X-RAY SPECTROMETER (SSB/A)

NSSDC ID- 82-118A-03　　INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY

PERSONNEL
PI - A. KOLASINSKY AEROSPACE CORP

BRIEF DESCRIPTION
The primary objective of the scanning X-ray spectrometer was to carry out studies in X rays, Lyman-alpha, and locally mirroring electrons. The instrument had three parts: (1) proportional counters to measure X rays between 2 and 30 keV, (2) CdTe crystals to measure X rays between 15 and 100 keV, and (3) two Geiger counters to measure electron fluxes above 40 keV and 100 keV.

------- DMSP 5D-2/F6, ROTHWELL-------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- 82-118A-05

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the precipitating electron/ion spectrometer was to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles were separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 3.00, 4.40, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons were used to count the impinging electrons and ions in each energy band.

------- DMSP 5D-2/F6, SAGALYN-------------------------------

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR (SSI/E)

NSSDC ID- 82-118A-04

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The instrument consisted of one spherical (SEA) and one planar (PEA) electrostatic analyzer. The SEA provided measurements of electron densities from 10 to 1.E6/cc in the temperature range from 200 to 15,000 deg K. The PEA measured ion temperatures in the same range as well as the average ion mass over the range 1 to 35 u. The PEA was oriented in the direction of the positive spacecraft velocity.

*************************** DYNAMICS EXPLORER 1**************

SPACECRAFT COMMON NAME- DYNAMICS EXPLORER 1
ALTERNATE NAMES- DE-A, DE 1
DYNAMICS EXPLORER-A

NSSDC ID- 81-070A

LAUNCH DATE- 08/03/81 WEIGHT- 409. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/03/81
ORBIT PERIOD- 410.8 MIN INCLINATION- 89.9 DEG
PERIAPSIS- 567.6 KM ALT APOAPSIS- 23289. KM ALT

PERSONNEL
MG - M.A. CALABRESE NASA HEADQUARTERS
SC - J.T. LYNCH NASA HEADQUARTERS
PM - J.P. CORRIGAN NASA-GSFC
PS - R.A. HOFFMAN NASA-GSFC

BRIEF DESCRIPTION
The general objective of the Dynamics Explorer (DE) mission was to investigate the strong interactive processes coupling the hot, tenuous, convecting plasmas of the magnetosphere and the cooler, denser plasmas and gases corotating in the earth's ionosphere, upper atmosphere, and plasmasphere. Two satellites, DE 1 and DE 2, were launched together and were placed in polar coplanar orbits, permitting simultaneous measurements at high and low altitudes in the same field-line region. The DE 1 spacecraft (high-altitude mission) used an elliptical orbit selected to allow (1) measurements extending from the hot magnetospheric plasma through the plasmasphere to the cool ionosphere; (2) global auroral imaging, wave measurements in the heart of the magnetosphere, and crossing of auroral field lines at several earth radii; and (3) measurements for significant periods along a magnetic field flux tube. The spacecraft approximated a short polygon 137 cm in diameter and 115 cm high. The antennas in the X-Y plane were 200-m tip-to-tip, and on the Z-axis were 9-m tip-to-tip. Two 6-m booms were provided for remote measurements. The weight of the spacecraft was 409 kg. Power was supplied by a solar cell array, mounted on the side and end panels. The spacecraft was spin stabilized. The spin axis was 90 deg from the orbit normal and the spin rate was 10 plus or minus 0.1 rpm. A pulse code modulation (PCM) telemetry data system was used that operated in real time or a tape recorder mode. Data were acquired on a science-problem-oriented basis, with closely coordinated operations of the various instruments, both satellites, and supportive experiments. Data acquired from the instruments were temporarily stored on tape recorders before transmission at an 8:1 playback-to-record ratio. Additional operational flexibility allowed a playback-to-record ratio of 4:1. The primary data rate was 16,384 bits per second. Since commands were stored in a command memory unit, spacecraft operations were not real time, except for the transmission of the wideband analog data from the Plasma Wave Instrument (81-070A-02). Additional details are found in R. A. Hoffman et al., Space Sci. Instrum., v. 5, n. 4, p. 349, 1981.

------- DYNAMICS EXPLORER 1, BURCH-----------------------------

INVESTIGATION NAME- HIGH ALTITUDE PLASMA INSTRUMENT

NSSDC ID- 81-070A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - J.L. BURCH SOUTHWEST RES INST
OI - R.A. HOFFMAN NASA-GSFC
OI - J.D. WINNINGHAM SOUTHWEST RES INST
OI - D.M. KLUMPAR U OF TEXAS, DALLAS
OI - P.H. REIFF RICE U

BRIEF DESCRIPTION
The High-Altitude Plasma Instrument (HAPI) consisted of an array of five electrostatic analyzers capable of making measurements of the phase-space distributions of electrons and positive ions in the energy/charge range from 5 eV to 32 keV as a function of pitch angle. This investigation provided data contributing to the studies of (1) the composition and energy of Birkeland current charge carriers, (2) the dynamic configuration of high-latitude magnetic flux tubes, (3) auroral particle source regions and acceleration mechanisms, (4) the role of E parallel to B and E perpendicular to B in the magnetosphere-ionosphere system, (5) the sources and the effects of polar cap particle fluxes, (6) the transport of plasma within and through the magnetospheric clefts, (7) wave-particle interactions, and (8) hot-cold plasma interactions. This instrument consisted of five identical detector heads, each having an electrostatic analyzer (of the ISIS 2 type) and two sensors (one electron channel and one ion channel). The detector heads were mounted on the main body. One of the detector heads was mounted in the spin plane, two were offset by plus and minus 12 deg, and two were offset by plus and minus 45 deg. One detector swept within a few deg of the field line during each rotation of the spacecraft, except when the magnetic field was greatly deformed from its meridian plane. The basic mode of operation provided a 32-point energy spectrum from each sensor, but the voltages on the electrostatic analyzers were programmable to allow for operation over limited portions of the energy spectrum, or at higher time resolution with reduced energy resolution. The energy resolution was 32%. The angular resolution was 2.5 deg FWHM (in the plane of detection) by 10 deg (polar angle). The sampling rate was 64 per second, and the total acceptance angle was 5 by 20 deg. More details can be found in J. L. Burch et al., Space Sci. Instrum., v. 5, n. 4, p. 455, 1981.

------- DYNAMICS EXPLORER 1, CHAPPELL-------------------------

INVESTIGATION NAME- RETARDING ION MASS SPECTROMETER

NSSDC ID- 81-070A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - C.R. CHAPPELL NASA-MSFC
OI - P.M. BANKS STANFORD U
OI - W.B. HANSON U OF TEXAS, DALLAS
OI - J.H. HOFFMAN U OF TEXAS, DALLAS
OI - A.F. NAGY U OF MICHIGAN
OI - G.R. CARIGNAN U OF MICHIGAN

BRIEF DESCRIPTION
The Retarding Ion Mass Spectrometer (RIMS) consisted of a retarding potential analyzer for energy analysis in series with a magnetic ion-mass spectrometer for mass analysis. Multiple sensor heads permitted the determination of the thermal plasma flow characteristics. This instrument was designed to operate in two basic commandable modes: a high-altitude mode in which the density, temperature, and bulk-flow characteristics of

principally H+, He+, and O+ ions were measured, and a low-altitude mode that concentrated on the composition in the 1- to 32-u (atomic mass units) range. This investigation provided information on (1) the densities of H+, He+, and O+ ions in the ionosphere, plasmasphere, plasma trough, and polar cap (including the density distribution along the magnetic vector in the vicinity of the satellite apogee); (2) the temperature of H+, He+, and O+ ions in the ionosphere, plasmasphere, plasma trough, and polar cap (energy range 0-45 eV); (3) the bulk flow velocities of H+, He+, and O+ in the plasmapause, plasma trough and polar cap; (4) the changing character of the cold plasma density, temperature, and bulk flow in regions of interaction with hot plasma such as at the boundary between the plasmasphere and the ring current; and (5) the detailed composition of ionospheric plasma in the 1- to 32-u range. He++ and O++ were also measured. The instrument consisted of three detector heads. One looked out in the radial direction, and the other two were along the plus and minus spin axis direction. Each detector had a 55-deg half-cone acceptance angle. The detector heads had a gridded, weakly collimating aperture where the retarding analysis was performed, followed by a parallel plate ceramic magnetic mass analyzer with two separate exit slits corresponding to ion masses in the ratio 1:4. Ions exiting from these slits were detected with electron multipliers. In the apogee mode, the thermal particle fluxes were measured while the potential on a set of retarding grids was stepped through a sequence of settings. In the perigee mode, the retarding grids were grounded and the detector utilized a continuous acceleration potential sweep that focused the mass ranges from 1 to 8, and 4 to 32 u. Additional details can be found in C. R. Chappell et al., Space Sci. Instrum., v. 5, n. 4, p. 477, 1981.

------- DYNAMICS EXPLORER 1, FRANK-----------------------------

INVESTIGATION NAME- GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS

NSSDC ID- 81-070A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - K.L.	ACKERSON	U OF IOWA
OI - R.L.	CAROVILLANO	BOSTON COLLEGE
OI - R.H.	EATHER	BOSTON COLLEGE

BRIEF DESCRIPTION

The Spin-Scan Auroral Imager (SAI) provided global auroral imaging at visible and ultraviolet wavelengths. It acquired (1) images at several visible wavelengths; (2) images within a vacuum ultraviolet "window", which allowed usable imaging of the aurora in the sunlit ionosphere; and (3) photometric measurements of the hydrogen corona. This investigation provided data that advanced the knowledge of (1) the spatial and temporal character of the entire auroral oval at both visible and vacuum ultraviolet wavelengths (with good time resolution); (2) the association of auroral and magnetospheric plasmas with the diverse auroral emission features; (3) the relationship of the auroral emissions with field-aligned currents; (4) the energy deposited in the auroral ionosphere by charged particles; (5) the acceleration mechanism responsible for "inverted-V" precipitation events; (6) the role of the polar cap and magnetotail in auroral and magnetospheric dynamics; and (7) the time-dependent distribution of neutral hydrogen in the ring current and polar regions. Of the three photometers, two measured radiation in the visible wavelength range and one measured it in the UV. A full image was 36 deg by 120 deg. In Angstroms (A) some of the wavelengths were 3914, 5577, 6300, 3175, 1304, 1216, 1400-1600, and 1400-1700. The spatial resolution of a pixel (picture element) at auroral altitudes in the nadir direction was 28 km at a spacecraft altitude of 1 earth radius (Re). At 3.9 Re altitude this resolution was 109 km. For each photometer, the time resolution was minutes per image. For visible wavelengths, the photometers had a wide-angle collimator; a super-reflecting scanning mirror; a mirror-drive motor; a quartz field lens; an image-viewing assembly of field-stop, pinhole and collimating lens; a filter wheel with narrow-band interference filters; and a small photomultiplier tube with an extended red photocathode. The vacuum ultraviolet imaging photometer was a spin-scan Newtonian telescope. The first optical element was an aluminum scanning mirror with a MgF2 overcoat. The collimation and mirror drive were similar to that used for the visible imaging photometer. A filter wheel with MgF2, CaF2, and BaF2 filters allowed global imaging from 1370 to 1700, at 1304, 1356, and 1216 A. The detector was a photomultiplier tube with a CsI photocathode and a MgF2 window. Additional details are found in L. A. Frank et al., Space Sci. Instrum., v. 5, n. 4, p. 369, 1981.

------- DYNAMICS EXPLORER 1, HELLIWELL------------------------

INVESTIGATION NAME- CONTROLLED AND NATURALLY OCCURING WAVE PARTICLE INTERACTIONS

NSSDC ID- 81-070A-08

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.A.	HELLIWELL	STANFORD U
OI - T.F.	BELL	STANFORD U
OI - D.L.	CARPENTER	STANFORD U
OI - C.G.	PARK	CORNELL U
OI - J.B.	REAGAN	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

This investigation used a ground-based very-low-frequency/low-frequency (VLF/LF) (0.5-200 kHz) transmitter located at Siple, Antarctica, at an L value of about 4, and the broad-band magnetic field detector from experiment 81-070A-02. The primary objective of the investigation was to determine the relationship between VLF/LF waves and energetic electrons in the magnetosphere, with emphasis on wave growth, stimulated emissions, and wave-induced perturbations of the energetic electrons. Other objectives were (1) to determine how wave propagation from both ground and magnetospheric sources was affected by field-aligned plasma structures such as the plasmapause and ducts of enhanced ionization, (2) to use the wave data to describe the structure of the plasmapause and the distribution of ionization along field-aligned ducts, and (3) to study the effects of earth power-line radiation and other VLF wave activity. The spacecraft instrumentation for this experiment consisted of the Linear Wave Receiver (LWR) provided by the Plasma Wave Instrument (81-070A-02). The LWR provided a waveform output with a 30 dB linear amplitude response for bands of 1.5-3.0, 3.11 plus or minus 7 1/2%, 3-6, or 10-16 kHz for a selected magnetic or electric sensor. This receiver was used to measure growth rates for waves stimulated by the Siple VLF transmitter or by natural wave phenomena. More details can be found in S. D. Shawhan et al., Space Sci. Instrum., v. 5, n. 4, p. 535, 1981.

------- DYNAMICS EXPLORER 1, MAGGS----------------------------

INVESTIGATION NAME- AURORAL PHYSICS

NSSDC ID- 81-070A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY
PARTICLES AND FIELDS

PERSONNEL

PI - J.E.	MAGGS	U OF CALIF, LA
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

The primary goal of this investigation was to use the results from other experiments, particularly 81-070A-03, to test theoretical models and to develop new ones, with emphasis on research areas related to auroral arcs, field-aligned currents, plasma wave turbulence associated with anomalous resistance, generation of auroral electron beams, production of kilometric and VLF hiss radiation, and spread-F. In addition, correlation studies were organized by selecting events that were interesting to the various investigators, and data reduction procedures were suggested to facilitate comparison and interpretation of the data.

------- DYNAMICS EXPLORER 1, SHAWHAN--------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 81-070A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

The Plasma Wave Instrument (PWI) measured ac electric fields over the frequency range from 1 Hz to 2 MHz, and an amplitude range of 0.03 microvolt per meter to 100 millivolts per meter. Magnetic fields were measured from 1 Hz to 400 kHz over an approximately 100 dB range. The objectives of this investigation were to measure the spatial, temporal, spectral, and wave characteristics (particularly the Poynting vector component along the magnetic field line) and the wave polarization for extremely-low-frequency (ELF), very-low-frequency (VLF), and high-frequency (HF) noise phenomena. Of special interest were the auroral kilometric radiation and VLF hiss, and a variety of electrostatic waves that may cause field-aligned acceleration of particles. The investigation made use of the long dipole antennas in the spin plane and Z axis and a magnetic loop antenna. A single-axis search coil magnetometer and a short electric antenna were included for low-frequency measurements and electrostatic noise measurements at short wavelengths. The electronics consisted of (1) a wideband/long baseline receiver with a bandwidth of 10 or 40 kHz in the range 0-2 MHz; (2) a sweep-frequency correlator, containing two sweep-frequency receivers and phase detectors, sweeping 100 Hz to 400 kHz in 32 s, and giving the phase between magnetic and electric components of the field; (3) a low-frequency correlator containing two filter receivers and phase detectors, (eight filters in the range 1.78-100 Hz were swept in 8 s); (4) dc monitors that measured the voltage difference between the two sets of long dipole antennas; and (5) a linear wideband receiver, selectable from 1.5 to 3.0, 3 to 6, or 10 to 16 kHz bands. The wideband receiver was flown to transmit wideband waveform signals to the ground via an analog transmitter, so that detailed high-resolution frequency-time analysis could be performed. More details are found in S. D. Shawhan et al., Space Sci. Instrum., v. 5, n. 4, p. 535, 1981.

------- DYNAMICS EXPLORER 1, SHELLEY---------------------------

INVESTIGATION NAME- HOT PLASMA COMPOSITION

NSSDC ID- 81-070A-06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.G.	JOHNSON	LOCKHEED PALO ALTO
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - A.	GHIELMETTI	U OF BERNE
OI - B.A.	WHALEN	NATL RES COUNC OF CAN

BRIEF DESCRIPTION

The Energetic Ion Composition Spectrometer (EICS) had high sensitivity and high resolution, and covered the energy range from 0 to 17 keV per unit charge and the mass range from less than 1 to greater than 150 atomic mass units/charge. This investigation provided data used in investigating the strong coupling mechanism between the magnetosphere and the ionosphere that results in large fluxes of energetic O+ ions being accelerated from the ionosphere and injected into the magnetosphere during magnetic storms. The properties of the minor ionic species such as He+ and He++ relative to the major constituents of the energetic magnetosphere plasma were also studied in order to evaluate the relative importance of the different sources of the plasma and of various energization, transport, and loss processes that may be mass- or charge-dependent. One of the primary objectives was to measure the energy and pitch angle distributions of the principal mass constituents (O+ and H+) of the upward flowing ions from the auroral acceleration region. An important area for study was the cusp region. The instrument was similar to one flown on the ISEE 1 satellite, and consisted of a curved-plate electrostatic energy analyzer, followed by a combined cylindrical electrostatic-magnetic mass analyzer. Open electron multipliers were used with pulse-amplitude discrimination as the mass analyzer detectors in order to improve the mass separation characteristics of the spectrometer. The energy resolution (delta E)/E (internal) was 5%. The mass resolution M/(delta M) was less than or equal to 10 on the focus line. Additional details can be found in E. G. Shelly et al., Space Sci. Instrum., v. 5, n. 4, p. 443, 1981.

------- DYNAMICS EXPLORER 1, SUGIURA---------------------------

INVESTIGATION NAME- MAGNETIC FIELD OBSERVATIONS

NSSDC ID- 81-070A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M.	SUGIURA	NASA-GSFC
OI - B.G.	LEDLEY	NASA-GSFC
OI - W.H.	FARTHING	NASA-GSFC
OI - L.J.	CAHILL, JR.	U OF MINNESOTA

BRIEF DESCRIPTION

This investigation used a triaxial fluxgate magnetometer (MAG-A), similar to one on board DE 2, to obtain vector magnetic field data needed to study the magnetosphere-ionosphere-atmosphere coupling. The primary objective of this investigation was to obtain measurements of field-aligned currents in the auroral oval and over the polar cap at two different altitudes. This was accomplished using the two spacecraft and correlations of these measurements with observations of electric fields, plasma waves, suprathermal particles, thermal particles, and auroral images obtained from investigation 81-070A-03. Ultra low frequency (ULF) waves were also studied. The magnetometer incorporated its own 12-bit analog-to-digital converter, a 4-bit digital compensation register for each axis, and a system control to generate a 48-bit data word consisting of a 16-bit representation of the field measured along each of the three magnetometer axes. Track and hold modules were used to obtain simultaneous samples on all three axes. Instrument bandwidth was 25 Hz. The instrument dynamic range was plus or minus 6.2E4 nT (gammas), and the resolution was plus or minus 1.5 nT in the 6.2E4 nT range, plus or minus 0.25 nT in the 1.E3 nT range, and plus or minus 0.02 nT in the 80 nT range. The magnetometer's digital compensation of the ambient field was nominally in 8.E3 nT increments. Further details are in W. H. Farthing et al., Space Sci. Instrum., v. 5, n. 4, p. 551, 1981.

**************************** DYNAMICS EXPLORER 2***************

SPACECRAFT COMMON NAME- DYNAMICS EXPLORER 2
ALTERNATE NAMES- DE-B, DE 2
DYNAMICS EXPLORER-B

NSSDC ID- 81-070B

LAUNCH DATE- 08/03/81 WEIGHT- 403. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 08/03/81
ORBIT PERIOD- 98. MIN	INCLINATION- 89.9 DEG
PERIAPSIS- 309. KM ALT	APOAPSIS- 1012.5 KM ALT

PERSONNEL

MG - M.A	CALABRESE	NASA HEADQUARTERS
SC - J.T.	LYNCH	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - R.A.	HOFFMAN	NASA-GSFC

BRIEF DESCRIPTION

The DE 2 spacecraft (low-altitude mission) complemented the high-altitude mission DE 1 and was placed into an orbit with a perigee sufficiently low to permit measurements of neutral composition, temperature, and wind. The apogee was high enough to permit measurements above the interaction regions of suprathermal ions, and also plasma flow measurements at the feet of the magnetospheric field lines. The general form of the spacecraft was a short polygon 137 cm in diameter and 115 cm high. The triaxial antennas were 23 m tip-to-tip. One 6-m boom was provided for remote measurements. The spacecraft weight was 403 kg. Power was supplied by a solar cell array, which charged two 6-ampere-hour nickel-cadmium batteries. The spacecraft was three-axis stabilized with the yaw axis aligned toward the center of the earth to within 1 deg. The spin axis was normal to the orbit plane within 1 deg with a spin rate of one revolution per orbit. A single-axis scan platform was included in order to mount the low-altitude plasma instrument (81-070B-08). The platform rotated about the spin axis. A pulse code modulation telemetry data system was used that operated in real time or in a tape-recorder mode. Data were acquired on a science-problem-oriented basis, with closely coordinated operations of the various instruments, both satellites, and supportive experiments. Measurements were temporarily stored on tape recorders before transmission at an 8:1 playback-to-record ratio. Since commands were also stored in a command memory unit, spacecraft operations were not real time. Additional details can be found in R. A. Hoffman et al., Space Sci. Instrum., v. 5, n. 4, p. 349, 1981. DE-2 reentered the atmosphere on February 19, 1983.

------- DYNAMICS EXPLORER 2, BRACE----------------------------

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- 81-070B-09

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES

PERSONNEL

PI - L.H.	BRACE	NASA-GSFC
OI - W.R.	HOEGY	NASA-GSFC
OI - R.F.	THEIS	NASA-GSFC
OI - K.D.	COLE	LA TROBE U
OI - G.R.	CARIGNAN	U OF MICHIGAN

BRIEF DESCRIPTION

The Langmuir Probe Instrument (LANG) was a cylindrical electrostatic probe that obtained measurements of electron temperature, Te, and electron or ion concentration, Ne or Ni, respectively, and spacecraft potential. Data from this investigation were used to provide temperature and density measurements along magnetic field lines related to thermal energy and particle flows within the magnetosphere-ionosphere system, to provide thermal plasma conditions for wave-particle interactions, and to measure large-scale and fine-structure ionospheric effects of energy deposition in the ionosphere. The Langmuir Probe instrument was identical to that used on the AE satellites and the Pioneer Venus Orbiter. Two independent sensors were connected to individual adaptive sweep voltage circuits which continuously tracked the changing electron temperature and spacecraft potential, while autoranging electrometers adjusted their gain in response to the changing plasma density. The control signals used to achieve this automatic tracking provided a continuous monitor of the ionospheric parameters without telemetering each volt-ampere (V-I) curve. Furthermore, internal data storage circuits permitted high resolution, high data rate sampling of selected V-I curves for transmission to ground to verify or correct the inflight processed data. More details are in J. P. Krehbiel et al., Space Sci. Instrum., v. 5, n. 4, p. 493, 1981.

------- DYNAMICS EXPLORER 2, CARIGNAN--------------------------

INVESTIGATION NAME- NEUTRAL ATMOSPHERE COMPOSITION SPECTROMETER

NSSDC ID- 81-070B-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL

PI -	G.R.	CARIGNAN	U OF MICHIGAN
OI -	N.W.	SPENCER	NASA-GSFC
OI -	C.A.	REBER	NASA-GSFC
OI -	A.E.	HEDIN	NASA-GSFC
OI -	B.P.	BLOCK	U OF MICHIGAN
OI -	J.C.	MAURER	U OF MICHIGAN

BRIEF DESCRIPTION

The Neutral Atmosphere Composition Spectrometer (NACS) was designed to obtain in situ measurements of the neutral atmospheric composition and to study the variations of the neutral atmosphere in response to energy coupled into it from the magnetosphere. Because temperature enhancements, large-scale circulation cells, and wave propagation are produced by energy input (each of which posseses a specific signature in composition variation), the measurements permitted the study of the partition, flow, and deposition of energy from the magnetosphere. Specifically, the investigation objective was to characterize the composition of the neutral atmosphere with particular emphasis on variability in constituent densities driven by interactions in the atmosphere, ionosphere, and magnetosphere system. The quadrupole mass spectrometer used was nearly identical to those flown on the AE-C, -D, and -E missions. The electron-impact ion source was used in a closed mode. Atmospheric particles entered an antechamber through a knife-edged orifice, where they were thermalized to the instrument temperature. The ions with the selected charge-to-mass ratios had stable trajectories through the hyperbolic electric field, exited the analyzer, and entered the detection system. An off-axis beryllium-copper dynode multiplier operating at a gain of 2.E6 provided an output pulse of electrons for each ion arrival. The detector output had a pulse rate proportional to the neutral density in the ion source of the selected mass. The instrument also included two baffles that scanned across the input orifice for optional measurement of the zonal and vertical components of the neutral wind. The mass select system provided for 256 mass values between 0 and 51 atomic mass units (u) or each 0.2 u. It was possible to call any one of these mass numbers into each of eight 0.016-s intervals. This sequence was repeated each 0.128 s. More details are found in G. R. Carignan et al., Space Sci. Instrum., v. 5, n. 4, p. 429, 1981.

------- DYNAMICS EXPLORER 2, HANSON----------------------------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 81-070B-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES

PERSONNEL

PI -	W.B.	HANSON	U OF TEXAS, DALLAS
OI -	R.A.	HEELIS	U OF TEXAS, DALLAS
OI -	D.R.	ZUCCARO	U OF TEXAS, DALLAS
OI -	C.R.	LIPPENCOTT	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

The Retarding Potential Analyzer (RPA) measured the bulk ion velocity in the direction of the spacecraft motion, the constituent ion concentrations, and the ion temperature along the satellite path. These parameters were derived from a least squares fit to the ion number flux vs energy curve obtained by sweeping or stepping the voltage applied to the internal retarding grids of the RPA. In addition, a separate wide aperture sensor, a duct sensor, was flown to measure the spectral characteristics of irregularities in the total ion concentration. The measured parameters obtained from this investigation were important to the understanding of mechanisms that influence the plasma; i.e., to understand the coupling between the solar wind and the earth's atmosphere. The measurements were made with a multigridded planar retarding potential analyzer very similar in concept and geometry to the instruments carried on the AE satellites. The retarding potential was variable in the range from approximately +32 to 0 volts. The details of this voltage trace, and whether it was continuous or stepped, depended on the operating mode of the instrument. Specific parameters deduced from these measurements were ion temperature; vehicle potential; ram component of the ion drift velocity; the ion and electron concentration irregularity spectrum; and the concentration of H+, He+, O+, and Fe+, and of molecular ions near perigee. Additional details are in W. B. Hanson et al., Space Sci. Instrum., v. 5, n. 4, p. 503, 1981.

------- DYNAMICS EXPLORER 2, HAYS------------------------------

INVESTIGATION NAME- FABRY-PEROT INTERFEROMETER

NSSDC ID- 81-070B-05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL

PI -	P.B.	HAYS	U OF MICHIGAN
OI -	R.G.	ROBLE	NATL CTR FOR ATMOS RES
OI -	G.R.	CARIGNAN	U OF MICHIGAN
OI -	A.F.	NAGY	U OF MICHIGAN
OI -	D.	REES	U COLLEGE LONDON
OI -	T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

The Fabry-Perot Interferometer (FPI) was a high-resolution remote sensing instrument designed to measure the thermospheric temperature, meridional wind, and density of the following metastable atoms: atomic oxygen (singlet S and D) and the 2P state of ionic atomic oxygen. The FPI performed a wavelength analysis on the light detected from the thermospheric emission features by spatially scanning the interference fringe plane with a multichannel array detector. The wavelength analysis characterized the Doppler line profile of the emitting species. A sequential altitude scan performed by a commandable horizon scan mirror provided a cross-sectional view of the thermodynamic and dynamic state of the thermosphere below the DE 2 orbit. The information obtained from this investigation was used to study the dynamic response of the thermosphere to the energy sources caused by magnetospheric electric fields and the absorption of solar ultraviolet light in the thermosphere. The instrument was based on the visible airglow experiment (VAE) used in the AE program. The addition of a scanning mirror, the Fabry-Perot etalon, an image plane detector, and a calibration lamp were the principal differences. Interference filters isolated lines at (in Angstroms) 5577, 6300, 7320, 5896, and 5200. The FPI had a field of view of 0.53 deg (half-cone angle). More details are found in P. B. Hays et al., Space Sci. Instrum., v. 5, n. 4, p. 395, 1981.

------- DYNAMICS EXPLORER 2, HEELIS----------------------------

INVESTIGATION NAME- ION DRIFT METER

NSSDC ID- 81-070B-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI -	R.A.	HEELIS	U OF TEXAS, DALLAS
OI -	W.B.	HANSON	U OF TEXAS, DALLAS
OI -	D.R.	ZUCCARO	U OF TEXAS, DALLAS
OI -	C.R.	LIPPENCOTT	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

The Ion Drift Meter (IDM) measured the bulk motions of the ionospheric plasma perpendicular to the satellite velocity vector. The measured parameters, horizontal and vertical ion-drift velocities, had an expected range of plus or minus 4 km/s. The accuracy of the measurement was expected to be plus or minus 50 m/s for the anticipated 0.5 deg accuracy in vehicle attitude determination. The nominal time resolution of the measurement was 1/32 s. This investigation yielded information on (1) the ion convection (electric field) pattern in the auroral and polar ionosphere; (2) the flow of plasma along magnetic field lines within the plasmasphere, which determines whether this motion was simply a breathing of the protonosphere, a refilling of this region after a storm, or an interhemispheric transport of plasma; (3) the thermal ion contribution to field-aligned electric currents; (4) velocity fields associated with small-scale phenomena that are important at both low and high latitudes; and (5) the magnitude and variation of the total concentration along the flight path. The ion drift meter measured the plasma motion parallel to the sensor face by using a gridded collimator and multiple collectors to determine the direction of arrival of the plasma. The instrument geometry was very similar to that used on the Atmosphere Explorer satellites. Each sensor consisted of a square entrance aperture that served as collimator, some electrically isolating grids, and a segmented planar collector. The angle of arrival of the ions with respect to the sensor was determined by measuring the ratio of the currents to the different collector segments, and this was done by taking the difference in the logarithms of the current. Two techniques were used to determine this ratio. In the standard drift sensor (SDS), the collector segments were connected in pairs to two logarithmic amplifiers. The second technique, called the univeral drift sensor (UDS), allowed simultaneous measurement of both components. Here, each collector segment was permanently connected to a logarithmic amplifier and two difference amplifiers were used to determine the horizontal and vertical arrival angles simultaneously. The IDM consisted of two sensors, one providing the SDS output and the other providing the UDS output. Further details are in R. A. Heelis et al., Space Sci. Instrum., v. 5, n. 4, p. 511, 1981.

------- DYNAMICS EXPLORER 2, HOFFMAN---------------------------

INVESTIGATION NAME- LOW ALTITUDE PLASMA INVESTIGATION HIGH ANGULAR RESOLUTION

NSSDC ID- 81-070B-13

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY
IONOSPHERES

PERSONNEL

PI - R.A.	HOFFMAN	NASA-GSFC
OI - J.D.	WINNINGHAM	SOUTHWEST RES INST
OI - D.M.	KLUMPAR	U OF TEXAS, DALLAS
OI - J.L.	BURCH	SOUTHWEST RES INST

BRIEF DESCRIPTION

This investigation used the suprathermal particle distribution functions measured by both the high-(81-070A-05) and low-(81-070B-08) altitude plasma instruments. The objectives were (1) to study the properties and locations of auroral acceleration mechanisms, (2) to determine the nature and distribution of electric fields parallel to the magnetic field, (3) to identify the charge carriers of the major electric current systems coupling the magnetosphere and ionosphere, and (4) to determine relations between these quantities and the convection electric field and auroral light emission patterns.

------- DYNAMICS EXPLORER 2, MAYNARD---------------------------

INVESTIGATION NAME- ELECTRIC FIELD INVESTIGATIONS

NSSDC ID- 81-070B-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
PARTICLES AND FIELDS

PERSONNEL

PI - N.C.	MAYNARD	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

The Vector Electric Field Instrument (VEFI) used flight-proven double-probe techniques with 20-m baselines to obtain measurements of dc electric fields. This electric field investigation had the following objectives: (1) to obtain accurate and comprehensive triaxial dc electric field measurements at ionospheric altitudes in order to refine the basic spatial patterns, define the large-scale time history of these patterns, and study the small-scale temporal and spatial variations within the overall patterns; (2) to study the degree to which and in what region the electric field projects to the equatorial plane; (3) to obtain measurements of extreme low frequency (ELF) and lower frequency irregularity structures; and (4) to perform numerous correlative studies. The instrument consisted of six cylindrical elements 11 m long and 28 mm in diameter. Each antenna was insulated from the plasma except for the outer 2 m. The baseline, or distance between the midpoints of these 2-m active elements, was 20 m. The antennas were interlocked along the edges to prevent oscillation and to increase their rigidity against drag forces. The basic electronic system was very similar in concept to those used on IMP-J and ISEE 1, but modified for a three-axis measurement on a nonspinning spacecraft. At the core of the system were the high-impedance (1.E12 ohm) preamplifiers, whose outputs were accurately subtracted and digitized (14-bit A/D conversion for sensitivity to about 0.1 microvolt/m) to maintain high resolution, for subsequent removal of the cross-product of the vectors V and B in data processing. This provided the basic dc measurement. Other circuitry was used to aid in interpreting the dc data and to measure rapid variations in the signals detected by the antennas. The planned dc electric field range was plus or minus 1 V/m, the planned resolution was 0.1 mV/m, and the variational electric field was measured from 4 Hz to 1024 Hz. The dc electric field was measured at 16 samples/s. The variational electric field was measured from 1 microvolt/m to 10 mV/m rms. Additional details are found in N. C. Maynard et al., Space Sci. Instrum., v. 5, n. 4, p. 523, 1981.

------- DYNAMICS EXPLORER 2, MAYR------------------------------

INVESTIGATION NAME- ATMOSPHERIC DYNAMICS AND ENERGETICS INVESTIGATION

NSSDC ID- 81-070B-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL

PI - H.G.	MAYR	NASA-GSFC
OI - G.P.	NEWTON	NASA HEADQUARTERS

BRIEF DESCRIPTION

The purpose of this investigation was to study the dynamic responses of the thermosphere and ionosphere to energy deposition in the form of Joule heating, particle precipitation, and momentum transfer by electric field-generated drifts. The objective was to determine the relative importance of the various phenomena and the conditions under which ordering occurs. Because the relative importance of the different processes varied with geomagnetic activity, both geomagnetically quiet and disturbed conditions were examined. Using theoretical models as tools, the principal goal was to quantitatively analyze the physical processes involved in the energy coupling between the magnetosphere and the thermosphere. In addition to data obtained from various DE satellite instruments, the investigation planned to use ground-based correlative measurements.

------- DYNAMICS EXPLORER 2, NAGY------------------------------

INVESTIGATION NAME- MAGNETOSPHERIC ENERGY COUPLING TO THE ATMOSPHERE INVESTIGATION

NSSDC ID- 81-070B-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY
IONOSPHERES

PERSONNEL

PI - A.F.	NAGY	U OF MICHIGAN

BRIEF DESCRIPTION

This investigation used data from various spacecraft instruments to study the following: (1) global thermospheric dynamics (the effects of energy input to the thermosphere from the magnetosphere by convection, Joule heating, particle precipitation and tidal energy), (2) the convective coupling of the thermal plasma between the ionosphere and magnetosphere; and (3) the energy-loss mechanisms of ionospheric photoelectrons in the plasmasphere.

------- DYNAMICS EXPLORER 2, ROBLE-----------------------------

INVESTIGATION NAME- NEUTRAL-PLASMA INTERACTIONS INVESTIGATION

NSSDC ID- 81-070B-11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES

PERSONNEL

PI - R.G.	ROBLE	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

This investigation used data from several spacecraft instruments to study the large-scale neutral-plasma interactions in the thermosphere caused by magnetospheric-ionospheric and thermospheric coupling processes. Planned use of the models is to provide a theoretical framework in which certain important ionospheric and atmospheric properties needed for coupling processes (such as the Pedersen and Hall conductivities) were consistently calculated using satellite data measured at a given height. Planned examples are (1) to calculate vertical profiles of ionospheric properties that were useful for comparison with incoherent scatter radar measurements and other ground-based supporting data, (2) to identify and evaluate the neutral thermospheric heat and momentum sources, and (3) to determine the effectiveness of high-latitude dynamic processes in controlling the global thermospheric circulation and thermal structure.

------- DYNAMICS EXPLORER 2, SPENCER---------------------------

INVESTIGATION NAME- WIND AND TEMPERATURE SPECTROMETER

NSSDC ID- 81-070B-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL

PI - N.W.	SPENCER	NASA-GSFC
OI - A.E.	HEDIN	NASA-GSFC
OI - H.B.	NIEMANN	NASA-GSFC
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - L.E.	WHARTON	NASA-GSFC
OI - J.C.	MAURER	U OF MICHIGAN

BRIEF DESCRIPTION

The Wind and Temperature Spectrometer (WATS) measured the in situ neutral winds, the neutral particle temperatures, and the concentrations of selected gases. The objective of this investigation was to study the interrelationships among the winds, temperatures, plasma drift, electric fields, and other properties of the thermosphere that were measured by this and other instruments on the spacecraft. Knowledge of how these properties are interrelated contributed to an understanding of the consequences of the acceleration of neutral particles by the ions in the ionosphere, the acceleration of ions by neutrals creating electric fields, and the related energy transfer between the ionosphere and the magnetosphere. Three components of the wind, one normal to the satellite velocity vector in the horizontal plane, one vertical, and one in the satellite direction were measured. A retarding potential quadrupole mass spectrometer, coupled to the atmosphere through a precisely orificed antechamber, was used. It was operated in either of two modes: one employed the retarding capability and the other used the ion source as a conventional nonretarding source. Two scanning baffles were used in front of the mass spectrometer: one moved vertically and the other moved horizontally. The magnitudes of the horizontal and vertical components of the wind normal to the spacecraft velocity vector were computed from measurements of the angular relationship between the neutral particle stream and the sensor. The component of the total stream velocity in the satellite direction was measured directly by the spectrometer system through determination of the required retarding potential. At altitudes too high for neutral species measurements, the planned operation required the instrument to measure the thermal ion species only. A series of four sequentially occurring "slots" --each a 2-s long measurement interval-- was adapted for the basic measurement format of the instrument. Different functions were commanded into these "slots" in any combination, one per measurement interval. Further details are found in N. W. Spencer et al., Space Sci. Instrum., v. 5, n. 4, p. 417, 1981.

------- DYNAMICS EXPLORER 2, SUGIURA---------------------------

INVESTIGATION NAME- MAGNETIC FIELD OBSERVATIONS

NSSDC ID- 81-070B-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
AERONOMY
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M.	SUGIURA	NASA-GSFC
OI - B.G.	LEDLEY	NASA-GSFC
OI - W.H.	FARTHING	NASA-GSFC
OI - L.J.	CAHILL, JR.	U OF MINNESOTA

BRIEF DESCRIPTION

A triaxial fluxgate magnetometer (MAG-B), similar to one on board DE 1 (81-070A-01), was used to obtain magnetic field data needed to study the magnetosphere-ionosphere-atmosphere coupling. The primary objectives of this investigation were to measure field-aligned currents in the auroral oval and over the polar cap at two different altitudes using the two spacecraft, and to correlate these measurements with observations of electric fields, plasma waves, suprathermal particles, thermal particles, and auroral images obtained from investigation 81-070A-03. The magnetometer had digital compensation of the ambient field in 8.E3 nT (8.E3 gamma) increments. The instrument incorporated its own 12-bit analog-to-digital converter, a 4-bit digital compensation register for each axis, and a system control that generated a 48-bit data word consisting of a 16-bit representation of the field measured along each of three magnetometer axes. Track and hold modules were used to obtain simultaneous samples on all three axes. The instrument bandwidth was 25 Hz. The analog range was plus or minus 6.2E4 nT, the accuracy was plus or minus 4 nT, and the resolution was 1.5 nT. More details can be found in W. H. Farthing et al., Space Sci. Instrum., v. 5, n. 4, p. 551, 1981.

------- DYNAMICS EXPLORER 2, WINNINGHAM-----------------------

INVESTIGATION NAME- LOW ALTITUDE PLASMA INSTRUMENT

NSSDC ID- 81-070B-08 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - J.D.	WINNINGHAM	SOUTHWEST RES INST
OI - D.M.	KLUMPAR	U OF TEXAS, DALLAS
OI - R.A.	HOFFMAN	NASA-GSFC
OI - J.L.	BURCH	SOUTHWEST RES INST

BRIEF DESCRIPTION

The Low-Altitude Plasma Instrument (LAPI) provided high-resolution velocity space measurements of positive ions and electrons from 5 eV to 32 keV, and a monitor of electrons with energies above 35 keV. Pitch angle measurements covered the full 180 deg range. Data from this investigation and supporting measurements were used to study (1) the identification and intensities of Birkeland currents, (2) auroral particle source regions and acceleration mechanisms, (3) the existence and role of E parallel to B, (4) sources and effects of polar cap particle fluxes, (5) the transport of plasma within and through the magnetospheric cusp, (6) dynamic configurations of high-latitude flux tubes, (7) loss-cone effects of wave-particle interactions, (8) hot-cold plasma interactions, (9) ionospheric effects of particle precipitation, and (10) plasma convection at high altitudes. The instrument contained an array of 15 parabolic electrostatic analyzers of the ISIS 2 type, each with an electron channel and an ion channel, in order to obtain detailed pitch-angle distributions as a function of energy. Two Geiger-Mueller counters were mounted on the scan platform. The basic mode of operation provided a 32-point energy spectrum in the range 5 eV to 32 kev every second. The voltages on the electrostatic analyzers were programmable to allow for greater space/time resolution over limited portions of the energy and angular distributions. The instrument was mounted on a one-axis scan platform controlled by a magnetometer, whose purpose was to maintain the detector array, which spanned 180 deg, at a nearly constant angle to the magnetic field. Additional details are found in J. D. Winningham et al., Space Sci. Instrum., v. 5, n. 4, p. 465, 1981.

*************************** ESA-GEOS 2***********************

SPACECRAFT COMMON NAME- ESA-GEOS 2
ALTERNATE NAMES- 10981

NSSDC ID- 78-071A

LAUNCH DATE- 07/14/78 WEIGHT- 273.6 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 08/06/78
ORBIT PERIOD- 1431.2 MIN	INCLINATION- 0.772 DEG
PERIAPSIS- 35615.5 KM ALT	APOAPSIS- 35774.1 KM ALT

PERSONNEL

PM - D.E.	MULLINGER	ESA-ESTEC
PS - K.	KNOTT	ESA-ESTEC

BRIEF DESCRIPTION

ESA-GEOS 2 was the first spacecraft placed in an equatorial geostationary orbit dedicated completely to scientific measurements. The spacecraft served as a core or reference spacecraft for the International Magnetospheric Study (IMS) and carried out correlative measurements with extensive ground-based networks in Scandinavia. The payload consisted of instruments to measure (1) dc and ac electric and magnetic fields; (2) gradient of the magnetic field; (3) thermal and suprathermal plasma parallel and perpendicular to the magnetic field; (4) energy spectra, angular distribution, and composition of positive ions; and (5) angular distribution and energy spectra of energetic electrons and protons. In the NSSDC experiment descriptions which follow, ESA Exp. S-300 was described as five separate experiments: 78-071A-05, -06, -07, -10, and -11. The spacecraft was cylindrical with a height of 1.321 m. The total mass, excluding propellants, was 273.6 kg. There were four telescopic axial booms 2.5 m in length for the wire mesh spheres of an ac electric field experiment, two 20-m cable booms for magnetic and electric field sensors and for an excitation antenna for plasma resonances, and two locking radiant booms 3 m in length for a variety of instruments. There were six hydrazine thrusters; two to tilt and precess the spacecraft, two to modify the orbit so the longitude of the apogee could be changed, and two for spin up and spin down. The spin rate was nominally 10 rpm. Data were telemetered in real time at 137.2 MHz (186 and 744 bps) and at 2299.5 MHz (11.91 or 95.25 kbs). Attitude measurements were obtained by a sun sensor, a dual infrared earth sensor, and accelerometers. Power was supplied by 7200 solar cells mounted on the spacecraft surface. To prevent spacecraft differential charging, 96% of the surface was electrically conductive. Because of the importance of the magnetic field measurements, the spacecraft residual field at the magnetometer was only 0.3

nT. Except for minor modifications to certain experiments, this spacecraft and its instruments were identical to ESA-GEOS 1 (77-029A). More detailed information can be found in ESA Bulletin, n. 9, May 1977. Because one solar panel developed a short circuit soon after launch, a number of the experiments were able to obtain useful data for only one-half of the spin period.

------- ESA-GEOS 2, BEGHIN--------------------------------------

INVESTIGATION NAME- WAVE FIELD IMPEDANCE

NSSDC ID- 78-071A-11 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - C.	BEGHIN	CNRS, CTR FOR SPECTROM
OI - P.	DECREAU	CNRS, CTR FOR SPECTROM

BRIEF DESCRIPTION

This investigation was part of ESA experiment S-300 and made use of one set of mesh electric spheres mounted on the end of the axial booms (part of 78-071A-10, Ungstrup) and the two vitreous carbon spheres mounted on the end of the 20-m radial booms (78-071A-07, Pedersen). The mesh spheres were used as transmitting elements for frequencies from 0.2 to 76 kHz. The self-impedance of these spheres and the mutual impedance between the mesh and long-boom carbon spheres were measured. Strong resonances at the hybrid resonance frequencies and anti-resonances at the gyro frequencies were used to determine the density of the surrounding plasma. Frequencies up to 450 Hz were telemetered directly, and sweep-frequency analyzers and digital correlation were employed to obtain the auto- and/or cross-correlation up to 77 kHz with selectable bandwidths of 2.5, 5.0, or 10.0 kHz.

------- ESA-GEOS 2, GEISS--------------------------------------

INVESTIGATION NAME- LOW-ENERGY ION COMPOSITION

NSSDC ID- 78-071A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - J.	GEISS	U OF BERNE
PI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - A.	GHIELMETTI	U OF BERNE
OI - H.	LOIDL	MPI-EXTRATERR PHYS
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This instrument (ESA experiment S-303) measured the energy, angular distribution, and composition of positive ions using a cylindrical electrostatic analyzer (ESA) followed by a crossed electric and magnetic field analyzer (CFA) to select the energy and velocity. The energy (per unit charge) ranged from 0.001 to 17.2 keV in 32 steps with a delta E/E of 0.03 and a mass range of 1 to 140 u in 64 logarithmically spaced steps. There was a thermal mode in which a retarding grid in the entrance slit was used for analysis below 0.1 keV. All particles that overcame this grid voltage were accelerated to 3 keV before entering the ESA in its lowest energy step, where both the ESA and CFA were transparent. The device viewed perpendicular to the spin or Z axis. For low-energy ions, the acceptance angles were plus or minus 6 deg in azimuth and plus or minus 30 deg in elevation (referenced to the Z axis). For the highest energies, these angles decreased to 3.5 and 7.1 deg, respectively. Three percent of the ions leaving the ESA were counted by a channeltron. The remaining 97% entered the CFA and the output was detected by an electron multiplier. This signal was pulse-height analyzed by one fixed and one variable discriminator to obtain better mass discrimination. The main purpose of this investigation was to identify the sources of low-energy particles in the magnetosphere. Time variations of the helium/hydrogen ratio, the degree of ionization of helium and oxygen, and the isotopic abundance ratio of helium 3/helium 4 could be measured to determine these sources.

------- ESA-GEOS 2, GENDRIN------------------------------------

INVESTIGATION NAME- MAGNETIC WAVE FIELDS

NSSDC ID- 78-071A-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.E.	GENDRIN	CNET
OI - J.M.	ETCHETO	CNET
OI - E.	UNGSTRUP	DANISH SPACE RES INST

BRIEF DESCRIPTION

The instrument used two sets of three-axis search coil magnetometers, one for the ULF/ELF range (0.1 to 450 Hz) and one for the VLF range (0.3 to 30 kHz). Each search coil consisted of a high-permeability material with a high-density pick up winding. Each set of the three coils was built into a single assembly and mounted on the locking 3-m booms at a distance of 2 m from the spacecraft. Typical sensitivities of these sensors in units of nT per sq root of Hz, were 1E-1 at 0.1 Hz, 2E-4 at 10 Hz, and about 3E-6 at 1 kHz. These sensors and some associated electronics consisting of (1) a large number of channel-selection switches, (2) a number of bandpass filters, (3) six swept-frequency analyzers (SFA), (4) a digital correlator, and (5) eight stepped-gain amplifiers, were a part of the ESA wave experiment S-300. These components were employed for the sensors described in 78-071A-07 (Pedersen) and 78-071A-10 (Ungstrup), and also the investigations described in 78-071A-05 (Petit) and 78-071A-11 (Beghin). Six analog channels of 450 Hz bandwidth and the digital correlator output were transmitted by the 95.25 kbs telemetry mode. The SFA covered the frequency range up to 77 kHz in 256 partly overlapping steps. The correlator provided an auto-correlogram of 128 points within 29 ms. Its bandwidth could be selected to be 2.5, 5.0, or 10.0 kHz. A cross-correlogram between two sensors could be provided. The correlator also operated in a time-sharing mode between auto- and cross-correlation.

------- ESA-GEOS 2, HULTQVIST------------------------------------

INVESTIGATION NAME- LOW-ENERGY ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 78-071A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
OI - H.	BORG	KIRUNA GEOPHYS INST
OI - L.A.	HOLMGREN	KIRUNA GEOPHYS INST

BRIEF DESCRIPTION

This instrument (ESA experiment S-310) measured the energy and pitch-angle distribution of electrons and protons in the energy range 0.2 to 20 keV with extensive angular coverage concentrated in the loss-cone region. The purpose of the investigation was to improve the understanding of auroral particle acceleration and precipitation mechanisms by comparing near-equatorial particle distributions with coordinated ground-based observations at the foot of the magnetic field line. High temporal and spatial resolution was provided to study wave-particle interactions. The experiment of Wilken (78-071A-01) was complementary to this one, extending both electron and proton observations to high energy ranges. A total of 10 curved-plate analyzers with channel electron multipliers for particle detection were used. Although normally eight analyzers were used to detect electrons and two to detect protons, a complex arrangement with four separate HV supplies allowed independent switching of four detector groups. The analyzing plate voltages could operate in a stepping mode, a sweeping mode, or a constant-voltage mode. In addition, the time accumulation could be varied with a nominal frame duration of 43 ms. However, this duration could be decreased by a factor of four at the expense of obtaining data from certain detectors in those cases where fast temporal variations were encountered in the loss cone. The energy intervals in the stepping mode consisted of 32 energy steps. The eight normal electron analyzers, with geometric factor (G) of 3E-4 sq cm-sr, consisted of four narrow-angle (2 deg x 2 deg, delta E/E of 0.11) and four wide-angle (8 deg x 7.5 deg, delta E/E of 0.09) devices. The two normal proton analyzers had delta E/E of 0.13, aperture of 6 deg x 3 deg, and G of 1E-3 sq cm-sr. Aperture angular widths refer to elevation and azimuth, respectively, in relation to the spacecraft spin axis. This experiment relied heavily on real-time ground computer control.

------- ESA-GEOS 2, MARIANI--------------------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 78-071A-09 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.	MARIANI	U OF ROME
OI - M.	CANDIDI	CNR, SPACE PLASMA LAB
OI - D.H.	FAIRFIELD	NASA-GSFC
OI - E.	AMATA	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION
A triaxial fluxgate magnetometer was employed for simultaneous measurements of the three components of the magnetic field. The frequency range covered by the instrument extended from dc up to 5 Hz. In the normal orientation of the satellite, the main component of the field coincided with the Z axis of the instrument, which was aligned with the spin axis of the satellite. The experiment had been designed with two sensitivity ranges for the X and Y components, for which the magnetic field component was only a fraction of the total field and was modulated by the rotation of the spacecraft. This last feature made the range switch technique preferable to a bias offset technique. The two selected sensitivity ranges were plus or minus 60 nT and plus or minus 180 nT, respectively. Along the Z axis, where the field was higher and not modulated by the satellite rotation, a single sensitivity range of plus or minus 60 nT was used. The signal was kept within range by superimposing positive and negative bias levels of 60 nT each, such that a range plus or minus 480 nT with a constant quantization error of plus or minus 0.125 nT, using 9-bit digits, was obtained. The noise level of the sensors was comparable to this quantization error.

------- ESA-GEOS 2, MELZNER------------------------------------

INVESTIGATION NAME- DC ELECTRIC FIELD AND GRADIENT B ELECTRON BEAM DEFLECTION

NSSDC ID- 78-071A-08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.	MELZNER	MPI-EXTRATERR PHYS
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - G.	METZNER	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION
The prime objective of this investigation (ESA experiment no. S-329) was the measurement of the dc electric field in the plane perpendicular to the local magnetic field (B). The investigation also measured the spatial gradient of B in the vicinity of the spacecraft. With these data, a mapping of the electric fields in the equatorial magnetosphere linked magnetically to the auroral zones could be achieved, as well as determining plasma convection and particle flow within the plasma sheet. The instrument consisted of four electron guns spaced logarithmically from the electron detector. Two of the guns were mounted on one of the 3-m radial booms. The guns were used one at a time to generate an electron beam of about 1.E-8 amp and energy about 1 keV. Both parameters were varied by telecommand. Deflection plates associated with each gun received a sinusoidal signal from the magnetometer investigation to ensure that the beam was always at right angles to B, in spite of the angle of the spin vector to B. The electron detector consisted of deflection plates that removed the elevation correction given to the beam by the magnetometer signal, a curved plate energy filter, and a photomultiplier tube. Because the maximum displacement occurred when the beam made an angle of 0 or 180 deg to the electric field, all possible displacements less than this occurred twice during a spin period. Consequently, the beam swept across the detector twice per spin period, provided the maximum displacement was less than the distance between the gun and the detector. The values of the spin angle at which the beam was detected after one gyration, and the distance between the gun and receiver, allowed the determination of the electric field. A possible contribution from the gradient of B could be determined by varying the energy of the beam. The investigation relied entirely on real-time control by a ground-based computer. It had four basic modes of operation: search, adjustment, optimization, and normal. The search mode was designed to find the signal at nominal beam parameters. If this was not achieved, the adjustment mode was used to vary these parameters systematically. Once the beam was detected, the optimization mode determined the best compromise between beam current and received signal quality. Then the normal mode started, which consisted of a continuous measurement of the electric field and the gradient of B, using the most appropriate of the four guns. Tungsten filaments were used in the electron gun and the problems caused by the barium oxide filaments on ESA-GEOS 1 were not experienced.

------- ESA-GEOS 2, PEDERSEN-----------------------------------

INVESTIGATION NAME- DC FIELDS BY DOUBLE PROBE

NSSDC ID- 78-071A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.	PEDERSEN	ESA-ESTEC
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - K.	KNOTT	ESA-ESTEC
OI - R.J.L.GRARD		ESA-ESTEC

BRIEF DESCRIPTION
This instrument (part of ESA Exp. S-300) consisted of two vitreous carbon spheres mounted at the tips of the 20-m cable booms, which extended radially from the spacecraft perpendicular to the spin axis. This investigation was concerned with the dc single axis electric field analysis. The two output signals were evaluated in terms of dc electric field and conditioned for further treatment in the analysis of ac electric fields. The output from one sphere was signal-conditioned on a linear scale; the differential output from the two spheres was compressed logarithmically. In addition, the two outputs were passed through 450-Hz to 77-kHz filters. These filtered signals were differenced and all three signals made available for analysis by the sweep-frequency analyzers and digital correlator as part of the 78-071A-05 (Petit), 78-071A-10 (Ungstrup), and 78-071A-01 (Beghin) investigations. The sensitivity of this probe was about 1E-4 V/m at dc and 1E-8 volts per meter per square root of Hz for ac.

------- ESA-GEOS 2, PETIT--------------------------------------

INVESTIGATION NAME- VLF PLASMA RESONANCES

NSSDC ID- 78-071A-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - M.	PETIT	CNET
OI - J.M.	ETCHETO	CNET

BRIEF DESCRIPTION
This investigation (part of ESA experiment S-300) utilized the 20-m booms (normal to the spacecraft spin axis) as a dipole antenna, and the carbon spheres (part of 78-071A-07, Pedersen) as the receiving element. Frequencies from 0.3 to 77 kHz were employed. On transmission of a VLF signal of limited duration, a transient signal was observed for a much longer period than the pulse length, provided that the spectrum of the transmitted signal included one of the resonant frequencies of the plasma. The ambient plasma density was inferred from the determination of the resonant frequencies. Received frequencies up to 450 Hz were telemetered directly, and six sweep-frequency analyzers and a digital correlator provided auto- and cross-correlations up to 77 kHz. Bandwidths of 2.5, 5.0, or 10.0 kHz could be selected for the correlator.

------- ESA-GEOS 2, UNGSTRUP-----------------------------------

INVESTIGATION NAME- ELECTRIC WAVE FIELDS

NSSDC ID- 78-071A-10 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - A.	BAHNSEN	DANISH SPACE RES INST

BRIEF DESCRIPTION
This investigation was part of the ESA S-300 wave experiment and employed four mesh spheres mounted at the end of the 2.5-m axial booms. Differential measurements from these sensors provided the three vector components of the electric field. Frequencies from 50 Hz to 77 kHz were analyzed with the sweep-frequency analyzer and the digital correlator. Frequencies up to 450 Hz were telemetered directly, and auto- and/or cross-correlation of the sensor outputs up to 77 kHz was accomplished with selectable bandwidths of 2.5, 5.0, and 10.0 kHz. The sensitivity of the mesh sphere probes at 10 kHz was 1E-6 volts per meter per square root of Hz.

------- ESA-GEOS 2, WILKEN-------------------------------------

INVESTIGATION NAME- ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 78-071A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - B.	WILKEN	MPI-AERONOMY
OI - G.	PFOTZER(DECEASED)	MPI-AERONOMY
OI - E.	KEPPLER	MPI-AERONOMY
OI - A.	KORTH	MPI-AERONOMY
OI - J.	MUENCH	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument (ESA experiment S-321) measured the energy and pitch-angle distribution of higher energy electrons and protons than that of Hultqvist (78-071A-04), and was complementary to that instrument. The detector system consisted of two separate magnetic spectrometers for electrons, with two proton telescopes associated with each of the magnets that focused the electrons away from the proton detectors. There were five rectangular solid-state detectors mounted along the focal line of each spectrometer to measure the electrons. Each spectrometer covered an angular aperture in elevation angle (relative to the spin axis) of 60 deg. The two deflection magnets were positioned so that elevation angles (referred to the spin axis) from 10 to 120 deg, on 10 deg centers, were covered for electrons, giving elevation angles of 23, 46, 83, and 106 deg for the proton telescopes. These telescopes consisted of a front, surface-barrier detector and a rear, solid-state detector. Electron energies from 30 to 200 keV and proton energies from 0.04 to 1.4 MeV were covered. The effective angular aperture for protons was 10 deg x 4 deg (elevation x azimuth) and for electrons was 6 deg x 4 deg. Geometric factors in units of 1E-4 sq cm sr were five for protons and one for electrons. A 12-channel pulse-height analyzer (PHA) for protons could be used for any one of the four front detectors, provided a front-rear coincidence was detected, and a 15-channel PHA could be used for any one of the 10 electron detectors. The singles rate for one of the four proton detectors and the coincidence rate from one of the four proton telescopes could be selected. There were three modes for data selection: mode 0, integral count rates and spectral measurements for all 14 detectors; mode 1, integral count rates and spectral measurements for four detectors (good time resolution of integral rates); and mode 2, integral count rates and spectral measurements (good time resolution for energy spectra). The minimum time for a complete spectrum was 688 ms; the minimum time for integral flux variations was 43 ms. The spectral measurements had a resolution of delta E/E=0.35.

------- ESA-GEOS 2, WRENN--

INVESTIGATION NAME- THERMAL PLASMA FLOW

NSSDC ID- 78-071A-02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - G.L.	WRENN	MULLARD SPACE SCI LAB
OI - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
OI - K.	NORMAN	MULLARD SPACE SCI LAB
OI - W.J.	RAITT	UTAH STATE U

BRIEF DESCRIPTION

This instrument (ESA experiment S-302) employed two hemispherical electrostatic analyzers mounted on one of the locking booms for the measurement of electrons or protons over the range 0.5 to 500 eV arriving close to parallel and close to perpendicular to the local magnetic field. The energy range was covered in 64 steps with a relative energy resolution of 0.11. One analyzer had its aperture pointing along the negative Z spin axis, with an opening angle of 18 deg x 18 deg providing a geometrical factor (G) of 6E-4 sq cm sr. The other analyzer made an angle of 100 deg with respect to the +Z axis, with an opening angle of 8 deg x 30 deg, providing a G of 5E-4 sq cm sr. Both detectors had to measure the same type of particles at the same time. The collimators of these instruments could be set at any voltage from -28 to +32 V in steps of 0.1 V to compensate for the potential difference between the instrument and the undisturbed plasma environment. This voltage was used to determine the spacecraft potential.

**************************** EXOSAT ****************************

SPACECRAFT COMMON NAME- EXOSAT
ALTERNATE NAMES- HI.ECCEN LUN OCCULT.SAT., EUROPEAN X-RAY OBS SAT
HELOS, 14095

NSSDC ID- 83-051A

LAUNCH DATE- 05/26/83 WEIGHT- 500. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA 3914

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 05/27/83
ORBIT PERIOD- 5435.4 MIN	INCLINATION- 72.5 DEG
PERIAPSIS- 347. KM ALT	APOAPSIS- 191709. KM ALT

PERSONNEL

PM - G.	ALTMANN	ESA-ESTEC
PS - R.D.	ANDRESEN	ESA-ESTEC
PS - A.	PEACOCK	ESA-ESTEC

BRIEF DESCRIPTION

The scientific mission of the European X-ray observatory satellite (EXOSAT) was to measure the position, structural features, and spectral and temporal characteristics of cosmic X-ray sources in the approximate range 0.04 to 80 keV. EXOSAT used two operational modes: (a) the occultation mode, for the precise determination and identification of sources and the observation of structural features, using primarily the moon or the earth as the occulting body, and (b) the arbitrary pointing mode for the study of the temporal and spectral variability of sources over long uninterrupted time intervals and the mapping of low-energy sources. The observatory, placed in a highly eccentric orbit with its apogee at 200,000 km and at a high latitude, was capable of observing lunar occultations over 20% of the celestial sphere within a year. The positional accuracy of bright (>1E-2 photons/sq cm-s in the range >1.5 keV) sources was limited to about 1 arc s by the inaccuracy of measurement of the position of the satellite and the uncertainty of the topography of the lunar limb. For weaker sources, the accuracy was limited by statistics; i.e., the total number of X-ray quanta received during the time of the corresponding angular displacement of the moon. When not engaged in occultation observations, the observatory could view the sky uninterruptedly in any chosen direction (except 60 deg about the solar direction) for as long as the orbital period was above the Van Allen belts (approximately 80 h). With accurate timekeeping on board, and with the capability of long continuous observation, EXOSAT could determine regular and irregular variations of the intensity of X-ray sources on a time scale ranging from tens of microseconds to tens of hours. The triaxial stabilized spacecraft was cylindrical with a diameter of 192 cm and a height of 117 cm. A rotatable solar array with an area of 3 sq m was mounted on top of the S/C. The star trackers were mounted on the optical benches of the two imaging telescopes to facilitate alignment and stability. In the occultation mode the observatory was able to view all of the celestial sphere except for a cone of half angle 15 deg centered on the sun; in the arbitrary pointing mode the excluded cone was a cone of half angle 60 deg, also centered on the sun. Consumables were distributed to enable some 100 orbital maneuvers for lunar occultation to be undertaken and over 2000 targets to be observed. The scientific payload was funded by ESA and its development managed by ESA. Use of the observatory was open to the scientific community following selection of observational proposals.

------- EXOSAT, BOYD--

INVESTIGATION NAME- LOW-ENERGY X-RAY IMAGING TELESCOPES

NSSDC ID- 83-051A-02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
TM - P.W.	SANFORD	U COLLEGE LONDON
TM - B.N.	SWANENBURG	U OF LEIDEN
TM - J.A.M.	BLEEKER	U OF LEIDEN
TM - C.	DE JAGER	U OF UTRECHT
TM - A.C.	BRINKMAN	U OF UTRECHT

BRIEF DESCRIPTION

The instrument consisted of two identical X-ray imaging telescopes (LE1 and LE2) utilizing two nested grazing-incidence parabolic/hyperbolic reflectors. The focal-plane assembly incorporated a gas-flow position-sensitive proportional counter and a channel-multiplier array, covering the energy range from 0.04 to 2 keV; this was limited by the reflecting optics. A transmission grating was located at the exit plane of the mirror for spectroscopic measurements. Each telescope had an FOV of 1 deg, a geometric collecting area of 90 sq cm, a mass of 30 kg, and consumed 5 W. Filters and a grating could be used to separate X-rays of different wavelengths.

------- EXOSAT, TAYLOR--

INVESTIGATION NAME- GAS SCINTILLATION X-RAY SPECTROMETER

NSSDC ID- 83-051A-03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - B.G.	TAYLOR	ESA-ESTEC
TM - R.D.	ANDRESEN	ESA-ESTEC
TM - R.L.F.	BOYD(RETIRED)	U COLLEGE LONDON
TM - P.W.	SANFORD	U COLLEGE LONDON
TM - L.	SCARSI	U OF PALERMO
TM - S.	SALENI	U OF PALERMO
TM - G.	BOELLA	U OF MILAN
TM - G.	VILLA	U OF MILAN
TM - A.	PEACOCK	ESA-ESTEC

BRIEF DESCRIPTION

A gas scintillation proportional counter spectrometer (GSPC) was used to study detailed spectral features in the energy range 2.5 to 50 keV. The device had an effective area of 250 sq cm and an energy resolution of 10% at 10 keV. The experiment FOV, defined by a mechanical collimator, was 45 arc min FWHM. The counter window was a 175-micrometer thick beryllium foil and the gas cell was filled with a one-atmosphere mixture of 95% xenon and 5% helium. The GSPC had an X-ray collecting area of 200 sq cm, a mass of 8 kg, and consumed 5 W.

------- EXOSAT, TRUEMPER--

INVESTIGATION NAME- MEDIUM-ENERGY COSMIC X-RAY PACKAGE

NSSDC ID- 83-051A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

TL - J.	TRUEMPER	MPI-EXTRATERR PHYS
TM - H.	ZIMMERMAN	MPI-EXTRATERR PHYS
TM - R.	STAUBERT	U OF TUBINGEN
TM - K.A.	POUNDS	U OF LEICESTER
TM - M.	TURNER	U OF LEICESTER

BRIEF DESCRIPTION

The instrument consisted of a large area proportional counter (ME) array of argon-filled counters, backed up by xenon-filled counters with an effective area of 1,800 sq cm, covering the energy range from 1.2 to 50 keV. The array was divided into four sections, each of which could be offset from the pointing direction to provide for a variable flat-top collimator response. The detectors had FOVs of 1.5 deg with an energy resolution of 20% at 6 keV for argon and 22 keV for xenon. The ME had a mass of 48 kg and consumed 17 W.

**************************** GEOS 3****************************

SPACECRAFT COMMON NAME- GEOS 3
ALTERNATE NAMES- GEODETIC SATELLITE-C, GEOS-C

NSSDC ID- 75-027A

LAUNCH DATE- 04/09/75 WEIGHT- 340. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/10/75
ORBIT PERIOD- 101.82 MIN INCLINATION- 114.96 DEG
PERIAPSIS- 839. KM ALT APOAPSIS- 853. KM ALT

PERSONNEL

MG - C.J.	FINLEY	NASA HEADQUARTERS
SC - J.P.	MURPHY	NASA HEADQUARTERS
PS - H.R.	STANLEY	NASA-GSFC-WFF

BRIEF DESCRIPTION

The GEOS 3 (Geodynamics Experimental Ocean Satellite) spacecraft was an octahedron, topped by a truncated pyramid, with a parabolic reflector for a radar altimeter on the flat bottom side. A metal ribbon boom with end mass extended upward approximately 6.1 m from the top of the pyramid. Passive laser retroreflector cubes were mounted in a ring around the parabolic reflector with the normal vector from each cube facing 45 deg outward from the earth direction of the boom axis. A turnstile antenna for VHF and UHF frequencies and separate antennae for earth-viewing 324-MHz Doppler, C-band, and S-band transponders were mounted separately on flat surfaces next to the parabolic reflector. The dimension across the flats of the octahedron was 1.22 m, and the spacecraft was 1.11 m high. The mission provided the stepping stone between the National Geodetic Satellite Program (NGSP) and the Earth and Ocean Physics Application Program. It provided data to refine the geodetic and geophysical results of the NGSP and served as a test for new systems. Mission objectives were to perform a satellite altimetry experiment in orbit, to support further the calibration and position determination of NASA and other agency C-band radar systems, and to perform a satellite-to-satellite tracking experiment with the ATS 6 spacecraft using an S-band transponder system. This system was also used for periodic GEOS 3 telemetry data relay through ATS 6, to support further the intercomparison of tracking systems, to investigate the solid-earth dynamic phenomena through precision laser tracking, to refine further orbit determination techniques and determine interdatum ties and gravity models, and to support the calibration and position determination of NASA Spaceflight Tracking and Data Network (STDN) S-band tracking stations. For more details, see special reports on the GEOS 3 in J. Geophys. Res., v. 84, n. B8, 1979.

------- GEOS 3, ANDERLE--

INVESTIGATION NAME- US NAVY DOPPLER SYSTEM

NSSDC ID- 75-027A-05 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY

PERSONNEL
PI - R.J. ANDERLE USN SURFACE WEAPNS CTR

BRIEF DESCRIPTION

The Doppler technique of timing and measuring the frequency shift of radio transmissions from a moving spacecraft was used to obtain data that further established the structure of the earth's gravitational field through the comparison of new with established geodetic measurements. Two transmitters were operated at frequencies of 162 and 324 MHz. The dual frequencies were coherently related and utilized in conjunction with ground Doppler receiving stations to obtain precision satellite range-rate data. The dual frequencies were generated by a highly stable oscillator driving two frequency multipliers. Both frequencies were used simultaneously to provide comparison data of the effect of the ionosphere on the signals. Thirteen or more fixed ground receiving stations operated by the U.S. Navy Doppler Tracking Network (TRANET) and 12 portable geoceivers operated by the U.S. Army, U.S. Navy, and U.S. Air Force, all under the direction of the Defense Mapping Agency (DMA) obtained data. Observations made from three or more known stations allowed deduction of orbital parameters. Range-rate data from either the fixed stations or the geoceivers were estimated to be accurate within 0.5 cm/s.

------- GEOS 3, JACKSON--

INVESTIGATION NAME- C-BAND SYSTEM

NSSDC ID- 75-027A-03 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - E.B. JACKSON NASA-GSFC-WFF

BRIEF DESCRIPTION

The objective of this experiment was to support the altimeter C-band system calibration as well as geometric, gravimetric, and other geodetic investigations. The C-cand transponder subsystem consisted of two transponders: one, the GEOS 2 noncoherent type and the other, a coherent C-band transponder. The noncoherent transponder provided for range and angle measurements, while the coherent transponder provided for both range, range-rate, and angle measurements. Both transponders received signals at 5690 MHz. The coherent transponder transmitted at 5690 MHz, while the noncoherent type transmitted at 5765 MHz. Each C-band transponder transmitted one pulse for each coded group of pulses transmitted by a ground tracking C-band radar. The internal delay between the received ground-transmitted pulse code and the transponder-transmitted pulse was calibrated prior to launch. Each transponder (while operating separately or simultaneously) operated in either standby or override mode. In standby, the receiver became operational after approximately 60 s of interrogation, or long enough for the output tube to warm up. In override, the output tube filament was energized by the external command and the warm-up delay circuit bypassed after the tube warmed up, thus allowing the transponder to respond immediately to interrogation signals. This override mode reduced ground-command requirements and conserved spacecraft power.

------- GEOS 3, PURDY--

INVESTIGATION NAME- RADAR ALTIMETER SYSTEM

NSSDC ID- 75-027A-01 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY
OCEANOGRAPHY

PERSONNEL
PI - C.L. PURDY NASA-GSFC-WFF

BRIEF DESCRIPTION

The radar altimeter was the highest priority experiment on GEOS 3. The objectives were (1) to determine the feasibility and utility of a spaceborne radar altimeter for mapping the topography of the ocean surface with an absolute accuracy within 5 m, and with a relative accuracy of 1 to 2 m, (2) to determine the feasibility of measuring the deflection of the vertical information at sea, (3) to determine the feasibility of measuring wave height, and (4) to contribute to the technology leading to a future operational altimeter-satellite system with a 10-cm measurement capability. To meet the experiment objectives, the altimeter had two distinct data-gathering modes: a long-pulse altimetry data mode and a short-pulse mode. Performance capabilities and operating characteristics of the altimeter differed for the two modes. Both modes operated on a 13.9-GHz frequency, used a parabolic antenna, had a maximum range acquisition time of 6 s, and had an altitude granularity of plus or minus 0.2 m. Differing characteristics were as follows: (1) altitude data rate for long pulse was two readings per second and for short pulse six readings per second, and (2) input power for long pulse was 50 W, for short pulse 100 W. The GEOS 3 radar altimeter had several features in common with the altimeter used on the Skylab satellite, but had advantages over the Skylab altimeter because of improved accuracy and ability to operate over extended areas for greater periods of time, thereby providing the capability of examining the earth over longer arcs and observing extensive ocean areas. The third in the series of satellite altimeters was flown on Seasat 1. The system provided good quality data and demonstrated the capabilities more than originally anticipated. More details can be found in J. Geophys. Res., v. 84, n. B8, 1979. Data are available from SDSD.

------- GEOS 3, SALZBERG---------------------------------------

INVESTIGATION NAME- S-BAND TRACKING SYSTEM

NSSDC ID- 75-027A-02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - I.M. SALZBERG NASA-GSFC

BRIEF DESCRIPTION

The S-band transponder subsystem provided metric tracking data (range, range-rate). It transmitted telemetry data, but did not receive commands. The transponder operated in the following three modes: (1) satellite-to-satellite tracking (SST) from the Rosman or European ATS ground stations through ATS 6 to GEOS 3 and back (also see experiment 75-027A-06), (2) direct unified S-band (Doppler only) ground-station tracking of GEOS 3, and (3) direct GRARR (Goddard Range and Range Rate) ground-station tracking of GEOS 3. The transponder subsystem consisted of a single-channel transponder, a power amplifier, a diplexer, and an earth-viewing and ATS-viewing antenna system. The antennae were selectable by ground command. The earth-viewing antenna for direct tracking with the USB (unified S-band) and GRARR ground stations had approximately hemispherical coverage and a minimum of 0 dB gain within 60 deg of the spacecraft Z axis. The SST antenna system consisted of an in-track array that provided a 3-dB gain in the direction of ATS for GEOS ascending and descending node passes, which crossed the equator within plus or minus 26 degrees of the ATS subsatellite point. In the SST operation mode, the interrogation signal was first transmitted at C-band by the ATS ground station to the ATS 6 spacecraft. ATS 6 instrumentation coherently altered the signal, making it compatible with the input frequency (2069.1125 MHz) of the S-band transponder on GEOS 3, and transmitted the signal to GEOS 3. GEOS 3 then, after translating the received signal, retransmitted it to ATS 6 as if ATS 6 were another ground station. ATS 6 then retransmitted the signal to the ATS ground station at C-band. Range sum and range-rate sum were obtained by comparing the interrogation and response signals. The S-band on GEOS 3 was also tracked by the USB and GRARR STDN stations. Carrier frequencies (2069.1125 MHz up and 2247 MHz down) were identical to those of the SST mode. Coherent GRARR tracking was accomplished via standard GRARR ranging side tones. USB tracking consisted only of coherent-carrier Doppler tracking. The S-band transponder was a single-channel transponder; therefore, simultaneous operation was not possible.

------- GEOS 3, STEPHANIDES------------------------------------

INVESTIGATION NAME- LASER TRACKING REFLECTOR

NSSDC ID- 75-027A-04 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION
GEODESY

PERSONNEL
PI - C.C. STEPHANIDES NASA-GSFC

BRIEF DESCRIPTION

Laser corner reflectors, composed of 264 35-mm cubes, and ground-based laser systems were used to obtain precise satellite tracking information. The Applied Physics Laboratory provided the laser cube reflector panels. The cubes were configured on the lateral surface of a conic frustum, with the lateral surface of the frustum adjoining the bottom, earth-oriented surface of the spacecraft at a 45-deg angle. The base of the frustum measured approximately 0.9 meter in diameter. When illuminated by a laser light pulse from the ground, each retroreflector cube in the array reflected the light ray back to a special telescope receiver on the ground. The reflected light was picked up by the telescope, and the optical impulses converted to an electrical signal. A digital counter recorded the time when the light beam was returned to the ground. The total travel time of the light pulses, from ground to satellite and back to the ground, measured the distance to the satellite, thus forming the basis of the satellite optical laser system. The following observational systems acquired the necessary data: NASA/Wallops Laser Ranging Systems, SAO (Smithsonian Astrophysical Observatory) Laser Ranging Systems, GSFC Laser Ranging Systems, and other national and international laser stations as determined.

**************************** GMS********************************

SPACECRAFT COMMON NAME- GMS
ALTERNATE NAMES- GEOSTATION.METEOROL.SAT., HIMAWARI

NSSDC ID- 77-065A

LAUNCH DATE- 07/14/77 WEIGHT- 647. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
JAPAN NASDA
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/17/77
ORBIT PERIOD- 1429.4 MIN INCLINATION- 1.2 DEG
PERIAPSIS- 35531. KM ALT APOAPSIS- 35779. KM ALT

PERSONNEL
PM - N. KODAIRA METEOROL SATELLITE CTR
PS - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The Geostationary Meteorological Satellite (GMS) was Japan's contribution to the international GARP (Global Atmospheric Research Program). One major objective of GARP was to obtain synoptic global meteorological data sets for 1 year's duration (to include two optimized observing periods of a few weeks each). These data served as raw material to optimize computer models for meteorological prediction. It was hoped that determination could be made of the time limitation for short-term modeling. This spacecraft was roughly cylindrical with a height of 345 cm and a diameter of 216 cm. The cylindrical surface was covered with solar cells which could provide 225 W. The satellite was spin-stabilized with a despun earth-pointing antenna. The satellite was positioned near 140 deg E and designed to operate for 5 years.

------- GMS, JMA STAFF---

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN
RADIOMETER (VISSR)

NSSDC ID- 77-065A-01 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The Visible-IR Spin-Scan Radiometer (VISSR) was similar to VISSR experiments on other GARP (Global Atmospheric Research Program) satellites such as GOES 1. It made both night IR (10.5 to 12.5 micrometers) and day IR, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel had a resolution of about 1.25 km and the IR channel had a resolution of about 5 km at nadir. Real-time transmission was available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed.

------- GMS, JMA STAFF---

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 77-065A-03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The GMS included a communications facility. The objectives of this equipment were (1) to collect and relay weather observations from remote stations, including buoys, ships, and unmanned stations, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS, KOHNO---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 77-065A-02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION
The Space Environment Monitor (SEM) experiment observed the in-situ charged particle environment. Solar protons (1 to 500 MeV), alpha particles (8 to 390 MeV) and solar electrons (greater than 2 MeV) were discriminated, and their respective energies monitored by means of a number of solid-state detectors.

*************************** GMS-2 ***************************

SPACECRAFT COMMON NAME- GMS-2
ALTERNATE NAMES- GEOSTATION.METEORO.SAT.2, HIMAWARI-2

NSSDC ID- 81-076A

LAUNCH DATE- 08/10/81 WEIGHT- 653. KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- N-2

SPONSORING COUNTRY/AGENCY
JAPAN NASDA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/26/81
ORBIT PERIOD- 1435.9 MIN INCLINATION- 0.2 DEG
PERIAPSIS- 35776. KM ALT APOAPSIS- 35792. KM ALT

PERSONNEL
PM - N. KODAIRA METEOROL SATELLITE CTR
PS - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Geostationary Meteorological Satellites (GMS) were Japan's contribution to the International Global Atmospheric Research Program (GARP). The spacecraft was roughly cylindrical with a height of 345 cm and a diameter of 216 cm. The cylindrical surface was covered with solar cells which provided 225 W. The satellite was spin-stabilized with a despun earth-pointing antenna. The satellite was positioned near 140 deg E and was designed to operate for 5 years. This was a follow-on GMS type spacecraft launched and controlled by NASDA of Japan.

------- GMS-2, JMA STAFF---------------------------------------

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 81-076A-01 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The Visible and Infrared Spin-Scan Radiometer (VISSR) was similar to VISSR experiments on other GARP (Global Atmospheric Research Program) satellites such as GOES 1 and GMS. It made both night IR (10.5 to 12.5 micrometers) and day IR measurements, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel had a resolution of about 1.25 km, and the IR channel had a resolution of about 5 km at nadir. Real-time transmission was available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed.

------- GMS-2, JMA STAFF---------------------------------------

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- 81-076A-03 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION
The GMS 2 included a communications facility. The objectives of this equipment were (1) to collect and relay weather observations from remote stations, including buoys, ships, and unmanned stations, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS-2, KOHNO---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 81-076A-02 INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION
The Space Environment Monitor (SEM) experiment observed the in-situ charged particle environment. Solar protons (1 to 500 MeV), alpha particles (8 to 390 MeV), and solar electrons (greater than 2 MeV) were discriminated, and their respective energies were monitored by means of a number of solid-state detectors.

*************************** GOES 1 ***************************

SPACECRAFT COMMON NAME- GOES 1
ALTERNATE NAMES- SMS-C, GOES-A
GOES-I

NSSDC ID- 75-100A

LAUNCH DATE- 10/16/75 WEIGHT- 631. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/17/75
ORBIT PERIOD- 1412.0 MIN INCLINATION- 1.0 DEG
PERIAPSIS- 34165. KM ALT APOAPSIS- 36458. KM ALT

PERSONNEL
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 1 (SMS-C) was a NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day and night cloudcover data and to take radiance temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit. For more detailed information, see "The GOES/SMS User's Guide." On December 1, 1978, responsibility for GOES 1 was turned over to ESA to use as part of GARP. It was stationed over the Indian Ocean and controlled

by ESOC in Darmstadt, F.R.G. In December 1979, it was returned under the control of NOAA and positioned at 135 deg W.

------- GOES 1, LEINBACH--

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 75-100A-02

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
A number of separate silicon solid-state detectors, each having a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain particle-type/energy measurements. Seven channels measured protons in the range 1 to 500 MeV. Six channels measured alpha particles in the range 4 to 400 MeV. One channel measured electrons greater than 2.8 MeV.

------- GOES 1, LEINBACH--

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 75-100A-03

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the full disk of the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 1.27E-4 m beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm and had a 1.27E-3 m beryllium window for measurements of X rays in the wavelength range 0.5 to 3 A.

------- GOES 1, LEINBACH--

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 75-100A-04

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION
A biaxial, closed-loop, fluxgate magnetometer was deployed on a boom about .61 m long. The magnetometer had one sensor aligned parallel to the spacecraft spin axis and the other perpendicular to this axis, and measured the magnetic field at synchronous altitude. Each sensor had a selectable range (+50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

------- GOES 1, NESS STAFF--------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 75-100A-01

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
The Visible Infrared Spin-Scan Radiometer (VISSR) flown on GOES 1 provided day/night observations of cloud cover and earth/cloud radiance temperature measurements from a synchronous, spin-stabilized, geostationary satellite for use in operational weather analysis and forecasting. The two-channel instrument was able to take both full and partial pictures of the earth's disk. The infrared channel (10.5 to 12.6 micrometers) and the visible channel (0.55 to 0.70 micrometer) used a common optics system. Incoming radiation was received by an elliptically shaped scan mirror and collected by a Ritchey-Chretien optical system. The scan mirror was set at a nominal angle of 45 deg to the VISSR optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-to-east scan motion when the spin axis of the spacecraft was oriented parallel with the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror north to south at the completion of each spin. A full picture took 18.2 min to complete and about 2 min to retrace. During each scan, the field of view on the earth was swept by a linear array of eight visible-spectrum detectors, each with a ground resolution of 0.9 km at zero nadir angle. A mercury-cadmium-telluride detector sensed the infrared portion of the spectrum with a horizontal resolution of approximately 8 km at zero nadir angle. The infrared portion of the detector measured radiance temperatures between 180 and 315 deg K, with a proposed sensitivity between 0.4 and 1.4 deg K. The VISSR output was digitized and transmitted to the National Oceanographic and Atmospheric Administration (NOAA) Command Data Acquisition Station (CDA), Wallops Island, Va. There the signal was fed into a "line stretcher" where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for re-broadcast to data utilization stations (DUS). The VISSR data, as with all operational type data, were handled by NOAA, and the majority of data was archived by National Climatic Center, Satellite Data Service Division, NOAA, Washington, D.C. The NSSDC has limited amount of research-oriented data.

------- GOES 1, NESS STAFF--------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 75-100A-05

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The meteorological data collection and transmission system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations were handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small, ground-based APT receiver stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations for contact in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the types and varieties of sensors used at an individual DCP station.

**************************** GOES 2 ****************************

SPACECRAFT COMMON NAME- GOES 2
ALTERNATE NAMES- GOES-B

NSSDC ID- 77-048A

LAUNCH DATE- 06/16/77 WEIGHT- 294. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/21/77
ORBIT PERIOD- 1436. MIN INCLINATION- 0.88 DEG
PERIAPSIS- 35266. KM ALT APOAPSIS- 36304. KM ALT

PERSONNEL
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

GOES 2 was a NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit. For more deatailed information, see "The GOES/SMS User's Guide."

------- GOES 2, LEINBACH--

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 77-048A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

A number of separate silicon solid-state detectors, each with a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain the following particle type and energy measurements: seven channels measuring protons in the range 1 to 500 MeV, six channels measuring alpha particles in the range 4 to 400 MeV, and one channel measuring electrons > 2.8 MeV.

------- GOES 2, LEINBACH--

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 77-048A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the full disk of the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 1.27E-4 m beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm, and had a 1.27E-3 m beryllium window for measurement of X rays in the wavelength range 0.5 to 3 A.

------- GOES 2, LEINBACH--

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 77-048A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
OI - J.C.	JOSELYN	NOAA-ERL

BRIEF DESCRIPTION

The magnetometer was a biaxial, closed-loop, fluxgate magnetometer with the two sensors aligned at right angles to one another. After mounting on a short boom (about .61 m), one sensor was aligned parallel to the spacecraft spin axis and the other perpendicular to this axis. Each sensor had a selectable range (50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

------- GOES 2, NESS STAFF--

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 77-048A-05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The meteorological data collection and transmission system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

**************************** GOES 3****************************

SPACECRAFT COMMON NAME- GOES 3
ALTERNATE NAMES- 10952, GOES-C

NSSDC ID- 78-062A

LAUNCH DATE- 06/16/78 WEIGHT- 294. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/17/78
ORBIT PERIOD- 1450.8 MIN	INCLINATION- 1.7 DEG
PERIAPSIS- 35469.1 KM ALT	APOAPSIS- 36679.2 KM ALT

PERSONNEL

PM - G.W.	LONGANECKER	NASA-GSFC
PS - W.E.	SHENK	NASA-GSFC

BRIEF DESCRIPTION

GOES 3 was a NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a visible infrared spin-scan radiometer (VISSR) to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small APT-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained orbit. For more detailed information, see "The GOES/SMS User's Guide."

------- GOES 3, LEINBACH---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 78-062A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

A number of separate silicon solid-state detectors, each with a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain the following particle type and energy measurements: seven channels measuring protons in the range 1 to 500 MeV, six channels measuring alpha particles in the range 4 to 400 MeV, and one channel measuring electrons greater than 2.8 MeV.

------- GOES 3, LEINBACH---------------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 78-062A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator, which was mounted so that the declination of its axis could be controlled by ground command to ensure that the sun was viewed by the telescope once during every vehicle rotation. One ion chamber was filled with argon at 1 atm for detection of 1- to 8-A X rays and had a 1.27E-4 m beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm, and had a 1.27E-3 m beryllium window for measurements of X rays in the wavelength range 0.5 to 3 A.

------- GOES 3, LEINBACH---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 78-062A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
OI - J.C.	JOSELYN	NOAA-ERL

BRIEF DESCRIPTION

The magnetometer was a biaxial, closed-loop, fluxgate magnetometer with the two sensors aligned at right angles to one another. After mounting on a short boom (about .61 m), one sensor was aligned parallel to the spacecraft spin axis and the other perpendicular to this axis. Each sensor had a selectable range (50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

------- GOES 3, NESS STAFF-------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 78-062A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS
OI - W.E.	SHENK	NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer (VISSR) flown on GOES 3 was capable of providing both day and night observations of cloud cover and earth/cloud radiance temperature measurements from a synchronous spin-stabilized, geostationary satellite for use in operational weather analysis and forecasting. The two-channel instrument was able to take both full and partial pictures of the earth's disk. Both the infrared channel (10.5 to 12.5 micrometers) and the visible channel (0.55 to 0.75 micrometers) used a common optics system. Incoming radiation was received by an elliptically shaped scan mirror and collected by a Ritchey-Chretien optical system. The scan mirror was set at a nominal angle of 45 deg to the VISSR optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-to-east scan motion when the spin axis of the spacecraft was oriented parallel to the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror north to south at the completion of each spin. A full picture took 18.2 min to complete and about 2 min to retrace. During each scan, eight visible-spectrum detectors swept the earth, with a ground resolution of 0.9 km at zero nadir angle. A mercury-cadmium-telluride detector sensed the infrared portion of the spectrum with a horizontal resolution of approximately 9 km at zero nadir angle. The infrared portion of the detector measured radiance temperatures between 180 and 315 deg K with a proposed sensitivity between 0.4 and 1.4 deg K. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for rebroadcast to APT user stations. The VISSR data were handled by NOAA and eventually sent to the National Climatic Center, Satellite Data Services Division, Washington, D.C., for archiving. The NSSDC also has some limited amounts of research-oriented data.

------- GOES 3, NESS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-062A-05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The data collection system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GOES 4 ***************************

SPACECRAFT COMMON NAME- GOES 4
ALTERNATE NAMES- GOES-D, 11964

NSSDC ID- 80-074A

LAUNCH DATE- 09/09/80 WEIGHT- 660. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 09/28/80
ORBIT PERIOD- 1436.2 MIN	INCLINATION- 0.2 DEG
PERIAPSIS- 35776. KM ALT	APOAPSIS- 35800. KM ALT

PERSONNEL

MG - A.J.	CERVENKA	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC
PS - W.E.	SHENK	NASA-GSFC

BRIEF DESCRIPTION

GOES 4 was the fourth in a series of NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a VISSR (visible infrared spin scan radiometer) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small automatic picture transmission (APT)-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit.

------- GOES 4, LEINBACH---

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 80-074A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six energy ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the energy range above 500 keV. The third detector, high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 4, LEINBACH---

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 80-074A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consisted of ion chamber detectors. The wavelength ranges and minimum useful threshold sensitivity were 0.5 to 3 A, 1.0E-13 J per cm per s; and 1 to 8 A, 1.0E-12 J per cm per s; with a dynamic range of 1.E4.

------- GOES 4, LEINBACH---

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 80-074A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION

The magnetometer had a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES 4, NESS STAFF--------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- 80-074A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 08

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

The Visible-Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS) operated in three distinct modes to provide parameter flexibility, spectral band selection, geographic location, and signal-to-noise ratio. The VISSR mode was the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometer) used common optics. Incoming radiation was collected by a Ritchey-Chretien optical system. The spinning motion of the spacecraft (100 rpm) provided a west-to-east (W-to-E) scan motion. Scan mirror tilt after each spin provided a north-to-south (N-to-S) scan motion. A full picture took 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9-km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9-km horizontal resolution) swept the earth during each scan. In the dwell-sounding mode, up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) were positioned into the optical train while the scanner was dwelling on a single N-to-S scan line. The filter wheel could be programmed so that each spectral band filter could dwell on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km resolution detectors could be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands the 13.8-km resolution detectors were used. Selectable frame size, position and scan direction were also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5-km) visible data were provided for imaging. In some of the spectral regions, multiple-line data were required to enhance the signal-to-noise ratio. Typically, 167 satellite spins at the same N-to-S scan line position were required to obtain the desired sounding data. This number of spins per line should be adequate to obtain soundings having a 30- x 30-km resolution and require approximately 1.9 minutes on the average. The multispectral imaging (MSI) mode could provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation took advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produced a complete infrared map when the detectors were operated every other scan line. This allowed using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, could be selected. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquistion Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for rebroadcast to APT user stations. Data from the VAS MSI mode and the dwell sounding mode were not "stretched". The VISSR data were handled by NOAA and eventually sent to the National Climatic Center, Satellite Data Services Division, NOAA, Washington, D.C., for archiving.

------- GOES 4, NESS STAFF--------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 80-074A-05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

The meteorological data collection and transmission system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GOES 5***************************

SPACECRAFT COMMON NAME- GOES 5
ALTERNATE NAMES- GOES-E

NSSDC ID- 81-049A

LAUNCH DATE- 05/22/81 WEIGHT- 660. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/29/81
ORBIT PERIOD- 1434. MIN INCLINATION- 0.32 DEG
PERIAPSIS- 35715. KM ALT APOAPSIS- 35769. KM ALT

PERSONNEL
MG - A.J. CERVENKA NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
GOES 5 was the fifth in a series of NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a visible infrared spin scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small automatic picture transmission (APT)-equipped regional stations and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit.

------- GOES 5, LEINBACH---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 81-049A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV and alpha particles in six energy ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the energy range above 500 keV. The third detector, high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 5, LEINBACH---------------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 81-049A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION
The X-ray monitor consisted of ion chamber detectors. The wavelength ranges and minimum useful threshold sensitivity were 0.5 to 3 A, 1.0E-13 J per sq cm per s; and 1 to 8 A, 1.0E-12 J per sq cm per s; with a dynamic range of 1.E4.

------- GOES 5, LEINBACH---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 81-049A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.C. JOSELYN NOAA-ERL

BRIEF DESCRIPTION
The magnetometer had a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES 5, NESS STAFF-------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- 81-049A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION
The Visible Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS) operated in three distinct modes to provide parameter flexibility, spectral band selection, geographic location, and signal-to-noise (S/N) ratio. The VISSR mode was the same as the VISSR system on board the other GOES spacecraft. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) used common optics. Incoming radiation was collected by a Ritchey-Chretien optical system. The spinning motion of the spacecraft (100 rpm) provided a west-to-east (W-to-E) scan motion. Scan mirror tilt after each spin provided a north-to-south (N-to-S) scan motion. A full picture took 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 horizontal resolution) swept the earth during each scan. In the dwell-sounding mode, up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) were positioned into the optical train while the scanner was dwelling on a single N-to-S scan line. The filter wheel could be programmed so that each spectral band filter could dwell on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km resolution detectors could be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands the 13.8-km resolution detectors were used. Selectable frame size, position and scan direction were also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data were provided for imaging. In some of the spectral regions, multiple-line data were required to enhance the signal-to-noise (S/N) ratio. Typically, 167 satellite spins at the same N-to-S scan line position were required to obtain the desired sounding data. This number of spins per line should be adequate to obtain soundings having a 30- x 30-km resolution and require approximately 1.9 minutes on the average. The multispectral imaging (MSI) mode could provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation took advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produced a complete infrared map when they were operated every other scan line. This allowed using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, could be selected. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched for transmission back to the

satellite at reduced bandwidth for rebroadcast to APT user stations. The VISSR data were handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Since Wallops Island is committed to NOAA operational support, data from the VAS MSI mode and the dwell sounding mode are not "stretched."

------- GOES 5, NESS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 81-049A-05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

The meteorological data collection and transmission system was an experimental communications and data-handling system designed to receive and process meteorological data collected from remotely located, earth-based, data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to existing small, ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GOES 6***************************

SPACECRAFT COMMON NAME- GOES 6
ALTERNATE NAMES- GOES-F, 14050

NSSDC ID- 83-041A

LAUNCH DATE- 04/28/83 WEIGHT- 660. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/29/83
ORBIT PERIOD- 1436.0 MIN INCLINATION- 0.27 DEG
PERIAPSIS- 35775.2 KM ALT APOAPSIS- 35796.2 KM ALT

PERSONNEL
MG - A.J. CERVENKA NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

GOES 6 was the sixth in a series of NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carried (1) a visible infrared spin scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water vapor content at various levels, (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with small automatic picture transmission (APT) and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measured 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylindrical shell. The primary structural members were a honeycombed equipment shelf and a thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially from the thrust tube and was affixed to the solar panels, which formed the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit.

------- GOES 6, LEINBACH---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 83-041A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consisted of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitored protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There was also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitored protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES 6, LEINBACH---------------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 83-041A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consisted of ion chamber detectors. The ranges and minimum useful threshold sensitivities were 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.E4.

------- GOES 6, LEINBACH---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 83-041A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
OI - J.N. BARFIELD SOUTHWEST RES INST

BRIEF DESCRIPTION

The magnetometer had a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES 6, NESS STAFF-------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- 83-041A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS) operated in three distinct modes to provide parameter flexibility, spectral band selection, geographic location, and signal-to-noise ratio. The VISSR mode was the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) used common optics. Incoming radiation was collected by a Ritchey-Chretien optical system. One west-to-east raster line was formed for each revolution of the spacecraft. A 20-deg north-to-south frame resulted from a total of 1821 steps of the scan mirror, one 0.192-mr step for each spacecraft revolution. A full picture took 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) swept the earth during each scan. In the dwell-sounding mode, up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) were positioned into the optical train while the scanner was dwelling on a single N-to-S scan line. The filter wheel was programmed so that each spectral band filter dwelled on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km-resolution detectors could be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors were used. Selectable frame size, position and scan direction were also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data were provided for imaging. In some of the spectral regions, multiple-line data were required to enhance the signal-to-noise ratio. Typically, 167 satellite spins at the same N-to-S scan line position were required to obtain the desired sounding data. This number of spins per line could provide the soundings a 30-x 30-km resolution and required approximately 1.9 minutes on the average. The multispectral imaging (MSI) mode could provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation took advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produced a complete infrared map when they were operated every other scan line. This allowed using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, could be selected. Visible data were not available in this mode. The VISSR output was digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal was fed into a "line stretcher," where it was stored and time-stretched. The stetched data were immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data were handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving.

------- GOES 6, NESS STAFF---------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 83-041A-05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The meteorological data collection system was an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations could be handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small ground-based APT receiving stations. This communications system operated on S-band frequencies. The minimum data collection system for one small meteorological satellite consisted of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** HAKUCHO***************************

SPACECRAFT COMMON NAME- HAKUCHO
ALTERNATE NAMES- COSMIC RADIATION SAT B, CORSA-B
11272

NSSDC ID- 79-014A

LAUNCH DATE- 02/21/79 WEIGHT- 96. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3C

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/22/79
ORBIT PERIOD- 93.1 MIN INCLINATION- 29.9 DEG
PERIAPSIS- 421. KM ALT APOAPSIS- 433. KM ALT

PERSONNEL
PM - M. ODA U OF TOKYO
PS - S. HAYAKAWA NAGOYA U

BRIEF DESCRIPTION
After launch, the sixth Japanese satellite, CORSA-B, was officially renamed Hakucho, the Japanese word for swan. The spacecraft had the shape of an octagonal rightprism, with maximum width 80 cm and height 65 cm, and was spin-stabilized at a rate of 5 to 8 rpm. The spin axis was maneuvered by means of magnetic torquing. Eleven X-ray detectors of various specifications were devoted to the observation of cosmic X-rays. Four detectors had fields of view (FOV) perpendicular to the spin axis and scanned over a wide region of the sky in search of X-ray novae and transients. The other seven detectors had FOVs along the spin axis and were used to study selected celestial objects. Observational data could either be telemetered back in real-time or stored in an on-board data-recorder. Telemetry frequencies were 136.725 MHz at 500 mW and 400.450 MHz at 100 mW. The scientific objectives of Hakucho were (1) a systematic survey and watch of short-lived X-ray phenomena, (2) observations of selected X-ray sources with a wide spectral coverage (0.1 to 100 keV), (3) study of short-term variabilities and pulsations of X-ray sources, and (4) study of the X-ray sky in the sub-keV range.

------- HAKUCHO, MAKINO---------------------------------------

INVESTIGATION NAME- DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES

NSSDC ID- 79-014A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - F. MAKINO ISAS
PI - Y. TANAKA ISAS

BRIEF DESCRIPTION
This experiment surveyed the sky and monitored transient soft X-ray sources, in the energy range 0.1 to 2 keV, by means of gas-flow proportional counters with thin polypropylene windows.

------- HAKUCHO, MIYAMOTO---------------------------------------

INVESTIGATION NAME- MONITOR OF X-RAY SOURCES

NSSDC ID- 79-014A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.	MIYAMOTO	OSAKA U
PI - Y.	OGAWARA	ISAS
PI - I.	KONDO	U OF TOKYO
PI - M.	YOSHIMORI	RIKKYO U
OI - H.	INOUE	ISAS
OI - K.	KOYAMA	ISAS
OI - K.	MAKISHIMA	ISAS
OI - M.	MATSUOKA	ISAS
OI - T.	MURAKAMI	ISAS
OI - T.	OHASHI	ISAS
OI - N.	SHIBAZAKI	ISAS
OI - Y.	TANAKA	ISAS
OI - H.	KUNIEDA	ISAS
OI - F.	MAKINO	ISAS
OI - K.	MASAI	NAGOYA U
OI - F.	NAGASE	NAGOYA U
OI - Y.	TAWARA	NAGOYA U
OI - H.	TSUNEMI	OSAKA U
OI - K.	YAMASHITA	OSAKA U

BRIEF DESCRIPTION
This experiment located and monitored X-ray burst sources and other variable X-ray sources, over the energy range 1 to 100 keV, using rotating modulation collimators and other collimators.

*************************** HELIOS-A***************************

SPACECRAFT COMMON NAME- HELIOS-A
ALTERNATE NAMES- HELIO-A, PL-741A
HELIOS 1

NSSDC ID- 74-097A

LAUNCH DATE- 12/10/74 WEIGHT- 371.2 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY BMWF
UNITED STATES NASA-OSSA

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC	EPOCH DATE- 01/16/75
ORBIT PERIOD- 190.15 DAYS	INCLINATION- 0.02 DEG
PERIAPSIS- 0.3095 AU RAD	APOAPSIS- 0.985 AU RAD

PERSONNEL

MG - E.J.	MONTOYA	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - A.	KUTZER	GES FUR WELTRAUMFORSCH
PM - G.W.	OUSLEY	NASA-GSFC
PS - H.	PORSCHE	DFVLR
PS - J.H.	TRAINOR	NASA-GSFC

BRIEF DESCRIPTION

This spacecraft was one of a pair of deep space probes developed by the Federal Republic of Germany (FRG) in a cooperative program with NASA. Experiments were provided by scientists from both FRG and the U.S. NASA supplied the Titan/Centaur launch vehicle. The spacecraft was equipped with two booms and a 32-m electric dipole. The payload consisted of a fluxgate magnetometer; electric and magnetic wave experiments, which covered various bands in the frequency range 6 Hz to 3 MHz; charged-particle experiments, which covered various energy ranges starting with solar wind thermal energies and extending to 1 GeV; a zodiacal-light experiment; and a micrometeoroid experiment. The purpose of the mission was to make pioneering measurements of the interplanetary medium from the vicinity of the earth's orbit to 0.3 AU. The spin axis was normal to the ecliptic, and the nominal spin rate was 1 rps. The outer spacecraft surface was dielectric, effectively (because of the sheath potential) raising the low-energy threshold for the solar wind plasma experiment to as high as 100 eV. Also, sheath-related coupling caused by the spacecraft antennae produced interference with the wave experiments. The spacecraft was capable of being operated at bit rates from 4096 to 8 bps, variable by factors of two. While the spacecraft was moving to perihelion, it was generally operated from 64 to 256 bps; and near 0.3 AU, it was operated at the highest bit rate. Because of a deployment failure of one axis of the 32-m, tip-to-tip, dipole antenna, one axis was shorted, causing the antenna to function as a monopole. The major effect of this anomaly was to increase the effective instrument thresholds, and to introduce additional uncertainties in the effective antenna length. Instrument descriptions written by the experimenters were published (some in German, some in English) in the journal Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, FECHTIG --

INVESTIGATION NAME- MICROMETEOROID DETECTOR AND ANALYZER

NSSDC ID- 74-097A-12

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
INTERPLANETARY DUST

PERSONNEL

PI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - J.	WEIHRAUCH	MPI-PHYS ASTROPHYS

BRIEF DESCRIPTION

The purpose of the experiment (E10) was to investigate some theories about the interplanetary dust including whether or not (1) the number of particles increases toward the sun, (2) the cutoff for small particles is dependent on the distance from the sun, because solar pressure increases nearer the sun, and (3) the number densities of particles change near the orbits of planets. The kinetic energy of dust particles hitting a target with high velocity (several km/s) caused the material to vaporize and become partially ionized. The generated plasma cloud was then separated by appropriate voltages into its negative (electron) part and into positive ions. The mass and the energy of the dust particles was determined from the impulse heights. A time-of-flight mass spectrometer in connection with the target allowed the small ion cloud to be analyzed. In this way, the investigation of the chemical composition of the dust particles became possible. The threshold for the detection of a particle was about 1.E-15 g. Mass and energy determination was possible for particles larger than about 1.E-14 g. For particles larger than 1.E-13 g, a mass spectrum was gathered. For further details, see pp. 268-269 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT --

INVESTIGATION NAME- SOLAR WIND PLASMA WAVE

NSSDC ID- 74-097A-04

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - S.J.	BAUER	GRAZ U
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5a) shared the 32-m, tip-to-tip electric antenna with experiments -05 and -06. The instrument consisted of a 16-channel spectrum analyzer with approximately logarithmically equispaced center frequencies, 16 log compressors, 16 R-C integrators for averaging the log compressed electric field amplitude between readouts, and 16 peak detectors which were reset after readout. The 16 averages and 16 peak log values were sampled almost simultaneously. The channels covered the frequency range of about 20 Hz to 200 kHz, with four channels per decade of frequency. The log compressors had a dynamic range of 100 dB. Sampling rate depended in detail on the spacecraft bit rate and telemetry format. The fastest real-time telemetered rate was for 16 averages and 16 peak values to be sampled every 1.125 s. Whenever a very strong signal was detected in a pre-selected channel, the shock alarm data mode was initiated in which the electric field spectrum, magnetic field, and plasma data were recorded into spacecraft memory for a period starting before and terminating after the triggering signal time. The maximum sampling rate of the spectrum data in this mode was 14.2 samples per s for each channel. One half of the dipole antenna failed to extend properly and was short circuited to the spacecraft ground. The resultant configuration was that of a monopole which was calculated to have an effective length of approximately 8 m. The primary detrimental effects were the loss of 6 dB in E field sensitivity due to the shortened antenna and the increase in the 178 kHz channel by 25 dB. Solar cell and sheath effects caused interference in the lowest 6 channels (which was less severe with increasing channel frequency). For more details, see J. Geophys. Res., v. 82, p. 632, 1975, and pp. 245-247 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT --

INVESTIGATION NAME- FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS

NSSDC ID- 74-097A-05

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - S.J.	BAUER	GRAZ U
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5b) shared the 32-m, tip-to-tip, electric dipole antenna with experiments -04 and -06. Instrumentation consisted of three tunable plasma wave receivers, a fixed-frequency wideband receiver, and a waveform sampler. The tunable receivers and wideband receiver provided data for direct telemetry to earth. Each of the tunable receivers covered a different frequency band in the range 1 Hz to 200 kHz. The high-frequency receiver had 96 frequency settings separated by about 4%, and covered the frequency range 6.4 kHz to 205 kHz. The mid-range receiver had 48 frequency settings separated by about 8%, and covered the range 208 Hz to 6.07 kHz. The low-frequency receiver had 24 settings with 15% separation, and covered the range 11 Hz to 309 Hz. The response time of the low-frequency receiver was approximately 1 s, necessitating the inclusion of the wideband receiver to obtain information about the angular distribution of waves appearing in the low-frequency band. This receiver covered the frequency range 1 Hz to 200 Hz. The time resolution depended in detail on the spacecraft telemetry format, bit rate, and experiment operational mode. When the shock alarm mode became activated, data from the waveform sampler were read into spacecraft memory for a period starting before and ending after the triggering event. In this mode, the instantaneous voltage across the antenna was passed through a low-pass filter with corner frequency dependent on the sampling rate, and measured at discrete intervals, the most rapid being 2.2 ms. One half of the electric dipole failed to deploy properly, and became short-circuited to ground. The resulting configuration was that of a monopole with an operational effective length of about 8 m. This resulted in a 6-dB loss in sensitivity, and an increased receiver noise level, particularly at low frequencies. In addition, the high-gain telemetry antenna produced additional interference. For a more detailed discussion, see p. 248 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, GURNETT --

INVESTIGATION NAME- 26.5-KHZ TO 3-MHZ RADIO WAVE

NSSDC ID- 74-097A-06

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - D.A. GURNETT — U OF IOWA
OI - P.J. KELLOGG — U OF MINNESOTA
OI - R.R. WEBER — NASA-GSFC
OI - R.G. STONE — NASA-GSFC

BRIEF DESCRIPTION

This experiment (E5c) shared the 32-m, tip-to-tip, electric dipole antenna with experiments -04 and -05. A dual (redundant) 16-frequency channel radiometer, with approximately logarithmically spaced channels, was used to detect type III radio emissions associated with solar flare events in the frequency band 26.5 kHz to 3 MHz. The experiment sampling rate was synchronized such that each spacecraft revolution was divided into 32 sectors. The sequence and frequency of sampling depended on the instrument operational mode (one of four) and the spacecraft bit rate. The most rapid sampling possible for a single-frequency channel was once every 1/32 of a satellite spin period, or about .03 s. A typical sampling sequence was for one frequency channel to be sampled for 16 sectors (1/2 revolution), followed by the next. One half of the 32-m dipole failed to extend properly during deployment, and was shorted to ground. The resulting antenna configuration was that of a monopole with an operational effective length of about 8 m. This shorter configuration resulted in increased radio-frequency interference (RFI) of from 3 to 30 dB above expected levels, and a loss of 6 dB in gain. Another problem was unexpected interference with the high-gain telemetry antenna. This added 60 dB RFI at 27.5 kHz, decreasing with increasing frequency, so that above 200 kHz it produced no detectable interference. For more details about the instrument and modes of operation, see p. 250 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, KEPPLER---------------------------------------

INVESTIGATION NAME- ENERGETIC ELECTRON AND PROTON DETECTOR

NSSDC ID- 74-097A-10

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - E. KEPPLER — MPI-AERONOMY
OI - B. WILKEN — MPI-AERONOMY
OI - D.J. WILLIAMS — APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objective of the experiment (E8) was to study the origin and the distribution mechanism of low-energy electrons and protons. The instrument, a magnetic spectrometer, consisted of six semiconductor detectors with the field of view in the plane of the ecliptic. Species separation was achieved by an inhomogeneous magnetic field oriented perpendicular to the particle path. Four electron and two proton detectors measured electrons from 20 to 1000 keV and protons from 80 to 1000 keV. The proton measurements were made with a two-detector telescope employing coincidence and anticoincidence logic. Both particle species were measured in 16 energy channels through pulse-height analysis. For further information see pp. 261-263 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, KUNDT---------------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 74-097A-14

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
CELESTIAL MECHANICS

PERSONNEL

PI - W. KUNDT — U OF HAMBURG
OI - W.G. MELBOURNE — NASA-JPL

BRIEF DESCRIPTION

This experiment used the tracking data to obtain a detailed spacecraft orbit and improved knowledge of the orbital elements of the earth-moon system and general relativity parameters.

------- HELIOS-A, KUNOW---------------------------------------

INVESTIGATION NAME- COSMIC-RAY PARTICLES

NSSDC ID- 74-097A-07

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - H. KUNOW — U OF KIEL
OI - G.H. WIBBERENZ — U OF KIEL
OI - G. GREEN — U OF KIEL
OI - M. MUELLER-MELLIN — U OF KIEL
OI - M. WITTE — MPI-AERONOMY
OI - H. HEMPE — U OF KIEL

BRIEF DESCRIPTION

The objective of the experiment (E6) was to study high-energy, charged, cosmic-ray particles of solar, planetary, and galactic origin in interplanetary space. Protons and alpha particles with energies >1.3 MeV/nucleon, and electrons >0.3 MeV were measured within interplanetary space over the range from 0.3 to 1.0 AU. The instrument, a particle telescope with a 55-deg field of view, consisted of five semiconductor detectors, one sapphire Cerenkov counter, and one scintillation counter, all enclosed by an anticoincidence cylinder. The telescope was calibrated prior to launch using radioactive sources, particle accelerators, and ground-level muons. It measured protons and alpha particles in six channels (1.3-3.3, 3.3-13, 13-27, 27-37, 37-45, and >45 MeV/nucleon) and electrons in five energy channels (0.3-0.8, 0.8-2, 2-3, 3-4, and >4 MeV). For more detail see pp. 253-257 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, LEINERT---------------------------------------

INVESTIGATION NAME- ZODIACAL LIGHT PHOTOMETER

NSSDC ID- 74-097A-11

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
ZODIACAL LIGHT

PERSONNEL

PI - C. LEINERT — MPI-ASTRONOMIE
OI - E. PITZ — MPI-ASTRONOMIE

BRIEF DESCRIPTION

This experiment (E9) consisted of three photometers looking at 15 deg, 30 deg, and 90 deg from the ecliptic. These photometers observed the intensity and polarization of the zodiacal light in UV, blue, and visual bands. The purpose of this experiment was to obtain information about the spatial distribution, size, and nature of interplanetary dust particles. For further details, see pp. 264-267 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, NESS---------------------------------------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS

NSSDC ID- 74-097A-02

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - N.F. NESS — NASA-GSFC
OI - F. MARIANI — U OF ROME
OI - L.F. BURLAGA — NASA-GSFC
OI - S.C. CANTARANO — CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

This experiment (E3) consisted of a boom-mounted, triaxial-fluxgate magnetometer. An automatic inflight range switch system selected the optimum of four ranges that were minus to plus 16, 48, 144, and 432 nT per sensor. These had corresponding digitization resolutions of minus to plus 0.03, 0.09, 0.28, and 0.84 nT. A sensor flipper was actuated every 36 h to assist in sensor zero level determination. For telemetry bit rates above 256 bps, vector measurements were made at rates between 1 and 16 per s, depending on bit rates. At lower bit rates, averages and variances were computed on board for transmission to earth.

------- HELIOS-A, NEUBAUER---------------------------------------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS

NSSDC ID- 74-097A-01

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - F.M. NEUBAUER — U OF COLOGNE
OI - A. MAIER — BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

The instrument (E2) consisted of a triaxial fluxgate magnetometer mounted on a 2.75-m boom to make magnetic field measurements up to 4 Hz. Data from each axis were first sent through a low-pass filter with the 3-dB attenuation point at 4 Hz. Depending on the telemetry format and bit rate, the data were fed either into a time-averaging computer or directly connected to telemetry. A shock identification computer triggered the storage of rapid-rate data in the spacecraft memory when there were discontinuities in the variations of the ambient magnetic field. Two measurement ranges were used, plus or minus 100 and 400 nT with resolutions of plus or minus 0.2 and 0.8 nT, respectively. The instrument was equipped with a flipper mechanism, which reoriented each sensor by 90 deg periodically. For detailed information, see p. 232 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, NEUBAUER-------------------------------------

INVESTIGATION NAME- SEARCH COIL MAGNETOMETER

NSSDC ID- 74-097A-03 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL

PI - F.M.	NEUBAUER	U OF COLOGNE
OI - G.	DEHMEL	BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

This experiment (E4) was designed to investigate the magnetic component of electromagnetic waves in the solar wind from 0.3 to 1.0 AU. By means of its waveform channel (WFC) the rapid variations of the magnetic field were measured up from plus or minus 8.75 nT to plus or minus 275 nT in three orthogonal directions from 4 to 128 Hz. A spectrum analyzer observed the field components in the ecliptic plane and perpendicular to it, to obtain the power spectral density and peak values for eight logarithmically spaced channels in the range from 4.7 to 2200 Hz. Because of the large amount of data produced by this experiment, an adaptive data reduction was applied. For interesting time intervals selected by the fluxgate magnetometer (74-097A-01, Neubauer) or Gurnett (-04), waveform data could be read into an on-board memory at a rapid rate to be transmitted slowly afterwards. For more detailed information see p. 241 in Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, ROSENBAUER-----------------------------------

INVESTIGATION NAME- PLASMA DETECTORS

NSSDC ID- 74-097A-09 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS SPACE PLASMAS

PERSONNEL

PI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - H.	PELLKOFER	MPI-EXTRATERR PHYS
OI - J.H.	WOLFE	NASA-ARC

BRIEF DESCRIPTION

This experiment (E1) employed three plasma analyzers for positive ions and one for electrons. All detectors were mounted normal to the spin axis. Positive ions with energy per charge within the range 0.155 to 15.32 keV/Q were measured in two angular dimensions using a combination of a hemispherical, a quadrispherical, and a sinusoidally shaped electrostatic analyzer. Electrons with energy from 0.5 to 1660 eV were measured with a hemispherical electrostatic analyzer in one dimension. The experiment operated in several modes, with differing time resolution depending in detail on telemetry format and satellite bit rate. Typical time resolution was on the order of a minute. Also, whenever the special shock alarm mode was triggered by experiments -04 or -01, high-time-resolution plasma data for a period before and after the event was recorded into spacecraft memory for later transmission. Because the spacecraft body was dielectric, sheath potentials of up to 100 eV degraded the usefulness of data taken in the lower electron-energy channels. This phenomenon was judged to have minimal effects on the usefulness of the ion data. For more detailed information see p. 226 of Raumfahrtforschung, v. 19, n. 5, 1975.

------- HELIOS-A, TRAINOR--------------------------------------

INVESTIGATION NAME- GALACTIC AND SOLAR COSMIC RAYS

NSSDC ID- 74-097A-08 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S) COSMIC RAYS PARTICLES AND FIELDS

PERSONNEL

PI - J.H.	TRAINOR	NASA-GSFC
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - B.J.	TEEGARDEN	NASA-GSFC
OI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - K.G.	MCCRACKEN	CSIRO

BRIEF DESCRIPTION

The detector complement of this experiment (E7) consisted of three separate delta E/delta x vs E telescopes and a proportional counter for monitoring solar X-rays in the range 2-8 keV. The high-energy telescope had a geometric factor of 0.22 sq cm-sr and measured electrons in three ranges between 2 and 8 MeV, and protons and alpha particles in three ranges between 20 and 56 MeV/n. Protons above 230 MeV are also measured. The first low-energy telescope (geometric factor was 0.155 sq cm-sr) measured protons and z >1 particles in three ranges between 3 and 21 MeV/n. The second low-energy telescope (geometric factor was 0.015 sq cm-sr) measured protons in several ranges between 0.12 and 2.1 MeV, alpha particles in the ranges 0.6-2.1 and 6-21.2 MeV/n, and electrons in four ranges between 0.12 and 2 MeV. For a number of coincidence modes, counting-rate data sectored into eight 45-deg sectors were obtained. The data cycle time was dependent on the spacecraft telemetry rate (variable between 4096 and 8 bits/s) and format. Under optimum conditions, five events per second were pulse-height analyzed and the rate data cycle was of the order of 5 min. At the slowest combination of bit rate and format, a complete data cycle required about 2.5 h. See IEEE Trans. on Nuc. Sci., NS-22, p. 570, 1975, and Raumfahrtforschung, v. 19, n. 5, pp. 258-260, 1975, for further details.

**************************** HILAT ****************************

SPACECRAFT COMMON NAME- HILAT
ALTERNATE NAMES- STP P83-1, P83-1
14154

NSSDC ID- 83-063A

LAUNCH DATE- 06/27/83 WEIGHT- 248.3 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY

UNITED STATES	DOD-USAF
CANADA	NRC

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE-
ORBIT PERIOD- 101.5 MIN	INCLINATION- 82.2 DEG
PERIAPSIS- 828.2 KM ALT	APOAPSIS- 830.8 KM ALT

PERSONNEL

PM - K.A.	POTOCKI	APPLIED PHYSICS LAB
PS - E.J.	FREMOUW	PHYSICAL DYNAMICS, INC

BRIEF DESCRIPTION

The HILAT satellite (also known as P83-1) was a refurbished TRANSIT satellite which carried experiments intended to provide remote-sensing and in-situ measurements of physical quantities likely to provide insight into the dynamics of plasma-density irregularity formation in the high-latitude ionosphere. The main objectives of the HILAT mission were (1) to extend the data base on irregularity strength and three-dimensional shape, (2) to probe several hypotheses about the development, transport, and decay of scintillation-producing irregularities, (3) to document the role of convective instabilities at high latitudes, and (4) to describe the role of peculiarly high-latitude influences such as particle precipitation and other aspects of ionospheric/magnetospheric coupling. The satellite was three-axis stabilized by means of a TRANSIT gravity-gradient boom and an added momentum wheel for yaw stabilization. The altitude was selected to be sufficiently high for scintillation and imager operation but low enough for the various in-situ measurements. The inclination was chosen to give overhead passes nearly along the geomagnetic meridian at the preferred receiving locations. The orbit precessed 24 hours in approximately 6 months, so that observations during all hours of the day and night were possible in roughly one calendar season.

------- HILAT, HARDY---

INVESTIGATION NAME- ELECTRON SPECTROMETER

NSSDC ID- 83-063A-04 INVESTIGATIVE PROGRAM SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S) MAGNETOSPHERIC PHYSICS IONOSPHERES PARTICLES AND FIELDS

PERSONNEL

PI - D.A.	HARDY	USAF GEOPHYS LAB

BRIEF DESCRIPTION

As a means for identifying primary ionization and energy input to the F layer, HILAT carried an electron spectrometer. The spectrometer could measure the number and energy flux of electrons in each of 16 channels in the energy range between 20 eV and 20 keV. The instrument contained sensors for viewing at the zenith, at the nadir, and at 40 deg to the zenith. It had three operating modes, including one designed for identification of finely structured precipitation. In this mode, eight channels from a given look direction could be sampled often enough to yield low-energy (20 to 600 eV) spectra with an in-track resolution of about 310 m.

------- HILAT, HUFFMAN -------

INVESTIGATION NAME- AURORAL IONOSPHERIC MAPPER

NSSDC ID- 83-063A-05

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - R.E. HUFFMAN — USAF GEOPHYS LAB
PI - C.I. MENG — APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The Auroral/Ionospheric Mapper (AIM) instrument was intended to give simultaneous synoptic information through optical remote sensing of the ionosphere. The instrument consisted primarily of a vacuum-ultraviolet (VUV) imaging spectrometer which could operate in any of three modes. The most ambitious mode provided an image at any of six selectable wavelengths in the band 1150 to 2000 A, with a bandwidth of 30 A. Cross-track line scans of 134.4 deg by 1.5 deg with 336 pixels per line could yield nadir resolution of 3 by 13 km at 350-km altitude. The other two modes were fixed nadir-viewing ones with a field-of-view of 1.5 deg by 0.4 deg. One of these modes was a spectrophotometer mode in which a 30-A filter could be swept from 1150 A to 2000 A. The other mode was a simple fixed-wavelength photometer mode. In addition to its VUV spectrophotometer, the AIM payload contained a pair of nadir-viewing visual-wavelength photometers. One operated at 3914 A and the other operated at 6300 A.

------- HILAT, POTEMRA -------

INVESTIGATION NAME- THREE-AXIS FLUXGATE MAGNETOMETER

NSSDC ID- 83-063A-03

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.A. POTEMRA — APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The three-axis fluxgate magnetometer was designed to measure the local vector magnetic field with a precision of 12 nT at a resolution of about 400 m. About 20 vector samples per second could be measured.

------- HILAT, RICH -------

INVESTIGATION NAME- PLASMA MONITOR

NSSDC ID- 83-063A-02

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - F.J. RICH — USAF GEOPHYS LAB
OI - W.B. HANSON — U OF TEXAS, DALLAS
OI - R.A. HEELIS — U OF TEXAS, DALLAS

BRIEF DESCRIPTION

This payload was designed to provide several in-situ measurements related to plasma density irregularities in the ionosphere and consisted of the following three instruments: a Langmuir probe, a retarding-potential analyzer (RPA), and an ion drift meter. These instruments were mostly of proven design. Once in 64 seconds, a 2-s voltage sweep of the Langmuir probe was made to obtain direct measurements of the electron density and temperature and refinement of the RPA measurements, including assessment of the spacecraft potential. Between sweeps, the Langmuir-probe voltage was held in the electron saturation region and current was employed to measure plasma-density fluctuations. Its output was sampled 32 times per second, logarithmically amplified, and passed through a bank of filters centered at 70, 120, 700, and 2200 Hz. The filter outputs were detected and sampled once per second to give samples of, respectively, 100-m, 60-m, 10-m, and 3-m irregularity strength at the satellite altitude (830 km), with precisions of about plus or minus 1% and resolutions of about 7 km. The RPA measured the plasma density with a precision of about plus or minus 25% and a spatial resolution of about 4.7 km by sensing ions during 28 rapid voltage sweeps in a 64-s operating sequence. In this RPA sequence, there were also slower sweeps for providing more accurate measurements of ion temperature and dominant-ion mass. The in-track ion drift speed was measured with the RPA three times every 2 seconds, with a resolution of about 4.7 km and a precision of about 200 m/s. The ion drift meter measured the cross-track drift velocity at the rate of 16 vectors per second with a resolution of about 460 meters and a precision of about 30 m/s. From these measurements of ion drift, the local convective electric field intensity could be determined.

------- HILAT, RINO -------

INVESTIGATION NAME- COHERENT BEACON

NSSDC ID- 83-063A-01

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - C.L. RINO — SRI INTERNATIONAL
OI - P.A. FORSYTH — WESTERN ONTARIO U

BRIEF DESCRIPTION

The coherent beacon experiment used both phase measurements and amplitude measurements to enhance the utility of scintillation measurements for the remote sensing of plasma density irregularities in the ionosphere. The experiment could transmit coherently on five frequencies: one at VHF (138 MHz), three at UHF (390, 413, and 536 MHz), and one at L band (1239 MHz). Complex-signal scintillation measurements were possible at both VHF and UHF. The triplet of UHF signals was used to obtain the total electron content (TEC) from measurements of the second difference of phase. The L-band signal served as a phase reference for the VHF and UHF scintillation measurements and could also be used for observations of amplitude scintillation at L band. Use of a moderate gain (about 9 dB) broad-beam steerable antenna allowed the measurement of minimum detectable phase fluctuations at UFH and VHF of 6 deg at low elevations and of about 1 degree overhead. These values are for post-detection bandwidths of 100 Hz, corresponding to a sampling resolution of about 30 m in an overhead phase screen at 350-km altitude. A considerably narrower post-detection bandwidth value was used for TEC measurements, yielding a minimum detectable value on the order of 1E15 electrons/sq m with an overhead sampling interval of about 3 km in the F layer.

*************** HINOTORI ***************

SPACECRAFT COMMON NAME- HINOTORI
ALTERNATE NAMES- ASTRONOMICAL SATELLITE-A, ASTRO-A
12307

NSSDC ID- 81-017A

LAUNCH DATE- 02/21/81 — WEIGHT- 188. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S

SPONSORING COUNTRY/AGENCY
JAPAN — ISAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/22/81
ORBIT PERIOD- 96.2 MIN	INCLINATION- 31.3 DEG
PERIAPSIS- 548. KM ALT	APOAPSIS- 603. KM ALT

PERSONNEL
PM - Y. TANAKA — ISAS
PS - K. TANAKA — U OF TOKYO

BRIEF DESCRIPTION

The main objective of the ASTRO-A mission was the detailed study of solar flares during solar maximum. Principal investigations were (1) imaging of solar flare X-rays in the range 10 to 40 keV by means of rotating modulation collimators and (2) spectroscopy of X-ray emission lines from highly ionized iron in solar flares in the range 1.7 to 2.0 A by means of a Bragg spectrometer. Wavelength scanning was achieved by the spacecraft revolution, with an offset pointing of the spin axis with respect to the sun. Investigations (1) and (2) each had a time resolution of 6 s. In addition, the following investigations were included: three solar flare X-ray monitors that recorded the time profile and spectrum of the X-ray flares in the range 2 to 20 keV, a solar flare gamma-ray detector for the range 0.2 to 9.0 MeV, a particle detector that monitored electron flux above 100 keV, and plasma probes for the measurement of electron density and temperature.

------- HINOTORI, HIRAO -------

INVESTIGATION NAME- PLASMA PROBES

NSSDC ID- 81-017A-06

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
SPACE PLASMAS

PERSONNEL
PI - K. HIRAO — ISAS
PI - F. OYA — U OF TOHOKU
OI - K. OYAMA — ISAS
OI - T. TAKAHASHI — U OF TOHOKU

BRIEF DESCRIPTION

This experiment used plasma probes to measure electron density and electron temperature during the solar maximum period.

------- HINOTORI, KONDO --

INVESTIGATION NAME- SOLAR FLARE GAMMA-RAY DETECTOR IN 0.2-9.0 MEV RANGE

NSSDC ID- 81-017A-04

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - I.	KONDO	U OF TOKYO
PI - K.	OKUDAIRA	RIKKYO U
OI - Y.	HIRASHIMA	RIKKYO U
OI - M.	YOSHIMORI	RIKKYO U

BRIEF DESCRIPTION

This experiment measured gamma-rays from solar flares in the energy range 0.2 to 9.0 MeV with a scintillation counter.

------- HINOTORI, MATSUOKA --

INVESTIGATION NAME- TIME PROFILE AND SPECTRA OF X-RAY FLARES IN THE 2-20 KEV RANGE

NSSDC ID- 81-017A-03

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - M.	MATSUOKA	ISAS
OI - K.	KOYAMA	ISAS
OI - H.	INOUE	ISAS
OI - Y.	TANAKA	ISAS

BRIEF DESCRIPTION

This experiment used a gas scintillation proportional counter to record time profiles and spectra of solar X-ray flares in the 2- to 20-keV and above 20-keV ranges.

------- HINOTORI, TAKAKURA --

INVESTIGATION NAME- SOLAR FLARE 5-40 KEV X-RAYS USING ROTATING MODULATION COLLIMATOR IMAGING

NSSDC ID- 81-017A-01

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - T.	TAKAKURA	ISAS
OI - S.	MIYAMOTO	OSAKA U
OI - Y.	OGAWARA	ISAS
OI - K.	OKI	U OF TOKYO
OI - T.	MURAKAMI	ISAS
OI - S.	TSANETA	ISAS

BRIEF DESCRIPTION

This experiment used rotating modulation collimators to image solar flare X-rays in the energy range of 10 to 40 keV. The time resolution was 6 s.

------- HINOTORI, TAKEUCHI --

INVESTIGATION NAME- ELECTRON FLUX ABOVE 100 KEV PARTICLE DETECTOR MONITOR

NSSDC ID- 81-017A-05

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - H.	TAKEUCHI	INST PHYS + CHEM RES
OI - T.	IMAI	INST PHYS + CHEM RES
OI - T.	KOHNO	INST PHYS + CHEM RES

BRIEF DESCRIPTION

This experiment used a pair of proportional counters to monitor solar electron flux above 100 keV.

------- HINOTORI, TANAKA --

INVESTIGATION NAME- SOLAR FLARE X-RAY BRAGG SPECTROSCOPY IN 1.7-2.0 A RANGE

NSSDC ID- 81-017A-02

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - K.	TANAKA	ISAS
OI - F.	MORIYAMA	ISAS
OI - K.	NISHI	U OF TOKYO

BRIEF DESCRIPTION

This experiment used a Bragg spectrometer to study the spectroscopy of X-ray emission lines from highly ionized iron in solar flares. The spectral range covered was 1.7 to 2.0 A. Wavelength scanning was achieved by spacecraft rotation with the spin axis offset slightly from the sun. The time resolution was 6 s.

*************************** IK BULGARIA 1300 *****************

SPACECRAFT COMMON NAME- IK BULGARIA 1300
ALTERNATE NAMES- INTERCOSMOS BULGAR 1300, 12645

NSSDC ID- 81-075A

LAUNCH DATE- 08/07/81 WEIGHT- KG
LAUNCH SITE-
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY

BULGARIA	BAS
U.S.S.R.	INTERCOS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 08/08/81
ORBIT PERIOD- 101.9 MIN	INCLINATION- 81.2 DEG
PERIAPSIS- 825. KM ALT	APOAPSIS- 906. KM ALT

PERSONNEL

PM - A.G.	IOSIPHIAN	INTERCOSMOS
PM - K.B.	SERAFIMOV	CLSR-BAS
PS - M.M.	GOGOSHEV	CLSR-BAS
PS - I.	KUTIEV	CLSR-BAS
PS - V.M.	BALEBANOV	IKI

BRIEF DESCRIPTION

The spacecraft contained a set of plasma, particles, fields, and optical experiments that were designed and constructed in Bulgaria. The spacecraft was three-axis stabilized with the negative Z-axis pointing toward the center of the earth and the X-axis pointing along the velocity vector. The outer skin of the spacecraft, including the solar panels, was coated with a conducting material in order to allow the proper measurement of electric fields and low energy plasma. Both active and passive thermal control were employed. The solar panels supplied 2 kilowatts and batteries were used during eclipse periods. There were two tape recorders, each with a capacity of 60 megabits. The transmitter radiated about 10 W in the 130 MHz band.

------- IK BULGARIA 1300, ARSHINKOV ----------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 81-075A-11

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - I.	ARSHINKOV	CLSR-BAS
PI - A.	BOCHEV	CLSR-BAS
OI - L.	JUSGOV	IZMIRAN

BRIEF DESCRIPTION

The instrument consisted of three fluxgate magnetometers that extended from the spacecraft along the negative Z-axis to obtain the vector field. The range of field intensity covered was plus or minus 64,000 nT with a resolution of 2 nT.

------- IK BULGARIA 1300, BANKOV -------------------------------

INVESTIGATION NAME- ION DRIFT METER AND RETARDING POTENTIAL ANALYZER

NSSDC ID- 81-075A-01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL

PI - L.	BANKOV	CLSR-BAS
OI - B.	KIROV	CLSR-BAS
OI - M.G.	GUSHEVA	CLSR-BAS
OI - V.G.	ISTOMIN	IKI

BRIEF DESCRIPTION

The instrument consisted of a Retarding Potential Analyzer (RPA) and an Ion Drift Meter (IDM) that pointed out along the spacecraft X-axis. This set of instruments was capable of measuring the three components of the ion velocity vector from 0.1 to 5 km/s, the ion density from 1.E2 to 1.E6 per cm cubed, the ion temperature from 600 to 10,000 deg K, plasma irregularities from 0.1 to 100%, the photoelectron energy range from 1 to 30 eV, and the mass range from 1 to 56 u. For more details on the IDM see L. G. Bankov et al., Adv. Space Res. v. 2, n. 7, pp. 71-74, 1983.

------- IK BULGARIA 1300, DACHEV-------------------------------

INVESTIGATION NAME- LOW-ENERGY ELECTRON-PROTON ELECTROSTATIC ANALYZER ARRAY IN 3 ORTHOGONAL DIRECTIONS

NSSDC ID- 81-075A-05

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	TS.	DACHEV	CLSR-BAS
OI -	Y.	MATVIYCHUK	CLSR-BAS
OI -	I.	IVANOV	CLSR-BAS
OI -	M.	TELZOV	IKI

BRIEF DESCRIPTION

The instrument consisted of three sets of electrostatic analyzers (ESA); each set had three ESAs, one to measure protons and two to measure electrons. The angular field of view for each individual analyzer was 7 deg x 24 deg. One set viewed out along the spacecraft Z-axis and the other two along perpendicular axes in the spacecraft X-Y plane at azimuthal angles of 50 and 140 deg. The energy per charge range from 0.2 to 15 keV/Q could be covered by up to 16 channels/s and the energy resolution adjusted to 0.1, 0.2, or 0.3. The flux range was 1.E4 to 1.E9 particle/(sq cm-sr-keV-s).

------- IK BULGARIA 1300, GOGOSHEV-----------------------------

INVESTIGATION NAME- VISIBLE AIRGLOW PHOTOMETERS

NSSDC ID- 81-075A-08

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI -	M.M.	GOGOSHEV	CLSR-AO
OI -	N.P.	PETKOV	CLSR-AO
OI -	TS.N.	GOGOSHEVA	CLSR-AO
OI -	A.	KUZMIN	IKI

BRIEF DESCRIPTION

The instrument consisted of two optical channels with interference filters at wavelengths (in A) of 4278 ,4861, 5577, 6300, 6345 and 7320. The field of view of one channel was 3 deg. The second channel viewed plus and minus 15 deg from the nadir in 6300 A and was done by a mirror scanning over this range so that an image of the upper atmosphere in the red line of oxygen was obtained. The nadir was the spacecraft negative Z-axis. The sensitivity range was 10 rayleighs to 100 kilorayleighs. For more details on this instrument see M. Gogoshev et al., Adv. Space Res., v. 2, n. 7, pp. 115-120, 1983.

------- IK BULGARIA 1300, GOGOSHEV-----------------------------

INVESTIGATION NAME- WAVELENGTH SCANNING UV PHOTOMETER

NSSDC ID- 81-075A-09

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI -	M.M.	GOGOSHEV	CLSR-AO
OI -	ST.I.	SARGOICHEV	CLSR-AO
OI -	B.	MENDEVA	CLSR-BAS
OI -	L.P.	SMIRNOVA	IKI

BRIEF DESCRIPTION

The instrument consisted of a lined grating spectrometer that scanned from 1150 to 2600 A with a resolution of 10 A. The field of view was conical with a half angle of 4.5 deg centered on the nadir, which was the spacecraft negative Z-axis. The intensity range covered from 80 rayleighs to 200 kilorayleighs. The instrument was capable of measuring the nightglow and the dayglow atmospheric spectra.

------- IK BULGARIA 1300, IVANOVA-----------------------------

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ION TRAP

NSSDC ID- 81-075A-02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI -	T.	IVANOVA	CLSR-BAS
OI -	T.	SAMARDZHIEV	CLSR-BAS
OI -	S.	HALOVA	CLSR-BAS
OI -	G.L.	GDALEVICH	IKI

BRIEF DESCRIPTION

The instrumentation consisted of two spherical electrostatic probes. The first was a three-electrode device, with a floating potential on the outer grid, that measured the plasma density fluctuations. The outer diameter of this probe was 60 mm and its optical transparency was 44%. The collector current was measured in the range of 1.E-10 to 1.E-6 amps and the outer grid potential was measured. The second probe was a four-electrode (three grids) device with a sawtooth voltage applied to the middle grid that sat on a step of 0, -4, -8, or -12 V, depending on what the potential of the outer floating grid was. The dynamic range of the collector current was 1.E-7 to 1.E-11 broken into 4 ranges. The first and second derivatives of the ion current were obtained to provide ion temperatures in the range of 500 to 5000 deg K and an ion density of 1.E2 to 1.E6 per cubic cm for each ion specie that could be determined. The outer diameter of this probe was 70 mm and its optical transparency was 27%. For more details on this instrument see T. N. Ivanova et al., Adv. Space Res., v. 2, n. 7, pp. 21-25, 1983.

------- IK BULGARIA 1300, IVANOVA-----------------------------

INVESTIGATION NAME- CYLINDRICAL LANGMUIR PROBE

NSSDC ID- 81-075A-03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI -	T.	IVANOVA	CLSR-BAS
OI -	K.	GEORGIEVA	CLSR-BAS
OI -	V.F.	GUBSKI	IKI

BRIEF DESCRIPTION

The instrumentation consisted of a cylindrical Langmuir probe, 14 cm long and 4 mm in diameter, that was capable of measuring the electron temperature from 1.E3 to 1.E4 deg K and the electron density from 5.E2 to 3.E5 per cm cubed. The probe viewed along the spacecraft negative Z-axis.

------- IK BULGARIA 1300, KAZAKOV-----------------------------

INVESTIGATION NAME- PROTON SOLID-STATE TELESCOPE

NSSDC ID- 81-075A-07

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	K.	KAZAKOV	CLSR-BAS
OI -	I.	GEORGIEV	CLSR-BAS
OI -	N.	NIKOLAEVA	IKI

BRIEF DESCRIPTION

The instrumentation consisted of a solid-state telescope that viewed out along the spacecraft Z-axis and measured protons from 90 keV to 1 MeV in four channels.

------- IK BULGARIA 1300, MARKOV------------------------------

INVESTIGATION NAME- DOUBLE SPHERICAL ELECTRON TEMPERATURE PROBES

NSSDC ID- 81-075A-04

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI -	V.	MARKOV	CLSR-BAS
OI -	D.	TEODOSIEV	CLSR-BAS

BRIEF DESCRIPTION

The instrumentation consisted of a double probe that viewed along the spacecraft X-axis. The gold spherical sensors were capable of measuring the electron temperature from 500 to 6,000 deg K and the spacecraft potential from -30 to +5 V.

------- IK BULGARIA 1300, NENOVSKI-----------------------------

INVESTIGATION NAME- ION ENERGY-MASS COMPOSITION ANALYZERS

NSSDC ID- 81-075A-06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.	NENOVSKI	CLSR-BAS
OI - R.	KOLEVA	CLSR-BAS
OI - J.	SEMKOVA	CLSR-BAS
OI - V.	SMIRNOV	IKI
OI - O.L.	VAISBERG	IKI

BRIEF DESCRIPTION

The instrument consisted of two separate analyzers: the low-energy one viewed out along the spacecraft X-axis (along the velocity vector of the spacecraft) and the high-energy one along the Z-axis. The mass range for both devices was 1 to 64 u. The electrostatic analyzer portion of the low-energy unit allowed ions with a range from 1 to 27 eV/Q to enter the magnetic analyzer. The energy resolution was 0.055; the field of view was 1 deg x 6 deg; and the flux range covered was 1.E5 to 1.E10 ions/(sq cm-sr-eV-s). The high-energy unit had the following parameters: E/Q range from 0.2 to 8 keV/Q; energy resolution of 0.07; and flux range 5.E5 to 1.E9 ions/(sq cm-sr-eV-s). For more details about this instrument see P. Nenovski et al., Adv. Space Res., v. 2, n. 7, pp. 27-30, 1983.

------- IK BULGARIA 1300, STANEV------------------------------

INVESTIGATION NAME- TRIAXIAL SPHERICAL VECTOR ELECTRIC FIELD PROBES

NSSDC ID- 81-075A-10

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.	STANEV	CLSR-BAS
OI - D.	TEODOSIEV	CLSR-BAS
OI - M.	PETRUNOVA	CLSR-BAS
OI - M.	PETRUNOVA	CLSR-BAS
OI - V.	CHMYREV	IZMIRAN

BRIEF DESCRIPTION

This investigation involved the measurement of: (1) the quasistatic vector electric field, (2) the spacecraft potential from -10 to + 2 V, (3) the vector electric and magnetic fields in the frequency range 0.2 to 6.5 Hz, (4) the X or Z electric field component (determined by ground command) over the frequency range 0.03 to 16 kHz with a dynamic range of 80 dB, and (5) the Y component of the magnetic field, over the same frequency and dynamic range as in (4). The double probe method was used for electric fields; four spherical probes covered with vitreous carbon were placed at the ends of 4.5-m booms to serve as the sensors. A triaxial fluxgate magnetometer with a frequency-dependent feedback loop was employed as the sensor for the frequency range of 0.2 to 6.5 Hz while a search-coil magnetometer was used for the high frequency range. The sensitivity of the DC electric field measurements was 0.6 mV/m while it was 0.01 mV/m for the 0.2 to 6.5 Hz range. In this range the magnetic field sensitivity was 3.E-2 nT. There were eight bandpass filters centered at (in Hz) 33, 70, 140, 560, 1200, 4900, 9300, and 15000 to measure wave amplitudes. In addition, two parallel correlators were used to determine autocorrelation functions in the range 0.1 to 5 kHz. For further details on this instrument see G. Stanev et al., Adv. Space Res., v. 2, n. 7, pp. 43-48, 1983.

**************************** IMP-J ****************************

SPACECRAFT COMMON NAME- IMP-J
ALTERNATE NAMES- PL-723A, IMP 8
EXPLORER 50, 6893

NSSDC ID- 73-078A

LAUNCH DATE- 10/26/73 WEIGHT- 371. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/29/73
ORBIT PERIOD- 17286. MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 141224. KM ALT	APOAPSIS- 288940. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - J.H.	KING	NASA-GSFC

BRIEF DESCRIPTION

IMP 8 (Explorer 50), the last satellite of the IMP series, was a drum-shaped spacecraft, 135.6 cm across and 157.4 cm high, instrumented for interplanetary and magnetotail studies of cosmic rays, energetic solar particles, plasma, and electric and magnetic fields. Its initial orbit was more elliptical than intended, with apogee and perigee distances of about 45 and 25 earth radii. Its eccentricity decreased after launch. The spacecraft spin axis was normal to the ecliptic plane, and the spin rate was 23 rpm. The data telemetry rate was 1600 bps. The objectives of the extended IMP-8 operations (after 1981) were (1) to provide solar wind parameters as input for magnetospheric studies and as a 1-AU baseline for deep space studies, (2) to add 30-40 RE IMP data to simultaneous ISEE 1, 2, and 3 data for studies of magnetospheric boundary and tail phenomena, and of the phenomena upstream of the bow shock, and (3) to continue solar cycle variation studies with a single set of well-calibrated and understood instruments.

------- IMP-J, AGGSON---

INVESTIGATION NAME- ELECTROSTATIC FIELDS

NSSDC ID- 73-078A-11

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.L.	AGGSON	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

The instrument was designed to measure ambient electric fields in the solar wind and the earth's magnetosheath up to 1 kHz in frequency. The sensor consisted of a pair of 70-m wire antennas (140 m, tip-to-tip), which were held rigid by centrifugal force due to satellite spin (about 24 rpm). The wires were insulated from the plasma, except for their short outer sections, to remove the active probe area from the spacecraft sheath. The antenna served as a double floating probe, and measurements were obtained every 1/4 spacecraft revolution (about 0.75 s). ULF and VLF measurements were obtained using seven 60% bandwidth filters with center frequencies logarithmically spaced from 1 Hz to 1 kHz. These frequency channels had an intrinsic sensitivity of 1.0E-5 V/m, and a peak range of 1.0E-2 V/m. However, the effective low-frequency filter threshold was determined by interference due to harmonics of the spacecraft spinning within an asymmetric sheath. The other major limitation was also due to sheath effect. Whenever the electron plasma density was less than about 10 particles/cu cm, the sheath overlapped the active antenna portions and precluded meaningful measurements of ambient conditions.

------- IMP-J, BAME--

INVESTIGATION NAME- SOLAR PLASMA ELECTROSTATIC ANALYZER

NSSDC ID- 73-078A-10

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

A hemispherical electrostatic analyzer measured the directional intensity of positive ions and electrons in the solar wind, magnetosheath, and magnetotail. Ions as heavy as oxygen were resolved when the solar wind temperature was low. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. In the solar wind, positive ions from 200 eV to 5 keV (15% spacing, 3% resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) were studied. In the magnetosheath, positive ions from 200 eV to 5 keV (15% spacing, 3% resolution) and from 200 eV to 20 keV (30% spacing, 15% percent resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) were studied. In the magnetotail, positive ions from 200 eV to 20 keV (30% spacing, 15% resolution) and electrons from 5 eV to 1 keV (30% spacing, 15% resolution) and from 100 eV to 20 keV (15% resolution) were studied.

------- IMP-J, BRIDGE--

INVESTIGATION NAME- SOLAR PLASMA FARADAY CUP

NSSDC ID- 73-078A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
OI - A.J.	LAZARUS	MASS INST OF TECH
OI - J.H.	BINSACK	MASS INST OF TECH
OI - E.F.	LYON	MASS INST OF TECH

BRIEF DESCRIPTION

A modulated split-collector Faraday cup, perpendicular to the spacecraft spin axis, was used to study the directional intensity of positive ions and electrons in the solar wind, transition region, and magnetotail. Electrons were studied in eight logarithmically equispaced energy channels between 17 eV and 7 keV. Positive ions were studied in eight channels between 50 eV and 7 keV. A spectrum was obtained every eight spacecraft revolutions. Angular information was obtained in either 15 equally spaced intervals during a 360-deg revolution of the satellite or in 15 angular segments centered more closely about the spacecraft-sun line.

------- IMP-J, FRANK--

INVESTIGATION NAME- MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 73-078A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA

BRIEF DESCRIPTION

This experiment was designed to measure the energy spectra of low-energy electrons and protons in the geocentric range of 30 to 40 earth radii to give further data on geomagnetic storms, aurora, tail and neutral sheet, and other magnetospheric phenomena. The detector was a dual-channel, curved-plate electrostatic analyzer (LEPEDEA - low energy proton and electron differential energy analyzer) with 16 energy intervals between 5 eV and 50 keV. It had an angular field of view of 9 deg by 25 deg. The detector could be operated in one of two modes: (1) one providing good angular resolution (16 directions for each particle energy band) once each 272 s, and (2) the other providing good temporal resolution in which the entire energy range in four directions was measured every 68 s. For further details see L. A. Frank et al., J. Geophys. Res., v. 81, p. 5859, 1976.

------- IMP-J, GLOECKLER--

INVESTIGATION NAME- SOLID-STATE DETECTORS

NSSDC ID- 73-078A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - G.	GLOECKLER	U OF MARYLAND
OI - C.Y.	FAN	U OF ARIZONA
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

This experiment was designed to determine the composition and energy spectra of low-energy particles observed during solar flares and 27-d recurrent events. The detectors used included (1) an electrostatic analyzer (to select particles of the desired energy per charge) combined with an array of windowless solid-state detectors (to measure the energy loss) and surrounded by an anticoincidence shield, and (2) a thin-window proportional counter, solid-state particle telescope. The experiment measured particle energies from 0.1 to 10 MeV per charge in 12 bands and uniquely identified positrons and electrons as well as nuclei with charges of Z from 1 to 8 (no charge resolution for Z greater than 8). Two 1000-channel pulse-height analyzers, one for each detector, were included in the experiment payload.

------- IMP-J, GURNETT--

INVESTIGATION NAME- ELECTROSTATIC WAVES AND RADIO NOISE

NSSDC ID- 73-078A-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - T.L.	AGGSON	NASA-GSFC
OI - G.W.	PFEIFFER	U OF IOWA

BRIEF DESCRIPTION

A wide-band receiver was used to observe high-resolution frequency-time spectra, and a six-channel narrow-band receiver with a variable center frequency was used to observe wave characteristics. The receivers operated from three antenna systems. The first system contained a pair of long dipole antennas (one, extendable to about 124 m, normal to the spacecraft spin axis and the other antenna, extendable to about 6.1 m, along the spin axis). The second system contained a boom-mounted triad of orthogonal loop antennas. The third system consisted of a boom-mounted 0.51-m spin-axis dipole. The magnetic and electric field intensities and frequency spectra, polarization, and direction of arrival of naturally occurring radio noise in the magnetosphere were observed. Phenomena studied were the time-space distribution, origin, propagation, dispersion, and other characteristics of radio noise occurring across and on either side of the magnetospheric boundary region. The frequency range for electric fields was 0.3 Hz to 200 kHz, and for magnetic fields it was 20 Hz to 200 kHz.

------- IMP-J, KRIMIGIS--

INVESTIGATION NAME- CHARGED PARTICLE MEASUREMENTS EXPERIMENT

NSSDC ID- 73-078A-08

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - T.P.	ARMSTRONG	U OF KANSAS
OI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

Three solid-state detectors in an anticoincidence plastic scintillator observed electrons between 0.2 and 2.5 MeV; protons between 0.3 and 500 MeV; alpha particles between 2.0 and 200 MeV; heavy particles with Z values ranging from 2 to 5 with energies greater than 8 MeV; heavy particles with Z values ranging between 6 and 8 with energies greater than 32 MeV; and integral protons and alphas of energies greater than 50 MeV/nucleon, all with dynamic ranges of 1 to 1E+6 particles per (sq cm s sr). Five thin-window Geiger-Mueller tubes observed electrons of energy greater than 15 keV, protons of energy greater than 250 keV, and X rays with wavelengths between 2 and 10 A, all with a dynamic range of 10 to 1E+8 (per sq cm s sr). Particles and X rays, primarily of solar origin, were studied, but the dynamic range and resolution of the instrument also permitted observation of cosmic rays and magnetotail particles. For further details, see T. P. Armstrong et al., J. Geophys. Res., v. 83, p. 5198, 1978.

------- IMP-J, MCDONALD--

INVESTIGATION NAME- SOLAR AND COSMIC-RAY PARTICLES

NSSDC ID- 73-078A-09

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - B.J.	TEEGARDEN	NASA-GSFC

BRIEF DESCRIPTION

The GSFC cosmic-ray experiment was designed to measure energy spectra, composition, and angular distributions of solar and galactic electrons, protons, and heavier nuclei up to Z=30. Three distinct detector systems were used. The first system consisted of a pair of solid-state telescopes that measured integral fluxes of electrons above 150, 350, and 700 keV and of protons above .05, .15, .50, .70, 1.0, 1.2, 2.0, 2.5, 5.0, 15, and 25 MeV. Except for the .05-MeV proton mode, all counting modes had unique species identification. The second detector system was a solid-state dE/dx vs E telescope that looked perpendicular to the spin axis. This telescope measured Z=1 to 16 nuclei with energies between 4 and 20 MeV/nucleon. Counts of particles in the 0.5- to 4-MeV/nucleon range, with no charge resolution, were obtained as counts in the dE/dx sensor but not in the E sensor. The third detector system was a three-element telescope whose axis made an angle of 39 deg with respect to the spin axis. The middle element was a CsI scintillator, while the other two elements were solid-state sensors. The instrument responded to electrons between 2 and 12 MeV and to Z=1 to 30 nuclei in the energy range 20 to 500 MeV/nucleon. For particles below 80 MeV, this instrument acted as a dE/dx vs E detector. Above 80 MeV, it acted as a bidirectional triple dE/dx vs E detector. Flux directionality information was obtained by dividing certain portions of the data from each detector into eight angular sectors. For further details, see B. J. Teegarden et al., Astrophys. J., v. 202, p. 815, 1975.

------- IMP-J, NESS---

INVESTIGATION NAME- MAGNETIC FIELD EXPERIMENT

NSSDC ID- 73-078A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
OI - C.S.	SCEARCE	NASA-GSFC
OI - J.B.	SEEK	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a boom-mounted triaxial fluxgate magnetometer designed to study the interplanetary and geomagnetic tail magnetic fields. Each sensor had three dynamic ranges of plus or minus 12, plus or minus 36, and plus or minus 108 nT. With the aid of a bit compaction scheme (delta modulation), there were 25 vector measurements made and telemetered per second. The experiment operated normally from launch until mid-1975. On July 11, 1975, because of a range indicator problem, the experiment operation was frozen into the 36-nT range. The digitization accuracy in this range is about plus or minus 0.3 nT. On March 23, 1978, the sensor flipper failed. After that time, alternative methods of Z-axis sensor zero-level determination were required.

------- IMP-J, SIMPSON---

INVESTIGATION NAME- SOLAR FLARE HIGH-Z/LOW-E AND LOW-Z ISOTOPE

NSSDC ID- 73-078A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - M.	GARCIA-MUNOZ	U OF CHICAGO

BRIEF DESCRIPTION

This experiment used two telescopes to measure the composition and energy spectra of solar (and galactic) particles above about 0.5 MeV/nucleon. The main telescope consisted of five collinear elements (three solid state, one CsI, and one sapphire Cerenkov) surrounded by a plastic anticoincidence shield. The telescope had a 60-deg, full-angle acceptance cone with its axis approximately normal to the spacecraft spin axis, permitting 8-sectored information on particle arrival direction. Four elements of the main telescope were pulse-height analyzed, and low- and high-gain modes could be selected by command to permit resolution of the elements H through Ni or of electrons and the isotopes of H and He and light nuclei. A selection-priority scheme was included to permit sampling of less abundant particle species under normal and solar-flare conditions. The low-energy telescope was essentially a two-element shielded solid-state detector with a 70-deg full-angle acceptance cone. The first element was pulse-height analyzed, and data were recorded by sectors.

------- IMP-J, STONE---

INVESTIGATION NAME- ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES

NSSDC ID- 73-078A-06 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - E.C.	STONE	CALIF INST OF TECH
OI - R.E.	VOGT	CALIF INST OF TECH

BRIEF DESCRIPTION

This experiment was designed to measure the differential energy spectra of the isotopes of hydrogen through oxygen from 2 to 40 MeV/nucleon, and of electrons from 0.2 to 5 MeV. The instrument consisted of a stack of 11 fully depleted silicon solid-state detectors surrounded by a plastic scintillator anticoincidence cup. The outer two solid-state detectors were annular, permitting measurements in both narrow-geometry (typical geometrical factor was 0.2 sq cm-sr) and wide-geometry (typical geometric factor was 1.5 sq cm-sr) coincidence modes. Anisotropy data (45-deg angular and 20-s temporal resolution) were obtained. For further details, see R. A. Mewaldt and E. C. Stone, Astrophys. J., v. 205, p. 93, 1976.

------- IMP-J, WILLIAMS---

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 73-078A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS
INTERPLANETARY PHYSICS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
OI - C.O.	BOSTROM	APPLIED PHYSICS LAB
OI - J.H.	TRAINOR	NASA-GSFC

BRIEF DESCRIPTION

The purposes of this investigation were (1) to study the propagation characteristics of solar cosmic rays through the interplanetary medium over the energy ranges indicated below, (2) to study electron and proton fluxes throughout the geomagnetic tail and near the flanks of the magnetosphere, and (3) to study the entry of solar cosmic rays into the magnetosphere. The instrumentation consisted of a three-element telescope employing fully depleted surface-barrier solid-state detectors and a magnet to deflect electrons. Two side-mounted detectors were used to measure the deflected electrons. Two additional detectors in separate mounts were used to measure charged particles above 15 keV (F), Z greater than or equal to 2 above 0.6 MeV (G1) and above 1.0 MeV (G2), and Z greater than or equal to 3 above 2.0 MeV (G3). The telescope measured protons in three ranges between 2.1 and 25 MeV (14, 15, 16); Z greater than or equal to 1 in three ranges between 0.05 and 2.1 MeV (11, 12, 13); alpha particles between 8.4 and 35.0 MeV in two ranges (111, 112); Z greater than or equal to 2 between 2.2 and 8.4 MeV (110); and a background channel (19). Deflected electrons were measured in two ranges between 30 and 200 keV (17, 18). A complete description of the instrument was given by D. J. Williams in NOAA Technical Report ERL 393-SEL 40, October 1977.

**************************** INSAT-1A **************************

SPACECRAFT COMMON NAME- INSAT-1A
ALTERNATE NAMES- INDIAN NATIONAL SAT., 13129

NSSDC ID- 82-031A

LAUNCH DATE- 04/10/82 WEIGHT- 1152. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

INDIA	ISRO
UNITED STATES	NASA-OSTO

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 04/11/82
ORBIT PERIOD- 631.5 MIN	INCLINATION- 28.1 DEG
PERIAPSIS- 225. KM ALT	APOAPSIS- 35784. KM ALT

PERSONNEL

MG - J.P.	SINGH	ISRO SATELLITE CENTER
PM - P.P.	KALE	INDIA DEPT OF SPACE

BRIEF DESCRIPTION

The Insat-1 satellite program incorporated two three-axis stabilized spacecraft in geostationary orbit (Insat-1A at 74 degrees E and Insat-1B at 94 degrees E) with a host of ground stations throughout India. The Insat-1A satellite, built by the Ford Aerospace and Communications Corporation, was designed to provide combined telecommunications, direct TV broadcast, and meteorological service to India's civilian community over a 7-year-in-orbit lifespan. The telecommunications package provided two-way, long distance telephone circuits and direct radio and TV broadcasting to the remotest areas of India. The meteorology package was composed of a scanning very-high-resolution, two-channel radiometer (VHRR) to provide full-frame, full-earth coverage every 30 minutes. The visual channel (0.55-0.75 micrometers) had a 2.75-km resolution while the IR channel (10.5-12.5 micrometers) had an 11-km resolution. Using the Insat TV capability, early warnings of impending disasters (i.e., floods, storms, etc.) could directly reach the civilian population, even in remote areas. The Insat-1A also had a data channel for relaying meteorological, hydrological, and oceanographic data from unattended land-based or ocean-based data collection and transmission platforms.

------- INSAT-1A, UNKNOWN---

INVESTIGATION NAME- VERY HIGH RESOLUTION RADIOMETER (VHRR)

NSSDC ID- 82-031A-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

The Very High Resolution Radiometer (VHRR) was a two-channel scanning instrument. Both channels gave full earth coverage with a full frame image every 30 minutes. The visible channel (10.5-12.5 micrometers) had a 2.75-km resolution, and the IR channel had an 11-km resolution. The half-hourly observations were used for monitoring weather systems over land and sea, i.e., observing cyclones and measuring sea surface and cloud top temperatures.

------- INSAT-1A, UNKNOWN-------------------------------------

INVESTIGATION NAME- TELECOMMUNICATIONS PACKAGE

NSSDC ID- 82-031A-02   INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

The telecommunications package had 12 transponders operating at 5935-6425 MHz (earth-to-satellite) and 3710-4200 MHz (satellite-to-earth) for thick route, thin route, and remote area communication and TV program distribution. It also had 2 transponders operating at 5855-5935 MHz (earth-to-satellite) and 2555-2635 MHz (satellite-to-earth) for direct broadcasting to augmented low-cost community TV sets in rural areas, radio-program distribution, national TV networking and disaster warning. 1

------- INSAT-1A, UNKNOWN-------------------------------------

INVESTIGATION NAME- DATA COLLECTION AND TRANSMISSION RELAY

NSSDC ID- 82-031A-03   INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS
METEOROLOGY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

The data collection and transmission package consisted of a data channel to provide for the relay of meteorological, hydrological, and oceanographic data from unattended land-based and ocean-based data collection and transmission platforms.

*************************** INTERCOSMOS 19*******************

SPACECRAFT COMMON NAME- INTERCOSMOS 19
ALTERNATE NAMES- 11285, IONOSONDE-IK
IONO-IK

NSSDC ID- 79-020A

LAUNCH DATE- 02/27/79   WEIGHT- 550. KG
LAUNCH SITE- PLESETSK, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R.   INTERCOS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC   EPOCH DATE- 02/28/79
ORBIT PERIOD- 99.8 MIN   INCLINATION- 74. DEG
PERIAPSIS- 502. KM ALT   APOAPSIS- 966. KM ALT

PERSONNEL
PS - V.V. MIGULIN   IZMIRAN

BRIEF DESCRIPTION

During the International Magnetosphere Study period an Intercosmos spacecraft, Ionosonde-IK, was launched into a high inclination, elliptical orbit with a low apogee. The main scientific objectives of Ionosonde-IK were : (1) the study of the electron-density distribution from the main ionization maximum of the F region up to the satellite altitude with a topside sounder, and the correlation of the time and space variations with solar activity, corpuscular fluxes and other geophysical phenomena, (2) global mapping of basic ionospheric parameters and construction of a topside ionosphere model, (3) the study of wave processes in magnetospheric plasma in the frequency range 100 Hz to 5 MHz, (4) the study of time and space variations of emissions in the 6300-6364 A bands and 3914 A and 5577 A lines, (5) the study of time and space variations of charged particles with energies between 10 eV and 50 MeV and their ionospheric effect, and (6) the study of time and space variations of local electron and ion densities and temperatures. The program included simultaneous ground-based observations at ionospheric and solar stations of the U.S.S.R. and Socialist countries. Experiment information was requested but never was supplied.

------- INTERCOSMOS 19, GOGOSHEV------------------------------

INVESTIGATION NAME- ELECTROPHOTOMETER (EMO-1)

NSSDC ID- 79-020A-02   INVESTIGATIVE PROGRAM
INTERCOSMOS

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - M.M. GOGOSHEV   CLSR-AO
OI - TS.N. GOGOSHEVA   CLSR-AO
OI - B.P. KOMITOV   CLSR-AO
OI - N.P. PETKOV   CLSR-AO
OI - ST.I. SARGOICHEV   CLSR-AO
OI - K.B. SERAFIMOV   CLSR-BAS

BRIEF DESCRIPTION

This investigation was concerned with the optical airglow emission of the earth's atmosphere around 4278, 5577, and 6300 A. The instrument was comprised of a photomultiplier tube, an 8-position wheel, a conical 3.5-deg aperture that contained a 10-element baffle, and an optical path that contained two lenses and two mirrors. The instrument was pointed 70 deg from the nadir. The filter wheel contained 6 interference filters (6247-6400, 6280-6400, 5520-5630, 5540-5640, 4230-4350, and 4250-4350 A), a plug for measuring dark current, and a radioactive calibration source. For more details, see M. M. Gogoshev, et al, Adv. Space Res., v. 1, n. 1, pp. 193-196, 1981.

------- INTERCOSMOS 19, UNKNOWN-------------------------------

INVESTIGATION NAME- TOPSIDE SOUNDER

NSSDC ID- 79-020A-01   INVESTIGATIVE PROGRAM
INTERCOSMOS

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

------- INTERCOSMOS 19, UNKNOWN-------------------------------

INVESTIGATION NAME- PLASMA EXPERIMENT

NSSDC ID- 79-020A-03   INVESTIGATIVE PROGRAM
INTERCOSMOS

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
SPACE PLASMAS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

------- INTERCOSMOS 19, UNKNOWN-------------------------------

INVESTIGATION NAME- WAVE EXPERIMENT

NSSDC ID- 79-020A-04   INVESTIGATIVE PROGRAM
INTERCOSMOS

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

------- INTERCOSMOS 19, UNKNOWN-------------------------------

INVESTIGATION NAME- PARTICLE EXPERIMENT

NSSDC ID- 79-020A-05   INVESTIGATIVE PROGRAM
INTERCOSMOS

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

**************************** IRAS*****************************

SPACECRAFT COMMON NAME- IRAS
ALTERNATE NAMES- INFRA-RED ASTRONOM SAT, IR ASTRON. SAT.
13777

NSSDC ID- 83-004A

LAUNCH DATE- 01/25/83 WEIGHT- 1000. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

THE NETHERLANDS	NIVR
UNITED STATES	NASA-OSSA
UNITED KINGDOM	SRC

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 01/26/83
ORBIT PERIOD- 103. MIN	INCLINATION- 99.1 DEG
PERIAPSIS- 889. KM ALT	APOAPSIS- 903. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - N.W.	BOGGESS	NASA HEADQUARTERS
PM - G.F.	SQUIBB	NASA-JPL
PS - H.H.	AUMANN	NASA-JPL

BRIEF DESCRIPTION

The Infrared Astronomical Satellite (IRAS) was a mission with joint execution by the United States (NASA), the Netherlands, and the United Kingdom. The basic goal of this planned 1-year mission was to obtain a full sky survey over the approximate wavelength range 8 to 120 micrometers with four broadband photometry channels. The IRAS contained a 0.6-meter Ritchey-Chretien telescope cooled by helium to a temperature of near 10 deg K. An array of 62 detectors was used to detect the infrared flux in bands centered at 12, 25, 60, and 100 micrometers. The noise equivalent flux densities were, respectively, 0.1, 0.1, 0.1, and 0.3 Jy (1 Jansky = 1E-26 W/sq m-Hz) in the four survey bands. The positions of galactic and extragalactic sources were determined to an accuracy of 0.5 arc min. In addition to the focal-plane detector array used for the all-sky survey, a low-resolution spectrometer and a 60- and 100-micrometer chopped photometric channel were included on the IRAS. The IRAS was flown in a 900-km orbit, with an inclination close to 99 deg. To scan the sky for the survey, the satellite was rotated at a constant angular velocity around the sun vector in the direction of the orbital angular velocity. The IRAS could be pointed also at a selected celestial object for up to 12 min. This pointing ability permitted observations of selected objects with up to a factor of ten increase in sensitivity or spatial resolution compared to that of the survey. The science working group is listed in Appendix B.

------- IRAS, SCIENCE WORKING TEAM-----------------------------

INVESTIGATION NAME- IR TELESCOPE

NSSDC ID- 83-004A-01 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - SCIENCE WORKING TEAM

BRIEF DESCRIPTION

The IRAS telescope system (TSY) consisted of the optical sub-system (OSS), electronic, cryogenic, structural and thermal sub-systems. The OSS consisted of a two-mirror Ritchey-Chretien folded-optics reflector telescope with an aperture of 57 cm and a focal length of 5.5 m. The FOV was slightly more than 1 deg and was diffraction limited at all wavelengths beyond 8 micrometers. The aperture was 41% obscured by the secondary mirror with a total effective area of 2024 sq cm. The focal plane assembly (FPA) was a subassembly of 62 IR and 8 visible detectors mounted at the focal plane of the OSS. The total array consisted of eight IR color band modules and two visible band modules.

------- IRAS, SCIENCE WORKING TEAM-----------------------------

INVESTIGATION NAME- LOW RESOLUTION SPECTROMETER

NSSDC ID- 83-004A-02 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - SCIENCE WORKING TEAM

BRIEF DESCRIPTION

The Dutch additional experiment (DAX) consisted of a low resolution spectrometer (LRS), a chopped photometric channels (CPC) long wavelength photometer, and a short wavelength channel (SWC) ac-coupled photometer. The LRS was used in combination with the survey instrument and measured spectra of point sources in the range 7.4 to 23 micrometers with a resolution of about 20. The CPC mapped IR sources in two bands, from 41 to 62.5 and from 84 to 114 micrometers, with a spatial resolution of 1.2 arc min and could not be used simultaneously with the survey instrument. The SWC scanned with the nominal survey rate over a band of 4.1 to 8 micrometers with a 15-arc-sec FOV and could be used with the survey instrument.

**************************** ISEE 1****************************

SPACECRAFT COMMON NAME- ISEE 1
ALTERNATE NAMES- IMP-K, 10422
MOTHER, INTNL SUN EARTH EXPL-A
ISEE-A

NSSDC ID- 77-102A

LAUNCH DATE- 10/22/77 WEIGHT- 340.2 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/23/77
ORBIT PERIOD- 3446.4 MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 281. KM ALT	APOAPSIS- 138120. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - K.W.	OGILVIE	NASA-GSFC
MO - R.O.	WALES	NASA-GSFC

BRIEF DESCRIPTION

The Explorer-class mother spacecraft, ISEE 1, was part of the mother/daughter/heliocentric mission which included the ISEE 1, ISEE 2, and ISEE 3 spacecraft. The purposes of the mission were (1) to investigate solar/terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near the earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The mother/daughter portion of the mission consisted of two spacecraft with a station-keeping capability in a highly eccentric earth orbit with apogee at 23 earth radii. The spacecraft maintained a small separation distance, and made simultaneous coordinated measurements to permit separation of spatial from temporal irregularities in the near-earth solar wind, the bow shock, and inside the magnetosphere. The spin rate was set at 19.75 rpm, differing slightly from that of the ISEE 2 spacecraft. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978.

------- ISEE 1, ANDERSON---------------------------------------

INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102A-10 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.I.	MENG	APPLIED PHYSICS LAB
OI - F.V.	CORONITI	U OF CALIF, LA
OI - J.M.	BOSQUED	PAUL SABATIER U
OI - R.	PELLAT	CTR FOR THEORETIC PHYS
OI - G.K.	PARKS	U OF WASHINGTON
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - H.	REME	CESR

BRIEF DESCRIPTION

This experiment was designed to determine, by using identical instrumentation (see 77-102B) on the mother/daughter spacecraft, the spatial extent, propagation velocity, and temporal behavior of a wide variety of particle phenomena. Electrons were measured at 2 and 6 keV and in two bands: 8 to 200 keV and 30 to 200 keV. Protons were measured at 2 and 6 keV and in three bands: 8 to 200 keV, 30 to 200 keV, and 200 to 380 keV. The 30 keV threshold could be commanded to 15 or 60 keV. Identical instrumentation on each spacecraft consisted of a pair of surface-barrier semiconductor-detector telescopes (one with a foil and one without a foil) and four fixed-voltage cylindrical electrostatic analyzers (two for electrons and two for protons). Channel multipliers were used as detectors with the fixed-voltage analyzers. The telescopes had a viewing cone with a 40-deg half-angle, oriented at about 20 deg to the spin axis.

------- ISEE 1, BAME---

INVESTIGATION NAME- FAST PLASMA AND SOLAR WIND IONS

NSSDC ID- 77-102A-01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - H.	MIGGENRIEDER	MPI-EXTRATERR PHYS
OI - K.	SCHINDLER	U OF BOCHUM
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - M.D.	MONTGOMERY	LOS ALAMOS NAT LAB
OI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed, in conjunction with a similar instrument (77-102B-01) provided by G. Paschmann of Max Planck Institute for flight on the daughter spacecraft, to study the plasma velocity distribution and its spatial and temporal variations in the solar wind, bow shock, magnetosheath, magnetopause, magnetotail, and magnetosphere. Protons from 50 eV to 40 keV and electrons from 5 eV to 20 keV were measured in one, two, and three dimensions by three 90-deg spherical electrostatic analyzers. The experiment, which utilized channeltron electron multipliers as detectors, operated in two ranges, with energy resolution for the several steps in each range of 10% of the center energy level.

------- ISEE 1, CLINE---

INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 77-102A-14

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - T.L.	CLINE	NASA-GSFC
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - B.J.	TEEGARDEN	NASA-GSFC
OI - G.	GLOECKLER	U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to recognize and record the time history of gamma-ray bursts. Two sensors were used: a 4-cm-diameter, CsI scintillator system and a 6-sq-cm, solid-state (Cd Te) array. An intensity increase in either of the sensors could cause a trigger signal to occur, freezing the circulating memory of the immediate past counting-rate history and filling another memory with the counting rates for 1 min following the trigger signal. The time of the trigger signal and its location in the temporal history were also stored in memory. All stored information was then read out at a very low bit rate during the succeeding several hours. Three trigger signals were used based on total counts in 4 ms, 32 ms, and 256 ms. Six memories were used, three before and three after the trigger signal, yielding storage of 1/64, 1/8, and 1 min of data each to provide detailed rise-time information.

------- ISEE 1, FRANK---

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - V.M.	VASYLIUNAS	MPI-AERONOMY
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment was designed to study, by means of identical instrumentation on the mother/daughter spacecraft, the spatial and temporal variations of the solar wind and magnetosheath electrons and ions. Protons and electrons in the energy range from 1 eV to 45 keV were measured in 64 contiguous energy bands with an energy resolution (delta E/E) of 0.16. A quadrispherical low-energy proton and electron differential energy analyzer (LEPEDEA), employing seven continuous channel electron multipliers in each of its two (one for protons and one for electrons) electrostatic analyzers was flown on both the mother and the daughter spacecraft. All but 2% of the 4-pi-sr solid angle was covered for particle velocity vectors. A GM tube was also included, with a conical field of view of 40-deg full-angle, perpendicular to the spin axis. This detector was sensitive to electrons with E>45 keV, and to protons with E>600 keV.

------- ISEE 1, GURNETT---

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102A-07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - R.W.	FREDRICKS	TRW SYSTEMS GROUP
OI - E.J.	SMITH	NASA-JPL

BRIEF DESCRIPTION

This experiment, in conjunction with a similar (but simpler) experiment (77-102B-05) on ISEE 2, was designed to measure wave phenomena occurring within the magnetosphere and solar wind. Three electric dipole antennas (215 m, 73.5 m, and 0.61m) and a triaxial search-coil antenna were used. The instrumentation consisted of four main elements: (1) a narrow-band sweep-frequency receiver with 32 frequency steps in each of four bands from 100 Hz to 400 kHz, a complete sweep required 32 s; (2) a high-time-resolution spectrum analyzer with 20 channels from 5.62 Hz to 311 kHz for electric field and 14 identical channels from 5.62 Hz to 10 kHz for magnetic field information, the electric and magnetic channels were sampled simultaneously; (3) a wave-normal analyzer to provide components for computing the wave normal and the Poynting flux, this analyzer had a 10 Hz bandwidth, and covered 32 frequencies from 100 Hz to 5 kHz; and (4) a wide-band receiver to condition electric and magnetic waveforms for transmission to the ground via the special-purpose analog transmitter, this receiver also provided the signals for long-baseline-interferometer measurements between ISEE 1 and ISEE 2. There were two basic frequency channels: 10 Hz to 1 kHz and 650 Hz to 10 or 40 kHz. In addition, the frequency range could be shifted by a frequency-conversion scheme to any of eight ranges up to 2 MHz.

------- ISEE 1, HARVEY---

INVESTIGATION NAME- PLASMA DENSITY

NSSDC ID- 77-102A-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - C.C.	HARVEY	PARIS OBSERVATORY
OI - M.	PETIT	CNET
OI - J.R.	MCAFEE	NOAA-ERL
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - J.M.	ETCHETO	CNET
OI - R.J.L.	GRARD	ESA-ESTEC
OI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION

This experiment measured the plasma electron density near the mother satellite and also the total electron content between the mother and the daughter spacecraft. The experiment consisted of two distinct parts. The mother spacecraft carried an experiment (the sounder) to detect resonances of the ambient plasma. After an antenna had been momentarily excited at one of the characteristic frequencies of the plasma in which it was immersed, a pronounced "ringing" was observed. These resonances occurred at the plasma frequency, the upper hybrid resonance, the cyclotron frequency and its harmonics, and the measurement of their frequencies permitted the determination of several plasma parameters, including the electron density. In this experiment, the transmitter was designed to step through 128 sub-bands, covering the characteristic resonance frequencies of the plasma, from 0.3 to 50.9 kHz, and from 0 to 353 kHz. The integrated density between the mother and the daughter was obtained from a second experiment (the propagation experiment) that measured the phase delay introduced by the ambient plasma onto a wave of frequency about 683 kHz transmitted from the mother and received on the daughter (experiment -06). The phase was compared against a phase-coherent signal transmitted from the mother to the daughter by modulation onto a carrier of frequency high enough to be unaffected by the ambient plasma (272.5 MHz). Due to perturbations to other experiments, active operation was on a limited duty cycle.

------- ISEE 1, HELLIWELL ---

INVESTIGATION NAME- VLF WAVE PROPAGATION

NSSDC ID- 77-102A-13

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - R.A. HELLIWELL — STANFORD U
OI - T.F. BELL — STANFORD U

BRIEF DESCRIPTION
This experiment was intended to provide data to study interactions between discrete VLF waves and energetic particles in the magnetosphere. The VLF waves were produced by a ground-based transmitter. Injection of the waves beyond the ionosphere was assured by transmitter location in a region where the magnetic lines of force are open: in this case, the Siple station, Antarctica. The injected signal and any stimulated VLF emissions were recorded through a loop antenna by a 1- to 32-kHz broadband receiver on the satellite. The observed parameters were the intensities of received radio frequency waves as a function of time.

------- ISEE 1, HEPPNER ---

INVESTIGATION NAME- DC ELECTRIC FIELD

NSSDC ID- 77-102A-11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - J.P. HEPPNER — NASA-GSFC
OI - T.L. AGGSON — NASA-GSFC
OI - N.C. MAYNARD — NASA-GSFC
OI - D.A. GURNETT — U OF IOWA
OI - D.P. CAUFFMAN — LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This experiment was intended to study quasi-static electric fields and low-frequency plasma waves in the plasmasphere, magnetosphere, magnetosheath, and solar wind. The double-probe floating-potential technique was applied using long-wire antenna probes with an effective electric field baseline of 179 m. The dc differential voltage was measured 8 or 32 times per s, depending on bit rate. In addition, the dc field was measured at selected azimuthal angles relative to the sun and the magnetic field, and the peak value of delta V and its azimuthal angles were measured. Low-frequency waves were measured in 8 frequency bands as follows: 0.19 to 0.6, 0.6 to 1.9, 1.9 to 6, 6 to 19, 19 to 60, 60 to 190, 190 to 600, and 600 to 1900 Hz. The dc-mode measurements had a two-step, variable-gain amplifier controlled from the ground. The resolution in the highest gain state was 0.5E-6 V/m. The ac measurement electronics consisted of two amplifier sections. One amplifier was used for low-frequency channels, and one for high-frequency channels. Gain lines for each amplifier were independently controllable from the ground. In the highest-gain mode, each analyzer channel had a sensitivity of 0.04E-6 V/m (rms). The experiment could be run in either a sun-sensor synchronized or a free state as controlled from the ground. In addition, the ac portion could be run in an averaging mode, or an alternating averaging and peak-amplitude-detection mode keyed to the telemetry readout sequence.

------- ISEE 1, HOVESTADT ---

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 77-102A-05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - D.K. HOVESTADT — MPI-EXTRATERR PHYS
OI - J.J. O'GALLAGHER — U OF MARYLAND
OI - M. SCHOLER — MPI-EXTRATERR PHYS
OI - L.A. FISK — U OF NEW HAMPSHIRE
OI - C.Y. FAN — U OF ARIZONA
OI - G. GLOECKLER — U OF MARYLAND

BRIEF DESCRIPTION
This instrument, carried on both ISEE 1 and ISEE 3, was designed to measure solar, interplanetary, and magnetospheric energetic ions in numerous bands within the energy range 2 keV/charge to 80 MeV/nucleon, and electrons in four contiguous bands from 75 to 1300 keV. At the lower energies, charge states of heavy ions in the high-speed (> 500 km/s) solar wind were determined. In the range 0.3 to 80 MeV/nucleon, the energy spectra, anisotropies, and composition of energetic ions were determined. In the limited range 0.4 to 6 MeV/nucleon, simultaneous determination of ionic and nuclear charge was possible. The instrument consisted of three different sensor systems. ULECA (ultralow-energy charge analyzer) was an electrostatic analyzer with solid-state detectors. Its energy range was approximately 3 to 560 keV/charge. ULEWAT (ultralow-energy wide-angle telescope) was a double dE/dx vs E, thin-window, flow-through proportional counter/solid-state detector telescope covering the range 0.2 to 80 MeV/nucleon (Fe). ULEZEQ (ultralow-energy Z, E, and Q) was a combination of an electrostatic analyzer and a dE/dx vs E system with a thin-window proportional counter and a position-sensitive solid-state detector. The energy range was 0.4 to 6 MeV/nucleon. Data could be obtained in 45-deg sectors.

------- ISEE 1, MOZER ---

INVESTIGATION NAME- QUASI-STATIC ELECTRIC FIELDS

NSSDC ID- 77-102A-06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - F.S. MOZER — U OF CALIF, BERKELEY
OI - M.C. KELLEY — CORNELL U

BRIEF DESCRIPTION
The objective of this experiment was to study quasi-static and low-frequency electric fields in the plasmasphere, magnetosphere, magnetosheath, and solar wind. Measurements were made of the potential difference between a pair of 8-cm diameter vitreous carbon spheres which were separated by 73.5 m and mounted on the ends of wire booms in the satellite spin plane. To attempt to overcome the spacecraft sheath (a potential problem which plagues all electric field detectors), an electron gun for changing the spacecraft potential was included and all exposed spacecraft surfaces were made electrically conducting. The instrument was designed to be sensitive to fields from 0.1 to 200 mV/m in the frequency band of 0 to 12 Hz. The experiment also measured the electric field component of waves at frequencies below 1000 Hz.

------- ISEE 1, OGILVIE ---

INVESTIGATION NAME- FAST ELECTRONS

NSSDC ID- 77-102A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - K.W. OGILVIE — NASA-GSFC
OI - J.D. SCUDDER — NASA-GSFC

BRIEF DESCRIPTION
This experiment studied the transport coefficients of turbulence in the collisionless plasma represented by the interplanetary medium and magnetosheath, low-energy solar electron events, and bow-shock-associated electrons. Two triaxial systems of 127-deg cylindrical electrostatic analyzers were used to make three-dimensional measurements of the electron distribution function. There were three modes of operation, with the following nominal energy ranges: solar wind, 7 to 500 eV; magnetosheath, 10 eV to 2 keV; and magnetotail and solar, 105 eV to 7.05 keV. The energy resolution (delta E/E) was 0.07. The entire set of six simultaneous spectrometer measurements was taken while the satellite rotated through 60 deg. Each spectrometer consisted of a curved-plate analyzer and two channeltron detectors.

------- ISEE 1, RUSSELL ---

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-102A-04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.T. RUSSELL — U OF CALIF, LA
OI - R.L. MCPHERRON — U OF CALIF, LA
OI - P.C. HEDGECOCK — IMPERIAL COLLEGE
OI - E.W. GREENSTADT — TRW SYSTEMS GROUP
OI - M.G. KIVELSON — U OF CALIF, LA

BRIEF DESCRIPTION

In this triaxial fluxgate magnetometer, three ring-core sensors in an orthogonal triad were enclosed in a flipper mechanism at the end of the magnetometer boom. The electronics unit was on the main body of the spacecraft at the foot of the boom. The magnetometer had two operating ranges of plus or minus 8192 nT and plus or minus 256 nT in each vector component. The data were digitized and averaged within the instrument to provide increased resolution and to provide Nyquist filtering. There were two modes for the transmission of the averaged data. In the double-precision mode of operation, 16-bit samples of data were transmitted. This provided a maximum resolution of plus or minus 1/4 nT or 1/128 nT in the low-sensitivity and high-sensitivity ranges. In the single-precision mode, any 8 consecutive bits of the above 16 bits were selected by ground command for transmission and the telemetry bandwidths of the magnetometer were doubled. This bandwidth varied from 2 Hz for the low-telemetry-rate, double-precision experiment mode to 32 Hz for the high-telemetry-rate, single-precision experiment mode.

------- ISEE 1, SHARP ---

INVESTIGATION NAME- ION COMPOSITION

NSSDC ID- 77-102A-12

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - R.G.	JOHNSON	LOCKHEED PALO ALTO
OI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - P.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - C.R.	CHAPPELL	NASA-MSFC
OI - A.	GHIELMETTI	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

The objective of this investigation was to determine the ion composition and energy spectra of the plasma within the magnetosphere, magnetosheath, and solar wind, and to determine the angular distribution of the plasma in the magnetosheath. An energetic ion mass spectrometer was flown that had an electrostatic energy analyzer followed by a combined cylindrical electrostatic/magnetic mass analyzer. A combination of electron multipliers was used as the detector. The energy-per-unit-charge range measured was from 0 to 17 keV/Q. The mass-per-unit-charge range measured extended from 1 to 150 u/Q.

**************************** ISEE 2 ****************************

SPACECRAFT COMMON NAME- ISEE 2
ALTERNATE NAMES- IMP-K PRIME, IME-D
10423, ISEE-B
DAUGHTER

NSSDC ID- 77-102B

LAUNCH DATE- 10/22/77 WEIGHT- 165.78 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

INTERNATIONAL	ESA
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/23/77
ORBIT PERIOD- 3454.1 MIN	INCLINATION- 28.7 DEG
PERIAPSIS- 280. KM ALT	APOAPSIS- 138317. KM ALT

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - A.	HAWKYARD	ESA-ESTEC
PS - A.	PEDERSEN	ESA-ESTEC
PS - A.C.	DURNEY(NLA)	ESA-ESTEC

BRIEF DESCRIPTION

The Explorer-class daughter spacecraft, ISEE 2, was part of the mother/daughter/heliocentric mission (ISEE 1, 2, and 3). The purposes of the mission were (1) to investigate solar-terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The mother/daughter portion of the mission consisted of two spacecraft with a station-keeping capability in a highly eccentric earth orbit with apogee of 23 earth radii. The two spacecraft maintained a small separation distance, and made simultaneous coordinated measurements to permit separation of spatial from temporal irregularities in the near-earth solar wind, the bow shock, and inside the magnetosphere. The spin rate of the ISEE 2 spacecraft was fixed at 19.8 rpm, differing slightly from that of the ISEE 1 spacecraft. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978.

------- ISEE 2, ANDERSON --

INVESTIGATION NAME- ELECTRONS AND PROTONS

NSSDC ID- 77-102B-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.I.	MENG	APPLIED PHYSICS LAB
OI - J.M.	BOSQUED	PAUL SABATIER U
OI - R.	PELLAT	CTR FOR THEORETIC PHYS
OI - F.V.	CORONITI	U OF CALIF, LA
OI - H.	REME	CESR
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - G.K.	PARKS	U OF WASHINGTON

BRIEF DESCRIPTION

This experiment was designed to determine, by using identical instrumentation on the mother/daughter spacecraft, the spatial extent, propagation velocity, and temporal behavior of a wide variety of particle phenomena. Electrons were measured at 2 and 6 keV and in two bands: 8 to 200 keV and 30 to 200 keV. Protons were measured at 2 and 6 KeV and in three bands: 8 to 200 keV, 30 to 200 keV, and 200 to 380 keV. The 30-keV threshold could be commanded to 15 or 60 keV. Identical instrumentation on each spacecraft consisted of a pair of surface-barrier, semiconductor-detector telescopes (one with a foil and one without a foil) and four fixed-voltage electrostatic analyzers (two for electrons and two for protons). Channel multipliers were used as detectors with the fixed-voltage analyzers. The telescopes had a viewing cone with a 40-deg half-angle, oriented at about 20 deg to the spin axis.

------- ISEE 2, EGIDI ---

INVESTIGATION NAME- SOLAR WIND IONS

NSSDC ID- 77-102B-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - A.	EGIDI	CNR, SPACE PLASMA LAB
OI - G.	MORENO	CNR, SPACE PLASMA LAB
OI - P.	CERULLI	CNR, SPACE PLASMA LAB
OI - V.	FORMISANO	ESA-ESTEC
OI - S.C.	CANTARANO	CNR, SPACE PLASMA LAB

BRIEF DESCRIPTION

This instrument was designed to measure the angular distributions and energy spectra of positive ions in the solar wind. The main region of interest was outward from and including the magnetopause (greater than 8 earth radii). Two hemispherical electrostatic analyzers were used to cover the energy range 100 eV to 10 keV/Q in up to 64 energy channels. There were two operating modes: one for high-time resolution and one for high-energy resolution. Energy levels were kept constant through a complete spacecraft revolution.

------- ISEE 2, FRANK ---

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- 77-102B-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - V.M.	VASYLIUNAS	MPI-AERONOMY
OI - C.F.	KENNEL	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment was designed to study, by means of identical instrumentation on the mother/daughter spacecraft, the spatial and temporal variations of the solar wind and magnetosheath electrons and ions. Protons and electrons in the energy range from 1 eV to 45 keV were measured in 64 contiguous energy bands with an energy resolution (delta E/E) of 0.16. A quadrispherical low-energy proton and electron differential energy analyzer (LEPEDEA), employing seven continuous-channel electron multipliers in each of its two (one for protons and one for electrons) electrostatic analyzers was flown on both the mother and the daughter spacecraft. All but 2% of the 4 pi-sr solid angle was covered for particle-velocity vectors. A GM tube was also included, with a conical field of view of 40-deg full-angle, perpendicular to the spin axis. This detector was sensitive to electrons with E>45 keV, and to protons with E>600 keV.

------- ISEE 2, GURNETT--

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102B-05 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - E.J.	SMITH	NASA-JPL
OI - R.W.	FREDRICKS	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

In this experiment, a single-axis search coil magnetometer with a high permeability core and two electric field dipoles (30 m tip-to-tip and 0.61 m) measured wave phenomena occurring within the magnetosphere and solar wind in conjunction with a similar experiment (77-102A-07) flown on the mother spacecraft. The antennas were mounted perpendicularly to the spin axis. The instrumentation was composed of two elements: (1) a high-time-resolution spectrum analyzer with 16 frequency channels (identical to those on ISEE 1) from 5.62 Hz to 31.1 kHz where all channels were sampled 1 or 4 times per s, depending on bit rate; and (2) a wide-band receiver to condition electric and magnetic waveforms for transmission to the ground via the special-purpose analog transmitter. There were two basic frequency channels, from 10 Hz to 1 kHz and from 650 Hz to 10 kHz. In addition, the frequency range could be shifted by a frequency-conversion scheme to any of eight ranges up to 2.0 MHz.

------- ISEE 2, HARVEY--

INVESTIGATION NAME- RADIO PROPAGATION

NSSDC ID- 77-102B-06 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - C.C.	HARVEY	PARIS OBSERVATORY
OI - R.E.	GENDRIN	CNET
OI - J.R.	MCAFEE	NOAA-ERL
OI - M.	PETIT	CNET
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - J.M.	ETCHETO	CNET
OI - R.J.L.	GRARD	ESA-ESTEC

BRIEF DESCRIPTION

The total electron content between the mother and daughter was obtained by measuring the phase delay introduced by the ambient plasma onto a wave of frequency about 683 kHz, transmitted from the mother (experiment -08) and received on the daughter. The phase was compared against a phase-coherent signal transmitted from the mother to the daughter by modulation onto a carrier of frequency high enough (272.5 MHz) to be unaffected by the ambient plasma.

------- ISEE 2, RUSSELL--

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-102B-04 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL

PI - C.T.	RUSSELL	U OF CALIF, LA
OI - R.L.	MCPHERRON	U OF CALIF, LA
OI - P.C.	HEDGECOCK	IMPERIAL COLLEGE
OI - E.W.	GREENSTADT	TRW SYSTEMS GROUP
OI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

In this triaxial fluxgate magnetometer, three ring-core sensors in an orthogonal triad were enclosed in a flipper mechanism at the end of the magnetometer boom. The electronics unit was on the main body of the spacecraft at the foot of the boom. The magnetometer had two operating ranges of plus or minus 8192 nT and plus or minus 256 nT in each vector component. The data were digitized and averaged within the instrument to provide increased resolution and to provide Nyquist filtering. There were two modes for the transmission of the averaged data. In the double-precision mode of operation, 16-bit samples of data were transmitted. This provided a maximum resolution of plus or minus 1/4 nT or 1/128 nT in the low-sensitivity and high-sensitivity ranges.

------- ISEE 2, WILLIAMS--

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 77-102B-07 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
OI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - C.O.	BOSTROM	APPLIED PHYSICS LAB
OI - E.	KEPPLER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - G.H.	WIBBERENZ	U OF KIEL

BRIEF DESCRIPTION

This experiment was designed to identify and to study plasma instabilities responsible for acceleration, source and loss mechanisms, and boundary and interface phenomena throughout the orbital range of the mother/daughter satellites. A proton telescope and an electron spectrometer were flown on each spacecraft to measure detailed energy spectra and angular distributions. These detectors used silicon, surface-barrier, totally depleted solid-state devices of various thicknesses, areas, and configurations. Protons in 5 directions and 12 energy channels between 20 keV and 2 MeV and electrons in 5 directions and 12 energy channels between 20 keV and 300 keV (to 1.2 MeV for 90 deg) were measured. Data were accumulated in up to 32 sectors per spin.

*************************** ISEE 3***************************

SPACECRAFT COMMON NAME- ISEE 3
ALTERNATE NAMES- STP PROBE, IME-H
HELIOCENTRIC, INTNL SUN EARTH EXPL-C
ISEE-C

NSSDC ID- 78-079A

LAUNCH DATE- 08/12/78 WEIGHT- 469. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC	EPOCH DATE- 11/25/78
ORBIT PERIOD- 365. DAYS	INCLINATION- 0. DEG
PERIAPSIS- 0.99 AU RAD	APOAPSIS- 0.99 AU RAD

PERSONNEL

MG - M.A.	CALABRESE	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - T.T.	VON ROSENVINGE	NASA-GSFC
MO - R.O.	WALES	NASA-GSFC

BRIEF DESCRIPTION

The Explorer-class heliocentric spacecraft, ISEE 3, was part of the mother/daughter/heliocentric mission (ISEE 1, 2, and 3). The purposes of the mission were (1) to investigate solar/terrestrial relationships at the outermost boundaries of the earth's magnetosphere, (2) to examine in detail the structure of the solar wind near the earth and the shock wave that forms the interface between the solar wind and earth, and (3) to continue the investigation of cosmic rays and solar flares in the interplanetary region near 1 AU. The mission thus extended the investigations of previous IMP spacecraft. The launch of three coordinated spacecraft in this mission permitted the separation of spatial and temporal effects. This heliocentric spacecraft had a spin axis normal to the ecliptic plane and a spin rate of about 20 rpm. It was placed into an elliptical halo orbit about the libration point (L1) 235 earth radii on the sun side of the earth, where it continuously monitored changes in the near-earth interplanetary medium. Because both the mother and daughter spacecraft had eccentric geocentric orbits, it was hoped that this mission would measure the cause/effect relationships between the incident solar plasma and the magnetosphere. Finally, the heliocentric spacecraft also provided a near-earth base for making cosmic-ray and other planetary measurements for comparison with coincident measurements from deep-space probes. For instrument descriptions written by the investigators, see IEEE Trans. on Geosci. Electron., v. GE-16, n. 3, July 1978. In 1982 the spacecraft began a magnetotail and comet encounter mission. On August 10, 1982, an orbit change maneuver was conducted to remove the spacecraft from the halo orbit around the L1 point and place it in a transfer orbit to a series of orbits between earth and the L2 (magnetotail) libration point. After several orbits through the earth's magnetotail, with gravity assists from lunar flybys in September and October of 1983, a critical lunar flyby December 22, 1983, will throw the spacecraft out of the earth-moon system and into an orbit which leads the earth. The spacecraft will encounter the tail of comet Giacobini-Zinner on September 11, 1985, and will be between the sun and comet Halley in late March 1986, when other spacecraft (Giotto, Planet-A, MS-T5, VEGA) will be nearer to comet Halley on comet rendezvous missions. Tracking and telemetry support will be provided by the DSN (Deep Space Network) starting in February 1985.

------- ISEE 3, ANDERSON--

INVESTIGATION NAME- INTERPLANETARY AND SOLAR ELECTRONS

NSSDC ID- 78-079A-09

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS
INTERPLANETARY PHYSICS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - D.F.	SMITH	HIGH ALTITUDE OBS
OI - S.R.	KANE	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This experiment was designed to study spectra and anisotropies of interplanetary and solar electrons (2 to 1000 keV) in the transition energy range between solar wind and low-energy cosmic rays. The electrons were measured by a pair of passively cooled, surface-barrier, semiconductor-detector telescopes (approximately 15 keV to approximately 1 MeV) and by a hemispherical plate electrostatic analyzer with channel-multiplier detectors (2-18 keV). Counting rates were sectored into angular sectors about either the magnetic field or the sun direction. The telescope yielded 8 or 16 sectors and the analyzer yielded 16 sectors.

------- ISEE 3, BAME--

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- 78-079A-01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.J.	BAME	LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB
OI - M.D.	MONTGOMERY	LOS ALAMOS NAT LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to make an integrated study of the nature, origin, and evolution of structure in the interplanetary medium. Also, the thermal state of the interplanetary plasma was studied, unperturbed by the earth's bow shock. Ion velocity distributions were measured by a 135-deg spherical electrostatic analyzer in both two and three dimensions. Step energy resolution for each energy window was 4.2%. Electron velocity distributions were measured by a 90-deg spherical electrostatic analyzer, also in two and three dimensions. The energy window per step for electrons was 10%. Channeltron electron multipliers were used as detectors for each of the analyzers. Solar wind electrons were measured in 15 contiguous channels from 8.5 to 1140 eV. A special photoelectron range of 1.6 to 220 eV could be commanded. Various mixtures of data for 2-D and 3-D distribution functions could be selected. Ions were measured in 32 channels from 237 eV per charge to 10.7 keV per charge. Various modes were available for basic sweep, search, and tracking of the peak of the distribution.

------- ISEE 3, HOVESTADT--

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - J.J.	O'GALLAGHER	U OF MARYLAND
OI - C.Y.	FAN	U OF ARIZONA
OI - G.	GLOECKLER	U OF MARYLAND
OI - M.	SCHOLER	MPI-EXTRATERR PHYS
OI - L.A.	FISK	U OF NEW HAMPSHIRE

BRIEF DESCRIPTION

This instrument (HOH), carried on ISEE 1 and ISEE 3, was designed to measure solar, interplanetary, and magnetospheric energetic ions in numerous bands within the energy range 2 keV/charge to 80 MeV/nucleon, and electrons in four contiguous bands from 75 to 1300 keV. At the lower energies, charge states of heavy ions in the high-speed (>500 km/s) solar wind were determined. In the range 0.3 to 80 MeV/nucleon, the energy spectra, anisotropies, and composition of energetic ions were determined. In the limited range 0.4 to 6 MeV/nucleon, simultaneous determination of ionic and nuclear charge was possible. The instrument consisted of three different sensor systems. ULECA (ultralow-energy charge analyzer) was an electrostatic analyzer with solid-state detectors. Its energy range was approximately 3 to 560 keV/charge. ULEWAT (ultralow-energy wide-angle telescope) was a dE/dx vs E, thin-window, flow-through proportional counter/solid-state detector telescope covering the range 0.2 to 80 MeV/nucleon (Fe). ULEZEQ (ultralow-energy Z, E, and Q) was a combination of an electrostatic analyzer and a dE/dx versus E system with a thin-window proportional counter and a position-sensitive solid-state detector. The energy range was 0.4 to 6 MeV/nucleon. Data could be obtained in 45-deg sectors.

------- ISEE 3, HYNDS--

INVESTIGATION NAME- ENERGETIC PROTONS

NSSDC ID- 78-079A-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.J.	HYNDS	IMPERIAL COLLEGE
OI - J.J.	VAN ROOIJEN	U OF UTRECHT
OI - J.N.	VAN GILS	U OF UTRECHT
OI - R.M.	VAN DEN NIEUWENHOF	U OF UTRECHT
OI - K.P.	WENZEL	ESA-ESTEC
OI - T.R.	SANDERSON	ESA-ESTEC
OI - V.	DOMINGO	ESA-ESTEC
OI - D.E.	PAGE	ESA-ESTEC
OI - A.	BALOGH	IMPERIAL COLLEGE
OI - C.	DE JAGER	U OF UTRECHT
OI - H.	ELLIOT	IMPERIAL COLLEGE

BRIEF DESCRIPTION

This experiment (DFH) was designed to study low-energy solar proton acceleration and propagation processes in interplanetary space. The instrument measured the energy spectrum in 8 channels, and the 3-dimensional angular distribution of protons in the energy range 0.035 to 1.6 MeV with a basic time resolution of 16 s. Counts of each channel were grouped into eight 45-deg sectors. The instrument consisted of three identical telescopes mounted at 30, 60, and 135 deg relative to the spacecraft spin axis, each containing two surface-barrier detectors, a mechanical collimator, and a "broom" magnet to sweep away electrons.

------- ISEE 3, MEYER--

INVESTIGATION NAME- COSMIC-RAY ELECTRONS AND NUCLEI

NSSDC ID- 78-079A-06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - P.	MEYER	U OF CHICAGO
OI - P.	EVENSON	U OF CHICAGO

BRIEF DESCRIPTION

This experiment was designed to study particle propagation within the solar system and the properties of the interplanetary medium. The following species were resolved: (1) electrons (differential spectrum from 5 to 400 MeV); (2) nuclei from protons to the iron group (differential spectra and relative abundances from 30 to 15,000 MeV/nucleon); and (3) helium through sulfur. A charged-particle telescope was used to make these measurements. It consisted of three solid-state detectors, a gas Cerenkov counter, a CsI scintillation detector, two plastic scintillation counters, and a quartz Cerenkov counter. The design of the telescope was based on that used in experiment 68-014A-09 for OGO 5.

------- ISEE 3, OGILVIE--

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 78-079A-11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - K.W. OGILVIE — NASA-GSFC
OI - J. GEISS — U OF BERNE
OI - M.H. ACUNA — NASA-GSFC
OI - M.A. COPLAN — U OF MARYLAND
OI - D.L. LIND — NASA-JSC

BRIEF DESCRIPTION

This experiment consisted of a hemispherical electrostatic energy analyzer and a Wien velocity filter configured as a mass spectrometer to determine the charge state and isotopic constitution of the solar wind. The instrument had an energy-per-unit-charge range of 0.84 to 11.7 keV per charge, a mass-per-unit-charge range of 1.5 to 5.6 u per charge, and a velocity range of 300 to 600 km/s.

------- ISEE 3, SCARF--

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 78-079A-07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - F.L. SCARF — TRW SYSTEMS GROUP
OI - D.A. GURNETT — U OF IOWA
OI - E.J. SMITH — NASA-JPL
OI - R.W. FREDRICKS — TRW SYSTEMS GROUP

BRIEF DESCRIPTION

This experiment was designed to provide data for plasma-wave studies undertaken to gain a better understanding of the wave-particle interaction and plasma instabilities, which lead to the equivalent collision phenomena that produce apparent fluid-like behavior in the solar wind near 1 AU. Two electric dipoles and a boom-mounted magnetic search coil were used to measure magnetic and electric field wave levels from 17 Hz to 1 kHz in 8 channels and electric field levels from 17 Hz to 100 kHz in 16 channels. In addition, a third spectrum analyzer with three bands between 0.316 and 8.8 Hz was included for measurement of the magnetic field. This unit used the search coil, but was located within the electronics unit of experiment 78-079A-02.

------- ISEE 3, SMITH--

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 78-079A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - E.J. SMITH — NASA-JPL
OI - L. DAVIS, JR. — CALIF INST OF TECH
OI - G.L. SISCOE — U OF CALIF, LA
OI - D.E. JONES — BRIGHAM YOUNG U
OI - B.T. TSURUTANI — NASA-JPL

BRIEF DESCRIPTION

The instrumentation for this experiment consisted of a boom-mounted triaxial vector helium magnetometer. Measurements were made of the steady magnetic field and its low-frequency variations. Eight field amplitude ranges (minus to plus 4, 14, 42, 144, 640, 4000, 22,000, and 140,000 nT) were available. The instrument ranged up and down automatically or could be commanded into a specific range. The field equivalent noise power spectral density was 2E-4 nT squared per Hertz (independent of frequency), or 0.01 nT rms in the passband 0 to 0.5 Hz. A single-axis spectrum analyzer measured fluctuations parallel to the spacecraft spin axis in three frequency bands centered at 0.33, 3.2, and 8.8 Hz.

------- ISEE 3, STEINBERG--

INVESTIGATION NAME- RADIO MAPPING

NSSDC ID- 78-079A-10

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
RADIO PHYSICS
SOLAR PHYSICS

PERSONNEL

PI - J.L. STEINBERG — PARIS OBSERVATORY
OI - P. COUTURIER — PARIS OBSERVATORY
OI - R. KNOLL — PARIS OBSERVATORY
OI - J. FAINBERG — NASA-GSFC
OI - R.G. STONE — NASA-GSFC
OI - S.R. MOSIER — NATL SCIENCE FOUND

BRIEF DESCRIPTION

This experiment was designed to measure the direction (two angles) of type-III solar bursts at 24 frequencies stepped from 30 kHz to 2 MHz. Relying on solar rotation, one could obtain a 3-D map of the magnetic lines of force which guide the electrons that produce type-III solar bursts. These results could be determined from 10 solar radii to 1 AU, in or out of the ecliptic. The instrument consisted primarily of two dipole antennas and a four-channel radiometer, with bandwidths of 3 kHz and 10 kHz. The frequency sequence had 72 steps and required 108 s. Self-calibration occurred every 18 h.

------- ISEE 3, STONE--

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-12

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - E.C. STONE — CALIF INST OF TECH
OI - R.E. VOGT — CALIF INST OF TECH

BRIEF DESCRIPTION

This experiment was designed to study the isotopic constitution of solar matter and galactic cosmic-ray sources, the processes of nucleosynthesis in the sun and in the galaxy, and astrophysical particle acceleration processes. The following species were resolved: lithium through nickel (Z from 3 through 28 and A from 6 through 64) in the energy range from 5 to 250 MeV/nucleon. The mass resolution was < 0.3 u for Z<30.

------- ISEE 3, TEEGARDEN--

INVESTIGATION NAME- GAMMA-RAY BURSTS

NSSDC ID- 78-079A-15

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - B.J. TEEGARDEN — NASA-GSFC
OI - D.K. HOVESTADT — MPI-EXTRATERR PHYS
OI - T.L. CLINE — NASA-GSFC
OI - G. GLOECKLER — U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to recognize and record the time history of gamma-ray bursts, and to provide high-resolution spectra of gamma-ray burst photons between 0.05 and 6.5 MeV. Three detectors were used. Detector 1 was a 4-cm diameter by 3-cm-thick germanium crystal, radiatively cooled to operate at approximately 101 deg K. The energy range was between 0.12 and 6.5 MeV, and the energy resolution was < 3.5 keV at 1 MeV. A 4096-channel ADC digitized the signals for input to the gamma-burst digital instrumentation, which was in the low-energy cosmic-ray experiment, 78-079A-03. Detector 2 consisted of the CsI and surrounding detectors in the cosmic-ray electrons and nuclei experiment, 78-079A-06. Both temporal and spectral information were obtained from this detector. This detector was felt to be somewhat noisy. Detector 3 consisted of the smaller CsI crystal in experiment 78-079A-03. Its energy range began at about 79 keV. Two time-history memories of 2000 12-bit words were used, and received information from any of the three detectors by command. The stored values were time intervals over which a fixed number (1-128) of counts was accumulated. The time-interval clock frequency was selectable from 1 to 8 kHz. Spectral information from either detector 1 or 2 was stored in a third memory of 3072 16-bit words. Twelve bits were used for pulse-height data and four bits for time. The counting rate input to the time history memories caused a trigger signal to occur if the rate exceeded a commandable value. When this occurred, all three memories were allowed to fill. These memories could be dumped at a very low bit rate, either automatically or by command.

------- ISEE 3, VON ROSENVINGE--

INVESTIGATION NAME- MEDIUM ENERGY COSMIC RAY

NSSDC ID- 78-079A-04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - T.T. VON ROSENVINGE — NASA-GSFC
OI - L.A. FISK — U OF NEW HAMPSHIRE
OI - F.B. MCDONALD — NASA HEADQUARTERS
OI - J.H. TRAINOR — NASA-GSFC
OI - M.A.I.VAN HOLLEBEKE — U OF MARYLAND

BRIEF DESCRIPTION

This experiment was designed to study the composition of solar cosmic rays from hydrogen through iron and the elemental abundance of galactic cosmic rays. Three cosmic-ray telescopes, plus a proportional counter for measurement of electrons and X rays, comprised the instrumentation. Nuclei with Z between 1 and 30 were measured in various energy windows in the range 1 to 500 MeV/nucleon. Unit mass resolution was obtained for isotopes with Z equal to 1, 2, and 3 to 7 in the energy ranges 4 to 70, 1 to 70, and 30 to 140 MeV/nucleon, respectively. Electrons were measured in the energy range approximately 2 to 10 MeV. Anisotropy information was obtained for the electrons and nuclei with Z equal to 1 to 26.

------- ISEE 3, WIEDENBECK-------------------------------------

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAY

NSSDC ID- 78-079A-05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - M.E.	WIEDENBECK	U OF CHICAGO
OI - D.E.	GREINER	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This experiment was designed to determine the isotopic abundance in the primary cosmic rays for hydrogen through nickel. The instrument used a 10-element solid-state particle telescope consisting of lithium-drifted silicon detectors. Energy ranges measured ran from approximately 20 to approximately 500 MeV/nucleon. The direction of incident nuclei was obtained from a six-plane drift chamber with 2-deg resolution.

------- ISEE 3, WILCOX---

INVESTIGATION NAME- GROUND BASED SOLAR STUDIES

NSSDC ID- 78-079A-13

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - J.M.	WILCOX	STANFORD U

BRIEF DESCRIPTION

This experiment consisted of the measurement of large-scale solar magnetic and velocity fields with the Stanford ground-based solar telescope, and the comparison of these measurements with measurements of the interplanetary magnetic field and solar wind made by other experiments on this spacecraft. The purpose of the experiment was to study the large-scale structure of the solar magnetic field and its extension into interplanetary space by the solar wind.

*************************** ISIS 1***************************

SPACECRAFT COMMON NAME- ISIS 1
ALTERNATE NAMES- ISIS-A, 03669

NSSDC ID- 69-009A

LAUNCH DATE- 01/30/69 WEIGHT- 241. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

CANADA	DRB-DRTE
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/04/69
ORBIT PERIOD- 128.42 MIN	INCLINATION- 88.42 DEG
PERIAPSIS- 578. KM ALT	APOAPSIS- 3526. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
MG - C.A.	FRANKLIN	COMMUN RESEARCH CENTRE
SC - E.R.	SCHMERLING	NASA HEADQUARTERS
SC - T.R.	HARTZ	COMMUN RESEARCH CENTRE
PM - L.H.	BRACE	NASA-GSFC
PS - L.H.	BRACE	NASA-GSFC

BRIEF DESCRIPTION

ISIS 1 was an ionospheric observatory instrumented with sweep- and fixed-frequency ionosondes, a VLF receiver, energetic and soft particle detectors, an ion mass spectrometer, an electrostatic probe, an electrostatic analyzer, a beacon transmitter, and a cosmic noise experiment. The sounder used two dipole antennas (73 and 18.7 m long, respectively). The satellite was spin-stabilized at about 2.9 rpm after antenna deployment. Some control was exercised over the spin rate and attitude by using magnetically induced torques to change the spin rate and to precess the spin axis. A tape recorder with 1-h capacity was included on the satellite. The satellite could be programmed to take recorded observations for four different time periods for each full recording period. The recorder data were dumped only at Ottawa. For non-tape-recorded observations, data for the satellite and subsatellite regions could be acquired and telemetered when the spacecraft was in the line of sight of telemetry stations. The selected telemetry stations were in areas that provided primary data coverage near the 80 deg W meridian and in areas near Hawaii, Singapore, Australia, England, Norway, India, Japan, Antarctica, New Zealand, and Central Africa. NASA support of the ISIS project was terminated on October 1, 1979. A significant amount of experimental data, however, was acquired after this date by the Canadian project team.

------- ISIS 1, BARRINGTON-------------------------------------

INVESTIGATION NAME- VLF RECEIVER

NSSDC ID- 69-009A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - R.E.	BARRINGTON	DOC-CRC
OI - F.H.	PALMER	DEFENCE RESEARCH ESTAB
OI - H.G.	JAMES	DOC-CRC

BRIEF DESCRIPTION

The purpose of this experiment was to study natural and man-made VLF signals. Specific objectives included the investigation of VLF propagation phenomena, ion and hybrid plasma resonances, and correlations between VLF emissions and intense fluxes of energetic particles. In this experiment an attempt was made to stimulate the ion resonances of the ambient plasma by using signals from a VLF swept-frequency exciter, contained within the spacecraft. The instrumentation consisted of a low-frequency, broadband receiver that sensed signals received by the 73-m dipole (split monopole) antenna, between 0.05 and 30 kHz. This same antenna was used for receiving frequencies below 5 MHz on the ionosonde. The receiver had a wide dynamic range (80 dB) that was achieved by use of an automatic gain control system. This VLF experiment included an optional-use onboard exciter that operated over a frequency cycle from 0 to 0.3 to 0 to 11 to 0 kHz over a 3.5-s "frame" period. The frames sequenced through four steps where the transmissions were attenuated by 0, 20, 20, then 40 dB, thus requiring 14 s for one complete cycle of exciter operation. The exciter transmitted on the short antennas and the receiver sensed the signals coupled between the two antennas by the ambient plasma, plus any noise signals which were excited in the plasma. This VLF experiment also permitted antenna impedance measurements, with or without a dc bias on the antenna. The real-time data were transmitted on 136.08-MHz telemetry. The VLF data could be recorded on one of the four tape-recorder channels during the time the tape recorder operated. Tape-recorded and backup real-time data were transmitted on 400-MHz telemetry.

------- ISIS 1, BRACE--

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBES

NSSDC ID- 69-009A-07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI - L.H.	BRACE	NASA-GSFC
OI - J.A.	FINDLAY	NASA-GSFC

BRIEF DESCRIPTION

The purpose of this experiment was to study the global variations of electron temperature and electron concentration at spacecraft (S/C) altitudes during solar maximum, and to study characteristics of the S/C ion sheath. The measurements were made with two cylindrical probes, operating as Langmuir probes. There were a boom probe and an axial probe. The axial probe extended 48.3 cm from the S/C, along the spin axis, and was centered among the four telemetry antennas on the underside of the S/C. This probe was capable of measurements undisturbed by the satellite motion only when the probe preceded the S/C in its motion through the plasma. The boom probe extended horizontally and outward (in S/C frame of reference) from a boom 1 m long, which in turn extended from an upper surface of the satellite at an angle of about 45 deg to the spin axis. This probe provided some observations during each S/C spin cycle that were free of S/C wake effects. The probes consisted of three concentric, electrically isolated, stainless steel tubes. The outer (0.24-cm diam and 23-cm long) tube floated at its own equilibrium potential and served to place the collector well away from the S/C plasma sheath. The center tube (0.165-cm diam) extending 23 cm outward from the outer tube acted as an electrical guard for the collector. Its electrical potential was controlled. The collector (0.058-cm diam) extended 23 cm outward from the driven guard. During each 2-min sequence, a volt-ampere curve was obtained from the sawtooth voltage (-2 to +10 V) applied to the collector. This was interpreted in electron densities over a range from 1.E2 to 1.5E6 electrons per cc, and temperatures from about 400 to 5.E4 deg K. NSSDC has all the useful data that exist from this investigation.

------- ISIS 1, CALVERT --

INVESTIGATION NAME- FIXED-FREQUENCY SOUNDER

NSSDC ID- 69-009A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - W.	CALVERT	U OF IOWA
OI - R.B.	NORTON	NOAA-ERL
OI - J.M.	WARNOCK	NOAA
OI - J.H.	WHITTEKER	DOC-CRC

BRIEF DESCRIPTION

This experiment was designed to study ionospheric features of a smaller scale than could be detected by the sweep sounder, and to study plasma resonances. Parameters measured were virtual range (a function of propagation time of the reflected pulse) and time. These data were normally observed only when the spacecraft was in range of a telemetry station. The fixed-frequency sounder operated from the same antenna, transmitter, and receiver used for the sweep-frequency experiment. It normally operated for 5 s during the frequency flyback period of the sweep-frequency operation that was every 19 or 29 s. One of six frequencies (0.25, 0.48, 1.00, 1.95, 4.00, or 9.303 MHz) was chosen for use by the experimenter as desired. Other modes of operation were available, including continuous observation at a selected frequency, and a special mixed mode with transmission at the fixed frequency of 0.82 MHz and sweep reception.

------- ISIS 1, HARTZ --

INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 69-009A-10

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - T.R.	HARTZ(RETIRED)	DOC-CRC
PI - H.G.	JAMES	DOC-CRC

BRIEF DESCRIPTION

This experiment used the sweep-frequency ionosonde receiver automatic gain control voltage to measure galactic and solar radio noise levels. The receiver swept from 0.1 to 20 MHz. The dynamic range was 50 dB, and the bandwidth was 55 kHz. The antennas used were 18.7-m and 73-m dipoles.

------- ISIS 1, MCDIARMID --

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 69-009A-04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - I.B.	MCDIARMID	NATL RES COUNC OF CAN
OI - J.R.	BURROWS	NATL RES COUNC OF CAN
OI - R.C.	ROSE(RETIRED)	NATL RES COUNC OF CAN

BRIEF DESCRIPTION

The purpose of this experiment was to provide data that would aid in understanding (1) the mechanisms responsible for the production and control of the outer radiation zone, (2) the related problems of particle entry into the earth's magnetic field, and (3) interactions between the earth's magnetosphere and the solar wind. This experiment consisted of four sets of detectors. The first set, comprising four Geiger counters, measured electrons greater than 20 and 40 keV and protons greater than 300 and 500 keV parallel and perpendicular to the satellite spin axis. All remaining detectors measured particles perpendicular to the spin axis. The second set consisted of solid-state silicon junction detectors. These responded to electrons greater than 25 and 140 keV, electrons in the range 200 to 770 keV, and protons greater than 200 and 400 keV. The third set consisted of five silicon junction detectors that responded to protons between 0.15 and 30 MeV. The fourth set consisted of cesium iodide scintillation photomultiplier systems. Each system operated in two modes and responded to electrons greater than 8, 40, and 60 keV and protons greater than 50 keV and in the range 50 to 70 keV.

------- ISIS 1, NELMS --

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 69-009A-01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - G.L.	NELMS	DOC-CRC
PI - C.B.	MULDREW	DOC-CRC
OI - J.E.	JACKSON	NASA-GSFC
OI - J.H.	WHITTEKER	DOC-CRC
OI - J.	TURNER	IONOSPHERIC PRED SERV
OI - M.	SYLVAIN	LGE
OI - O.	HOLT	AURORAL OBS
OI - Y.	OGATA	RADIO RESEARCH LAB
OI - R.	RAGHAVARAO	PHYSICAL RESEARCH LAB
OI - R.B.	NORTON	NOAA-ERL
OI - K.L.	CHAN	NASA-ARC
OI - R.S.	UNWIN	DEPT OF SCI+INDUST RES

BRIEF DESCRIPTION

The purpose of this experiment was to investigate the ionospheric electron density in the altitude range 300 to 3500 km for a full solar cycle (by combining the ISIS 1 measurements with the Alouette 2 data). Another important function of the sounder was to provide correlative data for the other ISIS 1 experiments, particularly those measuring ionospheric parameters. The ISIS 1 ionosonde was basically a radio transmitter/receiver that recorded the time delay between a transmitted and a returned radio frequency pulse. A continuum of frequencies between 0.1 and 20 MHz was sampled once every 19 or 29 s, and one of six selected frequencies was also used for a period of 3 to 5 s during this 19- or 29-s period. In addition to the sweep- and fixed-frequency modes of operation, a mixed mode was possible where the transmitter frequency was fixed at 0.82 MHz while the receiver swept. Several virtual height (delay time) traces were normally observed due to ground reflections, plasma resonances, birefringence of the ionosphere, nonvertical propagation, etc. Virtual height at a given frequency was primarily a function of distance traversed by the signal, electron density along the propagation path, and mode of propagation. The standard data format was an ionogram showing virtual height as a function of frequency.

------- ISIS 1, SAGALYN --

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ANALYZER

NSSDC ID- 69-009A-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI - R.C.	SAGALYN	USAF GEOPHYS LAB
OI - M.	SMIDDY	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objective of the spherical electrostatic analyzer experiment was to measure the temporal and spatial variations in the concentration and energy distribution of the charged particles throughout the orbit. Specifically, the objectives were to measure the following parameters: (1) the density of positive ions having thermal energy in the concentration range from 1.E1 to 1.E6 ions per cc, (2) the kinetic temperature of the thermal ions in the range from 700 to 4000 deg K, (3) the flux and energy spectrum of protons in the range from 0 to 2 keV, and (4) the satellite potential with respect to the undisturbed plasma. Two units made up the experiment package: a 96-cm boom that supported the sensor and made possible omnidirectional measurements, and an electronics package (considered to include the sensor) to perform the measurements and to process the data into a suitable form for telemetry. The sensor was made up of three concentric spherical meshed grids having radii of 3.18, 2.54, and 1.90 cm. The innermost grid was the collector. These grids were made from tungsten mesh and had a transparency of 80 to 90%. To measure the parameters listed above, suitable sweep and step voltages were applied to the grids. This instrument was operated in several modes. The ion densities were sampled 60 times a second, corresponding to a spatial resolution of 150 m. Once per minute the ratio of mass to temperature was sampled, and the energy distribution was sampled once every 2 min. NSSDC has all the useful data that exist from this investigation.

**************************** ISIS 2 ****************************

SPACECRAFT COMMON NAME- ISIS 2
ALTERNATE NAMES- ISIS-B, PL-701F
05104

NSSDC ID- 71-024A

LAUNCH DATE- 04/01/71 WEIGHT- 256. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

CANADA	DOC-CRC
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 04/02/71
ORBIT PERIOD- 113.6 MIN	INCLINATION- 88.1 DEG
PERIAPSIS- 1358. KM ALT	APOAPSIS- 1428. KM ALT

PERSONNEL

MG - M.B. WEINREB	NASA HEADQUARTERS
SC - E.R. SCHMERLING	NASA HEADQUARTERS
SC - T.R. HARTZ	COMMUN RESEARCH CENTRE
PM - L.H. BRACE	NASA-GSFC
PS - L.H. BRACE	NASA-GSFC

BRIEF DESCRIPTION

ISIS 2 was an ionospheric observatory instrumented with a sweep-and a fixed-frequency ionosonde, a VLF receiver, energetic and soft particle detectors, an ion mass spectrometer, an electrostatic probe, a retarding potential analyzer, a beacon transmitter, a cosmic noise experiment, and two photometers. Two long crossed-dipole antennas (73 and 18.7 m) were used for the sounding, VLF, and cosmic noise experiments. The spacecraft was spin-stabilized to about 2 rpm after antenna deployment. There were two basic orientation modes for the spacecraft, cartwheel and orbit-aligned. The spacecraft operated approximately the same length of time in each mode, remaining in one mode typically 3 to 5 months. The cartwheel mode with the axis perpendicular to the orbit plane was made available to provide ram and wake data for some experiments for each spin period, rather than for each orbit period. Attitude and spin information was obtained from a three-axis magnetometer and a sun sensor. Control of attitude and spin was possible by means of magnetic torquing. The experiment package also included a programmable tape recorder with a 1-h capacity. For nonrecorded observations, data from satellite and subsatellite locations were telemetered when the spacecraft was in the line of sight of a telemetry station. Telemetry stations were located so that primary data coverage was near the 80-deg-W meridian and near Hawaii, Singapore, Australia, England, France, Norway, India, Japan, Antarctica, New Zealand, and Central Africa. NASA support of the ISIS project was terminated on October 1, 1979. A significant amount of experimental data, however, was acquired after this date by the Canadian project team.

------- ISIS 2, ANGER---

INVESTIGATION NAME- 3914- AND 5577-A PHOTOMETER

NSSDC ID- 71-024A-11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
AERONOMY

PERSONNEL

PI - C.D. ANGER	U OF CALGARY

BRIEF DESCRIPTION

This dual-wavelength scanning auroral photometer was designed to map the distribution of auroral emissions at 5577 and 3914 A over the portion of the dark earth visible to the spacecraft. A combination of internal electronic scanning performed by an image dissector and of the natural orbital and rotational motions of the spacecraft permitted the sensor to systematically scan across the earth. The detector system was constructed to allow incident radiation to be accepted from two directions 180 deg apart, and then to focus this light at a common point on the single-image-dissector photometer tube. Only one of the two optical systems pointed at the earth at any one time, while the other faced into space. When the spacecraft spin axis was oriented to lie in the orbital plane, each rotation of the spacecraft resulted in an earth scan 5 deg wide. This width size was chosen to ensure overlap with the previous scan. The image dissector repetitively scanned at a high speed across the narrow dimension of each 5-deg band and divided it into separately resolved regions 0.4 deg by 0.4 deg. Similar strips were scanned at each of the two wavelengths, but at times that differed by half the rotation period of about 10 s. A calibration light source for each wavelength was built into the optical assembly, and a calibration cycle was initiated automatically whenever a "power on" command was given. To minimize the problems arising from solar illumination of the optics and the direct viewing of the sunlit earth, a sunlight protection system was included. Complete details about the experiment can be found in C. D. Anger et al., "The ISIS-II scanning auroral photometer," Applied Optics, v. 12, n. 8, pp. 1753-1766, August 1973.

------- ISIS 2, BARRINGTON-------------------------------------

INVESTIGATION NAME- VLF RECEIVER

NSSDC ID- 71-024A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - R.E. BARRINGTON	DOC-CRC
OI - F.H. PALMER	DEFENCE RESEARCH ESTAB
OI - H.G. JAMES	DOC-CRC

BRIEF DESCRIPTION

The purpose of this experiment was to study natural and man-made VLF signals. Specific objectives included the investigation of VLF propagation phenomena, ion and hybrid plasma resonances, and correlations between VLF emissions and intense fluxes of energetic particles. In this experiment a swept-frequency exciter, covering ~~the~~ range from 15 kHz down to 0.05 kHz in 1.0 s, was used to stimulate ion resonances in the plasma. The instrumentation consisted of a low-frequency broadband receiver that observed signals from the 73-m long dipole (split monopole) antenna between 0.05 and 30 kHz. This same antenna was used for re the region eiving signals below 5 MHz on the ionosonde. The VLF receiver had a wide dynamic range that was achieved by use of an automatic gain control system. The experiment also permitted antenna impedance measurements, with or without a dc bias on the antenna. The real-time data were transmitted on 136.08-MHz telemetry. The VLF data could be recorded on one of the four tape-recorder channels when the spacecraft tape-recorder was operating. Tape-recorded and backup real-time data were transmitted on 400-MHz telemetry.

------- ISIS 2, BRACE---

INVESTIGATION NAME- CYLINDRICAL ELECTROSTATIC PROBES

NSSDC ID- 71-024A-07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL

PI - L.H. BRACE	NASA-GSFC
OI - J.A. FINDLAY	NASA-GSFC

BRIEF DESCRIPTION

The purpose of this experiment was to study the global variations of electron temperature and electron concentration at spacecraft altitudes during the waning phase of the solar cycle. The measurements were made with two cylindrical probes mounted along the spin axis, one at each end of the spacecraft. The sensors were operated as Langmuir probes, with the probe current being measured as a function of probe voltage. Although basically the same cylindrical probe experiment was flown on ISIS 1, the ISIS 2 probe provided (1) greater sensitivity allowing a more complete coverage of low-density regions such as the region over the polar cap, (2) very high resolution of plasma structure (down to 10 m in extent), and (3) onboard signal processing with backup to provide data in the format that had been used for the ISIS 1 experiment. NSSDC has all the useful data that exist from this investigation.

------- ISIS 2, CALVERT---

INVESTIGATION NAME- FIXED-FREQUENCY SOUNDER

NSSDC ID- 71-024A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - W. CALVERT	U OF IOWA
OI - R.B. NORTON	NOAA-ERL
OI - J.H. WHITTEKER	DOC-CRC
OI - J.M. WARNOCK	NOAA

BRIEF DESCRIPTION

This experiment was designed to study ionospheric features of a smaller scale than could be detected by the sweep sounder and to study plasma resonances. Parameters measured were virtual range (a function of propagation time of the pulse) and time. These data were normally observed only when the spacecraft was in range of a telemetry station. The fixed-frequency sounder operated from the same antenna, transmitter, and receiver used for the sweep-frequency experiment. It normally operated for 3 to 5 s during the frequency flyback period of the sweep-frequency operation which was every 14 or 21 s. One of six frequencies (0.12, 0.48, 1.00, 1.95, 4.00, or 9.303 MHz) was chosen for use by the experimenter, as desired. Other modes of operation were available, including continuous observation at a selected frequency and a special mixed mode with transmission at a selected one of the six fixed frequencies and sweep reception.

------- ISIS 2, HARTZ ---

INVESTIGATION NAME- COSMIC RADIO NOISE

NSSDC ID- 71-024A-10 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - T.R. HARTZ(RETIRED) DOC-CRC
PI - H.G. JAMES DOC-CRC

BRIEF DESCRIPTION
This experiment used the sweep-frequency ionosonde receiver automatic gain control voltages to measure galactic and solar radio-noise levels. The receiver swept from 0.1 to 20 MHz. The dynamic range was 50 dB, and the bandwidth was 55 kHz. The antennas used were 18.7-m and 73-m dipoles.

------- ISIS 2, MAIER ---

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 71-024A-08 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL
PI - E.J. MAIER NASA-GSFC
OI - B.E. TROY, JR. US NAVAL RESEARCH LAB
OI - J.L. DONLEY NASA-GSFC

BRIEF DESCRIPTION
The primary objective of this experiment was to measure the positive ion density, composition, and temperature in the vicinity of the spacecraft. A secondary objective was to measure the thermal electron density and temperature, and the flux of suprathermal electrons. This retarding potential analyzer consisted of three grids (aperture grid, retarding grid, and suppressor grid) that provided a volt-ampere curve relating sweep voltage on the retarding grid to current flow to the collector. Analysis of the volt-ampere curves provided ion/electron temperatures and densities. This experiment was designed to operate only with the satellite in a cartwheel mode of operation. In this mode, the spin axis was perpendicular to the orbit plane. This allowed the analyzer aperture to face the direction of satellite motion once each spin period. NSSDC has all the useful data that exist from this investigation.

------- ISIS 2, MCDIARMID ---

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 71-024A-04 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - I.B. MCDIARMID NATL RES COUNC OF CAN
OI - J.R. BURROWS NATL RES COUNC OF CAN

BRIEF DESCRIPTION
The objectives of the energetic particle experiment were to provide data that would aid in the understanding of (1) the mechanisms responsible for the production and control of the outer radiation zone, (2) the related problem of solar-flare particle entry into the earth's magnetic field, and (3) interactions between the earth's magnetosphere and the solar wind. This experiment consisted of four sets of detectors. The first set consisted of three Geiger counters (of which one failed after launch) and measured electrons greater than 20 and 40 keV perpendicular and parallel to the spin axis. These Geiger counters were also sensitive to protons with energies greater than 240 and 600 keV, respectively. All remaining detectors measured particles perpendicular to the spin axis. The second set consisted of two solid-state silicon junction detectors. Both detectors were operated in low- and high-threshold mode, while one could additionally be switched to another discrimination level. They measured electrons with energies greater than 40, 60, 90, 120, 150, and 200 keV. They were also sensitive to protons with energies greater than 150, 200, and 750 keV. The switchable detector experienced continuous saturation. The third set consisted of three silicon-junction detectors that measured protons in the energy ranges 0.8 to 4.0, 3.2 to 12.7, and 12.9 to 28.0 MeV, alpha particles in the energy range 2.5 to 16.0 MeV, and electrons in the energy range 1.0 to 2.0 MeV. The fourth set was composed of two cesium iodide scintillation-photomultiplier systems (channeltrons with cylindrical electrostatic analyzers) stepped through eight energies in 64/60 of a second. These differential spectrometers measured electrons at 9.6, 7.8, 6.0, 4.1, 3.0, 2.2, 1.3, and 0.15 keV, and measured protons at 26.2, 21.6, 17.0, 12.4, 9.4, 7.6, 5.2, and 2.2 keV.

------- ISIS 2, SHEPHERD ---

INVESTIGATION NAME- 6300-A PHOTOMETER

NSSDC ID- 71-024A-12 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS
AERONOMY

PERSONNEL
PI - G.G. SHEPHERD YORK U

BRIEF DESCRIPTION
A two-channel photometer was used to measure directly and to map the intensity of the atomic oxygen red line at 6300 A in day, twilight, and night airglow and aurora. Each channel had its own optical input, and the two inputs were mounted at the same end of the spacecraft, separated by 180 deg, with their axes at 90 deg to the spacecraft's spin axis. One optical input was characterized by a spectral bandwidth of 12 A centered around the 6300-A line of atomic oxygen, and the other input was used for white-light measurements. The spinning satellite caused the photometer to alternately view the earth and then the sky, i.e., when one sensor viewed the earth, the other sensor saw the sky. Both sensors had a 2.5-deg circular field of view. With the use of a beam-combiner arrangement, the same photomultiplier accepted the two inputs. The dynamic range of intensity measurements was from about 1.E11 photons per sq m per s (10 rayleighs) to more than 1.E16 photons per sq m per s. Sunlight could enter the optical systems directly in addition to earth-reflected light. The instrument baffle was illuminated by the sun only for the off-axis angles less than 47 deg. Outside this limit, the data were not degraded by sunlight, permitting normal operation in the region of the orbit where the spacecraft was in sunlight, but the portion of the earth beneath it was dark. An external light source "saw" the filter only when it was 7.5 deg or less off axis. In the range 7.5 to 47 deg, good data were still obtained when the sunlit earth was the origin of the contamination. To perform the data analysis, it was necessary, among other operations, to evaluate different geometrical situations, and to locate the on-earth limb crossing of the 12-A bandpass photometer so that the data could be organized into spin maps. For more details see G. G. Shepherd et al. "ISIS-II atomic oxygen red line photometer," Applied Optics, v. 12, n. 8, pp. 1767-1774, August 1973.

------- ISIS 2, WHITTEKER ---

INVESTIGATION NAME- SWEEP-FREQUENCY SOUNDER

NSSDC ID- 71-024A-01 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - J.H. WHITTEKER DOC-CRC
PI - D.B. MULDREW DOC-CRC
OI - J. TURNER IONOSPHERIC PRED SERV
OI - M. SYLVAIN LGE
OI - O. HOLT AURORAL OBS
OI - Y. OGATA RADIO RESEARCH LAB
OI - R. RAGHAVARAO PHYSICAL RESEARCH LAB
OI - J.E. JACKSON NASA-GSFC
OI - R.B. NORTON NOAA-ERL
OI - K.L. CHAN NASA-ARC
OI - R.S. UNWIN DEPT OF SCI+INDUST RES

BRIEF DESCRIPTION
The purpose of this experiment was to measure the ionospheric electron density in the altitude range 300 to 1400 km. Another important function of the sounder was to provide correlative data for the other ISIS 2 experiments, particularly those measuring ionospheric parameters. The ISIS 2 ionosonde was a radio transmitter that recorded the time delay between a transmitted and returned radio-frequency pulse. A continuum of frequencies between 0.1 and 20 MHz was sampled every 14 or 21 s, and one of six selected frequencies was also used for sounding for a few seconds during each 14- or 21-s period. In addition to the sweep- and fixed-frequency modes of operation, a mixed mode was available in which the transmitter frequency was fixed at one of six possible frequencies while the receiver swept. Several virtual-range (delay-time) traces resulting from ground reflections, plasma resonances, birefringence of the ionosphere, nonvertical propagation, etc., were normally observed. Virtual range at a given frequency was primarily a function of distance traversed by the signal, electron density along the propagation path, and mode of propagation. The standard data format was an ionogram (graph) showing virtual range as a function of radio frequency.

*************************** ISS-B ***************************

SPACECRAFT COMMON NAME- ISS-B
ALTERNATE NAMES- IONOSP SOUNDING SAT 2, 10674
UME 2, ISS-2

NSSDC ID- 78-018A

LAUNCH DATE- 02/16/78 WEIGHT- 135. KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- NU

SPONSORING COUNTRY/AGENCY
JAPAN RRL

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/17/78
ORBIT PERIOD- 107. MIN INCLINATION- 69.4 DEG
PERIAPSIS- 972. KM ALT APOAPSIS- 1225. KM ALT

PERSONNEL
PM - Y. HAKURA RADIO RESEARCH LAB
PS - N. MATUURA RADIO RESEARCH LAB

BRIEF DESCRIPTION
The Ionosphere Sounding Satellite (ISS) was part of Japan's contribution to the International Magnetospheric Study (IMS). Its objectives were to accumulate data for study of the topside ionosphere and to survey radio noise at four frequencies, from both earth and cosmic sources. It prepared world-wide maps of F2 critical frequency from the ionosphere sounding data. The ISS 2 was a small observatory with four experiments on board. The spacecraft, a right cylinder, 82 cm long and 93.5 cm in diameter, was spin stabilized at about 13 rpm with the spin axis normal to the ecliptic plane. Two pairs of crossed dipole antennas extended from the central part of the satellite and lay perpendicular to the spin axis. These antennas, 36.8 and 11.4 m long, were unfurled in orbit and were shared by ionospheric sounding and radio noise experiments. A spherical retarding-potential trap sensor was mounted on a boom perpendicular to the spin axis. A magnetic attitude sensor was mounted on a similar boom on the opposite side of the spacecraft. The remaining experiment involved a Bennett-type mass spectrometer with two sensors flush-mounted on opposite ends of the spacecraft. Spacecraft attitude was determined by means of a magnetometer, a solar sensor, and an earth horizon sensor. Small telemetry and command antennas extended from the spacecraft. The spacecraft was powered from a battery solar-cell system with solar cells covering most of the cylindrical surface. One recorder on board permitted spacecraft operation in either a recorded (for up to 112 min) or real-time mode. Readout and real-time operation were done from Kashima, Japan, and Ottawa, Canada.

------- ISS-B, AIKYO---

INVESTIGATION NAME- SWEEP FREQUENCY TOPSIDE IONOSPHERIC SOUNDER (TOP)

NSSDC ID- 78-018A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - K. AIKYO RADIO RESEARCH LAB

BRIEF DESCRIPTION
The Ionosphere Sounding Satellite (ISS) ionosonde was a pulsed radio transmitter and receiver that recorded the time delay between a transmitted pulse and its return. Frequencies between 0.5 and 14.8 MHz were sampled in 0.1-MHz steps to provide virtual range (delay time) of signal reflections. More than one virtual range-vs-frequency trace was often observed. These resulted from ground reflections, plasma resonances, birefringence of the ionosphere, nonvertical propagation, etc. Virtual range at a given frequency was primarily a function of distance traversed by the signal, electron density along the propagation path, and mode of propagation. The standard data form, an ionogram (graph) showing virtual range as a function of radio pulse frequency, was used to display these observations. Two other forms of data were prepared from these ionograms. They were digital (virtual range vs frequency) values of characteristic ionospheric features read directly from the ionogram, and computed profiles of electron density. This sounding mode of operation, called TOP-B, required 16 s to sample all frequencies (one ionogram). A TOP-A mode was also available. In the TOP-A mode, an iterative logic was employed with the pulsed transmission to determine the F2 region critical frequency, its corresponding virtual height, and other related supporting data. Unfortunately, the TOP-A mode failed to function due to internal spurious noise. With data from the TOP-B mode, world-wide maps of critical frequency were prepared. For both the TOP-A and TOP-B modes, the complete cycle time between successive ionograms or successive critical frequency observations was 64 s.

------- ISS-B, IWAMOTO---

INVESTIGATION NAME- ION MASS SPECTROMETER

NSSDC ID- 78-018A-04 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL
PI - I. IWAMOTO RADIO RESEARCH LAB

BRIEF DESCRIPTION
This experiment was flown to measure the positive ion composition over the spacecraft orbit. Two Bennett-type ion-mass spectrometers were flush-mounted on opposite ends of the spacecraft to look in opposite directions along the spin axis. The inside diameter of these cylindrical sensors was 36 mm. The mass range covered was 1 to 20 atomic mass units and the ion concentrations were measured over the range from 1 to 1.E4 ions per cc.

------- ISS-B, KATOH---

INVESTIGATION NAME- RADIO NOISE NEAR 2.5, 5, 10, AND 25 MHZ

NSSDC ID- 78-018A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - C. KATOH RADIO RESEARCH LAB

BRIEF DESCRIPTION
The objectives of this experiment were to observe and study (1) the global distribution of spherics and (2) the time variation of spherics and cosmic noise. Radio noise was observed at the following frequencies: 2.497, 4.997, 9.997, 10.003, 24.996, and 25.006 MHz. Characteristics observed at each frequency were noise intensity (resolution of 1/12.8 s) and occurrence frequency of impulsive noise (>15 dB above resolved intensity).

------- ISS-B, SAGAWA---

INVESTIGATION NAME- RETARDING POTENTIAL TRAP

NSSDC ID- 78-018A-03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
AERONOMY

PERSONNEL
PI - E. SAGAWA RADIO RESEARCH LAB

BRIEF DESCRIPTION
This probe was a spherical retarding-potential trap designed to observe ambient ion and electron densities ranging from 1.E3 to 1.E6 per cc. Ambient ion and electron temperatures in the range 500 to 5000 deg K were determined. As with all retarding-potential instruments, these parameters were derived from interpretation of the current flow measurement with a given voltage sequence applied to the collector and screen grids. The sensor was mounted on a boom extending perpendicular to the spacecraft spin axis. It consisted of a 2-cm diameter collector, concentrically enveloped by 6- and 10-cm diameter spherical wire grids. The current-voltage analog data were telemetered and subsequently analyzed by the experimenter.

*************************** IUE*******************************

SPACECRAFT COMMON NAME- IUE
ALTERNATE NAMES- INT ULTRAVIOLET EXPL, SAS-D
10637

NSSDC ID- 78-012A

LAUNCH DATE- 01/26/78 WEIGHT- 669. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
INTERNATIONAL ESA
UNITED KINGDOM SRC

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 01/27/78
ORBIT PERIOD- 1436.6 MIN INCLINATION- 28.8 DEG
PERIAPSIS- 26643. KM ALT APOAPSIS- 44951. KM ALT

PERSONNEL
MG - J.W. WARNER NASA HEADQUARTERS
SC - E.J. WEILER NASA HEADQUARTERS
PM - J.P. CORRIGAN NASA-GSFC
PS - Y. KONDO NASA-GSFC

BRIEF DESCRIPTION
The International Ultraviolet Explorer (IUE, formerly SAS-D) satellite was a spaceborne ultraviolet astronomical observatory for use as an international facility. The IUE contained a 45-cm telescope solely for spectroscopy in the wavelength range of 1150 to 3250 A. The satellite and optical instrumentation were provided by the Goddard Space Flight Center (GSFC). The television cameras, used as detectors, were provided by the United Kingdom Science Research Council (UKSRC). The European Space Agency (ESA, formerly ESRO)

supplied solar paddles for the satellite and a European Control Center. After launch, two-thirds of the observing time was directed from a control center at GSFC; one-third of the time, the satellite was operated from the European Control Center near Madrid. The IUE observatory was in a synchronous orbit. The 45-cm Ritchey-Chretien f/15 telescope fed a spectrograph package. The spectrograph package, using secondary electron conduction (SEC) Vidicon cameras as detectors, covered the spectral range from 1150 to 3250 A, operating in either a high- or low-resolution mode with resolutions of approximately 0.1 and 6 A, respectively. The SEC Vidicons could integrate the signal for up to many hours. This integration time limited detection in the high- and low-resolution modes to approximately 5 and 0.03 photons/(sq cm s A), respectively, for a signal-to-noise ratio of 50. Listings of guest observers and their investigations can be obtained from the IUE Newsletter, IUE Observatory, Code 685, Goddard Space Flight Center, Greenbelt, Maryland, 20771, U.S.A.

------- IUE, GUEST INVESTIGATORS-------------------------------

INVESTIGATION NAME- LOW-/HIGH-RESOLUTION, ULTRAVIOLET SPECTROGRAPH PACKAGE

NSSDC ID- 78-012A-01 INVESTIGATIVE PROGRAM CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S) ASTRONOMY

PERSONNEL
PI - GUEST INVESTIGATORS SEE EXPER. DESCRIPT.

BRIEF DESCRIPTION
This experiment included the ultraviolet spectrograph package carried by the IUE, consisting of two physically distinct echelle-spectrograph/camera units capable of astronomical observations. Each spectrograph was a three-element echelle system composed of an off-axis paraboloidal collimator, an echelle grating, and a spherical first-order grating that was used to separate the echelle orders and focus the spectral display on an image converter plus SEC Vidicon camera. There was a spare camera for each unit. The camera units were able to integrate the signal. The readout/preparation cycle for the cameras took approximately 20 min. Wavelength calibration was provided by the use of a hollow cathode comparison lamp. The photometric calibration was accomplished by observing standard stars whose spectral fluxes had previously been calibrated by other means. Both echelle-spectrograph/camera units were capable of high-resolution (0.1 A) or low-resolution (6 A) performance. The dual high/low-resolution capability was implemented by the insertion of a flat mirror in front of the echelle grating, so that the only dispersion was provided by the spherical grating. As the SEC Vidicons could integrate the signal for up to many hours, data with a signal-to-noise ratio of 50 could be obtained for 80 stars of 9th and 14th magnitudes in the high- and low-resolution modes, respectively. The distinguishing characteristic of the units was their wavelength coverage. One unit covered the wavelength range from 1192 to 1924 A in the high-resolution mode, and 1135 to 2085 A in the low-resolution mode. For the other unit, the ranges were from 1893 to 3031 A and 1800 to 3255 A for the high- and low-resolution modes, respectively. Each unit also had its own choice of entrance apertures: either a 3-arc-s hole or a 10- by 20-arc-s slot. The 10- by 20-arc-s slots could be blocked by a common shutter but the 3-arc-s aperture was always open. As a result, two aperture configurations were possible: (1) both 3-arc-s apertures open and both 10- by 20-arc-s slots closed, or (2) all four apertures open. With this instrumentation, the observational options open to an observer were long-wavelength and/or short-wavelength spectrograph, high or low resolution, and large or small apertures. Exposures could be made with the two spectrographs simultaneously but the entrance apertures for each were distinct and separated in the sky by about 1 arc min. An additional restriction was that data could be read out from only one camera at a time. However, one camera could be exposed while the other camera was being read out. The choice of high or low resolution could be made independently for the two spectrographs. Listings of guest observers and their investigations can be obtained from the IUE Newsletter, IUE Observatory, Code 685, Goddard Space Flight Center, Greenbelt, Maryland, 20771, U.S.A.

------- IUE, NONE ASSIGNED------------------------------------

INVESTIGATION NAME- PARTICLE FLUX MONITOR (SPACECRAFT)

NSSDC ID- 78-012A-02 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL
PI - NONE ASSIGNED

BRIEF DESCRIPTION
The particle flux monitor experiment was placed in IUE to monitor the trapped electron fluxes that affected the sensitivity of the ultraviolet sensor in the IUE spectrograph package experiment, NSSDC ID 78-012A-01. The particle flux monitor was a lithium-drifted silicon detector with a half-angle conical field of view of 16 deg. It had an aluminum absorber of 0.357 g/sq cm in front of the collimator and a brass shield with a minimum thickness of 2.31 g/sq cm. The effective energy threshold for electron measurements was 1.3 MeV. The experiment was also sensitive to protons with energies greater than 15 MeV. The instrument was used as an operational tool to aid in determining background radiation and acceptable camera exposure time. The data were also useful as a monitor of the trapped radiation fluxes. The instrument was provided by Dr. C. Bostrom of the Applied Physics Laboratory.

*************************** JIKIKEN**************************

SPACECRAFT COMMON NAME- JIKIKEN
ALTERNATE NAMES- EXOSPHERIC SAT. B, EXOS-B
11027

NSSDC ID- 78-087A

LAUNCH DATE- 09/16/78 WEIGHT- 92. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3H

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 09/16/78
ORBIT PERIOD- 533. MIN	INCLINATION- 31. DEG
PERIAPSIS- 230. KM ALT	APOAPSIS- 30558. KM ALT

PERSONNEL

PM - T.	OBAYASHI	U OF TOKYO
PS - N.	KAWASHIMA	U OF TOKYO
PS - H.	OYA	U OF TOHOKU
PS - A.	NISHIDA	U OF TOKYO

BRIEF DESCRIPTION
This mission was part of the Japanese contribution to the International Magnetospheric Study, and it carried out coordinated observations with Kyokko. Investigations of correlated mechanisms between particles and fields and plasma turbulence were made with in situ measurement techniques using electrostatic particle analyzers. The spacecraft, a 12-sided polyhedron, carried extendable dipole antennas with lengths of 103 m and 69.6 m, and a 1-m boom for a vector magnetometer. A solar panel array provided 30 W into a battery and regulator system. The spacecraft spin stabilized at 150 rpm but dropped to 3 rpm when the two sets of antennas were extended. Attitude was measured with a sun sensor to an accuracy of 0.5 deg. A 0.5-W 136-MHz PCM/PM telemetry system handled 256 or 1024 bps, and a 2-W 400-MHz PM system handled wideband 10-kHz or 3-kHz data. Data acquisition was in real time except for a 10-Kbyte memory for housekeeping and plasma parameter data.

------- JIKIKEN, EJIRI--

INVESTIGATION NAME- IMPEDANCE AND ELECTRIC FIELD (IEF)

NSSDC ID- 78-087A-04 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - M.	EJIRI	ISAS
OI - A.	NISHIDA	ISAS
OI - Y.	WATANABE	U OF TOKYO
OI - T.	OGAWA	KYOTO U

BRIEF DESCRIPTION
Sweep-frequency impedance probe measurements were made in the frequency range from .02 to 3 MHz using a 103-m (tip-to-tip) antenna. This provided basic data for calibration of natural plasma wave detections and data for the estimation of the transmission efficiency for plasma wave stimulations. Electron density was measured independently and accurately by canceling stray capacitance. Using this same antenna, electric fields from dc to 1 kHz were measured. The spacecraft body was coated with conductive materials to avoid the generation of local electric fields, so that accurate measurements of natural fields could be made.

------- JIKIKEN, KAWASHIMA-----------------------------------

INVESTIGATION NAME- CONTROLLED ELECTRON BEAM EMISSIONS (CBE)

NSSDC ID- 78-087A-07 INVESTIGATIVE PROGRAM SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS SPACE PLASMAS

PERSONNEL

PI - N.	KAWASHIMA	U OF TOKYO
OI - S.	MURASATO	U OF TOKYO

BRIEF DESCRIPTION

This experiment provided important effects for the analyses of wave/particle interactions. Spacecraft potential was controlled by the emission of electron beams, that could be varied in energy from 1 to 200 eV in 4 steps, to allow other instruments to make accurate measurements of low-energy ions and electrons. The beams could also cause plasma instabilities that resulted in the production of many kinds of plasma waves. Beam currents of 0.25, 0.5, 0.75, and 1.0 mA could be selected for each energy, or an automatic mode could be selected where energy and beam current were changed every 8 or 32 s.

------- JIKIKEN, KIMURA--

INVESTIGATION NAME- VLF DOPPLER PROPAGATION (DPL)

NSSDC ID- 78-087A-03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - I.	KIMURA	KYOTO U
OI - K.	HASHIMOTO	KYOTO U

BRIEF DESCRIPTION

This experiment involved detecting the NWC 22.3-kHz signal transmitted regularly from Australia with one of the two long dipole antennas (69.6 m and 103 m tip-to-tip) extended perpendicular to the spacecraft spin axis. This signal was heterodyned down to 590 Hz, amplified with a bandwidth of 100 Hz, and transmitted to the ground on a wideband analog channel. The electric field intensity of the NWC signal was telemetered via the PCM system. Antenna impedance data were obtained also.

------- JIKIKEN, KUBO---

INVESTIGATION NAME- ENERGY SPECTRUM OF PARTICLES (ESP)

NSSDC ID- 78-087A-06 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - H.	KUBO	ISAS
OI - N.	KAWASHIMA	U OF TOKYO
OI - T.	MUKAI	ISAS
OI - T.	ARAKAWA	U OF TOKYO

BRIEF DESCRIPTION

This experiment consisted of a hemispherical electrostatic analyzer for electrons and a cylindrical one for ions. The energy range was 5 eV to 11 keV for electrons and 0.02 to 30 keV/Q for ions. The energy resolution for both analyzers (delta E/E) was 0.6. Besides being used to obtain spectra, the instrument was used to investigate wave-particle interactions and determine the response of the magnetospheric plasma when either the stimulated plasma wave transmitter or the controlled electron beam experiment was operating.

------- JIKIKEN, OYA--

INVESTIGATION NAME- STIMULATED PLASMA WAVE (SPW)

NSSDC ID- 78-087A-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - H.	OYA	U OF TOHOKU
OI - T.	KAMADA	NAGOYA U
OI - T.	ONO	U OF TOHOKU

BRIEF DESCRIPTION

This experiment was designed to excite plasma waves by transmitting 300-W pulses from a 103-m (tip-to-tip) antenna in the frequency range .02 to 3 MHz. The frequency could be changed in a continuous sweep or stepped through fixed frequencies to obtain electron temperature, temperature anisotropy, and electron density. Plasma instabilities and nonlinear wave/particle interactions were studied.

------- JIKIKEN, OYA--

INVESTIGATION NAME- NATURAL PLASMA WAVES (NPW)

NSSDC ID- 78-087A-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - H.	OYA	U OF TOHOKU
OI - H.	MATSUMOTO	KYOTO U
OI - J.	OHTSU	NAGOYA U
OI - A.	MORIOKA	U OF TOHOKU
OI - T.	MIYATAKE	U OF ELECTRO-COMMUN
OI - I.	KIMURA	KYOTO U
OI - H.	MIYAOKA	U OF TOHOKU

BRIEF DESCRIPTION

This experiment used a 103-m (tip-to-tip) dipole antenna or a cored loop antenna consisting of 76 turns with a diameter of 15.5 cm for detecting VLF waves in the plasmasphere, electrostatic plasma waves in the magnetosphere, and radio waves from the earth and planets. The dipole was used to detect hectometer and dekameter waves from the planets, as well as terrestrial kilometric waves, in the range 0.02 to 3 MHz. VLF waves up to 10 kHz were detected using the dipole and a wideband receiver. Ion waves (0.1 to 1 kHz) and plasma waves (0.1 to 1 MHz) were detected in the near-earth portion of the orbit. Correlated observations with the VLF transmitter at Siple Station were planned. Fluctuations of the electric field up to 450 Hz were measured with a Langmuir probe. The bandwidth and sweep time of the frequency analyzer could be selected by choosing one of four modes.

**************************** LANDSAT 2************************

SPACECRAFT COMMON NAME- LANDSAT 2
ALTERNATE NAMES- EARTH RES TECH SAT.-B, PL-7330
ERTS-B, 07615

NSSDC ID- 75-004A

LAUNCH DATE- 01/22/75 WEIGHT- 816. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 01/25/75
ORBIT PERIOD- 103.28 MIN	INCLINATION- 99.09 DEG
PERIAPSIS- 907. KM ALT	APOAPSIS- 918. KM ALT

PERSONNEL

MG - J.C.	WELCH	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - S.C.	FREDEN	NASA-GSFC

BRIEF DESCRIPTION

Landsat 2 was the second of a series of modified Nimbus satellites. The near-polar orbiting spacecraft served as a stabilized, earth-oriented platform for obtaining information on agricultural and forestry resources, geology and mineral resources, hydrology and water resources, geography, cartography, environmental pollution, oceanography and marine resources, and meteorological phenomena. To accomplish these objectives, the spacecraft was equipped with a three-camera return beam vidicon (RBV) and a four-channel multispectral scanner (MSS) to obtain visible and near IR photographic and radiometric images of the earth. A data collection system (DCS) was also used to collect information from remote individually equipped ground stations and to relay the data to central acquisition stations. Landsat 2 carried two wide-band video tape recorders (WBVTR), capable of storing up to 30 min of scanner or camera data. An advanced attitude control system, consisting of horizon scanners, sun sensors, and a command antenna combined with a freon gas propulsion system, permitted the spacecraft's orientation to be controlled to within plus or minus 0.7 deg in all three axes. Spacecraft communications included a command subsystem operating at 154.2 and 2106.4 MHz and a PCM narrow-band telemetry subsystem, operating at 2287.5 and 137.86 MHz, for spacecraft housekeeping, attitude, and sensor performance data. Video data from the three-camera RBV system was transmitted in both real time and from WBVTR at 2276.5 MHz, while information from the MSS was constrained to a 20-MHz rf bandwidth at 2229.5 MHz.

------- LANDSAT 2, BALLA--

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 75-004A-02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - J.A. BALLA NASA-GSFC

BRIEF DESCRIPTION

The Landsat 2 Multispectral Scanner (MSS) was designed to provide repetitive daylight acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function was to obtain information in various areas such as agriculture, forestry, geology, and hydrology, the MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a 22.86-cm double reflector-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: (1) 0.5 to 0.6 micrometer, (2) 0.6 to 0.7 micrometer, (3) 0.7 to 0.8 micrometer, and (4) 0.8 to 1.1 micrometers (these bands were designated as bands 4, 5, 6, and 7, respectively). Incoming radiation was collected by the scanning mirror, which oscillated 2.89 deg to either side of nadir and scanned cross-track swaths 185-km wide. The along-track scan was produced by the orbital motion of the spacecraft. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the four spectral bands: bands 4 through 6 used photomultiplier tubes as detectors, band 7 used silicon photodiodes. A multiplexer included in the MSS system processed the scanner's 24 channels of data. These data were time-multiplexed and then converted to a pulse-code modulated signal by an A/D converter. The data were then transmitted (at 2229.5 MHz) directly to an acquisition station or stored on magnetic tape for subsequent playback the next time the spacecraft came within communication range of an acquisition station. Data from this experiment are handled by the NASA Data Processing Facility, GSFC, Greenbelt, Md., and are available to approved investigators through its Landsat users' services section. All other interested individuals may obtain data through the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

************************** LANDSAT 3 **************************

SPACECRAFT COMMON NAME- LANDSAT 3
ALTERNATE NAMES- EARTH RES TECH SAT.-C, ERTS-C
10702, LANDSAT-C

NSSDC ID- 78-026A

LAUNCH DATE- 03/05/78 WEIGHT- 960. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/06/78
ORBIT PERIOD- 103.1 MIN	INCLINATION- 99.1 DEG
PERIAPSIS- 897. KM ALT	APOAPSIS- 914. KM ALT

PERSONNEL

MG - J.C.	WELCH	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - S.C.	FREDEN	NASA-GSFC

BRIEF DESCRIPTION

Landsat 3 was a modified version of the Nimbus satellite, with the general mission objective of extending the period of space-data acquisition for earth resources initiated by Landsat 1 (formerly ERTS 1) and continued by Landsat 2. The near-polar orbiting spacecraft served as a stabilized, earth-oriented platform for obtaining information on agricultural and forestry resources, geology and mineral resources, hydrology and water resources, geography, cartography, environmental pollution, oceanography and marine resources, and meteorological phenomena. To accomplish these objectives, the spacecraft was equipped with a two-camera return beam vidicon (RBV) and a five-channel multispectral scanner (MSS) to obtain both visible and IR photographic and radiometric images of the earth. A data collection system was also used to collect information from remote individually equipped ground stations and to relay the data to central acquisition stations. Landsat 3 carried two wide-band video tape recorders (WBVTR) capable of storing up to 30 min of scanner or camera data. An advanced attitude control system, consisting of horizon scanners, sun sensors, and a command antenna combined with freon gas propulsion system, permitted the spacecraft's orientation to be controlled to within plus or minus 1.0 deg in all three axes. Spacecraft communications included a command subsystem, operating at 154.2 and 2106.4 MHz, and a PCM narrow-band telemetry subsystem, operating at 2287.5 and 137.86 MHz, for spacecraft housekeeping, attitude, and sensor performance data. Video data from the two-camera RBV system were transmitted in both real time and from the wide-band recorder system at 2265.5 MHz, while information from the MSS was constrained to a 20-MHz rf bandwidth at 2229.5 MHz.

------- LANDSAT 3, BALLA--------------------------------------

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 78-026A-02

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - J.A. BALLA NASA-GSFC

BRIEF DESCRIPTION

The Landsat 3 Multispectral Scanner (MSS) provided repetitive day/night acquisition of high-resolution multispectral data on the earth's surface on a global basis. While its primary function was to obtain data in various areas such as agriculture, forestry, geology, and hydrology, the MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a double reflector-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: (1) 0.5 to 0.6 micrometer, (2) 0.6 to 0.7 micrometer, (3) 0.7 to 0.8 micrometer, (4) 0.8 to 1.1 micrometers, and (5) 10.4 to 12.6 micrometers (these bands were designated as bands 4, 5, 6, 7, and 8, respectively). The last band, which lies in the thermal (emissive) part of the spectrum, gave Landsat 3 nighttime sensing capabilities. But this thermal band failed on July 11, 1978, and produced little useful data. Incoming radiation was collected by the scanning mirror, which oscillated 2.89 deg to either side of nadir and scanned cross-track swaths 185-km wide. The along-track scan was produced by the orbital motion of the spacecraft. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the first four spectral bands and two in the fifth band: bands 4 through 6 used photomultiplier tubes as detectors, band 7 used silicon photodiodes, and band 8 used mercury-cadmium-telluride detectors. The minimum dimensions that were resolved by the MSS were 80 m for bands 4 through 7 and 240 m for band 8. A multiplexer included in the MSS system processed the scanner's 26 channels of data. These data were time-multiplexed and then converted to a PCM signal by an A/D converter. The data were transmitted (at 2229.5 MHz) directly to an acquisition station or stored on magnetic tape for subsequent playback the next time the spacecraft came within communication range of an acquisition station. Data from this experiment were handled by the NASA Data Processing Facility, GSFC, Greenbelt, Md., and were made available to approved investigators through its Landsat users' services. All other interested individuals can obtain data through the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

------- LANDSAT 3, GILBERT--------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 78-026A-03

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS
EARTH RESOURCES SURVEY

PERSONNEL
PI - E.L. GILBERT NASA-GSFC

BRIEF DESCRIPTION

The Landsat 3 Data Collection System (DCS) provided users with near real-time data collected from various remote locations. The DCS was composed of (1) the data collection platforms (DCPs) which might have been ocean buoys, constant pressure balloons, or automatic ground stations, (2) the satellite equipment, and (3) the ground data centers, including remote receiving sites and the ground data handling system at GSFC. Use of the Landsat spaceborne DCS provided a continual flow of information for better management of wildlife, marine, agriculture, water, and forestry resources and led to improved weather forecasts, pollution control, and earthquake prediction and warning. The environmental sensors mounted on a DCP were selected by individual investigators to satisfy their particular requirements. From an orbital altitude of 912 km, the spacecraft was capable of acquiring data from DCPs within a radius of approximately 3100 km from the subsatellite point, thus allowing data to be obtained from any remote platform at least once every 12 h. The DCPs transmitted at 401.55 MHz. The DCS equipment, essentially a receiver, received and retransmitted data (at 2287.5 MHz) to selected ground receiving stations. There was no signal multiplexing or data processing on the satellite. The Landsat 3 DCS accommodated up to 1000 DCPs deployed throughout the continental United States. Data from this experiment were handled and distributed to the various platform investigators by the NASA Data Processing Facility, GSFC, Greenbelt, Md.

------- LANDSAT 3, WEINSTEIN-----------------------------------

INVESTIGATION NAME- RETURN BEAM VIDICON CAMERA (RBV)

NSSDC ID- 78-026A-01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - O. WEINSTEIN NASA-GSFC

BRIEF DESCRIPTION

The Landsat 3 Return Beam Vidicon (RBV) camera system contained two identical cameras covering the spectral band from 0.53 to 0.75 micrometer. The two earth-oriented cameras were mounted on a common base, structurally isolated from the spacecraft to maintain accurate alignment. Each camera contained an optical lens, a RBV sensor, a thermoelectric cooler, deflection and focus coils, a mechanical shutter, erase lamps, and sensor electronics. The cameras were aligned to view adjacent 98-km square ground scenes which overlapped slightly so that the total width of the ground scene was 185 km. The cameras were operated every 12.5 s to produce overlapping images along the direction of spacecraft motion. After shuttering, the image was scanned by an electron beam to produce a video output signal. The timing cycle was arranged so that a 3.5-s offset was introduced between the readouts of the two cameras, permitting sequential readout of the cameras, allowing the same tape recorder and communication channel to be used. Video data from the RBV were transmitted (at 2265.5 MHz) in both real-time and tape-recorder modes. From a nominal spacecraft altitude of 912 km, the RBV had a ground resolution of 40 m (twice the Landsat 1 resolution of 80 m). Data from this experiment were handled by the NASA Data Processing Facility, GSFC, Greenbelt, Md., and were made available to approved investigators and agencies through its Landsat users' services section. All other interested individuals can obtain data through the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

**************************** LANDSAT 4*************************

SPACECRAFT COMMON NAME- LANDSAT 4
ALTERNATE NAMES- LFO-A, LANDSAT-D
13367

NSSDC ID- 82-072A

LAUNCH DATE- 07/16/82 WEIGHT- 1407. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/17/82
ORBIT PERIOD- 98.5 MIN INCLINATION- 98.3 DEG
PERIAPSIS- 678. KM ALT APOAPSIS- 696. KM ALT

PERSONNEL
MG - B.B. SCHARDT NASA-GSFC
PM - L. GONZALES NASA-GSFC
PS - V.V. SALOMONSON NASA-GSFC

BRIEF DESCRIPTION

The Landsat 4 system was an experimental earth resources monitoring system with the new powerful remote-sensing capabilities of the thematic mapper (TM), and it provided a transition for both foreign and domestic users from the multispectral scanner (MSS) data to the higher resolution and data rate of the TM. It had a complete end-to-end highly automated data system, which was designed to be a new generation system, and was a major step forward in global remote-sensing applications. The Landsat 4 mission consisted of an orbiting satellite (flight segment) with the necessary wideband data links and support systems, and a ground segment. The Landsat 4 flight segment consisted of two major systems: (1) the instrument module, containing the instruments together with the mission unique subsystems, such as the solar array and drive, the TDRS antenna, the wide-band module (WBM), and the global positioning system (GPS); and (2) the multimission modular spacecraft (MMS) that contained the modularized and standardized power, propulsion, attitude control, and communications and data handling subsystems. The flight segment was designed with 3 years nominal lifetime in orbit and could be extended through in-orbit replacement capability when the Space Shuttle became operational. The spacecraft was placed into an orbit having a descending node equatorial crossing between 9:30 and 10:00 a.m. local time. The spacecraft and attendant sensors were operated through the GSTDN stations before the Tracking And Data Relay Satellite System (TDRSS) available. An identical back-up spacecraft, Landsat-D Prime (NSSDC ID Landsat-E) will be placed in storage and launched after Landsat 4 is no longer operable. On October 1, 1982, NOAA assumed responsibility for Landsat data production and archiving activities at the Department of Interior's EROS Data Center. On January 31, 1983, NOAA also took over operation and maintenance of the Landsat spacecraft and ground system resources from NASA.

------- LANDSAT 4, BANKS-----------------------------------

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- 82-072A-02 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - G.F. BANKS NASA-GSFC

BRIEF DESCRIPTION

The Landsat 4 Multispectral Scanner (MSS) provided repetitive daytime acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function was to provide an alternate to the thematic mapper (TM), it provided data for agriculture, forestry, geology, and hydrology. The MSS system was also used for oceanographic and meteorological purposes, i.e., to map sea-ice, fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consisted of a double reflection-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operated in the following spectral intervals: band 1, 0.5 to 0.6 micrometers; band 2, 0.6 to 0.7 micrometers; band 3, 0.7 to 0.8 micrometers; band 4, 0.8 to 1.1 micrometers (the band numbering was different from Landsats 1-3). The Landsat 4 MSS was similar to the Landsat 3 MSS except for changes necessary to accommodate the lower orbital altitude. The swath width of 185 km remained the same by increasing the FOV of the sensors from 11.56 to 14.92 deg. The ground resolution was 82.6 m for all four bands. The primary image produced at the image plane was relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal was accomplished. Optical filters were used to produce the desired spectral separation. Six detectors were employed in each of the four spectral bands: bands 1 through 3 used photomultiplier tubes as detectors, and band 4 used silicon photodiodes. A multiplexer included in the MSS system processed the scanner's 24 channels of data. These data were time-multiplexed and then converted to a PCM signal by an A/D converter. The data were transmitted via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. For information about archival data, one may contact the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

------- LANDSAT 4, FEINBERG-----------------------------------

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)

NSSDC ID- 82-072A-03 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - P.M. FEINBERG NASA-GSFC

BRIEF DESCRIPTION

The Global Positioning System (GPS) was a Department of Defense (DOD) program to provide very precise position and timing information to a variety of users. The GPS assembly on Landsat 4 operated in two phases. The first phase (approximately 90 days) was an experimental one to validate and calibrate the position and timing information provided by the GPS assembly. The second phase called for operational use of the GPS data by Landsat 4.

------- LANDSAT 4, LINSTROM-----------------------------------

INVESTIGATION NAME- THEMATIC MAPPER (TM)

NSSDC ID- 82-072A-01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - L. LINSTROM NASA-GSFC

BRIEF DESCRIPTION

The Thematic Mapper (TM) was a seven-band, earth-looking, scanning radiometer with a 30-m ground element resolution covering a 185-km ground swath from a 705-km altitude. The instrument consisted of primary imaging optics, scanning mechanism, spectral band discrimination optics, detector arrays, radiative cooler, inflight calibrator, and required operating and processing electronics. The scanning mechanism provided the cross-track scan, while the progress of the spacecraft provided the scan along the track. Seven spectral bands were used to provide the spectral signature capability of the instrument: band 1, 0.45-0.52 micrometer; band 2, 0.52-0.60 micrometer; band 3, 0.63-0.69 micrometer; band 4, 0.76-0.90 micrometer; band 5, 1.55-1.75 micrometers; band 6, 10.40-12.50 micrometers; and band 7, 2.08-2.35 micrometers. The optical system imaged the earth's surface on a field stop or a detector sized to define an area on the earth's surface 30 m square (120 m for band 6). Several lines were scanned simultaneously to permit suitable dwell time for each resolution element. The variation in radiant flux passing through the field stop onto the photo and thermal detectors created an electrical output that represented the radiant history of the line. The information outputs from the detector channels were processed in the TM multiplexer for transmission via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. For information of archival data, one may contact the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

*************************** MAGION***************************

SPACECRAFT COMMON NAME- MAGION
ALTERNATE NAMES- 11110

NSSDC ID- 78-099C

LAUNCH DATE- 10/24/78 WEIGHT- 15. KG
LAUNCH SITE- PLESETSK, U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. INTERCOS
CZECHOSLOVAKIA CAS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/25/78
ORBIT PERIOD- 96.4 MIN INCLINATION- 82.96 DEG
PERIAPSIS- 407. KM ALT APOAPSIS- 768. KM ALT

PERSONNEL
PS - P. TRISKA CZECH ACAD OF SCI

BRIEF DESCRIPTION
MAGION was a Czechoslovakian subsatellite that separated from Intercosmos 18 on November 14, 1978. It was magnetically stabilized and was designed to carry ionospheric-type experiments related to the International Magnetospheric Study. MAGION had a prismatic shape (.3 x .3 x .15 m) and followed the orbit of Intercosmos 18. Czechoslovak participation in studies of mutual relations between the earth's magnetosphere and ionosphere consisted mainly of measuring VLF phenomena on board MAGION, which was moving slowly away from Intercosmos 18, and in cooperating in the measurements of plasma properties in the vicinity of this satellite. For more details on the spacecraft and its experiments see P. Triska, et. al., Adv. Space Res., v. 2, n. 7, p. 53-56, 1983.

------- MAGION, TRISKA--

INVESTIGATION NAME- ELF AND VLF RECEIVERS

NSSDC ID- 78-099C-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - P. TRISKA CZECH ACAD OF SCI
OI - F. JIRICEK CZECH ACAD OF SCI

BRIEF DESCRIPTION
This investigation was designed to utilize simultaneous measurements made on the nearby parent spacecraft, Intercosmos 18. Five parts of the experiment were identified. (1) Electric and magnetic fields from 0.05 to 0.16 kHz were measured in a broadband channel. (2) VLF narrow-band channels were set at 0.45, 0.8, 1.95, 4.65, and 15 kHz. (3) There was a 16-channel frequency analyzer. (4) A resonance exciter operated, sweeping the range 0.8 to 8 kHz. (5) Electric fields in the range 0.01 to 80 khz were measured. Due to power limitations, except during the short initial phase after separation and activation, not all components were operated simultaneously. Either electric field broadband, magnetic field broadband, or VLF narrow-band channels and particle detectors were operated.

------- MAGION, TRISKA--

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 78-099C-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - P. TRISKA CZECH ACAD OF SCI
OI - F. JIRICEK CZECH ACAD OF SCI

BRIEF DESCRIPTION
This investigation was designed to utilize simultaneous measurements made on the nearby parent spacecraft Intercosmos 18. The detectors were Geiger-Mueller tubes viewing in two directions, parallel and perpendicular to the magnetic orientation axis. The energy threshold was 30 keV for electrons. Due to power limitations, except during the short initial phase after separation and activation, not all instruments were operated simultaneously. Either electric field broadband, magnetic field broadband, or VLF narrow-band channels and particle detectors were operated.

*************************** METEOSAT 1***********************

SPACECRAFT COMMON NAME- METEOSAT 1
ALTERNATE NAMES- METEOROLOGICAL SAT-A, METOSAT
10489

NSSDC ID- 77-108A

LAUNCH DATE- 11/23/77 WEIGHT- 625.8 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/24/77
ORBIT PERIOD- 1411.5 MIN INCLINATION- 0.7 DEG
PERIAPSIS- 34913. KM ALT APOAPSIS- 35692. KM ALT

PERSONNEL
PM - J. AASTED ESA-TOULOUSE

BRIEF DESCRIPTION
Meteosat 1 was a geostationary spacecraft that served as part of European Space Agency's (ESA) contribution to the Global Atmospheric Research Program (GARP). As part of GARP, the satellite helped to supply data required for global data sets used in improvement of machine weather forecasts. In general, the spacecraft design, instrumentation, and operation were similar to SMS/GOES. The spin-stabilized spacecraft carried (1) a visible-IR radiometer to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system and (2) a meteorological data collection system to disseminate image data to user stations, to collect data from various earth-based platforms, and to relay data from polar-orbiting satellites. The cylindrically shaped spacecraft measured 210 cm in diameter and 430 cm in length, including the apogee boost motor. The primary structural members were an equipment platform and a central tube. The radiometer telescope was mounted on the equipment platform and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the central tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the central tube and the solar panels were stationkeeping and dynamics control equipment and batteries. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by jet thrusters mounted on the spacecraft and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystems. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft attained synchronous orbit. Meteosat 1 was placed in geosynchronous orbit near the prime meridian.

------- METEOSAT 1, PERA--

INVESTIGATION NAME- DATA COLLECTION PLATFORM (DCP)

NSSDC ID- 77-108A-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - L. PERA ESA-TOULOUSE

BRIEF DESCRIPTION
The data collection system was designed to (1) disseminate image data to user stations, (2) collect data from various earth-based platforms, and (3) provide for a space-to-space relay for data from polar-orbiting satellites. This experiment was similar to the meteorological data collection and transmission system (WEFAX) flown on SMS 1, SMS 2, and GOES series spacecraft. This experiment operated on S-band frequencies for WEFAX-type transmissions and UHF for data collection platform report and interrogation.

*************************** METEOSAT 2***********************

SPACECRAFT COMMON NAME- METEOSAT 2
ALTERNATE NAMES- METEOROLOGICAL SAT-B, METEOSAT-3

NSSDC ID- 81-057A

LAUNCH DATE- 06/19/81 WEIGHT- 625.8 KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/27/81
ORBIT PERIOD- 1442.1 MIN	INCLINATION- 1.01 DEG
PERIAPSIS- 35847. KM ALT	APOAPSIS- 35973. KM ALT

PERSONNEL
PM - J. AASTED ESA-TOULOUSE

BRIEF DESCRIPTION

Meteosat 2 was a geostationary spacecraft and served as part of the European Space Agency's (ESA) contribution to the Global Atmospheric Research Program (GARP). As part of GARP, the satellite helped to supply data required for global data sets used in improvement of machine weather forecasts. In general, the spacecraft design, instrumentation, and operation were similar to SMS/GOES. The spin-stabilized spacecraft carried (1) a visible-IR radiometer that provided high-quality day/night cloudcover data and that took radiance temperatures of the earth/atmosphere system and (2) a meteorological data collection system that disseminated image data to user stations, collected data from various earth-based platforms, and relayed data from polar-orbiting satellites. The cylindrically shaped spacecraft measured 210 cm in diameter and 430 cm in length, including the apogee boost motor. The primary structural members were an equipment platform and a central tube. The radiometer telescope was mounted on the equipment platform and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the central tube and was affixed to the solar panels, which formed the outer walls of the spacecraft and provided the primary source of electrical power. Located in the annulus-shaped space between the central tube and the solar panels were stationkeeping and dynamics control equipment and batteries. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by jet thrusters mounted on the spacecraft and activated by ground command. The spacecraft used both UHF-band and S-band frequencies in its telemetry and command subsystems. A low-power VHF transponder provided telemetry and command during launch and then served as a backup for the primary subsystem once the spacecraft had attained synchronous orbit.

------- METEOSAT 2, PERA---------------------------------------

INVESTIGATION NAME- DATA COLLECTION PLATFORM (DCP)

NSSDC ID- 81-057A-02 INVESTIGATIVE PROGRAM
COMMUNICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - L. PERA ESA-TOULOUSE

BRIEF DESCRIPTION

The data collection system was designed to (1) disseminate image data to user stations, (2) collect data from various earth-based platforms, and (3) provide for a space-to-space relay for data from polar orbiting satellites. This experiment was similar to the meteorological data collection and transmission system (WEFAX) flown on SMS 1, SMS 2, and GOES series spacecraft. This experiment operated on S-band frequencies for WEFAX-type transmissions and UHF for data collection platform report and interrogation.

------- METEOSAT 2, SERENE-------------------------------------

INVESTIGATION NAME- IMAGING RADIOMETER

NSSDC ID- 81-057A-01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - B. SERENE ESA-TOULOUSE

BRIEF DESCRIPTION

The visible-IR radiometer flown on Meteosat 2 was capable of providing day/night observations of cloud cover and earth/cloud radiance temperature measurements from a synchronous, spin-stabilized satellite for use in (1) operational weather analysis and forecasting and (2) for support to GARP. The five-channel instrument was able to take full pictures of the earth's disk. The three IR channels (two in the 10.5- to 12.5-micrometer region and one in the 5.7- to 7.1-micrometer region), and the two visible channels (0.4- to 1.1-micrometers) used a common optics system. Incoming radiation was received by a scan mirror and collected by an optical system. The scan mirror was set at a nominal angle of 45 deg to the radiometer optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-east scan motion when the spin axis of the spacecraft was oriented parallel with the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror at the completion of each spin. Resolutions at the sub-satellite point were 2.5 km for the visible, and 5 km for the IR and water-vapor channels. Data from this experiment are available through the European Space Operations Center (ESOC), Darmstadt, W. Germany.

*************************** NIMBUS 5*************************

SPACECRAFT COMMON NAME- NIMBUS 5
ALTERNATE NAMES- NIMBUS-E, PL-721B
06305

NSSDC ID- 72-097A

LAUNCH DATE- 12/11/72 WEIGHT- 770. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 12/11/72
ORBIT PERIOD- 107.2 MIN	INCLINATION- 99.9 DEG
PERIAPSIS- 1089. KM ALT	APOAPSIS- 1101. KM ALT

PERSONNEL

MG - G.F.	ESENWEIN	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - A.J.	FLEIG	NASA-GSFC

BRIEF DESCRIPTION

The Nimbus 5 research-and-development satellite was designed to serve as a stabilized, earth-oriented platform for the testing of advanced meteorological sensor systems and collecting meteorological and geological data on a global scale. The polar-orbiting spacecraft consisted of three major structures: (1) a hollow, ring-shaped sensor mount, (2) solar paddles, and (3) a control system housing. The solar paddles and control system housing were connected to the sensor mount by a truss structure, giving the satellite the appearance of an ocean buoy. Nimbus 5 was nearly 3.7 m tall, 1.5 m in diameter at the base, and about 3 m wide with solar paddles extended. The torus-shaped sensor mount, which formed the satellite base, housed the electronics equipment and battery modules. The lower surface of the torus provided mounting space for sensors and antennas. A box-beam structure mounted within the center of the torus provided support for the larger sensor experiments. Mounted on the control system housing, which was located on top of the spacecraft, were sun sensors, horizon scanners, and a command antenna. An advanced attitude-control system permitted the spacecraft orientation to be controlled to within plus or minus 1 deg in all three axes. Primary experiments included (1) a temperature-humidity infrared radiometer (THIR) for measuring day and night surface and cloudtop temperatures, as well as the water vapor content of the upper atmosphere, (2) an electrically scanning microwave radiometer (ESMR) for mapping the thermal radiation from the earth's surface and atmosphere, (3) an infrared temperature profile radiometer (ITPR) for obtaining vertical profiles of temperature and moisture, (4) a Nimbus E microwave spectrometer (NEMS) for determining tropospheric temperature profiles, atmospheric water vapor abundances, and cloud liquid water contents, (5) a selective chopper radiometer (SCR) for observing the global temperature structure of the atmosphere, and (6) a surface composition mapping radiometer (SCMR) for measuring the differences in the thermal emission characteristics of the earth's surface. A more detailed description can be found in "The Nimbus 5 User's Guide" (TRF 14758), available from NSSDC.

------- NIMBUS 5, HOUGHTON------------------------------------

INVESTIGATION NAME- SELECTIVE CHOPPER RADIOMETER (SCR)

NSSDC ID- 72-097A-02 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - J.T.	HOUGHTON	OXFORD U
OI - S.D.	SMITH	READING U

BRIEF DESCRIPTION

The Nimbus 5 Selective Chopper Radiometer (SCR) was designed to (1) observe the global temperature structure of the atmosphere up to 50 km in altitude, (2) make supporting observations of water vapor distribution, and (3) determine the density of ice particles in cirrus clouds. To accomplish these objectives, the SCR measured emitted radiation in 16 spectral intervals separated into the following four groups: (1) four CO_2 channels between 13.8 and 14.8 micrometers (2) four channels at 15.0 micrometers, (3) an IR window channel at 11.1 micrometers, a water vapor channel at 18.6 micrometers, two channels at 49.5 and 133.3 micrometers, and (4) four channels at 2.08, 2.59, 2.65, and 3.5 micrometers. From an average satellite altitude of 1100 km, the radiometer viewed a 48-km circle on the earth's surface with a ground resolution of about 25 km. A similar experiment was flown on Nimbus 4. For a more detailed description, see Section 6 in "The Nimbus 5 User's Guide" (TRF B14758), available from NSSDC. Both NSSDC and SDSD have data.

------- NIMBUS 5, WILHEIT, JR.-----------------------------------

INVESTIGATION NAME- ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)

NSSDC ID- 72-097A-04

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

PI - T.T.	WILHEIT, JR.	NASA-GSFC
OI - P.	GLOERSEN	NASA-GSFC

BRIEF DESCRIPTION

The primary objectives of the Nimbus 5 Electrically Scanning Microwave Radiometer (ESMR) were (1) to derive the liquid water content of clouds from brightness temperatures over oceans, (2) to observe differences between sea ice and the open sea over the polar caps, and (3) to test the feasibility of inferring surface composition and soil moisture. To accomplish these objectives, the ESMR was capable of continuous global mapping of the 1.55-cm (19.36 GHz) microwave radiation emitted by the earth/atmosphere system, and could function even in the presence of cloud conditions that block conventional satellite infrared sensors. An 83.3- by 85.5-cm radiometer antenna system, deployed after launch, scanned the earth successively at various angles in a plane perpendicular to the spacecraft orbital track, producing a brightness-temperature map of the surface of the earth and its atmosphere. The scanning process was controlled by a computer on board, and it consisted of 78 symmetrically distributed independent scan spots extending 50 deg to either side of nadir. Angular separation of the scan spots allowed for an 8.5% overlap between view positions. From a mean orbital height of 1100 km, the radiometer had an accuracy of about plus or minus 1 deg C with a spatial resolution of about 25 km at nadir. The ESMR data were stored on magnetic tape for transmission to ground acquisition stations. For more detailed information, see Section 4 in "The Nimbus 5 User's Guide" (TRF B14758). Selected ESMR images were presented in "The Nimbus 5 Data Catalog." Both documents are available from NSSDC.

**************************** NIMBUS 6**************************

SPACECRAFT COMMON NAME- NIMBUS 6
ALTERNATE NAMES- PL-731B, NIMBUS-F
07924

NSSDC ID- 75-052A

LAUNCH DATE- 06/12/75 WEIGHT- 585. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/12/75
ORBIT PERIOD- 107.3 MIN	INCLINATION- 100. DEG
PERIAPSIS- 1093. KM ALT	APOAPSIS- 1101. KM ALT

PERSONNEL

MG - G.F.	ESENWEIN	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - A.J.	FLEIG	NASA-GSFC

BRIEF DESCRIPTION

The Nimbus 6 research-and-development satellite served as a stabilized, earth-oriented platform for testing advanced systems for sensing and collecting meteorological data on a global scale. The polar-orbiting spacecraft consisted of three major structures: (1) a hollow torus-shaped sensor mount, (2) solar paddles, and (3) a control housing unit connected to the sensor mount by a tripod truss structure. Configured somewhat like an ocean buoy, Nimbus 6 was nearly 3.7 m tall, 1.5 m in diameter at the base, and about 3 m wide with solar paddles extended. The sensor mount that formed the satellite base housed the electronics equipment and battery modules. The lower surface of the torus provided mounting space for sensors and antennas. A box-beam structure mounted within the center of the torus supported the larger sensor experiments. Mounted on the control housing unit, which was located on top of the spacecraft, were sun sensors, horizon scanners, and a command antenna. An advanced attitude-control system permitted the spacecraft's orientation to be controlled to within plus or minus 1 deg in all three axes (pitch, roll, and yaw). The nine experiments selected for Nimbus 6 were (1) earth radiation budget (ERB), (2) electrically scanning microwave radiometer (ESMR), (3) high-resolution infrared radiation sounder (HIRS), (4) limb radiance inversion radiometer (LRIR), (5) pressure modulated radiometer (PMR), (6) scanning microwave spectrometer (SCAMS), (7) temperature-humidity infrared radiometer (THIR), (8) tracking and data relay experiment (T+DRE), and (9) tropical wind energy conversion and reference level experiment (TWERLE). This complement of advanced sensors was capable of (1) mapping tropospheric temperature, water vapor abundance, and cloud water content, (2) providing vertical profiles of temperature, ozone, and water vapor, (3) transmitting real-time data to a geostationary spacecraft (ATS 6), and (4) yielding data on the earth's radiation budget. A more detailed description can be found in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC.

------- NIMBUS 6, HOUGHTON-----------------------------------

INVESTIGATION NAME- PRESSURE MODULATED RADIOMETER (PMR)

NSSDC ID- 75-052A-09

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - J.T.	HOUGHTON	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U
OI - G.D.	PESKETT	OXFORD U
OI - P.	CURTIS	OXFORD U

BRIEF DESCRIPTION

The Nimbus 6 Pressure Modulator Radiometer (PMR) experiment took radiometric measurements in the 15-micrometer CO2 band at altitudes between 45 and 70 km on a global scale. By appropriate mathematical retrieval methods, the temperature structures of the upper stratosphere and lower mesosphere were then deduced. The pressure-modulation technique permitted the extension of selective chopping techniques to higher altitudes where the pressure-broadened emission lines in the 15-micrometer CO2 band became so narrow that conventional spectrometers and interferometers had insufficient spectral resolution. In addition to pressure scanning (in discrete steps), the radiometer also employed Doppler scanning along the direction of flight. The PMR comprised two similar radiometer channels, each consisting of a plane scanning mirror, reference blackbody, pressure-modulator cell, and detector assembly. The plane mirror was gold coated and mounted at 45 deg on a 90-deg stepping motor so that the field of view of the channel could be directed to space or to the internal reference blackbody for inflight range and zero calibration. The motor was mounted on a pair of flexible pivots so that the mirror could be rotated through plus or minus 7-1/2 deg from its rest position to give the required Doppler scan. Major components in the pressure-modulator cell were a movable piston, a diaphragm, and a magnetic drive coil. The detector assembly consisted of a field lens, a condensing light pipe, and a pyroelectric flake bolometer. Each radiometer had a field of view that was 20 deg whole-angle across the spacecraft's line of flight and 40 deg whole-angle parallel to the line of flight. The derived temperature values were within 2 deg K at 65 km and about 0.2 deg K near 50 km with a vertical resolution of 10 km. For a more detailed description, see Section 8 in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. The instrument performed satisfactorily.

------- NIMBUS 6, JACOBOWITZ-----------------------------------

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 75-052A-05

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - H.	JACOBOWITZ	NOAA-NESS
OI - A.J.	DRUMMOND(DECEASED)	EPPLEY LAB, INC
OI - I.	RUFF	NOAA-NESS
OI - J.R.	HICKEY	EPPLEY LAB, INC
OI - W.J.	SCHOLES	EPPLEY LAB, INC
OI - L.L.	STOWE	NOAA-NESS

BRIEF DESCRIPTION

The Nimbus 6 Earth Radiation Budget (ERB) experiment measured reflected and emitted terrestrial radiation fluxes in conjunction with solar radiation. The results were used (1) to determine the earth radiation budget, (2) to determine the angular distribution of terrestrial radiation for various meteorological and geographic regimes, and (3) to correlate measurements made using identical but independent channels calibrated to the same standard. Incoming solar radiation from 0.2 to 50 micrometers was normally monitored in 10 spectral intervals several times each day and in every orbit during periods of solar activity. Terrestrial radiation measurements were taken continuously in the 0.2 to 4-micrometer, 0.7 to 3-micrometer, and 4 to 50-micrometer intervals. The measurements were taken in two ways. Four channels, using fixed wide-angle optics (133.3-deg field of view), measured the total outgoing radiation integrated over the entire disk of the earth. The second set of measurements was obtained for eight high-resolution narrow-angle scanning channels that measured the terrestrial radiation emanating from a relatively small area over a range of various zenith and azimuth angles. The multichannel radiometer employed a bi-axial scanning mechanism which enabled measurements to be obtained from the forward horizon to the aft horizon in a 64-s interval. Each axis of the scanning mechanism contained four shortwave channels (0.2 to 4.0 micrometers) and four longwave channels (4.0 to 50 micrometers) with a 0.25- by 5.14-deg field of view. The channels were oriented in a directional fan to cover 20 deg to each side of the orbital plane. The 64-s scan period allowed an area to be measured from up to 17 different angles as the spacecraft passed overhead. For a more detailed description, see Section 6 in "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. A similar instrument was flown on Nimbus 5 and 7. The solar and wide-angle channels operated successfully and provided good quality data. The scanning channels developed mechanical scan problems in August 1975 and operated only in the nadir position after March 1976.

------- NIMBUS 6, JULIAN---------------------------------------

INVESTIGATION NAME- TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL (TWERLE)

NSSDC ID- 75-052A-01

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - P.	JULIAN	NATL CTR FOR ATMOS RES
OI - W.W.	KELLOGG	NATL CTR FOR ATMOS RES
OI - V.E.	SUOMI	U OF WISCONSIN
OI - C.R.	LAUGHLIN	NASA-GSFC
OI - R.L.	TALLEY	SIGMA DATA SERV CORP
OI - W.R.	BANDEEN	NASA-GSFC
OI - C.E.	COTE	NASA-GSFC

BRIEF DESCRIPTION

The goals of the Nimbus 6 Tropical Wind Energy Conversion And Reference Level Experiment (TWERLE) were closely associated with the objectives of GARP and included (1) measuring upper atmospheric winds in the tropics, (2) studying the relative air motion along isobaric surfaces to determine the rate of conversion of atmospheric potential energy into kinetic energy, and (3) providing direct measurements of various meteorological parameters that served as reference points in adjusting indirect temperature soundings made from satellites. The experiment consisted of two basic components: (1) approximately 300 constant-level meteorological balloons to yield measurements of winds, temperature, and pressure in the tropics and at southern hemisphere midlatitudes at 150 mb (about 13.6-km altitude), and (2) the Nimbus 6 random access measurements system (RAMS) to provide data collection and location determinations from the balloons. The 3.5-m-diam polyester-mylar balloons were equipped with a transmitter-oscillator, solar power supply, digitizer/modulator, and sensors. The sensors consisted of a radio altimeter having an accuracy of better than plus or minus 20 m, a bead thermistor monitoring the ambient air temperature to an accuracy of 0.5 deg C, and a pressure sensor measuring the 150-mb flight altitude to an accuracy of 0.5 mb. A magnetic cutdown device was used to eliminate any accidental overflights into regions of the northern hemisphere north of 20 deg N latitude. The RAMS merely detected each balloon signal (401.2 MHz) and extracted the carrier frequency, balloon identification, and sensor data. This information, along with time references, was stored in digital form for subsequent relay to a ground acquisition station. The balloon's position and velocity were derived from the relative motion between the platform and the satellite by measuring Doppler shifts in the carrier signal received from the balloon. TWERLE was capable of a location accuracy of 5 km and a platform velocity accuracy of 1 m/s. For more detailed information, see Section 9 in "The Nimbus 6 User's Guide" (TRF B23261). For information concerning TWERLE data, contact Dr. Paul R. Julian, NCAR, P.O. Box 3000, Boulder, Colorado 80303. In addition to the TWERLE balloon experiment, many other experiments used RAMS. These experiments used ocean buoys to measure oceanographic and atmospheric parameters. Information about experiments can be obtained from principal investigators listed as Nimbus RAMS Experiments in the User's Guide and "The Nimbus 6 Data Catalog" (TRF B26731), both available from NSSDC.

------- NIMBUS 6, WILHEIT, JR.---------------------------------

INVESTIGATION NAME- ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)

NSSDC ID- 75-052A-03

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

PI - T.T.	WILHEIT, JR.	NASA-GSFC
OI - A.T.	EDGERTON	AEROJET ELECTROSYSTEMS

BRIEF DESCRIPTION

The Nimbus 6 Electrically Scanning Microwave Radiometer (ESMR) measured the earth's microwave emission to provide the liquid water content of clouds, the distribution and variation of sea ice cover, and gross characteristics of land surfaces (vegetation, soil moisture, and snow cover). The two-channel scanning radiometer operated in a 250 MHz band centered at 37 GHz. One channel was used to measure the vertical polarization and the other measured the horizontal polarization. The antenna beam array, a 90- by 20- by 12-cm box-like structure, was mounted on top of the spacecraft sensory ring and was pointed in the direction of the spacecraft's forward motion and tilted down 45 deg from the satellite antenna axis. The antenna beam scanned the earth in 71 discrete steps for various angles extending up to 35 deg on either side of the orbital plane. The deduced brightness temperatures were expected to be accurate to within 3-5 deg K. Spatial resolution was 20 km in the cross-track direction and 45 km in the direction parallel to the subpoint track. For a more detailed description, see Section 5 of "The Nimbus 6 User's Guide" (TRF B23261), available from NSSDC. The ESMR performance was satisfactory until 15 September 1976, when the horizontal channel output was zero due to a failure of the Ferrite-Dicke switch. Selected ESMR images were presented in "The Nimbus 6 Data Catalog" (TRF B26731), also available from NSSDC.

**************************** NIMBUS 7*************************

SPACECRAFT COMMON NAME- NIMBUS 7
ALTERNATE NAMES- 11080, NIMBUS-G

NSSDC ID- 78-098A

LAUNCH DATE- 10/24/78 WEIGHT- 832. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/25/78
ORBIT PERIOD- 104.0 MIN	INCLINATION- 99.3 DEG
PERIAPSIS- 938. KM ALT	APOAPSIS- 953. KM ALT

PERSONNEL

MG - G.F.	ESENWEIN	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - A.J.	FLEIG	NASA-GSFC

BRIEF DESCRIPTION

The Nimbus 7 research-and-development satellite served as a stabilized, earth-oriented platform for the testing of advanced systems for sensing and collecting data in the pollution, oceanographic and meteorological disciplines. The polar-orbiting spacecraft consisted of three major structures: (1) a hollow torus-shaped sensor mount, (2) solar paddles, and (3) a control housing unit that was connected to the sensor mount by a tripod truss structure. Configured somewhat like an ocean buoy, Nimbus 7 was nearly 3.04 m tall, 1.52 m in diameter at the base, and about 3.96 m wide with solar paddles extended. The sensor mount that formed the satellite base housed the electronics equipment and battery modules. The lower surface of the torus provided mounting space for sensors and antennas. A box-beam structure mounted within the center of the torus provided support for the larger sensor experiments. Mounted on the control housing unit, which was located on top of the spacecraft, were sun sensors, horizon scanners, and a command antenna. An advanced attitude-control system within plus or minus 1 deg in all three axes (pitch, roll, and yaw). Eight experiments were selected: (1) limb infrared monitoring of the stratosphere (LIMS), (2) stratospheric and mesopheric sounder (SAMS), (3) coastal-zone color scanner (CZCS), (4) stratospheric aerosol measurement II (SAMS II), (5) earth radiation budget (ERB), (6) scanning multichannel microwave radiometer (SMMR), (7) solar backscatter UV and total ozone mapping spectrometer (SBUV/TOMS), and (8) temperature-humidity infrared radiometer (THIR). These sensors were capable of observing several parameters at and below the mesospheric levels. More details can be found in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, GLOERSEN-------------------------------------

INVESTIGATION NAME- SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMMR)

NSSDC ID- 78-098A-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL

TL - P.	GLOERSEN	NASA-GSFC
TM - R.O.	RAMSEIR	ENVIRONMENT CANADA
TM - D.H.	STAELIN	MASS INST OF TECH
TM - W.J.	CAMPBELL	US GEOLOGICAL SURVEY
TM - D.B.	ROSS	NOAA-ERL
TM - P.	GUDMANSEN	TECH U OF DENMARK
TM - F.T.	BARATH	NASA-JPL
TM - T.T.	WILHEIT, JR.	NASA-GSFC

BRIEF DESCRIPTION

The primary purpose of the Scanning Multichannel Microwave Radiometer (SMMR) was to obtain sea surface temperature and near-surface winds under all-weather conditions for developing and testing global ocean circulation models and other aspects of ocean dynamics. Winds, water vapor, liquid-water content, mean cloud droplet size, rainfall rate and sea ice parameters were also determined. Microwave brightness temperatures were observed with a 10-channel (five-frequency dual polarized) scanning radiometer operating at frequencies of 37, 21, 18, 10.69, and 6.6 GHz. Six Dicke-type radiometers were utilized. Those operating at the four longest wavelengths measured alternate polarizations during successive scans of the antenna; the others operated continuously for each polarization. The antenna was a parabolic reflector offset from the nadir by 42 deg. Motion of the antenna reflector provided observations from within a conical volume along the ground track of the spacecraft. The same instrument was flown on SEASAT 1. For a complete description, see Section 8 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, HEATH--

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SPECTROMETER (SBUV/TOMS)

NSSDC ID- 78-098A-09

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

TL - D.F.	HEATH	NASA-GSFC
TM - C.L.	MATEER	ENVIRONMENT CANADA
TM - A.D.	BELMONT	CONTROL DATA CORP
TM - A.J.	MILLER	NOAA-NMC
TM - A.E.S.	GREEN	U OF FLORIDA
TM - D.M.	CUNNOLD	GEORGIA INST OF TECH
TM - W.L.	IMHOF	LOCKHEED PALO ALTO
TM - A.J.	KRUEGER	NASA-GSFC

BRIEF DESCRIPTION

The objectives of the Solar Backscatter Ultraviolet and Total Ozone Mapping Spectrometer (SBUV/TOMS) were to determine the vertical distribution of ozone, map the total ozone content, and monitor the incident solar ultraviolet (UV) irradiance and ultraviolet radiation backscattered from the earth. The SBUV consisted of a double Ebert-Fastie spectrometer and a filter photometer similar to BUV on Nimbus 4. The SBUV spectrometer measured solar UV backscattered by the earth's atmosphere at 12 wavelengths between 0.25 and 0.34 micrometer (2500 and 3400 A), with a spectral bandpass of .001 micrometer (10 A). The instrument FOV of 0.20 rad was directed at the nadir. Both channels also viewed the sun for calibration through the use of a diffuser plate deployed near the terminator. The contribution functions for the eight shortest wavelengths were centered at levels ranging from 55 to 28 km and were used to infer the vertical ozone profile. The four longest wavelengths had contribution functions in the troposphere which were used to compute the total ozone amount. The SBUV spectrometer had a second mode of operation that allowed a continuous spectral scan from 0.16 to 0.4 micrometer (1600 to 4000 A) for detailed examination of the extraterrestrial solar spectrum and its temporal variations. A parallel photometer channel at 0.343 micrometer (3430 A) measured the reflectivity of the atmosphere's lower boundary in the same 0.21-rad FOV. The TOMS was a single Ebert-Fastie spectrometer with a fixed grating and an array of exit slits. The TOMS step-scanned across the orbital track 51 deg from the nadir in 3-deg steps with an FOV of approximately 0.052 rad. At each scan position, the earth radiance was monitored at six wavelengths between 0.31 and 0.38 micrometer (3125 and 3800 A) to infer the total ozone amount. The signal-to-noise ratio of the SBUV was greater than 5.E3. The TOMS signal-to-noise ratio was greater than 1.E5. For a more detailed description, see Section 7 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, HOUGHTON--------------------------------------

INVESTIGATION NAME- STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS)

NSSDC ID- 78-098A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - J.T.	HOUGHTON	OXFORD U
OI - G.D.	PESKETT	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U

BRIEF DESCRIPTION

The objective of the Stratospheric and Mesospheric Sounder (SAMS) was to observe emission from the limb of the atmosphere through various pressure-modulator radiometers in order to determine temperature and vertical concentrations of H2O, N2O, CH4, CO, and NO in the stratosphere and mesosphere. Measurements of zonal wind in this region were attempted by observing the Doppler shift of atmospheric emission lines. Radiation from the limb of the atmosphere was incident on a telescope of 15-cm aperture. In front of the telescope, a plane mirror scanned the limb, viewed space for calibration, and viewed the atmosphere obliquely to obtain vertical profiles. Three adjacent fields of view, each 28 by 2.8 mrad (corresponding to 100 km by 10 km at the limb), focused onto a field-splitting mirror which directed radiation to six detectors. The remaining division into channels was accomplished through dichroic beam splitters. There were seven pressure modulator cells (PMC), two containing CO2, the remainder N2O, NO, CH4, CO, H2O. Pressure in the cells could be varied on command by changing the temperature of a small container of molecular sieve material attached to each PMC. The spectral parameters for the H2O channel were 2.7 micrometers and 25 to 100 micrometers. All other channels lay within the range 4.1 to 15 micrometers. Within the telescope, a chopper operating at 250 Hz allowed measurement of two separate signals from all detectors, one at 250 Hz and one at the PMC frequency. Comparison of these signals permitted eliminating the emission from interfering gases within a particular spectral interval. In front of the chopper, a small black body at known temperature could be introduced for calibration. Accurate measurement of the atmospheric pressure at the level being viewed was obtained from the two signals from one CO2 channel. For a more detailed description, see Section 6 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

------- NIMBUS 7, HOVIS---

INVESTIGATION NAME- COASTAL ZONE COLOR SCANNER (CZCS)

NSSDC ID- 78-098A-03

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL

TL - W.A.	HOVIS	NOAA-NESS
TM - H.L.	RICHARD	NASA-GSFC
TM - C.S.	YENTSCH	BIGELOW LAB OCEAN SCI
TM - D.	CLARK	NOAA-NESS
TM - J.R.	APEL	APPLIED PHYSICS LAB
TM - S.Z.	EL-SAYED	TEXAS A+M
TM - H.R.	GORDON	NOAA-PMEL
TM - R.C.	WRIGLEY	NASA-ARC
TM - F.P.	ANDERSON	NATL RES INST OCEANOL
TM - R.	AUSTIN	SCRIPPS INST OCEANOGR

BRIEF DESCRIPTION

The Coastal Zone Color Scanner Experiment (CZCS) was designed to map chlorophyll concentration in water, sediment distribution, gelbstoffe concentrations as a salinity indicator, and temperature of coastal waters and ocean currents. Reflected solar energy was measured in six channels to sense color caused by absorption due to chlorophyll, sediments, and gelbstoffe in coastal waters. Spectral bands at 0.443 and 0.670 micrometers centered on the most intense absorption bands of chlorophyll, while the band at 0.550 micrometers centered on the "hinge point," the wavelength of minimum absorption. Ratios of measured energies in these channels were shown to closely parallel surface chlorophyll concentrations. Data from the scanning radiometer were processed, with algorithms developed from the field experiment data, to produce maps of chlorophyll absorption. The temperatures of coastal waters and ocean currents were measured in a spectral band centered at 11.5 micrometers. Observations were made also in two other spectral bands, 0.520 micrometers for chlorophyll correlation and 0.750 micrometers for surface vegetation. To avoid sun glint, the scanner mirror was tilted about the sensor pitch axis on command so that the line of sight of the sensor was moved in 2-deg increments up to 20 deg with respect to the nadir. The scan width was 1556 km centered on nadir and the ground resolution was 0.825 km at nadir. For a more detailed description, see Section 2 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC. Data are archived at SDSD.

------- NIMBUS 7, HWANG---

INVESTIGATION NAME- TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)

NSSDC ID- 78-098A-10

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - P.H.	HWANG	NASA-GSFC
OI - L.J.	ALLISON(RETIRED)	NASA-GSFC

BRIEF DESCRIPTION

The Nimbus 7 Temperature-Humidity Infrared Radiometer (THIR) detected emitted thermal radiation in both the 10.5- to 12.5-micrometer region (IR window) and the 6.5- to 7.0-micrometer region (water vapor). The window channel provided an image of the cloudcover, and temperatures of the cloud tops, land, and ocean surfaces. The other channel provided information on the moisture and cirrus cloud content of the upper troposphere and stratosphere, and the location of jet streams and frontal systems. The ground resolution at nadir was 6.7 km for the window channel and 20 km for the water vapor channel. Data from these two channels were used primarily to support other sophisticated meteorological experiments onboard Nimbus 7. The instrument consisted of a 12.7-cm Cassegrain system and scanning mirror common to both channels, a beam splitter, filters, and two germanium-immersed thermistor bolometers. In contrast to TV, no image was formed within the radiometer. Incoming radiant energy was collected by a flat scanning mirror inclined at 45 deg to the optical axis. The mirror rotated through 360 deg at 48 rpm and scanned in a plane normal to the spacecraft velocity. The energy then was focused on a dichroic beam splitter which divided the energy spectrally and spatially. The two channels of this sensor transformed the received radiation into electric output (voltages), which were recorded on magnetic tape for subsequent playback to a ground acquisition station. For a more complete information on instrument and data products, see Section 9 in "The Nimbus 7 Users' Guide" (TRF B30045) and the "Nimbus 7 Temperature Humidity Infrared Radiometer (THIR) Data User's Guide" (TRF B30601), both available from NSSDC. Except for data being digitized on board, the Nimbus 7 THIR was of the same design and operation as the THIR flown on Nimbus 4, 5, 6.

------- NIMBUS 7, JACOBOWITZ-----------------------------------

INVESTIGATION NAME- EARTH RADIATION BUDGET (ERB)

NSSDC ID- 78-098A-07

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - H.	JACOBOWITZ	NOAA-NESS
TM - T.H.	VONDERHAAR	COLORADO STATE U
TM - F.B.	HOUSE	DREXEL U
TM - K.L.	COULSON	U OF CALIF, DAVIS
TM - J.R.	HICKEY	EPPLEY LAB, INC
TM - L.L.	STOWE	NOAA-NESS
TM - A.P.	INGERSOLL	CALIF INST OF TECH
TM - G.L.	SMITH	NASA-LARC

BRIEF DESCRIPTION

The objective of the Earth Radiation Budget (ERB) experiment, a continuation of Nimbus 6 ERB, was to determine, over a period of a year, the earth radiation budget on both synoptic and planetary scales by simultaneous measurements of incoming solar radiation and outgoing earth-reflected (shortwave) and emitted (longwave) radiation. Both (1) fixed wide-angle sampling of terrestrial fluxes at the satellite altitude and (2) scanned narrow-angle sampling of the radiance components, which were dependent on angle, were used to determine outgoing radiation (reflected and emitted). The ERB subsystem consisted of a 22-channel radiometer containing separate subassemblies to perform the required solar, earth-flux (wide angle), and scanned earth radiance (narrow angle) measurements. The systems used optical filters for spectral discriminations, as well as uncooled thermal detectors, thermopile detectors in the solar and fixed-earth-flux channels, and pyroelectric detectors in the scanning channels. The 10 solar channels viewed in front of the observatory in the X-Y plane. The solar channels obtained usable solar data only during a period of about 3 min in each orbit when the spacecraft was over the Antarctic region. Their full response field of view (FOV) was 0.18 rad. The solar channel subassembly was pivoted plus or minus 0.35 rad in the X-Y plane to compensate for sun-angle deviation when required. The four earth-flux channels were mounted so that they could continuously view the total earth disk, and they were continuously sampled at four per second. Demodulator output signals were integrated for periods of at least 3.8 s. There were eight narrow FOV channels (four shortwave and four longwave) mounted in the scanning head. The head was gimbal-mounted in the radiometer unit main frame. The FOVs of the telescopes were asymmetric (4.4 by 89.4 mrad) and those of the shortwave and longwave channels were coincident. The 89.4 mrad FOVs of the four pairs of channels were not contiguous, but covered only alternate 89.4 mrad angular intervals along the horizon. For a more detailed description, see Section 3 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC. The narrow-view scanner failed in June 1980.

------- NIMBUS 7, MCCORMICK-----------------------------------

INVESTIGATION NAME- STRATOSPHERIC AEROSOL MEASUREMENT-II (SAM-II)

NSSDC ID- 78-098A-06

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - M.P.	MCCORMICK	NASA-LARC
TM - T.J.	PEPIN	U OF WYOMING
TM - G.W.	GRAMS	GEORGIA INST OF TECH
TM - B.M.	HERMAN	U OF ARIZONA
TM - P.B.	RUSSELL	SRI INTERNATIONAL

BRIEF DESCRIPTION

The objective of the Stratospheric Aerosol Measurement (SAM II) experiment was to provide vertical distribution of stratospheric aerosols in the polar regions of both hemispheres. When no clouds were present in the instantaneous field of view (IFOV), the tropospheric aerosols also could be mapped. The instrument, basically a sun photometer, measured the extinction of solar radiation at 1.0-micrometer wavelength during spacecraft sunrise and sunset. The photometer viewed a portion of the solar disk with a 0.145-mrad IFOV and a sampling rate of 50 samples per second. As the spacecraft first viewed the sunrise, the photometer-pointing axis was depressed approximately 0.52 rad with respect to the spacecraft horizontal. The photometer continued looking at the sun until its depression angle was on the order of 0.44 rad (approximately 1.4 min observing time). Before sunset, the photometer head rotated 3.14 rad in azimuth and viewed the sun from a depression of approximately 0.44 to 0.52 rad as the spacecraft orbited to the dark side of the earth. The extinction measurements were inverted for the number density times the aerosol scattering across the atmosphere by using the Lambert-Beer Law and assuming the atmosphere to be composed of layers. To determine the stratospheric aerosol optical properties, ground-truth and in situ balloon-borne aerosol measurements were also made. For more detailed information, see Section 5 in "The Nimbus 7 Users' Guide" (TRF B30045), available from NSSDC.

**************************** NOAA 6****************************

SPACECRAFT COMMON NAME- NOAA 6
ALTERNATE NAMES- NOAA-A, 11416

NSSDC ID- 79-057A

LAUNCH DATE- 06/27/79 WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/28/79
ORBIT PERIOD- 101.5 MIN	INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT	APOAPSIS- 833. KM ALT

PERSONNEL

MG - R.J.	ARNOLD	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC

BRIEF DESCRIPTION

NOAA 6 was an operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, and a TIROS operational vertical sounder (TOVS) for obtaining temperature and water-vapor profiles through the earth's atmosphere. Secondary experiments consisted of a space environment monitor (SEM), which measured the proton and electron fluxes near the earth, and a data collection system (DCS), which processed and relayed to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and it was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. For a more detailed description, see A. Schwalb, "The TIROS-N/NOAA A-G Satellite Series," NOAA Tech. Mem. Ness 95, 1978.

------- NOAA 6, LEINBACH ---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 79-057A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
PI - D.S. EVANS NOAA-ERL

BRIEF DESCRIPTION
This experiment was an extension of the solar proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measured protons above 16, 36, and 80 MeV, and the protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The high-energy proton alpha telescope (HEPAT), which had a 48-deg viewing cone, viewed in the anti-earth direction and measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 6, NESS STAFF ---

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 79-057A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The NOAA 6 Advanced Very High Resolution Radiometer (AVHRR) was a four-channel scanning radiometer capable of providing global daytime and nighttime sea-surface temperature and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 3.55 to 3.93 micrometers; and channel 4 (IR window), 10.5 to 11.5 micrometers. All four channels had a spatial resolution of 1.1 km, and the two IR-window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for central processing. They included global area coverage (GAC) data, with a resolution of 4 km, and local area coverage (LAC), that contained data from selected portions of each orbit with a 1-km resolution. Identical experiments were flown on the other spacecraft in the TIROS-N/NOAA series.

------- NOAA 6, NESS STAFF ---

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 79-057A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) consisted of three instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument was the second version of the high-resolution infrared spectrometer (HIRS/2). The HIRS was tested on the Nimbus 6. The HIRS/2 had 20 channels in the following spectral intervals: channels 1 through 5 , the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.70-micrometer window region. The second instrument, the stratospheric sounding unit (SSU), was provided by the British Meteorological Office. It was similar to the pressure-modulated radiometer (PMR) flown on Nimbus 6. The SSU operated at three 15.0-micrometer channels using selective absorption, passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), was similar to the scanning microwave spectrometer (SCAMS) flown on Nimbus 6. The MSU had one channel in the 50.31-GHz window region and three channels in the 55-GHz oxygen band (53.73, 54.96, 57.95) to obtain temperature profiles which were free of cloud interference. The instruments were cross-course scanning devices utilizing a step to provide a traverse scan, while the orbital motion of the satellite provided scanning in the orthogonal direction. The HIRS/2 had a field of view (FOV) 30 km in diameter at nadir, whereas the MSU had a FOV of 110 km in diameter. The HIRS/2 sampled 56 FOVs in each scan line about 2250 km wide, and the MSU sampled 11 FOVs along the swath with the same width. Each SSU scan line had 8 FOVs with a width of 1500 km. This experiment was also flown on other TIROS-N/NOAA series spacecraft. For a more detailed description, see W. L. Smith, "The TIROS-N operational vertical sounder," Bull. Am. Meteorol. Soc., v. 60, pp. 1177-1187, 1979. Archival data are available from the Satellite Data Services Division, National Climatic Center, NOAA, Washington, D.C.

------- NOAA 6, NESS STAFF ---

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 79-057A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA 6 was designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCS was expected, for a moving sensor platform, to have a location accuracy of 3 to 5 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from up to 4000 platforms per day. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series.

**************************** NOAA 7 ****************************

SPACECRAFT COMMON NAME- NOAA 7
ALTERNATE NAMES- NOAA-C, 12553

NSSDC ID- 81-059A

LAUNCH DATE- 06/23/81 WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/24/81
ORBIT PERIOD- 102. MIN INCLINATION- 98.9 DEG
PERIAPSIS- 845. KM ALT APOAPSIS- 863. KM ALT

PERSONNEL
MG - R.J. ARNOLD NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - A. ARKING NASA-GSFC

BRIEF DESCRIPTION
NOAA 7 was an operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, and a TIROS operational vertical sounder (TOVS) for obtaining temperature and water-vapor profiles through the earth's atmosphere. Secondary experiments consisted of a space environment monitor (SEM), which measured the proton and electron fluxes near the earth, and a data collection system (DCS), which processed and relayed to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A contamination monitor was provided by USAF to assess contamination sources, levels, and effects for consideration on future spacecraft. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and it was capable of maintaining an earth-pointing accuracy of better

than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s. For a more detailed description, see A. Schwalb, "The TIROS-N/NOAA A-G Satellite Series," NOAA Tech. Mem. Ness 95, 1978.

------- NOAA 7, LEINBACH--

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 81-059A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
PI - D.S.	EVANS	NOAA-ERL

BRIEF DESCRIPTION

This experiment was an extension of the solar proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measured protons above 16, 36, and 80 MeV, and the protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The high-energy proton alpha telescope (HEPAT), which had a 48-deg viewing cone, viewed in the anti-earth direction, and measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 7, NESS STAFF--

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 81-059A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The NOAA 7 Advanced Very High Resolution Radiometer (AVHRR) was a five-channel scanning radiometer capable of providing global daytime and nighttime sea-surface temperature and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 3.55 to 3.93 micrometers; channel 4 (IR window), 10.5 to 11.5 micrometers; and channel 5 (IR window), 11.5 to 12.5 micrometers. All five channels had a spatial resolution of 1.1 km, and the three IR-window channels had a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for central processing. They included global area coverage (GAC) data, with a resolution of 4 km, and local area coverage (LAC), that contained data from selected portions of each orbit with a 1-km resolution. Identical experiments were flown on the other spacecraft in the TIROS-N/NOAA series.

------- NOAA 7, NESS STAFF--

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 81-059A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) consisted of three instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument was the second version of high-resolution infrared spectrometer (HIRS/2). The HIRS was tested on the Nimbus 6. The HIRS/2 had 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H20 bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N20 bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N20 bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.70-micrometer window region. The second instrument, the stratospheric sounding unit (SSU), was provided by the British Meteorological Office. It was similar to the pressure-modulated radiometer (PMR) flown on Nimbus 6. The SSU operated at three 15.0-micrometer channels using selective absorption, passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), was similar to the scanning microwave spectrometer (SCAMS) flown on Nimbus 6. The MSU had one channel in the 50.31-GHz window region and three channels in the 55-GHz oxygen band (53.73, 54.96, 57.95) to obtain temperature profiles which were free of cloud interference. The instruments were cross-course scanning devices utilizing a step to provide a traverse scan, while the orbital motion of the satellite provided scanning in the orthogonal direction. The HIRS/2 had a field of view (FOV) 30 km in diameter at nadir, whereas the MSU had a FOV of 110 km in diameter. The HIRS/2 sampled 56 FOVs in each scan line about 2250 km wide, and the MSU sampled 11 FOVs along the swath with the same width. Each SSU scan line had 8 FOVs with a width of 1500 km. This experiment was also flown on other TIROS-N/NOAA series spacecraft. For a more detailed description, see W. L. Smith, "The TIROS-N operational vertical sounder," Bull. Am. Meteorol. Soc., v. 60, pp. 1177-1187, 1979. Archival data are available from the Satellite Data Services Division, National Climatic Center, NOAA, Washington, D.C.

------- NOAA 7, NESS STAFF--

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 81-059A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The Data Collection System (DCS) on NOAA 7 was designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCS was expected, for a moving sensor platform, to have a location accuracy of 3 to 5 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from as many as 4000 platforms per day. Identical experiments were flown on other spacecraft in the TIROS-N/NOAA series.

**************************** NOAA 8 ****************************

SPACECRAFT COMMON NAME- NOAA 8
ALTERNATE NAMES- 13923, NOAA-E

NSSDC ID- 83-022A

LAUNCH DATE- 03/28/83 WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/29/83
ORBIT PERIOD- 101.2 MIN	INCLINATION- 98.8 DEG
PERIAPSIS- 806. KM ALT	APOAPSIS- 829. KM ALT

PERSONNEL

MG - J.R.	GREAVES	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC
PS - A.	ARKING	NASA-GSFC

BRIEF DESCRIPTION

NOAA 8 was a third-generation operational meteorological satellite for use in the National Environmental Satellite Data and Information Service (NESDIS) of NOAA. NOAA 8 was the first spacecraft of the advanced TIROS-N (ATN) series. The satellite design provided an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors included an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloudcover and a TIROS operational vertical sounder (TOVS) for obtaining temperature and water-vapor profiles through the earth's atmosphere. Secondary experiments consisted of a space environment monitor (SEM), which measured the proton and electron fluxes near the earth, and a data collection system (DCS), which processed and relayed to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system was also included on NOAA 8 to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite was based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and was capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA 8, LEINBACH--------------------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- 83-022A-04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
PI - D.S.	EVANS	NOAA-ERL

BRIEF DESCRIPTION

This experiment was an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consisted of three detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measured protons above 16, 36, and 80 MeV, and protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The high-energy proton alpha telescope (HEPAT) had a 50-deg viewing cone, viewed in the anti-earth direction. The HEPAT measured protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/n. The total energy detector (TED) measured electrons and protons between 300 eV and 20 keV.

------- NOAA 8, NESS STAFF--------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- 83-022A-01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The NOAA 8 Advanced Very High Resolution Radiometer (AVHRR) was a four-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperatures and information about ice, snow, and clouds. These data were obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operated in the scanning mode and measured emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer, channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers, channel 3 (IR window), 10.5 to 11.5 micrometers, and channel 4 (IR window), 3.55 to 3.93 micrometers. All four channels have a spatial resolution of 1.1 km, and the two IR window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR was capable of operating in both real-time or recorded modes. Real-time or direct readout data were transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT), and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board were available for central processing. They included global area coverage (GAC) data (a 4-km resolution) and local area coverage (LAC) data from selected portions of each orbit (1-km resolution). The same experiments are flown on the other spacecraft in the TIROS-N/NOAA series.

------- NOAA 8, NESS STAFF--------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- 83-022A-02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) on NOAA-8 consisted of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument was the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 had 20 channels in the following spectral intervals: Channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; Channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provided data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the stratospheric sounding unit (SSU), had three channels operating at 15.0 micrometers using selective absorption by passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), had one channel in the 50.31-GHz window region and three channels in the 50 to 60 GHz oxygen band (53.73, 54.96 and 57.95) to obtain temperature profiles which were free of cloud interference. The instruments were cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provided scanning in the orthogonal direction. The same experiments were flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 8, NESS STAFF--------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 83-022A-03 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The Data Collection System (DCS) on NOAA 8 was designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system received low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations were organized on board the spacecraft and retransmitted when the spacecraft came in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal was observed to calculate the location of the balloons. The DCS was expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system had the capability of acquiring data from as many as 2000 platforms per day. The same experiments were flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA 8, NESS STAFF--------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- 83-022A-05 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The Search and Rescue (SAR) instruments had the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs were received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data were monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data were also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals were forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

**************************** PIONEER 6 ***********************

SPACECRAFT COMMON NAME- PIONEER 6
ALTERNATE NAMES- PIONEER-A, 01841

NSSDC ID- 65-105A

LAUNCH DATE- 12/16/65 WEIGHT- 146. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC — EPOCH DATE- 07/15/75
ORBIT PERIOD- 311.1 DAYS — INCLINATION- 0.168 DEG
PERIAPSIS- 0.813 AU RAD — APOAPSIS- 0.983 AU RAD

PERSONNEL
MG - G. STROBEL — NASA HEADQUARTERS
SC - A.G. OPP — NASA HEADQUARTERS
PM - R.O. FIMMEL — NASA-ARC
PS - P. DYAL — NASA-ARC

BRIEF DESCRIPTION

Pioneer 6 was the first in a series of solar-orbiting, spin-stabilized, solar-cell and battery-powered satellites designed to obtain measurements on a continuing basis of interplanetary phenomena from widely separated points in space. Its experiments studied the positive ions and electrons in the solar wind, the interplanetary electron density (radio propagation experiment), solar and galactic cosmic rays, and the interplanetary magnetic field. Its main antenna was a high-gain directional antenna. The spacecraft was spin-stabilized at about 60 rpm, and the spin axis was perpendicular to the ecliptic plane and pointed toward the south ecliptic pole. By ground command, one of five bit rates, one of four data formats, and one of four operating modes could be selected. The five bit rates were 512, 256, 64, 16, and 8 bps. Three of the four data formats contained primarily scientific data and consisted of 32 seven-bit words per frame. One scientific data format was for use at the two highest bit rates. Another was for use at the three lowest bit rates. The third contained data from only the radio propagation experiment. The fourth data format contained mainly engineering data. The four operating modes were real time, telemetry store, duty cycle store, and memory readout. In the real-time mode, data were sampled and transmitted directly (without storage) as specified by the data format and bit rate selected. In the telemetry store mode, data were stored and transmitted simultaneously in the format and at the bit rate selected. In the duty-cycle store mode, a single frame of scientific data was collected and stored at a rate of 512 bps. The time interval between the collection and storage of successive frames could be varied by ground command between 2 and 17 min to provide partial data coverage for periods up to 19 h, as limited by the bit storage capacity. In the memory readout mode, data were read out at whatever bit rate was appropriate to the satellite distance from the earth.

------- PIONEER 6, ANDERSON-----------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 65-105A-07 — INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
CELESTIAL MECHANICS

PERSONNEL
PI - J.D. ANDERSON — NASA-JPL

BRIEF DESCRIPTION

The purpose of this experiment was to use the tracking data from the mission to obtain primary determinations of the masses of the earth and moon, the astronomical unit, and the oscillating elements of the orbit of the earth. This was appropriate because of the absence of midcourse orbit corrections and near-planetary encounters. Also, solar radiation pressure effects were small. The experiment used the onboard receiver and transmitter equipment in conjunction with Deep Space Network station equipment to obtain Doppler measurements.

------- PIONEER 6, ANDERSON-----------------------------------

INVESTIGATION NAME- RELATIVITY INVESTIGATION

NSSDC ID- 65-105A-10 — INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - J.D. ANDERSON — NASA-JPL

BRIEF DESCRIPTION

The Pioneer 6 spacecraft presented the first opportunity to investigate the relativistic contribution of the sun to the Doppler shifting of the spacecraft transmitter signal. The Doppler transponder segment of the spacecraft transmitter was to be used for this purpose. However, the coronal noise produced a much larger contribution to the transmitter signal than did the relativistic Doppler effect. Thus, although the experiment failed in its primary purpose, it did contribute the first measure of the relative effect of coronal noise on Doppler shifting of radio signals.

------- PIONEER 6, BRIDGE-----------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA FARADAY CUP

NSSDC ID- 65-105A-02 — INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL
PI - H.S. BRIDGE — MASS INST OF TECH
OI - A.J. LAZARUS — MASS INST OF TECH
OI - F. SCHERB — U OF WISCONSIN

BRIEF DESCRIPTION

A multigrid Faraday cup with two semicircular, coplanar collectors was used to study solar wind ions and electrons. The instrument had 14 contiguous, energy-per-charge (E/Q) channels between 75 and 9485 V for positive ions, and four energy-per-charge channels between 90 and 1580 V for electrons. The instrument view axis was perpendicular to the spacecraft spin axis and parallel to the ecliptic plane. The line separating the two collectors lay in the ecliptic plane, enabling a rough determination of solar wind bulk flow perpendicular to the ecliptic plane. During every second spacecraft rotation and at one voltage level, the sum of the currents from the collectors was obtained in 28 contiguous 11.25-deg angular sectors (from -45 deg to 270 deg, with 0 deg being the spacecraft-sun line). The eight measurements about the sun-earth line (-45 deg to +45 deg) were telemetered, but only the largest measurement in each succeeding 45-deg interval (45 deg to 270 deg) was telemetered. In addition, during this rotation, the current from one of the collectors was measured in all twenty-eight 11.25-deg sectors, and the largest was identified and telemetered (both magnitude and sector). A complete set of positive ion measurements and one energy channel of electron measurements were completed every 32 s. The time between each 32-s group of measurements varied with the bit rate. For a more complete description, see J. Geophys. Res., v. 71, p. 3787-3791, August 1966.

------- PIONEER 6, GOLDSTEIN-----------------------------------

INVESTIGATION NAME- SPECTRAL BROADENING

NSSDC ID- 65-105A-09 — INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
SOLAR PHYSICS

PERSONNEL
PI - R.M. GOLDSTEIN — NASA-JPL

BRIEF DESCRIPTION

The objective of this experiment was to explore the structure of the corona and solar events by using telemetry signals and their spectral line broadening as they passed through the solar corona and approached the sun's limb during superior conjunction occultation. Normally, the signals consisted of very-narrow-band (monochromatic) and spectrally pure carrier waves, and a set of modulation side bands. The carrier-wave frequency was nominally 2295 Hz, and the side bands were separated by multiples of 2 kHz and were removed by filtering. Data were collected in the form of spectrograms, each consisting of a 15-min observation. The three parameters of interest were the signal power, center frequency, and bandwidth. The instrumentation consisted of the spacecraft S-band telemetry system and JPL's 64-m receiver antenna, which had a beamwidth of only 0.14 deg at 2300 MHz (S-band). It was extremely sensitive, having an equivalent noise temperature of only 25 deg K. The receiver was tuned continuously according to an ephemeris, with an accuracy to 0.05 Hz. This was necessary in order to compensate for frequency shifts resulting from orbital velocities of the spacecraft and earth's spin. The frecuency bandwidth was 100 Hz for each spectrum, defined by a filter at the last stage of the receiver. Frequency resolution was 0.2 Hz over the 100-Hz bandwidth.

------- PIONEER 6, MCCRACKEN-----------------------------------

INVESTIGATION NAME- COSMIC-RAY ANISOTROPY

NSSDC ID- 65-105A-05 — INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - K.G. MCCRACKEN — CSIRO
OI - W.C. BARTLEY — DOE HEADQUARTERS
OI - U.R. RAO — ISRO SATELLITE CENTER

BRIEF DESCRIPTION

This experiment was designed primarily to measure the directional characteristics of galactic and solar cosmic-ray fluxes. The particle detector was a CsI (Tl) scintillator crystal that was set into an anticoincidence plastic scintillator collimator cup. Separate photomultiplier tubes viewed the two scintillators. Pulses from the CsI crystal unaccompanied by pulses from the plastic scintillator were sorted by a three-window pulse-height analyzer, the windows corresponding to energy depositions of 7.4 to 44.0, 44.0 to 77.1, and 123.8 to 303.8 MeV. Counts in the two lower energy windows were due mainly to protons with the window energies, while only particles of Z greater than or equal to 2 contributed to the highest energy window count rate. (Protons above 90 MeV gave anticoincidence pulses.) For each energy window, counts were separately accumulated in each of four angular sectors as the spacecraft spun. Each angular sector was normally 89.5 deg in width, with the sun in the middle of one sector. However, when large fluxes were encountered, each angular sector was reduced to 11.2 deg, with the sun near the midpoint between two sectors. A spin-integrated (isotropic) mode, in which all particles depositing 7.4 MeV in the CsI crystal (no anticoincidence requirement) were counted, was also used. Accumulation times for each of the 12 directional modes and for the omnidirectional mode varied between 14 s and 112 s (spacecraft spin period was about 1 s) depending on the telemetry bit rate. See Bartley et al., Rev. Sci. Instrum., v. 38, p. 266, 1967, for a more detailed experiment description.

------- PIONEER 6, SIMPSON------------------------------------

INVESTIGATION NAME- COSMIC-RAY TELESCOPE

NSSDC ID- 65-105A-03 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.E.	LAMPORT	U OF CHICAGO

BRIEF DESCRIPTION

This experiment used a charged-particle telescope composed of four silicon solid-state detectors to study the anisotropy and fluctuations of solar protons and alpha particles. The proton energy ranges sampled were 0.6 to 13.9 MeV, 13.9 to 73.2 MeV, 73.2 to 175 MeV, and E>175 MeV. The alpha particle energy ranges sampled were 2.4 to 55.6 MeV, 55.6 to 293 MeV, and E>294 MeV. The time resolution ranged from about one measurement per 0.4 s to about one measurement per 28 s depending on the telemetry bit rate. The detector was mounted so that it made a 360-deg scan in the ecliptic plane about once per s. Pulse-height analysis of detector D1 output (128 channel) and D3 output (32 channel) was accomplished for the last event prior to each telemetry readout for the experiment. For further details, see Fan et al., J. Geophys. Res., v. 73, p. 1555, 1968.

------- PIONEER 6, WOLFE--------------------------------------

INVESTIGATION NAME- ELECTROSTATIC ANALYZER

NSSDC ID- 65-105A-06 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - J.H.	WOLFE	NASA-ARC

BRIEF DESCRIPTION

A quadrispherical electrostatic analyzer with eight contiguous current collectors was used to study the directional intensity of electrons and positive ions in the solar wind. Ions were detected in 16 logarithmically equispaced energy-per-charge (E/Q) steps from 200 to 10,000 V. There was an electron mode of operation in which electrons were measured in eight logarithmically equispaced E/Q steps ranging from 1 to 500 V. The eight collectors measured particles incident from eight different contiguous angular intervals relative to the spacecraft equatorial plane (same as the ecliptic plane). There were four 15-deg intervals, two 20-deg intervals, and two 30-deg intervals. As the spacecraft was spinning, fluxes were measured in 15 azimuthal angular sectors. Eight of these sectors were 5-5/8 deg wide, were contiguous, and bracketed the solar direction. The remaining seven sectors were 45 deg wide. Three different modes of data collection were used. At the highest bit rate (512 bps), the full scan mode was alternated with the maximum flux mode at each E/Q step. In the full scan mode, the maximum flux observed in each of the 15 azimuthal sectors as the spacecraft rotated was recorded for a given single collector at a given E/Q step. During 24 successive operations of the full scan mode (48 spacecraft revolutions), the 16 ion E/Q steps and eight electron E/Q steps were exercised for a given collector. During eight successive such periods, each of the eight collectors was exercised. The full cycle of full scan mode data required 400 spacecraft revolutions (about 400 s). Such cycles were repeated without interruption at the high bit rate. In the maximum flux mode, for the E/Q step used in the preceding revolution of full scan mode operation, all collectors were observed for one revolution, and the maximum flux observed was reported, along with the number of the collector that observed it and the angular direction (2-13/16-deg resolution) of the observation. At the next highest bit rate (256 bps), the short-scan mode was alternated every spacecraft revolution with the maximum-flux mode. The short-scan mode was the same as the full-scan mode, except that only the peak flux in each of the eight 5-5/8-deg-wide azimuthal sectors was recorded. Thus, this cycle also took 400 spacecraft revolutions. At the low bit rates (64, 16, and 8 bps), the maximum flux mode alone was used. Thus, no azimuthal distributions were measured. At the low bit rates, it took 32 s for a complete set of ion measurements and 16 s for a complete set of electron measurements. At 64 bps, the ion and electron measurements were taken and telemetered every 84 s. At 16 bps, they were taken and telemetered every 336 s. At 8 bps, they were taken and telemetered every 672 s.

**************************** PIONEER 9************************

SPACECRAFT COMMON NAME- PIONEER 9
ALTERNATE NAMES- PIONEER-D, PL-684K
03533

NSSDC ID- 68-100A

LAUNCH DATE- 11/08/68 WEIGHT- 147. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC	EPOCH DATE- 02/27/76
ORBIT PERIOD- 297.6 DAYS	INCLINATION- 0.086 DEG
PERIAPSIS- 0.754 AU RAD	APOAPSIS- 0.990 AU RAD

PERSONNEL

MG - G.	STROBEL	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - R.O.	FIMMEL	NASA-ARC
PS - P.	DYAL	NASA-ARC

BRIEF DESCRIPTION

Pioneer 9 was the fourth in a series of solar-orbiting, spin-stabilized, and solar-cell and battery-powered satellites designed to obtain measurements of interplanetary phenomena from widely separated points in space on a continuing basis. The spacecraft carried experiments to study the positive ions and electrons in the solar wind, the interplanetary electron density (radio propagation experiment), solar and galactic cosmic rays, the interplanetary magnetic field, cosmic dust, and electric fields. Also, a new coding process was implemented for Pioneer 9. Its main antenna was a high-gain directional one. The spacecraft was spin-stabilized at about 60 rpm, and the spin axis was perpendicular to the ecliptic plane and pointed toward the south ecliptic pole. By ground command, one of five bit rates, one of four data formats, and one of four operating modes could be selected. The five bit rates were 512, 256, 64, 16, and 8 bps. Three of the four data formats contained primarily scientific data and consisted of 32 seven-bit words per frame. One scientific data format was used at the two highest bit rates, another was used at the three lowest bit rates, and the third contained data from only the radio-propagation experiment. The fourth data format contained mainly engineering data. The four operating modes were real-time, telemetry-store, duty-cycle store, and memory readout. In the real-time mode, data were sampled and transmitted directly (without storage) as specified by the data format and bit rate selected. In the telemetry-store mode, data were stored and transmitted simultaneously in the format and at the bit rate selected. In the duty-cycle store mode, a single frame of scientific data was collected and stored at a rate of 512 bps. The time period between collection and storage of successive frames could be varied by ground command between 2 and 17 min to provide partial data coverage for periods of up to 19 h, as limited by the bit-storage capacity. In the memory readout mode, data were read out at whatever bit rate was appropriate to the satellite distance from the earth.

------- PIONEER 9, ANDERSON---------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 68-100A-08 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
CELESTIAL MECHANICS

PERSONNEL

PI - J.D.	ANDERSON	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation were (1) to obtain primary determinations of the masses of the earth and moon and the distance between the earth and sun, (2) to use the tracking data from the whole series of Pioneer probes in a program designed to improve the ephemeris of the earth, and (3) to investigate the possibility of a test of general relativistic mechanics using the Pioneer orbits and data. The instrumentation was a two-way S-band Doppler tracking mechanism, using high-gain antennas with disk-like patterns in a plane perpendicular to the spin axis of the spacecraft. When the spin axis was perpendicular to the ecliptic, radio signals from the antenna continuously illuminated the earth. Data were transmitted continuously and were received at ground-based Deep Space Network stations with 26.5-m diameter antennas, and at the 64-m antenna in California.

------- PIONEER 9, BERG--

INVESTIGATION NAME- COSMIC DUST DETECTOR

NSSDC ID- 68-100A-04   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - O.E. BERG(RETIRED)   NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed (1) to measure the cosmic-dust flux density in the solar system, (2) to determine the distribution of cosmic-dust concentrations in the earth's orbit, (3) to determine the gradient, flux density, and speed of particles in meteor streams, and (4) to perform an inflight control experiment on the reliability of the microphone as a cosmic-dust sensor. The experiment instrumentation was identical to that carried on Pioneer 8, consisting essentially of two thin-film-grid detectors (separated by a distance of 5 cm) that produced an electrical signal when the film was penetrated by a micrometeoroid. Each film had a sensitive area of 100 sq cm and was composed of 16 segments that provided both the direction and the time of flight needed for the meteoroid to traverse the 5-cm distance between the front-film and the rear-film sensor. The combined results of the Pioneer 8 and 9 cosmic-dust experiments lent strong support to the hypothesis that the bulk of meteoroid dust is of cometary origin.

------- PIONEER 9, ESHLEMAN-----------------------------------

INVESTIGATION NAME- TWO-FREQUENCY BEACON RECEIVER

NSSDC ID- 68-100A-03   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - V.R. ESHLEMAN   STANFORD U
OI - T.A. CROFT   SRI INTERNATIONAL
OI - H.T. HOWARD   STANFORD U
OI - R.L. LEADABRAND   SRI INTERNATIONAL
OI - R.A. LONG   SRI INTERNATIONAL
OI - A.M. PETERSON   STANFORD U

BRIEF DESCRIPTION
Both 423.3-MHz and its 2/17 subharmonic 49.8-MHz signals were transmitted from a 4.6-m steerable parabolic antenna at Stanford University to the two-frequency radio receiver on the spacecraft. The high-frequency signal served as a reference signal, since its propagation time was not appreciably delayed. The low-frequency signal was delayed in proportion to the total electron content in the propagation path. On the spacecraft, a phase-locked receiver counted the beat frequency zero crossings of the received signals to obtain measurements of phase-path differences. Differential delay of the group velocity was also observed, and these values were telemetered to the ground station and used to calculate the total electron content. The ionospheric contribution (up to a selected altitude obtained from other experimental techniques) could be subtracted to produce data describing the interplanetary electron content of the solar wind and its variations. More detailed descriptions of the experiment can be found in J. Geophys. Res., v. 71, pp. 3325-3327, and in Radio Sci., v. 6, pp. 55-63.

------- PIONEER 9, MCCRACKEN----------------------------------

INVESTIGATION NAME- COSMIC-RAY ANISOTROPY

NSSDC ID- 68-100A-05   INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - K.G. MCCRACKEN   CSIRO
OI - U.R. RAO   ISRO SATELLITE CENTER
OI - W.C. BARTLEY   DOE HEADQUARTERS

BRIEF DESCRIPTION
This experiment consisted of a CsI scintillator and three solid-state telescopes. The CsI scintillator was collimated by an anticoincidence plastic scintillator and had a conical aperture with a 38.2-deg half-angle. The scintillator look direction was centered in the ecliptic plane. Three solid-state detectors were oriented in a fan arrangement with respect to a fourth solid-state detector, such that each of the first three detectors formed a telescope with the fourth detector. Each of the three telescopes thus formed had an acceptance cone of 23-deg half-angle. The mean viewing directions of the telescopes were in the ecliptic plane and 48 deg above and below that plane, respectively. Two concurrent modes of counting were employed. In the first mode, counts were accumulated in eight separate 45-deg intervals during the spacecraft spin, while, in the second, spin-integrated counts were acquired. In the first mode, the scintillator separately measured particles with energies in the ranges 7.4 to 21.5 MeV/nucleon and 19.7 to 63.0 MeV/nucleon (no species discrimination) while each solid-state telescope separately measured protons in the energy ranges 3.3 to 3.6 MeV and 3.6 to 6.7 MeV. In the second mode, the scintillator separately measured particles in six contiguous energy intervals between 4.5 and 40 MeV/nucleon (interval lower limits at 4.5, 7.0, 9.6, 13, 21, and 28 MeV/nucleon), while each of the solid-state telescopes separately measured protons in the energy ranges 1 to 8, 1 to 5, 1 to 3, and 4 to 6 MeV, and alpha particles in the energy range 4 to 8 MeV. During each 224-bit main telemetry frame, two first-mode 9-bit accumulators and one second-mode 9-bit accumulator were read out. Inflight calibration of the scintillator and of some of the electronics was performed daily. See Bukata et al, IEEE Trans. Nuc. Sci., NS-17, pp. 18-24, 1970, for a more detailed experiment description.

------- PIONEER 9, SCARF--------------------------------------

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR

NSSDC ID- 68-100A-07   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL
PI - F.L. SCARF   TRW SYSTEMS GROUP
OI - I.M. GREEN   TRW SYSTEMS GROUP
OI - G.M. CROOK   GAINES M. CROOK ASSOC
OI - R.W. FREDRICKS   TRW SYSTEMS GROUP

BRIEF DESCRIPTION
Electrostatic and electromagnetic plasma waves were measured in the solar wind near 1 AU using an unbalanced electric dipole antenna. The 423-MHz Stanford University antenna, which served as the sensor, was capacitively coupled to three telemetry channels. Channel 1 was a 15% bandpass filter centered at 400 Hz, and channel 2 was a 15% bandpass filter centered at 30 kHz. These channels were each sampled 64 times per telemetry sequence. Channel 3 was a broadband 100-Hz to 100-kHz channel. The broadband channel was fed into a count-rate meter that measured the number of positive-going pulses per unit time having amplitudes large enough to cross the present trigger level. The trigger level was varied through eight steps, eight times per telemetry sequence. The trigger levels, together with the count rate at each level, gave a measure of the broadband power spectrum. Due to ambient conditions, these data usually represented the power at about 100 Hz. The telemetry sequence was repeated over time intervals from 7 min 28 s to 472 min 52 s.

------- PIONEER 9, SONETT-------------------------------------

INVESTIGATION NAME- TRIAXIAL MAGNETOMETER

NSSDC ID- 68-100A-01   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - C.P. SONETT   U OF ARIZONA
OI - D.S. COLBURN   NASA-ARC

BRIEF DESCRIPTION
A boom-mounted, triaxial fluxgate magnetometer was used to study the interplanetary magnetic field and its fluctuations. The sensors were orthogonally mounted with one axis parallel to the spacecraft spin axis. Upon command, a motor interchanged a sensor in the spin plane with the sensor along the spin axis, enabling inflight determination of zero levels. Every 24 hours, the instrument was commanded into a self-calibrate sequence, and this was often repeated after the sensors were flipped. The instrument, which had a dynamic range of plus or minus 200 nT with a resolution of plus or minus 0.2 nT, was capable of inflight demodulation of the signals received from the two sensors in the spin plane. Each magnetic field component was digitized into a 10-bit telemetry word. Nine magnetic field components, comprising three magnetic field vectors, were transmitted in each spacecraft telemetry frame.

------- PIONEER 9, WEBBER-------------------------------------

INVESTIGATION NAME- COSMIC-RAY GRADIENT

NSSDC ID- 68-100A-06   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - W.R. WEBBER   U OF NEW HAMPSHIRE

BRIEF DESCRIPTION
This experiment utilized a telescope comprised of five solid-state sensors, a Cerenkov detector, and an anticoincidence shield. The telescope axis was perpendicular to the spacecraft spin axis. As determined by two coincidence modes and electronic discrimination of sensor output pulses, particles measured were (1) electrons in three contiguous energy intervals between 0.31 and 5.1 MeV, (2) protons in five contiguous energy intervals between 2.2 and 42 MeV, and (3) alpha particles in contiguous energy intervals between 5.8 and 42 MeV/nucleon. A third coincidence mode measured the sum of counts due to electrons above 0.6 MeV and nuclei above 14 MeV/nucleon. A fourth coincidence mode measured the sum of nuclei above 42 MeV/nucleon and electrons above 5.1 MeV. Spacecraft spin-integrated directional fluxes were measured in the various modes. Accumulation times and readout intervals were dependent on the telemetry bit rate and were typically in tens of seconds. In all cases, they were longer than the spacecraft spin period.

------- PIONEER 9, WOLFE---

INVESTIGATION NAME- SOLAR PLASMA DETECTOR

NSSDC ID- 68-100A-02   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - J.H. WOLFE   NASA-ARC
OI - D.D. MCKIBBIN   NASA-ARC

BRIEF DESCRIPTION
A truncated hemispherical electrostatic analyzer (120-deg total parallel-plate curvature) with three contiguous current collectors was used to study the directional intensity of the electrons and positive ions in the solar wind. Ions were detected in 30 logarithmically equispaced energy per unit charge (E/Q) steps from 150 to 15,000 V. There was an electron mode of operation in which electrons were measured in 14 logarithmically equispaced E/Q steps ranging from 12 to 1000 V. There was also a zero E/Q, or background, step. The three collectors measured particles incident from three different contiguous angular intervals relative to the spacecraft equatorial plane (same as the ecliptic plane). Two collectors measured flux from 10 to 85 deg on either side of the spacecraft equatorial plane, and the third measured flux in a 20-deg interval centered on the spacecraft equatorial plane. As the spacecraft was spinning, fluxes were measured in 23 possible 2-13/16-deg-wide azimuthal angular sectors. Seventeen of these sectors were contiguous and bracketed the solar direction. The remaining six sectors were widely spaced. The instrument had three modes of data collection: polar scan, azimuthal scan, and maximum flux. At the two highest bit rates (512 and 256 bps), the polar-scan mode was alternated with the azimuthal scan mode at each E/Q step. In the polar-scan mode, all three collectors were observed, and the peak flux obtained and the azimuthal direction (to 2-13/16 deg) of the observation were reported for each collector. In the azimuthal scan mode, the peak flux observed in the 23 azimuthal sectors was recorded for the central collector at each E/Q step. At the low bit rates (64, 16, and 8 bps), the maximum flux mode was used at each E/Q step followed by either (1) for ions, a polar scan and an azimuthal scan at that E/Q step where the peak flux measurement during the maximum flux mode was obtained, or (2) for electrons, a polar scan and an azimuthal scan at E/Q = 100 V. In the maximum flux mode, only the central collector was observed, the peak flux obtained, and the azimuthal direction (to 2-13/16 deg) of the observation reported. A complete set of measurements consisted of seven sets of ion measurements (at each E/Q step) and one set of electron measurements (at each E/Q step). At the high bit rates (512 and 256 bps) one set of ion measurements took 62 s and one set of electron measurements, 38 s. At the low bit rates (64, 16, and 8 bps), one set of ion measurements took 37 s and one set of electron measurements took 28 s. At 64 bps, a complete set of measurements (seven ions plus one electron) was taken and telemetered every 402.5 s. At 16 bps, it took 1610 s, and, at 8 bps, it took 3220 s.

**************************** PIONEER 10************************

SPACECRAFT COMMON NAME- PIONEER 10
ALTERNATE NAMES- PIONEER-F, PL-723D
05860

NSSDC ID- 72-012A

LAUNCH DATE- 03/03/72   WEIGHT- 231. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES   NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- JUPITER FLYBY

PERSONNEL
MG - G. STROBEL   NASA HEADQUARTERS
SC - A.G. OPP   NASA HEADQUARTERS
PM - R.O. FIMMEL   NASA-ARC
PS - P. DYAL   NASA-ARC

BRIEF DESCRIPTION
This mission was the first to be sent to the outer solar system, and after encountering the planet Jupiter it assumed an escape trajectory from the solar system. The spacecraft body was mounted behind a 2.74-m-diameter parabolic dish antenna that was 46 cm deep. The spacecraft structure was a 36-cm-deep flat equipment compartment, the top and bottom being regular hexagons. Its sides were 71 cm long. One side joined a smaller compartment that carried the scientific experiments. The high-gain antenna feed was situated on three struts, which projected forward about 1.2 m. This feed was topped with a medium-gain antenna. A low-gain omnidirectional antenna extended about 0.76 m behind the equipment compartment and was mounted below the high-gain antenna. Power for the spacecraft was obtained by four SNAP-19 radioisotope thermonuclear generators (RTG), which were held about 3 m from the center of the spacecraft by two three-rod trusses 120 deg apart. A third boom extended 6.6 m from the experiment compartment to hold the magnetometer away from the spacecraft. The four RTG's generated about 155 watts at launch and decayed to approximately 140 watts by the time the spacecraft reached Jupiter on December 3, 1973, 21 months after launch. There were three reference sensors: a star sensor for Canopus, and two sun sensors. Attitude position could be calculated from the reference directions to the earth and the sun, with the known direction to Canopus as a backup. Three pairs of rocket thrusters provided spin-rate control (maintained at 4.8 rpm) and changed the velocity of the spacecraft. These thrusters could be pulsed or fired steadily by command. Communications were maintained via (1) the omnidirectional and medium-gain antennas which operated together while connected to one receiver and (2) the high-gain antenna which was connected to another receiver. These receivers could be interchanged by command to provide some redundancy. Two radio transmitters, coupled to two traveling-wave tube amplifiers, produced 8 watts at 2292 MHz each. Uplink was accomplished at 2110 MHz, while data transmission downlink was at 2292 MHz. The data were received by NASA's Deep Space Network. The spacecraft was temperature-controlled between minus 23 deg C and plus 38 deg C. Fifteen experiments were carried to study the interplanetary and planetary magnetic fields; solar wind parameters; cosmic rays; transition region of the heliosphere; neutral hydrogen abundance; distribution, size, mass, flux, and velocity of dust particles; Jovian aurorae; Jovian radio waves; atmosphere of Jupiter and some of its satellites, particularly Io; and to photograph Jupiter and its satellites. Instruments carried for these experiments were magnetometer, plasma analyzer, charged particle detector, ionizing detector, non-imaging telescopes with overlapping fields of view to detect sunlight reflected from passing meteoroids, sealed pressurized cells of argon and nitrogen gas for measuring the penetration of meteoroids, UV photometer, IR radiometer, and an imaging photopolarimeter, which produced photographs and measured polarization. Further scientific information was obtained from the tracking and occultation data. The spacecraft achieved its closest approach on December 3, 1973, when it reached approximately three Jovian radii (about 210,000 km). The spacecraft contains plaques that have drawings depicting a man, a woman, and the location of the sun and the earth in our galaxy. It has left the solar system and passed into interstellar space.

------- PIONEER 10, ANDERSON-----------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 72-012A-09   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETOLOGY
CELESTIAL MECHANICS

PERSONNEL
PI - J.D. ANDERSON   NASA-JPL
OI - G.W. NULL   NASA-JPL

BRIEF DESCRIPTION
In this investigation, carried on both Pioneers 10 and 11, two-way Doppler tracking of the spacecraft was used to make more precise determinations of planetary masses, the heliocentric orbit of Jupiter, and the gravitational fields of the sun, Jupiter, and the Galilean satellites.

------- PIONEER 10, FILLIUS-----------------------------------

INVESTIGATION NAME- JOVIAN TRAPPED RADIATION

NSSDC ID- 72-012A-05 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.W. FILLIUS U OF CALIF, SAN DIEGO
OI - C.E. MCILWAIN U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
This experiment consisted of an array of five particle detectors with electron thresholds in the range .01 to 35 MeV and proton thresholds in the range 0.15 to 80 MeV. A Cerenkov counter (C) had four output channels (C1, C2, C3, and CDC) sensitive to electrons having energies above 6, 9, 13, and 1 MeV, respectively. An electron-scatter counter (E) had three output channels (E1, E2, and E3) sensitive to electrons above .16, .26, and .46 MeV. A minimum ionization counter (M) had three output channels, M1 sensitive to electrons having energies greater than 35 MeV, M2 that measured background, and M3 that was sensitive to protons having energies greater than 80 MeV. The last two sensors were scintillator detectors (SP and SE), both of which had energy thresholds of 10 keV for electrons and 150 keV for protons. The sensitivity of the SE detector to protons was about a factor of 10 lower than its sensitivity to electrons. Thus, the SEDC channel effectively measured the electron flux, which could then be subtracted from the SPDC channel response to obtain the proton flux. Several other channels, listed above, required corrections to obtain the fluxes of the species indicated. Three of the channels (CDC, SPDC, and SEDC) were read out through a common electrometer. Due to a malfunction that occurred between launch and Jovian encounter, these three channels produced no usable encounter data. The detector channels could be programmed for readout in any one of four patterns at each of the eight spacecraft bit rate modes. During encounter when the spacecraft was operating in the highest bit rate mode, the minimum time to sample one channel was 1.5 s and the time to obtain a complete scan through all channels was 108 s. Since the directional detectors pointed perpendicular to the spin axis and the spin rate was 5 rpm, pitch-angle measurements were obtained. While the experiment was primarily designated for encounter studies, some data were obtained at low rates in interplanetary space. A description of the instrumentation and initial results was published in J. Geophys. Res., v. 79, p. 3589, 1974.

------- PIONEER 10, GEHRELS-----------------------------------

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 72-012A-07 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES

PERSONNEL
PI - T. GEHRELS U OF ARIZONA
OI - D.L. COFFEEN NASA-GISS
OI - J. HAMEEN-ANTTILA U OF ARIZONA
OI - C.E. KENKNIGHT U OF ARIZONA
OI - R.F. HUMMER SANTA BARBARA RES CTR
OI - M.G. TOMASKO U OF ARIZONA
OI - W. SWINDELL U OF ARIZONA

BRIEF DESCRIPTION
The Imaging Photopolarimeter (IPP) experiment (also on Pioneer 11) used during Jovian encounter made simultaneous, two-color (blue - 3900 to 4900 A, red - 5800 to 7000 A) polarimetric and radiometric measurements, and moderate-resolution (about 200 km at best) spin-scan images of Jupiter and the Jovian satellites. The polarimetric and radiometric work was performed using an 8- x 8- mrad field-stop aperture, while the spin-scan imaging used a 0.5- by 0.5-mrad aperture stop. Relative radiometric calibration was derived using an internal tungsten lamp. Long-term absolute calibration of the instrument was accomplished by means of a sunlight diffuser/attenuator element located in the spacecraft antenna structure. Primary radiometric calibration was obtained throughout the mission by periodically commanding the telescope to view this diffuse backlighted (sunlight) source. The experimental train for the IPP package consisted of the following elements: (1) a near-diffraction-limited 2.54-cm Maksutov catadioptric telescope of focal ratio f/3.4, (2) a focal-plane wheel containing field-of-view (FOV) apertures, depolarizers, calibration source, etc., (3) a Wollaston prism to split light into two orthogonally polarized beams, (4) a 45-deg dichromatic mirror that reflected wavelengths shorter than 5500 A (blue beam) and transmitted all light of greater wavelength (red beam), (5) for each spectral beam (two polarizations) a filtering-coated relay lens and folding mirrors , and (6) for each spectral beam, two Bendix Channeltron detectors (blue bialkili S-11 photocathodes and red S-20 photocathodes) to register the intensity in each polarization component. Polarization data also include the interplanetary region.

------- PIONEER 10, JUDGE-----------------------------------

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 72-012A-06 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES

PERSONNEL
PI - D.L. JUDGE U OF SOUTHERN CALIF
OI - R.W. CARLSON NASA-JPL

BRIEF DESCRIPTION
This experiment (on both Pioneers 10 and 11) consisted of a broadband photometer sensitive between 200 and 800 A. During the cruise phase of the mission, this experiment was used to search for the supersonic-to-subsonic transition region in the solar wind. During the Jovian encounter, this experiment was used to look for evidence of an auroral oval on the Jovian dayside, to find the ratio of hydrogen to helium in the Jovian atmosphere, and to find the temperature of the outer portion of the Jovian atmosphere. Evidence of helium was found in the interplanetary region indicating interactions between charged particles and neutral hydrogen.

------- PIONEER 10, KINARD-----------------------------------

INVESTIGATION NAME- METEOROID DETECTORS

NSSDC ID- 72-012A-04 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
INTERPLANETARY DUST

PERSONNEL
PI - W.H. KINARD NASA-LARC
OI - R.E. TURNER NASA-LARC
OI - J.M. ALVAREZ NASA-LARC
OI - D.H. HUMES NASA-LARC
OI - R.L. O'NEAL NASA-LARC

BRIEF DESCRIPTION
This experiment was designed to measure the number of meteoroid impacts on the Pioneer 10 spacecraft (and a similar one was on Pioneer 11), by means of 12 panels, each containing 18 pressurized cells, mounted on the back of the antenna disk. The total exposed area was 0.465 sq m. Each panel of gas-filled cells consisted of a 2.54E-5 m (1-mil) thick and a 5.08E-5 m (2-mil) thick sheet of stainless steel welded together in such a way that many small pockets of gas were left between them. Whenever a pocket was punctured, the gas escaped and a cold cathode device detected the loss. The rate of pressure loss indicated the size of the hole made, and thus the particle's mass and incident energy could be determined. The combination of these data with trajectory data provided an indication of the spatial density of the particles. The 2.54E-5 m thick side of the gas panel was exposed to the interplanetary medium, and penetrations of the cells from that side indicated encounters with particles having masses of 1 nanogram or more.

------- PIONEER 10, KLIORE-----------------------------------

INVESTIGATION NAME- S-BAND OCCULTATION

NSSDC ID- 72-012A-10 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL
PI - A.J. KLIORE NASA-JPL
OI - G. FJELDBO(NLA) NASA-JPL
OI - D.L. CAIN NASA-JPL
OI - B.L. SEIDEL NASA-JPL
OI - S.I. RASOOL IBM

BRIEF DESCRIPTION
This experiment, carried on both Pioneers 10 and 11, utilized the S-band (2292 MHz, 8 W) spacecraft radio transmitter signal characteristics to obtain information about the ionospheres and atmospheres of Jupiter and its satellite Io. Entrance into and exit from Jupiter and Io occultation provided changes in the signal characteristics from which atmospheric temperature, pressure, and electron density profiles could be calculated. Temperature and pressure profiles were limited to levels above the pressure of one earth atmosphere. Signal occultation also provided a determination of the planetary diameter.

------- PIONEER 10, MCDONALD-----------------------------------

INVESTIGATION NAME- COSMIC-RAY SPECTRA

NSSDC ID- 72-012A-12   INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - K.G.	MCCRACKEN	CSIRO
OI - W.R.	WEBBER	U OF NEW HAMPSHIRE
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - J.H.	TRAINOR	NASA-GSFC
OI - B.J.	TEEGARDEN	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of three multi-element solid-state telescopes, all looking normal to the spacecraft spin axis. The high-energy telescope (HET) consisted of five collinear sensors, and measured stopping particles (Z = 1 to 8) in the energy range 20 to 50 MeV/nucleon and penetrating particles in the range 50 to 800 MeV/nucleon. Charge resolution for penetrating particles was possible up to 200 MeV/nucleon. The first low-energy telescope (LET-I) had four elements and measured stopping (Z = 1 to 8) particles in the energy range 3 to 32 MeV/nucleon. The second low-energy telescope (LET-II) had three elements and measured stopping electrons between 50 and 1000 keV and stopping protons between 50 keV and 20 MeV. For each telescope, count rates were obtained for each of several sensor coincidence-anticoincidence modes. Some of the rates from each telescope were sectored into eight octants in the spacecraft spin plane. In addition, three-sensor pulse-height analysis, with priority schemes favoring the analysis of heavier particles, was associated with each telescope.

------- PIONEER 10, SIMPSON-----------------------------------

INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION

NSSDC ID- 72-012A-02   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.J.	O'GALLAGHER	U OF MARYLAND
OI - A.	TUZZOLINO	U OF CHICAGO

BRIEF DESCRIPTION

This experiment (carried also on Pioneer 11) measured charged-particle composition and spectra using four detector systems: (1) the main telescope, consisting of seven elements and providing energy spectra (approximately 3 to 68 MeV for protons and 10 to 150 MeV/N for oxygen), element resolution (through oxygen), and isotope resolution (for H and He); (2) the low-energy subsystem telescope, consisting of two elements and using a very small thin first element to extend the high-sensitivity proton measurements below 1 MeV (0.3 to 9 MeV) in the presence of a high gamma-ray background aboard the spacecraft; (3) the electron-current detector (or ECG), consisting of a beryllium-shield silicon detector operated in current mode to measure high fluxes of electrons with energies above 3 MeV; and (4) the fission cell detector, recording fission fragments from the nucleon-induced fission of thorium 232 sandwiched between two large-area silicon detectors to measure fluxes of protons (above 30 MeV) in the presence of high fluxes of electrons. The experiment sample time was synchronized with the spacecraft spin, permitting sectoring of the readout of the main and low-energy telescopes into eight octants about the spin axis. Data also include the interplanetary region.

------- PIONEER 10, VAN ALLEN-----------------------------------

INVESTIGATION NAME- JOVIAN CHARGED PARTICLES

NSSDC ID- 72-012A-11   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

This experiment used seven miniature Geiger tubes in three arrays to measure proton and electron fluxes in interplanetary space and in the vicinity of Jupiter. Detector groupings were as follows: (1) a three-element (A, B, and C) differentially shielded telescope, with tube C shielded omnidirectionally and used for background subtraction to provide directional rates such as A-C (5-21 MeV electrons and 30-77.5 MeV protons) and B-C (0.55-21 MeV electrons and 6.6-77.5 MeV protons), (2) a three-element (D, E, and F) triangular array, each element responding to electrons above 31 MeV and protons above 77.5 MeV, and (3) a thin-window tube (G) with a gold-plated elbow as the aperture which admitted scattered electrons above 0.06 MeV while discriminating strongly against protons. Single element and coincidence rates were telemetered from the first two telescopes. The telemetry bit rate prevailing during the Jupiter encounter permitted directional sampling in intervals of about 14 deg of roll about the spin axis. For further details, see Baker and Van Allen, J. Geophys. Res., v. 81, p. 617, 1976.

------- PIONEER 10, WOLFE-----------------------------------

INVESTIGATION NAME- PLASMA

NSSDC ID- 72-012A-13   INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - J.H.	WOLFE	NASA-ARC
OI - L.A.	FRANK	U OF IOWA
OI - R.	LUEST	MPI-EXTRATERR PHYS
OI - D.S.	INTRILIGATOR	U OF SOUTHERN CALIF
OI - D.D.	MCKIBBIN	NASA-ARC
OI - V.T.	ZAVIENTSEFF(NLA)	NASA-ARC
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - H.R.	COLLARD	NASA-ARC
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - Z.A.	SMITH	NOAA-SEL

BRIEF DESCRIPTION

The instrument consisted of dual 90-deg quadraspherical electrostatic analyzers, one with 26 individual particle detectors and the other with 5 current collectors. The system was capable of measuring incident plasma distribution parameters over the energy range 0.1 to 18 keV for protons and approximately 1-500 eV for electrons. The high-resolution analyzer, with a constant of 9 keV/Q per kV applied to the plates, had a mean plate radius of 9 cm and separation of 0.5 cm. This analyzer which was used to measure ions only and had 26 channeltrons mounted on the semicircular exit to the analyzer. The aperture pointed through a wide slit in the back of the spacecraft high-gain antenna reflector and pointed along the spin axis toward the earth (and therefore the sun). The edges of the antenna reflector limited the viewing of the instrument to 73 deg with respect to the spin axis. The channeltrons covered a range of plus or minus 51 deg. Each channeltron near the center covered 3 deg, and approximately 8 deg near the edges of the analyzer. The angular width perpendicular to the long angular width was about 2 deg. In one half the spin period, the whole cone of half angle 51 deg, centered on the sun, was swept out. A medium-energy analyzer with a mean radius of 12 cm and a 1-cm plate separation (constant of 6 keV/Q per kV applied) was used to detect both ions and electrons. The detectors were five flat-surface current collectors. The three center collectors each covered 15 deg and covered the angular range of plus or minus 22.5 deg from the spin axis. The two outside collectors had an angular width of 47.5 deg and were located at plus or minus 46.25 deg from the center of the analyzer. There were a variety of possible operating modes for the experiment; however, the principal mode utilized during the encounter phase was one in which the analyzer plate potential was stepped through its range every one-half revolution of the spacecraft, and all current collectors or channeltrons were read out at the peak flux roll angle. The high- and medium-resolution analyzers operated independently, so that a cross-check between these analyzers was possible. The dynamic range for the particle fluxes was from 1.0E+2 to 3.0E+9/sq cm and the proton temperature could be ascertained down to 2.0E+3 deg K.

************************** PIONEER 11 **************************

SPACECRAFT COMMON NAME- PIONEER 11
ALTERNATE NAMES- PIONEER-G, PL-733C
6421

NSSDC ID- 73-019A

LAUNCH DATE- 04/06/73   WEIGHT- 231. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES   NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG - G.	STROBEL	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - R.O.	FIMMEL	NASA-ARC
PS - P.	DYAL	NASA-ARC

BRIEF DESCRIPTION

This was the second mission to investigate Jupiter and the outer solar system. Pioneer 11, like Pioneer 10, used Jupiter's gravitational field to alter its trajectory radically. It passed close to Saturn and then it followed an escape trajectory from the solar system . The spacecraft was 2.9 m long and contained a 2.74-m diameter high-gain antenna of aluminum honeycomb sandwich material whose feed was topped with a medium-gain antenna. A low-gain, omnidirectional antenna was mounted below the high-gain dish. It contained two nuclear electric-power generators, which generated 144 W at Jupiter, but decreased to 100 W at Saturn. There were three reference sensors: a star (Canopus) sensor, and two sun sensors. Attitude position could be calculated from the reference direction to the earth and the sun, with the known direction to Canopus as backup. Pioneer 11's star sensor gain and threshold settings were modified, based on experience gained from the settings used on Pioneer 10. Three pairs of rocket thrusters provided spin-axis control (at 4.8 rpm) and change of the spacecraft velocity. The thrusters could be either fired steadily or pulsed, by command. Communications were maintained via the omnidirectional and medium-gain antennas, which operated together, connected to one receiver, while the high-gain antenna was connected to the other receiver. The receivers could be interchanged by command. Two radio transmitters, coupled to two traveling wave tube amplifiers, produced 8 W power each in S-band. Communication uplink (earth to spacecraft) operated at 2110 MHz, and downlink (spacecraft to earth) at 2292 MHz. At Jupiter's distance, round-trip communication time took 92 min. Data were received at the Deep Space Network (DSN). The spacecraft was temperature-controlled to between -23 and +38 deg C (-10 to +100 deg F). An additional experiment, a low-sensitivity fluxgate magnetometer, was added to the Pioneer 11 payload. Instruments studied the interplanetary and planetary magnetic fields; solar wind properties; cosmic rays; transition region of the heliosphere; neutral hydrogen abundance; distribution, size, mass, flux, and velocity of dust particles; Jovian aurorae; Jovian radio waves; the atmospheres of planets and satellites; and the surfaces of Jupiter, Saturn, and some of their satellites. Instruments carried for these experiments were magnetometer, plasma analyzer (for solar wind), charged-particle detector, ionizing detector, non-imaging telescopes with overlapping fields of view to detect sunlight reflected from passing meteoroids, sealed pressurized cells of argon and nitrogen gas for measuring penetration of meteoroids, UV photometer, IR radiometer, and an imaging photopolarimeter, which produced photographs and measured the polarization. Further scientific information was obtained from celestial mechanics and occultation phenomena. This spacecraft, like Pioneer 10, contains a plaque that has a drawing depicting man, woman, and the location of the sun and earth in the galaxy. Pioneer 11 was 36,800 km from Jupiter during its closest approach, December 4, 1974, to within 43,000 km of its cloud tops. It passed by Saturn on Aug. 5, 1979, at a distance of 21,400 km from Saturn's cloud tops.

------- PIONEER 11, ANDERSON-----------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS

NSSDC ID- 73-019A-09

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ASTRONOMY
CELESTIAL MECHANICS

PERSONNEL

PI - J.D.	ANDERSON	NASA-JPL
OI - G.W.	NULL	NASA-JPL

BRIEF DESCRIPTION

In this investigation, two-way Doppler tracking of the spacecraft was used to make more precise determinations of planetary masses, the heliocentric orbits of Jupiter and Saturn, and the gravitational fields of the Sun, Jupiter, Saturn, and the Galilean and Saturnian satellites.

------- PIONEER 11, FILLIUS-------------------------------------

INVESTIGATION NAME- JOVIAN TRAPPED RADIATION

NSSDC ID- 73-019A-05

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETOLOGY

PERSONNEL

PI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO
OI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

This experiment consisted of an array of five particle detectors with electron thresholds in the range .01 to 35 MeV and proton thresholds in the range 0.15 to 80 MeV. A Cerenkov counter (C) had four output channels (C1, C2, C3, and CDC) sensitive to electrons having energies above 5, 8, 12, and 1 MeV, respectively. An electron scatter counter (E) had three output channels (E1, E2, and E3) sensitive to electrons above .16, .26, and .46 MeV. A minimum ionization counter (M) had three output channels: M1, sensitive to electrons having energies greater than 35 MeV; M2, measuring background; and M3, sensitive to protons having energies greater than 80 MeV. The last two sensors were scintillator detectors (SP and SE), both of which had energy thresholds of 10 keV for electrons and 150 keV for protons. The sensitivity of the SE detector to protons was about a factor of 10 lower than its sensitivity to electrons. Thus, the SEDC channel effectively measured the electron flux, which could then be subtracted from the SPDC channel response to obtain the proton flux. Several other channels listed above required corrections to obtain the fluxes of the species indicated. The detector channels could be programmed for readout in any one of four patterns at each of the eight spacecraft bit-rate modes. During encounter when the spacecraft was operating in the highest bit-rate mode, the minimum time to sample one channel was 1.5 s and the time to obtain a complete scan through all channels was 108 s. Since the directional detectors pointed perpendicularly to the spin axis and the spin rate was 5 rpm, pitch-angle measurements were obtained. Although this experiment was primarily designed for encounter studies, some data were obtained at low rates in interplanetary space. A description of the instrumentation and initial Pioneer 10 results was published in J. Geophys. Res., v. 79, p. 3589, 1974.

------- PIONEER 11, GEHRELS------------------------------------

INVESTIGATION NAME- IMAGING PHOTOPOLARIMETER (IPP)

NSSDC ID- 73-019A-07

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

PI - T.	GEHRELS	U OF ARIZONA
OI - D.L.	COFFEEN	NASA-GISS
OI - J.	HAMEEN-ANTTILA	U OF ARIZONA
OI - C.E.	KENKNIGHT	U OF ARIZONA
OI - R.F.	HUMMER	SANTA BARBARA RES CTR
OI - M.G.	TOMASKO	U OF ARIZONA
OI - W.	SWINDELL	U OF ARIZONA

BRIEF DESCRIPTION

The Imaging Photopolarimeter (IPP) experiment used during Jovian and Saturnian encounter made simultaneous, two-color (blue - 3900 to 4900 A, red - 5800 to 7000 A) polarimetric and radiometric measurements, and moderate-resolution (about 200 km at best) spin-scan images of Jupiter and the Jovian satellites and Saturn and some of its satellites. The polarimetric and radiometric work was performed using an 8- by 8-mrad field-stop aperture, while the spin-scan imaging used a 0.5- by 0.5-mrad aperture stop. Relative radiometric calibration was derived using an internal tungsten lamp. Long-term absolute calibration of the instrument was accomplished by means of a sunlight diffusor/attenuator element located in the spacecraft antenna structure. Primary radiometric calibration was obtained throughout the mission by periodically commanding the telescope to view this diffuse backlighted (sunlight) source. The experimental train for the IPP package consisted of the following elements: (1) a near-diffraction-limited 2.54-cm Maksutov telescope of focal ratio f/3.4, (2) a focal-plane wheel containing field-of-view (FOV) apertures, depolarizers, calibration source, etc., (3) a Wollaston prism to split the light into two orthogonally polarized beams, (4) a 45-deg dichromatic mirror that reflected wavelengths of less than 5500 A (blue beam) and transmitted all light of longer wavelength (red beam), (5) a filtering-coated relay lens and folding mirrors for each spectral beam (the two polarizations were separated), and (6) two Bendix channeltron (blue - bialkali S-11, red - S-20) photocathodes for each spectral beam to register the intensity in each polarization component. Polarization data included the interplanetary region.

------- PIONEER 11, INGERSOLL----------------------------------

INVESTIGATION NAME- INFRARED RADIOMETER

NSSDC ID- 73-019A-08

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

PI - A.P.	INGERSOLL	CALIF INST OF TECH
OI - R.W.	BOESE	NASA-ARC
OI - S.C.	CHASE, JR.	SANTA BARBARA RES CTR
OI - G.	NEUGEBAUER	CALIF INST OF TECH
OI - L.M.	TRAFTON	U OF TEXAS, AUSTIN

BRIEF DESCRIPTION

The Pioneer 11 infrared radiometer experiment measured the Jovian and Saturnian thermal balance, temperature distribution in the outer atmosphere, general surface composition (including the overall hydrogen-to-helium ratio), and dark-side temperature. The instrument consisted of a 7.62-cm reflecting Cassegrain telescope with a 1-deg by 3-deg field of view that illuminated a pair of 88-channel, thin-film bimetallic thermopiles in two bands of the IR spectrum (14 to 25 micrometers and 19 to 56 micrometers) to measure the irradiance. The two-channel radiometer was similar to those flown on Mariners 6 and 7, but was more accurate and had better spatial resolution.

------- PIONEER 11, JUDGE--------------------------------------

INVESTIGATION NAME- ULTRAVIOLET PHOTOMETRY

NSSDC ID- 73-019A-06

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
PLANETARY ATMOSPHERES
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - D.L.	JUDGE	U OF SOUTHERN CALIF
OI - R.W.	CARLSON	NASA-JPL

BRIEF DESCRIPTION

This experiment consisted of a broadband photometer, sensitive between 200 and 800 A. During the cruise phase of the mission, this experiment was used to search for the supersonic-to-subsonic transition region in the solar wind. During the Jovian encounter, this experiment was used to look for evidence of an auroral oval on the Jovian dayside, to find the ratio of hydrogen to helium in the Jovian atmosphere, and to find the temperature of the outer portion of the Jovian atmosphere. Evidence of helium was found in the interplanetary region, indicating interactions between charged particles and neutral hydrogen.

------- PIONEER 11, KINARD--------------------------------------

INVESTIGATION NAME- METEOROID DETECTORS

NSSDC ID- 73-019A-04

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
INTERPLANETARY DUST

PERSONNEL

PI - W.H.	KINARD	NASA-LARC
OI - J.M.	ALVAREZ	NASA-LARC
OI - D.H.	HUMES	NASA-LARC

BRIEF DESCRIPTION

The Pioneer 11 meteoroid detection experiment attempted to detect the distribution in interplanetary space of meteoroids too small to be seen by light-scattering techniques. Twelve panels, each containing 18 pressurized cells, were mounted on the back of the spacecraft antenna dish. The pressurized cells consisted of a 5.08E-5 m thick stainless steel outer layer welded to a 2.54E-5 m thick stainless steel inner layer, with a large number of small pockets of gas trapped between them. Loss of gas pressure from any of the cells indicated a hit, and the rate of gas loss indicated the size of the hole made. Thus, the mass and incident energy of each meteoroid particle could be obtained, and when combined with the trajectory data, allowed the spatial density of the meteoroids to be determined. The panels detected impacts of particles having a mass of greater than 1.E-8 g. The panels covered 0.46 sq m of exposed area on Pioneer 11. Results from this experiment were combined with those from a similar experiment flown on Pioneer 10 to determine the range in mass of small particles on both the inner and outer boundaries and within the asteroid belt.

------- PIONEER 11, KLIORE--------------------------------------

INVESTIGATION NAME- S-BAND OCCULTATION

NSSDC ID- 73-019A-10

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J.	KLIORE	NASA-JPL
OI - G.	FJELDBO(NLA)	NASA-JPL
OI - D.L.	CAIN	NASA-JPL
OI - B.L.	SEIDEL	NASA-JPL
OI - S.I.	RASOOL	IBM

BRIEF DESCRIPTION

This experiment utilized the S-band (2292-MHz, 8-W) spacecraft radio transmitter signal characteristics to obtain information about the ionospheres and atmospheres of Jupiter, Io, and Saturn. Entrance into and exit from Jupiter and Io occultations provided changes in the signal characteristics from which atmospheric temperature, pressure, and electron density profiles could be calculated. Temperature and pressure profiles were limited to levels above the pressure of one earth atmosphere. Signal occultation also provided a determination of the planetary diameter.

------- PIONEER 11, MCDONALD--------------------------------------

INVESTIGATION NAME- COSMIC-RAY SPECTRA

NSSDC ID- 73-019A-12

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA HEADQUARTERS
OI - K.G.	MCCRACKEN	CSIRO
OI - W.R.	WEBBER	U OF NEW HAMPSHIRE
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - B.J.	TEEGARDEN	NASA-GSFC
OI - J.H.	TRAINOR	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of three 3-element telescopes, all looking normal to the spacecraft spin axis. A bidirectional telescope measured 20- to 800-MeV/nucleon particles with 5 to 10% energy resolution. Another telescope measured 3- to 22-MeV/nucleon particles with 5% resolution. These two telescopes measured particles with Z values between 1 and 8. The third telescope measured 50-keV to 1-MeV electrons and 50-keV to 20-MeV protons with 20% resolution. Data include the interplanetary region.

------- PIONEER 11, SIMPSON--------------------------------------

INVESTIGATION NAME- CHARGED PARTICLE COMPOSITION

NSSDC ID- 73-019A-02

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - J.J.	O'GALLAGHER	U OF MARYLAND
OI - A.	TUZZOLINO	U OF CHICAGO

BRIEF DESCRIPTION

This experiment used two telescopes to measure the composition and energy spectra of solar (and galactic) particles above about 0.5 MeV/nucleon. The main telescope consisted of five collinear elements (three solid state, one CsI, and one sapphire Cerenkov) surrounded by a plastic anticoincidence shield. The telescope had a 60-deg, full-angle acceptance cone with its axis approximately normal to the spacecraft spin axis, permitting 8-sectored information on particle arrival direction. Four elements of the main telescope were pulse-height analyzed, and low- and high-gain modes could be selected by command to permit resolution of the elements H through Ni or of the electrons of H and He and the isotopes of H, He, and light nuclei. A selection-priority scheme was included to permit sampling of less abundant particle species under normal and solar-flare conditions. The low-energy telescope was essentially a two-element, shielded, solid-state detector with a 70-deg, full-angle acceptance cone. The first element was pulse-height analyzed, and data were recorded by sectors. Data include the interplanetary region.

------- PIONEER 11, SMITH--------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- 73-019A-01

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS

PERSONNEL

PI - E.J.	SMITH	NASA-JPL
OI - D.S.	COLBURN	NASA-ARC
OI - P.	DYAL	NASA-ARC
OI - C.P.	SONETT	U OF ARIZONA
OI - P.J.	COLEMAN, JR.	LOS ALAMOS NAT LAB
OI - L.	DAVIS, JR.	CALIF INST OF TECH
OI - D.E.	JONES	BRIGHAM YOUNG U

BRIEF DESCRIPTION

The magnetometer on Pioneer 11 was a triaxial helium magnetometer with seven dynamic ranges, from plus or minus 2.5 nT to plus or minus 1.0E-3 T. The linearity was 0.1% and the noise threshold was 0.01 nT rms for 0-1 Hz. The accuracy was 0.5% of full scale range. The experimenter used RTN coordinates in the data analysis. In this system, R (or X) is radially outward from the sun, T (or Y) was parallel to the sun's equatorial plane and had its direction given by the cross product of the sun's spin vector into the radial direction (i.e., into R), and N (or Z) completed the right-handed orthogonal system (positive northward). A detailed instrument description may be found in Smith et al., IEEE Trans. On Magnetics, v. M-11, p. 962, July 1975. Data include the interplanetary region.

------- PIONEER 11, VAN ALLEN-----------------------------------

INVESTIGATION NAME- JOVIAN CHARGED PARTICLES

NSSDC ID- 73-019A-11   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

This experiment used seven miniature Geiger tubes in three arrays to measure proton and electron fluxes near Jupiter and Saturn. Detector groupings were as follows: (1) a three-element (A, B, and C) differentially shielded telescope. Tube C was shielded omnidirectionally and was used for background subtraction to provide rates such as A-C (5 to 21 MeV electrons and 30 to 77.5 MeV protons) and B-C (0.55 to 21 MeV electrons and 6.6 to 77.5 MeV protons); (2) a three-element triangular array, each element responding to electrons above 31 MeV and protons above 77.5 MeV; and (3) a thin-window tube (G) with a gold-plated elbow as the entrance aperture to admit scattered electrons above 0.06 MeV while discriminating strongly against protons. For a description of the similar experiment on Pioneer 10, see Van Allen et al., J. Geophys. Res., v. 79, p. 3395, 1974. Early results are given in Science, v. 188, p. 459, 1975. Data include the interplanetary region.

------- PIONEER 11, WOLFE---------------------------------------

INVESTIGATION NAME- PLASMA

NSSDC ID- 73-019A-13   INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - J.H.	WOLFE	NASA-ARC
OI - L.A.	FRANK	U OF IOWA
OI - R.	LUEST	MPI-EXTRATERR PHYS
OI - D.S.	INTRILIGATOR	U OF SOUTHERN CALIF
OI - V.T.	ZAVIENTSEFF(NLA)	NASA-ARC
OI - Z.A.	SMITH	NOAA-SEL
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - H.R.	COLLARD	NASA-ARC
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - D.D.	MCKIBBIN	NASA-ARC

BRIEF DESCRIPTION

The instrument consisted of dual 90-deg quadrispherical electrostatic analyzers, one with 26 individual particle detectors and the other with 5 current collectors. The system was capable of measuring incident plasma distribution parameters over the energy range 0.1 to 18 keV for protons and approximately 1-500 eV for electrons. The high-resolution analyzer with a constant of 9 keV/Q per kV applied to the plates, had a mean plate radius of 9 cm and separation of 0.5 cm. This analyzer was used to measure ions only, and had 26 channeltrons mounted on the semicircular exit to the analyzer. The aperture pointed through a wide slit in the back of the spacecraft high-gain antenna reflector and pointed along the spin axis toward the earth (and therefore the sun). The edges of the antenna reflector limited the viewing of the instrument to 73 deg with respect to the spin axis. The channeltrons covered a range of plus or minus 51 deg. Each channeltron near the center covered 3 deg and approximately 8 deg near the edges of the analyzer. The angular width perpendicular to the long angular width was about 2 deg. In half the pin period the whole cone of half-angle 51 deg centered on the sun was swept out. A medium-energy analyzer with a mean radius of 12 cm and a 1-cm plate separation (constant of 6 keV/Q per kV applied) was used to detect both ions and electrons. The detectors were five flat-surface current collectors. The three center collectors each covered 15 deg and covered the angular range of plus or minus 22.5 deg from the spin axis. The two outside collectors had an angular width of 47.5 deg and were located at plus or minus 46.25 deg from the center of the analyzer. There was a variety of possible operating modes for the experiment; however, the principal mode utilized during the encounter phase was one in which the analyzer plate potential was stepped through its range every one-half revolution of the spacecraft, and all current collectors or channeltrons were read out at the peak flux roll angle. The high and medium resolution analyzers operated independently, so a cross check between these analyzers was possible. The dynamic range for the particle fluxes was from 1.0E+2 to 3.0E+9/sq cm s and the proton temperature down to 2.0E+3 deg K could be ascertained. Data include the interplanetary region.

*************************** PIONEER VENUS 1*****************

SPACECRAFT COMMON NAME- PIONEER VENUS 1
ALTERNATE NAMES- PIONEER VENUS 1978 ORBIT, 10911
PIONEER VENUS ORBITER

NSSDC ID- 78-051A

LAUNCH DATE- 05/20/78   WEIGHT- 517. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS-CENT

SPONSORING COUNTRY/AGENCY
UNITED STATES   NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- VENUS ORBITER	EPOCH DATE- 12/04/78
ORBIT PERIOD- 1440. MIN	INCLINATION- 105. DEG
PERIAPSIS- 200. KM ALT	APOAPSIS- 66614. KM ALT

PERSONNEL

MG - G.	STROBEL	NASA HEADQUARTERS
SC - H.	BRINTON	NASA HEADQUARTERS
PM - R.O.	FIMMEL	NASA-ARC
PS - L.	COLIN	NASA-ARC
PS - R.A.	CRAIG	NASA-ARC

BRIEF DESCRIPTION

Pioneer Venus 1 was the first of two missions designed to conduct a comprehensive investigation of the atmosphere of Venus. The spacecraft was a solar-powered cylinder about 250 cm in diameter with its spin axis spin-stabilized perpendicular to the ecliptic plane. A high-gain antenna was mechanically despun to remain focused on the earth. The instruments were mounted on a shelf within the spacecraft except for a magnetometer mounted at the end of a boom to ensure against magnetic interference from the spacecraft. Pioneer Venus 1 measured the detailed structure of the upper atmosphere and ionosphere of Venus, investigated the interaction of the solar wind with the ionosphere and the magnetic field in the vicinity of Venus, determined the characteristics of the atmosphere and surface of Venus on a planetary scale, determined the planet's gravitational field harmonics from perturbations of the spacecraft orbit, and detected gamma-ray bursts.

------- PIONEER VENUS 1, BARNES---------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA ANALYZER (OPA)

NSSDC ID- 78-051A-18   INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - A.	BARNES	NASA-ARC
OI - H.R.	COLLARD	NASA-ARC
OI - D.D.	MCKIBBIN	NASA-ARC
OI - J.D.	MIHALOV	NASA-ARC
OI - R.C.	WHITTEN	NASA-ARC
OI - D.S.	INTRILIGATOR	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

The instrument for this experiment was a quadrispherical electrostatic analyzer (similar to the plasma instrument on Pioneers 10 and 11), with five current collectors and electrometers. The energy/charge range was 50-8000 (ions) in 32 steps and 1-500 (electrons) in 16 steps. The angular range covered was plus or minus 85 deg elevation by 360 deg azimuth, and the detector field of view was 15 deg times 25 deg or 15 deg times 45 deg, depending on position. The logic design was essentially that used on Pioneers 8 and 9. The objectives were to measure solar wind conditions outside the Venusian bow shock, inside the magnetosheath flow field, and to study the ionopausal structure. Solar-wind measurements were made during the transit to Venus, particularly to study macroscale problems and to determine average gradients. The near-planet wake region was also available for study.

------- PIONEER VENUS 1, BRACE----------------------------------

INVESTIGATION NAME- ELECTRON TEMPERATURE PROBE (OETP)

NSSDC ID- 78-051A-01   INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
PLANETARY IONOSPHERES

PERSONNEL

PI - L.H.	BRACE	NASA-GSFC
OI - M.B.	MCELROY	HARVARD U
OI - A.	PEDERSEN	ESA-ESTEC
OI - A.F.	NAGY	U OF MICHIGAN
OI - T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

This experiment consisted of a pair of cylindrical Langmuir probes of the type used on the Atmospheric Explorer (AE) series. Two probes were required, so that one was always out of the wake of the spacecraft. In flight analysis, 56 measurements taken at a rate of one per second provided high spatial resolution for the measurements of Ne and Te. The results of these high-resolution measurements were used both to study the upper atmosphere and the ionosphere and to investigate the interaction of the solar wind with the Venusian ionosphere. This experiment provided measurements over the whole region traversed by the orbiter, covering a large range of solar aspect angles, to yield a more complete configuration of the physical properties of the ionopause region.

------- PIONEER VENUS 1, CROFT---------------------------------

INVESTIGATION NAME- GAS-PLASMA ENVIRONMENT-DUAL FREQUENCY EXPERIMENT (OGPE)

NSSDC ID- 78-051A-03

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

TL - T.A.	CROFT	SRI INTERNATIONAL
TM - G.M.	KEATING	NASA-LARC
TM - A.J.	KLIORE	NASA-JPL
TM - R.J.	PHILLIPS	LUNAR + PLANETARY INST
TM - I.I.	SHAPIRO	MASS INST OF TECH
TM - R.	WOO	NASA-JPL

BRIEF DESCRIPTION

This experiment used data obtained from the S-band and X-band radio signals. The objectives were (1) to determine the lateral variations in the Venusian atmosphere and ionosphere, (2) to study the solar wind microscopic flow, and (3) to analyze solar wind scintillations (scale and characteristics of the irregularities in the Venusian atmosphere).

------- PIONEER VENUS 1, DONAHUE-------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-04

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

PI - T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

This investigation combined results obtained from the orbiter mission with results from the multi-probe mission to obtain a unified picture of the atmospheric and ionospheric chemistry and transport processes occurring in the atmosphere of Venus.

------- PIONEER VENUS 1, EVANS---------------------------------

INVESTIGATION NAME- GAMMA BURST DETECTOR (OGBD)

NSSDC ID- 78-051A-05

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - W.D.	EVANS	LOS ALAMOS NAT LAB
OI - J.P.	CONNER	LOS ALAMOS NAT LAB
OI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
OI - R.W.	KLEBESADEL	LOS ALAMOS NAT LAB
OI - R.A.	OLSON	LOS ALAMOS NAT LAB
OI - I.B.	STRONG	LOS ALAMOS NAT LAB
OI - R.E.	SPALDING	SANDIA LABORATORIES

BRIEF DESCRIPTION

An omnidirectional gamma-ray detector employing two Phoswich scintillation spectrometers sensitive to protons from 0.2 to 2.0 MeV was used with logic circuitry to detect the beginning of a gamma event and to initiate a period of rapid data collection. Data were stored in a memory unit for subsequent transmission to earth. Confirmation that a true gamma event had occurred was obtained by comparison with results from other experiments in earth satellites. This experiment provided long-baseline time correlations necessary for calculating accurate source locations.

------- PIONEER VENUS 1, KEATING-------------------------------

INVESTIGATION NAME- ATMOSPHERIC DRAG (OAD)

NSSDC ID- 78-051A-19

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - G.M.	KEATING	NASA-LARC

BRIEF DESCRIPTION

This experiment made use of the spacecraft S-band and X-band radio signals for data measurements. The objectives were (1) to establish the diurnal variation of thermospheric density and density scale height (2) to determine the relationship of solar wind variations to variations in atmospheric density, (3) to determine the relationship of long and short term variation in solar extreme UV radiation to density variations, (4) to search for phenomena such as a semi-annual variation and super rotation of the thermosphere, and (5) to formulate a thermospheric model for the Venusian atmosphere.

------- PIONEER VENUS 1, KLIORE--------------------------------

INVESTIGATION NAME- RADIO OCCULTATION (ORO)

NSSDC ID- 78-051A-20

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J.	KLIORE	NASA-JPL

BRIEF DESCRIPTION

This experiment made use of the S-band and X-band radio signals for data measurements. The objectives were (1) to measure refractivity profiles, (2) to measure S- and X-band dispersion and absorption, (3) to measure electron density height profiles, and (4) to determine the dynamics of the lower atmosphere.

------- PIONEER VENUS 1, KNUDSEN-------------------------------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER (ORPA)

NSSDC ID- 78-051A-07

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
PLANETARY IONOSPHERES

PERSONNEL

PI - W.C.	KNUDSEN	LOCKHEED PALO ALTO
OI - K.	SPENNER	INST FUR PHYS WELTRAUM
OI - R.C.	WHITTEN	NASA-ARC

BRIEF DESCRIPTION

This investigation used a Langmuir-probe retarding-potential analyzer designed to measure electron concentration and temperature, major ion concentrations and temperatures, ion drift velocities, and the energy distribution function of ambient photoelectrons. It was an adaptation of the instrument flown on the German Aeros satellite in 1972. Either one of two sensor heads could be used, each consisting of a multigrid cup and electrometer, which could operate in electron, ion, or photoelectron modes, initiated by spacecraft roll pulses. The measurements taken when the sensor axis was closest to the plasma flow velocity vector were transmitted. The aims of the investigation were to improve knowledge of the important ionic reactions in the Venusian ionosphere, to study the plasma transport processes to determine if Venus has a polar wind, to study the processes at the solar wind-ionosphere boundary, and to study similar aims concerning the ambient electron population.

------- PIONEER VENUS 1, MASURSKY------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-08

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY
PLANETOLOGY

PERSONNEL

PI - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

Surface profile, roughness, and electrical properties data from the Pioneer Venus radar altimeter were analyzed in conjunction with spacecraft-derived gravity information and earth-based radar backscatter data to produce a series of cartographic and geologic maps. The initial maps included geometric arrays of radar profiles and topographic contour data. These were then utilized to produce a shaded relief cartographic map, scale 1 to 25 million, with superimposed contour information. Preliminary Venusian geologic information, inferred from all available spacecraft and earth-based radar data sources, will subsequently be added to the cartographic map base to produce geologic maps. It is anticipated that one to three larger-scale (1 to 5.E6) cartographic and geologic maps of scientifically interesting Venusian surface features also will be produced.

------- PIONEER VENUS 1, MCGILL---------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-09 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - G.E. MCGILL U OF MASSACHUSETTS

BRIEF DESCRIPTION
Investigations of the topography and geology of Venus were undertaken to assure correct recognition of topographic and material characteristics of the planet and to arrive at the geological and geophysical interpretation of these characteristics.

------- PIONEER VENUS 1, NAGY----------------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-10 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
AERONOMY
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL
PI - A.F. NAGY U OF MICHIGAN

BRIEF DESCRIPTION
Investigations of the ionosphere of Venus were optimized by extending current models and formulating a mission plan best suited to address topics including the physics of the solar wind-ionosphere interaction, energetics of the upper atmosphere, ion chemistry, and the processes responsible for the general structure of the ionosphere, including mechanisms responsible for the maintenance of the nighttime ionosphere.

------- PIONEER VENUS 1, NIEMANN-------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER (ONMS)

NSSDC ID- 78-051A-11 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
AERONOMY
PLANETARY ATMOSPHERES

PERSONNEL
PI - H.B. NIEMANN NASA-GSFC
OI - G.R. CARIGNAN U OF MICHIGAN
OI - R.E. HARTLE NASA-GSFC
OI - N.W. SPENCER NASA-GSFC

BRIEF DESCRIPTION
The experiment used a quadrupole mass spectrometer with three ion-source operating modes and three mass-scanning modes. The ion source could be operated alternately in open and closed configurations to increase accuracy. An adaptive mass scan was used to reduce the bit rate required for a given information-return rate. The resolution was 1.E-4 for adjacent masses, and the mass range was 1 to 45 u. Vertical and horizontal density variations of the major neutral constituents of the upper atmosphere of Venus were detected and measured to define the dynamic, chemical, and thermal states of the upper atmosphere. Important constituents measured were He, O, O2, CO, CO2 and/or N2, and A. It was also possible to study H, D and/or H2, C, and NO.

------- PIONEER VENUS 1, PETTENGILL----------------------------

INVESTIGATION NAME- RADAR MAPPER (ORAD)

NSSDC ID- 78-051A-02 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY
PLANETOLOGY

PERSONNEL
PI - G. PETTENGILL MASS INST OF TECH
OI - W.E. BROWN, JR. NASA-JPL
OI - W.M. KAULA U OF CALIF, LA
OI - D.H. STAELIN MASS INST OF TECH

BRIEF DESCRIPTION
A radar altimeter was used to obtain information on the orbiter altitude, planetary surface temperature, and radar scattering properties in order to infer the surface topography, geology, and the thermal and mechanical properties of the interior of Venus. The weight of the instrument was 9.0 kg (20 lb), and the power consumption was 25 W.

------- PIONEER VENUS 1, PHILLIPS------------------------------

INVESTIGATION NAME- INTERNAL DENSITY DISTRIBUTION (OIDD)

NSSDC ID- 78-051A-23 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY PHYSICS

PERSONNEL
PI - R.J. PHILLIPS LUNAR + PLANETARY INST
PI - W.L. SJOGREN NASA-JPL

BRIEF DESCRIPTION
This experiment used the S-band and X-band radio signals for data measurements. The objectives were (1) to determine the internal mass distribution and the physical processes that have operated to produce the distribution, (2) to determine the relationship of the surface morphology to the internal density distribution, (3) to determine the amount of isostatic compensation of the Venusian topography, and (4) to describe an evolutionary track for Venus that is consistent with the above.

------- PIONEER VENUS 1, RUSSELL-------------------------------

INVESTIGATION NAME- MAGNETOMETER (OMAG)

NSSDC ID- 78-051A-12 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
ATMOSPHERIC PHYSICS

PERSONNEL
PI - C.T. RUSSELL U OF CALIF, LA
OI - P.J. COLEMAN, JR. LOS ALAMOS NAT LAB
OI - F.V. CORONITI U OF CALIF, LA
OI - C.F. KENNEL U OF CALIF, LA
OI - R.L. MCPHERRON U OF CALIF, LA
OI - G.L. SISCOE U OF CALIF, LA

BRIEF DESCRIPTION
This experiment used a triaxial fluxgate magnetometer with two ring-core sensors at the end of a magnetometer boom and one ring-core sensor, at 45 deg to the spin axis, halfway down the boom. The drive and electronics design had been used on the Apollo 15 and 16 subsatellites. The objectives were to determine any planetary and remnant magnetic fields, to deduce the location and strength of the ionospheric current system, to determine the energy and mass balance in the upper atmosphere of Venus, to determine the nature of the solar wind interaction with Venus, and to study the near-wake region of Venus and the structure of the Venusian bow shock. Interplanetary objectives were to determine the perturbation of the near-planet region by Venus and to compare the properties of the average field at 0.7 and 1.0 AU. The instrument was intended to, in the worst case of low-bit and low-sample rates, measure one vector per 32 s. While in Venus orbit, when the spacecraft was coasting through the interplanetary region in the apoapsis mode, the sample rate was one vector per 8 s. While the spacecraft was passing through the Venusian ionosphere in the periapsis mode, the sample rate was four vectors per s.

------- PIONEER VENUS 1, SCARF---------------------------------

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR (OEFD)

NSSDC ID- 78-051A-13 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL
PI - F.L. SCARF TRW SYSTEMS GROUP
OI - I.M. GREEN TRW SYSTEMS GROUP

BRIEF DESCRIPTION
This experiment consisted of a modified version of the Pioneer 8 and Pioneer 9 experiments to measure the electric-field components in four 30%, narrow-band channels centered at 100, 730, 7350, and 30,000 Hz. The aims of the investigation were to perform an analysis of VLF electric fields at Venus and to elucidate the plasma interactions between the solar wind and the ionospheric or exospheric plasma. The role of plasma instabilities in modifying the heat flux from the solar wind and in thermalizing newly-born ions from Venus was also studied. A self-contained balanced V-type antenna with a differential preamplifier was employed to make the measurements. At the 512-bps satellite mode, one frequency

scan per second was obtained.

------- PIONEER VENUS 1, SCHUBERT-----------------------------

INVESTIGATION NAME- INTERDISCIPLINARY SCIENTIST

NSSDC ID- 78-051A-14 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
MAGNETOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
PLANETOLOGY
GEODESY AND CARTOGRAPHY

PERSONNEL
PI - G. SCHUBERT U OF CALIF, LA

BRIEF DESCRIPTION
Measurements of plasma temperatures, magnetic fields, particle composition, and other data were used to develop and test theories of atmospheric circulation and solar wind-ionosphere interactions. In the case of topography and gravity, the data (altimetry and tracking) were used both in descriptive fashion, to simply characterize the surface of Venus and its gravitational field, and in a more quantitative way to model the internal structure of the planet.

------- PIONEER VENUS 1, SHAPIRO-------------------------------

INVESTIGATION NAME- CELESTIAL MECHANICS (OCM)

NSSDC ID- 78-051A-21 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
CELESTIAL MECHANICS

PERSONNEL
PI - I.I. SHAPIRO MASS INST OF TECH

BRIEF DESCRIPTION
This experiment used the S-band and X-band radio signals for data measurements. The objectives were: (1) to model the gravity field of Venus, (2) to estimate the direction and magnitude of the Venus spin vector, (3) to bound the magnitude of (and possibly estimate) the polar motion of Venus, (4) to determine the density profile of the upper atmosphere, and (5) to determine a connection between the coordinate system of planetary ephemerides and an inertial coordinate system referenced to extragalactic radio sources.

------- PIONEER VENUS 1, STEWART-------------------------------

INVESTIGATION NAME- PROGRAMMABLE ULTRAVIOLET SPECTROMETER
(OUVS)

NSSDC ID- 78-051A-15 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
AERONOMY
IONOSPHERES

PERSONNEL

PI -	A.I.	STEWART	U OF COLORADO
OI -	C.A.	BARTH	U OF COLORADO
OI -	C.W.	HORD	U OF COLORADO
OI -	G.E.	THOMAS	U OF COLORADO
OI -	D.	ANDERSON	NOAA-SEL

BRIEF DESCRIPTION
This investigation used a 125-mm Cassegrain telescope on a 125-mm Ebert-Fastie spectrometer with a programmable grating drive. Airglow, scattered sunlight, and hydrogen Lyman-alpha emissions were detected in the thermosphere, mesosphere, and exosphere of Venus. These measurements were used to establish and map the composition, temperature, and photochemistry of the thermosphere and ionosphere, to determine the pressure at and above the visible cloud tops, and to establish the distribution and escape rate of atomic hydrogen. The instrument operated in the 1100-3400 A region.

------- PIONEER VENUS 1, TAYLOR, JR.---------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER 1-60AMU (OIMS)

NSSDC ID- 78-051A-17 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY IONOSPHERES
PLANETARY ATMOSPHERES

PERSONNEL

PI -	H.A.	TAYLOR, JR.	NASA-GSFC
OI -	S.J.	BAUER	GRAZ U
OI -	R.E.	HARTLE	NASA-GSFC
OI -	H.C.	BRINTON	NASA HEADQUARTERS
OI -	J.R.	HERMAN	NASA-GSFC
OI -	T.M.	DONAHUE	U OF MICHIGAN
OI -	P.A.	CLOUTIER	RICE U
OI -	F.C.	MICHEL	RICE U

BRIEF DESCRIPTION
The composition and concentration of thermal positive ions in the ionosphere of Venus were determined and interpreted in terms of vertical and horizontal components. The instrument used was a Bennett radio-frequency mass spectrometer based on the design of those flown on OGO and Atmospheric Explorer satellites. A mass range of 1 to 60 u was covered with a variety of automatic scan-search modes available.

------- PIONEER VENUS 1, TRAVIS--------------------------------

INVESTIGATION NAME- CLOUD PHOTOPOLARIMETER

NSSDC ID- 78-051A-06 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES.

PERSONNEL

PI -	L.	TRAVIS	NASA-GISS
OI -	P.H.	STONE	MASS INST OF TECH
OI -	A.A.	LACIS	NASA-GISS

BRIEF DESCRIPTION
This experiment used a simplified version of the Imaging Photopolarimeter (IPP) flown on Pioneers 10 and 11 to provide low-resolution, four-color maps of the Venusian cloud cover with a high-resolution imaging capability near apocenter. The principal objective of this investigation was to determine the properties of the clouds and haze, including the vertical and horizontal distribution of the particles, cloud particle size and refractive index, the cloud-top height, and the number density of particles.

------- PIONEER VENUS 1, WOO-----------------------------------

INVESTIGATION NAME- ATMOSPHERIC AND SOLAR CORONA TURBULENCE
(OTUR)

NSSDC ID- 78-051A-22 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL
PI - R. WOO NASA-JPL

BRIEF DESCRIPTION
This experiment made use of the S-band and X-band radio signals for data measurements. The objectives of the experiment were to measure (1) the intensity variation of turbulence with altitude, (2) planetary latitude and longitude, and (3) the distribution of scale sizes in the atmosphere.

**************************** PROGNOZ 8 ************************

SPACECRAFT COMMON NAME- PROGNOZ 8
ALTERNATE NAMES- 12116

NSSDC ID- 80-103A

LAUNCH DATE- 12/25/80 WEIGHT- 915. KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 12/25/80
ORBIT PERIOD- 5689. MIN	INCLINATION- 65.8 DEG
PERIAPSIS- 980. KM ALT	APOAPSIS- 197390. KM ALT

PERSONNEL
PS - A.A. GALEEV IKI

BRIEF DESCRIPTION
This spacecraft was a member of a continuing series to measure charged particles, plasma, magnetic fields and electromagnetic radiation. Although no specific information has been provided concerning the experiments and the scientific objectives, it is likely they were both similar to Prognoz 7. The study of solar UV, X-ray, and gamma-ray emissions was continued along with the monitoring of electrons and protons in interplanetary space and the magnetosphere. The investigation of the nuclear compositions of solar and galactic cosmic rays was continued along with the measurement of in-situ magnetic fields. A request was made to the Project Scientist to provide descriptions of the various instruments but no response was received. It was known from other sources that the solar X-ray experiment was the same as that flown on Prognoz 7.

------- PROGNOZ 8, LICKIN--

INVESTIGATION NAME- SOLAR X-RAY SPECTROMETER

NSSDC ID- 80-103A-01 INVESTIGATIVE PROGRAM SCIENCE

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL

PI - O.B.	LICKIN	IKI
PI - B.	VALENICEK	ASTRONOMICAL INST

BRIEF DESCRIPTION

Two detectors were used to record solar X rays in the energy range 2.2 to 98 keV. A NaI (Tl) scintillation detector 3 mm thick with 4.5 sq cm area was used for the energy range 6 to 98 keV. Pulse-amplitude analysis was done for 5 contiguous energy channels over this range. An additional energy range of 2.2 to 7 keV was covered by a gas-filled, beryllium window proportional counter, using amplitude discrimination. The high voltage to the gas counter was automatically switched off by a rate-sensitive device during passage through the radiation belts, to prolong the life of the detector. The same instrument was used on Prognoz 5, 6, and 7.

*************************** SAGE*****************************

SPACECRAFT COMMON NAME- SAGE
ALTERNATE NAMES- AEM-B, STRAT AERO AND GAS EXP
APPL EXPL MISSION B, 11270

NSSDC ID- 79-013A

LAUNCH DATE- 02/18/79 WEIGHT- 148.7 KG
LAUNCH SITE- WALLOPS FLIGHT CENTER, UNITED STATES
LAUNCH VEHICLE- SCOUT-F

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSTA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/19/79
ORBIT PERIOD- 96.8 MIN	INCLINATION- 54.9 DEG
PERIAPSIS- 547.5 KM ALT	APOAPSIS- 660.2 KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - R.A.	SCHIFFER	NASA HEADQUARTERS
PM - C.M.	MACKENZIE	NASA-GSFC
PS - R.S.	FRASER	NASA-GSFC

BRIEF DESCRIPTION

The Stratospheric Aerosol and Gas Experiment (SAGE) spacecraft was the second of the Applications Explorer Missions (AEM). The small, versatile, low-cost spacecraft was made of two distinct parts: (1) the SAGE instrument module containing the detectors and the associated hardware, and (2) the base module containing the necessary data handling, power, communications, command, and attitude control subsystem to support the instrument mode. The objectives of the SAGE mission were to obtain a global data base for stratospheric aerosols and ozone and to use these data sets for a better understanding of the earth's environmental quality and radiation budget. The spacecraft was designed for a 1-year life in orbit. The spacecraft experienced power problems after May 15, 1979. Spacecraft operations continued until November 19, 1981. The signal from the spacecraft was last received on January 7, 1982, when the battery failed. For more detailed information, see "Satellite studies of the stratospheric aerosol" by M. P. McCormick, et. al., Bull. Am. Meteorol. Soc., v. 60, pp. 1038-1046, 1979.

------- SAGE, MCCORMICK---------------------------------------

INVESTIGATION NAME- STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE)

NSSDC ID- 79-013A-01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S) UPPER ATMOSPHERE RESEARCH METEOROLOGY

PERSONNEL

PI - M.P.	MCCORMICK	NASA-LARC
OI - D.M.	CUNNOLD	GEORGIA INST OF TECH
OI - G.W.	GRAMS	GEORGIA INST OF TECH
OI - B.M.	HERMAN	U OF ARIZONA
OI - D.E.	MILLER	METEOROLOGICAL OFFICE
OI - D.G.	MURCRAY	U OF DENVER
OI - T.J.	PEPIN	U OF WYOMING
OI - W.G.	PLANET	NOAA-NESS
OI - P.B.	RUSSELL	SRI INTERNATIONAL

BRIEF DESCRIPTION

The objectives of the Stratospheric Aerosol and Gas Experiment (SAGE) were to determine the spatial distribution of stratospheric aerosols and ozone on a global scale. Specific objectives were (1) to develop a satellite-based remote-sensing technique for stratospheric aerosols and ozone, (2) to map aerosol and ozone concentrations on a time scale shorter than major stratospheric changes, (3) to locate stratospheric aerosol and ozone sources and sinks, (4) to monitor circulation and transfer phenomena, (5) to observe hemisphere differences, and (6) to investigate the optical properties of aerosols and assess their effects on global climate. The SAGE instrument was a radiometer consisting of a Gregorian telescope and a detector subassembly which measured the attenuation of solar radiation at four wavelengths (.385, .45, .6, and 1.0 micrometer) during solar occultation. As the spacecraft emerged from the earth's shadow, the sensor scanned the earth's atmosphere from the horizon up, and measured the attenuation of solar radiation by different atmospheric layers. This procedure was repeated during spacecraft sunset. Two vertical scannings were obtained during each orbit, with each scan requiring approximately 1 min of time to cover the atmosphere above the troposphere. The instrument had a field of view of approximately 0.15 mrad which resulted in a vertical resolution of about 1 km. Spatial coverage extended from about 79 deg N to 79 deg S latitude and thus complemented the coverage (68 deg N - 80 deg N and 68 deg S - 80 deg S) of the SAM II on Nimbus 7. The instrument performed satisfactorily. Because of power problems, the data collection was limited to sunset events after June 1979, and was eventually terminated on November 18, 1981. Both NSSDC and World Ozone Data Center, Atmospheric Environmental Services, 4905 Duffins St., Downsview, Ontario, M3H 5T4 Canada, have data.

*************************** SME*****************************

SPACECRAFT COMMON NAME- SME
ALTERNATE NAMES- SOLAR MESOSPHERE EXPL, 12887

NSSDC ID- 81-100A

LAUNCH DATE- 10/06/81 WEIGHT- 145. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 10/16/81
ORBIT PERIOD- 95.5 MIN	INCLINATION- 97.5 DEG
PERIAPSIS- 535. KM ALT	APOAPSIS- 551. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
SC - S.G.	TILFORD	NASA HEADQUARTERS
PM - K.S.	WATKINS	NASA-JPL
PS - C.A.	BARTH	U OF COLORADO

BRIEF DESCRIPTION

The Solar Mesosphere Explorer (SME) mission objective was primarily to investigate the processes that create and destroy ozone in the earth's mesosphere and upper stratosphere. Some specific goals were (1) to determine the nature and magnitude of changes in mesospheric ozone densities that are the result of changes in the solar ultraviolet flux; (2) to determine the interrelationship between solar flux, ozone, and the temperature of the upper stratosphere and mesosphere; (3) to determine the interrelationship between ozone and water vapor; and (4) to determine the interrelationship between nitrogen dioxide and ozone. The satellite experiment complement consisted of a solar ultraviolet spectrometer, a UV ozone spectrometer, an infrared radiometer, a 1.27-micrometer spectrometer, and a nitrogen dioxide spectrometer. In addition, a solar proton alarm detector was carried to measure the integrated solar flux in the range 30 to 500 MeV. Spin stabilized at 5 rpm, the satellite moved in a 3 am to 3 pm sun-synchronous orbit. The spacecraft body was a cylinder approximately 1.7 by 1.25 m and consisted of two major modules: the observatory module which housed the scientific instruments, and the spacecraft bus. The spin axis was oriented normal to the orbital plane. The command system was capable of executing commands in real time or from stored program control. Power was supplied by a solar cell array. The telemetry system was used either in a real-time or in a tape-recorder mode. Further details and some measurement results can be found in C.A. Barth et al., "Solar mesosphere explorer: scientific objectives and results," Geophys. Res. Lett., v. 10, n. 4, p. 237, 1983.

------- SME, BARTH---

INVESTIGATION NAME- UV OZONE

NSSDC ID- 81-100A-01 INVESTIGATIVE PROGRAM CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S) AERONOMY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO

BRIEF DESCRIPTION

The objective of the Ultraviolet Ozone Experiment was to measure ozone absorption of rayleigh-scattered sunlight in the middle ultraviolet region. A dual-channel Ebert-Fastie spectrometer operated in the regions 1880-3100 Angstroms (A) and 2230-3404 A and viewed normal to the spin axis. At half maximum the full width of the signal was 15 A. There were 208/11 grating steps per scan, respectively.

------- SME, BARTH---

INVESTIGATION NAME- INFRARED RADIOMETER (4 CHANNELS)

NSSDC ID- 81-100A-02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the Infrared Radiometer Experiment was to determine the altitude-mixing ratio profiles for water and ozone from thermal emissions. Also, pressure and temperature were determined between 20 and 70 km altitude. The four-channel radiometer/telescope had the following spectral ranges (in micrometers): 17.2 to 13.2, 15.7 to 14.7, 10.6 to 8.6, and 7.2 to 6.1. The full-widths at half-maximum were 4.0, 1.0, 2.0, and 1.1 micrometers, respectively. All four channels utilized (Hg-Cd)Te detectors. Wavelength separation was accomplished with multilayer bandpass filters. The instrument line of sight was normal to the spin axis.

------- SME, BARTH---

INVESTIGATION NAME- 1.27 MICROMETER AIRGLOW

NSSDC ID- 81-100A-03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
AERONOMY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the 1.27-Micrometer Airglow Experiment was to obtain limb-scanning measurements of the 1.27-micrometer airglow in the 50- to 90-km altitude range, and of the hydroxyl emission between 60 and 90 km altitude. A dual-channel Ebert-Fastie spectrometer operated in the regions 1.1 to 2.6 micrometers (channel 1) and 1.1 to 3.2 micrometers (channel 2), and viewed normal to the spin axis. The full width of the signal at half-maximum was 123 A. There were 512 grating steps per scan.

------- SME, BARTH---

INVESTIGATION NAME- VISIBLE NITROGEN DIOXIDE

NSSDC ID- 81-100A-04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the Visible Nitrogen Dioxide Experiment was to measure the distribution of nitrogen dioxide in the 25- to 40-km altitude region. This was done by measuring the differential absorption of scattered sunlight by NO2 at two wavelengths near 4400 A. A dual-channel Ebert-Fastie spectrometer operated in the following wavelength intervals: 4390 to 4420 A and 3200-6400 A. The signal at half maximum had a full width of 9.8 A/19.6 A, respectively. There were 512/438 grating steps per scan, respectively. The instrument line of sight was normal to the spin axis.

------- SME, BARTH---

INVESTIGATION NAME- SOLAR UV MONITOR

NSSDC ID- 81-100A-05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
IONOSPHERES
AERONOMY

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of the Ultraviolet Solar Monitor Experiment was to monitor the incoming solar radiation to determine the effect on the ozone concentration. A dual-channel Ebert-Fastie spectrometer measured solar radiation at 1216 A and between 1600 and 3100 A with a resolution of 1 A. The look direction was 45 deg to the spacecraft axis of rotation. In the 3 am to 3 pm sun-synchronous orbit, the instrument scanned through the sun once per orbit. The full width at half maximum was 14 A. There were 512 grating steps per scan.

------- SME, BARTH---

INVESTIGATION NAME- SOLAR PROTON ALARM

NSSDC ID- 81-100A-06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - C.A.	BARTH	U OF COLORADO
OI - G.J.	ROTTMAN	U OF COLORADO
OI - R.J.	THOMAS	U OF COLORADO
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES
OI - P.L.	BAILEY	NATL CTR FOR ATMOS RES
OI - J.F.	NOXON	NOAA-ERL
OI - A.I.	STEWART	U OF COLORADO
OI - C.W.	HORD	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - J.	LONDON	U OF COLORADO
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.E.	DICKINSON	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The Solar Proton Alarm Detector monitored the integrated solar proton flux in the 30 to 500 MeV range. When the flux exceeded a selected commandable value, the instrument signaled an opportunity to alter science commands to observe the effects of solar protons on atmospheric constituents.

*************************** SMM******************************

SPACECRAFT COMMON NAME- SMM
ALTERNATE NAMES- SOLAR MAXIMUM MISSION, 11703

NSSDC ID- 80-014A

LAUNCH DATE- 02/14/80 WEIGHT- 2315. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/15/80
ORBIT PERIOD- 94.8 MIN	INCLINATION- 28.5 DEG
PERIAPSIS- 508. KM ALT	APOAPSIS- 512. KM ALT

PERSONNEL

MG - B.R.	MCCULLAR	NASA HEADQUARTERS
SC - E.G.	CHIPMAN	NASA HEADQUARTERS
PM - J.P.	CORRIGAN	NASA-GSFC
PS - K.J.	FROST	NASA-GSFC

BRIEF DESCRIPTION

The Solar Maximum Mission (SMM) was designed to provide coordinated observations of solar activity, in particular solar flares, during a period of maximum solar activity. The payload was made up of seven instruments, specifically selected to study the short-wavelength and coronal manifestations of flares. Data were obtained on the storage and release of flare energy, particle acceleration, formation of hot plasma, and mass ejection. Complementary studies were made as part of the SMM guest investigator program and coordinated in-situ measurements of flare particle emissions were made from the ISEE 3 satellite. The SMM observatory was approximately 4 m in length, fitting into a circular envelope 2.3 m in diameter. The construction was modular. The instrument module occupied the top 2.3 m and contained all the solar payload instruments together with the fine-pointing sun-sensor system. Below the instrument module was the multimission modular spacecraft (MMS) containing the systems for attitude control, power, communication, and data handling. Between the instrument module and the MMS was the transition adaptor, supporting two fixed solar paddles that supplied between 1500 and 3000 W of power. Quick and coordinated responses to solar flares were considered essential for meeting the scientific objectives of the mission. Therefore, the ground system was designed to facilitate coordinated data evaluation, observation, planning, and command uplink to the onboard stored command processor. Onboard coordination of response to a flare was performed in real time. The attitude-control software allowed observatory re-pointings and slow scanning motions; there was also a special module for tracking a solar feature over many days. A repair mission on STS-13 is planned. For this mission, astronauts rendezvous with SMM to make repairs and an orbital adjustment.

------- SMM, ACTON--

INVESTIGATION NAME- SOFT X-RAY POLYCHROMATOR (XRP)

NSSDC ID- 80-014A-04 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - L.W.	ACTON	LOCKHEED PALO ALTO
PI - A.H.	GABRIEL	RUTHERFORD/APPLTON LAB
PI - J.L.	CULHANE	U COLLEGE LONDON
OI - R.C.	CATURA	LOCKHEED PALO ALTO
OI - J.H.	PARKINSON	U COLLEGE LONDON
OI - C.G.	RAPLEY	U COLLEGE LONDON
OI - B.B.	JONES	RUTHERFORD/APPLTON LAB
OI - C.	JORDAN	OXFORD U
OI - C.J.	WOLFSON	LOCKHEED PALO ALTO
OI - B.C.	FAWCETT	RUTHERFORD/APPLTON LAB

BRIEF DESCRIPTION

The soft X-ray polychromator (XRP) was a high-resolution instrument that covered the spectral region from 1.4 A to 22.4 A. This area included emission lines which were important for the diagnosis of plasmas in the 1.5 to 5.0E7 deg K temperature range, an area especially useful for solar flare and active solar region studies. The XRP consisted of two instruments with a common control data handling and power system. The bent crystal spectrometer (BCS) was designed for high time-resolution studies in the lines of Fe I to Fe XXVI and Ca XIX. It simultaneously observed eight fixed-wavelength intervals with a relatively large FOV (6 by 6 min FWHM). A programmable microprocessor controlled tradeoffs between temporal and spectral resolution that could provide an ultimate temporal resolution of 0.064 s. The flat crystal scanning spectrometer (FCS) provided for 7-channel polychromatic mapping of flaring and other active regions in the resonance lines of O VIII, Ne IX, Mg XI, Si XIII, S XV, Ca XIX and Fe XXV with 14-arc-s spatial resolution. In its spectral scanning mode it could cover the entire 1.4 to 22.4 A region in about 7 s. The FCS consisted of a finely collimated array of flat-crystal spectrometers with a field of view 14 by 14 arc s that could be rastered in 5-s steps over any portion of a target 7 arc-min square. The FCS provided good spatial and spectral resolution at some cost to temporal resolution. Its programmable microprocessor controlled the operation of the FCS's raster and crystal drive mechanisms. For further information see Acton et al., Solar Physics, v. 65, p. 53 (1980).

------- SMM, CHUPP--

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER (GRE)

NSSDC ID- 80-014A-07 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - E.L.	CHUPP	U OF NEW HAMPSHIRE
OI - D.J.	FORREST	U OF NEW HAMPSHIRE
OI - K.	PINKAU	MPI-EXTRATERR PHYS
OI - C.	REPPIN	MPI-EXTRATERR PHYS
OI - E.	RIEGER	MPI-EXTRATERR PHYS
OI - W.N.	JOHNSON	US NAVAL RESEARCH LAB
OI - R.L.	KINZER	US NAVAL RESEARCH LAB
OI - J.D.	KURFESS	US NAVAL RESEARCH LAB
OI - G.H.	SHARE	US NAVAL RESEARCH LAB
OI - A.S.	JACOBSON	NASA-JPL

BRIEF DESCRIPTION

The gamma-ray spectrometer (GRE) utilized a set of NaI(Tl) detectors and CsI(Na) detectors to form three separate instruments for measurement of the solar gamma-ray spectrum: (1) an actively shielded, multicrystal gamma-ray spectrometer, (2) a high-energy gamma-ray detector, and (3) an auxiliary X-ray detector. The heart of the gamma-ray spectrometer consisted of seven 7.6 cm sq NaI integral line detectors shielded by an annulus of CsI and a 7.6-cm thick CsI back; the front and back of this system was shielded by a plastic scintillator to reject charged particles. The spectrometer produced a 476-channel pulse-height spectrum every 16 s over the energy range 0.3 to 9 MeV. The energy resolution was less than 7% FWHM at 0.662 MeV. A 2-s time resolution was available in three windows to study prompt line emission at 4.4 and 6.1 MeV; photons from 0.3 to 0.35 MeV were recorded with a 64-ms resolution. The high-energy detector consisted of the seven NaI front detectors of the gamma-ray spectrometer and the large 25-cm diameter by 7.6-cm CsI back detector. Events in the 10 to 100 MeV range occurring in this total detector mass were analyzed by separate pulse-height analyzers. Neutrons above 20 MeV could be distinguished by a difference in signature and in time of flight from the solar surface. The high-energy system had a 2-s time resolution. The auxiliary X-ray detector consisted of two 0.6-cm thick NaI detectors, one with an Al filter to cover the 10 to 80 keV range and the other with an Al-Fe filter to cover the 25 to 140 keV range. The X-ray system had a time resolution of 1 s and 4 channels of energy. For more details on this experiment see Forrest et al., Solar Physics, v. 65, p. 15 (1980).

------- SMM, DE JAGER---

INVESTIGATION NAME- HARD X-RAY IMAGING SPECTROMETER (HXIS)

NSSDC ID- 80-014A-05 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - C.	DE JAGER	U OF UTRECHT
OI - H.F.	VAN BEEK	SPACE RESEARCH LAB
OI - A.P.	WILLMORE	U OF BIRMINGHAM

BRIEF DESCRIPTION

The objective of the hard X-ray imaging spectrometer (HXRIS) experiment was to measure the position, structure, and thermodynamic properties of hot thermal and nonthermal sources in active regions and in flares. This instrument produced two-dimensional images with 8-arc-s resolution over an approximately square area of side 2 min 40 s, or 32-arc-s resolution over a square of side 6 min 24 s. These images were observed in six selectable energy channels, between 3.5 and 30 keV, with a temporal resolution of 0.5 to 7 s, depending on the mode of operation. By means of a flare flag, the experiment alerted other SMM instruments when a flare began and indicated the position of the brightest pixel of the observation. The instrument consisted of 10 etched grid plates, each divided into 576 sections that formed the collimator, and 900 mini-proportional counters that provided a position-sensitive detector system capable of spectral analysis. A dual microcomputer system permitted three modes of operation with commandable parameters that provided for a flexible trade-off between temporal resolution and spatial coverage during different phases of a solar flare. For more details on this experiment see Van Beek et al., Solar Physics, v. 65, p. 39 (1980).

------- SMM, FROST---

INVESTIGATION NAME- HARD X-RAY BURST SPECTROMETER (HXRBS)

NSSDC ID- 80-014A-06 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - K.J.	FROST	NASA-GSFC
OI - L.E.	ORWIG	NASA-GSFC
OI - B.R.	DENNIS	NASA-GSFC
OI - T.L.	CLINE	NASA-GSFC
OI - U.D.	DESAI	NASA-GSFC

BRIEF DESCRIPTION

The hard X-ray burst spectrometer (HXRBS) was concerned with impulsive flare emission to determine the role of energetic electrons in solar flare mechanisms. The instrument consisted of a disk-shaped CsI(Na) central detector and a CsI(Na) active collimator element that surrounded the central detector. Photomultiplier (PM) tubes were used to view the crystals. The central crystal was 0.635 cm thick with a sensitive area of 71 sq cm. The collimator provided a 40 deg FWHM FOV. The energy range 20 to 260 keV was covered by 15 energy-loss channels that provided continuous measurements with a time resolution of 128 milliseconds. The system possessed an energy resolution of 30% FWHM at 122 keV. By use of a circulating 32k word memory, time resolutions as short as 1 ms were obtained for fast-rising bursts, but no spectral data were available with this memory. Either a constant time (CT) or constant count (CC) mode for the memory could be selected. Using the CT mode during solar observing periods, 10-ms resolution could be obtained for any flare output that triggered the device. Using the CC mode during spacecraft night, gamma-ray bursts could be detected effectively. A charged particle detector was used to sense the South Atlantic anomaly region and to turn off the voltage to the PM tubes. For more detailed information about this experiment see Orwig et al., Solar Physics, v. 65, p. 25 (1980).

------- SMM, HOUSE---

INVESTIGATION NAME- CORONAGRAPH/POLARIMETER

NSSDC ID- 80-014A-01 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - L.L.	HOUSE	HIGH ALTITUDE OBS
OI - W.J.	WAGNER	HIGH ALTITUDE OBS
OI - E.G.	HILDNER	HIGH ALTITUDE OBS
OI - G.A.	DULK	U OF COLORADO
OI - C.B.	SAWYER	HIGH ALTITUDE OBS
OI - R.	KOPP	LOS ALAMOS NAT LAB
OI - G.W.	PNEUMAN	HIGH ALTITUDE OBS
OI - C.W.	QUERFELD	HIGH ALTITUDE OBS
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - K.V.	SHERIDAN	CSIRO,DIV OF RADIOPHYS

BRIEF DESCRIPTION

The prime objective of this experiment was to measure the response of the coronal electron density and magnetic field structure to the passage of transient phenomena on rapid time scales. The secondary objective was to determine the density and orientation of the magnetic field structure of the corona on a synoptic basis. The coronagraph/polarimeter (C/P) was the most recent version of a spaceborne externally occulted Lyot coronagraph designed to produce images of the solar corona in seven wavelength bands in the visual spectral range. The C/P was occulted by three disks with a 2.6-cm diameter primary objective lens of air-spaced doublet design. Coronal quadrants were imaged at f/34 on a meshless vidicon with a nutating mirror arrangement and were recorded on a dedicated tape recorder for subsequent transmission to the earth. Fields of view ranged from 1.5 to 6.0 sq solar radii and were selectable within the coronal quadrant. Spatial resolution was selectable between 6.4 and 12.8 arc s. Seven filters were available within the range 4465 to 6583 A and polarization was measured by a sequence of three polaroids oriented 60 deg apart (a clear position was also available). The stray radiance was about 3E-10 of the solar brightness in the outer field. The instrument was on an independent gimbal mount and was sun-centered to within 10 arc s. Experiments with the C/P involved either radiance observations or polarization sequences. For further information see MacQueen et al., Solar Physics, v. 65, p. 91 (1980).

------- SMM, TANDBERG-HANSSEN------------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER AND POLARIMETER

NSSDC ID- 80-014A-02 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ATMOSPHERIC PHYSICS
AERONOMY
ASTRONOMY

PERSONNEL

PI - E.	TANDBERG-HANSSEN	NASA-MSFC
OI - R.G.	ATHAY	HIGH ALTITUDE OBS
OI - J.M.	BECKERS	SACRAMENTO PEAK OBS
OI - J.C.	BRANDT	NASA-GSFC
OI - E.C.	BRUNER	LOCKHEED PALO ALTO
OI - R.D.	CHAPMAN	NASA-GSFC
OI - B.E.	WOODGATE	NASA-GSFC

BRIEF DESCRIPTION

The ultraviolet spectrometer and polarimeter (UVSP) was a modified version of the telescope-spectrograph system flown on OSO 8. The objective of the experiment was to study solar ultraviolet radiation from active regions, flares, prominences, and the corona, in order to determine temperature, density, velocity and the magnetic field in the solar plasma. A secondary objective was to conduct an aeronomy program to measure the height distribution of major absorbers in the earth's atmosphere, such as ozone and oxygen, and to detect trace constituents and their changes as a result of solar flares. The instrument consisted of a Gregorian telescope and an Ebert spectrometer. The telescope had an effective focal length of 1.8 m, a collecting area of 66.4 sq cm and FOV 256 by 256 arc s sq. The secondary mirror had a raster mechanism that allowed up to a 256- by 256-arc s scan range. Spatial resolution was determined by an entrance slit mechanism that was adjustable from 1 by 1 arc s to 30 by 30 arc s. A choice of 22 entrance/exit slit combinations was available. The Ebert spectrometer had a spectral range of 1750 to 3600 A with a resolution of 0.04 A FWHM in the first order and 1150 to 1800 A with a resolution of 0.02 A FWHM in the second order. The polarimeter was located behind the entrance slit and consisted of two retarders (waveplates), a linear polarizer, and drive mechanisms. The control electronics for the instrument included a programmable microprocessor. Simultaneous measurements, at different heights in the chromosphere and in the corona, could be made by selecting any of three sets of four line pairs for spectroscopy and any of six line pairs for polarimetry. For further information see Woodgate et al., Solar Physics, v. 65, p. 73 (1980).

------- SMM, WILLSON---

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER IRRADIANCE MONITOR

NSSDC ID- 80-014A-08 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL

PI - R.C.	WILLSON	NASA-JPL

BRIEF DESCRIPTION

The objective of the active cavity radiometer irradiance monitor (ACRIM) was to measure the total solar irradiance with state-of-the-art accuracy and precision (<0.5%) in order to determine the magnitude and direction of variations in the total solar output of optical energy. Solar irradiance in the far ultraviolet was measured by three active cavity radiometer detectors, individually shuttered. These detectors were electrically self-calibrated, conical cavity pyroheliometers capable of defining the solar flux with an uncertainty of 0.1% and a precision of 0.2%. One detector was used routinely to monitor the sun, a second detector was intermittently exposed to the sun to establish the long-term stability of the first detector, and a third detector was used for resolving ambiguities in the performance of the first two detectors.

**************************** SMS 2 ****************************

SPACECRAFT COMMON NAME- SMS 2
ALTERNATE NAMES- PL-731E, SYNCH METEOROL SATELL B
SMS-B, ME02

NSSDC ID- 75-011A

LAUNCH DATE- 02/06/75 WEIGHT- 243. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 04/01/75
ORBIT PERIOD- 1436.2 MIN	INCLINATION- 1.0 DEG
PERIAPSIS- 35778. KM ALT	APOAPSIS- 35799. KM ALT

PERSONNEL

PM - T.J. KARRAS	NOAA-NESS
PS - W.E. SHENK	NASA-GSFC

BRIEF DESCRIPTION

The SMS 2, a NASA-developed, NOAA-operated spacecraft, carried (1) a visible-infrared spin-scan radiometer (VISSR) to provide high-quality day/night cloudcover data and to take radiance temperatures of the earth/atmosphere system, (2) a meteorological data collection and transmission system to relay processed data from central weather facilities to small APT-equipped regional stations and to collect and retransmit data from remote earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The spin-stabilized, earth-synchronous, and cylindrically shaped spacecraft measured 190.5 cm in diam and 230 cm in length, exclusive of a magnetometer that extended an additional 83 cm beyond the cylinder shell. The primary structural members were a honeycomb equipment shelf and a thrust tube. The VISSR telescope was mounted on the equipment shelf and viewed the earth through a special aperture in the side of the spacecraft. A support structure extended radially out from the thrust tube and was affixed to the solar panels, which formed the outer walls of the spacecraft. Located in the annulus-shaped space between the thrust tube and the solar panels were stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) were maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. Both UHF-band and S-band frequencies were used in the telemetry and command subsystems. A low-power VHF transponder provided telemetry and command during launch, and then served as a backup for the primary subsystem after the synchronous orbit was attained. For more detailed information, see "The GOES/SMS User's Guide."

------- SMS 2, NESS STAFF --

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)

NSSDC ID- 75-011A-04

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - NESS STAFF	NOAA-NESS
OI - W.E. SHENK	NASA-GSFC

BRIEF DESCRIPTION

The visible infrared spin-scan radiometer (VISSR) flown on SMS 2 provided day/night observations of cloud cover and earth/cloud radiance temperature measurements from a synchronous, spin-stabilized, geostationary satellite for use in operational weather analysis and forecasting. The two-channel instrument was able to take both full and partial pictures of the earth's disk. The infrared channel (10.5 to 12.6 micrometers) and the visible channel (0.55 to 0.70 micrometer) used a common optics system. Incoming radiation was received by an elliptically shaped scan mirror and collected by a Ritchey-Chretien optical system. The scan mirror was set at a nominal angle of 45 deg to the VISSR optical axis, which was aligned parallel to the spin axis of the spacecraft. The spinning motion of the spacecraft (approximately 100 rpm) provided a west-to-east scan motion when the spin axis of the spacecraft was oriented parallel with the earth's axis. The latitudinal scan was accomplished by sequentially tilting the scanning mirror north to south at the completion of each spin. A full picture took 18.2 min to complete and about 2 min to retrace. During each scan, the field of view on the earth was swept by a linear array of eight visible-spectrum detectors, each with a ground resolution of 0.9 km at zero nadir angle. A mercury-cadmium-telluride detector sensed the infrared portion of the spectrum with a horizontal resolution of approximately 8 km at zero nadir angle. The infrared portion of the detector measured radiance temperatures between 180 and 315 deg K with a proposed sensitivity between 0.4 and 1.4 deg K. The VISSR output was digitized and transmitted to the National Oceanographic and Atmospheric Administration (NOAA) Command and Data Acquisition Station (CDA), Wallops Island, Va. There, the signal was fed into a "line stretcher," where it was stored and time-stretched for transmission back to the satellite at reduced bandwidth for re-broadcast to data utilization stations (DUS). The VISSR data were handled by NOAA, and the majority of data were archived by the Satellite Data Service Division, National Climatic Center, NOAA, Washington, D.C. Limited amounts of research-oriented data were collected by NASA and are maintained at NSSDC.

------- SMS 2, NESS STAFF --

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- 75-011A-05

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The meteorological data collection and transmission system, an experimental communications and data handling system operating on S-band frequencies, received and processed meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data were retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations were handled by the system. The system also allowed for the retransmission of narrow-band (WEFAX-type) data to existing small ground-based APT receiving stations from a larger weather central facility. The minimum data collection for one spacecraft consisted of approximately 3500 DCP stations contacted in 6 h. The total amount of data collected during the 6 h was between 350 and 600 kilobits, depending on the coding techniques. Data received from individual stations varied from 50 to 3000 bits, depending on the type and variety of sensors used at the DCP station.

------- SMS 2, WILLIAMS --

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- 75-011A-01

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL

PI - D.J. WILLIAMS	APPLIED PHYSICS LAB
OI - R.N. GRUBB	NOAA-ERL
OI - H.H. SAUER	NOAA-ERL

BRIEF DESCRIPTION

A number of separate silicon solid-state detectors, each with a tailored moderator thickness and a separate electronics unit for pulse amplification and pulse-height discrimination, were used to obtain the following particle type and energy measurements: seven channels measured protons in the range 1 to 500 MeV, six channels measured alpha particles in the range 4 to 400 MeV, and one channel measured electrons greater than 0.5 MeV.

------- SMS 2, WILLIAMS --

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- 75-011A-02

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - D.J. WILLIAMS	APPLIED PHYSICS LAB
OI - R.N. GRUBB	NOAA-ERL
OI - R.F. DONNELLY	NOAA-ERL

BRIEF DESCRIPTION

The X-ray counter was composed of a collimator, two ionization chambers, and two electrometers. A small angular aperture was chosen for the telescope collimator. The collimator, mounted so its axis declination was controlled by ground command, viewed the full disk of the sun once every vehicle rotation. One ion chamber, filled with argon at 1 atm, detected 1- to 8-A X rays, and had a 1.27E-4 m beryllium window to exclude X rays of longer wavelengths. The other chamber was filled with xenon at 1.5 to 2 atm and had a 1.27E-3 m beryllium window to measure X rays of 0.5 to 3 A.

------- SMS 2, WILLIAMS --

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 75-011A-03

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.J. WILLIAMS	APPLIED PHYSICS LAB
OI - R.N. GRUBB	NOAA-ERL
OI - J.C. JOSELYN	NOAA-ERL

BRIEF DESCRIPTION

A short-boom-deployed (.61 m) biaxial, closed-loop, fluxgate magnetometer with one sensor aligned parallel to the spacecraft spin axis and the other perpendicular to this axis measured the vector magnetic field. There was a selectable range (+50, 100, 200, or 400 nT), an offset field capability (plus or minus 1200 nT in 40-nT steps), and an inflight calibration capability.

************************** STP P78-1 ************************

SPACECRAFT COMMON NAME- STP P78-1
ALTERNATE NAMES- SPACE TEST PROGRAM P78-1, P78-1
11278, SOLWIND

NSSDC ID- 79-017A

LAUNCH DATE- 02/24/79 WEIGHT- 849.6 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/24/79
ORBIT PERIOD- 96.3 MIN	INCLINATION- 97.9 DEG
PERIAPSIS- 560. KM ALT	APOAPSIS- 600. KM ALT

PERSONNEL

PM - R.B. KEHL	USAF SPACE DIVISION
PS - H.E. WANG	AEROSPACE CORP

BRIEF DESCRIPTION

The space test program (STP) P78-1 mission was designed to obtain scientific data from earth and sun-oriented experiments. The spacecraft was sun-oriented and had its spin axis perpendicular to the orbit plane and the satellite-sun line. The instrumentation consisted of (1) a gamma-ray spectrometer and particle detectors, (2) a white-light coronagraph and an extreme-ultraviolet heliograph, (3) solar X-ray spectrometer and spectroheliograph, (4) an extreme-ultraviolet spectrometer, (5) a high-latitude particle spectrometer, (6) an X-ray monitor, and (7) a preliminary aerosol monitor.

------- STP P78-1, BOWYER ---------------------------------------

INVESTIGATION NAME- EXTREME ULTRAVIOLET SPECTROMETER

NSSDC ID- 79-017A-04

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
AERONOMY
IONOSPHERES

PERSONNEL

PI - C.S. BOWYER	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This investigation used an extreme ultraviolet spectrometer to measure airglow radiation in the upper atmosphere. The instrument had a 6-deg by 6-deg field of view and measured a selected 600-A bandwidth with 5-A resolution within the 200- to 1400-A range.

------- STP P78-1, IMHOF ---------------------------------------

INVESTIGATION NAME- GAMMA RAY SPECTROMETER

NSSDC ID- 79-017A-01

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
PARTICLES AND FIELDS

PERSONNEL

PI - W.L. IMHOF	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

This investigation used gamma-ray spectrometers to measure the distribution of gamma-ray sources and the characteristics of energetic particle fluxes at low altitudes. The instrument consisted of three different types of detectors. There were two GE detectors, cooled by a mechanical refrigerator, two CsI/plastic Phoswich detectors, and an array of eight cadmium tellurium detectors. Each GE detector had a conical field of view (FOV) of 45 deg half angle, was 80 cc in volume and 15 sq cm in front area, and measured energy loss from 40 keV to 2.5 MeV in 4096 channels. A factor-of-3 gain change allowed the range to change to 0.12 to 7.5 MeV. The initial energy resolution was 3.5 keV at 1 MeV, but, due to radiation damage and temperature cycling caused by the necessity to turn off the refrigerator for power conservation, the resolution degraded to about 40 keV at the 0.511-MeV line. The Phoswich detectors were 10.16-cm diameter disks of 1.27 cm thickness; they measured energy loss from 40 keV to 2.5 MeV in 256 channels. The cadmium tellurium detectors had a fan-shaped FOV of 90 deg by 10 deg and were equally spaced in the 10-deg widths around the circle. The energy loss range was 20 to 200 keV in six channels.

------- STP P78-1, MCKENZIE ---------------------------------------

INVESTIGATION NAME- SOLAR X-RAY SPECTROMETER

NSSDC ID- 79-017A-03

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - D.L. MCKENZIE	AEROSPACE CORP
PI - R.W. KREPLIN	US NAVAL RESEARCH LAB
OI - G.A. DOSCHEK	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation was composed of four parts: Solex, Solflex, Monex, and Magmap. The objective of these four experiments was the study of solar flares and active regions. Solex obtained spectra in the 3- to 25-A wavelength interval while pointed at a specific solar region, as well as maps of the sun in individual X-ray spectral lines using multigrid collimators and Bragg crystal spectrometers. Solflex obtained flare spectra in four narrow-wavelength bands between 1.8 and 8.6 A using uncollimated Bragg crystal spectrometers. Monex recorded full solar-disk intensity with 32-ms time resolution from 0.1 to 12 A using uncollimated proportional counters. Magmap obtained full-disk solar maps from 8 to 12 A using filtered collimated proportional counters.

------- STP P78-1, MICHELS ---------------------------------------

INVESTIGATION NAME- SOLAR WIND MONITOR

NSSDC ID- 79-017A-02

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - D.J. MICHELS	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation used a white-light coronagraph and an extreme ultraviolet (EUV) heliograph to monitor the sun's inner and outer corona. The purpose of the investigation was to determine the character of the plasma outflow at the source of the solar wind. The investigation also measured the form and structure of solar flares, coronal holes, and Alfven waves. Due to background light problems, the EUV heliograph data were completely compromised.

------- STP P78-1, PEPIN ---------------------------------------

INVESTIGATION NAME- PRELIMINARY AEROSOL MONITOR

NSSDC ID- 79-017A-07

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - T.J. PEPIN	U OF WYOMING

BRIEF DESCRIPTION

This investigation used an aerosol-monitoring instrument to measure the concentration and vertical distribution of aerosols and ozone in the earth's stratosphere.

------- STP P78-1, SHULMAN ---------------------------------------

INVESTIGATION NAME- X-RAY MONITOR

NSSDC ID- 79-017A-06

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.D. SHULMAN(NLA)	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This investigation used an X-ray monitor to determine the frequency and location of short-lived X-ray bursts from space. It provided a low-resolution mapping capability for auroral X-ray emission.

------- STP P78-1, VANCOUR ---------------------------------------

INVESTIGATION NAME- HIGH LATITUDE PARTICLE SPECTROMETER

NSSDC ID- 79-017A-05

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.P. VANCOUR — USAF GEOPHYS LAB

BRIEF DESCRIPTION

This investigation used two sets of dual electrostatic analyzers at right angles to acquire electron data in high-latitude auroral zones, primarily during magnetic storm and substorm periods. One analyzer in each set swept through the energy range 50 to 1000 eV, while the other analyzer swept from 1 to 20 keV simultaneously. The total energy range 0.05 to 20 keV was divided into 16 channels.

*************************** STP P78-2************************

SPACECRAFT COMMON NAME- STP P78-2
ALTERNATE NAMES- SESP P78-2A, P78-2
SCATHA, 11256

NSSDC ID- 79-007A

LAUNCH DATE- 01/30/79 — WEIGHT- 343. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 04/29/79
ORBIT PERIOD- 1416.2 MIN — INCLINATION- 7.7 DEG
PERIAPSIS- 27553. KM ALT — APOAPSIS- 43239. KM ALT

PERSONNEL
PM - R.B. KEHL — USAF SPACE DIVISION

BRIEF DESCRIPTION

Spacecraft Charging At High Altitudes (SCATHA) was a satellite program for measuring the characteristics of the plasmasheath charging process. This program determined the response of the satellite to the charging and evaluated the techniques to correct the problem. The spacecraft was essentially a right circular cylinder, 1.7 m in diameter and 1.8 m high. It had a near-synchronous orbit and spun about the cylinder axis at a rate of 1 rpm. The spin vector was normal to the earth-sun line and in the equatorial plane of the earth. There were three 3-m booms, a 2-m, and a 7-m boom, all for deployment of experiments. In addition, there was a 100-m tip-to-tip electric field antenna. An electron gun and a positive ion (xenon) gun were included, to test the control of the spacecraft potential. Telemetry capability was both PCM and FM, and data could be stored up to 12 hours using on-board tape recorders. The planned mission lifetime of 1 year has been surpassed.

------- STP P78-2, AGGSON--------------------------------------

INVESTIGATION NAME- ELECTRIC FIELD DETECTOR

NSSDC ID- 79-007A-05 — INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.L. AGGSON — NASA-GSFC

BRIEF DESCRIPTION

This experiment (SC10) measured the absolute potential between the satellite and the plasma using a 100-m tip-to-tip dipole antenna. The antenna elements were copper-beryllium stem extendable antennas and were 0.64-cm diameter tubes when extended. Two 50-m elements plus the 1.7-m spacecraft body made the total length 101.7 m. The antenna elements were insulated except for 20 m at the ends. Thus, for ambient plasma conditions, the conducting segments of the antenna were positioned outside the sheath region. The experiment measured dc electric fields from 0.1 to 20 mV/m and ac fields in the frequency range from 3 to 200 Hz from 1 to 100 microvolts/m.

------- STP P78-2, BLAKE--------------------------------------

INVESTIGATION NAME- ENERGETIC PROTON DETECTOR

NSSDC ID- 79-007A-14 — INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.B. BLAKE — AEROSPACE CORP

BRIEF DESCRIPTION

This experiment (SC2-6) measured the proton flux in the energy range from 20 to 1000 keV in six differential channels plus integral fluxes for energies above 1 and 3 MeV.

------- STP P78-2, COHEN--------------------------------------

INVESTIGATION NAME- ELECTRON GUN-ION GUN

NSSDC ID- 79-007A-07 — INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
TECHNOLOGY
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - H.A. COHEN — USAF GEOPHYS LAB

BRIEF DESCRIPTION

This experiment (SC4) consisted of an electron-beam system (EBS) and a positive-ion-beam system (PIBS), which were flown to control the ejection, respectively, of negative charge (electrons) and positive charge (xenon ions) from the space vehicle. The EBS consisted of a control grid and an indirectly heated oxide-covered cathode, which was kept at a controlled negative potential with respect to the space vehicle. The controlled negative potential determined the energy of ejected electrons and varied in steps as follows (in volts): 50, 150, 300, 500, 1500, and 3000. The control grid was normally kept negative with respect to the cathode and was pulsed positively to allow electron ejection current. The duration and electron-current level of the pulse were controlled by ground command. A focusing element between the control grid and the grounded exit anode served to reduce the beam divergence. The magnitude of the beam current could vary over six steps (in milliamperes = 0.001, 0.01, 0.10, 1.0, 5.0, and 13). The maximum power drawn was 42 W. Mounted in bonded electrical contact with the spacecraft frame ground, the EBS was oriented so that the beam axis was perpendicular to the spacecraft spin axis. A protective aperture cover was removed by ground command when the spacecraft was in orbit. The PIBS consisted of a Penning discharge-chamber ion source and a control grid. The ion source consisted of an ionization chamber and beam formation electrodes. A cylinder of pressurized xenon constituted the gas source and was controlled by a leak valve with the flow rate commandable from the ground. The intensity and duration of the ion beam was also determined by ground command. The two beam bias voltages were 1000 V dc and 2000 V dc, and the five selectable beam intensity levels were (in milliamperes) 0.3, 0.5, 1.0, 1.5, and 2.0. During maximum beam ejection, the power drawn was 60 W. The PIBS nozzle was the element that controlled the nature of the ejected beam, and the thin wires mounted on top of the nozzle could neutralize all or a fraction (including zero) of the beam, depending on satellite experiment requirements. The expellant storage tank was connected to the ion source through a pressure regulator, a solenoid-operated latching, a porous plug, and an insulator. The ion source was maintained under vacuum and opened to the atmosphere in orbit on command.

------- STP P78-2, FENNELL--------------------------------------

INVESTIGATION NAME- SPACECRAFT SHEATH FIELDS DETECTOR

NSSDC ID- 79-007A-06 — INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.F. FENNELL — AEROSPACE CORP

BRIEF DESCRIPTION

This experiment (SC2-1, 2, and 3) consisted of three miniature electrostatic analyzers. Two of the analyzers were separately enclosed within 17.8-cm-diameter spherical probes mounted on diametrically opposed 3-m booms. The third analyzer was mounted behind the center band of the spacecraft. The three analyzers had the same look directions and entrance angles so that, if there were no electric fields about the spacecraft, all three analyzers would measure the same flux, spectrum, and angular distrbution of electrons and ions in the energy range 1 to 1000 eV. An optical data-transmission system was used to telemeter digital data from the analyzers to the spacecraft data-processing system to maintain electrical isolation at the analyzers. The experiment also measured the floating potential of the spherical probes relative to the spacecraft reference point over a large dynamic range. The spherical probes could be biased relative to the spacecraft upon ground command. Potential and electric field measurements at three positions in the plasma sheath were obtained.

------- STP P78-2, HALL --

INVESTIGATION NAME- QUARTZ CRYSTAL MICROBALANCES IN RETARDING POTENTIAL ANALYZERS

NSSDC ID- 79-007A-03

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.F. HALL — AEROSPACE CORP

BRIEF DESCRIPTION

In this experiment (part of ML12), two quartz-crystal microbalances were placed in retarding potential analyzers, with one microbalance-analyzer set mounted on the spacecraft side, and the other set placed on a spacecraft end maintained in continuous shadow. The retarding potential analyzer was used to exclude ions from the microbalance and to maintain a zero-electric-field condition at the sensor. To determine the dependence of contamination rate upon surface charge, measurements were made with and without the retarding-potential bias. The quartz sensors had an active temperature control and could be operated over a range of temperatures from -60 to +60 deg C.

------- STP P78-2, HALL --

INVESTIGATION NAME- THERMAL CONTROL SAMPLE MONITOR

NSSDC ID- 79-007A-04

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.F. HALL — AEROSPACE CORP

BRIEF DESCRIPTION

This experiment (part of ML12) evaluated the performance of thermal-control materials as a function of orbit contamination conditions. The sensor measured the backface temperature of eight thermal-control-material samples. The instruments were positioned contiguously with the quartz crystal monitors. It was possible to heat the samples and to purge contaminants which froze out on the test surface.

------- STP P78-2, HARDY --

INVESTIGATION NAME- RAPID SCAN PARTICLE DETECTOR

NSSDC ID- 79-007A-12

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - D.A. HARDY — USAF GEOPHYS LAB

BRIEF DESCRIPTION

This experiment (SC5) employed curved-plate electrostatic analyzers and solid-state spectrometers to measure the flux of electrons and ions. The experiment recorded a spectrum for both electrons and ions once per second in two orthogonal directions. The electron flux was measured in 16 energy ranges spanning 50 eV to 1.1 MeV. The ion flux was measured in 18 energy ranges spanning 50 eV to 35 MeV. Any given energy channel could be read out with a time resolution of 240 microseconds.

------- STP P78-2, JOHNSON --

INVESTIGATION NAME- ENERGETIC ION SPECTROMETER

NSSDC ID- 79-007A-13

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.G. JOHNSON — LOCKHEED PALO ALTO

BRIEF DESCRIPTION

This experiment (SC8) measured the flux of ions in the mass range from 1 to 150 u and in the energy range from 100 to 20,000 eV. The sensor was an energetic ion mass spectrometer.

------- STP P78-2, KOONS --

INVESTIGATION NAME- CHARGING ELECTRICAL EFFECTS ANALYZER

NSSDC ID- 79-007A-02

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
TECHNOLOGY
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H.C. KOONS — AEROSPACE CORP

BRIEF DESCRIPTION

This experiment (part of SC1) measured electromagnetic interference in the range 100 to 1E7 Hz. Three separate instruments were used. The frequency range from 2 to 30 MHz was measured with a swept-frequency analyzer. The frequency band 1.3 to 300 kHz was monitored by fixed-frequency analyzers. The capability also existed to telemeter broadband signals from sensors in the frequency band 100 to 5000 Hz. The analyzer sampled signals from a variety of sensors, including solar array bus, power line bus, typical command line, external short dipole, and electric-field-detector boom.

------- STP P78-2, LEDLEY --

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 79-007A-08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - B.G. LEDLEY — NASA-GSFC

BRIEF DESCRIPTION

This experiment (SC11) obtained triaxial measurements of the geomagnetic field. A boom-mounted (7-m boom) fluxgate magnetometer was used. Time resolution was 4 vectors per second. Field resolution was approximately 0.3 nT with a dynamic range of plus and minus approximately 450 nT per axis. Sensor response was from dc to 70 Hz.

------- STP P78-2, MIZERA --

INVESTIGATION NAME- SPACECRAFT SURFACE POTENTIAL MONITOR

NSSDC ID- 79-007A-01

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
TECHNOLOGY
SPACE PLASMAS

PERSONNEL
PI - P.F. MIZERA — AEROSPACE CORP

BRIEF DESCRIPTION

This experiment (part of SC1) measured the surface potential of seven different types of materials relative to a gold cylindrical common reference point on the satellite. The sample was mounted on one surface of a dielectric slab, and a conducting plate was mounted on the other surface. The surface potential was measured from leakage currents and by a chopper electrometer (Monroe detectors). Some of the materials used were silicon, cloth fabric, solar cell cover glasses, gold (reference), silver-teflon, and kapton multilayer insulation. Five of the samples were placed on the sides of the satellite and rotated in and out of sunlight. Four samples were located at the end of the spacecraft in shadow.

------- STP P78-2, NANEVICZ --

INVESTIGATION NAME- TRANSIENT PULSE MONITOR

NSSDC ID- 79-007A-16

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - J.E. NANEVICZ — STANFORD RES INST

BRIEF DESCRIPTION

The Transient Pulse Monitor (TPM) was an engineering experiment which provided data on the electromagnetic pulse environment on the spacecraft. The experiment consisted of an electronic processor and four sensors which were built into the wiring harness. Two of the sensors were current probes which provided voltage signals to the electronic processor with sensitivities of 1 mV/mA. One of these probes measured current fluctuations in the solar array power line, and the other measured current fluctuations in the ground line of the main power system. The other two sensors were long wire antennas mounted outside the shields of the main cable bundles. The two antennas ran parallel to each other and differed only in the magnitude of their terminal impedances. The electronic processor had commandable sensitivities and continuously monitored electrical signals from each of the four sensors simultaneously. The processor provided the following information for each sensor once per second: total pulse count, positive voltage-time integral, negative voltage-time integral, positive peak voltage amplitude, and negative peak voltage amplitude. For more detail see Stevens, J. R., and A. L. Vampola, "Description of the space test program P78-2 spacecraft and payloads," Air Force Space and Missile Systems Organization (now Space Division) report SAMSO TR-78-24, October 1978 (TRF B34218).

------- STP P78-2, REAGAN---------------------------------------

INVESTIGATION NAME- HIGH-ENERGY PARTICLE DETECTOR

NSSDC ID- 79-007A-15 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.B. REAGAN LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This experiment (SC3) measured the electron flux in the 0.3 to 2.1 MeV range, the proton flux in the 1 to 100 MeV range, and alpha particles in the range from 6 to 60 MeV. A high-energy particle spectrometer was used to determine flux and pitch-angle distributions.

------- STP P78-2, WHIPPLE, JR.---------------------------------

INVESTIGATION NAME- UCSD CHARGED PARTICLE DETECTOR

NSSDC ID- 79-007A-11 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL
PI - E.C. WHIPPLE, JR. U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
This experiment (SC9) measured the electron and ion differential flux, energy, and pitch-angle distribution. This particle detector measured energy spectra in 64 steps between 1 and 70,000 eV. The acceptance angle of the telescope was 5 deg half-angle. This same type instrument was flown on the ATS 5 and ATS 6 spacecraft.

*************************** STP S81-1************************

SPACECRAFT COMMON NAME- STP S81-1
ALTERNATE NAMES- 13170, S81-1

NSSDC ID- 82-041A

LAUNCH DATE- 05/11/82 WEIGHT- KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
UNITED STATES DOD-NAVY

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 05/13/82
ORBIT PERIOD- 88.91 MIN INCLINATION- 96.4 DEG
PERIAPSIS- 177. KM ALT APOAPSIS- 262. KM ALT

PERSONNEL
MG - M. WEINREB NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - M.A. DAVIS NASA-GSFC

BRIEF DESCRIPTION
This U.S. Air Force STP satellite was three-axis stabilized, and in an approximately polar, sun-synchronous orbit at an altitude of approximately 200 km. Two unclassified experiments were flown on this satellite.

------- STP S81-1, IMHOF---

INVESTIGATION NAME- STIMULATED EMISSION OF ENERGETIC PARTICLES, ONR-804

NSSDC ID- 82-041A-02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - W.L. IMHOF LOCKHEED PALO ALTO
CI - J.B. REAGAN LOCKHEED PALO ALTO
CI - H.D. VOSS LOCKHEED PALO ALTO
CI - E.E. GAINES LOCKHEED PALO ALTO
CI - D.W. DATLOW LOCKHEED PALO ALTO
CI - J. MOBILIO LOCKHEED PALO ALTO
CI - R.A. HELLIWELL STANFORD U
CI - U.S. INAN STANFORD U
CI - J. KATSUFRAKIS STANFORD U

BRIEF DESCRIPTION
The purpose of this experiment was to measure radiation belt electrons precipitated by controlled injection of VLF signals from ground stations. It measured precipitated particles directly with an array of seven solid-state silicon electron spectrometers, and indirectly through an X-ray imaging proportional counter (XRIP) to map bremsstrahlung X rays, and an airglow photometer (AP) to measure optical emissions. The AP sensed radiation at 3914 A and 6300 A. The XRIP was a spectrometer which could be used with either 8 or 24 levels and which covered the range of 3 to 60 keV. Five of the electron spectrometers (LE1, LE2, LE3, LE4, and LE5) were radiatively-cooled low-energy spectrometers with energy ranges of 3 keV to 1 MeV, and were aimed to receive electrons at five separate pitch angles. The other two spectrometers (ME1 and ME2) were middle-energy spectrometers with energy ranges of 45 keV to 1 MeV.

------- STP S81-1, SIMPSON--------------------------------------

INVESTIGATION NAME- COSMIC RAY ISOTOPE EXPERIMENT-LOW ENERGY (ONR-602) (PHOENIX 1)

NSSDC ID- 82-041A-01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
SOLAR PHYSICS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO
OI - M. GARCIA-MUNOZ U OF CHICAGO
OI - J.P. WEFEL LOUISIANA STATE U

BRIEF DESCRIPTION
The primary objectives of this investigation were (1) to study solar flare energy conversion and solar acceleration mechanisms, and (2) to monitor solar flare particle fluxes. Objective (1) was accomplished through the identification of isotopes whose presence was a measure of the amount of solar matter traversed during acceleration and the time spent within the solar corona. The instrument package contained a low-energy eight-element solid-state detector telescope and a low-energy single-element solid-state proton flare monitor. The low-energy telescope was used to resolve isotopes from He to Ni in the range 4 to 230 MeV/nucleon, and its view angle was 80 deg. The flare monitor was supported by fast electronics which allowed proton counting rates up to 2.0E5/s to be monitored for protons in the range 0.5 to 3.2 MeV. The data rate was one 360-bit word/s for the low-energy telescope and the flare monitor combined. This experiment worked well throughout the satellite lifetime.

*************************** STS-2***************************

SPACECRAFT COMMON NAME- STS-2
ALTERNATE NAMES- SHUTTLE OFT-2, OSTA-1
STS-2/OSTA-1, OSTA-1/STS-2

NSSDC ID- 81-111A

LAUNCH DATE- 11/12/81 WEIGHT- 2542. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/12/81
ORBIT PERIOD- 89.0 MIN INCLINATION- 38. DEG
PERIAPSIS- 219. KM ALT APOAPSIS- 229. KM ALT

PERSONNEL
MG - L.J. DEMAS NASA HEADQUARTERS
SC - M. SETTLE NASA HEADQUARTERS
PM - G.S. LUNNEY NASA-JSC

BRIEF DESCRIPTION
The second flight of the Space Shuttle (STS-2) carried the first scientific payload OSTA-1 (Office of Space and Terrestrial Application 1). The instruments from the OSTA-1 payload were designed to perform remote sensing of the earth's atmosphere, oceans, and land resources. During its time in orbit, the Shuttle assumed an earth-viewing orientation, thus accommodating the experiments of the OSTA-1 payload. In this attitude, called Z-axis local vertical (ZLV), the Shuttle's payload bay faces the earth on a line perpendicular to the earth's surface. The OSTA-1 payload consisted of (1) a shuttle imaging radar-A (SIR-A), (2) a shuttle multispectral infrared radiometer (SMIRR), (3) a feature identification and location

experiment (FILE), (4) a measurement of air pollution from satellites (MAPS), (5) an ocean color experiment (OCE), (6) a night/day optical survey of lightning (NOSL), and (7) a helfex bioengineering test (HBT). The first five instruments were located in the payload bay. A pallet, supplied by the European Space Agency, made the interface between the payload bay and these five experiments. The NOSL and HBT instruments were located in the crew compartment. Due to the loss of one of three fuel cells, the STS-2 mission was shortened from the planned 124-h to a 54-h minimum mission. The OSTA-1 payload was activated approximately 4.5 h after launch. The earth-viewing time was reduced from the planned 88 h to 36 h. The STS-2 mission successfully demonstrated the capability of the Space Shuttle to conduct scientific research. For more detailed descriptions of the OSTA-1 payload, see "OSTA-1 Experiments," JSC 17059, NASA-JSC, and Science, v. 218, n. 4576, pp. 993-1033, 1982.

------- STS-2, BROWN--

INVESTIGATION NAME- HEFLEX BIOENGINEERING TEST (HBT)

NSSDC ID- 81-111A-07 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - A.H. BROWN U OF PENNSYLVANIA

BRIEF DESCRIPTION
The objective of the Heflex Bioengineering Test (HBT) was to determine the effect of near weightlessness and soil content on Helianthus annus (dwarf sunflower) growth. The HBT was a precursor to the Heflex (Helianthus Annus Flight Experiment) planned on Spacelab 1. The HBT experiment was a suitcase-like container loaded with 85 sealed plant modules varying in soil moisture content from 55% by weight to 77%. This plant carry-on was stored in a locker in the crew compartment of the Space Shuttle. There was insufficient time for the plants to grow because of the shortened mission. Germination percentage was 98%, but the data relating to growth required to support the Spacelab 1 experiment were not obtained.

------- STS-2, ELACHI---

INVESTIGATION NAME- SHUTTLE IMAGING RADAR-A (SIR-A)

NSSDC ID- 81-111A-01 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL

PI - C.	ELACHI	NASA-JPL
OI - W.E.	BROWN, JR.	NASA-JPL
OI - L.F.	DELLWIG	U OF KANSAS
OI - A.W.	ENGLAND	NASA-JSC
OI - M.	GUY	CNES
OI - H.	MACDONALD	U OF ARKANSAS
OI - R.S.	SAUNDERS	NASA-JPL
OI - G.	SCHABER	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION
The prime objective of Shuttle Imaging Radar-A (SIR-A) was to obtain maplike images of the earth's surface and to evaluate their utility for geologic exploration. The SIR-A experiment used a sidelooking, synthetic aperture radar operating at L-band (1.278 GHz) with a viewing angle of 47 deg to create two dimensional images of the earth's surface. The imaging radar was independent of sunlight and able to penetrate cloud cover. A radar image 50 km wide and a total of 160,000 km long was produced. A resolution of 40 m both across and along the track of the beam was attained by this system. Radar imagery recorded differences in surface roughness and terrain attitude and thus was used to delineate such geological features as faults, anticlines, folds and domes, drainage patterns, and stratification. Landsat multispectral imagery could provide the supplementary information necessary to identify rock types and types of vegetation. For more detailed descriptions, see "Shuttle Imaging Radar-A (SIR-A) Experiment," JPL 82-77, NASA-JPL, and C. Elachi, et al., "Shuttle Imaging Radar Experiment," Science, v. 218, n. 4576, pp. 996-1003, 1982.

------- STS-2, GOETZ--

INVESTIGATION NAME- SHUTTLE MULTISPECTRAL INFRARED
RADIOMETER (SMIRR)

NSSDC ID- 81-111A-02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL

PI - A.H.	GOETZ	NASA-JPL
OI - L.C.	ROWAN	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION
The purpose of the Shuttle Multispectral Infrared Radiometer (SMIRR) experiment was to determine the spectral bands to be included in a future high-resolution imaging system for mapping rocks associated with mineral deposits from space. The SMIRR system consisted of a Cassegrain telescope, a filter wheel, two Hg-Cd-Te detectors, two film cameras, and supporting electronics. The telescope was a modified version of the Mariner telescope that gathered images of Venus and Mercury in 1973. Since SMIRR was not an imaging device, photographs were necessary to locate the 100-m diameter radiometer reading within the cameras' ground view (20 by 25 km). The two cameras, one color and one black-and-white, were aligned with the telescope. Analysis showed that the cameras remained aligned after launch stresses. The filter wheel allowed 10 filters to sample the following spectral bands: filters 1 and 2 at 0.5 and 0.6 micrometer for correlation with Landsat; filters 3 and 4 at 1.05 and 1.2 micrometers for field measurements; filter 5 at the 1.6-micrometer Landsat D band; filter 6 at the 2.1-micrometer NO hydroxyl absorption band; filters 7, 8 and 9 at the 2.17, 2.20, and 2.22-micrometer hydroxyl ion absorption bands; and filter 10 at the 2.35-micrometer carbonate absorption band. The SMIRR sampled 80,000 km of the earth's surface for 3 h and 6 min. Over 1 h of prime data was obtained over cloud-free land areas.

------- STS-2, KIM--

INVESTIGATION NAME- OCEAN COLOR EXPERIMENT (OCE)

NSSDC ID- 81-111A-05 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL

PI - H.H.	KIM	NASA-GSFC
OI - L.R.	BLAINE	NASA-GSFC
OI - R.S.	FRASER	NASA-GSFC
OI - N.E.	HUANG	NASA-WFC
OI - H.	VAN DER PIEPER	DFVLR

BRIEF DESCRIPTION
The Ocean Color Experiment (OCE) was primarily to demonstrate the ability to locate plankton or chlorophyll concentrations and identify circulation features by mapping color patterns in the ocean. The OCE instrument was a modified version of the U-2-borne ocean color scanner. It consisted of two main modules: the scanner and the electronics. The scanner was mounted on the experiment pallet shelf, and the electronics were coupled to a cold plate on the pallet deck. The rotating mirror on the OCE instrument scanned plus or minus 45 deg from nadir across the direction of flight with a ground resolution of 3 km. The scanner operated in the eight spectral intervals: 486 nm (blue), 518 nm, 553 nm (green), 585 nm, 621 nm, 655 nm (red), 685 nm, and 787 nm (near-infrared). The OCE experiment operated successfully and overall image quality and spectral information were excellent. The instrument acquired approximately 20 to 30 minutes of cloud-free data.

------- STS-2, REICHLE, JR.--

INVESTIGATION NAME- MEASUREMENT OF AIR POLLUTION FROM
SATELLITES (MAPS)

NSSDC ID- 81-111A-04 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - H.G.	REICHLE, JR.	NASA-LARC
OI - W.L.	CHAMEIDES	GEORGIA INST OF TECH
OI - W.D.	HESKETH	NASA-LARC
OI - C.B.	LUDWIG	PHOTON RESEARCH INC
OI - R.E.	NEWELL	MASS INST OF TECH
OI - L.K.	PETERS	U OF KENTUCKY
OI - W.	SEILER	MPI-CHEMISTRY
OI - J.W.	SWINNERTON	US NAVAL RESEARCH LAB
OI - H.A.	WALLIO	NASA-LARC

BRIEF DESCRIPTION
The Measurement of Air Pollution from Satellites (MAPS) experiment measured the distribution of carbon monoxide in the middle troposphere, upper troposphere, and lower stratosphere over the region from 38 deg N to 38 deg S during both daytime and nighttime. The performance of the MAPS instrument under various temperatures and other orbital conditions indicated the efficiency of using orbiting spacecraft to measure environmental quality. The MAPS equipment consisted of an electro-optical head, an electronics module, a digital tape recorder, and an aerial camera. The core of the MAPS instrument was a nadir viewing gas filter radiometer operating at the 4.67-micrometer CO band. The instantaneous field of view was approximately 20 by 22 km. The equipment was coupled to a cold plate and mounted on the experiment pallet shelf.

The aerial camera was mounted alongside the MAPS electro-optical head to provide information on cloud cover and the terrain over which the data were gathered.

------- STS-2, SCHAPPELL--

INVESTIGATION NAME- FEATURE IDENTIFICATION AND LOCATION (FILE)

NSSDC ID- 81-111A-03

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL

PI - R.T.	SCHAPPELL	MARTIN-MARIETTA AEROSP
OI - W.E.	SIVERTSON, JR.	NASA-LARC
OI - J.C.	TIETZ	MARTIN-MARIETTA AEROSP
OI - R.G.	WILSON	NASA-LARC

BRIEF DESCRIPTION

The objective of the Feature Identification and Location Experiment (FILE) was to test a technique for autonomously classifying earth's features into four categories: water, vegetation, bare land, and clouds/snow/ice. The FILE system consisted of a sunrise sensor, two TV cameras, a decision-making electronics unit, a buffer memory, a tape recorder, and a 70-mm Hasselblad camera. This equipment was mounted on the experiment pallet shelf. The sunrise sensor would activate the experiment when the sun was 60 deg from the Space Shuttle's zenith. The two TV cameras were equipped with optical filters for visual red (0.65 micrometer) and near infrared (0.85 micrometer) to determine the ground track. The FILE was a data management technique. Using the ratio between visual red reflectance and near-IR reflectance, it categorized scenes as vegetation, bare ground, water, or snow and clouds. And it would suppress further data acquisition in a certain category after it had acquired a given number of scenes. The FILE experiment operated successfully for several orbits. But only 5 s of classified data were recorded due to a tape recorder malfunction. The data are available from investigators Eugene Sivertson, Jr. and Gale Wilson, NASA-LARC.

------- STS-2, VONNEGUT--

INVESTIGATION NAME- NIGHT/DAY OPTICAL SURVEY OF LIGHTING

NSSDC ID- 81-111A-06

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - B.	VONNEGUT	STATE U OF NEW YORK
OI - M.	BROOK	NM INST OF MINE + TECH
OI - O.H.	VAUGHAN, JR.	NASA-MSFC

BRIEF DESCRIPTION

The objective of the Night/Day Optical Survey of Lightning (NOSL) was to obtain motion picture films and correlated photocell sensor signals of lightning storms. The NOSL equipment consisted of the camera, the attached photocell sensor, and the connected tape recorder. During launch, boost, and reentry, this equipment was secured in stowage lockers in the crew compartment. In orbit, the equipment was retrieved and assembled for use in the crew cabin. The motion picture camera was a 16-mm data acquisition camera, a model which has been flight tested on Apollo and Skylab missions. Despite the curtailed duration of the flight and the greatly increased demands on the crew, the crew obtained photographs of lightning at night and excellent motion picture sequences of six large thunderstorm systems during the day. This experiment was planned to refly on later Shuttle missions. Data are available from the principal investigator, Dr. Bernard Vonnegut.

*************************** STS-3*****************************

SPACECRAFT COMMON NAME- STS-3
ALTERNATE NAMES- SHUTTLE OFT-3, 13106
OSS-1/STS-3, SHOFT-4

NSSDC ID- 82-022A

LAUNCH DATE- 03/22/82 WEIGHT- 3730. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 03/23/82
ORBIT PERIOD- 89.3 MIN	INCLINATION- 38. DEG
PERIAPSIS- 240. KM ALT	APOAPSIS- 240. KM ALT

PERSONNEL

MM - K.	KISSIN	NASA-GSFC
MS - W.M.	NEUPERT	NASA-GSFC

BRIEF DESCRIPTION

The experiments selected to be part of the OSS-1/STS-3 payload had several objectives which included the following: (a) to conduct supplementary observations of the Orbiter's environment that have specific applicability to plasma physics and astronomical payloads; (b) to conduct scientific observations that demonstrate the Space Shuttle's research capabilities and are appropriate for flight on an early mission; and (c) to evaluate technology that may have application in future experiments in space. Three hours after liftoff, Columbia's payload bay doors were opened and the payload pallet was exposed to the space environment. Eight experiments were mounted on the U-shaped pallet, and the plant lignification experiment was mounted in the cabin area. The parameters measured by the payload included (1) plasma, waves, and fields; (2) polarization in solar X-ray bursts; (3) solar flux in the wavelength range 120-400 nanometers; (4) electrical charging properties of the Orbiter vehicle; (5) thermal properties of the canister experiment; (6) optical properties of the Shuttle-induced atmosphere; and (7) micrometeorite impacts. In addition, there were measurements of plant lignification in weightlessness, and of the induced contamination environment of the Orbiter bay.

------- STS-3, BANKS--

INVESTIGATION NAME- VEHICLE CHARGING AND POTENTIAL EXPERIMENT

NSSDC ID- 82-022A-04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - P.M.	BANKS	STANFORD U
OI - W.J.	RAITT	UTAH STATE U
OI - P.R.	WILLIAMSON	UTAH STATE U
OI - R.M.	GOLDSTEIN	NASA-JPL
OI - U.	SAMIR	U OF MICHIGAN
OI - T.	OBAYASHI	U OF TOKYO
OI - H.B.	LIEMOHN	BATTELLE MEMORIAL INST
OI - C.R.	CHAPPELL	NASA-MSFC
OI - L.M.	LINSON	SCIENCE APPL, INC
OI - J.L.	BURCH	SOUTHWEST RES INST

BRIEF DESCRIPTION

The objectives of the Vehicle Charging and Potential Experiment (VCAP) were (1) to determine electrical potential changes associated with the Orbiter and with the experiment operation, (2) to determine the electrical charging properties of the Orbiter, (3) to observe electrical potential changes arising from active electron emission, (4) to observe electrical processes associated with charging and discharging of vehicle dielectric surfaces, (5) to assess the electrical response of the vehicle to low levels of electron emission, (6) to document the operation of a low-power electron accelerator in the Orbiter environment, (7) to evaluate the suitability of the Orbiter bay for in situ thermal plasma measurements, and (8) to map the wave and particle distributions in the vicinity of the electron beam with the plasma diagnostic package (82-022A-01) group. To achieve these objectives, the following instruments were flown: (1) two charge and current probes (CCP) to measure vehicle return currents and dielectric charges at two locations on the pallet; (2) a spherical retarding potential analyzer/langmuir probe (SRPA/LP) to measure vehicle potential relative to the plasma, electron density, and plasma temperature; and (3) a fast-pulse electron gun (FPEG) to provide bursts of electron emission with durations of 500 ns to several minutes at controlled repetition rates.

------- STS-3, BRUECKNER--

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE MONITOR

NSSDC ID- 82-022A-03

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.	BARTOE	US NAVAL RESEARCH LAB
OI - D.K.	PRINZ	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objectives of the Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) experiment were (1) to measure the intensity of the solar ultraviolet continuum at 180 nm relative to its intensity at 210 nm with an accuracy of + or - 1%; (2) to measure the relative spectral distribution of the solar radiance throughout the spectral region from 120 to 400 nm with an accuracy of 1 to 5% (dependent on wavelength) using a single instrument; (3) to measure the absolute intensity of the solar spectrum between 120 and 400 nm with an absolute accuracy of 6 to 10%, depending on wavelength, and tie into high-accuracy ground-based measurements above 300 nm; and (4) to search for variability of the solar continuum and emission lines attributable to changing levels of solar activity. The instrumentation consisted of two double-dispersion scanning spectrometers, seven detectors, an ultraviolet calibration source, and a solar-pointing error sensor. The spectrometers were sun-pointed. One spectrometer was used almost continuously during the daylight portion of each solar-pointed orbit to measure the short time variations of the solar ultraviolet flux. The second spectrometer was used only once a day to track any change in sensitivity of the first spectrometer. Similarly, three of the five photodiodes were used only once a day. A deuterium lamp was used as the transfer standard source for daily inflight calibration and stability tracking of both spectrometers and all seven detectors.

------- STS-3, COWLES---

INVESTIGATION NAME- INFLUENCE OF WEIGHTLESSNESS IN LIGNIFICATION OF PLANT SEEDLINGS

NSSDC ID- 82-022A-07 INVESTIGATIVE PROGRAM CODE EB-3

INVESTIGATION DISCIPLINE(S) SPACE BIOLOGY

PERSONNEL

PI - J.R.	COWLES	U OF HOUSTON
OI - H.W.	SCHELD	U OF HOUSTON

BRIEF DESCRIPTION

The objectives of the study of the Influence Of Weightlessness On Lignification In Developing Plant Seedlings Experiment were: to test the function and effectiveness of the plant growth unit (PGU) to support plant growth in space; 2) to utilize the PGU to determine the effect of weightlessness on synthesis of a major plant structural polymer, lignin; and 3) to observe the overall growth and development of young seedlings exposed to weightlessness. The PGU was located in the Shuttle mid-deck area. This experiment was self-contained and required minimal data taking during flight. The two PGU's remained powered throughout the mission. Mung beans, oat seeds, and pine seedlings were grown. Quantities measured included germination success, stem growth, root growth, and respiratory gases. Analysis were performed on lignin, plant tissue, protein, and enzyme activities. Further details and experiment results can be found in J. R. Cowles, "Final Report-PGU and Plant Lignification -STS-3," U of Houston, Houston, Tex., April, 1983. (NSSDC TRF-B-35029-000A)

------- STS-3, MCDONNELL-------------------------------------

INVESTIGATION NAME- MICROABRASION FOIL

NSSDC ID- 82-022A-08 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S) INTERPLANETARY DUST

PERSONNEL

PI - J.A.M.MCDONNELL		U OF KENT, CANTERBURY
OI - W.C.	CAREY	U OF KENT, CANTERBURY
OI - D.	DIXON	U OF KENT, CANTERBURY

BRIEF DESCRIPTION

This Microabrasion Foil Experiment (MFE) was flown to measure the flux of small micrometeoroids in cislunar (near-earth) space. This cosmic dust investigation was designed to measure the flux of micrometeoroids for particle masses greater than 1.E-8 g; velocity of incident particles by observation of their characteristic penetration profile; density of incident particles using a "meteor bumper" technique; and chemical properties of incident particles from analysis of impact debris.

------- STS-3, NOVICK--

INVESTIGATION NAME- SOLAR FLARE X-RAY POLARIMETER EXPERIMENT

NSSDC ID- 82-022A-02 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) SOLAR PHYSICS

PERSONNEL

PI - R.	NOVICK	COLUMBIA U
OI - G.A.	CHANAN	COLUMBIA U

BRIEF DESCRIPTION

The objectives of the Solar Flare X-Ray Polarimeter (SFXP) Experiment were to measure the : (1) the degree of polarization in solar X-ray bursts, (2) the temporal dependence of the X-ray polarization, (3) the energy dependence of the X-ray polarization, (4) the polarization angle of the X-ray emission, and (5) the solar X-ray flare emission between 5 and 30 keV. In addition, the correlation of the X-ray polarization with other phenomena associated with solar flares was studied, and the systematic effects of the operation of the instrument in a satellite environment was evaluated. The flight instrument, a scatter block polarimeter, consisted of three detectors mounted in an equilateral configuration to provide redundant observations of X-ray polarization. There were four counters and four rectangular lithium scattering blocks per detector assembly designed to detect anisotropic X-ray scattering if the incoming beam was polarized. The polarimeter was pointed at the sun during the occurrence of solar flares, and when sun-pointed, it had a 3-deg field of view.

------- STS-3, OLLENDORF--------------------------------------

INVESTIGATION NAME- THERMAL CANISTER EXPERIMENT

NSSDC ID- 82-022A-05 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - S.	OLLENDORF	NASA-GSFC

BRIEF DESCRIPTION

The objectives of the Thermal Canister Experiment (TCE) were (1) to demonstrate under the diverse thermal environment of the Space Shuttle the performance of a thermal canister utilizing feedback variable-conductance heatpipes, and (2) to demonstrate the ability of the system to maintain temperature control within narrow limits by varying internal power dissipation over a wide range and monitoring thermal behavior. To achieve these objectives, the investigator flew a canister measuring 1 m x 1 m x 3 m and weighing 160 kg; fixed conductance canister heat pipes; variable conductance heat pipes; a radiator and radiator heat pipes; a control electronics and data acquisition and command system; and simulated instrument heat loads (heaters) within the canister. The thermal canister was built as close in configuration as possible to the flight application and mounted on a structure together with support electronics. Heaters within the canister simulated instrument power dissipation. Canisters developed for flight instruments are a standard inventory item for future use as required.

------- STS-3, SHAWHAN---

INVESTIGATION NAME- PLASMA DIAGNOSTIC PACKAGE

NSSDC ID- 82-022A-01 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S) SPACE PLASMAS PARTICLES AND FIELDS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
OI - L.A.	FRANK	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA
OI - N.	D'ANGELO	U OF IOWA
OI - H.C.	BRINTON	NASA HEADQUARTERS
OI - D.L.	REASONER	NASA-MSFC
OI - N.H.	STONE	NASA-MSFC

BRIEF DESCRIPTION

The objectives of the Plasma Diagnostic Package (PDP) experiment were (1) to study the Orbiter-magnetoplasma interactions within 15 m of the Orbiter by measurement of electric and magnetic fields, ionized particle wakes, and generated waves; (2) to measure and locate the sources of fields, electromagnetic interference (EMI), and plasma contamination in the environment of the Orbiter out to 15 m; (3) to demonstrate the operation of the PDP prior to its flight on Spacelab 2; and (4) to determine the characteristics of the electron beam emitted from the Fast-Pulse Electron Gun (FPEG) of Experiment 82-022A-04 out to a range of 15 m from the Orbiter, and to measure the results of beam-plasma interactions in terms of fields, waves, and particle distribution functions. The electromagnetic interference and plasma contamination within the Orbiter bay were mapped using the remote manipulator arm to scan the PDP over the bay area. The following instruments were in the PDP: (1) a low-energy proton and electron differential energy analyzer (LEPEDEA) to measure nonthermal electron and ion energy spectra and pitch angle distributions for particle energies between 2 eV and 50 keV; (2) an ac magnetic wave search coil sensor to measure magnetic fields with a frequency range of 10 Hz to 30 kHz; (3) an ac electric and electrostatic wave analyzers to measure electric fields with a frequency range of 10 Hz to 1 GHz; (4) a dc electrostatic double probe with spherical sensors to measure electric fields in one axis from 2 mV/m to 2 V/m; (5) a dc triaxial fluxgate magnetometer to measure magnetic fields from 1.2E3 to 1.5E5 nT; (6) a Langmuir probe to measure thermal electron densities between 10.E4 and 10.E7 per cubic cm and density irregularities with 10-m to 10-km scale size; (7) a retarding potential analyzer/differential velocity probe to measure ion number density from 10.E2 to 10.E7 per cubic cm, the energy distribution function below 16 eV, and directed ion velocities up to 15 km/s; (8) an ion mass spectrometer to measure ion densities from 20 to 2.E7 ions per cubic cm in the mass range from 1 to 64 u (atomic mass units); and (9) a pressure gauge to measure ambient pressure from 10.E-3 to 10.E-7 torr.

------- STS-3, TRIOLO---

INVESTIGATION NAME- CONTAMINATION MONITOR

NSSDC ID- 82-022A-09 | INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S)
DUST
TECHNOLOGY

PERSONNEL
PI - J.J. TRIOLO — NASA-GSFC
OI - C. MAAG — NASA-JPL
OI - P. PORZIO — USAF SPACE DIVISION
OI - R. MCINTOSH — NASA-GSFC

BRIEF DESCRIPTION
The Contamination Monitor Package (CMP) measured mass accretion emanating from sources on and around the OSS-1/STS-3 pallet. Quartz crystal microbalances (QCM) viewed orthogonally in three directions and measured the accumulated mass of molecular and gas contaminant. They were not affected by particulate contaminants. Correlation studies of the data obtained here with those from other pallet instruments were undertaken. Two monitor mirrors were mounted on the front face of this CMP, and were coated with magnesium fluoride over aluminum, a material commonly used for optics in ultraviolet instruments. The mirrors' UV reflectivity was measured prior to and after flight.

------- STS-3, WEINBERG---

INVESTIGATION NAME- CHARACTERISTICS OF SHUTTLE/SPACELAB INDUCED ATMOSPHERE

NSSDC ID- 82-022A-06 | INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
PI - J.L. WEINBERG — U OF FLORIDA
OI - D.W. SCHUERMAN — U OF FLORIDA
OI - F. GIOVANE — U OF FLORIDA
OI - J.A.M.MCDONNELL — U OF KENT, CANTERBURY

BRIEF DESCRIPTION
The primary objective of the Shuttle/Spacelab Induced Atmosphere Experiment (SSIA) was to provide an early assessment of the effect of the Orbiter-induced atmosphere on astronomical observations, using measurements of the brightness and polarization of light scattered in the vicinity of the Orbiter at ten wavelengths between 400 and 820 nm. Secondary science objectives were to use repeated or continuous measurements of the optical properties of the Shuttle environment to characterize decay rates for contamination resulting from outgassing, thruster firings, water dumps, and flash evaporation operations, and to determine the brightness, polarization, and color of the diffuse astronomical background (zodiacal light and background starlight). The existing Skylab photometer/camera system was used. A photoelectric polarimeter measured the intensity and polarization of sky brightness in ten colors. It had a self-contained pointing system and automatic shutdown and startup provisions to allow maximum viewing time. A boresighted 16-mm camera provided concurrent photographic records of star fields to establish instrument pointing direction. The instrument operated in a single-axis scan mode, sweeping fore and aft through the Orbiter's vertical axis. A photometer mount provided adaptation of the existing instrumentation to the pallet mounting surface.

*************************** STS-7*****************************

SPACECRAFT COMMON NAME- STS-7
ALTERNATE NAMES- OSTA-2/STS-7, OSTA-2
SPACE TRANSPORT SYS-7, 14132

NSSDC ID- 83-059A

LAUNCH DATE- 06/18/83 — WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA
FED REP OF GERMANY — BMFT

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 06/18/83
ORBIT PERIOD- 90.4 MIN — INCLINATION- 28.5 DEG
PERIAPSIS- 291. KM ALT — APOAPSIS- 296. KM ALT

PERSONNEL
MG - N.R. WIRMAN — NASA HEADQUARTERS
SC - W.A. ORAN — NASA HEADQUARTERS
SC - G.H. OTTO — DFVLR
PM - R.P. CHASSAY — NASA-MSFC
PM - D. BAUM — DFVLR

BRIEF DESCRIPTION
On the seventh flight of the Space Shuttle (STS-7), Challenger carried a five-person crew on its second trip into space. The mission objectives for the STS-7 were (1) to carry and perform the experiments on the Office of the Space and Terrestrial Application (OSTA-2) payload, (2) to carry and operate the experiment packages monodisperse latex reactor (MLR) and continuous flow electrophoresis system (CFES), (3) to deploy the Canadian communication satellite Telesat-F, (4) to deploy the Indonesian communication satellite PALAPA-B1, (5) to complete attached and detached experiments with the Shuttle Pallet Satellite (SPAS-01, NSSDC ID 83-059F), and (6) to conduct experiments on seven Get-Away-Special (GAS) payloads. The OSTA-2 payload shared the cargo bay with Telesat-F, PALAPA-B1, SPAS-01, and seven GAS self-contained payload canisters. The SPAS-01 was deployed following attached operations and was retrieved for return to the orbiter after completing free-flying operations. The MLR and the CFES were mounted in the middeck area. The OSTA-2 payload was the first in a series of planned orbital investigations of materials processing in space. The OSTA-2 comprised the Materials Experiments Assembly (MEA), developed and managed by the Marshall Center, and the Materialwissenschaftliche Autonome Experiments unter Schwerelosigkeit (MAUS), developed by the German Ministry for Research and Technology (BMFT). The MEA was a desk-size package carrying two experiment furnaces and an acoustic levitator; each was contained inside individual experiment containers. The experiments were vapor growth of alloy-type semiconductor crystals, liquid phase miscibility gap materials, and containerless processing of glass-forming melts. The MAUS consisted of three instruments; each was contained in a get-away-special (GAS) canister. Each cylindrical canister carried an experiment furnace, which was thermally insulated, and had its own service module. The MAUS experiments were two metallic dispersions and a solidification front.

------- STS-7, DAY---

INVESTIGATION NAME- CONTAINERLESS PROCESSING OF GLASS FORMING MELTS

NSSDC ID- 83-059A-03 | INVESTIGATIVE PROGRAM CODE EN

INVESTIGATION DISCIPLINE(S)
SPACE PROCESSING

PERSONNEL
PI - D.E. DAY — U OF MISSOURI

BRIEF DESCRIPTION
The objective of this experiment was to gain further knowledge of high-temperature, containerless processing of various compositions of glass-forming substances. The experiment utilized the one-dimensional levitation furnace with automatic sample exchange for eight samples. Three of the eight samples were aluminum oxide and were processed in the solid state to perform an engineering checkout of the levitator-furnace apparatus. The other five samples were glass-forming compositions to be processed for acquiring scientific information. The sample was suspended in a sound wave to melt and purify, then cooled and collected.

------- STS-7, GELLES---

INVESTIGATION NAME- LIQUID PHASE MISCIBILITY GAP MATERIALS

NSSDC ID- 83-059A-02 | INVESTIGATIVE PROGRAM CODE EN

INVESTIGATION DISCIPLINE(S)
SPACE PROCESSING

PERSONNEL
PI - S.H. GELLES — S.H. GELLES ASSOCIATES
CI - A.J. MARKWORTH — BATTELLE COLUMBUS LABS

BRIEF DESCRIPTION
This experiment was to produce space-formed alloys difficult to obtain on earth for analysis of their physical, chemical, and electrical properties. The experiment process was analogous to mixing water and oil on earth. Two liquid metals were heated, mixed, and cooled to produce a new solid metal alloy retaining the qualities of both materials.

------- STS-7, KLEIN---

INVESTIGATION NAME- SOLIDIFICATION FRONT

NSSDC ID- 83-059A-05 | INVESTIGATIVE PROGRAM CODE EN/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PROCESSING

PERSONNEL
PI - H. KLEIN — DFVLR
CI - A. BEWERSDORFF — DFVLR
CI - F.U. WALTER — DFVLR
CI - J. POETSCHKE — KRUPP RESEARCH INST

BRIEF DESCRIPTION

This experiment, using a general purpose rocket furnace, was designed to investigate the particle transport mechanisms during the melting and solidification of metal alloys. This knowledge is of value in the fabrication of composite materials.

------- STS-7, OTTO -------

INVESTIGATION NAME- STABILITY OF METALLIC DISPERSIONS

NSSDC ID- 83-059A-04

INVESTIGATIVE PROGRAM
CODE EN/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PROCESSING

PERSONNEL
PI - G.H. OTTO — DFVLR

BRIEF DESCRIPTION

The scientific objective of this experiment was to investigate in low gravity the behavior of metallic dispersions during the heat-up, temperature soak, and repeated cooling into a temperature region where the two liquids do not mix in earth gravity. The engineering objective was to develop a technique for taking X-ray photographs of the melting and solidification of metals. The experiment unit consisted of an X-ray unit working at 80 kV, supplied through a cascade system, an X-ray transparent Teflon oven, and a motorized advance mechanism for double-layered continuous X-ray film. The sample, consisting of gallium with 20 atom percent of mercury, was sealed within the oven. This experiment occupied two GAS canisters. The experiment configuration was identical in each canister, but the experiments had different heating and cooling cycles.

------- STS-7, WIEDEMEIER -------

INVESTIGATION NAME- VAPOR GROWTH OF ALLOY-TYPE SEMICONDUCTOR CRYSTALS

NSSDC ID- 83-059A-01

INVESTIGATIVE PROGRAM
CODE EN

INVESTIGATION DISCIPLINE(S)
SPACE PROCESSING

PERSONNEL

PI - H.	WIEDEMEIER	RENSSELAER POLYTECHNIC
CI - E.A.	IRENE	IBM
CI - C.C.	WANG	RCA

BRIEF DESCRIPTION

The objective of this experiment was to grow crystals of alloy semiconductors to provide data for a better understanding of the fluid dynamics of vapor transport systems in space. A quantity of germanium selenide was placed in a sealed glass tube. Both ends of the tube were heated at different temperatures. The substance turned into a vapor when heated and moved to the cooler end of the tube to crystallize. The applications resulting from this type of research include improved semiconductor technology for the electronics industry.

**************************** TENMA ****************************

SPACECRAFT COMMON NAME- TENMA
ALTERNATE NAMES- X-RAY OBSERVATION SAT., 13829
ASTRO-B

NSSDC ID- 83-011A

LAUNCH DATE- 02/20/83 — WEIGHT- 216. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S-3

SPONSORING COUNTRY/AGENCY
JAPAN — ISAS

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/21/83
ORBIT PERIOD- 94.5 MIN	INCLINATION- 31.5 DEG
PERIAPSIS- 489. KM ALT	APOAPSIS- 503. KM ALT

PERSONNEL

PM - Y.	TANAKA	ISAS
PS - J.	NISHIMURA	ISAS

BRIEF DESCRIPTION

This X-ray astronomy mission had the following major objectives: (1) study of X-ray source spectra with good energy resolution, (2) study of temporal variations of X-ray sources, (3) all-sky survey for X-ray bursts and transients, and (4) observation of soft X-ray sources with a reflecting telescope. The spacecraft could spin at 0.546, 0.137, or 0.068 rpm with the aid of a momentum wheel. The spin axis was maneuvered by magnetic torquing.

------- TENMA, MIYAMOTO -------

INVESTIGATION NAME- HADAMARD TRANSFORM TELESCOPE

NSSDC ID- 83-011A-02

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.	MIYAMOTO	OSAKA U
OI - K.	YAMASHITA	OSAKA U
OI - H.	TSUNEMI	OSAKA U

BRIEF DESCRIPTION

A wide-angle FOV Hadamard transform telescope, looking parallel to the spacecraft spin axis, monitored X-ray bursts and transients.

------- TENMA, MIYAMOTO -------

INVESTIGATION NAME- ALL SKY X-RAY MONITOR

NSSDC ID- 83-011A-03

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - S.	MIYAMOTO	OSAKA U
OI - K.	YAMASHITA	OSAKA U
OI - H.	TSUNEMI	OSAKA U

BRIEF DESCRIPTION

A pair of proportional counters, with a fan-beam FOV, was used on the spinning spacecraft to provide an all-sky monitor.

------- TENMA, TANAKA -------

INVESTIGATION NAME- GAS SCINTILLATION PROPORTIONAL COUNTERS (GSPC)

NSSDC ID- 83-011A-01

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - Y.	TANAKA	ISAS
OI - M.	MATSUOKA	ISAS
OI - Y.	OGAWARA	ISAS
OI - T.	MURAKAMI	ISAS
OI - K.	KOYAMA	ISAS
OI - H.	INOUE	ISAS
OI - K.	MAKISHIMA	ISAS
OI - T.	OHASHI	ISAS

BRIEF DESCRIPTION

A cluster of 10 gas scintillation proportional counters (GSPCs), having an effective area of 800 sq cm, was used to obtain the energy spectra of X-ray sources with an energy resolution that was a factor of 2 better than that of conventional proportional counters. Two GSPCs were equipped with modulation collimators.

------- TENMA, YAMASHITA -------

INVESTIGATION NAME- X-RAY REFLECTING TELESCOPE

NSSDC ID- 83-011A-04

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - K.	YAMASHITA	OSAKA U
OI - F.	MAKINO	ISAS
OI - F.	NAGASE	NAGOYA U
OI - H.	KUNIEDA	ISAS
OI - Y.	TAWARA	ISAS

BRIEF DESCRIPTION

A one-dimensional reflecting telescope pointed along the spacecraft spin axis. The focal length of the telescope was 60 cm and the effective area was 15 sq cm.

**************************** TIP 1 ****************************

SPACECRAFT COMMON NAME- TIP 1
ALTERNATE NAMES- TRIAD 1, TRIAD OI 1X
TRIAD A, 06173
TRIAD

NSSDC ID- 72-069A

LAUNCH DATE- 09/02/72 WEIGHT- 94. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-NAVY

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/04/72
ORBIT PERIOD- 100.7 MIN INCLINATION- 90.1 DEG
PERIAPSIS- 716.0 KM ALT APOAPSIS- 863.0 KM ALT

PERSONNEL
PM - J. DASSOULAS APPLIED PHYSICS LAB
PS - R.E. FISCHELL APPLIED PHYSICS LAB

BRIEF DESCRIPTION
This three-body spacecraft was connected by booms which served as gravity-gradient stabilizers in the radial direction. A momentum wheel was used for stabilization in roll and yaw. The primary function of the spacecraft was to test various concepts for improving the USN Transit Navigation System. The power was supplied by a radioisotope thermal electric generator.

------- TIP 1, POTEMRA--

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 72-069A-01 INVESTIGATIVE PROGRAM
NAVIGATION TECHNOLOGY

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T.A. POTEMRA APPLIED PHYSICS LAB

BRIEF DESCRIPTION
This experiment consisted of a triaxial fluxgate magnetometer designed to measure vector fields with magnitudes up to 5.E4 nT. Measurements were made by sampling each axis sequentially at a rate of 2.25 samples/s. Digitization resolution was about 10 nT as given by a 13-bit analog-to-digital converter, but zero-level drifts were not readily checked. Therefore, the experiment was most useful in studies of magnetic fluctuations. Due to the real-time data transmission and the locations of the tracking stations, most of the data obtained related to northern and southern hemisphere high latitudes.

*************************** UK 6*****************************

SPACECRAFT COMMON NAME- UK 6
ALTERNATE NAMES- UNITED KINGDOM-6, ARIEL 6
11382

NSSDC ID- 79-047A

LAUNCH DATE- 06/02/79 WEIGHT- 152. KG
LAUNCH SITE- WALLOPS FLIGHT CENTER, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED KINGDOM SRC
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/02/79
ORBIT PERIOD- 97.3 MIN INCLINATION- 55. DEG
PERIAPSIS- 605. KM ALT APOAPSIS- 651. KM ALT

PERSONNEL
PM - J.E. FOSTER RUTHERFORD/APPLTON LAB
PS - J.L. CULHANE U COLLEGE LONDON

BRIEF DESCRIPTION
UK 6 was the 6th and last satellite in the Ariel series. The objective of this mission was to undertake studies in high-energy astrophysics. Two X-ray experiments, one cosmic-ray experiment, and three technology experiments were carried. The spacecraft was spin stabilized, with the spin axis commanded into a sequence of orientations to accommodate the X-ray experiment requirements.

------- UK 6, BOYD--

INVESTIGATION NAME- X-RAY GRAZING INCIDENCE SYSTEM

NSSDC ID- 79-047A-03 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - R.L.F.BOYD(RETIRED) U COLLEGE LONDON
OI - A.P. WILLMORE U OF BIRMINGHAM
OI - A.M. CRUISE U COLLEGE LONDON
OI - C.V. GOODALL U OF BIRMINGHAM

BRIEF DESCRIPTION
This system consisted of four grazing-incidence hyperboloid mirrors that reflected X-rays through an aperture/filter to four continuous-flow propane gas detectors covered with a 1-micrometer polypropylene window. The instrument was sensitive to X-rays from 0.1 to 2 keV and had seven selectable FOVs from 0.2 to 3.6 deg. The system could be operated in four different modes: spectral (32 channels of pulse height), time (0.5 ms to 16 s), pulsar (periods from 8 ms to 4 h), and autocorrelator (periodic variations from 128 ms to 2 s). The detectors pointed along the spacecraft spin axis.

------- UK 6, FOWLER--

INVESTIGATION NAME- COSMIC RAY

NSSDC ID- 79-047A-01 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - P.H. FOWLER U OF BRISTOL

BRIEF DESCRIPTION
The instrument consisted of 4-pi Cerenkov and gas scintillation counters with a geometric factor of 2 sq m-sr. These were used to measure the charge and energy spectra of the ultraheavy component of cosmic radiation with particular emphasis on the charge region Z>=30.

------- UK 6, POUNDS--

INVESTIGATION NAME- X-RAY PROPORTIONAL COUNTER SPECTROMETER

NSSDC ID- 79-047A-02 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - K.A. POUNDS U OF LEICESTER

BRIEF DESCRIPTION
The instrument consisted of an array of xenon-filled proportional counters designed for detailed measurement of time variability and spectra of both galactic and extragalactic sources. The detector array was sensitive over the energy range 1.2 to 50 keV and viewed along the spacecraft spin axis through 3-deg FWHM field collimators. Bright X-ray sources could be measured to several microseconds time resolution, and spectral data were obtained in 32 channels.

*************************** UOSAT*****************************

SPACECRAFT COMMON NAME- UOSAT
ALTERNATE NAMES- 12888

NSSDC ID- 81-100B

LAUNCH DATE- 10/06/81 WEIGHT- 54. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA 2310

SPONSORING COUNTRY/AGENCY
UNITED STATES AMSAT
UNITED KINGDOM U OF SURR

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/07/81
ORBIT PERIOD- 95.4 MIN INCLINATION- 97.5 DEG
PERIAPSIS- 536. KM ALT APOAPSIS- 561. KM ALT

PERSONNEL
MG - D. DANIELS NASA HEADQUARTERS
SC - J.A. KING AMSAT CORP
PM - M.N. SWEETING U OF SURREY
PS - R.A. PARISE AMSAT CORP

BRIEF DESCRIPTION
The experiments selected to be part of the UOSAT payload had several objectives which included the following: to provide the educational community with an operational scientific satellite which could be utilized with a minimal ground station; to provide the scientific community with a new source of data to aid in the understanding of the electro-magnetic properties of the near earth environment; and to provide the amateur radio community with a full complement of instruments for the study and monitoring of radio propagation conditions from the high frequency to microwave. In order to meet these objectives the following instruments comprised the UOSAT payload: a triaxial fluxgate magnetometer with a resolution of plus or minus 2 nT and maximum vector sample rate of 6.25 per s; two charged particle counters with threshold energies of 20 and 60 keV; four-phase referenced

high-frequency beacons at 7, 14, 21, and 28 MHz; two microwave beacons at 2.4 and 10.47 GHz; and a CCD earth imaging camera with 2 km resolution, and spectral response of 0.4 - 1.0 micrometers. One VHF and one UHF telemetry channel provided data in standard FSK ASCII at a variety of baud rates, as well as Morse code and synthesized voice formats.

------- UOSAT, ACUNA--

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 81-100B-01 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - M.H. ACUNA NASA-GSFC

BRIEF DESCRIPTION
The magnetometer provided vector measurements of the earth's magnetic field. The output of the experiment consisted of a vector sample of the field approximately once every second. Each measurement cycle provided three analog signals representing the magnetic field components Bx, By, and Bz, as well as three 16-bit digital versions of these values. The on-board computer was sent a series of seven 10-ms strobe pulses. These seven strobe pulses occurred at 20-ms intervals giving a calibration word and the most significant byte (msb) and the least significant byte (lsb) of the magnetic field components Bx msb, By msb, Bz msb, Bx lsb, By lsb, and Bz lsb. Thus the complete sample length was 160 ms of each s. Each vector component was represented by 16 bits of which 1 count equaled 2 nT and the dynamic range was 2 to power 15. The maximum sample rate at a spacecraft bit rate of 1.2 kb/s was 6.25 vector samples per s.

------- UOSAT, FEREBEE---------------------------------------

INVESTIGATION NAME- CHARGED PARTICLE

NSSDC ID- 81-100B-03 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - I.C. FEREBEE U OF SURREY
OI - D.R. LEPINE RUTHERFORD/APPLTON LAB
OI - D.A. BRYANT RUTHERFORD/APPLTON LAB
OI - P. GUTTRIDGE MULLARD SPACE SCI LAB

BRIEF DESCRIPTION
The system incorporated two Geiger counters with electron threshold energies of 20 and 60 keV. These energies were chosen to give good resolution of auroral activity for the study of VHF radio propagation effects. The instrument output was in the form of a 12-bit count supplied to the on-board computer at a maximum rate of once every 200 ms.

------- UOSAT, SMITHERS--------------------------------------

INVESTIGATION NAME- HIGH FREQUENCY BEACON

NSSDC ID- 81-100B-04 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL
PI - C.W. SMITHERS U OF SURREY
OI - M.J. UNDERHILL U OF SURREY

BRIEF DESCRIPTION
The objectives of this experiment were the investigation of trans-ionospheric propagation of high-frequency (HF) radio signals and the measurement of ionospheric electron column densities by phase-referenced observations at multiple frequencies. The instrument transmitter radiated up to four phase-referenced HF signals simultaneously. These signals were all synthesized from the same oscillator using frequency division techniques. The approximate frequencies chosen for the experiment were 7, 14, 21, and 28 MHz.

------- UOSAT, SWEETING--------------------------------------

INVESTIGATION NAME- EARTH IMAGING

NSSDC ID- 81-100B-02 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
The video display and imaging system consisted of a CCD camera and 256 kbit video memory. Snapshot pictures of the earth's surface covering 512 x 512 km were taken by the camera and stored in the video memory for subsequent transmission to the ground. The on-board computer could have access to the video memory enabling on-board picture processing and graphic display of computer data. Each image contained 256 x 256 pixels, with a resolution of 2 km per pixel, and a spectral response of 0.4 - 1.0 micrometers. Picture data was transmitted at 1.2 kb/s synchronously with a 32-bit sync word at the beginning of each line.

------- UOSAT, SWEETING--------------------------------------

INVESTIGATION NAME- MICROWAVE BEACON

NSSDC ID- 81-100B-05 INVESTIGATIVE PROGRAM
CODE EC-4/CO-OP

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - M.N. SWEETING U OF SURREY

BRIEF DESCRIPTION
Beacons at 2.4 and 10.47 GHz were used to demonstrate the feasibility of using the higher frequency bands in transponder applications for future amateur communications satellites and to encourage the development of relatively inexpensive microwave ground station equipment by amateurs. The spacecraft-to-ground transmission link budget was very marginal, and required considerable skill to overcome Doppler and azimuth-elevation tracking requirements.

*************************** VENERA 11************************

SPACECRAFT COMMON NAME- VENERA 11
ALTERNATE NAMES- 11020

NSSDC ID- 78-084A

LAUNCH DATE- 09/09/78 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE-
ORBIT PERIOD- DAYS INCLINATION- DEG
PERIAPSIS- AU RAD APOAPSIS- AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - V.G. KURT IKI

BRIEF DESCRIPTION
Venera 11 was part of a two-spacecraft mission to study Venus and the interplanetary medium. Each of the two spacecraft, Venera 11 and Venera 12, consisted of a flight platform and a lander probe. Identical instruments were carried on both spacecraft. The flight platform had instruments to study solar-wind composition, gamma-ray bursts, ultraviolet radiation, and the electron density of the ionosphere of Venus. The lander probe carried instruments to study the characteristics and composition of the atmosphere of Venus. After ejection of the lander probe, the flight platform continued in a heliocentric orbit. Near encounter with Venus occurred on December 25, 1978, at approximately 34,000 km altitude.

------- VENERA 11, ESTULIN-----------------------------------

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER

NSSDC ID- 78-084A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - I.V. ESTULIN IKI
PI - G. VEDRENNE CESR

BRIEF DESCRIPTION
The objectives of this investigation were to measure solar and cosmic gamma-ray bursts, to accurately measure their position in conjunction with measurements from other spacecraft, and to determine the energy spectra and temporal characteristics of the bursts. The instrumentation consisted of two scintillation detectors. One pointed towards the sun; the other pointed at 180 deg from the first. The detectors measured 0.08 to 2.5 MeV energy loss in 7 channels. The detectors had a sensitivity of 5.0E-6 ergs/sq cm for each gamma-ray burst detected.

------- VENERA 11, GRINGAUZ-------------------------------------

INVESTIGATION NAME- RETARDING POTENTIAL TRAPS

NSSDC ID- 78-084A-02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - K.I. GRINGAUZ SOVIET ACAD OF SCI

BRIEF DESCRIPTION
The objective of this investigation was to study the energy spectra of the ion and electron components of the solar wind at varying distances from the sun. The instrument was a retarding potential analyzer which measured ions from 0 to 4.5 keV and electrons from 0 to 300 eV. The detector had a flux sensitivity of 3.0E5 to 3.0E9 particles/sq cm-s. It was operated at intervals during the mission.

------- VENERA 11, KURT-------------------------------------

INVESTIGATION NAME- UV GRATING MONOCHROMATOR

NSSDC ID- 78-084A-03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - V.G. KURT IKI
PI - J.L. BERTAUX CNRS-SA

BRIEF DESCRIPTION
The objectives of this investigation were to measure scattered UV radiation from interplanetary space and Venus by analyzing spectra lines at 304, 584, 736, 869, 1048, 1216, 1300, 1356, and 1500 A. Determinations of line spectra for H, He I, He II, O I, Ne I, Ar I, and CO were made when the spacecraft was close to Venus. Line intensities for H, He I, and He II were determined while the spacecraft was in interplanetary space. The detector consisted of a multichannel grating monochromator with the optical axis oriented in the anti-solar direction. This investigation was operated at selected intervals during the mission including a scan of the solar-illuminated disk of Venus.

------- VENERA 11, LOGACHEV-------------------------------------

INVESTIGATION NAME- ELECTRON AND PROTON SPECTROMETER

NSSDC ID- 78-084A-04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - YU.I. LOGACHEV INST NUCLEAR PHYSICS

BRIEF DESCRIPTION
The objectives of this investigation were to measure the spectra and angular distribution of electrons and protons in the solar wind. It used proportional counters, Geiger counters, and semiconductor and scintillation detectors. Electrons from 5 to 500 keV and protons in two ranges, 0.05 to 1 MeV and 30 to 200 MeV, were measured. The instrumentation had a dynamic range up to 5.0E5 particles/sq cm-s-sr.

------- VENERA 11, MAZETS-------------------------------------

INVESTIGATION NAME- GAMMA-RAY BURST DETECTORS

NSSDC ID- 78-084A-05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - E.P. MAZETS LENGRAD INST PHYS TECH

BRIEF DESCRIPTION
The objective of this investigation was to determine the coordinates of gamma-ray bursts to within 2-3 deg. The instrumentation consisted of six identical scintillation detectors with their orientation along the geometric axis of the spacecraft. They had a measurement range of 20 to 300 keV with a sensitivity of 1.0E-6 ergs/sq cm-s.

------- VENERA 11, PISARENKO-------------------------------------

INVESTIGATION NAME- PROTON SPECTROMETER

NSSDC ID- 78-084A-06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - N.F. PISARENKO IKI

BRIEF DESCRIPTION
The objectives of this investigation were to study proton acceleration in the interplanetary medium and the solar-activity processes involved in the origin of charged particles. The instrumentation consisted of a semiconductor spectrometer with a Si n-p detector. It had 10 energy channels covering from 0.1 to 100 MeV, and was sensitive to a flux > 1.0E4 protons/sq cm-s at 10 MeV.

------- VENERA 11, SAVICH-------------------------------------

INVESTIGATION NAME- TWO-FREQUENCY TRANSMITTERS

NSSDC ID- 78-084A-07 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - N.A. SAVICH IRE

BRIEF DESCRIPTION
The objectives of this investigation were to study the electron concentration distribution in the ionosphere of Venus and to study fluctuations of electron concentration in interplanetary and near-sun plasmas. This investigation used radio transmissions in the centimeter and decimeter range.

------- VENERA 11, VAISBERG-------------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA DETECTORS

NSSDC ID- 78-084A-08 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - O.L. VAISBERG IKI

BRIEF DESCRIPTION
The objective of this investigation was to measure the energy spectra of the solar wind ion and electron components. It also measured separately protons and alpha particles at varying distances from the sun. The investigation used electrostatic analyzers and a cylindrical Faraday cup. Electrons were measured from 10 to 200 eV in 24 steps, total ion concentrations from 0.25 to 5 keV in 24 steps, protons from 0.25 to 5 keV in 24 steps, and alpha particles from 0.5 to 10 keV in 24 steps. Spectral measurements took 192 s. The flux sensitivity was 5.0E7 to 1.0E10 particles/sq cm-s. The instrument was operated at intervals during the mission.

**************************** VENERA 12 ****************************

SPACECRAFT COMMON NAME- VENERA 12
ALTERNATE NAMES- 11025

NSSDC ID- 78-086A

LAUNCH DATE- 09/14/78 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS

ORBIT TYPE- HELIOCENTRIC		EPOCH DATE-	
ORBIT PERIOD-	DAYS	INCLINATION-	DEG
PERIAPSIS-	AU RAD	APOAPSIS-	AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - V.G. KURT IKI

BRIEF DESCRIPTION
Venera 12 was part of a two-spacecraft mission to study Venus and the interplanetary medium. Each of the two spacecraft, Venera 11 and Venera 12, consisted of a flight platform and a lander probe. Identical instruments were carried on both spacecraft. The flight platform had instruments to study solar wind composition, gamma-ray bursts, ultraviolet radiation, and the electron density of the ionosphere of Venus. The lander probe carried instruments to study the characteristics and composition of the atmosphere of Venus. After ejection of the lander probe, the flight platform continued in a heliocentric orbit. Near encounter with Venus occurred on December 21, 1978, at approximately 34,000 km altitude.

------- VENERA 12, ESTULIN---------------------------------------

INVESTIGATION NAME- GAMMA-RAY SPECTROMETER

NSSDC ID- 78-086A-01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - I.V. ESTULIN — IKI
PI - G. VEDRENNE — CESR

BRIEF DESCRIPTION
The objectives of this investigation were to measure solar and cosmic gamma-ray bursts, to accurately measure their position in conjunction with measurements from other spacecraft, and to determine the energy spectra and temporal charcteristics of the bursts. The instrumentation consisted of two scintillation detectors. One pointed towards the sun; the other pointed at 180 deg from the first. The detectors measured 0.08 to 2.5. MeV energy loss in 7 channels. The detectors had a sensitivity of 5.0E-6 ergs/sq cm for each gamma-ray burst detected.

------- VENERA 12, GRINGAUZ---------------------------------------

INVESTIGATION NAME- RETARDING POTENTIAL TRAPS

NSSDC ID- 78-086A-02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - K.I. GRINGAUZ — SOVIET ACAD OF SCI

BRIEF DESCRIPTION
The objective of this investigation was to study the energy spectra of the ion and electron components of the solar wind at varying distances from the sun. The instrument was a retarding potential analyzer which measured ions from 0 to 4.5 keV and electrons from 0 to 300 eV. The detector had a flux sensitivity of 3.0E5 to 3.0E9 particles/sq cm-s. It was operated at intervals during the mission.

------- VENERA 12, KURT---------------------------------------

INVESTIGATION NAME- UV GRATING MONOCHROMATOR

NSSDC ID- 78-086A-03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - V.G. KURT — IKI
PI - J.L. BERTAUX — CNRS-SA

BRIEF DESCRIPTION
The objectives of this investigation were to measure scattered UV radiation from interplanetary space and Venus by analyzing spectra lines at 304, 584, 736, 869, 1048, 1216, 1300, 1356, and 1500 A. Determinations of line spectra for H, He I, He II, O I, Ne I, Ar I, and CO were made when the spacecraft was close to Venus. Line intensities for H, He I, and He II were determined while the spacecraft was in interplanetary space. The detector consisted of a multichannel grating monochromator with the optical axis oriented in the anti-solar direction. This investigation was operated at selected intervals during the mission including a scan of the solar-illuminated disk of Venus.

------- VENERA 12, LOGACHEV---------------------------------------

INVESTIGATION NAME- ELECTRON AND PROTON SPECTROMETER

NSSDC ID- 78-086A-04

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - YU.I. LOGACHEV — INST NUCLEAR PHYSICS

BRIEF DESCRIPTION
The objectives of this investigation were to measure the spectra and angular distribution of electrons and protons in the solar wind. It used proportional counters, Geiger counters, and semiconductor and scintillation detectors. Electrons from 5 to 500 keV and protons in two ranges, 0.05 to 1 MeV and 30 to 200 MeV, were measured. The instrumentation had a dynamic range up to 5.0E5 particles/sq cm-s-sr.

------- VENERA 12, MAZETS---------------------------------------

INVESTIGATION NAME- GAMMA-RAY BURST DETECTORS

NSSDC ID- 78-086A-05

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - E.P. MAZETS — LENGRAD INST PHYS TECH

BRIEF DESCRIPTION
The objective of this investigation was to determine the coordinates of gamma-ray bursts to within 2-3 deg. The instrumentation consisted of six identical scintillation detectors with their orientation along the geometric axis of the spacecraft. They had a measurement range of 20 to 300 keV with a sensitivity of 1.0E-6 ergs/sq cm-s.

------- VENERA 12, PISARENKO---------------------------------------

INVESTIGATION NAME- PROTON SPECTROMETER

NSSDC ID- 78-086A-06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - N.F. PISARENKO — IKI

BRIEF DESCRIPTION
The objectives of this investigation were to study proton acceleration in the interplanetary medium and the solar-activity processes involved in the origin of charged particles. The instrumentation consisted of a semiconductor spectrometer with a Si n-p detector. It had 10 energy channels covering from 0.1 to 100 MeV, and was sensitive to a flux > 1.0E4 protons/sq cm-s at 10 MeV.

------- VENERA 12, SAVICH---------------------------------------

INVESTIGATION NAME- TWO-FREQUENCY TRANSMITTERS

NSSDC ID- 78-086A-07

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - N.A. SAVICH — IRE

BRIEF DESCRIPTION
The objectives of this investigation were to study the electron concentration distribution in the ionosphere of Venus and to study fluctuation of electron concentration in interplanetary and near-sun plasmas. This investigation used radio transmissions in the centimeter and decimeter range.

------- VENERA 12, VAISBERG---------------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA DETECTORS

NSSDC ID- 78-086A-08

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - O.L. VAISBERG — IKI

BRIEF DESCRIPTION
The objective of this investigation was to measure the energy spectra of the solar wind ion and electron components. It also measured separately protons and alpha particles at varying distances from the sun. The investigation used electrostatic analyzers and a cylindrical Faraday cup. Electrons were measured from 10 to 200 eV in 24 steps, total ion concentrations from 0.25 to 5 keV in 24 steps, protons from 0.25 to 5 keV in 24 steps, and alpha particles from 0.5 to 10 keV in 24 steps. Spectral measurements took 192 s. The flux sensitivity was 5.0E7 to 1.0E10 particles/sq cm-s. The instrument was operated at intervals during the mission.

**************************** VENERA 15 ****************************

SPACECRAFT COMMON NAME- VENERA 15
ALTERNATE NAMES- 14104

NSSDC ID- 83-053A

LAUNCH DATE- 06/02/83 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE-
ORBIT PERIOD- DAYS INCLINATION- DEG
PERIAPSIS- AU RAD APOAPSIS- AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - UNKNOWN IKI

BRIEF DESCRIPTION
Venera 15 is part of a two spacecraft mision (along with Venera 16) designed to study the properties of Venus. Details of the spacecraft and its instrumentation are not known, but it is believed to be a Venus Orbiter carrying a Venus surface radar mapper. Information indicates that there is not a lander probe as part of this mission.

*************************** VENERA 16************************

SPACECRAFT COMMON NAME- VENERA 16
ALTERNATE NAMES- 14107

NSSDC ID- 83-054A

LAUNCH DATE- 06/07/83 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- UNKNOWN

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC EPOCH DATE-
ORBIT PERIOD- DAYS INCLINATION- DEG
PERIAPSIS- AU RAD APOAPSIS- AU RAD

PERSONNEL
PM - UNKNOWN IKI
PS - UNKNOWN IKI

BRIEF DESCRIPTION
Venera 16 is part of a two spacecraft mission (along with Venera 15) designed to study the properties of Venus. Details of the spacecraft and its instrumentation are not known, but it is believed to be a Venus Orbiter carrying a Venus surface mapper. Information indicates that there is not a lander probe as part of this mission.

*************************** VIKING 1 LANDER******************

SPACECRAFT COMMON NAME- VIKING 1 LANDER
ALTERNATE NAMES- VIKING-B LANDER

NSSDC ID- 75-075C

LAUNCH DATE- 08/20/75 WEIGHT- 605. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- MARS LANDER

PERSONNEL
MG - G.K. STROBEL NASA HEADQUARTERS
SC - J.M. BOYCE NASA HEADQUARTERS
PM - J.S. MARTIN(NLA) NASA-JPL
PS - G.A. SOFFEN(NLA) NASA-LARC

BRIEF DESCRIPTION
This spacecraft was the landing vehicle for the two-part Viking spacecraft mission. It soft-landed on July 20, 1976, in the Chryse region of Mars at 22.27 deg N latitude and 47.94 deg W longitude. The lander carried instruments to study the biology, chemical composition (organic and inorganic), meteorology, seismology, magnetic properties, surface appearance, and physical properties of the Martian surface and atmosphere. The lander had a 70-W power capacity and a scientific payload of approximately 91 kg (200 lb). Some of the data collected were returned by direct radio link to earth, but most of the data were returned by relay through one of the orbiters. The lander was approximately 3 m across and about 2 m high. For a detailed description of the Viking mission and experiments see "Scientific Results of the Viking Project," J. Geophys. Res., v. 82, n. 28, 1977.

------- VIKING 1 LANDER, ARVIDSON------------------------------

INVESTIGATION NAME- LANDER IMAGING

NSSDC ID- 75-075C-06 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
METEOROLOGY
PLANETOLOGY

PERSONNEL
TL - R.E. ARVIDSON WASHINGTON U
TM - T.A. MUTCH(DECEASED) NASA HEADQUARTERS
TM - C. SAGAN CORNELL U
TM - A.B. BINDER U OF KIEL
TM - E.C. MORRIS US GEOLOGICAL SURVEY
TM - F.O. HUCK NASA-LARC
TM - E.C. LEVINTHAL NUCLEAR REGULATORY COM
TM - S. LIEBES, JR. STANFORD U
TM - J.B. POLLACK NASA-ARC

BRIEF DESCRIPTION
The lander imaging experiment viewed the scene surrounding the lander, the surface sampler and other parts of the lander, the sun, Phobos, and Deimos to provide data for operational purposes and for geological and meteorological investigations. Two scanning cameras, capable of resolving 0.04 deg (high-resolution) or 0.12 deg (low-resolution, color, and IR) were used on each lander. Each image acquired covered a vertical field of 20 deg (high-resolution) or 60 deg (low-resolution, color, and IR) and a horizontal field that was commandable from 2.5 deg to 342.5 deg in 2.5-deg increments. Images were acquired from 40 deg above the nominal horizon to 60 deg below, and were commandable in 10-deg increments. The cameras were mounted 1.3 m above the nominal landing plane and were capable of viewing two footpads and most of the area accessible to the surface sampler. The two cameras were separated by 0.8 m, and stereoscopic pictures were obtained over most of the scene. Black-and-white images in either low or high resolution included radiation wavelengths from 0.4 to 1.1 micrometers. The use of a single detector to image an entire frame allowed a relative radiometric accuracy of plus or minus 10 percent. For more information concerning the cameras, see Huck et al., Space Science Instrumentation, v. 1, p. 189-214, 1975.

------- VIKING 1 LANDER, HESS----------------------------------

INVESTIGATION NAME- METEOROLOGY

NSSDC ID- 75-075C-07 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL
TL - S.L. HESS(DECEASED) FLORIDA STATE U
TM - C.B. LEOVY U OF WASHINGTON
TM - R.M. HENRY U OF WASHINGTON
TM - J.A. RYAN CALIF ST U, FULLERTON
TM - J.E. TILLMAN U OF WASHINGTON

BRIEF DESCRIPTION
This experiment analyzed the meteorological environment near the planetary surface and obtained information about motion systems of various scales. The atmospheric parameters determined were pressure, temperature, wind speed, and wind direction. Diurnal and seasonal variations were of particular importance. The sampling rates and durations for any one Martian day (sol) were selectable by ground command. The sensors were mounted on an erected boom. Three hot-film anemometers, through which an electric current was passed to heat two glass needles coated with platinum and overcoated with aluminum oxide, were used to measure wind speed. The electric power needed to maintain these sensors at a fixed temperature above the surrounding air was the measure of wind speed. Atmospheric temperature was measured by three fine-wire thermocouples in parallel. A thin metal diaphragm, mounted in a vacuum-sealed case, was used to measure atmospheric pressure.

------- VIKING 1 LANDER, MICHAEL, JR.--------------------------

INVESTIGATION NAME- LANDER RADIO SCIENCE

NSSDC ID- 75-075C-11 INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

TL - W.H.	MICHAEL, JR.	NASA-LARC
TM - I.I.	SHAPIRO	MASS INST OF TECH
TM - G.F.	LINDAL	NASA-JPL
TM - J.G.	DAVIES	U OF MANCHESTER
TM - D.L.	CAIN	NASA-JPL
TM - M.D.	GROSSI	RAYTHEON CORP
TM - G.L.	TYLER	STANFORD U
TM - J.P.	BRENKLE	NASA-JPL
TM - R.H.	TOLSON	NASA-LARC
TM - C.T.	STELZRIED	NASA-JPL
TM - G.	BORN	NASA-JPL
TM - R.	REASENBERG	MASS INST OF TECH

BRIEF DESCRIPTION

This experiment used the lander S-band radio transmitter to acquire Doppler and range data for the lander, utilizing the same Deep Space Network facilities that were used by the orbiters. The resulting data were used to determine the location of the lander on the planet's surface. They also provided more precise information about the orbital, rotational, and precessional motion of Mars than had previously been available. The two principal differences between orbiter and lander tracking data are (1) lander tracking periods were never longer than 2 h and were sometimes much shorter because of thermal constraints on the duration of lander transmitter operation, and (2) landers had no X-band signals to provide the corrections to range data for the interplanetary plasma effects. Consequently, lander ranging sessions were scheduled to be nearly simultaneous with orbiter ranging whenever possible, so that the orbiter S- and X-band data could supply these corrections.

*************************** VOYAGER 1************************

SPACECRAFT COMMON NAME- VOYAGER 1
ALTERNATE NAMES- MARINER JUPITER/SATURN A, OUTER PLANETS A
MARINER 77A, MJS 77A
10321

NSSDC ID- 77-084A

LAUNCH DATE- 09/05/77 WEIGHT- 700. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG - R.	MILLS	NASA HEADQUARTERS
SC - W.A.	BRUNK(DECEASED)	NASA HEADQUARTERS
PM - R.P.	LAESER	NASA-JPL
PS - E.C.	STONE	CALIF INST OF TECH

BRIEF DESCRIPTION

The overall objectives of Voyager were to conduct exploratory investigations of the planetary systems of Jupiter and Saturn and of the interplanetary medium out to Saturn. Primary emphasis was placed on comparative studies of these two planetary systems by obtaining (1) measurements of the environment, atmosphere, and body characteristics of the planets and the satellites of each planet, (2) studies of the nature of the rings of Saturn, and (3) exploration of the interplanetary (or interstellar) medium at increasing distances from the sun. These objectives were attained by using a variety of instruments and methods including imaging, a coherent S- and X-band RF receiver, an infrared interferometer and radiometer, UV spectrometer, fluxgate magnetometers, Faraday cups, a charged-particle analyzer, plasma detector, plasma-wave radio receiver, cosmic-ray telescopes, photopolarimeter, and a sweep-frequency radio receiver. Voyager 1 had its closest encounter with Jupiter on March 5, 1979, and with Saturn on November 12, 1980.

------- VOYAGER 1, BRIDGE------------------------------------

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-084A-06 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
CI - J.W.	BELCHER	MASS INST OF TECH
CI - C.K.	GOERTZ	U OF IOWA
CI - A.J.	LAZARUS	MASS INST OF TECH
CI - S.	OLBERT	MASS INST OF TECH
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.F.	BURLAGA	NASA-GSFC
CI - R.E.	HARTLE	NASA-GSFC
CI - K.W.	OGILVIE	NASA-GSFC
CI - G.L.	SISCOE	U OF CALIF, LA
CI - A.J.	HUNDHAUSEN	NATL CTR FOR ATMOS RES
CI - J.D.	SULLIVAN	MASS INST OF TECH
CI - J.D.	SCUDDER	NASA-GSFC

BRIEF DESCRIPTION

The plasma investigation made use of two Faraday-cup detectors, one pointed along the earth-spacecraft line and one at right angles to this line. The earth-pointing detector determined the macroscopic properties of the plasma ions, obtaining accurate values of their velocity, density, and pressure. Three sequential energy scans were employed with (delta E)/E equal to 20, 7.2, and 1.8%, allowing a coverage from subsonic to highly supersonic flow. The side-looking Faraday cup measured electrons in the energy range from 5 eV to 1 keV.

------- VOYAGER 1, BROADFOOT---------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-084A-04 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI - H.W.	MOOS	JOHNS HOPKINS U
CI - M.J.S.	BELTON	KITT PEAK NATL OBS
CI - D.F.	STROBEL	US NAVAL RESEARCH LAB
CI - T.M.	DONAHUE	U OF MICHIGAN
CI - M.B.	MCELROY	HARVARD U
CI - J.C.	MCCONNELL	YORK U
CI - R.M.	GOODY	HARVARD U
CI - A.	DALGARNO	SAO
CI - J.E.	BLAMONT	CNRS-SA
CI - J.L.	BERTAUX	CNRS-SA
CI - S.K.	ATREYA	U OF MICHIGAN
CI - B.R.	SANDEL	U OF SOUTHERN CALIF
CI - D.E.	SHEMANSKY	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

The UV spectrometer was designed to measure atmospheric properties, and to measure radiation in the wavelength range from 0.04 to 0.16 micrometers (400 to 1600 A). Two modes of instrument operation were planned, airglow and occultation. In the airglow mode the atmospheric radiation was measured. This radiation is predominantly resonance-scattered solar radiation, where the scattering is by molecular or atomic atmospheric constituents such as hydrogen (1216 A) or helium (584 A). In the occultation mode, sunlight was reflected into the spectrometer, and the solar spectrum was recorded. As the atmosphere moved between the spacecraft and the sun, the absorption characteristics of the atmosphere were obtained over the measured wavelength region. The absorption spectrum was used to identify the absorber as well as to measure its abundance in the line of sight to the sun. In addition, the atmospheric thermal structure could be inferred.

------- VOYAGER 1, HANEL-------------------------------------

INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY

NSSDC ID- 77-084A-03 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.A.	HANEL	NASA-GSFC
CI - V.G.	KUNDE	NASA-GSFC
CI - D.P.	CRUIKSHANK	U OF HAWAII
CI - W.C.	MAGUIRE	NASA-GSFC
CI - J.C.	PEARL	NASA-GSFC
CI - J.A.	PIRRAGLIA	NASA-GSFC
CI - R.E.	SAMUELSON	NASA-GSFC
CI - P.J.	GIERASCH	CORNELL U
CI - C.A.	PONNAMPERUMA	U OF MARYLAND
CI - D.	GAUTIER	PARIS OBSERVATORY
CI - F.M.	FLASAR	NASA-GSFC
CI - S.	KUMAR	U OF SOUTHERN CALIF
CI - B.J.	CONRATH	NASA-GSFC

BRIEF DESCRIPTION

This investigation was carried out using an infrared radiometer and an interferometer-spectrometer similar in design to the Mariner 9 IRIS, combined into a single instrument. The investigation studied both global and local energy balance, using infrared spectral measurements in conjunction with broad-band measurements of reflected solar energy. Atmospheric composition was also investigated, including determination of the H2/He ratio, and the abundance of CH2 and NH3. Vertical temperature profiles were obtained on the planets and satellites with atmospheres. Studies of the composition, thermal properties, and size of particles in Saturn's rings were conducted. The interferometer had a spectral range of 200 to 4000 1/cm, while the radiometer range covered 5000 to 33,000 1/cm. The instrument used a single primary mirror 51 cm in diameter with a field of view of 0.25 deg.

------- VOYAGER 1, KRIMIGIS------------------------------------

INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE

NSSDC ID- 77-084A-07

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
CI - C.Y.	FAN	U OF ARIZONA
CI - G.	GLOECKLER	U OF MARYLAND
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - T.P.	ARMSTRONG	U OF KANSAS
CI - W.I.	AXFORD	VICTORIA U WELLINGTON
CI - C.O.	BOSTROM	APPLIED PHYSICS LAB
CI - E.P.	KEATH	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objective of this experiment was to study the magnetospheres of Jupiter and Saturn, using a low-energy magnetospheric particle analyzer. This detector made measurements in (1) the distant magnetosphere and bow shock of Jupiter, (2) the magnetosphere of Saturn, and (3) the trapped-radiation belts in the vicinity of Jupiter. Additionally, this detector was able to study low-energy particles in the interplanetary medium. The energy range of this detector was 10 keV to 1.1 MeV for electrons and 10 keV to 150 MeV for ions. During the interplanetary cruise period, protons, alpha particles, and heavier nuclei (z from 3 to 26) were separately identified and their energy measured in the range from 0.05 to 30 MeV, using a low-energy particle telescope.

------- VOYAGER 1, NESS------------------------------------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 77-084A-05

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
CI - M.H.	ACUNA	NASA-GSFC
CI - K.W.	BEHANNON	NASA-GSFC
CI - L.F.	BURLAGA	NASA-GSFC
CI - R.P.	LEPPING	NASA-GSFC
CI - F.M.	NEUBAUER	U OF COLOGNE

BRIEF DESCRIPTION

This experiment was designed to investigate the magnetic fields of Jupiter and Saturn, the solar-wind interaction with the magnetospheres of these planets, and the interplanetary magnetic field out to the solar wind boundary with the interstellar magnetic field and beyond, if crossed. The investigation was carried out using two high-field and two low-field triaxial fluxgate magnetometers. Data accuracy of the interplanetary fields was plus or minus 0.1 nT, and the range of measurements was from 0.01 nT to 2.E-3 T.

------- VOYAGER 1, SCARF------------------------------------

INVESTIGATION NAME- PLASMA WAVE (.01-56 KHZ)

NSSDC ID- 77-084A-13

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
PLANETARY IONOSPHERES

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

This investigation provided continuous, sheath-independent measurements of the electron-density profiles at Jupiter and Saturn. It also gave basic information on local wave-particle interaction required to carry out comparative studies of the physics of the Jupiter and Saturn magnetospheres. The instrumentation consisted of a 16-channel, step-frequency receiver and a low-frequency waveform receiver, with associated electronics. The frequency range for this instrument was from 10 Hz to 56 kHz. This instrument shared the 10-m antennas developed for the investigation of planetary radio astronomy.

------- VOYAGER 1, SMITH------------------------------------

INVESTIGATION NAME- IMAGING

NSSDC ID- 77-084A-01

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
PLANETOLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - B.A.	SMITH	U OF ARIZONA
DT - L.A.	SODERBLOM	US GEOLOGICAL SURVEY
TM - G.A.	BRIGGS	NASA HEADQUARTERS
TM - A.F.	COOK	SAO
TM - G.E.	DANIELSON	CALIF INST OF TECH
TM - M.E.	DAVIES	RAND CORP
TM - G.E.	HUNT	U COLLEGE LONDON
TM - T.	OWEN	STATE U OF NEW YORK
TM - C.	SAGAN	CORNELL U
TM - V.E.	SUOMI	U OF WISCONSIN
TM - T.V.	JOHNSON	NASA-JPL
TM - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

The photographic experiment used a two-camera system, based on the Mariner 10 system. This system included one narrow-angle, long-focal-length camera and one wide-angle, short-focal-length camera. The maximum resolution achievable depended on the actual trajectory on this multi-encounter mission, but the resolution was as high as 0.5 to 1.0 km on the closest approaches to some objects. At Jupiter and Saturn, the resolution was better than 20 km and 5 km, respectively. The objectives of the experiment were to photograph global motions and cloud distributions on Jupiter and Saturn, gross dynamical properties, zonal rotation, orientation of spin axis, zonal shear, vertical shear, flow instabilities, spots, and spectrum of scale of atmospheric motions in time and space. Additional objectives included the study of the mode of release of internal energy flux (search for convection cells and rolls), study of growth, dissipation, morphology, and vertical structure of cloud complexes, gross optical properties, global and localized scattering function in the visible spectrum, polarimetry, nature of chromophores (their structure and development), and high resolution of the Great Red Spot. The objectives of the satellite encounters included the following: (1) gross characteristics (size, shape, rotation, spin axis, cartography, improved ephemerides, and masses), (2) geology (major physiographic provinces, impact and volcanic features, lineaments, polar caps, erosion processes, low- and high-density satellite comparative studies, detection of atmospheres, frosts, and limb stratification of aerosols), and (3) surface properties (colorimetry, scattering function, nature of brightness variation, and search for new satellites). Studies of Saturn's rings included (1) resolution of individual ring components or clumps of material, (2) vertical and radial distribution of material at very high resolution, (3) scattering function, (4) coarse polarimetry, (5) occultation - optical depth, and (6) distinguishing different types of material in the rings. Other objectives were to search for new comets, asteroids, and targets of opportunity.

------- VOYAGER 1, TYLER------------------------------------

INVESTIGATION NAME- RADIO SCIENCE TEAM

NSSDC ID- 77-084A-02

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
CELESTIAL MECHANICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - G.L.	TYLER	STANFORD U
TM - V.R.	ESHLEMAN	STANFORD U
TM - J.D.	ANDERSON	NASA-JPL
TM - T.A.	CROFT	SRI INTERNATIONAL
TM - G.F.	LINDAL	NASA-JPL
TM - G.S.	LEVY	NASA-JPL
TM - G.E.	WOOD	NASA-JPL

BRIEF DESCRIPTION

The Radio Science Team used the telecommunications system of the Voyager spacecraft to perform its studies. The system was a coherent S- and X-band downlink and an S-band uplink. The science objectives of the radio science investigation were (1) to determine the physical properties of planetary and satellite ionospheres and atmospheres by examining the propagation effects on a dual-frequency radio signal during immersion and emersion of spacecraft occultation by the subject body, (2) to determine planetary and satellite masses, gravity fields, and densities by precise tracking of a dual-frequency radio signal from the spacecraft during the encounter period, and (3) to determine the amount and size distribution of material in Saturn's rings and the ring dimensions by examining the propagation effects on a dual-frequency radio signal that passed through each ring in succession, and through the gap between the C ring and Saturn's surface.

------- VOYAGER 1, VOGT---------------------------------------

INVESTIGATION NAME- HIGH- AND MODERATELY LOW-ENERGY COSMIC-RAY TELESCOPE

NSSDC ID- 77-084A-08

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.E.	VOGT	CALIF INST OF TECH
CI - J.R.	JOKIPII	U OF ARIZONA
CI - E.C.	STONE	CALIF INST OF TECH
CI - F.B.	MCDONALD	NASA HEADQUARTERS
CI - J.H.	TRAINOR	NASA-GSFC
CI - W.R.	WEBBER	U OF NEW HAMPSHIRE
CI - A.W.	SCHARDT	NASA-GSFC

BRIEF DESCRIPTION

This investigation studied the origin and acceleration process, life history, and dynamic contribution of interstellar cosmic rays, the nucleosynthesis of elements in cosmic-ray sources, the behavior of cosmic rays in the interplanetary medium, and the trapped planetary energetic-particle environment. The instrumentation included a High-Energy Telescope System (HETS) and a Low-Energy Telescope System (LETS). The HETS covered an energy range between 6 and 500 MeV/nucleon for nuclei ranging in atomic numbers from 1 through 30. In addition, electrons in the energy range between 3 and 100 MeV/nucleon were measured by this telescope and an electron telescope. The LETS measured the energy and determined the identity of nuclei for energies between 30. The instruments also measured the anisotropies of electrons and nuclei. In addition, electrons in the energy range between 3 and 100 MeV/nucleon were measured by an electron telescope.

------- VOYAGER 1, WARWICK-------------------------------------

INVESTIGATION NAME- PLANETARY RADIO ASTRONOMY

NSSDC ID- 77-084A-10

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.W.	WARWICK	U OF COLORADO
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - T.D.	CARR	U OF FLORIDA
CI - F.T.	HADDOCK	U OF MICHIGAN
CI - D.H.	STAELIN	MASS INST OF TECH
CI - A.	BOISCHOT	PARIS OBSERVATORY
CI - C.C.	HARVEY	PARIS OBSERVATORY
CI - Y.	LEBLANC	PARIS OBSERVATORY
CI - W.E.	BROWN, JR.	NASA-JPL
CI - S.	GULKIS	NASA-JPL
CI - R.J.	PHILLIPS	LUNAR + PLANETARY INST
CI - J.B.	PEARCE	RADIOPHYSICS, INC
CI - A.C.	RIDDLE	U OF COLORADO
CI - R.G.	PELTZER	MARTIN-MARIETTA AEROSP
CI - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a sweep-frequency radio receiver operating in both polarization states, between 20 kHz and 40.5 MHz. The signal was received by a pair of orthogonal 10-m monopole antennas. Study of the radio-emission signals from Jupiter and Saturn over this range of frequencies yielded data concerning the physics of magnetospheric plasma resonances and nonthermal radio emissions from these planetary regions.

*************************** VOYAGER 2***********************

SPACECRAFT COMMON NAME- VOYAGER 2
ALTERNATE NAMES- MARINER JUPITER/SATURN B, OUTER PLANETS B
MARINER 77B, MJS 77B
10271

NSSDC ID- 77-076A

LAUNCH DATE- 08/20/77 WEIGHT- 700. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SATURN FLYBY

PERSONNEL

MG - R.	MILLS	NASA HEADQUARTERS
SC - W.A.	BRUNK(DECEASED)	NASA HEADQUARTERS
PM - R.P.	LAESER	NASA-JPL
PS - E.C.	STONE	CALIF INST OF TECH

BRIEF DESCRIPTION

The overall objectives of Voyager 2 were to conduct exploratory investigations of the planetary systems of Jupiter, Saturn, Uranus, and Neptune, and of the interplanetary medium. Primary emphasis was placed on comparative studies of these planetary systems by obtaining (1) measurements of the environment, atmosphere, and body characteristics of the planets and one or more of the satellites of each planet, (2) studies of the nature of the rings of Saturn and Uranus, and (3) exploration of the interplanetary (or interstellar) medium at increasing distances from the sun. These objectives were met using a variety of instruments and methods including imaging, a coherent S- and X-band RF receiver, an IR interferometer and radiometer, a UV spectrometer, fluxgate magnetometers, Faraday cups, a charged-particle analyzer, plasma detector, plasma-wave radio receiver, cosmic-ray telescopes, photopolarimeter, and a sweep-frequency radio receiver. Jupiter close encounter was achieved on July 9, 1979, and Saturn on August 5, 1981.

------- VOYAGER 2, BRIDGE--------------------------------------

INVESTIGATION NAME- PLASMA SPECTROMETERS

NSSDC ID- 77-076A-06

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
CI - A.J.	LAZARUS	MASS INST OF TECH
CI - S.	OLBERT	MASS INST OF TECH
CI - J.W.	BELCHER	MASS INST OF TECH
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.F.	BURLAGA	NASA-GSFC
CI - C.K.	GOERTZ	U OF IOWA
CI - G.L.	SISCOE	U OF CALIF, LA
CI - A.J.	HUNDHAUSEN	NATL CTR FOR ATMOS RES
CI - R.E.	HARTLE	NASA-GSFC
CI - K.W.	OGILVIE	NASA-GSFC
CI - J.D.	SULLIVAN	MASS INST OF TECH
CI - J.D.	SCUDDER	NASA-GSFC

BRIEF DESCRIPTION

The plasma investigation made use of two Faraday-cup detectors, one pointed along the earth-spacecraft line and one at right angles to this line. The earth-pointing detector determined the macroscopic properties of the plasma ions, obtaining accurate values of their velocity, density, and pressure. Three sequential energy scans were employed with (delta E)/E equal to 29, 7.2, and 1.8%, allowing a coverage from subsonic to highly supersonic flow. The side-looking Faraday cup measured electrons in the energy range from 5 eV to 1 keV.

------- VOYAGER 2, BROADFOOT-----------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY

NSSDC ID- 77-076A-04

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI - A.	DALGARNO	SAO
CI - J.C.	MCCONNELL	YORK U
CI - R.M.	GOODY	HARVARD U
CI - T.M.	DONAHUE	U OF MICHIGAN
CI - M.B.	MCELROY	HARVARD U
CI - M.J.S.	BELTON	KITT PEAK NATL OBS
CI - D.F.	STROBEL	US NAVAL RESEARCH LAB
CI - H.W.	MOOS	JOHNS HOPKINS U
CI - J.E.	BLAMONT	CNRS-SA
CI - J.L.	BERTAUX	CNRS-SA
CI - S.K.	ATREYA	U OF MICHIGAN
CI - B.R.	SANDEL	U OF SOUTHERN CALIF
CI - D.E.	SHEMANSKY	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

The UV spectrometer was designed to measure atmospheric properties and measured radiation in the wavelength range 0.04 to 0.16 micrometer (400 to 1600 A). Two modes of instrument operation were planned: airglow and occultation. In the airglow mode, the atmospheric radiation was measured. This radiation is predominantly resonance-scattered solar radiation, where the scattering is by the molecular or atomic atmospheric constituents, such as hydrogen (1216 A) or helium (584 A). In the occultation mode, sunlight was reflected into the spectrometer, and the solar spectrum was recorded. As the atmosphere moved between the spacecraft and the sun, the absorption characteristics of the atmosphere were obtained over the measured wavelength region. The absorption spectrum was used to identify the absorber as well as to measure its abundance in the line of sight to the sun. In addition, the atmosphere's thermal structure could be inferred.

------- VOYAGER 2, HANEL --

INVESTIGATION NAME- INFRARED SPECTROSCOPY AND RADIOMETRY

NSSDC ID- 77-076A-03 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.A.	HANEL	NASA-GSFC
CI - C.A.	PONNAMPERUMA	U OF MARYLAND
CI - P.J.	GIERASCH	CORNELL U
CI - J.A.	PIRRAGLIA	NASA-GSFC
CI - R.E.	SAMUELSON	NASA-GSFC
CI - W.C.	MAGUIRE	NASA-GSFC
CI - J.C.	PEARL	NASA-GSFC
CI - V.G.	KUNDE	NASA-GSFC
CI - D.P.	CRUIKSHANK	U OF HAWAII
CI - B.J.	CONRATH	NASA-GSFC
CI - D.	GAUTIER	PARIS OBSERVATORY
CI - F.M.	FLASAR	NASA-GSFC
CI - S.	KUMAR	U OF SOUTHERN CALIF

BRIEF DESCRIPTION

This investigation was carried out using an infrared radiometer and an interferometer spectrometer similar in design to the Mariner 9 IRIS, combined into a single instrument. The investigation studied both global and local energy balance, using infrared spectral measurements in conjunction with broad-band measurements of reflected solar energy. Atmospheric composition was also investigated, including determination of the H2/He ratio and the abundance of CH2 and NH3. Vertical temperature profiles were obtained on the planets and satellites with atmospheres. Studies of the composition, thermal properties, and size of particles in Saturn's rings were conducted. The interferometer had a spectral range of 200 to 4000 1/cm, while the radiometer range covered 5000 to 33,000 1/cm. The instrument used a single primary mirror 51 cm in diameter with a field of view of 0.25 deg.

------- VOYAGER 2, KRIMIGIS --

INVESTIGATION NAME- LOW-ENERGY CHARGED PARTICLE ANALYZER AND TELESCOPE

NSSDC ID- 77-076A-07 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
CI - C.O.	BOSTROM	APPLIED PHYSICS LAB
CI - T.P.	ARMSTRONG	U OF KANSAS
CI - W.I.	AXFORD	VICTORIA U WELLINGTON
CI - G.	GLOECKLER	U OF MARYLAND
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - C.Y.	FAN	U OF ARIZONA
CI - E.P.	KEATH	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objective of this experiment was to study the magnetospheres of Jupiter, Saturn, Uranus, and Neptune, using a low-energy magnetospheric particle analyzer. This detector made measurements in (1) the distant magnetosphere and bow shock of Jupiter, (2) the magnetosphere of Saturn and possible magnetosphere of Uranus and Neptune, and (3) the trapped radiation belts in the vicinity of these planets. Additionally, this detector was able to study low-energy particles in the interplanetary medium. The energy range of this detector was 10 keV to 1.1 MeV for electrons and 10 keV to 150 MeV for ions. During the interplanetary cruise period, protons, alpha particles, and heavier nuclei (z from 3 to 26) were separately identified and their energies measured in the range from 0.05 to 30 MeV, by the low-energy particle telescope.

------- VOYAGER 2, LANE --

INVESTIGATION NAME- MULTIFILTER PHOTOPOLARIMETER, 2200-7300 A

NSSDC ID- 77-076A-11 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.L.	LANE	NASA-JPL
CI - K.D.	PANG	NASA-JPL
CI - J.E.	HANSEN	NASA-GISS
CI - D.L.	COFFEEN	NASA-GISS
CI - L.W.	ESPOSITO	U OF COLORADO
CI - M.	SATO(NLA)	NASA-GISS
CI - R.A.	WEST	U OF COLORADO
CI - C.W.	HORD	U OF COLORADO

BRIEF DESCRIPTION

This experiment consisted of an 8-in. (20-cm) f/1.1 telescope that sent radiation through a polarizer and a filter for one of eight bands in the 2200- to 7300-A spectral region, then on to a photomultipler tube. By study of these emission intensity data, information on surface texture and composition of Jupiter, Saturn, Uranus, and Neptune could be obtained, along with information of size distribution and composition of Saturn's and Uranus' rings and information on atmospheric scattering properties and density for all planets. Molecular scale heights for these planets could also be determined from these data.

------- VOYAGER 2, NESS --

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETERS

NSSDC ID- 77-076A-05 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS
INTERPLANETARY MAGNETIC FIELDS

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
CI - R.P.	LEPPING	NASA-GSFC
CI - F.M.	NEUBAUER	U OF COLOGNE
CI - K.W.	BEHANNON	NASA-GSFC
CI - L.F.	BURLAGA	NASA-GSFC
CI - M.H.	ACUNA	NASA-GSFC

BRIEF DESCRIPTION

This experiment was designed to investigate (1) the magnetic fields of Jupiter, Saturn, Uranus, and Neptune and (2) the solar-wind interaction of the magnetospheres of these planets with the interplanetary magnetic field out to the solar-wind boundary with the interstellar magnetic field, and beyond, if crossed. The investigation was carried out using two high-field and two low-field triaxial fluxgate magnetometers. Data accuracy of the interplanetary fields was plus or minus 0.1 nT, and the range of measurements was from 0.01 nT to 2.E-3 T.

------- VOYAGER 2, SCARF --

INVESTIGATION NAME- PLASMA WAVE (.01-56 KHZ)

NSSDC ID- 77-076A-13 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY IONOSPHERES
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - D.A.	GURNETT	U OF IOWA

BRIEF DESCRIPTION

This investigation provided continuous, sheath-independent measurements of the electron density profiles at Jupiter and Saturn and will provide similar measurements for Uranus and Neptune. It also gave basic information on local wave-particle interactions required to carry out comparative studies of the physics of the magnetospheres of these planets. The instrumentation consisted of a 16-channel step frequency receiver and a low-frequency waveform receiver with associated electronics. The frequency range for this instrument was from 10 Hz to 56 kHz. This instrument shared the 10-m antennas developed for the planetary radio astronomy investigation.

------- VOYAGER 2, SMITH --

INVESTIGATION NAME- IMAGING

NSSDC ID- 77-076A-01 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
PLANETOLOGY

PERSONNEL

TL - B.A.	SMITH	U OF ARIZONA
DT - L.A.	SODERBLOM	US GEOLOGICAL SURVEY
TM - G.A.	BRIGGS	NASA HEADQUARTERS
TM - A.F.	COOK	SAO
TM - G.E.	DANIELSON	CALIF INST OF TECH
TM - M.E.	DAVIES	RAND CORP
TM - G.E.	HUNT	U COLLEGE LONDON
TM - T.	OWEN	STATE U OF NEW YORK
TM - C.	SAGAN	CORNELL U
TM - V.E.	SUOMI	U OF WISCONSIN
TM - T.V.	JOHNSON	NASA-JPL
TM - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

The photographic experiment used a two-camera system, based on the Mariner 10 system. This system included one narrow-angle, long-focal-length camera and one wide-angle, short-focal-length camera. The maximum resolution achievable depended greatly on the actual trajectory on this multi-encounter mission, but was as high as 0.5 to 1.0 km on the closest approaches to some objects. At Jupiter and Saturn, the resolution that was achieved was better than 20 km and 5 km, respectively. The objectives of the experiment were to photograph global motions and cloud distributions (on Jupiter, Saturn, Uranus, and Neptune), gross dynamical properties, zonal rotations, orientation of spin axes, zonal shear, vertical shear, flow instabilities, spots, and spectram of scale of atmospheric motions in time and space. Additional objectives included the study of the mode of release of internal energy flux (search for convection cells and rolls), study of growth, dissipation, morphology, and vertical structure of cloud complexes, gross optical properties, global and localized scattering function in the visible spectrum, polarimetry, nature of chromophores (their structure and development), and high resolution of the Great Red Spot. The objectives of the satellite encounters included (1) gross characteristics (size, shape, rotation, spin axis, cartography, improved ephemerides and masses); (2) geology (major physiographic provinces, impact and volcanic features, lineaments, polar caps, erosion processes, and low- and high-density satellite comparative studies, detection of atmospheres, frosts, and limb stratification of aerosols); and (3) surface properties (colorimetry, scattering function, nature of brightness variation, and search for new satellites). Studies of Saturn's rings were carried out and will be for Uranus' rings. Objectives included (1) resolution of individual ring components of clumps of material; (2) vertical and radial distribution of material at very high resolution; (3) scattering function; (4) coarse polarimetry; (5) occultation - optical depth; and (6) distinguishing different types of material in the rings. Other objectives were to search for new comets, asteroids, and targets of opportunity.

------- VOYAGER 2, TYLER---------------------------------------

INVESTIGATION NAME- RADIO SCIENCE TEAM

NSSDC ID- 77-076A-02

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
CELESTIAL MECHANICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - G.L.	TYLER	STANFORD U
TM - G.F.	LINDAL	NASA-JPL
TM - G.S.	LEVY	NASA-JPL
TM - T.A.	CROFT	SRI INTERNATIONAL
TM - V.R.	ESHLEMAN	STANFORD U
TM - J.D.	ANDERSON	NASA-JPL
TM - G.E.	WOOD	NASA-JPL

BRIEF DESCRIPTION

The Radio Science Team used the telecommunications systems of the Voyager spacecraft to perform their studies. The system was a coherent S- and X-band downlink and S-band uplink. The science objectives of the radio science investigation were (1) to determine the physical properties of planetary and satellite ionospheres and atmospheres by examining the propagation effects on a dual-frequency radio signal during immersion of spacecraft occultation by the subject body, (2) to determine planetary and satellite masses, gravity fields and densities by precise tracking of a dual-frequency radio signal from the spacecraft during the encounter period, and (3) to determine the amount and size distributions of material in the rings of Saturn and the ring dimensions by examining the propagation effects on a dual-frequency radio signal that passes through each ring in succession and through the gap between the C ring and the surface of Saturn.

------- VOYAGER 2, VOGT---------------------------------------

INVESTIGATION NAME- HIGH- AND MODERATELY LOW-ENERGY COSMIC-RAY TELESCOPE

NSSDC ID- 77-076A-08

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.E.	VOGT	CALIF INST OF TECH
CI - J.R.	JOKIPII	U OF ARIZONA
CI - E.C.	STONE	CALIF INST OF TECH
CI - F.B.	MCDONALD	NASA HEADQUARTERS
CI - J.H.	TRAINOR	NASA-GSFC
CI - W.R.	WEBBER	U OF NEW HAMPSHIRE
CI - A.W.	SCHARDT	NASA-GSFC

BRIEF DESCRIPTION

This investigation studied the origin and acceleration process, life history, and dynamic contribution of interstellar cosmic rays, the nucleosynthesis of elements in cosmic-ray sources, the behavior of cosmic rays in the interplanetary medium, and the trapped planetary energetic particle environment. The instrumentation included a High-Energy Telescope System (HETS) and a Low-Energy Telescope System (LETS). The HETS covered an energy range between 6 and 500 MeV/nucleon for nuclei ranging in atomic numbers from 1 through 30. In addition, electrons in the energy range between 3 and 100 MeV were measured by this telescope and an electron telescope. The LETS measured the energy and determined the identity of nuclei for energies between .15 and 30 MeV/nucleon and atomic numbers from 1 to 30. The instruments also measured the anisotropies of electrons and nuclei. In addition, electrons in the energy range between 3 and 100 MeV were measured by the electron telescope.

------- VOYAGER 2, WARWICK---------------------------------------

INVESTIGATION NAME- PLANETARY RADIO ASTRONOMY

NSSDC ID- 77-076A-10

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.W.	WARWICK	U OF COLORADO
CI - W.E.	BROWN, JR.	NASA-JPL
CI - S.	GULKIS	NASA-JPL
CI - C.C.	HARVEY	PARIS OBSERVATORY
CI - Y.	LEBLANC	PARIS OBSERVATORY
CI - D.H.	STAELIN	MASS INST OF TECH
CI - A.	BOISCHOT	PARIS OBSERVATORY
CI - T.D.	CARR	U OF FLORIDA
CI - F.T.	HADDOCK	U OF MICHIGAN
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - R.J.	PHILLIPS	LUNAR + PLANETARY INST
CI - R.G.	PELTZER	MARTIN-MARIETTA AEROSP
CI - J.B.	PEARCE	RADIOPHYSICS, INC
CI - A.C.	RIDDLE	U OF COLORADO
CI - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

This experiment consisted of a sweep-frequency radio receiver operating in both polarization states, between 20 kHz and 40.5 MHz. The signal was received by a pair of orthogonal 10-m monopole antennas. The physics of magnetospheric plasma resonances and of nonthermal radio emissions from these planetary regions was studied by investigation of the radio emission signals from Jupiter and Saturn over this range of frequencies, and similar studies will be done at Uranus and Neptune.

3

DESCRIPTIONS OF PLANNED SPACECRAFT AND EXPERIMENTS

3. DESCRIPTIONS OF PLANNED SPACECRAFT AND EXPERIMENTS

This section contains descriptions of spacecraft and experiments pertinent to this report that were planned as of May 31, 1983, that had progressed beyond the experiment or investigation selection stage, and for which NSSDC has at least minimal documentation. A few changes subsequent to this date may appear, depending on availability. The descriptions are sorted by spacecraft common name (for "free flying" spacecraft) and by onboard experiment package name (for experiment packages which are not deployed from the Shuttle). Within each spacecraft or onboard experiment package listing, experiments are ordered by the principal investigator's, lead investigator's, or team leader's last name. If the common name, as used by NSSDC, is not known, it can be found by referring to an alternate name found in the Index of Active and Planned Spacecraft and Experiments (Section 4).

Each spacecraft, onboard Shuttle experiment package, or experiment entry in this section is composed of two parts, a heading and a brief description. The headings list characteristics of spacecraft and experiments. Many of the terms used in this section are defined in Appendix C.

3.1 Contents of Spacecraft Entries

The heading for each spacecraft description in this section includes a set of planned initial orbit parameters: orbit type, orbit period, apoapsis, periapsis, and inclination for the spacecraft. No orbit parameters are listed for lander, flyby, or probe missions. In addition, the heading contains the spacecraft weight, launch date (as provided by the project office; actual date may change), site, vehicle, spacecraft common and alternate names, NSSDC ID code, sponsoring country and agency, and spacecraft personnel codes. The personnel codes are as follows:

CODE CO (general contact)
CODE MG (program manager)
CODE MM (mission manager)
CODE MO (mission operations manager)
CODE MS (mission scientist)
CODE PC (project coordinator)
CODE PD (project director)
CODE PE (project engineer)
CODE PM (project manager)
CODE PS (project scientist)
CODE SC (program scientist)
CODE TD (technical director)

This terminology is standard for NASA missions; the equivalent functions for the missions of other countries or agencies have been given the same position names. The spacecraft brief description is immediately below each heading.

3.2 Contents of Experiment Entries

Each experiment entry heading includes the experiment name, the NSSDC ID code, the investigative program, the investigation discipline, and the name and affiliation or location of the principal investigator (PI), lead investigator (LI), or team leader (TL) for the experiment as well as other investigators (OI), team members (TM), deputy team leader (DT), co-investigator (CI), experiment manager (EM), experiment scientist (ES), or general contact (CO) associated with the experiment. The investigators are not listed in any particular order within each experiment. The experiment brief description is immediately below each heading.

The investigative program may include one of the following NASA Headquarters division codes:

CODE EB (Life Sciences)
CODE EC (Communications)
CODE EE (Earth & Science Applications)
CODE EL (Solar System Exploration)
CODE EN (Materials Processing)
CODE EZ (Astrophysics)
CODE RS (Space Systems)

The addition of /CO-OP to any code indicates a cooperative effort between NASA and another agency.

3.3 Planned Spacecraft and Experiment Descriptions

A spacecraft or onboard Shuttle experiment package is included in the planned section of this report if it is either an approved or a proposed mission where the experiments or investigations have already been selected and NSSDC has at least minimal documentation.

**************************** AMPTE/CCE **************************

SPACECRAFT COMMON NAME- AMPTE/CCE
ALTERNATE NAMES- AMPTE/CHARGE COMP EXPL, CHARGE COMPOSITION EXPL
CCE

NSSDC ID- CCE

LAUNCH DATE- 08/00/84 WEIGHT- 220. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 960. MIN INCLINATION- 0. DEG
PERIAPSIS- 550. KM ALT APOAPSIS- 51000. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
SC - E.R.	SCHMERLING	NASA HEADQUARTERS
PM - G.W.	OUSLEY	NASA-GSFC
PS - M.H.	ACUNA	NASA-GSFC
PI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The AMPTE (Active Magnetospheric Particle Tracer Experiment) mission is designed to study the access of solar-wind ions to the magnetosphere, the convective-diffusive transport and energization of magnetospheric particles, and the interactions of plasmas in space. The program consists of three spacecraft: the CCE; the IRM, which provides multiple ion releases in the solar wind, the magnetosheath, and the magnetotail, with in-situ diagnostics of each; and the UKS, which uses thrusters to station-keep near the IRM to provide two-point local measurements. This particular spacecraft, the CCE (Charge Composition Explorer), is instrumented to detect those lithium and barium tracer ions from the IRM releases that are transported into the magnetosphere within the CCE orbit. The spacecraft is spin stabilized at 10 rpm with the spin axis in the equatorial plane and offset from the earth-sun line by about 20 deg, and can adjust attitude with both magnetic torqueing and cold gas thrusters. The s/c uses a 2.E8-bit tape recorder and redundant 2.5-W S-Band transponders. The spacecraft battery is charged by a 140-W solar array. Each instrument is provided by a Lead Investigator (LI). The PI for the U.S. AMPTE Program and for the CCE is S. M. Krimigis. The PI for the European AMPTE Program, the IRM, and the UKS is G. Haerendel.

------- AMPTE/CCE, GLOECKLER -----------------------------------

INVESTIGATION NAME- CHARGE-ENERGY-MASS SPECTROMETER(CHEM)

NSSDC ID- CCE -03 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - G.	GLOECKLER	U OF MARYLAND
OI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - F.M.	IPAVICH	U OF MARYLAND
OI - W.	STUDEMANN	MPI-AERONOMY
OI - W.I.	AXFORD	VICTORIA U WELLINGTON

BRIEF DESCRIPTION
The instrument consists of an entrance collimator and electrostatic analyzer section followed by a time-of-flight and total-energy-measurement section floating at a 30kV acceleration potential. The energy range covered is from 1 to 300 keV/Q, with a geometric factor of 2.E-3 sq cm-sr and 32-sector angular resolution. Energy resolution is 5 to 18%, and all charge states and isotopes of H and He, Li with its charge states, and major elements and charge states up to and including Fe are resolved.

------- AMPTE/CCE, MCENTIRE -----------------------------------

INVESTIGATION NAME- MEDIUM ENERGY PARTICLE ANALYZER (MEPA)

NSSDC ID- CCE -02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
OI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - A.T.Y.	LUI	APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The instrument consists of a collimator and electron sweeping magnet followed by a 10-cm time-of-flight (TOF) telescope with thin foils at the front and mid-point and a solid state detector at the rear. Incident ion TOF is measured from the front foil to the back detector and from the center foil to the back detector, and energy is measured in the back detector. The dual TOF measurement and very fast energy channel processing give high immunity to accidental events, and allow the instrument to measure the composition and spectra of both common species and tracer ions over a species-dependent energy range of > 10 keV/nucleon to 6 MeV/nucleon, with a geometric factor of 1.E-2 sq cm-sr and 32-sector angular resolution.

------- AMPTE/CCE, POTEMRA -----------------------------------

INVESTIGATION NAME- CCE MAGNETOMETER (MAG)

NSSDC ID- CCE -05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - T.A.	POTEMRA	APPLIED PHYSICS LAB
OI - M.H.	ACUNA	NASA-GSFC

BRIEF DESCRIPTION
The instrument is a triaxial fluxgate magnetometer mounted on a 2.4-m boom. It has seven automatically switchable ranges (from plus and minus 16 nT to plus and minus 65,536 nT) with resolution commensurate with a 13-bit A/D converter, and is read out at 8.6 vector samples/s. The signals from two sensors (one parallel to the spin axis and one orthogonal) are also fed into 5-50 Hz bandpass channels that are read out every 5 s.

------- AMPTE/CCE, SCARF -----------------------------------

INVESTIGATION NAME- PLASMA WAVE EXPERIMENT (PWE)

NSSDC ID- CCE -04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - F.L.	SCARF	TRW SYSTEMS GROUP

BRIEF DESCRIPTION
The instrument consists of a balanced electric dipole with an effective length of 70 cm and six bandpass channels covering the range from 5 Hz to 178 kHz. The highest five channels are sampled every 0.6 s and the lowest (5-50 Hz) channel is sampled every 20 s. The instrument is the flight spare of the Pioneer Venus Electric Field Detector, with two additional filters added.

------- AMPTE/CCE, SHELLEY -----------------------------------

INVESTIGATION NAME- HOT PLASMA COMPOSITION EXPERIMENT (HPCE)

NSSDC ID- CCE -01 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

LI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - R.G.	JOHNSON	LOCKHEED PALO ALTO
OI - F.X.	EBERHARDT	U OF BERNE
OI - H.	BALSIGER	U OF BERNE
OI - J.	GEISS	U OF BERNE
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - A.	GHIELMETTI	U OF BERNE
OI - W.K.	PETERSON	LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This instrument consists of an entrance collimator and retarding potential analyzer, a curved-plate electrostatic energy analyzer, and a combined electrostatic-magnetic mass analyzer in series. The energy range covered is approximately 0 to 17 keV/Q, with a geometric factor ranging from 0.01 to 0.05 sq cm-sr, an energy resolution from 6 to 60%, and a M/Q resolution of 10%. This instrument cleanly separates Li+ and Ba+ tracer ions from the background. It is nearly identical to one flown on DE 1 by the same group of investigators. An additional set of 8 spectrometers containing permanent bending magnets and channeltrons measures electrons in eight channels from 50 eV to 25 keV.

*************************** AMPTE/IRM************************

SPACECRAFT COMMON NAME- AMPTE/IRM
ALTERNATE NAMES- ION RELEASE MODULE, AMPTE/ION RELEASE MODULE
IRM

NSSDC ID- IRM

LAUNCH DATE- 08/00/84 WEIGHT- 690. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA 3924

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY BMFT

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 2630. MIN INCLINATION- 28.7 DEG
PERIAPSIS- 550. KM ALT APOAPSIS- 112824. KM ALT

PERSONNEL

MG - M.	OTTERBEIN	BMFT
PM - U.	JONELEIT	DFVLR
PM - B.	HAUSLER	MPI-EXTRATERR PHYS
PS - G.	PASCHMANN	MPI-EXTRATERR PHYS
PI - G.	HAERENDEL	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION
The IRM provides multiple ion releases in the solar wind, the magnetosheath, and the magnetotail with in situ diagnostics of each. The ions released by the IRM are detected within the magnetosphere by the instruments on CCE. The spacecraft is spin-stabilized at 15 rpm. The spin axis is initially in the ecliptic plane, but later it is adjusted with magnetic torqueing to be at right angles to the ecliptic. The power system is a 60-W solar array with redundant batteries. There is a redundant S-band telemetry and telecommand system. Telemetry rates can be chosen between 1 and 8 kbps. For injection into the final orbit, the IRM carries its own kick stage. The PI for the German AMPTE Program is G. Hearendel. The release experiment and the diagnostic instruments are each provided by a lead investigator (LI).

------- AMPTE/IRM, HAUSLER------------------------------------

INVESTIGATION NAME- PLASMA WAVE INSTRUMENT

NSSDC ID- IRM -04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - B.	HAUSLER	MPI-EXTRATERR PHYS
OI - R.	TREUMANN	MPI-EXTRATERR PHYS
OI - D.A.	GURNETT	U OF IOWA
OI - R.R.	ANDERSON	U OF IOWA
OI - R.	HOLZWORTH	U OF WASHINGTON
OI - H.C.	KOONS	AEROSPACE CORP

BRIEF DESCRIPTION
The instrument uses a 42-m tip-to-tip antenna to measure electric fields from dc to 5 MHz and two boom-mounted search coil magnetometers to measure magnetic fields from 30 Hz to 1 MHz. The signals are analyzed by a VLF/MF 16-channel spectrum analyzer, three VLF narrow-band swept frequency receivers, a 60-channel HF stepped frequency receiver and an analog wide-band receiver.

------- AMPTE/IRM, HOVESTADT----------------------------------

INVESTIGATION NAME- SUPRATHERMAL IONIC CHARGE ANALYZER

NSSDC ID- IRM -06 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - D.K.	HOVESTADT	MPI-EXTRATERR PHYS
OI - M.	SCHOLER	MPI-EXTRATERR PHYS
OI - E.	MOEBIUS	MPI-EXTRATERR PHYS
OI - B.	KLECKER	MPI-EXTRATERR PHYS
OI - F.M.	IPAVICH	U OF MARYLAND
OI - G.	GLOECKLER	U OF MARYLAND

BRIEF DESCRIPTION
The main instrument consists of a curved plate electrostatic energy-per-charge analyzer followed by a 12-cm time-of-flight telescope with a thin carbon foil at the front and a solid-state detector at the rear, which measures ion velocity and residual energy. The energy-per-charge range is 10 to 300 keV/Q. The mass resolution, delta M/M, ranges from 0.25 to 0.12. The instrument package also contains an electron sensor for the energy range 35 to 220 keV, provided by UC Berkeley.

------- AMPTE/IRM, LUEHR--------------------------------------

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- IRM -02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

LI - H.	LUEHR	BRAUNSCHWEIG TECH U
OI - N.	KLOECKER	BRAUNSCHWEIG TECH U
OI - B.	HAUSLER	MPI-EXTRATERR PHYS
OI - M.H.	ACUNA	NASA-GSFC

BRIEF DESCRIPTION
The instrument is a three-axis fluxgate magnetometer mounted on a 2-m boom. It has two switchable ranges (plus and minus 4 micro tesla, and plus and minus 60 micro tesla) with resolutions of 0.12 and 1.8 nT, respectively and is read out at 32, 16, 8, or 4 vector samples per second, depending on the T/M rate. Signals from each sensor are also fed into four band pass filters with 5.5, 11, 22, and 44-Hz center frequencies read out up to two times per second.

------- AMPTE/IRM, PASCHMANN----------------------------------

INVESTIGATION NAME- PLASMA INSTRUMENT

NSSDC ID- IRM -03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - N.	SCKOPKE	MPI-EXTRATERR PHYS
OI - C.W.	CARLSON	U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The main instrument consists of two symmetrized quadrispherical electrostatic analyzers to measure the 3-D distributions of electrons and ions, respectively over 4-pi sr every satellite spin (4 s). The energy range covered is 15 eV to 30 keV/Q in 30 channels. The angular resolution is 22.5 deg. Moments of the measured distributions are directly computed onboard. An additional retarding potential analyzer measures electrons between approximately 0 and 25 eV.

------- AMPTE/IRM, ROSENBAUER---------------------------------

INVESTIGATION NAME- PLASMA ION COMPOSITION INSTRUMENT

NSSDC ID- IRM -05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

LI - F.R.	ROSENBAUER	MPI-AERONOMY
OI - H.	GRUENWALDT	MPI-AERONOMY
OI - M.	WITTE	MPI-AERONOMY
OI - H.	GOLDSTEIN	MPI-AERONOMY

BRIEF DESCRIPTION
The instrument consists of a retarding potential analyzer entrance section, a toroidal electrostatic energy-per-charge analyzer, and is followed by a quadrispherical electrostatic analyzer with superimposed radial magnetic field for mass-per-charge analysis. The energy range covered is approximately 0 to 12 (or 24) keV/Q, with adequate mass resolution to separate the Li and Ba tracer ions. Up to eight different ion species can be analyzed simultaneously.

------- AMPTE/IRM, VALENZUELA---------------------------------

INVESTIGATION NAME- ION RELEASE EXPERIMENT

NSSDC ID- IRM -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - A.	VALENZUELA	MPI-EXTRATERR PHYS
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - H.	FOEPPL	MPI-EXTRATERR PHYS
OI - E.	RIEGER	MPI-EXTRATERR PHYS
OI - O.	BAUER	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The experiment consists of eight lithium and eight barium canisters, which are injected from the IRM pair-wise by ground command and ignited 10 minutes after separation from the spacecraft. A pair of Li/Ba canisters produces a total of 2.E25/7.E24 Li/Ba atoms, respectively, which are subsequently ionized by solar radiation. Li releases in the solar wind are followed by an artificial comet release of Ba ions in the dawnside magnetosheath and a number of Ba and Li releases in the geomagnetic tail. In situ diagnostics by IRM and UKS and optical observations of the clouds from the ground are followed by tracing of the ions in the inner magnetosphere by CCE.

*************************** AMPTE/UKS***********************

SPACECRAFT COMMON NAME- AMPTE/UKS
ALTERNATE NAMES- UK SUBSATELLITE, UNITED KINGDOM SUBSAT
UKS

NSSDC ID- UKS

LAUNCH DATE- 08/00/84 WEIGHT- 74. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED KINGDOM SERC

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 2630. MIN INCLINATION- 28.5 DEG
PERIAPSIS- 550. KM ALT APOAPSIS- 112771. KM ALT

PERSONNEL

MG - A.H.	GABRIEL	RUTHERFORD/APPLTON LAB
PD - J.T.	HOUGHTON	RUTHERFORD/APPLTON LAB
PM - A.K.	WARD	RUTHERFORD/APPLTON LAB
PM - T.	PATRICK	MULLARD SPACE SCI LAB
PS - D.A.	BRYANT	RUTHERFORD/APPLTON LAB
MO - E.A.	BUCK	RUTHERFORD/APPLTON LAB
PI - G.	HAERENDEL	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The UKS is one spacecraft of the AMPTE (Active Magnetosphere Particle Tracer Experiment) program (along with CCE and IRM) and serves as a subsatellite of the IRM spacecraft. Its purpose is to help distinguish between spatial structure and temporal changes in the plasma phenomena initiated by ion releases from the IRM and in the natural magnetospheric environment. Measured quantities are similar to those of the IRM and include magnetic fields, positive ions, electrons, plasma waves, and modulations in ions and electrons. The spacecraft is spin stabilized at 12 rpm and employs S-band communications. It carries a cold gas propulsion system and a VHF radar system for station keeping with the IRM normally at a distance of a few hundred kilometers. The lead investigator for the UKS spacecraft is D. A. Bryant.

------- AMPTE/UKS, GOUGH--

INVESTIGATION NAME- SUSSEX PARTICLE CORRELATOR EXPERIMENT (SPACE)

NSSDC ID- UKS -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - M.P.	GOUGH	U OF SUSSEX
OI - D.S.	HALL	RUTHERFORD/APPLTON LAB
OI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The instrument consists of microprocessor-controlled counting and timing circuitry which uses as input the particle arrival pulses from the electron and ion spectrometers on board the spacecraft. The instrument computes autocorrelation functions and fast Fourier transforms of the particle modulations resulting from wave-particle interactions in the frequency range 1 Hz to 1 MHz with an average frequency resolution of 3%.

------- AMPTE/UKS, HALL--

INVESTIGATION NAME- ELECTRON DISTRIBUTION FUNCTIONS

NSSDC ID- UKS -02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - D.S.	HALL	RUTHERFORD/APPLTON LAB
OI - C.P.	CHALONER	RUTHERFORD/APPLTON LAB
OI - D.A.	BRYANT	RUTHERFORD/APPLTON LAB

BRIEF DESCRIPTION

Electron distribution functions are measured using two hemispherical electrostatic analyzers with microchannel plate detectors. The instrument has several operating modes. In its primary mode electron intensities are measured, in 1 s, in 24 energy channels covering the range 6 eV to 25 keV within 8 angular sectors spanning 180 deg relative to the spacecraft spin axis. The three dimensional distribution function is measured during the 5-s spin period of UKS. The geometric factors of the sectors are within the range 0.4 to 1.0 sq mm - sr and the energy bandwidth ,delta E/E, is 3%.

------- AMPTE/UKS, JOHNSTONE----------------------------------

INVESTIGATION NAME- THREE-DIMENSIONAL ION ENERGY/CHARGE DISTRIBUTIONS

NSSDC ID- UKS -03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
OI - A.J.	COATES	MULLARD SPACE SCI LAB
OI - S.J.	KELLOCK	MULLARD SPACE SCI LAB
OI - G.L.	WRENN	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The objective of this investigation is to study the three-dimensional ion distributions in the plasma clouds, the solar wind, the magnetosphere, and the boundaries between them and to measure these distributions with high time and angular resolution. The instrument consists of a pair of 270-deg spherical electrostatic energy analyzers with microchannel plate detectors that measure the three-dimensional energy/charge distribution of positive ions from 10 eV/Q to 20 keV/Q over the polar angle range 0 to 180 deg with respect to the spin axis of the spacecraft. A complete set of measurements is obtained every 5-s spin period.

------- AMPTE/UKS, SOUTHWOOD----------------------------------

INVESTIGATION NAME- TRIAXIAL MAGNETOMETER

NSSDC ID- UKS -04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

LI - D.J.	SOUTHWOOD	IMPERIAL COLLEGE
OI - S.W.H.COWLEY		IMPERIAL COLLEGE
OI - C.T.	RUSSELL	U OF CALIF, LA

BRIEF DESCRIPTION

The objective of this investigation is to study the magnetic fields in the near-earth environment. The instrument consists of a three-axis orthogonal fluxgate magnetometer with ring core sensors. It is a refurbished ISEE 1/2 flight spare. The two ranges, plus and minus 256 and 8192 nT, are selected by ground command. The accuracy of the instrument is plus and minus 1 nT per axis in the high range and plus and minus 0.03 nT in the low range.

------- AMPTE/UKS, WOOLLISCROFT-------------------------------

INVESTIGATION NAME- PLASMA WAVE MEASUREMENTS

NSSDC ID- UKS -05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

LI - L.J.C.WOOLLISCROFT		U OF SHEFFIELD
OI - D.	JONES	BRITISH ANTARCTIC SURV
OI - M.	GOUGH	U OF SUSSEX
OI - P.	CHRISTIANSEN	U OF SUSSEX

BRIEF DESCRIPTION

The instrument consists of an electric dipole antenna with 7-m separation between its sensors and a high permeability core coil to measure the magnetic component of the wave field. The electric component is measured up to 2 MHz and the magnetic component up to 20 kHz. The signal processing equipment is composed of a stepped frequency analyzer covering the range up to 130 kHz and four discrete filters with 10% bandwidths covering the range up to 2 MHz. A correlator (64 point auto) permits study at higher frequency resolution.

*************************** ASTRO*****************************

SPACECRAFT COMMON NAME- ASTRO
ALTERNATE NAMES- ASTRO-1, ASTRO-2
ASTRO-3

NSSDC ID- ASTRO

LAUNCH DATE- 03/00/86 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92. MIN INCLINATION- 28. DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 300. KM ALT

PERSONNEL

MS - T.R.	GULL	NASA-GSFC
MG - R.L.	KINSLEY	NASA HEADQUARTERS
PM - L.B.	ALLEN	NASA-MSFC
PS - J.	JONES	NASA-MSFC
PS - E.J.	WEILER	NASA HEADQUARTERS

BRIEF DESCRIPTION

ASTRO is an astronomy observatory consisting of three ultraviolet telescopes mounted and co-aligned on a common structure. The Spacelab instrument pointing system, pallets and avionics are utilized for attachment to the Shuttle and for control and data handling. The primary objectives of this observatory are to obtain (1) imagery in the spectral range 1200-3100 A (Ultraviolet Imaging Telescope, UIT); (2) spectrophotometry in the spectral region 500 to 1800 A (Hopkins Ultraviolet Telescope, HUT); and (3) spectropolarimetry from 1350 to 3200 A (Wisconsin Ultraviolet Photopolarimetry Experiment, WUPPE). Since many science objectives and selected astronomical targets of the three instrument teams are inter-related, simultaneous observations by all three instruments are planned. Therefore, the total ultraviolet data set is greatly enhanced by these simultaneous observations, especially of variable astronomical sources. Three flights are planned for the ASTRO Observatory. ASTRO-1 overlaps the passage of Comet Halley through the ecliptic plane. During the planned flight interval, up to four deep space probes fly past this comet. This observatory is used to study the UV properties of the comet. A visual-wavelength wide field camera is baselined for this flight to study the solar-wind interactions with the comet. Comet Halley is one of many important astronomical targets studied on Astro-1, and the comet may be observed as often as every other orbit. The follow-up flights, Astro-2 and Astro-3, will be dedicated to studies of many astronomical objects, and will include increasing participation of Guest Investigators. The ASTRO Observatory requires both mission specialists and payload specialists to control its operations from the Shuttle aft flight deck. Instrument monitoring and quick-look data analysis are planned for real-time ground operations.

------- ASTRO, CODE--

INVESTIGATION NAME- WISCONSIN ULTRAVIOLET PHOTOPOLARIMETRY EXPERIMENT (WUPPE)

NSSDC ID- ASTRO -01 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
ASTRONOMY

PERSONNEL

PI - A.D.	CODE	U OF WISCONSIN
OI - K.H.	NORDSIECK	U OF WISCONSIN
OI - C.M.	ANDERSON	U OF WISCONSIN
OI - R.C.	BLESS	U OF WISCONSIN

BRIEF DESCRIPTION

The scientific observations of the Wisconsin UV Photopolarimetry Experiment (WUPPE) consist of sequences of exposures of each object through various analyzing filters. WUPPE is used to obtain spectropolarimetric and spectrophotometric observations of stars, solar system objects, interstellar matter, galactic nuclei and quasars from 1400 to 3200 A. These observations provide a new polarimetric diagnostic tool in an unexplored region of the spectrum where it is expected that polarization effects from scattering, absorption, and non-thermal emission are far more important than at visible wavelengths. The WUPPE is a 50-cm f/10 Cassegrain telescope feeding a Monk-Gilleson grating spectrometer with spectro-polarimetric analyzers. The dimensions are 66 cm diameter and 274 cm length. The mass is 250 kg and the experiment uses 170 watts of power in normal operation. The WUPPE detector is a dual 1024-pixel Reticon self-scanned photodiode array coupled by fiber optics to a proximity-focused micro-channel plate image intensifier which has a CsTe photocathode. In the spectro-polarimetric mode the experiment will produce information about the linear and circular polarization as a function of wavelength in the range 1400 to 3200 A with a resolution of 40 A. The technique with which the polarization analysis is accomplished allows the photometrically calibrated spectrum of each object to be recovered simultaneously with a resolution of 4 A.

------- ASTRO, DAVIDSEN--

INVESTIGATION NAME- HOPKINS ULTRAVIOLET TELESCOPE (HUT)

NSSDC ID- ASTRO -02 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
ASTRONOMY

PERSONNEL

PI - A.F.	DAVIDSEN	JOHNS HOPKINS U
OI - P.D.	FELDMAN	JOHNS HOPKINS U
OI - H.W.	MOOS	JOHNS HOPKINS U
OI - R.C.	HENRY	JOHNS HOPKINS U
OI - W.G.	FASTIE	JOHNS HOPKINS U
OI - S.T.	DURRANCE	JOHNS HOPKINS U
OI - K.S.	LONG	JOHNS HOPKINS U

BRIEF DESCRIPTION

The general objective of the Hopkins Ultraviolet Telescope (HUT) is to obtain moderate resolution spectrophotometry of faint astronomical objects in the far-ultraviolet (900 to 1700 A). By extending the sensitivity range from 1200 A downward to the Lyman limit at 912 A where the interstellar medium becomes opaque in many directions, the HUT measurements supplement and complement information obtained with IUE and expected from the Space Telescope. HUT is used for a broad program of studies of the far and extreme UV spectra of quasars, galaxies, stars, nebulae, planets, and comets. The HUT consists of a 0.9-m f/2 primary mirror, which reflects light into a prime focus spectrograph. Its dimensions are 117 x 117 x 320 cm (or 370 cm with a 100-cm baffle); the mass is 480 kg, and 160 watts of power are required in normal operation. HUT can be used to observe objects brighter than 17th magnitude in the 900-1800 A range with a resolution of 3 A. In second order, it is also sensitive to the wavelength range between 450 and 900 A. The spectrograph consists of an aperture wheel assembly, a Rowland grating, and a photon-counting microchannel plate detector. The HUT detector uses a MCP intensifier with a CsI photocathode, fiber-optically coupled to a Reticon self-scanned linear photodiode array with 1024 diodes. The aperture wheel assembly, which has eight positions, is used both as a seal for the evacuated spectrograph and as a means of changing the entrance aperture of the spectrograph. Visible light that does not enter the slit is reflected through a transfer lens onto a SIT vidicon camera. For point sources, a 6-arc-second diameter aperture is normally used; apertures as large as 2 arc minutes are used on extended sources. A far-UV spectrum of a 14th magnitude star can be obtained in 20 minutes.

------- ASTRO, STECHER---

INVESTIGATION NAME- ULTRAVIOLET IMAGING TELESCOPE (UIT)

NSSDC ID- ASTRO -03 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
ASTRONOMY

PERSONNEL

PI - T.P.	STECHER	NASA-GSFC
OI - R.C.	BOHLIN	SPACE TELESCOPE SCI IN
OI - A.M.	SMITH	NASA-GSFC
OI - M.S.	ROBERTS	NATL RADIO ASTRON OBS
OI - H.R.	BUTCHER	KITT PEAK NATL OBS
OI - R.W.	O'CONNELL	U OF VIRGINIA

BRIEF DESCRIPTION

The objectives of the Ultraviolet Imaging Telescope (UIT) are to obtain images of faint objects in broad ultraviolet bands in the wavelength range 1250 to 2800 A. These images will be used to investigate the present stellar content and history of star formation in galaxies, the nature of spiral structure, and non-thermal sources in galaxies. Specific extragalactic problems to be addressed are the initial mass function for star formation, advanced stellar evolution in nearby galaxies, the nature of dust, extragalactic globular clusters, and integrated ultraviolet colors of nearby galaxies. Globular cluster evolution can be investigated from observations of the stellar content which will reach down to include the white dwarfs. In our own galaxy, there is a variety of interesting targets that can be better understood with ultraviolet imagery. Included in this category are supernovae remnants, reflection nebulae, dark nebulae, and planetary nebulae. In the solar system, the planets, their satellites, and comets are studied. The UIT is a 38-cm f/9 Ritchey-Cretien telescope with 1.8 arc second resolution and a 40 arc minute field of view. The dimensions are 80 cm x 80 cm x 333 cm, the mass is 400 kg, and 100 watts of power are required. The detectors are magnetically focused two-stage image intensifiers, which have phosphor outputs that are coupled to 70-mm film transports through fiber optics. Two cathodes, CsI and CsTe, will be used in combination with six filters for each cathode to accurately define bandpass. There is also a transmission grating, which can be used for low dispersion objective spectra. The telescope will obtain images of very faint objects in the ultraviolet that are similar in angular resolution to that obtainable in the visible wavelength from the ground.

**************************** ASTRO-C****************************

SPACECRAFT COMMON NAME- ASTRO-C
ALTERNATE NAMES-

NSSDC ID- ASTRO-C

LAUNCH DATE- 00/00/87 WEIGHT- 400. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S2-3

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PERSONNEL

PM - F.	MAKINO	ISAS
PS - S.	MIYAMOTO	OSAKA CITY U

BRIEF DESCRIPTION
This spacecraft houses the following three X-ray astronomy experiments: (1) large area proportional counter array, (2) all sky monitor, and (3) gamma-ray burst detector. The S/C provides a three-axis stabilized platform. The whole system weighs about 400 kg and is scheduled to be launched in 1987. The primary mission objective is the study of the time variability of X-rays from active galaxies such as Seyfert galaxies, BL Lac objects, and quasars. Accurate timing analysis of galactic X-ray sources is also planned.

------- ASTRO-C, MIYAMOTO--------------------------------------

INVESTIGATION NAME- ALL SKY X-RAY MONITOR (ASM)

NSSDC ID- ASTRO-C-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL
PI - S. MIYAMOTO OSAKA U

BRIEF DESCRIPTION
A set of wide FOV counters covers all of the sky by intermittent S/C revolutions.

------- ASTRO-C, NISHIMURA--------------------------------------

INVESTIGATION NAME- GAMMA-RAY BURST DETECTOR

NSSDC ID- ASTRO-C-03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - J. NISHIMURA ISAS

BRIEF DESCRIPTION
A set of a proportional counter and a scintillation counter measures the spectrum and time structure of X-ray bursts.

------- ASTRO-C, TANAKA--------------------------------------

INVESTIGATION NAME- LARGE AREA PROPORTIONAL COUNTERS (LAC)

NSSDC ID- ASTRO-C-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI - Y.	TANAKA	ISAS
PI - K.A.	POUNDS	U OF LEICESTER

BRIEF DESCRIPTION
These counters are low background and have a total area of 5000 sq cm. The experiment is implemented by collaboration of Japanese and UK X-ray astronomy groups.

**************************** COBE****************************

SPACECRAFT COMMON NAME- COBE
ALTERNATE NAMES- COSMIC BACKGROUND EXPL

NSSDC ID- COBE

LAUNCH DATE- 10/01/87 WEIGHT- 4500. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 103. MIN INCLINATION- 99. DEG
PERIAPSIS- 900. KM ALT APOAPSIS- 900. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - N.W.	BOGGESS	NASA HEADQUARTERS
PM - R.A.	MATTSON	NASA-GSFC
PS - J.C.	MATHER	NASA-GSFC

BRIEF DESCRIPTION
The purpose of the Cosmic Background Explorer (COBE) mission is to take precise measurements of the diffuse radiation between 1 micrometer and 10 mm over the whole celestial sphere. The following quantities are measured: (1) the spectrum of the 3 deg K radiation over the range 0.1 to 10 mm, (2) the isotropy of this radiation from 3.3 to 10 mm, and (3) the spectrum and angular distribution of diffuse infrared background radiation at wavelengths from 1 to 300 micrometers. The spacecraft consists of a base module to which an experiment module is attached. The experiment module contains a liquid-He Dewar filled with 87 kg of 1.6 deg K superfluid, with a conical sun shade/ground plane. The two modules rotate at one rpm about the axis of symmetry; the orientation of the 1-rpm spin axis is maintained anti-earth and at 94 deg to the sun-earth line. The spacecraft is a cylindrical 12-sided polyhedron that has solar panels on each side to supply an orbit-averaged power of 600 W. The communications and data handling system provides for control of all spacecraft and experiment functions. A NASA standard TDRSS transponder is used for command, telemetry, and tracking. Transmission of data is through an S-band phased-array antenna, either in real time or from a tape recorder. The spacecraft also houses a propulsion system that boosts it from its 300-km altitude shuttle parking orbit to the 900-km operational altitude. The operational orbit is dawn-dusk sun-synchronous so that the sun is always to the side and can be shielded from the instruments. With this orbit and the spin axis orientation, the instruments perform a complete scan of the celestial sphere every 6 months. The spin and symmetrical configuration eliminate local thermal effects that could bias the data. Low-conductance supports and multilayered insulation are used to decouple the spacecraft and experiment modules.

------- COBE, HAUSER--------------------------------------

INVESTIGATION NAME- DIFFUSE INFRARED BACKGROUND EXPERIMENT (DIRBE)

NSSDC ID- COBE -02 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - M.G.	HAUSER	NASA-GSFC
OI - J.C.	MATHER	NASA-GSFC
OI - D.T.	WILKINSON	PRINCETON U
OI - S.	GULKIS	NASA-JPL
OI - R.	WEISS	MASS INST OF TECH
OI - G.F.	SMOOT	LAWRENCE BERKELEY LAB

BRIEF DESCRIPTION
The diffuse IR background experiment (DIRBE) consists of a cryogenically cooled (to 2 deg K) multiband radiometer used to investigate diffuse infrared radiation from 1 to 300 micrometers. The instrument measures the absolute flux in 10 wavelength bands with a 1-deg field of view pointed 30 deg off the spin axis. Detectors (photoconductors) and filters for the 8 to 100 micrometer channels are the same as for the IRAS mission. Bolometers are used for the longest wavelength channel (120 to 300 micrometers). The DIRBE sensitivity will be better than 2E-12 W/(sq cm sr) in channels 1 to 3. Channels 4 to 8 will reach 6E-13 while channels 9 and 10, with their less sensitive bolometers but larger etendue, will reach 4E-12. These limits are achievable with existing detectors cooled to near the cryostat temperature of 1.6 deg K. The telescope is a well baffled, off-axis, Gregorian flux collector with re-imaging. The instrument weighs approximately 34 kg, uses 100 W and has a data rate of 1700 bps.

------- COBE, MATHER--------------------------------------

INVESTIGATION NAME- FAR INFRARED ABSOLUTE SPECTROPHOTOMETER (FIRAS)

NSSDC ID- COBE -01 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.C.	MATHER	NASA-GSFC
OI - R.	WEISS	MASS INST OF TECH
OI - M.G.	HAUSER	NASA-GSFC
OI - D.T.	WILKINSON	PRINCETON U
OI - G.F.	SMOOT	LAWRENCE BERKELEY LAB
OI - S.	GULKIS	NASA-JPL

BRIEF DESCRIPTION

The far-IR absolute spectrophotometer (FIRAS) is a cryogenically cooled polarizing Michelson interferometer used as a Fourier transform spectrometer. The instrument points along the spin axis and has a 7-deg field of view. This device measures the spectrum to a precision of 1/1000 of the peak flux at 1.7 mm for each 7-deg field of view on the sky (over the range 0.1 to 10 mm). The FIRAS uses a special flared trumpet horn flux collector having very low sidelobe levels and an external calibrator covering the entire beam; precise temperature regulation and calibration are required. The instrument has a differential input to compare the sky with an internal reference at 3 deg K. This feature provides immunity from systematic errors in the spectrometer, and contributes significantly to the ability to detect small deviations from a blackbody spectrum. The instrument weighs 60 kg, uses 84 W and has a data rate of 1200 bps.

------- COBE, SMOOT--

INVESTIGATION NAME- DIFFERENTIAL MICROWAVE RADIOMETERS (DMR)

NSSDC ID- COBE -03

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - G.F.	SMOOT	LAWRENCE BERKELEY LAB
OI - S.	GULKIS	NASA-JPL
OI - D.T.	WILKINSON	PRINCETON U
OI - J.C.	MATHER	NASA-GSFC
OI - M.G.	HAUSER	NASA-GSFC
OI - R.	WEISS	MASS INST OF TECH

BRIEF DESCRIPTION

The differential microwave radiometer (DMR) investigation uses three differential radiometers to map the sky at 31.4, 53, and 90 GHz. The radiometers are distributed around the outer surface of the cryostat. Each radiometer employs a pair of horn antennas viewing at 30 deg from the spin axis of the spacecraft, measuring the differential temperature between points in the sky separated by 60 deg. At each frequency there are two channels for dual polarization measurements for improved sensitivity and for reliability. Each radiometer is a microwave receiver whose input is switched rapidly between the two horn antennas, obtaining the difference in brightness of two fields of view 7 deg in diameter located 60 deg apart and 30 deg from the axis of the spacecraft. High sensitivity is achieved by temperature stabilization (at 300 deg K for 31.4 GHz and at 140 deg K for 53 and 90 GHz), by spacecraft spin, and by the ability to integrate over the entire year. Sensitivity to large-scale anisotropies is about 3E-5 deg K. The instrument weighs 120 kg, uses 114 W, and has a data rate of 500 bps.

*************************** CRRES***************************

SPACECRAFT COMMON NAME- CRRES
ALTERNATE NAMES- CHEM RELEASE+RAD EFF SAT

NSSDC ID- CRRES

LAUNCH DATE- 03/00/86 WEIGHT- 4383. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
UNITED STATES	DOD-USAF
UNITED STATES	DOD-NAVY

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- MIN INCLINATION- 28.5 DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 300. KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - J.	LYNCH	NASA HEADQUARTERS
PM - J.F.	STONE	NASA-MSFC
PS - D.L.	REASONER	NASA-MSFC

BRIEF DESCRIPTION

The Combined Release and Radiation Effects Satellite (CRRES) mission has two phases. For the first 45 to 60 days after release from the shuttle, Phase I, CRRES is in a circular earth orbit with an altitude of 300 km and a 28.5 deg inclination. In this phase the chemical release experiment and the Low Altitude Satellite Study of Ionospheric Irregularities (LASSII) take place in order to perform active experiments in the ionosphere and do basic plasma physics research. After this, CRRES is boosted to a 400 by 35,800 km elliptical geosynchronous transfer orbit with an inclination of 22.9 deg. In this orbit for more than one year, Phase II, CRRES operates four experiments to (1) map and characterize the dynamic behavior of the radiation belts, (2) study solar flare conversion and particle acceleration mechanisms through identification of isotopes, (3) expose state-of-the-art electronics to the radiation belt environment, and (4) verify performance and radiation hardness of advanced GaAs solar cells. CRRES weighs 4383 kg and has the shape of an octagonal prism that is 95 cm high and 2.6 m between opposite faces.

------- CRRES, HEPPNER--

INVESTIGATION NAME- CHEMICAL RELEASE EXPERIMENTS

NSSDC ID- CRRES -06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES

PERSONNEL
PI - J.P. HEPPNER NASA-GSFC

BRIEF DESCRIPTION

The chemical release experiment consists of up to 1000 kg of powdered and liquid chemicals in up to 40 ejectable canisters, to be released during Phase I of the CRRES mission. These releases have a large number of objectives which include learning more about upper atmosphere dynamics, magnetospheric and ionospheric physics, and space plasma physics.

------- CRRES, MULLEN--

INVESTIGATION NAME- SPACERAD (AFGL-701)

NSSDC ID- CRRES -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - E.G. MULLEN USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objectives of this experiment are to determine the radiation effects on advanced microelectronic devices and to map the inner and outer radiation belts to significantly improve existing radiation belt models. To do this, the experiment uses a microelectronics package, two dosimeters, a high energy (1 to 10 MeV) electron spectrometer, a medium energy (10 keV to 1 MeV) electron spectrometer, a low energy (10 eV to 30 keV) plasma analyzer, a relativistic (100 to 1200 MeV) proton spectrometer, a high energy (1 to 100 MeV) proton telescope, a heavy ion spectrometer measuring H to Fe ions in the energy range 0.5 to 500 keV, a search coil and a flux gate magnetometer on a 6.1-m boom, a Langmuir probe on two 50-m wire booms, and a passive plasma sounder on two 50-m booms. This experiment is operated during Phase II of the CRRES mission.

------- CRRES, REAGAN--

INVESTIGATION NAME- ENERGETIC PROTON AND HEAVY ION
ENVIRONMENT MEASUREMENTS (ONR-307)

NSSDC ID- CRRES -03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
IONOSPHERES AND RADIO PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - J.B. REAGAN LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The objectives of this experiment are to map and characterize the dynamic behavior of the earth's radiation belts and to understand the wave-particle interactions that cause particle precipitation and the disruption of ELF/VLF communications. To do this, the experiment uses an electron and proton spectrometer and a heavy ion mass spectrometer. This experiment is operated during Phase II of the CRRES mission.

------- CRRES, SIMPSON---

INVESTIGATION NAME- ISOTOPES IN SOLAR FLARES II (CRIE-HI)
(ONR-604)

NSSDC ID- CRRES -01

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
SOLAR PHYSICS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO
OI - M. GARCIA-MUNOZ U OF CHICAGC

BRIEF DESCRIPTION
The primary objectives of this investigation are (1) to study solar flare energy conversion and solar acceleration mechanisms, and (2) to monitor solar flare particle fluxes. Objective (1) is accomplished through the identification of isotopes whose presence is a measure of the amount of solar matter traversed during acceleration and the time spent within the solar corona. The instrument is a 15-element solid-state detector telescope used to resolve isotopes from H to Ni in the energy range 20 to 500 MeV/nucleon, and its view angle is 93 deg (full cone).

------- CRRES, SZUSZCZEWICZ----------------------------------

INVESTIGATION NAME- LOW ALTITUDE SATELLITE STUDY OF IONOSPHERIC IRREGULARITIES (NRL-701)

NSSDC ID- CRRES -05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - E.P. SZUSZCZEWICZ US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
The objectives of this experiment are to determine a comprehensive information profile on the ionospheric state, its condition of irregularity, its susceptibility to exploitation as a plasma laboratory in space, its disposition to modification and control, and its signal channel characteristics over the ELF to EHF domain. This experiment is operated during Phase I of the CRRES mission.

------- CRRES, TRUMBLE--

INVESTIGATION NAME- HIGH EFFICIENCY SOLAR PANEL (AFAPL-801)

NSSDC ID- CRRES -04

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - T. TRUMBLE USAF AEROPROPUL LAB

BRIEF DESCRIPTION
The objective of this experiment is to verify the performance and radiation hardness of advanced GaAs and Si solar cells. To do this, the experiment uses two solar cell panels (35.6 by 25.4 cm, and 20.3 by 12.7 cm), plus the necessary electronics and load banks. This experiment is operated during Phase II of the CRRES mission.

**************************** DMSP 5D-2/F10*********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F10
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F10
DMSP 5D-2/S10

NSSDC ID- DMSPF10

LAUNCH DATE- WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 96.89 MIN INCLINATION- 97.6 DEG
PERIAPSIS- 564. KM ALT APOAPSIS- 653. KM ALT

PERSONNEL
MG - R. RIVERS USAF SPACE DIVISION

BRIEF DESCRIPTION
DMSP 5D-2/F10 is one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program is to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consists of two satellites in sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 6.4-m-long spacecraft is separated into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization is controlled by a combination flywheel and magnetic control coil system so that sensors are maintained in the desired earth-looking mode. One feature is the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allows automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, is the primary data acquisition system that provides real-time or stored multi-orbit day-and-night visual and infrared imagery of clouds. A supplementary sensor package contains five special sensors: (1) special sensor M/T (SSM/T), a microwave temperature sounder, (2) special sensor B/X (SSB/X), an X-ray spectrometer, (3) special sensor I/ES (SSI/ES), an ionospheric/scintillation monitor, (4) special sensor J/4 (SSJ/4), a precipitating electron/ion spectrometer, and (5) special sensor M/I (SSM/I), a microwave imager. Either recorded or real-time data are transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data are read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data are read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F10, AFGWC STAFF----------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- DMSPF10-01

INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The Operational Linescan System (OLS) is the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment is to provide global, day/night observations of cloud cover and measurements of cloud temperature to support Department of Defense requirements for operational weather analysis and forecasting. The OLS employs a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which results in near-constant resolution throughout the sensor field of view. The radiometer operates in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produces, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There are four onboard recorders, and each has a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment is programmed so that LF and TS data are obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of 1 deg K. The LS data mode provides visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusts the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F10, AFGWC STAFF----------------------------

INVESTIGATION NAME- MICROWAVE TEMPERATURE SOUNDER (SSM/T)

NSSDC ID- DMSPF10-02

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The microwave temperature sounder is a seven-channel scanning radiometer which measures radiation in the 5- to 6-mm wavelength (50- to 60-GHz) region (specifically 50.5, 53.2, 54.35, 54.9, 58.4, 58.825, and 59.4 GHz) to provide data on vertical temperatures from the earth's surface to above 30 km. The SSM/T operates in the absorption band of molecular oxygen. By choosing frequencies with different absorption coefficients on the wing of the oxygen absorption band, a series of weighting functions peaking at preselected altitudes is obtained. The radiometer scans across the nadir track on seven scan positions and two calibration positions (cold sky and 300 deg K). The dwell time for the crosstrack and calibration positions is 2.7 s each. The total scan period is 32 s. The instrument has an instantaneous field of view of 12 deg and scans plus or minus 36 deg from nadir.

------- DMSP 5D-2/F10, AFGWC STAFF------------------------------

INVESTIGATION NAME- MICROWAVE IMAGER (SSM/I)

NSSDC ID- DMSPF10-05 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
OCEANOGRAPHY
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The purpose of the microwave imager is to provide day and night measurements of ocean surface wind speed, ice coverage and age, area and intensity of precipitation, cloud water content and land surface moisture. An estimate of atmospheric attenuation at each of the SSM/I sensor frequencies is also available. Microwave brightness temperatures are obtained with a 7-channel passive microwave radiometer operating at four frequencies, three with both vertical and horizontal polarization (19.35, 37.0, 85.5 GHz) and one with vertical polarization (22.23 GHz). The instrument scans across the track to gather data over an approximate 1400 km swath width with horizontal resolutions 13 to 50 km for different frequencies. The data can be used for tropical storm reconnaissance, ship routing in polar regions, agricultural weather, aircraft routing and refueling, etc.

------- DMSP 5D-2/F10, ROTHWELL--------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER
(SSJ/4)

NSSDC ID- DMSPF10-04 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION

The purpose of the precipitating electron/ion spectrometer is to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles are separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 3.00, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons are used to count the impinging electrons and ions in each energy band.

------- DMSP 5D-2/F10, SAGALYN--------------------------------

INVESTIGATION NAME- IONOSPHERIC/SCINTILLATION MONITOR
(SSI/ES)

NSSDC ID- DMSPF10-03 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION

The primary purpose of the ionospheric/scintillation monitor is to measure electron density and temperature, hydrogen and oxygen ion density and temperature, the power spectrum of plasma irregularities, and the velocity components of bulk plasma flow at satellite altitude. The experiment consists of four sensors. The electrostatic analyzer measures electron parameters at least 1 m above the satellite surface. The ion retarding potential analyzer has a body-mounted electrostatic trap with a circular aperture to measure ion density and temperature. The driftmeter uses a planar electrostatic ion trap with a four-quadrant collector. The current is measured in pairs of quadrants and differenced to provide plasma drift velocities. The scintillation monitor obtains power spectrum irregularities by an ion trap with electrometer and amplifiers capable of measuring dc and ac current from 20 Hz to 12 kHz.

*************************** DMSP 5D-2/F7*********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F7
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F7
DMSP 5D-2/S7

NSSDC ID- DMSP-F7

LAUNCH DATE- WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.4 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 817. KM ALT APOAPSIS- 839. KM ALT

PERSONNEL
MG - J. RIVERS USAF SPACE DIVISION

BRIEF DESCRIPTION

DMSP 5D-2/F7 is one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program is to provide global visual and infrared cloud cover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consists of two satellites in planned 830-km sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other one at local noon. The 6.4-m-long spacecraft is divided into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization is controlled by a combination flywheel and magnetic control coil system so sensors are maintained in the desired "earth-looking" mode. One feature is the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allows automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, is the primary data acquisition system that provides real-time or stored multi-orbit day-and-night visual and infrared imagery of the clouds. A supplementary sensor package contains seven special sensors: (1) special sensor H-2 (SSH-2), a temperature/humidity sounder, (2) special sensor M/T (SSM/T), a microwave temperature sounder, (3) special sensor B/S (SSB/S), an X-ray spectrometer, (4) special sensor I/E (SSI/E), an ionospheric plasma monitor, (5) special sensor J/4 (SSJ/4), a precipitating electron/ion spectrometer, (6) special sensor M (SSM), a magnetometer, and (7) special sensor J* (SSJ*), a space radiation dosimeter. Either recorded or real-time data are transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data are read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data are read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F7, AFGWC STAFF------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- DMSP-F7-01 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION

The Operational Linescan System (OLS) is the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment is to provide global day/night observations of cloud cover and measurements of cloud temperature to support Department of Defense requirements for operational weather analysis and forecasting. The OLS employs a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which results in near-constant resolution throughout the sensor field of view. The radiometer operates in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produces, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There are four onboard recorders, and each has a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment is programmed so that LF and TS data are obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of 1 deg K. The LS data mode provides visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusts the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D.

A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F7, AFGWC STAFF------------------------------

INVESTIGATION NAME- VERTICAL TEMPERATURE PROFILE RADIOMETER (SSH-2)

NSSDC ID- DMSP-F7-02

INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The objective of this experiment is to obtain vertical temperature and water vapor profiles of the atmosphere to support Department of Defense requirements in operational weather analysis and forecasting. The SSH-2 is a 16-channel sensor with one channel (800 cm-1) in the atmospheric window, one channel (835 cm-1) in the 12-micrometer atmospheric window, six channels (747, 725, 708, 695, 676, 668.5 cm-1) in the 15-micrometer CO2 absorption band, and eight channels (535, 408.5, 441.5, 420, 374, 397.5, 355, 353.5 cm-1) in the 22- to 30-micrometer rotational water vapor absorption band. The experiment consists of an optical system, detector and associated electronics, and a scanning mirror. The scanning mirror is stepped across the satellite subtrack, allowing the SSH-2 to view 25 separate columns of the atmosphere every 32 s over a cross track ground swath of 2000 km. While the scanning mirror is stopped at a scene station, the channel filters are sequenced through the field of view. The surface resolution is approximately 39 km at nadir. The radiance data are transformed into temperature and water vapor profiles by a mathematical inversion technique.

------- DMSP 5D-2/F7, AFGWC STAFF------------------------------

INVESTIGATION NAME- MICROWAVE TEMPERATURE SOUNDER (SSM/T)

NSSDC ID- DMSP-F7-03

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
This experiment is a seven-channel scanning radiometer which measures radiation in the 5- to 6-mm wavelength (50- to 60-GHz) region, (specifically 50.5, 53.2, 54.35, 54.9, 58.4, 58.825, and 59.4 GHz) to provide data on vertical temperatures from the earth's surface to above 30 km. The SSM/T provides temperature soundings at higher altitudes and over cloudy regions inaccessible to the SSH-2. By choosing frequencies with different absorption coefficients on the wing of the oxygen absorption band, a series of weighting functions peaking at preselected altitudes is obtained. The radiometer scans across the nadir track on seven scan positions and two calibration positions (cold sky and 300 deg K). The dwell time for the crosstrack and calibration positions is 2.7 s each. The total scan period is 32 s. The instrument has an instantaneous field of view of 12 deg and scans plus or minus 36 deg from nadir.

------- DMSP 5D-2/F7, AFGWC STAFF------------------------------

INVESTIGATION NAME- MAGNETOMETER (SSM)

NSSDC ID- DMSP-F7-06

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - AFGWC STAFF USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the magnetometer experiment is to obtain the components of magnetic field transverse to the main geomagnetic field at high latitudes which are associated with auroral field-aligned currents. The instrument consists of (1) a triaxial fluxgate magnetometer with a fixed Z-axis sensor and adjustable X- and Y-axis sensors and (2) a signal processor to provide data at a 10-nT resolution.

------- DMSP 5D-2/F7, AFGWC STAFF------------------------------

INVESTIGATION NAME- SPACE RADIATION DOSIMETER (SSJ*)

NSSDC ID- DMSP-F7-07

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - AFGWC STAFF USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the space radiation dosimeter is to measure the radiation dose above desired thresholds in silicon under aluminum shielding of four thicknesses representative of the Block 5D DMSP spacecraft. The instrument consists of four detectors mounted beneath hemispherical domes of different thicknesses. Each detector is a pin-diffused junction silicon diode. The dosimeter directly measures the ionization in the silicon cube caused by natural radiation and serves as an electron-proton spectrometer, thus yielding the fluences of energetic electrons and protons encountered in the orbit as a function of time. The energy thresholds for measured electrons by different dome sensors are 1.0, 2.5, 5.0 and 10.0 MeV, and those for protons are 20, 35, 51, and 75 MeV. The radiation dose and the energetic electron flux obtained in this experiment may result in an optimization of space radiation-shielding design to protect sensitive electronics components.

------- DMSP 5D-2/F7, ROTHWELL---------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- DMSP-F7-05

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the precipitating electron/ion spectrometer is to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles are separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 3.00, 4.40, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons are used to count the impinging electrons and ions in each energy band.

------- DMSP 5D-2/F7, SAGALYN---------------------------------

INVESTIGATION NAME- IONOSPHERIC PLASMA MONITOR (SSI/E)

NSSDC ID- DMSP-F7-04

INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The instrument consists of one spherical (SEA) and one planar (PEA) electrostatic analyzer. The SEA provides measurements of electron densities from 10 to 1.E6/cc in the temperature range from 200 to 15,000 deg K. The PEA measures ion temperatures in the same range as well as the average ion mass over the range 1 to 35 u. The PEA is oriented in the direction of the positive spacecraft velocity.

**************************** DMSP 5D-2/F8**********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F8
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP 5D-2/S8
DMSP-F8

NSSDC ID- DMSP-F8

LAUNCH DATE- WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.4 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 817. KM ALT APOAPSIS- 839. KM ALT

PERSONNEL
MG - J. RIVERS USAF SPACE DIVISION

BRIEF DESCRIPTION
DMSP 5D-2/F8 is one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program is to provide global visual and infrared cloudcover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consists of two satellites in planned 830-km sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 6.4-m-long spacecraft is separated into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization is controlled by a combination flywheel and magnetic control coil system so sensors are maintained in the desired "earth-looking" mode. One feature is the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allows automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, is the primary data acquisition system that provides real-time or stored, multi-orbit, day-and-night visual and infrared imagery of clouds. A supplementary sensor package contains three special sensors: (1) special sensor B/S (SSB/S), an X-ray spectrometer, (2) special sensor I/ES (SSI/ES), an ionospheric/scintillation monitor, and (3) special sensor J/4 (SSJ/4), a precipitating electron/ion spectrometer. Either recorded or real-time data are transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data are read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Center, Offutt AFB, Nebraska. Real-time data are read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D.A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F8, AFGWC STAFF------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- DMSP-F8-01 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The Operational Linescan System (OLS) is the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment is to provide global, day/night observations of cloud cover and measurements of cloud temperature to support Department of Defense requirements for operational weather analysis and forecasting. The OLS employs a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which results in near-constant resolution throughout the sensor field of view. The radiometer operates in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produces, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There are four onboard recorders, and each has a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment is programmed so that LF and TS data are obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of 1 deg K. The LS data mode provides visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusts the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D.A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August 1975.

------- DMSP 5D-2/F8, ROTHWELL---------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)

NSSDC ID- DMSP-F8-03 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The purpose of the precipitating electron/ion spectrometer is to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles are separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 3.00, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons are used to count the impinging electrons and ions in each energy band.

------- DMSP 5D-2/F8, SAGALYN----------------------------------

INVESTIGATION NAME- IONOSPHERIC/SCINTILLATION MONITOR (SSI/ES)

NSSDC ID- DMSP-F8-02 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the ionospheric/scintillation monitor is to measure electron density and temperature, ion density and temperature, the power spectrum of plasma irregularities, and the velocity components of bulk plasma flow at satellite altitude. The experiment consists of four sensors. The electrostatic analyzer measures electron parameters at least 1 m above the satellite surface. The ion retarding potential analyzer has a body-mounted electrostatic trap with a circular aperture to measure ion density and temperature. The driftmeter uses a planar electrostatic ion trap with a four-quadrant collector. The current is measured in pairs of quadrants and differenced to provide plasma drift velocities. The scintillation monitor obtains power spectrum irregularities by an ion trap with an electrometer and amplifiers capable of measuring dc and ac current from 20 Hz to 12 kHz.

**************************** DMSP 5D-2/F9*********************

SPACECRAFT COMMON NAME- DMSP 5D-2/F9
ALTERNATE NAMES- DMSP BLOCK 5D-2, DMSP-F9
DMSP 5D-2/S9

NSSDC ID- DMSP-F9

LAUNCH DATE- WEIGHT- 468. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS E

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 96.89 MIN INCLINATION- 97.6 DEG
PERIAPSIS- 564. KM ALT APOAPSIS- 653. KM ALT

PERSONNEL
MG - J. RIVERS USAF SPACE DIVISION

BRIEF DESCRIPTION
DMSP 5D-2/F9 is one of a series of meteorological satellites developed and operated by the Air Force under the Defense Meteorological Satellite Program (DMSP). This program, previously known as DAPP (Data Acquisition and Processing Program), was classified until March 1973. The objective of this program is to provide global visual and infrared cloud cover data and specialized environmental data to support Department of Defense requirements. Operationally, the program consists of two satellites in sun-synchronous polar orbits, with the ascending node of one satellite in early morning and the other at local noon. The 6.4-m-long spacecraft is separated into four sections: (1) a precision mounting platform (PMP) for sensors and equipment requiring precise alignment; (2) an equipment support module (ESM) containing the electronics, reaction wheels, and some meteorological sensors; (3) a reaction control equipment (RCE) support structure containing the third-stage rocket motor and supporting the ascent phase reaction control equipment; and (4) a 9.29-sq-m solar cell panel. The spacecraft stabilization is controlled by a combination flywheel and magnetic control coil system so sensors are maintained in the desired earth-looking mode. One feature is the precision-pointing accuracy of the primary imager to 0.01 deg provided by a star sensor and an updated ephemeris navigation system. This allows automatic geographical mapping of the digital imagery to the nearest picture element. The operational linescan system (OLS), built by Westinghouse, is the primary data acquisition system that provides real-time or stored multi-orbit day-and-night visual and infrared imagery of clouds. A supplementary sensor package contains five special sensors: (1) special sensor M/T (SSM/T), a microwave temperature sounder, (2) special sensor B/X (SSB/X), an X-ray spectrometer, (3) special sensor I/ES

(SSI/ES), an ionospheric/scintillation monitor, (4) special sensor J/4 (SSJ/4), a precipitating electron/ion spectrometer, and (5) special sensor M/I (SSM/I), a microwave imager. Either recorded or real-time data are transmitted to ground-receiving sites by two redundant S-band transmitters. Recorded data are read out to tracking sites located at Fairchild AFB, Wash., and Loring AFB, Maine, and relayed by SATCOM to Air Force Global Weather Central, Offutt AFB, Nebraska. Real-time data are read out at mobile tactical sites located around the world. A more complete description of the satellite can be found in the report, D. A. Nichols, "The defense meteorological satellite program," Optical Engineering, v. 14, n. 4, July-August, 1975.

------- DMSP 5D-2/F9, AFGWC STAFF------------------------------

INVESTIGATION NAME- OPERATIONAL LINESCAN SYSTEM (OLS)

NSSDC ID- DMSP-F9-01 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The Operational Linescan System (OLS) is the primary experiment on the DMSP Block 5D spacecraft. The purpose of this experiment is to provide global, day/night observations of cloud cover and measurements of cloud temperature to support Department of Defense requirements for operational weather analysis and forecasting. The OLS employs a scanning optical telescope driven in an oscillating motion, with optical compensation for image motion, which results in near-constant resolution throughout the sensor field of view. The radiometer operates in two ("light" and "thermal") spectral intervals: (1) visible and near infrared (0.4 to 1.1 micrometers) and (2) infrared (10.2 to 12.8 micrometers). The radiometer produces, with onboard processing, data in four modes: LF (light fine) and TF (thermal fine) data with a resolution of .56 km, and LS (light smoothed) and TS (thermal smoothed) data, with a resolution of 2.8 km. There are four onboard recorders, and each has a storage capability of 400 min of both LS and TS data or 20 min of LF and TF data. For direct readout to tactical sites, the experiment is programmed so that LF and TS data are obtained at night. The infrared data (TF and TS) cover a temperature range of 190 to 310 deg K with an accuracy of 1 deg K. The LS data mode provides visual data through a dynamic range from full sunlight down to a quarter moon. This mode also automatically adjusts the gain along the scan to allow useful data to be obtained across the terminator. Additional information on this experiment is contained in the report, D. A. Nichols, "Primary optical subsystems for DMSP Block 5D," Optical Engineering, v. 14, n. 4, July-August, 1975.

------- DMSP 5D-2/F9, AFGWC STAFF------------------------------

INVESTIGATION NAME- MICROWAVE TEMPERATURE SOUNDER (SSM/T)

NSSDC ID- DMSP-F9-02 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The microwave temperature sounder is a seven-channel scanning radiometer which measures radiation in the 5- to 6-mm wavelength (50- to 60-GHz) region (specifically 50.5, 53.2, 54.35, 54.9, 58.4, 58.825, and 59.4 GHz) to provide data on vertical temperatures from the earth's surface to above 30 km. The SSM/T operates in the absorption band of molecular oxygen. By choosing frequencies with different absorption coefficients on the wing of the oxygen absorption band, a series of weighting functions peaking at preselected altitudes is obtained. The radiometer scans across the nadir track on seven scan positions and two calibration positions (cold sky and 300 deg K). The dwell time for the crosstrack and calibration positions is 2.7 s each. The total scan period is 32 s. The instrument has an instantaneous field of view of 12 deg and scans plus or minus 36 deg from nadir.

------- DMSP 5D-2/F9, AFGWC STAFF------------------------------

INVESTIGATION NAME- MICROWAVE IMAGER (SSM/I)

NSSDC ID- DMSP-F9-05 INVESTIGATIVE PROGRAM
OPERATIONAL METEOROLOGICAL SYS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY

PERSONNEL
PI - AFGWC STAFF GLOBAL WEATHER CTR

BRIEF DESCRIPTION
The purpose of the microwave imager is to provide day and night measurements of ocean surface wind speed, ice coverage and age, area and intensity of precipitation, cloud water content and land surface moisture. An estimate of atmospheric attenuation at each of the SSM/I sensor frequencies is available. Microwave brightness temperatures are obtained with a 7-channel passive microwave radiometer operating at four frequencies, three with both vertical and horizontal polarization (19.35, 37.0, 85.5 GHz) and one with vertical polarization (22.23 GHz). The instrument scans a cross track to gather data over an approximate 1400-km swath width with horizontal resolutions 13 to 50 km for different frequencies. The data can be used for tropical storm reconnaissance, ship routing in polar regions, agricultural weather, aircraft routing and refueling, etc.

------- DMSP 5D-2/F9, ROTHWELL--------------------------------

INVESTIGATION NAME- PRECIPITATING ELECTRON/ION SPECTROMETER
(SSJ/4)

NSSDC ID- DMSP-F9-04 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PARTICLES AND FIELDS

PERSONNEL
PI - P.L. ROTHWELL USAF GEOPHYS LAB

BRIEF DESCRIPTION
The purpose of the precipitating electron/ion spectrometer is to measure fluxes and energies of electrons and ions precipitated into the upper atmosphere. Particles are separated by an electrostatic analyzer into 20 energy bands from 30 eV to 30 keV: (1) 10 high-energy levels, 0.948, 1.39, 2.04, 3.00, 4.40, 6.46, 9.48, 13.92, 20.44 and 30.00 keV; and (2) 10 low-energy levels, 3.00, 44.0, 64.6, 94.9, 139.2, 204.4, 300, 440, 646, and 948 eV. Channeltrons are used to count the impinging electrons and ions in each energy band.

------- DMSP 5D-2/F9, SAGALYN---------------------------------

INVESTIGATION NAME- IONOSPHERIC/SCINTILLATION MONITOR
(SSI/ES)

NSSDC ID- DMSP-F9-03 INVESTIGATIVE PROGRAM
OPERATIONAL ENVIRON. MONITORING

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB

BRIEF DESCRIPTION
The primary purpose of the ionospheric/scintillation monitor is to measure electron density and temperature, hydrogen and oxygen ion density and temperature, the power spectrum of plasma irregularities, and the velocity components of bulk plasma flow at satellite altitude. The experiment consists of four sensors. The electrostatic analyzer measures electron parameters at least 1 m above the satellite surface. The ion retarding potential analyzer has a body-mounted electrostatic trap with a circular aperture to measure ion density and temperature. The driftmeter uses a planar electrostatic ion trap with a four-quadrant collector. The current is measured in pairs of quadrants and differenced to provide plasma drift velocities. The scintillation monitor obtains power spectrum irregularities by an ion trap with electrometer and amplifiers capable of measuring dc and ac current from 20 Hz to 12 kHz.

***************************** ERBS*****************************

SPACECRAFT COMMON NAME- ERBS
ALTERNATE NAMES- AEM-D, EARTH RAD BUDGET SAT
ERBS-A

NSSDC ID- ERBS-A

LAUNCH DATE- 08/29/84 WEIGHT- 170. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 96.6 MIN INCLINATION- 46. DEG
PERIAPSIS- 600. KM ALT APOAPSIS- 600. KM ALT

PERSONNEL
MG - D.S. DILLER NASA HEADQUARTERS
SC - R.A. SCHIFFER NASA HEADQUARTERS
PM - C.L. WAGNER, JR. NASA-GSFC
PS - R. CURRAN NASA HEADQUARTERS

BRIEF DESCRIPTION

The Earth Radiation Budget Satellite-A (ERBS) is a 2-yr mission to gather required radiation budget data, aerosol data, and ozone data to assess climate change and ozone depletion. The experiments are the earth radiation budget experiment (ERBE) and the stratospheric aerosol and gas experiment II (SAGE II). The ERBE will be also carried on two TIROS-N/NOAA series missions.

------- ERBS, COOPER---

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- ERBS-A -01

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
EM - J.E. COOPER NASA-LARC
TL - B.R. BARKSTROM NASA-LARC

BRIEF DESCRIPTION

The Earth Radiation Budget Experiment (ERBE) is designed to measure the energy exchange between the earth-atmosphere system and space. These measurements are important for climate prediction and for developing statistical relationships between regional weather and radiation budget anomalies. The earth radiation budget experiments will be flown on both TIROS-N/NOAA series and ERBS satellites to measure global, zonal, and regional budgets on monthly time scales, equator-to-pole gradients, and monthly diurnal variations of regional scales. The ERBE consists of eight channels distributed within two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBE-S) instrument. The non-scanner is a five-channel radiometer. Four channels are primarily earth-viewing, but upon command can be pointed toward the sun for periodic calibration. The fifth channel is fixed for continuous observation of the sun for calibration. Two of the four gimbaled sensors are wide-angled and view the entire earth from limb to limb, approximately 135 deg. These detectors have broadband spectral responses varying from 0.2 micrometer to over 50 micrometers. Channel 1 makes total radiation measurements while channel 2, with its filter attached, makes measurements over the shortwave spectral band characterized by the Suprasil-W dome filter which cuts off at 5 micrometers. The remaining two gimbaled sensors are medium field-of-view channels with an 88-deg field of view, equivalent to a Texas-size footprint. Channel 3 measures total radiation while channel 4, placed under a Suprasil-W dome, measures the shortwave spectral band. The earth-emitted longwave radiation component is determined by subtracting the shortwave channel from the total channel. The solar channel (5) has a 10-deg field of view measuring the total solar spectral range of the sun. The scanner instrument is a small spatial resolution (FOV equals 3 deg diameter) scanning radiometer containing three separate channels (6,7,8). Channel 6 isolates the shortwave spectral interval (0.2 to 5 micrometers). Channel 7 measures the longwave spectral region (5 to 50 micrometers), and channel 8 measures total radiation (0.2 to 50 micrometers). All three sensors are located within a continuously rotating scan drum which scans the FOV across track sequentially from horizon to horizon. The scanner also views the sun for calibration. Additional information can be obtained from "System considerations for an earth radiation budget scanning radiometer," and "The earth radiation budget satellite system of the early 1980's," Fourth Symp. on Meteorol. Obs. and Instrum., Denver, Colo., April 10-14, 1978. See Appendix B for a list of ERBE investigators.

------- ERBS, MCCORMICK---------------------------------------

INVESTIGATION NAME- STRATOSPHERIC AEROSOL AND GAS (SAGE)

NSSDC ID- ERBS-A -02

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
UPPER ATMOSPHERE RESEARCH
ATMOSPHERIC PHYSICS

PERSONNEL
PI - M.P. MCCORMICK NASA-LARC
OI - J.E. PLEASANTS NASA-LARC

BRIEF DESCRIPTION

The SAGE sensor is a multi-spectral channel radiometer which measures the extinction of solar radiation intensity during solar occultation. As the spacecraft emerges from the earth's shadow during each orbit, the sensor acquires the sun and measures the solar intensity in wavelength bands centered between 0.385 and 1.0 micrometers as it scans the sun vertically. As the spacecraft continues in orbit, the line of sight from the spacecraft to the rising sun scans the earth's atmosphere, resulting in a measurement of the attenuated solar intensity at different atmospheric layers. The procedure then is repeated in a reverse sense during spacecraft sunset. Each sunrise or sunset event is monitored from the top of the clouds to approximately 150 km above the earth's surface. The sensor has an instantaneous field of view of approximately 0.5 km measured at the horizon for a 600-km orbit. The dynamic range of each radiometric channel is approximately 4000, and the uncertainty in any radiometric measurement is specified to be less than 0.1% of the unattenuated solar intensity (the sensor is partially self-calibrating in that a measurement of the unattenuated solar intensity is made prior to each spacecraft sunset and following each spacecraft sunrise). Furthermore, zero intensity levels are reached every time the elevation mirror scans off the sun. The instrument module consists of optical and electronic subassemblies mounted side by side. The optical subassembly consists of a flat scanning mirror, Cassegrain optics, and a detector package. The entire optical subassembly is gimbaled in azimuth. The azimuth servo employs sun sensors driven to null on the center of the sun to a tolerance of plus or minus 1 arc min. At the beginning of a sunrise or sunset event, the instrument slews in azimuth to a position to acquire the sun. Upon acquisition in azimuth, the mirror servo scans in elevation until the sun is acquired. The scan range is then reduced to scanning back and forth across the solar image only. The solar input is reflected from the scan mirror through the Cassegrain telescope, which produces a solar image upon the science detector aperture. This image is scanned across the aperture by the motion of the scan mirror. The radiation through the aperture is dispersed, and the beams representing the wavelength bands are then collected and applied to silicon pin diode detectors. The outputs of the detectors are fed to signal-conditioning amplifiers whose outputs go to the PCM encoder. The PCM encoder multiplexes and digitizes the signals and then transfers the digital data to the ERBS data system. The radiometric data for each wavelength channel are sampled 64 times per second or approximately 4 times per kilometer of tangent altitude, and are digitized to 12 bits. These data, plus science supporting data and instrument module housekeeping data, total approximately 6 kbps.

*************************** EUVE******************************

SPACECRAFT COMMON NAME- EUVE
ALTERNATE NAMES- EXTREME UV EXPLORER, BERKSAT

NSSDC ID- EUVE

LAUNCH DATE- 09/00/87 WEIGHT- 400. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 95.0 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 550. KM ALT APOAPSIS- 550. KM ALT

PERSONNEL
MG - M.B. WEINREB NASA HEADQUARTERS
SC - E.J. WEILER NASA HEADQUARTERS
PM - J. KING NASA-JPL
PS - C.S. BOWYER U OF CALIF, BERKELEY

BRIEF DESCRIPTION

Extreme-Ultraviolet Explorer (EUVE) is a spinning spacecraft designed to rotate about the earth/sun line. The spacecraft objective is to carry out a full-sky survey in the extreme ultraviolet (EUV) range of the spectrum, from 100 to 1000 A, for the purpose of discovering and studying UV sources radiating in this region and for analyzing effects of the interstellar medium on the radiation from these sources. The search is accomplished by three EUV telescopes, each sensitive to a different band within the EUV range. A fourth telescope performs a high sensitivity search of a limited sample of the sky in a single EUV band. In six months, the entire sky is scanned at a sensitivity level comparable to existing surveys in other more traditional astronomical bandpasses. A moderate resolution spectroscopy option is also under consideration; this covers the band from 80 to 600 A and provides spectra of at least the 100 brightest EUV sources.

------- EUVE, BOWYER---

INVESTIGATION NAME- EXTREME ULTRAVIOLET FULL-SKY SURVEY

NSSDC ID- EUVE -01

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL
PI - C.S. BOWYER U OF CALIF, BERKELEY
OI - R. MALINA U OF CALIF, BERKELEY
OI - F. PARESCE U OF CALIF, BERKELEY
OI - F. HEETDERKS U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This investigation is designed to perform a full-sky survey, searching for EUV sources. The instrument package contains four Wolter-Schwarzschild grazing-incidence telescopes (with EUV thin-film filters) to collect and to isolate radiation. The detector system for each telescope is a resistor anode image converter (RANICON), consisting of a microchannel plate, a resistor, and detector amplifiers designed to produce images of sky fields in selected wavelength ranges. Three telescopes are designed to operate at right angles to the spin axis and to carry out the sky survey, with bandpass filters (tentatively) for the wavelength ranges 80 to 190 A, 170 to 330 A, and 500 to 750 A. These three telescopes point perpendicular to the earth-sun line and sweep out a great circle in the sky with each S/C revolution. As the earth moves around the sun, the great circle is shifted by 1 deg each day and so the entire celestial sphere is surveyed in six months. The fourth telescope points in the anti-solar direction, within the earth's shadow cone. In this limited direction, the He II 304 A background is almost completely absent, and thus higher sensitivity can be obtained for observing selected interesting objects.

*************************** EXOS-C***************************

SPACECRAFT COMMON NAME- EXOS-C
ALTERNATE NAMES- EXOSPHERIC SAT. C

NSSDC ID- EXOS-C

LAUNCH DATE- 02/00/84 WEIGHT- 210. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 98. MIN INCLINATION- 74. DEG
PERIAPSIS- 320. KM ALT APOAPSIS- 1000. KM ALT

PERSONNEL

PM - T.	ITOH	ISAS
PS - H.	OYA	U OF TOHOKU
PS - T.	OGAWA	ISAS

BRIEF DESCRIPTION

The purpose of this mission is to perform remote sensing of the minor constituents of the middle atmosphere and to study the wave-particle interactions in the ionospheric plasma in the South American anomaly and the auroral zones. This mission will be part of the Middle Atmosphere Program (MAP).

------- EXOS-C, DOKE--

INVESTIGATION NAME- MONITOR OF HIGH ENERGY PARTICLES

NSSDC ID- EXOS-C -08 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.	DOKE	WASEDA U
OI - H.	MURAKAMI	RIKKYO U
OI - K.	NAGATA	TAMAGAWA U

BRIEF DESCRIPTION

This experiment monitors the energy spectra and flux of electrons, protons and alpha particles with energies greater than 50 keV using solid-state detectors.

------- EXOS-C, MAKINO--

INVESTIGATION NAME- LIMB SCANNING IR RADIOMETER

NSSDC ID- EXOS-C -01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - T.	MAKINO	RIKKYO U
OI - H.	YAMAMOTO	RIKKYO U
OI - H.	SEKIGUCHI	RIKKYO U

BRIEF DESCRIPTION

This investigation uses a limb scanning radiometer to measure the 1.27-micrometer atmospheric band to deduce the ozone density in the 70- to 90-km altitude range.

------- EXOS-C, MUKAI---

INVESTIGATION NAME- PRECIPITATING PARTICLE ENERGY ANALYZER

NSSDC ID- EXOS-C -04 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.	MUKAI	ISAS
OI - H.	KUBO	ISAS
OI - T.	ITOH	ISAS
OI - K.	HIRAO	ISAS
OI - N.	KAYA	KOBE U
OI - H.	MATSUMOTO	KOBE U

BRIEF DESCRIPTION

The purpose of this experiment is to measure the energy spectrum of precipitating electrons and protons with electrostatic analyzers.

------- EXOS-C, NAKAMURA--------------------------------------

INVESTIGATION NAME- INFRARED SOLAR SPECTROMETER

NSSDC ID- EXOS-C -03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - Y.	NAKAMURA	ISAS
OI - A.	MATSUZAKI	ISAS
OI - T.	ITOH	ISAS

BRIEF DESCRIPTION

This investigation uses an infrared (IR) spectrometer to measure the limb absorption of the solar spectrum to obtain profiles of stratospheric water vapor, methane, carbon dioxide, and nitrous oxide.

------- EXOS-C, OGAWA---

INVESTIGATION NAME- ULTRAVIOLET SPECTROMETER

NSSDC ID- EXOS-C -02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - T.	OGAWA	ISAS
OI - K.	SUZUKI	ISAS
OI - N.	IWAGAMI	ISAS

BRIEF DESCRIPTION

This investigation involves the measurement of backscattered ultraviolet (2500-3500 A) to obtain profiles of the ozone density in the 25- to 60-km altitude range.

------- EXOS-C, OYA---

INVESTIGATION NAME- TOPSIDE PLASMA SOUNDER

NSSDC ID- EXOS-C -06 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - H.	OYA	U OF TOHOKU
OI - A.	MORIOKA	U OF TOHOKU
OI - T.	YOSHINO	U OF ELECTRO-COMMUN

BRIEF DESCRIPTION

This experiment uses a topside sounder with a receiver that can measure ionospheric electron density profiles, radio waves emanating from the planets and the higher harmonic emissions from terrestrial electric power lines.

------- EXOS-C, TAKAGI--

INVESTIGATION NAME- SOLAR IMAGE-RADIOMETER

NSSDC ID- EXOS-C -05 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.	TAKAGI	NAGOYA U
OI - Y.	KONDO	NAGOYA U

BRIEF DESCRIPTION

This investigation uses a solar image radiometer in several visible and near-infrared bands to measure the limb absorption of the solar spectrum to obtain vertical profiles of stratospheric aerosols and ozone.

------- EXOS-C, TAKAHASHI---

INVESTIGATION NAME- PLASMA PROBES

NSSDC ID- EXOS-C -07

INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - T.	TAKAHASHI	U OF TOHOKU
OI - H.	OYA	U OF TOHOKU
OI - K.	HIRAO	ISAS
OI - K.	OYAMA	ISAS

BRIEF DESCRIPTION

This experiment uses plasma probes to measure electron density and electron temperature.

*************************** GALILEO ORBITER*******************

SPACECRAFT COMMON NAME- GALILEO ORBITER
ALTERNATE NAMES- JUPITER ORBITER PROBE, JOP
GALILEO

NSSDC ID- JOPO

LAUNCH DATE- 05/30/86 WEIGHT- 103. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- JUPITER ORBITER
ORBIT PERIOD- 86000. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 320000. KM ALT APOAPSIS- 1.95E+7 KM ALT

PERSONNEL

MG - D.R.	MCCULLAR	NASA HEADQUARTERS
SC - R.E.	MURPHY	NASA HEADQUARTERS
PM - J.	CASANI	NASA-JPL
PM - W.S.	SHIPLEY	NASA-JPL
PS - T.V.	JOHNSON	NASA-JPL

BRIEF DESCRIPTION

The Galileo mission consists of a Jupiter orbiter and a separate Jupiter atmospheric entry probe. The Orbiter will be launched from the Shuttle with a Centaur upper stage and will use a Mars-powered flyby. The Orbiter serves as a relay link to earth from the Probe. The Orbiter power sources are two modular selenide isotope generators (SIG) that provide dc current at 28 V to all subsystems and a total power of 500 W. Temperature is controlled by radioisotope heater units (RHUs). Telemetry is by a two-channel downlink, one for continuous transmission of fixed format (6.25 bps) on the S-band, and the other for real-time playback data at rates between 2 and 128 kbs on the X-band.

------- GALILEO ORBITER, ANDERSON------------------------------

INVESTIGATION NAME- GRAVITY, CELESTIAL MECHANICS AND RADIO PROPAGATION

NSSDC ID- JOPO -11

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
RADIO PHYSICS
PLANETARY ATMOSPHERES
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

TL - J.D.	ANDERSON	NASA-JPL
TL - H.T.	HOWARD	STANFORD U
TM - V.R.	ESHLEMAN	STANFORD U
TM - F.B.	ESTABROOK	NASA-JPL
TM - A.J.	KLIORE	NASA-JPL
TM - R.	WOO	NASA-JPL
TM - G.F.	LINDAL	NASA-JPL

BRIEF DESCRIPTION

The purposes of this investigation are (1) to investigate the high-altitude neutral atmosphere of Jupiter, using occultation techniques to measure pressure, temperature, molecular weight, and turbulence; (2) to investigate the ionosphere of Jupiter and its interaction with the magnetosphere, using occultation techniques to determine electron number density and plasma scale height; (3) to determine the sizes and shapes of the Galilean satellites; (4) to search for and characterize atmospheres and ionospheres of the Galilean satellites and study their interactions with the Jovian magnetosphere; (5) to determine the structure of the gravitational field of Jupiter from Doppler tracking; (6) to determine the masses and gravitational moments of the Galilean satellites and improve knowledge of their orbits; (7) to study turbulence, electron density fluctuations, and winds in the Jovian ionosphere; (8) to investigate microwave emission from the atmosphere and trapped radiation belts of Jupiter; and (9) to search for VLF gravitational waves incident on the solar system to a level of strain amplitude approximately 1.E-15. Investigators use the signals transmitted between the earth and the Orbiter and between the Probe and the Orbiter to carry out their investigations. The earth-Orbiter communications use an S-band (2115 MHz) uplink and transponder to generate a coherent S-X band downlink (2297 MHz and 8422 MHz), using an earth-oriented 5-m dish antenna. The frequency stability is approximately 1 part in 1.E+11. The Probe-to-Orbiter transmission is at a frequency between 1 and 2 GHz, using a wide-band receiver and body-fixed 1-m dish antenna. Following the probe mission, this receiver and antenna are available to carry out additional investigations. Individual investigators and their investigations are listed in Appendix B.

------- GALILEO ORBITER, BELTON------------------------------

INVESTIGATION NAME- IMAGING SCIENCE

NSSDC ID- JOPO -10

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY ATMOSPHERES

PERSONNEL

TL - M.J.S.	BELTON	KITT PEAK NATL OBS
TM - C.D.	ANGER	U OF CALGARY
TM - C.R.	CHAPMAN	PLANETARY SCIENCE INST
TM - M.E.	DAVIES	RAND CORP
TM - R.	GREELEY	ARIZONA STATE U
TM - R.	GREENBERG	PLANETARY SCIENCE INST
TM - J.W.	HEAD, 3RD	BROWN U
TM - G.	NEUKUM	U OF MUNICH
TM - G.	SCHUBERT	U OF CALIF, LA
TM - C.B.	PILCHER	U OF HAWAII
TM - J.	VEVERKA	CORNELL U
TM - M.H.	CARR	US GEOLOGICAL SURVEY
TM - J.B.	WELLMAN	NASA-JPL

BRIEF DESCRIPTION

The purpose of this investigation is to study Jupiter and its satellites through multi-spectral, high-resolution imaging with a charge-coupled device (CCD) camera. Specific science objectives are (1) to investigate the structure of the Jovian atmosphere and clouds through multi-spectral photometry and polarimetry; (2) to investigate the dynamics of the Jovian atmosphere through synoptic imaging of cloud structures; (3) to measure the sizes and shapes of the Galilean satellites and determine their librations; (4) to map the surface morphology of the Galilean satellites at a spatial resolution better than 1 km and over a range of viewing and lighting angles in order to investigate the geological processes that have acted on their surfaces; (5) to use multispectral imaging to identify and map the distribution of ices and minerals on the surfaces of the satellites; (6) to search for auroral or other atmospheric emission on the night side of Jupiter, on the satellites, and in circum-Jovian space; and (7) to seek targets of opportunity for imaging the irregular satellites of Jupiter. The imaging investigation uses a single camera consisting of a 1500-nanometer focal length catadioptric telescope imaging onto an 800 x 800 element CCD. Optics are fused silicon. An eight-position filter wheel (filters not specified) is used. The spectral response is 350 to 1100 nanometers, the resolution is 20 microrad per line pair, the field of view is 0.46 deg, the minimum exposure is 5 milliseconds, and the maximum frame rate is about 1/min. The linear dynamic range exceeds 1000, with 8 bit/pixel encoding. The instrument is mounted on the scan platform of the Orbiter. The total mass is 23 kg and the total continuous power is 23 W. Individual investigators and their investigations are listed in Appendix B.

------- GALILEO ORBITER, CARLSON------------------------------

INVESTIGATION NAME- NEAR INFRARED MAPPING SPECTROSCOPY (NIMS)

NSSDC ID- JOPO -01

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
GEODESY AND CARTOGRAPHY

PERSONNEL

PI - R.W.	CARLSON	NASA-JPL
OI - T.V.	JOHNSON	NASA-JPL
OI - G.E.	DANIELSON	CALIF INST OF TECH
OI - F.P.	FANALE	U OF HAWAII
OI - H.H.	KIEFFER	US GEOLOGICAL SURVEY
OI - J.S.	LEWIS	MASS INST OF TECH
OI - H.	MASURSKY	US GEOLOGICAL SURVEY
OI - D.L.	MATSON	NASA-JPL
OI - T.B.	MCCORD	U OF HAWAII
OI - L.A.	SODERBLOM	US GEOLOGICAL SURVEY
OI - F.W.	TAYLOR	OXFORD U

BRIEF DESCRIPTION

The purposes of this investigation are (1) to map the mineral distribution on the surfaces of the satellites of Jupiter at a spatial resolution of 5 to 30 km, (2) to identify the individual phases and mixtures present, (3) to relate the mineralogical provinces to geological provinces observed with the imaging system, and (4) to map regions of the Jovian atmosphere over a wide range of phase angles to determine cloud morphology and vertical structure. The instrument is a high-speed scanning reflection-grating spectrometer mounted on the scan platform of the Orbiter. Imaging is done by a 20-cm aperture telescope onto an InSb detector array in order to produce multi-spectral line images of sources without external scanning. Angular resolution is 0.5 millirad and the spectral range is 0.9 to 3.0 micrometers in 144 channels at a spectral resolution of 0.03 micrometers. The total mass of the spectrometer is 11 kg and the total power is 8 W.

------- GALILEO ORBITER, FANALE-------------------------------

INVESTIGATION NAME- FORMATION AND EVOLUTION OF THE GALILEAN SATELLITES (IDS)

NSSDC ID- JOPO -12

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL

PI - F.P.	FANALE	U OF HAWAII

BRIEF DESCRIPTION

This investigation utilizes Galileo Orbiter remote sensing data, primarily from the imaging, NIMS, and UVS investigations, to study the formation conditions and subsequent geological evolution of the Galilean satellites, including the interaction of these bodies with their space environments.

------- GALILEO ORBITER, FRANK-------------------------------

INVESTIGATION NAME- PLASMA (PLS)

NSSDC ID- JOPC -04

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - F.V.	CORONITI	U OF CALIF, LA
OI - V.M.	VASYLIUNAS	MPI-AERONOMY

BRIEF DESCRIPTION

The purposes of this investigation are (1) to establish the sources of Jovian plasma; (2) to investigate plasma interactions with the Jovian satellites; (3) to investigate the role of plasma as a source for energetic charged particles in the radiation zones; (4) to determine the nature of the equatorial current sheet; and (5) to evaluate the roles of magnetic merging, co-rotational forces and field-aligned currents in the dynamics of the Jovian magnetosphere. The investigation uses an electrostatic analyzer (quadrispherical LEPEDEA) in determining differential energy spectra of both positive ions and electrons with essentially complete angular coverage in 63 contiguous passbands. The fractional energy resolution is 0.17 and the range is 1 eV to 50 keV. Three miniature mass spectrometers at the analyzer exit aperture are used for mass analysis, with a fractional mass resolution of 0.18, sufficient to identify H+, He+ He++, Na+, K+, and S+. The analyzer is mounted on a short boom on the spinning section of the Orbiter. The total mass (excluding the boom) is 6.9 kg, and the total power is 7.2 W.

------- GALILEO ORBITER, GIERASCH-------------------------------

INVESTIGATION NAME- JOVIAN ATMOSPHERIC DYNAMICS (IDS)

NSSDC ID- JOPO -13

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - P.J.	GIERASCH	CORNELL U

BRIEF DESCRIPTION

The objective of this investigation is to utilize data from the Imaging and NIMS investigations on the Orbiter, together with in situ atmospheric data from the Probe, to study the dynamics of the atmosphere, with particular emphasis on the nature and cause of the horizontal temperature gradients beneath the clouds.

------- GALILEO ORBITER, GRUEN-------------------------------

INVESTIGATION NAME- DUST (DDS)

NSSDC ID- JOPO -09

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST
PARTICLES AND FIELDS

PERSONNEL

PI - E.	GRUEN	MPI-NUCLEAR PHYS
OI - F.	FECHTIG	MPI-NUCLEAR PHYS
OI - J.	KISSEL	MPI-NUCLEAR PHYS
OI - B.A.	LINDBLAD	LUND OBS
OI - G.E.	MORFILL	MPI-EXTRATERR PHYS
OI - H.A.	ZOOK	NASA-JSC
OI - M.S.	HANNER	NASA-JPL

BRIEF DESCRIPTION

The purpose of this investigation is to determine the physical and dynamical properties of small dust particles in the Jovian environment, with emphasis on the interaction of dust with the magnetosphere and satellite surfaces. Parameters measured include mass, direction of motion, and charge. The instrument package consists of entrance grids for sensing charge, an impact plasma detector to measure pulse height and rise time for both electrons and ions generated by impact, and appropriate electronics. Mass and velocity are derived from measurements by empirical relationships determined in ground-based calibrations. The impact rate range is 1.E-7 to 1.E+2 per second, the particle mass range is 1.E-16 to 1.E-6 g, and the charge range is 1.E-14 to 1.E-10 C. The instrument package is mounted on the spinning section of the Orbiter. Its total mass is 4.2 kg, and the total power is 1.7 W.

------- GALILEO ORBITER, GURNETT-------------------------------

INVESTIGATION NAME- PLASMA WAVE (PWS)

NSSDC ID- JOPO -07

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - R.E.	GENDRIN	CNET
OI - C.F.	KENNEL	U OF CALIF, LA
OI - F.L.	SCARF	TRW SYSTEMS GROUP
OI - S.D.	SHAWHAN	U OF IOWA

BRIEF DESCRIPTION

The purposes of this investigation are to measure the varying electric and magnetic fields in the Jovian plasma in order to determine the characteristics and origin of plasma waves in the magnetosphere and to analyze various wave-particle interaction phenomena in the magnetospheric interactions. The instrument package includes a 2-m electric dipole antenna for electric field measurement and two 27-cm search coil magnetometers, one for low-frequency (less than 10 kHz) and the other for high-frequency magnetic field measurements. There is also a 20-channel spectrum analyzer covering the range 5.6 Hz to 311 kHz, with 4 channels per decade and a high-data-rate waveform receiver to be used during selected periods. Sensors are mounted as a single unit in a boom approximately 2-m long on the spinning section of the Orbiter. Electronics are mounted near the base of the boom. The total mass of the package is 3.1 kg (1.2 kg for the sensors and 1.9 kg for electronics). The total power is 2.8 W.

------- GALILEO ORBITER, HANSEN-------------------------------

INVESTIGATION NAME- PHOTOPOLARIMETERY/RADIOMETER (PPR)

NSSDC ID- JOPO -08

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.E.	HANSEN	NASA-GISS
OI - A.A.	LACIS	NASA-GISS
OI - D.L.	COFFEEN	NASA-GISS
OI - P.H.	STONE	MASS INST OF TECH
OI - L.	TRAVIS	NASA-GISS
OI - W.-C.	WANG	CALIF INST OF TECH
OI - Y.L.	YUNG	CALIF INST OF TECH

BRIEF DESCRIPTION

The purposes of the Photopolarimeter Radiometer (PPR) investigation are to determine the cloud and haze properties (vertical and horizontal distribution and microstructure) and radiation budget (including vertical profile of solar heating) of Jupiter and to investigate the photometric and thermal properties of satellite surfaces. The instrument is a 10-cm Dall-Kirkham telescope followed by a 16-position filter wheel, giving polarimetry in three spectral bands from 410 to 1050 nanometers and photometry in seven spectral bands from 560 to 890 nanometers. Silicon photodiodes are used for photopolarimetry and a thermopile detector for radiometry. Measurement accuracy is 0.1% absolute polarimetry; 1% relative photometry and 3% absolute photometry; 1% relative radiometry and 5% absolute radiometry. The instrument is mounted on the Orbiter scan platform. The total mass is 3.6 kg and the total power is 7.5 W.

------- GALILEO ORBITER, HORD----------------------------------

INVESTIGATION NAME- ULTRAVIOLET SPECTROSCOPY (UVS)

NSSDC ID- JOPO -02

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - C.W.	HORD	U OF COLORADO
OI - C.A.	BARTH	U OF COLORADO
OI - A.L.	LANE	NASA-JPL
OI - A.I.	STEWART	U OF COLORADO
OI - G.E.	THOMAS	U OF COLORADO
OI - R.E.	STEELE	U OF COLORADO

BRIEF DESCRIPTION

This investigation studies (1) the composition and structure of the high neutral atmospheres of Jupiter and the Galilean satellites to determine atmospheric loss rates from satellites, (2) mixing ratios on Jupiter of NH3 and of UV-active trace constituents, and (3) auroral emissions and interactions between atmospheres and the Jovian plasmasphere. Instrumentation consists of a Fastie-Ebert UV spectrometer (wavelength range of 110 to 430 nanometers) with a Cassegrain telescope having a 5-cm aperture, 25-cm focal length, and a programmable grating. The spectrum is measured with microchannel detectors at a FOV resolution of 1.8 km (1 nautical mile) at periapsis. The spectrometer is mounted on the Orbiter scan platform and has a total mass of 3.4 kg. The total power is 4.2 W.

------- GALILEO ORBITER, HOWARD-------------------------------

INVESTIGATION NAME- RADIO PROPAGATION

NSSDC ID- JOPO -27

INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
CELESTIAL MECHANICS

PERSONNEL

PI - H.T.	HOWARD	STANFORD U

BRIEF DESCRIPTION

The purpose of this experiment is to study the structure of the atmospheres and ionospheres of Jupiter and its satellites. This can be accomplished through the use of the radio signals from both the Probe and the spinning section of the Orbiter.

------- GALILEO ORBITER, HUNTEN-------------------------------

INVESTIGATION NAME- STRUCTURE + AERONOMY OF THE ATMOSPHERES
OF JUPITER AND ITS SATELLITES (IDS)

NSSDC ID- JOPO -14

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.M.	HUNTEN	U OF ARIZONA

BRIEF DESCRIPTION

The objectives of this investigation are to study the heat balance of Jupiter's atmosphere, to estimate the eddy diffusion coefficients in the atmosphere, and to study the aeronomy of neutral and ionized atmospheres (including those of the satellites) by using data from a wide variety of Probe and Orbiter instruments.

------- GALILEO ORBITER, KIVELSON-----------------------------

INVESTIGATION NAME- MAGNETOMETER (MAG)

NSSDC ID- JOPO -03

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
PLANETOLOGY
MAGNETOSPHERIC PHYSICS
IONOSPHERES

PERSONNEL

PI - M.G.	KIVELSON	U OF CALIF, LA
OI - P.J.	COLEMAN, JR.	LOS ALAMOS NAT LAB
OI - C.F.	KENNEL	U OF CALIF, LA
OI - R.L.	MCPHERRON	U OF CALIF, LA
OI - C.T.	RUSSELL	U OF CALIF, LA

BRIEF DESCRIPTION

The purposes of this investigation are to study the Jovian magnetic field in order to map the configuration of the magnetosphere and analyze its dynamics, investigate magnetospheric-ionospheric coupling, measure magnetic fluctuations, search for magnetic fields on the satellites, and investigate the properties of the satellites and their interactions with the ambient medium. The instrument package includes dual triaxial fluxgate magnetometers with a dynamic range of 2.5E-12 to 1.6E-5 teslas (0.0025 to 1.6E4 gammas), mounted on a boom on the spinning part of the Orbiter spacecraft. Each sensor triad can be mechanically flipped about the boom axis. Outbound sensors are wound for low field readings of 1.E-12 to 5.12E-7 teslas (1 milligamma to 512 gammas), inbound sensors for high field readings of 3.1E-11 to 1.6E-5 teslas (31 milligammas to 16 kilogammas). Electronics are mounted on the spinning section and include optimum averaging capability. The mass, excluding the boom, is 3.2 kg (1.0 for the sensors, 2.2 for the electronics). The total power is 3.7 W.

------- GALILEO ORBITER, MASURSKY------------------------------

INVESTIGATION NAME- GEOLOGY OF THE GALILEAN SATELLITES (IDS)

NSSDC ID- JOPO -15

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL

PI - H.	MASURSKY	US GEOLOGICAL SURVEY

BRIEF DESCRIPTION

The objective of this investigation is to use Orbiter Imaging and NIMS data to investigate geological processes on the Galilean satellites, with emphasis on the identification and distribution of surface materials, the morphologies and densities of impact craters, and the search for structure indicative of glacial and periglacial processes.

------- GALILEO ORBITER, MCELROY------------------------------

INVESTIGATION NAME- INVESTIGATION OF JOVIAN UPPER ATMOSPHERE
AND OF SATELLITE ATMOSPHERES (IDS)

NSSDC ID- JOPO -16

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES

PERSONNEL

PI - M.B.	MCELROY	HARVARD U

BRIEF DESCRIPTION

This investigation uses data from a variety of Probe and Orbiter investigations to study the composition and structure of planetary and satellite atmospheres, with emphasis on photochemistry and interaction of the atmospheres with the magnetosphere.

------- GALILEO ORBITER, MORRISON-----------------------------

INVESTIGATION NAME- JOVIAN ATMOSPHERIC STUDIES (IDS)

NSSDC ID- JOPO -25

INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - D.	MORRISON	U OF HAWAII

BRIEF DESCRIPTION

The objectives of this experiment are to utilize data from the Imaging, Photopolarimeter/Radiometer, Near Infrared Mapping Spectrometer, and Dust Detector investigations in order to study the physical nature of the satellites and their regoliths. Emphasis will be on radiometric temperatures and surface thermal properties and on the sources and sinks of dust in the satellite system. These studies should clarify the nature of the surface material and indicate the internal and external processes that determine its physical properties. Extension of these interpretations can then be made to improve the utility of other remote-sensing observations of satellites, asteroids, and comets, made both from earth and from other space missions.

------- GALILEO ORBITER, ORTON------------------------------------

INVESTIGATION NAME- GROUND-TRUTH ANALYSIS OF RADIATIVE TRANSFER IN ATMOSPHERE OF JUPITER (IDS)

NSSDC ID- JOPO -17 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - G.S. ORTON NASA-JPL

BRIEF DESCRIPTION
The objective of this investigation is to study the structure of the atmosphere of Jupiter using data from the Probe structure, composition, Nephelometer, and Net-Flux Radiometer investigations, together with Orbiter Photopolarimeter/Radiometer and NIMS remote-sensing data. Results include an analysis of radiative equilibrium in the upper troposphere and stratosphere and an assessment of the information required in general for successful remote determination of atmospheric conditions on the outer planets.

------- GALILEO ORBITER, OWEN------------------------------------

INVESTIGATION NAME- COMPOSITION OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -18 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - T. OWEN STATE U OF NEW YORK

BRIEF DESCRIPTION
This investigation uses in situ data from the Mass Spectrometer and Helium Interferometer investigations on the Probe and remote data from the NIMS and other Orbiter investigations to establish a direct calibration of previous remote measurements of the composition of Jupiter by Voyager, IRIS, and earth-based spectroscopic observations.

------- GALILEO ORBITER, POLLACK------------------------------------

INVESTIGATION NAME- THERMAL AND DYNAMICAL PROPERTIES OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -19 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - J.B. POLLACK NASA-ARC

BRIEF DESCRIPTION
The purpose of this investigation is to determine the vertical temperature structure and dynamics of the Jovian atmosphere using data from all of the probe investigations to characterize the roles of radiative heating, thermal convection, latent heat release, and internal energy sources.

------- GALILEO ORBITER, RUSSELL------------------------------------

INVESTIGATION NAME- JUPITER MAGNETOSPHERE AND SATELLITE MAGNETOSPHERE INTERACTIONS (IDS)

NSSDC ID- JOPO -20 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS INTERPLANETARY PHYSICS

PERSONNEL
PI - C.T. RUSSELL U OF CALIF, LA

BRIEF DESCRIPTION
This investigation uses data from the Orbiter Magnetometer, Plasma, Plasma Wave, and Energetic Particle investigations (1) to study the Jovian magnetosphere and satellite-magnetosphere interactions (with emphasis on refining models of the Jovian main field); (2) to study the internal structure of the Galilean satellites from their interactions with the ambient medium; (3) to investigate the dynamics of the magnetosphere; and (4) to examine critically the observational data pertaining to energetic particle transport, acceleration, and loss in the Jovian magnetosphere.

------- GALILEO ORBITER, SAGAN------------------------------------

INVESTIGATION NAME- ORGANIC CHEMISTRY OF THE JOVIAN ATMOSPHERE (IDS)

NSSDC ID- JOPO -21 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - C. SAGAN CORNELL U

BRIEF DESCRIPTION
This investigation uses data from the Orbiter, NIMS and UVS investigations, together with the Probe Composition and Nephelometer investigations, to study the organic chemistry of the Jovian atmosphere, with emphasis on the nature of the organic and inorganic chromophores that produce the colors of the Jovian clouds.

------- GALILEO ORBITER, SCARF------------------------------------

INVESTIGATION NAME- WAVE-PARTICLE INTERACTION PHENOMENA AT JUPITER (IDS)

NSSDC ID- JOPO -22 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL
PI - F.L. SCARF TRW SYSTEMS GROUP

BRIEF DESCRIPTION
This investigation uses magnetospheric data from the Orbiter Plasma, Plasma Wave, and Energetic Particle investigations to study wave-particle integration phenomena, with emphasis on evaluating the effective transport coefficients (anomalous conductivity, pitch-angle diffusion coefficient, etc.) associated with the magnetospheric plasma instabilities and satellite-magnetosphere interactions.

------- GALILEO ORBITER, SCHUBERT------------------------------------

INVESTIGATION NAME- JOVIAN ATMOSPHERIC STRUCTURE AND CIRCULATION (IDS)

NSSDC ID- JOPO -23 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PLANETARY ATMOSPHERES

PERSONNEL
PI - G. SCHUBERT U OF CALIF, LA

BRIEF DESCRIPTION
This investigation uses data from the Orbiter Imaging investigation and from all of the Probe investigations to study the thermal and dynamical processes responsible for the global atmospheric circulation of Jupiter and the ways that these processes are influenced by the structure of the cloud layers.

------- GALILEO ORBITER, SONETT------------------------------------

INVESTIGATION NAME- GALILEAN SATELLITE MAGNETIC PROPERTIES + JOVIAN MAGNETOSPHERE INTERACTION (IDS)

NSSDC ID- JOPO -24 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS INTERPLANETARY PHYSICS

PERSONNEL
PI - C.P. SONETT U OF ARIZONA

BRIEF DESCRIPTION
The purposes of this investigation are to use data from the Orbiter Magnetometer, Plasma, and Plasma Wave investigations to measure any intrinsic magnetic fields that may exist on the Galilean satellites and to investigate the processes whereby these satellites interact with the magnetosphere and main field of Jupiter, including comparisons to similar interactions involving the moon.

------- GALILEO ORBITER, VAN ALLEN------------------------------------

INVESTIGATION NAME- DYNAMICS ENERGETIC PARTICLES, ROLE OF GALILEAN SATELLITES

NSSDC ID- JOPO -26 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS

PERSONNEL

PI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

The objectives of this experiment are to use data from the particles and fields experiments to study the physical dynamics (origin, accelerations, diffusion, and loss) of energetic charged particles in the Jovian magnetodisc with particular emphasis on the variability of phenomena with real time and with local time; the role of the Galilean satellites in the absorption, injection, acceleration, and diffusion of energetic charged particles; and acceleration, diffusion, and loss of energetic charged particles within the inner magnetosphere, and the overall energetics of the Jovian magnetosphere.

------- GALILEO ORBITER, WILLIAMS------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES-ORBITER (EPD)

NSSDC ID- JOPO -06

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
OI - T.P.	ARMSTRONG	U OF KANSAS
OI - T.A.	FRITZ	LOS ALAMOS NAT LAB
OI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
OI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
OI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
OI - J.G.	ROEDERER	U OF ALASKA
OI - E.C.	ROELOF	APPLIED PHYSICS LAB
OI - W.	STUDEMANN	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY

BRIEF DESCRIPTION

The purposes of this investigation are (1) to study the detailed energy, angular distribution, and stability of trapped protons, electrons, and ions, and determine ion composition; (2) to investigate the interactions of these particles with the satellites and the solar wind; (3) to measure thermal plasma flow velocities and temperatures; and (4) to investigate adiabatic and nonthermal processes in the trapped radiation. The instrument package consists of a low-energy magnetospheric measurement system (LEMMS), a composition measurement system (CMS), and an instrument stepping platform. The LEMMS' energy range and charge response are 0.015 - 11 MeV for electrons and 0.02 - 55 MeV/ nucleon for protons and ions. These are determined through magnetic deflection, dE/dx, and E techniques. The CMS uses dE/dx, E, time of flight, and pulse height analysis techniques to measure He through Fe with varying energy responses in the 0.15 - 100 MeV/nucleon range. The instrument package is mounted on the spinning section of the Orbiter. The total mass is 7.4 kg and the total power is 7.4 W.

*************************** GALILEO PROBE*********************

SPACECRAFT COMMON NAME- GALILEO PROBE
ALTERNATE NAMES- JUPITER ORBITER PROBE, JOP
GALILEO

NSSDC ID- JOP

LAUNCH DATE- 05/30/86 WEIGHT- 250. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- JUPITER PROBE

PERSONNEL

MG - D.R.	MCCULLAR	NASA HEADQUARTERS
SC - R.E.	MURPHY	NASA HEADQUARTERS
PM - J.	CASANI	NASA-JPL
PM - J.	SPERANS	NASA-ARC
PS - L.	COLIN	NASA-ARC
PS - T.V.	JOHNSON	NASA-JPL

BRIEF DESCRIPTION

The Probe is a staged-vented system composed of a deceleration module and a descent module. The Probe is launched from the Shuttle separately with Centaur upper stages. Its mass and diameter are 250 kg and 1.2 m, respectively. The deceleration module consists of structure and heat shields. The descent module contains the science instruments. Probe electronics and power sources are vented to the Jovian atmosphere. A parachute is used to separate the descent module from the deceleration module and to control the Probe descent rate. It may be jettisoned near the termination of the mission (at a pressure of 10 bars) to allow a more rapid descent at the higher pressures and temperatures. In situ science measurements are made prior to and during high-speed entry and descent. Power is supplied by a battery. Data are telemetered to the Orbiter, which in turn relays them to earth. The in situ measurements give information on the physical structure, chemical composition, and location of clouds in the troposphere, and the thermal balance of the planet. Data are stored in a memory unit for the period of communication blackout during entry, and then transmitted to the Orbiter, interleaved with real-time data.

------- GALILEO PROBE, BOESE------------------------------------

INVESTIGATION NAME- NET FLUX RADIOMETER (NFR)

NSSDC ID- JOP -04

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - R.W.	BOESE	NASA-ARC
OI - J.B.	POLLACK	NASA-ARC
OI - P.M.	SILVAGGIO	LAWRENCE LIVERMORE LAB
OI - M.	LOEWENSTEIN	NASA-ARC
OI - L.A.	SROMOVSKY	U OF WISCONSIN

BRIEF DESCRIPTION

The purposes of this investigation are (1) to measure vertical distribution of net flux of solar energy and planetary emission in the region of the atmosphere from 0.1 to 10 bars, (2) to determine the location of cloud layers, and (3) to obtain evidence on the mixing ratios of selected constituents and the opacity of clouds and aerosols in the infrared. A multichannel radiometer measures flux in about 30-deg cones alternately centered plus or minus 45 deg from the Probe horizontal. The radiometer has an on-board calibration system (two black bodies), a multidetector array (with channels at approximately 0.3 - 3.0, 0.3 - 2000, 20 - 30, 30 - 40, and 40 - 60 micrometers), and an array of six pyroelectric detectors. The radiometer is mounted on the Probe with external viewing after shield deployment. The total mass is 2.3 kg and the total power is 4.6 W.

------- GALILEO PROBE, LANZEROTTI------------------------------

INVESTIGATION NAME- LIGHTNING AND RADIO EMISSIONS (LRD)

NSSDC ID- JOP -06

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
SPACE PLASMAS
PLANETARY MAGNETIC FIELD

PERSONNEL

PI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
OI - G.	DEHMEL	BRAUNSCHWEIG TECH U
OI - F.O.	GLIEM	BRAUNSCHWEIG TECH U
OI - E.P.	KRIDER	U OF ARIZONA
OI - K.	RINNERT	MPI-AERONOMY
OI - M.	UMAN	U OF FLORIDA
OI - H.	FISCHER	U OF KIEL
OI - J.D.	MIHALOV	NASA-ARC
OI - G.	SCHMIDKE	U OF KIEL
OI - G.H.	WIBBERENZ	U OF KIEL

BRIEF DESCRIPTION

The objectives of this investigation are (1) to verify the existence of lightning on Jupiter and measure its basic physical characteristics and (2) to measure RF noise levels and one magnetic field component near Jupiter. Two instruments are used for this investigation: an electromagnetic sensor and an optical sensor. The electromagnetic sensor has a ferrite-core antenna with a preamplifier as an RF sensor. The frequency domain is 3, 15, and 100 kHz narrow-band. The time domain is 1 Hz to 100 kHz, and the resolution is 16 s. The optical sensor has a photodiode with fisheye lens. There is coincidence and anticoincidence between the RF and optical sensors. The electromagnetic sensor is mounted under the Probe afterbody, while the optical sensor is mounted on the Probe envelope, looking out perpendicularly to the Probe spin axis. The total mass is 1.1 kg and the total continuous power is 1.0 W.

------- GALILEO PROBE, NIEMANN--------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROSCOPY (NMS)

NSSDC ID- JOP -03

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - H.B.	NIEMANN	NASA-GSFC
OI - S.K.	ATREYA	U OF MICHIGAN
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - T.M.	DONAHUE	U OF MICHIGAN
OI - R.E.	HARTLE	NASA-GSFC
OI - D.M.	HUNTEN	U OF ARIZONA
OI - T.	OWEN	STATE U OF NEW YORK
OI - N.W.	SPENCER	NASA-GSFC

BRIEF DESCRIPTION

The objective of this investigation is to determine the chemical and isotopic composition and physical state of the Jovian atmosphere, including vertical variations from 0.1 to 10 bars or greater. Mixing ratios are determined for He to 1% accuracy and for H20, CH4, and NH3 to 5% accuracy. The isotopic ratio of Ne20 to Ne22 is measured to an accuracy of 2%. All species with mass numbers 1-52, plus selected species at higher mass numbers (including krypton and xenon) are measured. The instrument is a quadrupole mass spectrometer with an electron impact ion source having redundant electron beam guns of variable kinetic energy and a secondary electron multiplier ion detector. The dual-channel sample inlet system includes an enrichment system for trace-gas and isotope determination, a tandem getter, and a sputter ion pump. The mass range is 1-52, 84, and 131 u. The dynamic range is 1.E+8. Other species with masses greater than 52 can be sought at the sacrifice of integration time below 52 u. The scan period is 3 to 60 s. The instrument is mounted on the Probe with the sample inlet port near the stagnation point and the sample outlet port near the minimum pressure point. The total mass is 7.1 kg and the total power is 15 W.

------- GALILEO PROBE, RAGENT---------------------------------

INVESTIGATION NAME- NEPHELOMETRY (NEP)

NSSDC ID- JOP -05 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
ATMOSPHERIC PHYSICS

PERSONNEL

PI - B.	RAGENT	NASA-ARC
OI - J.E.	BLAMONT	CNRS-SA
OI - G.W.	GRAMS	GEORGIA INST OF TECH
OI - J.B.	POLLACK	NASA-ARC

BRIEF DESCRIPTION

The objective of this investigation is to determine vertical extent, structure, and microphysical characteristics (particle size distribution, number density, and physical structure) of Jupiter's clouds over the range 0.1 to 10 bars. A single-wavelength, multiple-angle (5) scattering nephelometer, with a gallium-arsenide LED (9000 A) source and solid-state detectors is mounted on the Probe, with appropriate external viewing geometry. Deployment takes place after the heat shield is removed. The total mass is 1.8 kg and the total continuous power is 3.0 W.

------- GALILEO PROBE, SIEFF----------------------------------

INVESTIGATION NAME- ATMOSPHERIC STRUCTURE (ASI)

NSSDC ID- JOP -02 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.	SIEFF	NASA-ARC
OI - R.C.	BLANCHARD	NASA-LARC
OI - D.B.	KIRK	NASA-ARC
OI - G.	SCHUBERT	U OF CALIF, LA
OI - S.C.	SOMMER(RETIRED)	NASA-ARC
OI - R.E.	YOUNG	NASA-ARC

BRIEF DESCRIPTION

The objective of this investigation is to determine temperature, pressure, density, and molecular weight over an altitude range from a threshold of about 1000 km above the cloud deck down to Probe failure (deeper than 10-bar pressure). The instrument package consists of acceleration, temperature, and pressure sensors and associated electronics. The package is mounted in the Probe with the accelerometers near the Probe's center of gravity. The temperature-sensing head and pressure inlet are deployed outside the Probe boundary layer. The total mass is 1.9 kg and the total continuous power is 5.5 W.

------- GALILEO PROBE, VON ZAHN-------------------------------

INVESTIGATION NAME- HELIUM ABUNDANCE (HAD)

NSSDC ID- JOP -01 INVESTIGATIVE PROGRAM CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - U.	VON ZAHN	U OF BONN
OI - H.-J.	HOFFMAN	MESSERSCHMIT-BOLK-BLOM
OI - D.M.	HUNTEN	U OF ARIZONA

BRIEF DESCRIPTION

The objective of this investigation is the precise (0.1%) determination of the helium abundance in the Jovian atmosphere from 3 to 8 bars. A two-arm, double-pathlength optical interferometer that includes an IR light-emitting diode (LED) light source, an interference filter, and a photodetector array, is used to measure the refractive index difference between an atmospheric sample and a reference gas mixture. It is mounted on the Probe with an inlet pipe to the ambient atmosphere. The total mass is 1.0 kg and the total continuous power is 0.7 W.

*************************** GAMMA-RAY OBSERVATORY*************

SPACECRAFT COMMON NAME- GAMMA-RAY OBSERVATORY
ALTERNATE NAMES-

NSSDC ID- GRO

LAUNCH DATE- 05/00/88 WEIGHT- 14000. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.5 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 400. KM ALT APOAPSIS- 400. KM ALT

PERSONNEL

MG - B.R.	MCCULLAR	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - J.J.	MADDEN	NASA-GSFC
PS - D.A.	KNIFFEN	NASA-GSFC

BRIEF DESCRIPTION

The Gamma-Ray Observatory (GRO) is designed as a free-flying satellite launched from the Space Shuttle, carrying five gamma-ray instruments that require sustained pointing toward gamma-ray sources in space. The spacecraft is stabilized in three axes. GRO is supported by a mechanical structure which, in addition to the scientific instruments, houses an attitude-control system, a power system, and a command and communications system. All the main subsystems are redundant for increased reliability of the mission. The planned operating life in orbit is 2 years. Data are retrieved through the TDRSS. The objective of the mission is to conduct exploration of the gamma-ray spectrum originating in our galaxy and beyond. Observations span the energy range from 30 keV to 30 GeV with better than 10 times the sensitivity of previous missions. Low-energy studies attempt to determine the origin of gamma-ray bursts. Medium- and high-energy studies address numerous astrophysical questions.

------- GAMMA-RAY OBSERVATORY, FICHTEL------------------------

INVESTIGATION NAME- HIGH-ENERGY GAMMA-RAY TELESCOPE

NSSDC ID- GRO -04 INVESTIGATIVE PROGRAM CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - C.E.	FICHTEL	NASA-GSFC
PI - R.	HOFSTADTER	STANFORD U
PI - K.	PINKAU	MPI-EXTRATERR PHYS
OI - D.L.	BERTSCH	NASA-GSFC
OI - A.J.	FAVALE	GRUMMAN AEROSPACE CORP
OI - R.C.	HARTMAN	NASA-GSFC
OI - E.B.	HUGHES	STANFORD U
OI - D.A.	KNIFFEN	NASA-GSFC
OI - H.A.	MAYER-HASSELWANDER	MPI-EXTRATERR PHYS
OI - H.	ROTHERMEL	MPI-EXTRATERR PHYS
OI - E.J.	SCHNEID	GRUMMAN AEROSPACE CORP
OI - M.K.	SOMMER	MPI-EXTRATERR PHYS
OI - D.J.	THOMPSON	NASA-GSFC

BRIEF DESCRIPTION

The instrument is a pictorial-type telescope using a digitized spark chamber to identify the electron pair produced by a gamma-ray interaction, and a large NaI(Tl) scintillator crystal to determine the gamma-ray energy. The specific objectives of the experiment are (1) to search for localized sources (e.g., neutron stars, black holes) in the 20 MeV to 30 GeV range and study their properties, (2) to improve location accuracy of known sources, (3) to search for evidence of cosmic-ray particle acceleration in supernova remnants, (4) to study gamma-ray bursts and line emission from solar flares, (5) to obtain a cetailed picture of the diffuse gamma-ray emission from our galaxy, and study galactic dynamics, cosmic-ray composition, and magnetic fields, (6) to study other galaxies, both normal and peculiar, and (7) to study the diffuse celestial radiation as it relates to cosmology. The instrument weighs 1830 kg, uses 180 W and has a data rate of 6859 bps.

------- GAMMA-RAY OBSERVATORY, FISHMAN-------------------------

INVESTIGATION NAME- TRANSIENT-EVENT MONITOR

NSSDC ID- GRO -05

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - G.J.	FISHMAN	NASA-MSFC
OI - C.A.	MEEGAN	NASA-MSFC
OI - T.A.	PARNELL	NASA-MSFC

BRIEF DESCRIPTION

The six-detector array of the transient-event monitor provides definitive data on (1) the distribution of gamma-ray burst sizes (log n - log s curve) down to 6E-15 J/sq cm, (2) the precise direction of many sources through interplanetary timing, (3) the general location of numerous additional burst sources, and (4) fluctuations and spectral changes on time scales of 1 millisecond or less. These data not only impose constraints upon theories of burst sources and their emission mechanism, but may provide identifications with optical or X-ray objects. The experiment also provides GRO with a monitor of the entire unocculted sky for transient events and bursts. The experiment package consists of 12 48-cm diameter, 1.27-cm thick NaI(Tl) disks with anti-coincidence shields. The energy range is 60 to 600 keV in approximately six channels; the time resolution is 0.1 microsecond. The package weighs 790 kg, uses 157 W, and has a data rate of 3555 bps.

------- GAMMA-RAY OBSERVATORY, KURFESS-------------------------

INVESTIGATION NAME- SCINTILLATION SPECTROMETER

NSSDC ID- GRO -02

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - J.D.	KURFESS	US NAVAL RESEARCH LAB
OI - M.	ULMER	NORTHWESTERN U
OI - W.N.	JOHNSON	US NAVAL RESEARCH LAB
OI - R.L.	KINZER	US NAVAL RESEARCH LAB
OI - G.H.	SHARE	US NAVAL RESEARCH LAB
OI - C.	DYER	ROYAL AIRCRAFT ESTABL
OI - D.D.	CLAYTON	RICE U

BRIEF DESCRIPTION

The instrument is composed of four identical high-sensitivity scintillation detectors that are independently mounted on one-axis orientation systems. For most observations, two detectors are pointed at the source while the other two are offset by 15 deg for simultaneous background measurements. For time-variable phenomena, all four detectors can be pointed at the source for maximum sensitivity. Of particular interest are observations of nuclear line radiation from supernovae, novae, neutron stars, accretion onto black holes, solar flares, and continuum radiation. The detectors are optimized in the 0.1 to 10 MeV range but have additional capability for measurements from 10 to 150 MeV. The FOV is 9 deg with an effective area of 1507 sq cm at 0.51 MeV. The time resolution is 8 s in normal mode and 4 microseconds in burst mode. All detectors can be solar pointed for flare observations without affecting the other instruments on the spacecraft. The instrument weighs 1900 kg, uses 161 W, and has a data rate of 6492 bps.

------- GAMMA-RAY OBSERVATORY, SCHONFELDER---------------------

INVESTIGATION NAME- IMAGING COMPTON TELESCOPE

NSSDC ID- GRO -03

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
GAMMA-RAY ASTRONOMY
ASTRONOMY
HIGH ENERGY ASTROPHYSICS

PERSONNEL

PI - V.	SCHONFELDER	MPI-EXTRATERR PHYS
OI - B.N.	SWANENBURG	U OF LEIDEN
OI - J.A.	LOCKWOOD	U OF NEW HAMPSHIRE
OI - B.G.	TAYLOR	ESA-ESTEC
OI - J.A.M.	BLEEKER	U OF LEIDEN
OI - A.J.M.	DEERENBERG	U OF LEIDEN
OI - W.	HERMSEN	U OF LEIDEN
OI - W.R.	WEBBER	U OF NEW HAMPSHIRE
OI - K.	BENNETT	ESA-ESTEC
OI - R.D.	WILLS	ESA-ESTEC
OI - G.	LICHTI	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The investigation employs an imaging Compton telescope that covers the 1 to 30 MeV energy range. This instrument is able to overcome background problems and provide unprecedented sensitivity and spatial resolution. The scientific objectives of this experiment are (1) study of intensities, spectra, and spatial distribution of localized sources to an intensity of about 1/50 of the Crab Nebula, (2) study of the diffuse galactic emission in the energy range where electromagnetic processes are expected to dominate, (3) study of the diffuse cosmic intensity, and (4) study of broadened line emission from excited nuclei in the diffuse galactic emission and from localized sources, including the sun, using the 1-sq-m NaI detectors with an energy resolution of about 10% FWHM and an angular resolution of 2 to 6 deg (FWHM). The instrument weighs 1460 kg, uses 216 W, and has a data rate of 6125 bps.

*************************** GIOTTO***************************

SPACECRAFT COMMON NAME- GIOTTO
ALTERNATE NAMES-

NSSDC ID- GIOTTO

LAUNCH DATE- 07/15/85 WEIGHT- 950. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE 3

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC
ORBIT PERIOD- 299.1 DAYS INCLINATION- 1.46 DEG
PERIAPSIS- 0.6994 AU RAD APOAPSIS- 1.0512 AU RAD

PERSONNEL

PM - D.	DALE	ESA-ESTEC
PS - R.	REINHARD	ESA-ESTEC

BRIEF DESCRIPTION

This mission is designed to encounter Halley's comet on March 13, 1986, at a distance of 0.89 AU from the sun and 0.98 AU from the earth at an angle of 107 deg from the comet-sun line. The spacecraft is based as much as possible on the ESA-GEOS spacecraft and is spin stabilized with a rate of 15 rpm. During the Halley encounter, the spin axis is aligned with the relative vector velocity. The 1.5-m dish antenna, operating at X-band, is inclined and despun in order to point at the earth (44 deg with respect to the velocity vector). The scientific payload of 10 experiments weighs 54.4 kg. A camera produces color photographs of the nucleus. Other objectives of the mission are (1) to determine the elemental and isotopic composition of volatile components in the cometary coma, particularly parent molecules; (2) to characterize the physical and chemical processes that occur in the cometary atmosphere and ionosphere; (3) to determine the elemental and isotopic composition of dust particles; (4) to measure total gas-production rate and dust flux and size/mass distribution; and to derive the dust-to-gas ratio; and (5) to investigate the macroscopic systems of plasma flows resulting from the cometary-solar wind interaction. The goal is to come within 500 km of Halley at closest encounter. The spacecraft has a dust shield consisting of a front sheet of Al 1 mm thick and a 12-mm Kelvar near sheet separated by 25 cm, which should withstand impacts of particles up to 0.1 g. The experiments are switched on 3 h 45 min before closest approach. During the cruise mode, the spacecraft is controlled by ESOC using the 30-m antenna at Weilheim. For the 4-h encounter, the 64-m antenna at Parkes, Australia, is employed.

------- GIOTTO, BALSIGER--------------------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER (IMS)

NSSDC ID- GIOTTO -03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - H.	BALSIGER	U OF BERNE
OI - E.G.	SHELLEY	LOCKHEED PALO ALTO
OI - R.G.	JOHNSON	LOCKHEED PALO ALTO
OI - H.S.	BRIDGE	MASS INST OF TECH
OI - A.J.	LAZARUS	MASS INST OF TECH
OI - B.E.	GOLDSTEIN	NASA-JPL
OI - W.T.	HUNTRESS	NASA-JPL
OI - M.M.	NEUGEBAUER	NASA-JPL
OI - R.M.	GOLDSTEIN	NASA-JPL
OI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - R.	SCHWENN	MPI-AERONOMY
OI - W.-H.	IP	MPI-AERONOMY
OI - D.T.	YOUNG	LOS ALAMOS NAT LAB
OI - R.D.	SHARP	LOCKHEED PALO ALTO
OI - J.	GEISS	U OF BERNE
OI - F.	BUEHLER	U OF BERNE
OI - R.	BENSON	TEXAS A+M

BRIEF DESCRIPTION

The objective of the investigation is to measure the ion composition, energy, and angular distribution in the coma of comet Halley. The instrument consists of two sensors: the High-Energy Range Spectrometer (HERS) specialized for the outer coma and the High-Intensity Spectrometer (HIS) specialized for the inner coma. The HERS sensor has (1) an electrostatic mirror for deflecting ions from the spacecraft ram direction into the sensor, instead of having the solar wind ions enter; (2) cylindrical acceleration grids which change the energy of the ions so they can pass through the magnetic analyzer; (3) a sector magnet that acts as a momentum/charge filter; (4) an electrostatic deflection plate that sorts the ions by energy/charge; and (5) particle detectors consisting of a two-dimensional microchannel plate (MCP) and channel-electron-multipliers (CEM) for measuring mass/charge and elevation angle. The energy range is from 20 eV up to nearly 16 keV, depending on the M/Q, and the mass is determined in 3 or 4 mass groups (e.g., 1 to 4, 4 to 16, 16 to 64) with a mass resolution of M/delta M equal about 20. The elevation angle, the polar angle relative to the spin axis, covers 30 deg and is measured in 4 bins, giving a resolution of 7.5 deg. The azimuth angle is spin-scanned and has a resolution of 4 deg. The MCP allows the simultaneous measurement of mass and elevation angle for a given ion momentum per charge (8 kV). A complete scan over mass, energy, and angle takes about 12 s, but other scans can be selected. The HIS sensor is used to measure the relatively cold, low-energy cometary species. This sensor has (1) a set of deflection plates above the spacecraft skin; (2) a quadrispherical lens followed by (3) a set of acceleration grids; (4) a permanent magnet; (5) a second quadrispherical lens, or analyzer; (6) a block of glass with conductive surfaces with holes in four directions that serves as a particle distributor and amplifier; and (7) 16 CEMs to detect the emergent particles. HIS measures energies from 300 to 1625 eV over a M/Q of 12 - 65 with a resolution (M/Delta M) of about 20, in an elevation angular range of 27 deg. The azimuth angle is spin-scanned and the time resolution for a set of measurements is about 4 s. The density range covered by HERS is 1.E-3 to 1.E2/cubic cm, while that for HIS is 1.E-2 to 1.E4. The instrument uses a microprocessor for operation and control. More details about this instrument can be found in "The Giotto Mass Spectrometer" by Balsiger et al., ESA SP-169, June 1981.

------- GIOTTO, JOHNSTONE---------------------------------------

INVESTIGATION NAME- COMETARY PLASMA ION MASS AND ENERGY PER CHARGE ANALYZERS

NSSDC ID- GIOTTO -05

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
OI - W.C.	FELDMAN	LOS ALAMOS NAT LAB
OI - P.	CERULLI	CNR, SPACE PLASMA LAB
OI - A.	EGIDI	CNR, SPACE PLASMA LAB
OI - M.	DOBROWOLNY	CNR, SPACE PLASMA LAB
OI - H.	REME	CESR
OI - M.K.	WALLIS	U COLLEGE CARDIFF
OI - J.D.	WINNINGHAM	SOUTHWEST RES INST
OI - K.	JOCKERS	MPI-AERONOMY
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - B.	WILKEN	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - D.A.	BRYANT	RUTHERFORD/APPLTON LAB
OI - D.R.	LEPINE	RUTHERFORD/APPLTON LAB
OI - R.	LUEST	MPI-EXTRATERR PHYS
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - G.	PASCHMANN	MPI-EXTRATERR PHYS
OI - L.F.B.	BIERMANN	MPI-EXTRATERR PHYS
OI - G.	HAERENDEL	MPI-EXTRATERR PHYS
OI - V.	FORMISANO	ESA-ESTEC

BRIEF DESCRIPTION

The objective of this investigation is to measure the plasma flow around comet Halley in order to study (1) the mass loading of the solar wind by ions of cometary origin, (2) the existence, location, and strength of the upstream shock transition in the solar wind flow, (3) the position of and forces controlling the pressure balance surface between the cometary and the solar plasma, (4) the processes that form tail rays and other discrete visible features in the coma, and (5) the detection of wave motion induced by the cometary interaction that leads to the thermalization of solar wind and implanted ions. The instrument employs two sensors. One is a 270-deg spherical electrostatic energy analyzer (EEA) with a microchannel plate detector that measures the three-dimensional energy/charge distribution of positive ions from 10 eV to 20 keV over the polar angle range 20 - 180 deg with respect to the spin axis of the spacecraft. A complete set of measurements is obtained every spin period (4 s). The second sensor consists of a quadrispherical EEA with six time-of-flight analyzers set at different polar angles in the range 20 - 160 deg. The three-dimensional energy distribution of five major mass groups of ions up to 44 u over the energy range 0.1 - 70 keV is measured in 32 spin periods (128 s).

------- GIOTTO, KELLER---------------------------------------

INVESTIGATION NAME- HALLEY NUCLEUS IMAGING (HMC)

NSSDC ID- GIOTTO -01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.U.	KELLER	MPI-AERONOMY
OI - R.M.	BONNET	ESA
OI - C.B.	COSMOVICI	DFVLR
OI - W.A.	DELAMERE	BALL AEROSPACE SYS DIV
OI - C.	JAMAR	INST D'ASTROPHYSIQUE
OI - C.	BARBIERI	INST DI ASTRONOMIA
OI - C.	ARPIGNY	INST D'ASTROPHYSIQUE
OI - L.F.B.	BIERMANN	MPI-EXTRATERR PHYS
OI - G.	COLOMBO	U OF PADOVA
OI - W.F.	HUEBNER	LOS ALAMOS SCI LAB
OI - D.W.	HUGHES	U OF SHEFFIELD
OI - F.L.	WHIPPLE	HARVARD COLLEGE OBS
OI - W.K.H.	SCHMIDT	MPI-AERONOMY
OI - K.	WILHELM	MPI-AERONOMY
OI - D.	MALAISE	INST D'ASTROPHYSIQUE
OI - S.	CAZES	CNRS-LPSP
OI - P.	BENVENUTI	INST DI ASTRONOMIA
OI - P.	SEIGE	DFVLR

BRIEF DESCRIPTION

The Halley Multicolor Camera (HMC) is designed to provide high-resolution images of the nucleus and the coma of Halley's comet in nine colors and two polarizations. The camera operates in a spin scan mode and uses a 1-m focal length Ritchey-Chretien telescope with an effective F number of 7.68. The instanteous field of view is 1.5 deg with no vignetting and the whole sphere can be viewed using rotation of the camera, tilting of the 45-deg deflecting mirror, and the spacecraft spin. The entrance collimator is at 90 deg with respect to the telescope axis of symmetry, which is the axis of rotation for the whole system. The light is deflected by 90 deg by a mirror that can be adjusted by about one deg about an axis perpendicular to the plane of symmetry of the telescope. The sensors are two area charged coupled devices (CCD) and one Reticon. The CCDs have two segments each that provides 390 x 292 pixels while the Reticon has 2 x 936 pixels. The pixel size in micrometers is 22.3 x 22.3 for the CCDs and 30 x 375 for the Reticon. The spectral response of the whole system is about 350 to 1100 nm and a filter wheel is used to obtain 4 bands simultaneously for color and polarization or 11 broad and narrow bands alternately. The resolution in observing the comet is 11 m/pixel at a slant range of 500 km.

------- GIOTTO, KISSEL---------------------------------------

INVESTIGATION NAME- DUST IMPACT MASS SPECTROMETER (PIA)

NSSDC ID- GIOTTO -04

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

PERSONNEL

PI - J.	KISSEL	MPI-NUCLEAR PHYS
OI - Z.	SEKANINA	NASA-JPL
OI - N.G.	UTTERBACK	NASA-JPL
OI - B.C.	CLARK	MARTIN-MARIETTA AEROSP
OI - H.A.	ZOOK	NASA-JSC
OI - H.	FECHTIG	MPI-NUCLEAR PHYS
OI - E.	GRUEN	MPI-NUCLEAR PHYS
OI - H.J.	VOELK	MPI-NUCLEAR PHYS
OI - E.K.	JESSBERGER	MPI-NUCLEAR PHYS
OI - F.R.	KRUEGER	MPI-NUCLEAR PHYS
OI - J.A.M.	MCDONNELL	U OF KENT, CANTERBURY
OI - G.H.	SCHWEHM	U OF BOCHUM
OI - G.E.	MORFILL	MPI-EXTRATERR PHYS
OI - J.	RAHE	BAMBERG OBSERVATORY
OI - E.B.	IGENBERGS	TECH U OF MUNICH
OI - K.	KORNUNG	U AT MUNICH-NEUBIBERG

BRIEF DESCRIPTION

The objective of this investigation is to determine the chemical and physical properties of the dust particles released by comet Halley. The instrument is a redesign of the one flown on Helios-A and -B by Fechtig and colleagues. The chemical composition and the mass of individual particles are measured. The impact count as a function of the position relative to the comet's nucleus provides the mass distribution and the rate of production of dust. The measurements should provide (1) the elemental abundance of individual particles, (2) compositional distribution around the comet, and (3) determination of specific isotopic ratios, such as super 6 Li/super 7 Li, super 10 B/ super 11 B, or super 12 C/super 13 C. The instrument consists of (1) an adjustable entrance port, (2) a target of atomic mass > 105, (3) a set of acceleration grids, (4) a two-section time-of-flight drift tube, (5) an ion reflector chamber, and an electron multiplier tube. The particles are measured by the charge of the impact plasma, the impact light flash, and mass dispersion through the time-of-flight tube. Calibration with a ground-based dust accelerator is imperative to the interpretation of the data. The instrument handles an impact rate up to 100/s, which is controlled by the variable entrance port (1-500 sq mm) under microprocessor control and covers the particle mass range from 3.E-16 to 5.E-10 g. The mass resolution M/delta M is 200 at 100 u and the dynamic range that can be handled in one mass spectrum is 1.E3. Additional detail for this instrument can be found in "The Particulate Impact Analyzer, an Instrument to Analyze Small Particles Released by Halley's Comet" by J. Kissel ESA SP-169, June 1981.

------- GIOTTO, KRANKOWSKY-------------------------------------

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER (NMS)

NSSDC ID- GIOTTO -02

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - D.	KRANKOWSKY	MPI-NUCLEAR PHYS
OI - P.	LAMMERZAHL	MPI-NUCLEAR PHYS
OI - P.X.	EBERHARDT	U OF BERNE
OI - U.	HERRMANN	U OF BERNE
OI - J.J.	BERTHELIER	CNRS-LGE
OI - J.M	ILLIANO	CNRS-CRPE
OI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
OI - R.R.	HODGES	U OF TEXAS, DALLAS
OI - H.U.	KELLER	MPI-AERONOMY
OI - M.	FESTOU	CNRS-SA

BRIEF DESCRIPTION

The objective of the investigation is to identify the chemical nature of the neutral gas molecules and ionic species in the coma of comet Halley, and to measure their chemical and isotopic abundances and their velocity distributions. The instrument consists of two sensors: (1) the M-analyzer that will provide direct mass analysis in the range 1-36 u, and (2) the E-analyzer that will provide energy analysis in the range from about 25 eV up to 2.1 keV, corresponding to kinetic energies of coma particles with masses between 1 u and 86 u, at the relative probe velocity of 68.7 km/s. The energy analyzer is a parallel plate electrostatic deflector using an extended focal plane detector to cover the entire range in two or three measurements. The mass analyzer is a parallel plate deflector followed by a magnet; this configuration provides double focusing; i.e., suprathermal species having different energies resulting from their motions in the comet frame of reference will still be focused. The detectors are microchannel plates followed by an array of charge-sensitive anodes. Both analyzers cycle between a neutral mode when gas molecules are ionized by electrons bombarding them in a fly-through type source, and an ion mode measuring ambient cometary ions. At greater distance from the nucleus (until 1 hour before closest encounter) the experiment provides ion composition and directional analysis, by applying variable deflecting voltages in front of the analyzers. During the close encounter, emphasis is on the neutral gas investigation which includes low ionization energies for the discrimination of fragmentation effects. Repetition periods are in the order of 3 seconds which gives a spatial resolution of about 200 km.

------- GIOTTO, LEVASSEUR-REGOURD------------------------------

INVESTIGATION NAME- HALLEY OPTICAL PROBE (HOPE)

NSSDC ID- GIOTTO -09

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS

PERSONNEL

PI - A.C.	LEVASSEUR-REGOURD	CNRS-SA
OI - J.L.	WEINBERG	U OF FLORIDA
OI - P.	LAMY	CNRS-LAS

BRIEF DESCRIPTION

The optical probe technique is employed in this investigation to determine, unequivocally, changes in the densities of emissive gases (OH, C sub 2, CN, CO super +, and CS) and scattering dust, as well as to measure the optical properties of dust, in the coma of Halley's comet. The instrument contains no moving parts and performs photopolarimetric measurements parallel to the direction of motion through the coma. The choice of wavelengths is the following: 368, 444, 575, and 718 nm for dust, and 307, 387, 462, and 514 nm for gases. The rapid motion of the spacecraft allows line-of-sight measurements to be differenced so that the resulting brightnesses and polarizations refer to the small volume of space of about 140 km length centered at the moving probe.

------- GIOTTO, MCDONNELL---------------------------------------

INVESTIGATION NAME- DUST IMPACT DETECTOR (DID)

NSSDC ID- GIOTTO -08

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
DUST

PERSONNEL

PI - J.A.M.	MCDONNELL	U OF KENT, CANTERBURY
OI - W.M.	ALEXANDER	BAYLOR U
OI - D.W.	HUGHES	U OF SHEFFIELD
OI - E.B.	IGENBERGS	TECH U OF MUNICH
OI - R.J.L.	GRARD	ESA-ESTEC
OI - D.H.	CLARK	RUTHERFORD/APPLTON LAB
OI - G.H.	SCHWEHM	U OF BOCHUM
OI - Z.	SEKANINA	NASA-JPL
OI - M.S.	HANNER	NASA-JPL
OI - B.A.	LINDBLAD	LUND OBS
OI - E.	GRUEN	MPI-NUCLEAR PHYS
OI - A.	MINAFRA	U OF BARI
OI - J.C.	MANDEVILLE	CERT/ONERA
OI - E.	BUSSOLETTI	U OF LECCE

BRIEF DESCRIPTION

The investigation uses a system comprised of an array of dust impact sensors to answer some of the fundamental questions in cometary science, namely, the measure of the particulate mass efflux from a comet, its mass distribution, and the particulate grain density. Using the entire surface of the meteoroid shield of the spacecraft system, the array of sensors is able to detect masses over the range 1.E-17 to 1.E-3 g, and perhaps even larger. The upper limit is dependent on the maximum mass of the particulate matter intercepted by the probe during the fly-by. This mass range encompasses almost all the non-volatile comet nucleus component, currently believed to comprise 50% of the comet mass. The range also encompasses about 90% of the mass and scattering area distributions of the zodiacal cloud. The instrumentation is comprised of (1) an impact plasma micro-perforation and sensing array which determines the mass, penetration properties, density and ionization of the impacting particles in the range 1.E-17 to 1.E-10 g; (2) a penetration-initiated capacitor discharge array for determining the impacting flux above a precisely defined threshold of 1.E-9 g; and (3) a meteoroid shield array incorporating three transducers on the front shield and one on the rear shield. The latter array determines the impact position and momentum exchange of the entire probe from the mass range 1.E-10 to 1.E-3 g, or larger. The techniques have been selected with a special regard for the Halley comet environment and the anticipated high flux rates based on experience from previous missions. The comparison of different detection techniques and correlation of independent sensor outputs has guided the design. Reliability of event detection in the unexplored environment of the comet is high and the limiting accuracy of the measurements is believed to be better than 20% over a dynamic range of 1.E+14. A microprocessor is used to monitor each sensor status and to process each event as well as the cumulative data, which represents the total event amplitude distribution from each sensor.

------- GIOTTO, MCKENNA-LAWLOR-------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES ONSET ADMONITOR (EPONA)

NSSDC ID- GIOTTO -10

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - S.M.P.	MCKENNA-LAWLOR	ST PATRICK'S COLLEGE
OI - E.	KIRSCH	MPI-AERONOMY
OI - A.	THOMPSON	DUBLIN INST ADV STUDY
OI - D.	O'SULLIVAN	DUBLIN INST ADV STUDY
OI - D.B.	MELROSE	U OF SYDNEY
OI - K.P.	WENZEL	ESA-ESTEC

BRIEF DESCRIPTION

The purpose of this investigation is to study, at high spatial and temporal resolution, the energetic charged particles in the environment of Comet Halley (e.g. those produced by acceleration at Halley's bow shock and/or in its tail). Observations of energetic particles and their angular distributions, taken in conjunction with onboard magnetic measurements, can determine whether the magnetic field lines in the cometary tail are open or closed. Encounter data can be used to provide the background corrections for those devices on other Giotto experiments which are sensitive to energetic particle radiation. The instrument employs both active and passive shielding of surface barrier detectors along with dE/dx vs E circuitry to measure: electrons above about 15 keV, protons above about 20 keV, and particles with Z> or = 2 above 2.1 MeV with eight separate energy channels. Two identical particle telescopes are used at each of the two viewing angles except that one at each angle has an additional foil over its aperture for the purpose of separating low-energy protons from low-energy protons. The telescopes are pointed at 45 and 137 deg with respect to the spacecraft spin axis and provide some measure of the angular distribution. The instrument can operate in two modes, namely (a) in a real time mode and (b) in a cruise or storage mode. During the real time mode a 0.5-s time resolution is available in the 8 energy channels in each of 16 angular sectors. In the storage mode 48-m averaged solar particle flux measurements with quadrisectored information from selected energy channels yield data concerning solar particle propagation in the corona and in interplanetary space.

------- GIOTTO, NEUBAUER---

INVESTIGATION NAME- MAGNETOMETER (MAG)

NSSDC ID- GIOTTO -07

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETARY MAGNETIC FIELD
PARTICLES AND FIELDS

PERSONNEL

PI - F.M.	NEUBAUER	U OF COLOGNE
OI - N.F.	NESS	NASA-GSFC
OI - L.F.	BURLAGA	NASA-GSFC
OI - M.H.	ACUNA	NASA-GSFC
OI - F.	MARIANI	U OF ROME
OI - H.U.	SCHMIDT	MPI-PHYS ASTROPHYS
OI - E.	UNGSTRUP	DANISH SPACE RES INST
OI - M.K.	WALLIS	U COLLEGE CARDIFF
OI - G.	MUSMANN	BRAUNSCHWEIG TECH U

BRIEF DESCRIPTION

The purpose of this investigation is to study the interplanetary and induced cometary magnetic fields before and during the encounter with comet Halley. The instrument consists of a main triaxial fluxgate magnetometer system mounted on top of a tripod on the spacecraft. In a 12-bit analog-to-digital conversion the dynamical ranges are plus and minus 16, 64, 256, 1024, 4096, 16384, and 65536 nT with automatic range switching. An inner biaxial magnetometer system is used for correcting the spacecraft magnetic field. During the encounter the sampling rate will be approximately 28 vectors per second, while the spacecraft spin rate is 15 rpm.

------- GIOTTO, REME---

INVESTIGATION NAME- ELECTRON ESA AND POSITIVE ION CLUSTER COMPOSITION ANALYZER (RPA)

NSSDC ID- GIOTTO -06

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
PARTICLES AND FIELDS

PERSONNEL

PI - H.	REME	CESR
OI - C.	D'USTON	CESR
OI - F.	COTIN	CESR
OI - J.A.	SAUVAUD	CESR
OI - D.A.	MENDIS	U OF CALIF, SAN DIEGO
OI - R.P.	LIN	U OF CALIF, BERKELEY
OI - A.	WEKHOF	U OF CALIF, BERKELEY
OI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - C.W.	CARLSON	U OF CALIF, BERKELEY
OI - A.	KORTH	MPI-AERONOMY
OI - A.K.	RICHTER	MPI-AERONOMY
OI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The purpose of the investigation is to measure and study the three-dimensional distributions of electrons and ions, as well as the ion composition, in the vicinity of Halley's comet. These studies will help to determine: (1) the nature of the comet tail and the solar wind interaction with the comet; (2) the chemical and physical nature of the cometary atmosphere and ionosphere; and (3) the chemical and physical structure of the cometary nucleus. The instrument consists of two major units, a symmetric quadrispherical electrostatic analyzer (ESSA) for electrons and a positive ion composition analyzer (PICCA). ESSA covers the energy range 10 eV - 30 keV with a resolution of 0.1 and has a field of view (FOV) of 360 deg x 4 deg. It is constructed of two concentric hemispheres with a circular opening, a circular top cap which determines the entrance aperture, and 16 channel-electron-multipliers (CEM) for detectors. The energy range is swept every 0.25 s and the spin rate is about 4 s. PICCA consists of an electrostatic deflection plate above the spacecraft skin, a hemispherical ESA, electrostatic optics, and a fast-counting CEM. The mass range measured is 10 - 233 u with a delta M of < 1. The FOV is 3 deg x 3 deg and the device has a dynamic range in density from 1.E-3 to 1.E4/cubic cm. More details can be found in "The Copernicus Experiment to Measure Three-Dimensional Electron Distribution and the Composition of Thermal Positive Ions Including Water Clusters near Comet Halley" by Reme et al., in ESA SP-169, June 1981.

*************************** GMS-3****************************

SPACECRAFT COMMON NAME- GMS-3
ALTERNATE NAMES- HIMAWARI-3

NSSDC ID- GMS-3

LAUNCH DATE- 03/00/84 WEIGHT- KG
LAUNCH SITE- TANEGASHIMA, JAPAN
LAUNCH VEHICLE- N-2

SPONSORING COUNTRY/AGENCY
JAPAN NASDA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN INCLINATION- 0. DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL
PM - Y. ICHIKAWA NASDA

BRIEF DESCRIPTION

The Geostationary Meteorological Satellites (GMS) are Japan's contribution to the International Global Atmospheric Research Program (GARP). The spacecraft is roughly cylindrical with a height of 345 cm and a diameter of 216 cm. The cylindrical surface is covered with solar cells which provide 225 W. The satellite is spin-stabilized with a despun earth-pointing antenna. The satellite is positioned near 140 deg E and is designed to operate for 5 years. This is a follow-on GMS type spacecraft launched and controlled by NASDA of Japan.

------- GMS-3, JMA STAFF---

INVESTIGATION NAME- VISIBLE AND INFRARED SPIN-SPAN RADIOMETER (VISSR)

NSSDC ID- GMS-3 -01

INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The Visible and Infrared Spin-Scan Radiometer (VISSR) is similar to VISSR experiments on other GARP (Global Atmospheric Research Program) satellites such as GOES 1 and GMS. It makes both night IR (10.5 to 12.5 micrometers) and day IR measurements, plus visible (0.5 to 0.75 micrometer) photometric observations of the subsatellite area at 30-min intervals. The visible channel has a resolution of about 1.25 km, and the IR channel has a resolution of about 5 km at nadir. Real-time transmission is available to the data acquisition station in Japan, with additional data transmission to other meteorological users as needed.

------- GMS-3, JMA STAFF---

INVESTIGATION NAME- WEATHER COMMUNICATIONS FACILITY

NSSDC ID- GMS-3 -03

INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - JMA STAFF JAPANESE METEOROL AGCY

BRIEF DESCRIPTION

The GMS 3 includes a communications facility. The objectives of this equipment are (1) to collect and relay weather observations from remote stations, including buoys, ships, and unmanned stations, and (2) to transmit weather information and analyses from the central weather facility to other weather stations.

------- GMS-3, KOHNO---

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- GMS-3 -02

INVESTIGATIVE PROGRAM
APPLICATIONS SATELLITE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T. KOHNO INST PHYS + CHEM RES

BRIEF DESCRIPTION

The Space Environment Monitor (SEM) experiment observes the in-situ charged particle environment. Solar protons (1 to 500 MeV), alpha particles (8 to 390 MeV), and solar electrons (greater than 2 MeV) are discriminated, and their respective energies are monitored by means of a number of solid-state detectors.

***************************** GOES-G *****************************

SPACECRAFT COMMON NAME- GOES-G
ALTERNATE NAMES-

NSSDC ID- GOES-G

LAUNCH DATE- 05/00/86 WEIGHT- 660. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN INCLINATION- 0.1 DEG
PERIAPSIS- 35788. KM ALT APOAPSIS- 35788. KM ALT

PERSONNEL

MG - J.R.	GREAVES	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC
PS - W.E.	SHENK	NASA-GSFC

BRIEF DESCRIPTION

GOES-G is the seventh in a series of NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carries (1) a visible infrared spin scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water content at various levels, (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with small automatic picture transmission (APT) and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measures 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extends an additional 83 cm beyond the cylindrical shell. The primary structural members are a honeycombed equipment shelf and a thrust tube. The VISSR telescope is mounted on the equipment shelf and views the earth through a special aperture in the side of the spacecraft. A support structure extends radially from the thrust tube and is affixed to the solar panels, which form the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels are stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) are maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft uses both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provides telemetry and command during launch and then serves as a backup for the primary subsystem once the spacecraft attains synchronous orbit.

------- GOES-G, LEINBACH---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-G -02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consists of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitor protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There is also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitors protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES-G, LEINBACH---------------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-G -03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consists of ion chamber detectors. The ranges and minimum useful threshold sensitivities are 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.E4.

------- GOES-G, LEINBACH---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-G -04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL

BRIEF DESCRIPTION

The magnetometer has a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES-G, NESS STAFF---------------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-G -01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS
OI - W.E.	SHENK	NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS) operates in three distinct modes to provide parameter flexibility, spectral band selection, geographic location, and signal-to-noise ratio. The VISSR mode is the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) use common optics. Incoming radiation is collected by a Ritchey-Chretien optical system. One west-to-east raster line is formed for each revolution of the spacecraft. A 20-deg north-to-south frame results from a total of 1821 steps of the scan mirror, one 0.192-mr step for each spacecraft revolution. A full picture takes 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) sweep the earth during each scan. The dwell-sounding mode uses up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) positioned into the optical train while the scanner is dwelling on a single N-to-S scan line. The filter wheel is programmed so that each spectral band filter dwells on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km-resolution detectors can be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors are used. Selectable frame size, position and scan direction are also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data are provided for imaging. In some of the spectral regions, multiple-line data are required to enhance the signal-to-noise ratio. Typically, 167 satellite spins at the same N-to-S scan line position are required to obtain the desired sounding data. This number of spins per line can provide the soundings a 30- x 30-km resolution and require approximately 1.9 minutes on the average. The multispectral imaging (MSI) mode can provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation takes advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produces a complete infrared map when they are operated every other scan line. This allows using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, can be selected. Visible data are not available in this mode. The VISSR output is digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal is fed into a "line stretcher," where it is stored and time-stretched. The processed data are immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data are handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Data from the VAS MSI mode and the dwell sounding mode are not "stretched".

------- GOES-G, NESS STAFF-----------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM

NSSDC ID- GOES-G -05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

The meteorological data collection system is an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data are retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations can be handled by the system. The system also allows for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small ground-based APT receiving stations. This communications system operates on S-band frequencies. The minimum data collection system for one small meteorological satellite consists of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period is between 350k and 600k bits, depending on the coding techniques. Data received from individual stations vary from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

*************************** GOES-H ***************************

SPACECRAFT COMMON NAME- GOES-H
ALTERNATE NAMES-

NSSDC ID- GOES-H

LAUNCH DATE- 08/00/86 WEIGHT- 660. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN INCLINATION- 0.1 DEG
PERIAPSIS- 35788. KM ALT APOAPSIS- 35788. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

GOES-H is the eighth in a series of NASA-developed, NOAA-operated spacecraft. The spin-stabilized, earth-synchronous spacecraft carries (1) a visible infrared spin scan radiometer (VISSR) atmospheric sounder (VAS) to provide high-quality day/night cloudcover data, to take radiance temperatures of the earth/atmosphere system, and to determine atmospheric temperature and water content at various levels, (2) a meteorological data collection system to relay processed data from central weather facilities to regional stations equipped with small automatic picture transmission (APT) and to collect and retransmit data from remotely located earth-based platforms, and (3) a space environment monitor (SEM) system to measure proton, electron, and solar X-ray fluxes and magnetic fields. The cylindrically shaped spacecraft measures 190.5 cm in diameter and 230 cm in length, exclusive of a magnetometer that extends an additional 83 cm beyond the cylindrical shell. The primary structural members are a honeycombed equipment shelf and a thrust tube. The VISSR telescope is mounted on the equipment shelf and views the earth through a special aperture in the side of the spacecraft. A support structure extends radially from the thrust tube and is affixed to the solar panels, which form the outer wall of the spacecraft to provide the primary source of electrical power. Located in the annulus-shaped space between the thrust tube and the solar panels are stationkeeping and dynamics control equipment, batteries, and most of the SEM equipment. Proper spacecraft attitude and spin rate (approximately 100 rpm) are maintained by two separate sets of jet thrusters mounted around the spacecraft equator and activated by ground command. The spacecraft uses both UHF-band and S-band frequencies in its telemetry and command subsystem. A low-power VHF transponder provides telemetry and command during launch and then serves as a backup for the primary subsystem once the spacecraft attains synchronous orbit.

------- GOES-H, LEINBACH-----------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLE MONITOR

NSSDC ID- GOES-H -02 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The energetic particle monitor consists of three detector assemblies, each covering limited regions of the overall energy spectrum. The first two detector assemblies monitor protons in seven energy ranges between 0.8 and 500 MeV, and alpha particles in six ranges from 4 to >400 MeV. There is also one channel for the measurement of electrons in the >=500 keV range. The third detector, the high energy proton and alpha detector (HEPAD), monitors protons in four energy ranges above 370 MeV and alpha particles in two energy ranges above 640 MeV/nucleon.

------- GOES-H, LEINBACH-----------------------------------

INVESTIGATION NAME- SOLAR X-RAY MONITOR

NSSDC ID- GOES-H -03 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The X-ray monitor consists of ion chamber detectors. The ranges and minimum useful threshold sensitivities are 0.5 to 3 A, 1.0E-13 J per sq cm per s and 1 to 8 A, 1.0E-12 J per sq cm per s with a dynamic range of 1.E4.

------- GOES-H, LEINBACH-----------------------------------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- GOES-H -04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL

BRIEF DESCRIPTION

The magnetometer has a range of plus or minus 400 nT (without saturation) and a resolution of 0.1 nT over a range of plus or minus 50 nT.

------- GOES-H, NESS STAFF-----------------------------------

INVESTIGATION NAME- VISIBLE INFRARED SPIN-SCAN RADIOMETER
ATMOSPHERIC SOUNDER (VAS)

NSSDC ID- GOES-H -01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS
OI - W.E. SHENK NASA-GSFC

BRIEF DESCRIPTION

The Visible Infrared Spin-Scan Radiometer Atmospheric Sounder (VAS) operates in three distinct modes to provide parameter flexibility, spectral band selection, geographic location, and signal-to-noise ratio. The VISSR mode is the same as the VISSR system on board GOES 1, 2, 3. Both the IR channel (10.5 to 12.5 micrometers) and visible channel (0.55 to 0.75 micrometers) use common optics. Incoming radiation is collected by a Ritchey-Chretien optical system. One west-to-east raster line is formed for each revolution of the spacecraft. A 20-deg north-to-south frame results from a total of 1821 steps of the scan mirror, one 0.192-mr step for each spacecraft revolution. A full picture takes 18.2 min to complete and 2 min to reset for the next image. Eight visible-spectrum detectors (0.9 km horizontal resolution) and one mercury-cadmium-telluride IR detector (6.9 km horizontal resolution) sweep the earth during each scan. The dwell-sounding mode uses up to 12 spectral filters in a wheel covering the range 678.7 per cm (14.74 micrometers) through 2535 per cm (3.94 micrometers) positioned into the optical train while the scanner is dwelling on a single N-to-S scan line. The filter wheel is programmed so that each spectral band filter dwells on a single scan line for from 0 to 255 spacecraft spins. Either the 6.9-km or 13.8-km-resolution detectors can be selected for the seven filter positions operating in the spectral region 701.6 per cm (14.25 micrometers) through 1487 per cm (6.725 micrometers). For the remaining five spectral bands, the 13.8-km-resolution detectors are used. Selectable frame size, position and scan direction are also programmable via ground command. For the VAS demonstration, 10-bit reduced resolution (3.5 km) visible data are provided for imaging. In some of the spectral regions, multiple-line data are required to enhance the signal-to-noise ratio. Typically, 167 satellite spins at the same N-to-S scan line position are required to obtain the desired sounding data. This number of spins per line can provide the soundings a 30- x 30-km resolution and require approximately 1.9 minutes on the average. The multispectral imaging (MSI) mode can provide normal VISSR IR imaging plus data in any two selected spectral bands having a spatial resolution of 13.8 km. This mode of operation takes advantage of the small mercury-cadmium-telluride detector offset in the N-to-S plane. Using the data from these detectors simultaneously produces a complete infrared map when they are operated every other scan line. This allows using the larger detectors during half of the imaging/scanning sequence period to obtain additional spectral information. Unlimited N-to-S frame size and position selection, within the maximum N-to-S FOV scan direction, can be selected. Visible data are not available in this mode. The VISSR output is digitized and transmitted to the NOAA Command and Data Acquisition Station, Wallops Island, Va. There the signal is fed into a "line stretcher," where it is stored and time-stretched. Processed data are immediately transmitted back to the satellite at reduced bandwidth for rebroadcast to APT user stations and regional forecast centers. The VISSR data are handled by NOAA and eventually sent to the Satellite Data Services Division, National Climatic Center, Washington, D.C., for archiving. Data from the VAS MSI mode and the dwell sounding mode are not "stretched".

------- GOES-H, NESS STAFF---

INVESTIGATION NAME- DATA COLLECTION SYSTEM

NSSDC ID- GOES-H -05 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The meteorological data collection system is an experimental communications and data handling system designed to receive and process meteorological data collected from remotely located earth-based data collection (observation) platforms (DCP). The collected data are retransmitted from the satellite to small, ground-based, regional data utilization centers. Data from up to 10,000 DCP stations can be handled by the system. The system also allows for the retransmission of narrow-band (WEFAX-type) data from centralized weather facilities to small ground-based APT receiving stations. This communications system operats on S-band frequencies. The minimum data collection system for one small meteorological satellite consists of approximately 3500 DCP stations to be contacted in a 6-h period. The total amount of data collected during the 6-h period is between 350k and 600k bits, depending on the coding techniques. Data received from individual stations vary from 50 to 3000 bits, depending on the type and variety of sensors used at an individual DCP station.

**************************** GRM-A1***************************

SPACECRAFT COMMON NAME- GRM-A1
ALTERNATE NAMES- GEOPOTENTIAL RES MISS-A1

NSSDC ID- GRM-A1

LAUNCH DATE- 1990 WEIGHT- 2800. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 88. MIN INCLINATION- 90. DEG
PERIAPSIS- 160. KM ALT APOAPSIS- 160. KM ALT

PERSONNEL
MS - T. FLYNN
MG - J.P. MURPHY NASA HEADQUARTERS
PS - D.E. SMITH NASA-GSFC
PS - R.A. LANGEL NASA-GSFC

BRIEF DESCRIPTION
The Geopotential Research Mission (GRM) consists of a pair of spacecraft in identical polar orbits at 160 km altitude, but with a nominal 300-km separation from each other. The objective of the GRM is to determine the earth's gravity and magnetic fields in order to provide accurate mathematical models for studies of the structure, composition and movement of the solid earth and oceans; resource exploration; orbit determination; and navigation. The spacecraft are flown in a "drag-free" orbit obtained by providing thrust to counter the atmospheric drag forces. A disturbance compensation system senses the drag forces and actuates the thrusters. Accurate measurement of the gravity field is obtained by the sensitive spacecraft-to-spacecraft velocity measurement system. The precise orbital position is measured using the ground-based Doppler tracking stations operated by the Defense Mapping Agency (DMA). The two spacecraft are alike with respect to the gravity field detection system, but this particular spacecraft, A1, also carries scalar and vector magnetometers, with four star cameras to provide accurate orientation information for the vector magnetometer. Command, telemetry, and tracking use the TDRSS Single Access (SA) link. In order to operate with the TDRSS, the conformal array antennas are in two parts to allow communications whether approaching or receding from a particular TDRS. Redundant data storage devices are used to record the data during the TDRSS Zone of Exclusion (ZOE), during switchover from one TDRS to the other, and at other times as required. Recorder playback at a rate of 34 kbps for 12 minutes is required for one orbit of data. The disturbance compensation system contains a 14-cm diameter ball housed in a 16-cm diameter spherical cavity in which the position of the ball is electrically sensed. When in orbit, the ball responds only to the gravity fields as the spacecraft shields the ball from all other forces. When the position of the ball in the cavity changes, the sensor commands the propulsion system to "fly" the spacecraft to re-center the ball in the cavity. The propulsion system is able to move the spacecraft linearly and angularly with six degrees of freedom, so that the ball remains at the center of the cavity. Since the ball is attracted by the mass of the spacecraft and the propulsion fuel, the fuel must be balanced between the front and rear tanks to null out the gravity fields generated by the mass of fuel in each tank. NASA standard reaction wheels are used to provide the torque to control the spacecraft. An onboard computer provides for autonomous control of the spacecraft, independent of ground command control. To eliminate perturbations that could be induced by rotating solar panels, the panels are rigidly attached. The solar array can support an orbital average load of 400 W. The structure of the spacecraft consists of an axial cruciform aluminum basic frame which supports all of the subsystems. Strong rings at each end support the 1-m diameter propellant tanks. The outer monocoque shell is a secondary structural element and serves primarily to support the thermal heat pipes and the solar array mounted on the upper half of the cylindrical surface. A 4-m boom separates the magnetometers from the main body of the spacecraft. Because of the need for stability of the thermal rate of change of spacecraft dimensions, the thermal design concept uses the lower half of the spacecraft as a radiator for internal power and isolates the upper body and solar array from the lower body and from each other. Heat pipes are used to distribute heat uniformly over the spacecraft. Expected mission lifetime is 7 months, with 6 months of scientific data.

------- GRM-A1, ACUNA--

INVESTIGATION NAME- VECTOR MAGNETOMETER

NSSDC ID- GRM-A1 -03 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
GEODYNAMICS
PARTICLES AND FIELDS

PERSONNEL
PI - M.H. ACUNA NASA-GSFC

BRIEF DESCRIPTION
The vector magnetometer is a triaxial fluxgate instrument similar to that flown on Magsat (79-094A-02). This magnetometer has a dynamic range of positive and negative 2000 nT and, with the use of offset generators, provides a total operational range of 64,000 nT. The accuracy is 3 nT, with a resolution of 0.5 nT. Both the scalar and vector magnetometers are mounted on the same 4-m boom extending from the end of the spacecraft.

------- GRM-A1, FARTHING---------------------------------------

INVESTIGATION NAME- SCALAR MAGNETOMETER

NSSDC ID- GRM-A1 -02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
GEODYNAMICS
PARTICLES AND FIELDS

PERSONNEL
PI - W.H. FARTHING NASA-GSFC

BRIEF DESCRIPTION
The scalar magnetometer is a cesium vapor instrument similar to that flown on Magsat (79-094A-01). This magnetometer determines the absolute value of the magnetic field to an accuracy of 1 nT. Both the scalar and vector magnetometers are mounted on the same 4-m boom extending from the end of the spacecraft.

------- GRM-A1, SMITH---

INVESTIGATION NAME- SST (S/C-TO-S/C TRACKING)

NSSDC ID- GRM-A1 -01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S) GEODYNAMICS

PERSONNEL
PI - D.E. SMITH NASA-GSFC

BRIEF DESCRIPTION
The objective of the spacecraft-to-spacecraft tracking (SST) instrument is to measure the relative velocity between the two spacecraft. The Doppler frequency shift due to changes in the relative velocity between the two spacecraft (which are orbiting at 160 km altitude and separated by about 300 km) is done at two frequencies: 91 GHz and 42 GHz. A continuous wave signal is radiated by the GRM-A1 spacecraft to the GRM-A2 spacecraft, which receives it and compares it to an onboard signal. At the same time the A2 spacecraft is radiating an incrementally frequency-shifted signal to the A1 spacecraft where it is compared. The resulting continuous comparison of the signals serves to measure the velocity changes to a value of 1.E-6 m/s. The gravity field is determined by processing the Doppler data that will be time-correlated to the spacecraft position as measured by the ground-based tracking network. This network, operated by DMA (Defense Mapping Agency), provides a spacecraft-to-ground Doppler shift measurement. The two sets (spacecraft-to-spacecraft and spacecraft-to-ground) of Doppler data are processed at GSFC to provide a geoid relating the gravitational field strength to a geographic location on the earth. Accuracy of 2.5 milligal is obtained with 100-km spatial resolution.

*************************** GRM-A2 ***************************

SPACECRAFT COMMON NAME- GRM-A2
ALTERNATE NAMES- GEOPOTENTIAL RES MISS-A2

NSSDC ID- GRM-A2

LAUNCH DATE- 1990 WEIGHT- 2600. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 88. MIN INCLINATION- 90. DEG
PERIAPSIS- 160. KM ALT APOAPSIS- 160. KM ALT

PERSONNEL
MS - T. FLYNN NASA HEADQUARTERS
MG - J.P. MURPHY NASA HEADQUARTERS
PS - D.E. SMITH NASA-GSFC
PS - R.A. LANGEL NASA-GSFC

BRIEF DESCRIPTION
The Geopotential Research Mission (GRM) consists of a pair of spacecraft in identical polar orbits at 160 km altitude, but with a nominal 300-km separation from each other. The objective of the GRM is to determine the earth's gravity and magnetic fields in order to provide accurate mathematical models for studies of the structure, composition and movement of the solid earth and oceans; resource exploration; orbit determination; and navigation. The spacecraft are flown in a "drag-free" orbit obtained by providing thrust to counter the atmospheric drag forces. A disturbance compensation system senses the drag forces and actuates the thrusters. Accurate measurement of the gravity field is obtained by the sensitive spacecraft-to-spacecraft velocity measurement system. The precise orbital position is measured using the ground-based Doppler tracking stations operated by the Defense Mapping Agency (DMA). The two spacecraft are alike with respect to the gravity field detection system, but this particular spacecraft, A2, carries no magnetometers. Command, telemetry, and tracking use the TDRSS Single Access (SA) link. In order to operate with the TDRSS, the conformal array antennas are in two parts to allow communications whether approaching or receding from a particular TDRS. Redundant data storage devices are used to record the data during the TDRSS Zone of Exclusion (ZOE), during switchover from one TDRS to the other, and at other times as required. Recorder playback at a rate of 34 kbps for 12 minutes is required for one orbit of data. The disturbance compensation system contains a 14-cm diameter ball housed in a 16-cm diameter spherical cavity in which the position of the ball is electrically sensed. When in orbit, the ball responds only to the gravity fields as the spacecraft shields the ball from all other forces. When the position of the ball in the cavity changes, the sensor commands the propulsion system to "fly" the spacecraft to re-center the ball in the cavity. The propulsion system is able to move the spacecraft linearly and angularly with six degrees of freedom, so that the ball remains at the center of the cavity. Since the ball is attracted by the mass of the spacecraft and the propulsion fuel, the fuel must be balanced between the front and rear tanks to null out the gravity fields generated by the mass of fuel in each tank. NASA standard reaction wheels are used to provide the torque to control the spacecraft. An onboard computer provides for autonomous control of the spacecraft, independent of ground command control. To eliminate perturbations that could be induced by rotating solar panels, the panels are rigidly attached. The solar array can support an orbital average load of 400 W. The structure of the spacecraft consists of an axial cruciform aluminum basic frame which supports all of the subsystems. Strong rings at each end support the 1-m diameter propellant tanks. The outer monocoque shell is a secondary structural element and serves primarily to support the thermal heat pipes and the solar array mounted on the upper half of the cylindrical surface. Because of the need for stability of the thermal rate of change of spacecraft dimensions, the thermal design concept uses the lower half of the spacecraft as a radiator for internal power and isolates the upper body and solar array from the lower body and from each other. Heat pipes are used to distribute heat uniformly over the spacecraft. Expected mission lifetime is 7 months, with 6 months of scientific data.

------- GRM-A2, SMITH---

INVESTIGATION NAME- SST (S/C-TO-S/C TRACKING)

NSSDC ID- GRM-A2 -01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S) GEODYNAMICS

PERSONNEL
PI - D.E. SMITH NASA-GSFC

BRIEF DESCRIPTION
The objective of the spacecraft-to-spacecraft tracking (SST) instrument is to measure the relative velocity between the two spacecraft. The Doppler frequency shift due to changes in the relative velocity between the two spacecraft (which are orbiting at 160 km altitude and separated by about 300 km) is done at two frequencies: 91 GHz and 42 GHz. A continuous wave signal is radiated by the GRM-A1 spacecraft to the GRM-A2 spacecraft, which receives it and compares it to an onboard signal. At the same time the A2 spacecraft is radiating an incrementally frequency-shifted signal to the A1 spacecraft where it is compared. The resulting continuous comparison of the signals serves to measure the velocity changes to a value of 1.E-6 m/s. The gravity field is determined by processing the Doppler data that will be time-correlated to the spacecraft position as measured by the ground-based tracking network. This network, operated by DMA (Defense Mapping Agency), provides a spacecraft-to-ground Doppler shift measurement. The two sets (spacecraft-to-spacecraft and spacecraft-to-ground) of Doppler data are processed at GSFC to provide a geoid relating the gravitational field strength to a geographic location on the earth. Accuracy of 2.5 milligal is obtained with 100-km spatial resolution.

*************************** HIPPARCOS ***************************

SPACECRAFT COMMON NAME- HIPPARCOS
ALTERNATE NAMES- SPACE ASTROMETRY

NSSDC ID- HIPPA

LAUNCH DATE- 04/00/88 WEIGHT- 1025. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1436. MIN INCLINATION- 3. DEG
PERIAPSIS- 35266. KM ALT APOAPSIS- 36304. KM ALT

PERSONNEL
PM - L. EMILIANI ESA-ESTEC
PS - M.A.C.PERRYMAN ESA-ESTEC

BRIEF DESCRIPTION
The scientific goals of this mission are the accurate measurement of the trigonometric parallaxes, proper motions, and positions of 1.E5 selected stars, mostly fainter than 10th magnitude. The spacecraft consists of two platforms and six vertical panels, all made of Al honeycomb. The solar array consists of three deployable sections. Antennae are located on the top and bottom of the spacecraft. An attitude and orbit-control subsystem ensures correct dynamic attitude control and determination during the 2.5-year planned lifetime. The spacecraft spins around its Z-axis at the rate of 12 rev/day at an angle of 43 deg to the sun. The Z-axis rotates about the sun-satellite line at 6.4 rev/year. The spacecraft carries a single telescope which, in the focal plane, superimposes two fields of view 58 deg apart. The attitude of the spacecraft about its CG is controlled to scan the celestial sphere in a regular movement. The telescope uses a system of grids, at the focal surface, composed of alternate opaque and transparent bands. Behind these grids, an image-dissector tube converts the modulated light into a sequence of photon counts from which the phase of the entire pulse train from a star can be derived. The apparent angle between two stars in the combined fields of view is obtained from the phase difference

of the two star pulse trains. The telescope is an all-reflective eccentric Schmidt system. A complex mirror is employed which consists of two mirrors tilted in opposite directions, each occupying half of the rectangular entrance pupil. The unvignetted field of view is 94 arc min by 54 arc min. An additional photomultiplier system known as Tycho views a beam splitter in the optical path and is used to gather photometric and astrometric data of 4.E5 stars down to 11th magnitude. Measurements are made in two broad bands corresponding to B and V in the Johnson BUV system. The latter stars will be determined to a precision of 0.05 arc sec, which is a factor of 25 less than the main mission stars. The mission is a facility type in which guest investigators propose particular research programs and selected stars are incorporated into the overall observing strategy.

*************************** INSAT-1B *************************

SPACECRAFT COMMON NAME- INSAT-1B
ALTERNATE NAMES- INDIAN NATIONAL SAT.

NSSDC ID- INSAT1B

LAUNCH DATE- 08/00/83 WEIGHT- 1152. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
INDIA ISRO

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1440. MIN INCLINATION- 0.0 DEG
PERIAPSIS- 36000. KM ALT APOAPSIS- 36000. KM ALT

PERSONNEL
MG - J.P. SINGH ISRO SATELLITE CENTER
PM - P.P. KALE INDIA DEPT OF SPACE

BRIEF DESCRIPTION
The Insat-1 satellite program incorporates two three-axis stabilized spacecraft in geostationary orbit (Insat-1A at 74 degrees E and Insat-1B at 94 degrees E) with a host of ground stations throughout India. The Insat-1B satellite, built by the Ford Aerospace and Communications Corporation, is designed to provide combined telecommunications, direct TV broadcast, and meteorological service to India's civilian community over a 7-year-in-orbit lifespan. The telecommunications package provides two-way, long-distance telephone circuits and direct radio and TV broadcasting to the remotest areas of India. The meteorology package is comprised of a scanning very-high-resolution, two-channel radiometer (VHRR) to provide full-frame, full-earth coverage every 30 minutes. The visual channel (0.55-0.75 micrometers) has a 2.75-km resolution while the IR channel (10.5-12.5 micrometers) has an 11-km resolution. Using the Insat TV capability, early warnings of impending disasters (i.e., floods, storms, etc.) can directly reach the civilian population, even in remote areas. The Insat-1B also has a data channel for relaying meteorological, hydrological, and oceanographic data from unattended land-based or ocean-based data collection and transmission platforms.

------- INSAT-1B, UNKNOWN--------------------------------------

INVESTIGATION NAME- TELECOMMUNICATIONS PACKAGE

NSSDC ID- INSAT1B-02 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The telecommunications package has 12 transponders operating at 5935-6425 MHz (earth-to-satellite) and 3710-4200 MHz (satellite-to-earth) for thick route, thin route, and remote area communication and TV program distribution. It also has 2 transponders operating at 5855-5935 MHz (earth-to-satellite) and 2555-2635 MHz (satellite-to-earth) for direct broadcasting to augmented low-cost community TV sets in rural areas, radio-program distribution, national TV networking and disaster warning.

------- INSAT-1B, UNKNOWN--------------------------------------

INVESTIGATION NAME- DATA COLLECTION AND TRANSMISSION RELAY

NSSDC ID- INSAT1B-03 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS
METEOROLOGY

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
The data collection and transmission relay package consists of a data channel to provide for the relay of meteorological, hydrological, and oceanographic data from unattended land-based and ocean-based data collection and transmission platforms.

**************************** ISPM *****************************

SPACECRAFT COMMON NAME- ISPM
ALTERNATE NAMES- ISPM-B, ISP
INTERNATIONL SOLAR POLAR, SOLAR POLAR
ISPM/CENTAUR

NSSDC ID- ISPESA

LAUNCH DATE- 05/23/86 WEIGHT- 370. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHTLE-CGP

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC
ORBIT PERIOD- 2190. DAYS INCLINATION- 81. DEG
PERIAPSIS- 1.1 AU RAD APOAPSIS- 5.0 AU RAD

PERSONNEL
PM - D. EATON ESA-ESTEC
PS - K.P. WENZEL ESA-ESTEC

BRIEF DESCRIPTION
The primary objectives of the International Solar Polar Mission (ISPM) are to investigate, as a function of solar latitude, the properties of the solar wind, the sun-wind interface, the heliospheric magnetic field, solar X-rays, solar radio bursts and plasma waves, solar and galactic cosmic rays and the interplanetary/interstellar neutral dust and gas. ISPM also investigates cosmic gamma-ray bursts and searches for gravitational waves. Secondary objectives include interplanetary and planetary physics investigations during the initial Earth-Jupiter phase and investigations in the Jovian magnetosphere. Following the Jupiter swingby, the spacecraft travels in a heliocentric orbit with high heliographic inclination, and passes over the rotational poles of the sun. Radio-science interdisciplinary/theoretical investigations are conducted in addition to the operation of nine scientific instruments. The ISPM spacecraft is spin stabilized at a rate of 5 rpm and its high-gain antenna points continuously to the earth. It carries a scientific payload of 55 kg and is powered by a single radio-isotope generator (RTG) providing 290 W of power. The telemetry system operates in X-band (8 GHz). A low-power S-band (2 GHz) transmitter is also carried for dual-frequency radio-science investigations and early orbit maneuvers. The uplink telecommunication system works in S-band. Throughout the mission the spacecraft will be tracked by the 34-m antennas of NASA's Deep Space Network (DSN) for 8 hours per day, providing real time data at a rate of 1024 bps. During the remaining 16 hours data are stored onboard at a rate of 512 bps. and played back during the next tracking period. The original mission plans consisted of two spacecraft, one built by ESA and the other by NASA. NASA cancelled its spacecraft in 1981. The list of co-investigators for ISPM investigations will be included when available.

------- ISPM, BAME---

INVESTIGATION NAME- PLASMA SPECTROMETER

NSSDC ID- ISPESA -05 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
The objectives of this investigation are (1) to investigate and characterize bulk-flow parameters and internal-state conditions of the solar wind as functions of solar latitude; (2) to investigate radial variations of solar wind properties between Earth and Jupiter; and (3) to investigate the solar wind interactions with the Jovian magnetosphere. The instrument consists of two sensor systems and associated electronics that interface with the spacecraft. Electrons in the energy range between 1 and 900 eV are measured by a 120-deg spherical-section electrostatic analyzer with seven channel electron multipliers (CEMs) which cover a polar angle range of 146 deg. The plate spacing is 0.35 cm and the average radius of curvature is 4.2 cm. The solar wind ion analyzer makes three-dimensional measurements of solar-wind ions with energies in the range between 257 eV and 35 keV per charge. It consists of a 105-deg spherical-section electrostatic analyzer fitted with 16 CEM sensors which cover a polar angle range of 80 deg. It is mounted so that the first CEM views along the spin axis direction and the sixteenth at a

polar angle of 75 deg from the spin axis. A stepping motor is used to rotate any one of seven apertures into place. The mass of the electron instrument is 2.6 kg. It uses 2.6 W of power and has a data rate of 24 bps in storage mode and 48 bps in tracking mode. The mass of the ion instrument is 4.1 kg. It uses 2.9 W mean and 7 W peak power, and has a data rate of 56 bps in storage mode and 112 bps in tracking mode.

------- ISPM, BERTOTTI ---

INVESTIGATION NAME- RADIO SCIENCE

NSSDC ID- ISPESA -11 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
RADIO PHYSICS
HIGH ENERGY ASTROPHYSICS

PERSONNEL
PI - B. BERTOTTI U OF PAVIA

BRIEF DESCRIPTION
The objective of this radio science investigation is to search for low-frequency (1.E-4 to 1.E-2 Hz) gravitational waves expected to be generated by the violent collapse of stars, galactic nuclei and other astrophysical objects, and for a gravitational wave background. Doppler data to be analyzed for characteristic signatures are recorded during phases of the ISPM opposition, using the spacecraft telecommunication system and the NASA DSN. Correlative measurements with Galileo are planned.

------- ISPM, GLOECKLER ---------------------------------------

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION SPECTROMETER

NSSDC ID- ISPESA -04 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - G. GLOECKLER U OF MARYLAND
OI - J. GEISS U OF BERNE

BRIEF DESCRIPTION
The objective of this investigation is to study the elemental and ionic-charge composition, temperatures, and mean speeds of all major solar wind ions from H through Fe in solar wind speeds ranging from 145 km/s (H+) to 1352 km/s (Fe 8+). The instrument consists of a deflection assembly, a high-voltage bubble containing analog electronics, a post-acceleration 30 kV supply, and electronics for data processing and power conversion. The instrument has a mass of 5.6 kg, uses 3.6 W mean and 4.7 W peak power, and has a data rate of 44 bps in storage mode and 88 bps in tracking mode.

------- ISPM, GRUEN ---

INVESTIGATION NAME- COSMIC DUST

NSSDC ID- ISPESA -07 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
DUST

PERSONNEL
PI - E. GRUEN MPI-NUCLEAR PHYS

BRIEF DESCRIPTION
The objectives of this investigation are to study particulate matter with masses between 1.E-19 and 1.E-10 g in the heliosphere; determine its physical and dynamical properties as a function of ecliptic latitude and heliocentric distance; and investigate its interaction with other interplanetary/interstellar phenomena such as solar radiation, solar wind, heliospheric magnetic field, and interstellar neutral gas. The instrument is a multicoincidence plasma impact detector which measures mass, speed, flight direction and electric charge of individual dust particles. The instrument has a mass of 3.75 kg and uses 2.0 W of power. The data rate is 8 bps.

------- ISPM, HEDGECOCK --------------------------------------

INVESTIGATION NAME- MAGNETIC FIELD

NSSDC ID- ISPESA -08 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - P.C. HEDGECOCK IMPERIAL COLLEGE

BRIEF DESCRIPTION
The objectives of this investigation are to determine the strength and geometry of the interplanetary magnetic field in the inner heliosphere (particularly at high solar latitudes) and to investigate the heliographic latitude dependence of the field fluctuation spectra with special emphasis on the frequency range below 0.01 Hz. Secondary objectives are to study the internal dynamics of the solar wind, the role of discontinuities and waves in the interplanetary field on propagation and acceleration of energetic particles, the interplanetary propagation and development of discontinuities and waves, and the structure and dynamics of the dusk region of the Jovian magnetosphere. The instrument consists of a triaxial fluxgate magnetometer, a vector helium magnetometer, and associated electronics. The instrument has a mass of 4.75 kg. It has a data rate of 40 bps in the cruise mode and 80 bps in the tracking mode. It uses 5.4 W of power.

------- ISPM, HURLEY --

INVESTIGATION NAME- SOLAR-FLARE X-RAYS AND COSMIC GAMMA RAY BURSTS

NSSDC ID- ISPESA -01 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
GAMMA-RAY ASTRONOMY
X-RAY ASTRONOMY

PERSONNEL
PI - K.C. HURLEY CESR
OI - M.K. SOMMER MPI-EXTRATERR PHYS

BRIEF DESCRIPTION
The objectives of this investigation are to study the acceleration and storage of energetic electrons accelerated during solar flares by measuring solar X-radiation; to identify gamma-ray burst sources with known celestial objects or phenomena; and to study plasma and energetic charged particle processes in the Jovian magnetosphere. The instrument consists of two hemispherical cesium iodide (sodium) crystals coupled to curved cathode photomultipliers; two small solid-state detectors with an americium 241 radioactive source deposited on the sensors, and a digital electronics unit. The scintillation counters measure X-rays in the energy range from 15 keV to 150 keV, while the solid state detectors measure X-rays from 5 keV to 15 keV. The instrument has a mass of 2.0 kg, uses 2.6 W of power, and has a data rate of 20 bps in storage mode and 40 bps in tracking mode.

------- ISPM, KEPPLER ---

INVESTIGATION NAME- ENERGETIC PARTICLE COMPOSITION AND NEUTRAL GAS

NSSDC ID- ISPESA -12 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
ASTRONOMY

PERSONNEL
PI - E. KEPPLER MPI-AERONOMY

BRIEF DESCRIPTION
The objectives of this investigation are (1) to study the composition, energy spectra and spatial distribution of ions in the energy range 80 keV to 15 MeV/nucleon and (2) to study the temperature, bulk velocity and density of the interstellar neutral gas in the vicinity of the solar system. The investigation comprises two independent sensor systems, the ion measurements being made by a set of four solid state detector telescopes with active anticoincidence shields having a total geometrical factor of 0.4 sq cm sr. The front element of each telescope is an epitaxial silicon detector of 5 micrometer thickness. The neutral gas sensor uses a channeltron to amplify and count secondary electrons produced by neutral particle impact on a lithium fluoride (LiF) surface. The latter is periodically refreshed via a heated filament. Automatic scanning of the neutral gas sensor is provided by a stepping motor, and a mechanical collimator suppresses charged particles and photoelectrons. The complete instrument has a mass of 4.4 kg and uses 3.1 W of power. The data rate is 16 bps in the tracking mode.

------- ISPM, LANZEROTTI -------------------------------------

INVESTIGATION NAME- LOW ENERGY PARTICLE SPECTRUM, COMPOSITION, AND ANISOTROPY

NSSDC ID- ISPESA -03 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - L.J. LANZEROTTI BELL TELEPHONE LAB

BRIEF DESCRIPTION
The objectives of this investigation are (1) to investigate the solar-flare process with measurements of non-relativistic and relativistic electrons, and non-relativistic ions, and their dependence on heliolatitude; (2) to investigate solar elemental abundances with measurements of chemical composition of nuclei of solar origin at all heliolatitudes; (3) to investigate the interplanetary propagation of solar energetic particles by measurement of anisotropy and composition parameters; (4) to investigate acceleration processes; and (5) to investigate temporal and spatial variations of particle intensity in and near the Jovian magnetosphere. The instrumentation consists of two double-ended solid state detector systems which measure ions in the range 50 keV to 5 MeV and electrons in the range 30 keV to 300 keV, and a (dE/dX, E) telescope using a 5-micrometer-thick front detector for ion elemental abundances in the range 1 to 15 MeV/nucleon (Fe). Each double-ended system comprises a magnetic spectrometer, using a rare-earth magnet to separate electrons from ions (geometric factor for ions is approximately 0.5 sq cm sr, and for electrons 0.05 sq cm sr), and a foil spectrometer in which a 0.35 mg/sq cm thin foil excludes ions below 350 keV, allowing electrons above 30 keV to be detected. Orientation of the sensor systems is such that complete pitch-angle coverage is obtained. The instrument has a mass of 5.8 kg including shielding, and uses 4.0 W of power. The data rate is 80 bps in cruise mode and 160 bps in tracking mode.

------- ISPM, SIMPSON--

INVESTIGATION NAME- COSMIC RAY AND CHARGED PARTICLE

NSSDC ID- ISPESA -02 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO

BRIEF DESCRIPTION
The objectives of this investigation are to study the energy, charge, and mass spectra of energetic charged particles in interplanetary space in the energy range from approximately 0.5 MeV/nucleon (for protons) to approximately 100 MeV/nucleon; and to study spatial gradients and the propagation of charged particles throughout the heliosphere by measuring absolute flux and vector anisotropy. The instrument consists of six charged-particle telescopes (CPT) and associated electronics. A high-energy telescope provides measurements of the chemical and isotopic composition and of the energy spectrum of the cosmic radiation above approximately 10 MeV/nucleon. A low-energy telescope (LET) extends chemical composition and spectral measurements downward to < 1 MeV/nucleon. The anisotropy telescopes, in conjunction with the LET, provide a means of determining the distribution of arrival directions in three dimensions of low-energy protons and He nuclei. A high-flux telescope provides measurements of the intensity and arrival direction of protons, helium, CNO, and Fe group nuclei in high-flux environments, such as intense solar flares or Jupiter's magnetosphere, where the other sensor systems may become saturated. Each CPT provides output to a data-processing unit (DPU). The electron telescope consists of a double Cerenkov and semiconductor detector telescope which interfaces with the DPU. The instrument has a mass of 14.6 kg including shielding and uses 14.6 W of power. The data rate is 80 bps in cruise mode and 160 bps in tracking mode.

------- ISPM, STONE--

INVESTIGATION NAME- UNIFIED RADIO AND PLASMA WAVE

NSSDC ID- ISPESA -06 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS

PERSONNEL
PI - R.G. STONE NASA-GSFC

BRIEF DESCRIPTION
The objectives of this investigation are (1) to investigate source positions of travelling solar radio bursts in the range from dc to 1 MHz; (2) to investigate the large-scale magnetic field topology and the electron density along the exciter trajectory as a function of heliographic latitude and longitude at distances of 0.1 AU to approximately 5 AU; (3) to investigate Jovian radio source locations in the range from dc to 1 MHz; and (4) to investigate waves in the plasma between dc and 35 kHz, their instabilities, their energy transport mechanisms, and the thermal electron density. The instrument comprises three antenna systems (a 70-m tip-to-tip dipole in the equatorial plane, a monopole along the spin axis, and a pair of crossed-axis magnetic search coils) and four receiver systems (an rf receiver for the 1.25-kHz to 1-MHz range in two intervals from 1.25 to 48.5 kHz and from 52 kHz to 940 kHz; a plasma frequency receiver covering from 0.57 kHz to 35 kHz in 32 contiguous intervals; a fast envelope sampler from 10 Hz to 60 kHz with four commandable decade ranges to capture transient events; and a wave form analyzer, dc to 500 Hz, that operates in two frequency bands, from dc to 10 Hz and from 10 Hz to 500 Hz). It also includes an active sounder for determining the ambient electron density. The instrument has a mass of 7.3 kg, excluding antennas and booms, and has a data rate of 116 bps in storage mode and 232 bps in tracking mode. It uses 9.9 W mean power and 10.4 W when the sounder is operated.

------- ISPM, VOLLAND--

INVESTIGATION NAME- CORONAL SOUNDING

NSSDC ID- ISPESA -10 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
RADIO PHYSICS

PERSONNEL
PI - H.E. VOLLAND U OF BONN

BRIEF DESCRIPTION
The objective of this radio science investigation is to determine the density, turbulence spectrum, and velocity of the coronal plasma in the acceleration regime of the solar wind. Dual-frequency ranging and Doppler data are recorded during phases of the ISPM superior conjunction using the spacecraft transmitters and the NASA DSN.

**************************** LANDSAT-D1 ***********************

SPACECRAFT COMMON NAME- LANDSAT-D1
ALTERNATE NAMES- LAND SATELLITE-E

NSSDC ID- LAND-E

LAUNCH DATE- 06/00/85 WEIGHT- 1407. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA
UNITED STATES NOAA-NESS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 99.3 MIN INCLINATION- 98.2 DEG
PERIAPSIS- 705.3 KM ALT APOAPSIS- 705.3 KM ALT

PERSONNEL
MG - B.B. SCHARDT NASA-GSFC
PM - L. GONZALES NASA-GSFC
PS - V.V. SALOMONSON NASA-GSFC

BRIEF DESCRIPTION
The Landsat-E system is an experimental earth resources monitoring system with the new powerful remote-sensing capabilities of the thematic mapper (TM), and it provides a transition for both foreign and domestic users from the multispectral scanner (MSS) data (which are also part of the instrument package) to the higher resolution and data rate of the TM. It has a complete end-to-end highly automated data system, which is designed to be a new generation system, and is a major step forward in global remote-sensing applications. The Landsat-E mission consists of an orbiting satellite (space segment) with the necessary wideband data links and support systems, and a ground segment. The Landsat-E is an identical back-up for Landsat 4 (NSSDC ID 82-072A). The Landsat-E space segment consists of two major systems: (1) the instrument module, containing the instruments together with the mission unique subsystems, such as the solar array and drive, the TDRS antenna, the wide-band module (WBM), and the global positioning system (GPS), and (2) the multimission modular spacecraft (MMS) that contains the modularized and standardized power, propulsion, attitude control, and communications and data handling subsystems. When the Landsat-E satellite is launched, it will be deployed at an orbital altitude of 705.3 km, inclination of 98.2 deg, and a sun angle of 9:30 a.m. at the descending node. This orbit has a frequency of 19-9/16 orbits per day and covers the earth in 16 days. The distance between ground tracks is 172 km, which, when used in conjunction with the 185-km TM and MSS swath width, provides an overlap of 7.6%. The space segment is designed with 3 years nominal lifetime in orbit and can be extended through in-orbit replacement capability when the Space Shuttle is operational. The spacecraft and attendant sensors will be operated through the Tracking And Data Relay Satellite System (TDRSS).

------- LANDSAT-D1, BANKS ---------------------------------------

INVESTIGATION NAME- MULTISPECTRAL SCANNER (MSS)

NSSDC ID- LAND-E -02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY
OCEANOGRAPHY

PERSONNEL
PI - G.F. BANKS NASA-GSFC

BRIEF DESCRIPTION
The Landsat-E Multispectral Scanner (MSS) provides repetitive day/night acquisition of high-resolution multispectral data of the earth's surface on a global basis. While its primary function is to provide an alternate to the thematic mapper (TM), it provides data for agriculture, forestry, geology, and hydrology. The MSS system is also used for oceanographic and meteorological purposes, i.e., to map sea-ice fields, locate and track major ocean currents, monitor both air and water pollution, determine snow cover, investigate severe storm environments, etc. The MSS consists of a double reflection-type telescope, scanning mirror, filters, detectors, and associated electronics. The scanner operates in the following spectral intervals: band 1, 0.5 to 0.6 micrometers; band 2, 0.6 to 0.7 micrometers; band 3, 0.7 to 0.8 micrometers; and band 4, 0.8 to 1.1 micrometers. The swath width is 185 km; the ground resolution is 82.6 m for all four bands. The primary image produced at the image plane is relayed by use of fiber-optic bundles to detectors where conversion to an electronic signal is accomplished. Optical filters produce spectral separation. Six detectors are employed in each of the first four spectral bands: bands 1 through 3 use photomultiplier tubes as detectors, and band 4 uses silicon photodiodes. A multiplexer included in the MSS system processes the scanner's 24 channels of data. These data are time-multiplexed and then converted to a PCM signal by an A/D converter. The data are transmitted directly to an acquisition station via the TDRSS. Data from this experiment will be available through the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

------- LANDSAT-D1, FEINBERG ---------------------------------------

INVESTIGATION NAME- GLOBAL POSITIONING SYSTEM (GPS)

NSSDC ID- LAND-E -03 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
NAVIGATION

PERSONNEL
PI - P.M. FEINBERG NASA-GSFC

BRIEF DESCRIPTION
The Global Positioning System (GPS) is a Department of Defense (DOD) program to provide very precise position and timing information to a variety of users. The GPS assembly on Landsat-E operates in two phases. The first phase (approximately 90 days) is an experimental one to validate and calibrate the position and timing information provided by the GPS assembly. The second phase calls for operational use of the GPS data by Landsat-E.

------- LANDSAT-D1, WEINSTEIN ---------------------------------------

INVESTIGATION NAME- THEMATIC MAPPER (TM)

NSSDC ID- LAND-E -01 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY
METEOROLOGY

PERSONNEL
PI - O. WEINSTEIN NASA-GSFC

BRIEF DESCRIPTION
The Thematic Mapper (TM) is a seven-band, earth-looking, scanning radiometer with a 30-m ground element resolution covering a 185-km ground swath from a 705-km altitude. The instrument consists of primary imaging optics, scanning mechanism, spectral band discrimination optics, detector arrays, radiative cooler, inflight calibrator, and required operating and processing electronics. The scanning mechanism provides the cross-track scan while the progress of the spacecraft provides the scan along the track. Seven spectral bands are used to provide the spectral signature capability of the instrument: band 1, 0.45-0.52 micrometer; band 2, 0.52-0.60 micrometer; band 3, 0.63-0.69 micrometer; band 4, 0.76-0.90 micrometer; banc 5, 1.55-1.75 micrometers; band 6, 10.40-12.50 micrometers; and band 7, 2.08-2.35 micrometers. The optical system images the earth's surface on a field stop or a detector sized to define an area on the earth's surface 30 m square (120 m for band 6). Several lines are scanned simultaneously to permit suitable dwell time for each resolution element. The variation in radiant flux passing through the field stop onto the photo and thermal detectors creates an electrical output that represents the radiant history of the line. The information outputs from the detector channels are processed in the TM multiplexer for transmission via the Tracking And Data Relay Satellites (TDRS) and/or direct readout to local receiving stations. Archival data will be available through the Earth Resources Data Center, Department of the Interior, Sioux Falls, S.D.

*************************** MS-T5 ***************************

SPACECRAFT COMMON NAME- MS-T5
ALTERNATE NAMES-

NSSDC ID- MS-T5

LAUNCH DATE- 01/00/85 WEIGHT- 140. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S2-1

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PERSONNEL
PM - K. HIRAO ISAS
PS - H. OYA U OF TOHOKU

BRIEF DESCRIPTION
MS-T5 is a test spacecraft similar to Planet-A which will fly by Comet Halley at a distance of 0.1 AU. It carries instruments to measure plasma wave spectra, solar wind ions, and interplanetary magnetic fields. The spacecraft is spin-stabilized at two different rates (5 and 0.2 rpm) during the mission. It is equipped with hydrazine thrusters for attitude and velocity control, star and sun sensors for attitude determination, and a mechanically despun off-set parabolic dish for long range communication.

------- MS-T5, OYA ---------------------------------------

INVESTIGATION NAME- PLASMA WAVE SPECTRAL RECEIVERS

NSSDC ID- MS-T5 -01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETOLOGY

PERSONNEL
PI - H. OYA U OF TOHOKU

BRIEF DESCRIPTION
This investigation involves measuring plasma wave spectra within 0.1 AU of Comet Halley. Both electric and magnetic field components are measured using sweep frequency receivers. The measured frequency ranges from 70 Hz to 196 KHz.

------- MS-T5, OYAMA ---------------------------------------

INVESTIGATION NAME- ION RETARDING POTENTIAL ANALYZER

NSSDC ID- MS-T5 -02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PLANETOLOGY

PERSONNEL
PI - K. OYAMA ISAS

BRIEF DESCRIPTION
This investigation involves the measurement of the solar wind ion temperature and bulk velocity within a distance of 0.1 AU of Comet Halley and in interplanetary space. A retarding potential analyzer is used to obtain the measurements.

------- MS-T5, SAITO ---------------------------------------

INVESTIGATION NAME- TRIAXIAL RING-CORE MAGNETOMETERS

NSSDC ID- MS-T5 -03 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY MAGNETIC FIELDS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - T. SAITO U OF TOHOKU

BRIEF DESCRIPTION
This investigation involves the measurement of the vector magnetic field in the interplanetary medium and within 0.1 AU of Comet Halley. The magnetometer is constructed with a three-axis ring core and provides a resolution of 1 nT or less.

**************************** NOAA-D ****************************

SPACECRAFT COMMON NAME- NOAA-D
ALTERNATE NAMES-

NSSDC ID- NOAA-D

LAUNCH DATE- WEIGHT- 588.9 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT APOAPSIS- 833. KM ALT

PERSONNEL

MG - J.R.	GREAVES	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC
PS - A.	ARKING	NASA-GSFC

BRIEF DESCRIPTION
NOAA-D is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover and a TIROS operational vertical sounder for obtaining temperature and water vapor profiles through the earth's atmosphere. Secondary experiments consist of a space environment monitor (SEM), which measures the proton and electron fluxes near the earth, and a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-D, LEINBACH -------

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- NOAA-D -04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - H.	LEINBACH	NOAA-ERL
PI - H.H.	SAUER	NOAA-ERL
PI - D.S.	EVANS	NOAA-ERL

BRIEF DESCRIPTION
This experiment is an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consists of two detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measures protons above 16, 36, and 80 MeV, and protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The total energy detector (TED) measures electrons and protons between 300 eV and 20 keV.

------- NOAA-D, NESS STAFF -------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-D -01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The NOAA-D Advanced Very High Resolution Radiometer (AVHRR) is a four-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer, channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers, channel 3 (IR window), 10.5 to 11.5 micrometers, and channel 4 (IR window), 3.55 to 3.93 micrometers. All four channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. Similar experiments are flown on the other spacecraft in the TIROS-N/NOAA series.

------- NOAA-D, NESS STAFF -------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-D -02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA-D consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: Channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; Channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the stratospheric sounding unit (SSU), has three channels operating at 15.0 micrometers using selective absorption by passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), has four channels operating in the 50 to 60 GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-D, NESS STAFF -------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-D -03 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA-D is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from as many as 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

**************************** NOAA-F ****************************

SPACECRAFT COMMON NAME- NOAA-F
ALTERNATE NAMES-

NSSDC ID- NOAA-F

LAUNCH DATE- 03/00/84 WEIGHT- 386. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY

UNITED STATES	NOAA-NESS
UNITED STATES	NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC

ORBIT PERIOD-	101.5 MIN	INCLINATION-	98.7 DEG
PERIAPSIS-	833. KM ALT	APOAPSIS-	870. KM ALT

PERSONNEL

MG - J.R.	GREAVES	NASA HEADQUARTERS
PM - G.W.	LONGANECKER	NASA-GSFC
PS - A.	ARKING	NASA-GSFC

BRIEF DESCRIPTION

NOAA-F is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include (1) an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, (2) a TIROS operational vertical sounder (TOVS) for obtaining temperature and water vapor profiles through the earth's atmosphere, and (3) an earth radiation experiment (ERBE) for measuring the energy exchange between the earth-atmosphere system and space. The secondary experiment is a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system is also carried on NOAA-F to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-F, BROOME--

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- NOAA-F -05

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

TL - G.C.	BROOME	NASA-LARC
TM - A.A.	RUDMANN	NASA-GSFC

BRIEF DESCRIPTION

The Earth Radiation Budget Experiment (ERBE) is designed to measure the energy exchange between the earth-atmosphere system and space. These measurements are important for climate prediction and for developing statistical relationships between regional weather and radiation budget anomalies. The earth radiation budget experiments will be flown on both NOAA and ERBS satellites to measure global, zonal, and regional budgets on monthly time scales, equator-to-pole gradients, and monthly diurnal variations of regional scales. The ERBE consists of eight channels distributed within two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBE-S) instrument. The non-scanner is a five-channel radiometer. Four channels are primarily earth-viewing, but upon command they can be pointed toward the sun for periodic calibration. The fifth channel is fixed for continuous observation of the sun for calibration. Two of the four gimbaled sensors are wide-angled and view the entire earth from limb to limb, approximately 135 deg. These detectors have broadband spectral responses varying from 0.2 micrometers to over 50 micrometers. Channel 1 makes total radiation measurements while channel 2, with its filter attached, makes measurements over the shortwave spectral band characterized by the Suprasil-W dome filter which cuts off at 5 micrometers. The remaining two gimbaled sensors are medium field of view channels with a 32-deg field of view, equivalent to a Texas-size footprint. Channel 3 measures total radiation while channel 4, placed under a Suprasil-W dome, measures the shortwave spectral band. The earth-emitted longwave radiation component is determined by subtracting the shortwave channel from the total channel. The solar channel (5) has an 18-deg field-of-view measuring the total solar spectral range of the sun. The scanner instrument is a small spatial resolution (FOV equals 3 x 4.5 deg) scanning radiometer containing three separate channels (6,7,8). Channel 6 isolates the shortwave spectral interval (0.2 to 5 micrometers). Channel 7 measures the longwave spectral region (5 to 50 micrometers), and channel 8 measures total radiation (0.2 to 50 micrometers). All three sensors are located within a continuously rotating scan drum which scans the FOV across the track sequentially from horizon to horizon. The scanner also views the sun for calibration. Additional information can be obtained from "System considerations for an earth radiation budget scanning radiometer," and "The earth radiation budget satellite system of the early 1980's," Fourth Symp. on Meteorol. Obs. and Instrum., Denver, Colo., April 10-14, 1978. See Appendix B for a list of ERBE investigators.

------- NOAA-F, NESS STAFF---------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-F -01

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The NOAA-F Advanced Very High Resolution Radiometer (AVHRR) is a four-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer, channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers, channel 3 (IR window), 10.5 to 11.5 micrometers, and channel 4 (IR window), 3.55 to 3.93 micrometers. All four channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. The same experiments are flown on the other spacecraft in the TIROS-N/NOAA series.

------- NOAA-F, NESS STAFF---------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-F -02

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION

The TIROS Operational Vertical Sounder (TOVS) on NOAA-F consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: Channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer, water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; Channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the microwave sounding unit (MSU), has four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-F, NESS STAFF---------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-F -03

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

The Data Collection System (DCS) on NOAA-F is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from as many as 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-F, NESS STAFF---------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- NOAA-F -06 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION

The Search and Rescue (SAR) instruments have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

*************************** NOAA-G***************************

SPACECRAFT COMMON NAME- NOAA-G
ALTERNATE NAMES-

NSSDC ID- NOAA-G

LAUNCH DATE- 04/15/85 WEIGHT- 386. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT APOAPSIS- 870. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC
PS - A. ARKING NASA-GSFC

BRIEF DESCRIPTION

NOAA-G is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for the support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include (1) an advanced very-high-resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, (2) a TIROS operational vertical sounder (TOVS) for obtaining temperature and water vapor profiles through the earth's atmosphere, (3) an earth radiation experiment (ERBE) for measuring the energy exchange between the earth-atmosphere system and space, and (4) a solar backscatter ultraviolet spectrometer (SBUV/2) for providing ozone distributions in the atmosphere. Secondary experiments consist of a space environment monitor (SEM), which measures the proton and electron fluxes near the earth, and a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system is also carried on NOAA-G to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-G, BROOME---------------------------------------

INVESTIGATION NAME- EARTH RADIATION BUDGET EXPERIMENT (ERBE)

NSSDC ID- NOAA-G -05 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL
TL - G.C. BROOME NASA-LARC
TM - A.A. RUDMANN NASA-GSFC

BRIEF DESCRIPTION

The Earth Radiation Budget Experiment (ERBE) is designed to measure the energy exchange between the earth-atmosphere system and space. These measurements are important for climate prediction and for developing statistical relationships between regional weather and radiation budget anomalies. The earth radiation budget experiments will be flown on both NOAA and ERBS satellites to measure global, zonal, and regional budgets on monthly time scales, equator-to-pole gradients, and monthly diurnal variations of regional scales. The ERBE consists of eight channels distributed within two instrument packages: the non-scanner (ERBE-NS) instrument and the scanner (ERBE-S) instrument. The non-scanner is a five-channel radiometer. Four channels are primarily earth-viewing, but upon command they can be pointed toward the sun for periodic calibration. The fifth channel is fixed for continuous observation of the sun for calibration. Two of the four gimbaled sensors are wide-angled and view the entire earth from limb to limb, approximately 135 deg. These detectors have broadband spectral responses varying from 0.2 micrometers to over 50 micrometers. Channel 1 makes total radiation measurements while channel 2, with its filter attached, makes measurements over the shortwave spectral band characterized by the Suprasil-W dome filter which cuts off at 5 micrometers. The remaining two gimbaled sensors are medium field-of-view channels with a 32-deg field of view, equivalent to a Texas-size footprint. Channel 3 measures total radiation while channel 4, placed under a Suprasil-W dome, measures the shortwave spectral band. The earth-emitted longwave radiation component is determined by subtracting the shortwave channel from the total channel. The solar channel (5) has an 18-deg field of view measuring the total solar spectral range of the sun. The scanner instrument is a small spatial resolution (FOV equals 3 x 4.5 deg) scanning radiometer containing three separate channels (6,7,8). Channel 6 isolates the shortwave spectral interval (0.2 to 5 micrometers). Channel 7 measures the longwave spectral region (5 to 50 micrometers), and channel 8 measures total radiation (0.2 to 50 micrometers). All three sensors are located within a continuously rotating scan drum which scans the FOV across the track sequentially from horizon to horizon. The scanner also views the sun for calibration. Additional information can be obtained from "System considerations for an earth radiation budget scanning radiometer," and "The earth radiation budget satellite system of the early 1980's," Fourth Symp. on Meteorol. Obs. and Instrum., Denver, Colo., April 10-14, 1978. See Appendix B for a list of ERBE investigators.

------- NOAA-G, CUNNINGHAM---------------------------------------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET
RADIOMETER (SBUV/2)

NSSDC ID- NOAA-G -07 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY

PERSONNEL
TL - F.G. CUNNINGHAM NASA-GSFC
TM - C.F. HEATH NASA-GSFC

BRIEF DESCRIPTION

The Solar Backscatter Ultraviolet Radiometer (SBUV/2) is designed to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design is based upon the technology developed for the SBUV/TOMS flown on the Nimbus 7. The SBUV/2 instrument measures backscattered solar radiation in an 11.3-degree field-of-view in the nadir direction at 12 discrete, 1.1 nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance is determined at the same 12 wavelength bands by deploying a diffuser which reflects sunlight into the instrument field-of-view. The SBUV/2 can also measure the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 nm to 400 nm in increments nominally 0.148 nm. The SBUV/2 has another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measures the earth's surface brightness at 380 nm. The CCR field-of-view is 11.3 degrees.

------- NOAA-G, LEINBACH ---------------------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT MONITOR (SEM)

NSSDC ID- NOAA-G -04   INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH   NOAA-ERL
PI - H.H. SAUER   NOAA-ERL
PI - D.S. EVANS   NOAA-ERL

BRIEF DESCRIPTION
This experiment is an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consists of two detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measures protons above 16, 36, and 80 MeV, and protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The total energy detector (TED) measures electrons and protons between 300 eV and 20 keV.

------- NOAA-G, NESS STAFF ---------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-G -01   INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The NOAA-G Advanced Very High Resolution Radiometer (AVHRR) is a five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer, channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers, channel 3 (IR window), 10.5 to 11.5 micrometers, channel 4 (IR window), 3.55 to 3.93 micrometers, and channel 5, 11.5 to 12.5 micrometers. All five channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-G, NESS STAFF ---------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-G -02   INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA-G consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the stratospheric sounding unit (SSU), has three channels operating at 15.0 micrometers using selective absorption by passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), has four channels operating in the 50 to 60 GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. Similar experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-G, NESS STAFF ---------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-G -03   INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA-G is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from up to 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-G, NESS STAFF ---------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- NOAA-G -06   INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The Search and Rescue (SAR) instruments have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

**************************** NOAA-H ****************************

SPACECRAFT COMMON NAME- NOAA-H
ALTERNATE NAMES-

NSSDC ID- NOAA-H

LAUNCH DATE-   WEIGHT- 386. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES   NOAA-NESS
UNITED STATES   NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN   INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT   APOAPSIS- 870. KM ALT

PERSONNEL
MG - J.R. GREAVES — NASA HEADQUARTERS
PM - G.W. LONGANECKER — NASA-GSFC

BRIEF DESCRIPTION
NOAA-H is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include (1) an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, (2) a TIROS operational vertical sounder (TOVS) for obtaining temperature and water vapor profiles through the earth's atmosphere, and (3) a solar backscatter ultraviolet spectrometer (SBUV/2) for providing ozone distributions in the atmosphere. The secondary experiment is a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system is also carried on NOAA-H to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-H, CUNNINGHAM-------------------------------------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER (SBUV/2)

NSSDC ID- NOAA-H -05

INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY

PERSONNEL
TL - F.G. CUNNINGHAM — NASA-GSFC
TM - D.F. HEATH — NASA-GSFC

BRIEF DESCRIPTION
The Solar Backscatter Ultraviolet Radiometer (SBUV/2) is designed to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design is based upon the technology developed for the SBUV/TOMS flown on the Nimbus 7. The SBUV/2 instrument measures backscattered solar radiation in an 11.3-degree field-of-view in the nadir direction at 12 discrete, 1.1 nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance is determined at the same 12 wavelength bands by deploying a diffuser which will reflect sunlight into the instrument field-of-view. The SBUV/2 can also measure the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 nm to 400 nm in increments nominally 0.148 nm. The SBUV/2 has another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measures the earth's surface brightness at 380 nm. The CCR field-of-view is 11.3 degrees.

------- NOAA-H, NESS STAFF-------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-H -01

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF — NOAA-NESS

BRIEF DESCRIPTION
The NOAA-H Advanced Very High Resolution Radiometer (AVHRR) is a five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer, channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers, channel 3 (IR window), 10.5 to 11.5 micrometers, channel 4 (IR window), 3.55 to 3.93 micrometers, and channel 5, 11.5 to 12.5 micrometers. All five channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-H, NESS STAFF-------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-H -02

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF — NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA-H consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the microwave sounding unit (MSU), has four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. Similar experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-H, NESS STAFF-------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-H -03

INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF — NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA-H is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 3 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from as many as 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-H, NESS STAFF-------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- NOAA-H -04

INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF — NOAA-NESS

BRIEF DESCRIPTION
The Search and Rescue (SAR) instruments have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by the search and rescue processor (SARP) and

retransmitted in real time and stored on the spacecraft for later transmittal to the NOAA Command and Data Acquisition (CDA) stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

*************************** NOAA-I ***************************

SPACECRAFT COMMON NAME- NOAA-I
ALTERNATE NAMES-

NSSDC ID- NOAA-I

LAUNCH DATE- WEIGHT- 386. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES NOAA-NESS
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT APOAPSIS- 870. KM ALT

PERSONNEL
MG - J.R. GREAVES NASA HEADQUARTERS
PM - G.W. LONGANECKER NASA-GSFC

BRIEF DESCRIPTION
NOAA-I is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include (1) an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, (2) a TIROS operational vertical sounder (TOVS) for obtaining temperature and water vapor profiles through the earth's atmosphere, and (3) a solar backscatter ultraviolet spectrometer (SBUV/2) for providing ozone distributions in the atmosphere. Secondary experiments consist of a space environment monitor (SEM), which measures the proton and electron fluxes near the earth, and a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system is also carried on NOAA-I to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-I, CUNNINGHAM -------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER (SBUV/2)

NSSDC ID- NOAA-I -06 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY

PERSONNEL
TL - F.G. CUNNINGHAM NASA-GSFC
TM - D.F. HEATH NASA-GSFC

BRIEF DESCRIPTION
The Solar Backscatter Ultraviolet Radiometer (SBUV/2) is designed to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design is based upon the technology developed for the SBUV/TOMS flown on the Nimbus 7. The SBUV/2 instrument measures backscattered solar radiation in an 11.3-degree field-of-view in the nadir direction at 12 discrete, 1.1 nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance is determined at the same 12 wavelength bands by deploying a diffuser which will reflect sunlight into the instrument field-of-view. The SBUV/2 can also measure the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 nm to 400 nm in increments nominally 0.148 nm. The SBUV/2 has another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measures the earth's surface brightness at 380 nm. The CCR field-of-view has the size of 11.3 degrees.

------- NOAA-I, LEINBACH -------

INVESTIGATION NAME- SPACE ENVIRONMENTAL MONITOR (SEM)

NSSDC ID- NOAA-I -04 INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - H. LEINBACH NOAA-ERL
PI - H.H. SAUER NOAA-ERL
PI - D.S. EVANS NOAA-ERL

BRIEF DESCRIPTION
This experiment is an extension of the solar-proton monitoring experiment flown on the ITOS spacecraft series. The experiment package consists of two detector systems and a data processing unit. The medium energy proton and electron detector (MEPED) measures protons above 16, 36, and 80 MeV, and protons in five energy ranges from 30 keV to >2.5 MeV; electrons above 30, 100, and 300 keV; and protons and electrons (inseparable) above 6 MeV. The total energy detector (TED) measures electrons and protons between 300 eV and 20 keV.

------- NOAA-I, NESS STAFF -------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-I -01 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 08

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The NOAA-I Advanced Very High Resolution Radiometer (AVHRR) is a five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 10.5 to 11.5 micrometers; channel 4 (IR window), 3.55 to 3.93 micrometers; and channel 5, 11.5 to 12.5 micrometers. All five channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-I, NESS STAFF -------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-I -02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER 03

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA-I consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H2O bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N2O bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N2O bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the stratospheric sounding unit (SSU), has three channels operating at 15.0 micrometers using selective absorption by passing the incoming radiation through three pressure-modulated cells containing CO2. The third instrument, the microwave sounding unit (MSU), has four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles

which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. Similar experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-I, NESS STAFF--------------------------------------

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-I -03   INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA-I is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from up to 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-I, NESS STAFF--------------------------------------

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- NOAA-I -05   INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The Search and Rescue (SAR) instruments have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

*************************** NOAA-J***************************

SPACECRAFT COMMON NAME- NOAA-J
ALTERNATE NAMES-

NSSDC ID- NOAA-J

LAUNCH DATE-   WEIGHT- 386. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- ATLAS F

SPONSORING COUNTRY/AGENCY
UNITED STATES   NOAA-NESS
UNITED STATES   NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.5 MIN   INCLINATION- 98.7 DEG
PERIAPSIS- 833. KM ALT   APOAPSIS- 870. KM ALT

PERSONNEL
MG - J.R. GREAVES   NASA HEADQUARTERS
PM - G.W. LONGANECKER   NASA-GSFC

BRIEF DESCRIPTION
NOAA-J is a third-generation operational meteorological satellite for use in the National Operational Environmental Satellite System (NOESS) and for support of the Global Atmospheric Research Program (GARP) during 1978-84. The satellite design provides an economical and stable sun-synchronous platform for advanced operational instruments to measure the earth's atmosphere, its surface and cloud cover, and the near-space environment. Primary sensors include (1) an advanced very high resolution radiometer (AVHRR) for observing daytime and nighttime global cloud cover, (2) a TIROS operational vertical sounder (TOVS) for obtaining temperature and water vapor profiles through the earth's atmosphere, and (3) a solar backscatter ultraviolet spectrometer (SBUV/2) for providing ozone distributions in the atmosphere. The secondary experiment is a data collection system (DCS), which processes and relays to central data acquisition stations the various meteorological data received from free-floating balloons and ocean buoys distributed around the globe. A search and rescue (SAR) system is also carried on NOAA-J to receive, process, and relay distress signals transmitted by beacons carried by civil aircraft and some classes of marine vessels. The satellite is based upon the Block 5D spacecraft bus developed for the U.S. Air Force, and is capable of maintaining an earth-pointing accuracy of better than plus or minus 0.1 deg with a motion rate of less than 0.035 deg/s.

------- NOAA-J, CUNNINGHAM--------------------------------------

INVESTIGATION NAME- SOLAR BACKSCATTER ULTRAVIOLET RADIOMETER (SBUV/2)

NSSDC ID- NOAA-J -05   INVESTIGATIVE PROGRAM
CODE EE-8/OPER. ENVIRON. MONITOR

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
METEOROLOGY

PERSONNEL
TL - F.G. CUNNINGHAM   NASA-GSFC
TM - D.F. HEATH   NASA-GSFC

BRIEF DESCRIPTION
The Solar Backscatter Ultraviolet Radiometer (SBUV/2) is designed to provide the vertical distribution of ozone in the earth's atmosphere. The instrument design is based upon the technology developed for the SBUV/TOMS flown on the Nimbus 7. The SBUV/2 instrument measures backscattered solar radiation in an 11.3-degree field-of-view in the nadir direction at 12 discrete, 1.1 nm wide, wavelength bands between 252.0 and 339.8 nm. The solar irradiance is determined at the same 12 wavelength bands by deploying a diffuser which will reflect sunlight into the instrument field-of-view. The SBUV/2 can also measure the solar irradiance or the atmospheric radiance with a continuous spectral scan from 160 nm to 400 nm in increments nominally 0.148 nm. The SBUV/2 has another narrowband filter photometer channel, called the cloud cover radiometer (CCR), which continuously measures the earth's surface brightness at 380 nm. The CCR field-of-view has the size of 11.3 degrees.

------- NOAA-J, NESS STAFF--------------------------------------

INVESTIGATION NAME- ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)

NSSDC ID- NOAA-J -01   INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF   NOAA-NESS

BRIEF DESCRIPTION
The NOAA-J Advanced Very High Resolution Radiometer (AVHRR) is a five-channel scanning radiometer capable of providing global daytime and nighttime sea surface temperature and information about ice, snow, and clouds. These data are obtained on a daily basis for use in weather analysis and forecasting. The multispectral radiometer operates in the scanning mode and measures emitted and reflected radiation in the following spectral intervals: channel 1 (visible), 0.55 to 0.9 micrometer; channel 2 (near-IR), 0.725 micrometer to detector cutoff around 1.1 micrometers; channel 3 (IR window), 10.5 to 11.5 micrometers; channel 4 (IR window), 3.55 to 3.93 micrometers; and channel 5, 11.5 to 12.5 micrometers. All five channels have a spatial resolution of 1.1 km, and the two IR-window channels have a thermal resolution of 0.12 deg K at 300 deg K. The AVHRR is capable of operating in both real-time or recorded modes. Real-time or direct readout data are transmitted to ground stations both at low (4-km) resolution via automatic picture transmission (APT) and at high (1-km) resolution via high-resolution picture transmission (HRPT). Data recorded on board are available for central processing. They include global area coverage (GAC) data, which have a resolution of 4 km, and local area coverage (LAC) data, which contain data from selected portions of each orbit with a 1-km resolution. The same experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-J, NESS STAFF--------------------------------------

INVESTIGATION NAME- TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)

NSSDC ID- NOAA-J -02 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The TIROS Operational Vertical Sounder (TOVS) on NOAA-J consists of instruments designed to determine radiances needed to calculate temperature and humidity profiles of the atmosphere from the surface to the stratosphere (approximately 1 mb). The first instrument is the second version of the high-resolution spectrometer (HIRS/2). The HIRS/2 has 20 channels in the following spectral intervals: channels 1 through 5, the 15-micrometer CO2 bands (15.0, 14.7, 14.5, 14.2, and 14.0); channels 6 and 7, the 13.7 and 13.4-micrometer CO2/H20 bands; channel 8, the 11.1-micrometer window region; channel 9, the 9.7-micrometer ozone band; channels 10 through 12, the 6-micrometer water vapor bands (8.3, 7.3, and 6.7); channels 13 and 14, the 4.57 and 4.52-micrometer N20 bands; channels 15 and 16, the 4.46 and 4.40-micrometer CO2/N20 bands; channel 17, the 4.24-micrometer CO2 band; channels 18 and 19, the 4.0 and 3.7-micrometer window bands; and channel 20, the 0.7-micrometer window region. The HIRS/2 provides data for calculations of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere, and total ozone content. The second instrument, the microwave sounding unit (MSU), has four channels operating in the 50- to 60-GHz oxygen band (50.31, 53.73, 54.96 and 57.95) to obtain temperature profiles which are free of cloud interference. The instruments are cross-course scanning devices utilizing a step scan to provide a traverse scan while the orbital motion of the satellite provides scanning in the orthogonal direction. Similar experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-J, NESS STAFF---

INVESTIGATION NAME- DATA COLLECTION SYSTEM (DCS)

NSSDC ID- NOAA-J -03 INVESTIGATIVE PROGRAM
CODE EE-8/OPERATIONAL WEATHER OB

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The Data Collection System (DCS) on NOAA-J is designed to meet the meteorological data needs of the United States and to support the Global Atmospheric Research Program (GARP). The system receives low-duty-cycle transmissions of meteorological observations from free-floating balloons, ocean buoys, other satellites, and fixed ground-based sensor platforms distributed around the globe. These observations are organized on board the spacecraft and retransmitted when the spacecraft comes in range of a command and data acquisition (CDA) station. For free-moving balloons, the Doppler frequency shift of the transmitted signal is observed to calculate the location of the balloons. The DCS is expected, for a moving sensor platform, to have a location accuracy of 5 to 8 km rms, and a velocity accuracy of 1 to 1.6 m/s. This system has the capability of acquiring data from up to 2000 platforms per day. Identical experiments are flown on other spacecraft in the TIROS-N/NOAA series.

------- NOAA-J, NESS STAFF---

INVESTIGATION NAME- SEARCH AND RESCUE (SAR)

NSSDC ID- NOAA-J -04 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)
COMMUNICATIONS

PERSONNEL
PI - NESS STAFF NOAA-NESS

BRIEF DESCRIPTION
The Search and Rescue (SAR) instruments have the capability of detecting and locating existing emergency transmitters in a manner independent of the environmental data. Data from the 121.5-MHz emergency locator transmitters (ELT), the 243-MHz emergency position indicating radio beacons (EPIRB), and experimental 406-MHz ELTs/EPIRBs are received by the search and rescue repeater (SARR) and broadcast in real time on an L-band frequency (1544.5 MHz). Real-time data are monitored by local user terminals operated in the United States, Canada, and France. The 406-MHz data are also processed by the search and rescue processor (SARP) and retransmitted in real time and stored on the spacecraft for later transmittal to the CDA stations in Alaska and Virginia, thus providing full global coverage. The distress signals are forwarded to Mission Control Centers located in each country for subsequent relay to the appropriate Rescue Coordination Center.

*************************** OPEN/EML ***************************

SPACECRAFT COMMON NAME- OPEN/EML
ALTERNATE NAMES- EML, EQ. MAGNETOSPHERE LAB.

NSSDC ID- EML

LAUNCH DATE- 02/00/90 WEIGHT- 744. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1560. MIN INCLINATION- 0. DEG
PERIAPSIS- 6000. KM ALT APOAPSIS- 70000. KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - M.H.	ACUNA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION
The EML (Equatorial Magnetosphere Laboratory) is one of the four spacecraft in the OPEN (Origins of Plasmas in the Earth's Neighborhood) program. The OPEN program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ISPM (International Solar Polar Mission) and the UARS (Upper Atmosphere Research Satellite) program. The OPEN program may be expanded to include more extensive participation from ESA and/or ISAS. The OPEN program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has on-board propulsion systems and ample fuel supplies to achieve and maintain their different orbits. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high (plus 1.25 m for its despun platform), with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin plane antennas, inertia booms, and spin plane appendages to support sensors. Prior to stabilization, all four spacecraft may have spin rates up to 60 rpm. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, the EML, measures solar wind entry at the sunward nose of the magnetosphere, and the transport and storage of plasma in the equatorial ring current and near-earth plasma sheet. Data are stored using on-board tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate for EML is 22.2 kbps. There is a despun gimballed instrument platform on one end. EML will be in a 26-h equatorial orbit with perigee and apogee of 2,400 by 70,000 km. It weighs 744 kg and uses 306 W of power. The spin rate is 10 rpm around an axis lying in the orbit plane and maintained within 30 deg of normal to the earth-sun line.

------- OPEN/EML, BURCH---

INVESTIGATION NAME- PLASMA ION COMPOSITION

NSSDC ID- EML -03 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SOLAR PHYSICS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.L.	BURCH	SOUTHWEST RES INST
CI - S.F.	HAHN	SOUTHWEST RES INST
CI - J.D.	WINNINGHAM	SOUTHWEST RES INST
CI - E.G.	SHELLEY	LOCKHEED PALO ALTO
CI - P.H.	REIFF	RICE U
CI - D.T.	YOUNG	LOS ALAMOS NAT LAB
CI - A.D.	JOHNSTONE	MULLARD SPACE SCI LAB
CI - M.	EJIRI	ISAS

BRIEF DESCRIPTION

This investigation is designed to study definitively (1) the composition of magnetospheric plasma storage regions, (2) the entry of solar wind plasma into the magnetosphere, (3) the injection of ionospheric plasma into the magnetosphere, (4) magnetospheric plasma transport and acceleration, (5) the role of minor ionic constituents in magnetospheric plasma processes, (6) species-dependent magnetospheric ion loss mechanisms, e.g., wave-particle interactions and charge exchange, (7) the physics of heavy ions and multi-component plasmas, and (8) magnetotail composition phenomena (during the deep tail extended mission phase of EML). The instrument consists of a toroidal ion mass spectrograph (TIMS). This instrument has a mass per charge range of 1 to 150 u/Q in 128 channels, with resolution (M/delta M) of 10, and an energy range of 0 to 40 keV/Q, with 32 energy steps logarithmically spaced and a resolution (delta E/E) of 0.08. The field of view covers 10 deg of azimuth and plus and minus 20 deg in elevation, with 5 elements of 8 deg each in elevation. The sample rate of 32 samples per second yields one mass-energy-angle spectrum per 4 spin periods. This instrument is identical to the instrument on OPEN/PPL.

------- OPEN/EML, FRITZ--

INVESTIGATION NAME- CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)

NSSDC ID- EML -04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD/APPLTON LAB
CI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
CI - G.	KREMSER	MPI-AERONOMY
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - W.N.	SPJELDVIK	NOAA-SEL
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - T.	DOKE	WASEDA U
CI - J.M.	CORNWALL	AEROSPACE CORP
CI - M.	SCHULZ	AEROSPACE CORP
CI - C.K.	GOERTZ	U OF IOWA
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.R.	LYONS	NOAA-SEL

BRIEF DESCRIPTION

The objectives of this investigation (CAMMICE, charge and mass magnetospheric ion composition experiment) are the unambiguous determination of the composition of the earth's plasma populations, their original sources, and the mechanisms acting to energize and transport these populations within the closely coupled magnetosphere/ionosphere and magnetosphere/solar-wind systems, and in the two major geospace energy storage reservoirs -- the near-earth plasma sheet and the ring current. The CAMMICE incorporates two types of sensor systems, MICS and HIT, which each perform a three-parameter measurement on the ion composition over a combined range from < 10 keV/Q to 15 MeV/Q for elements from hydrogen through iron. Each of the sensor systems is supported by its own independent data processing unit. The MICS sensor is mounted on a scan platform. These sensors are identical to those flown on the OPEN/PPL spacecraft, although the mountings are different.

------- OPEN/EML, HIGBIE--

INVESTIGATION NAME- ENERGETIC ELECTRONS AND IONS

NSSDC ID- EML -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.N.	BAKER	LOS ALAMOS NAT LAB
CI - R.D.	BELIAN	LOS ALAMOS NAT LAB
CI - W.	STUDEMANN	MPI-AERONOMY
CI - E.	KIRSCH	MPI-AERONOMY
CI - A.	KORTH	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - H.D.	VOSS	LOCKHEED PALO ALTO
CI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

This investigation (CEPPAD, comprehensive energetic particle pitch angle distribution) is designed to provide detailed pitch angle measurements of energetic particle fluxes, to cover the particle energy spectra over as wide a range as possible with statistically meaningful results, to separately identify ions and electrons, and to give information on high energy ion composition. This instrument is identical to the one flown on OPEN/PPL. The instrument measures electrons with energies from 20 keV to 3000 keV and protons from 20 keV to 17 MeV. Alpha particles and the CNO group of nuclei are also uniquely identified with high time resolution in broad energy bands over the range 30 to 3300 keV/nucleon. Multiple detector heads on the body-mounted portion of the instrument (BEPS) provide detailed high-resolution three-dimensional measurement of the energetic particle distribution function at all angles outside the loss cone. The detectors mounted on the scan platform (SEPS) are designed to look along the local magnetic field direction. The major components of the body-mounted detectors (BEPS) are the three sensor types LEMS, HIST, and DPU. The scan platform energetic particle spectrometers (SEPS) are divided into three different spectrometers designated HARE, HARP, and HISS. Both the BEPS and the SEPS are controlled by microprocessors.

------- OPEN/EML, MAYNARD--

INVESTIGATION NAME- ELECTRIC FIELDS: BURST MODE

NSSDC ID- EML -05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - N.C.	MAYNARD	NASA-GSFC
CI - T.L.	AGGSON	NASA-GSFC
CI - J.P.	HEPPNER	NASA-GSFC
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - L.P.	BLOCK	ROYAL INST OF TECH
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - W.J.	BURKE	USAF GEOPHYS LAB
CI - M.	SMIDDY	USAF GEOPHYS LAB
CI - A.	PEDERSEN	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - R.J.L.	GRARD	ESA-ESTEC

BRIEF DESCRIPTION

The major objectives of this investigation are (1) to study the extent and variability of convective electric fields in the magnetosphere, (2) to determine the electric field structure of the magnetopause and the energy dissipated at that boundary, (3) to understand the relationship between convective electric fields and inductive electric fields generated by magnetic activity and the causes of strong turbulence in the electric field during magnetically active times, (4) to study plasmapause dynamics including the degree of penetration into the plasmasphere of the convection electric field, and (5) to determine the degree of electrical coupling and the extent of electrical mapping between different regions of the magnetosphere through comparison of electric field measurements at different points along a common boundary, within the same magnetic field line regions or in different regions of the magnetosphere (with the aid of the other spacecraft in the OPEN program). The instrument consists of three orthogonal double probes, each of which is a pair of separated conductors whose potential difference is measured. One pair consists of spheres located in the satellite spin plane and separated by 160 m at the ends of wire booms. A second pair consists of cylindrical wire boom elements located in the spin plane and separated by an effective distance of 350 m. The third pair consists of spheres that are oriented parallel to the satellite spin axis and are separated by 14 m at the ends of rigid booms.

------- OPEN/EML, MCILWAIN--

INVESTIGATION NAME- ELECTRIC FIELD INVESTIGATION BY ELECTRON DRIFT STUDIES (EFIELDS)

NSSDC ID- EML -07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO
CI - G.	HAERENDEL	MPI-EXTRATERR PHYS
CI - F.	MELZNER	MPI-EXTRATERR PHYS
CI - D.P.	CAUFFMAN	LOCKHEED PALO ALTO
CI - R.	GREENWALD	APPLIED PHYSICS LAB
CI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO
CI - J.	QUINN	U OF CALIF, SAN DIEGO
CI - E.C.	WHIPPLE, JR.	U OF CALIF, SAN DIEGO
CI - R.B	TORBERT	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

The objective of this investigation is to accurately measure the vector electric field in the earth's neighborhood using a method of test electrons that is inherently immune to spacecraft interference. This technique is used to study (1) the spatial and temporal characteristics of the convective electric field near the equatorial plane, (2) the physical processes at play near the magnetopause, plasma sheet, and plasmapause, (3) the instabilities associated with low-frequency plasma turbulence, (4) resonance of low-frequency waves with ions in the equatorial magnetosphere, and (5) acceleration processes associated with substorms, auroras, and ring current particle energization. The instrument measures the vector electric field at a nominal rate of 32 times per second, with burst intervals sampling 100 times per second. Three electron guns and a detector system are used, controlled by a microprocessor. Information from the onboard magnetometer is utilized in selecting electron beam directions.

------- OPEN/EML, MCPHERRON------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- EML -06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.L.	MCPHERRON	U OF CALIF, LA
CI - W.	BAUMJOHANN	U OF MUNSTER
CI - N.U.	CROOKER	U OF CALIF, LA
CI - M.G.	KIVELSON	U OF CALIF, LA
CI - E.W.	GREENSTADT	TRW SYSTEMS GROUP
CI - W.J.	HUGHES	BOSTON U
CI - S.	KOKUBUN	U OF TOKYO
CI - J.V.	OLSON	U OF ALASKA
CI - T.	SAITO	U OF TOHOKU
CI - D.J.	SOUTHWOOD	IMPERIAL COLLEGE

BRIEF DESCRIPTION

The major objective of this investigation is to study the process of energy extraction, transport, storage, and release as it is evidenced through changes in the magnetic field. The instrument consists of dual triaxial magnetometers with flippers. Dual microprocessors and random access memory are used to process the data so that the cata sent to earth are immediately usable by all OPEN investigators without extensive calculations, as well as available on board the spacecraft to other instruments in final corrected form. One million bits of internal storage under microprocessor control provide snapshots with up to 4 ms resolution on command or triggered by changes in the data. The instrument ranges are plus and minus 256, 4096, and 65,536 nT, with corresponding resolutions of 0.004, 0.06, and 1 nT.

------- OPEN/EML, PARKS---------------------------------------

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- EML -01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - G.K.	PARKS	U OF WASHINGTON
CI - B.H.	MAUK	U OF WASHINGTON
CI - C.S.	LIN	U OF WASHINGTON
CI - M.	ASHOUR-ABDALLA	U OF CALIF, LA
CI - C.W.	CARLSON	U OF CALIF, BERKELEY
CI - H.	REME	CESR

BRIEF DESCRIPTION

This investigation is designed to study both macroscopic and microscopic phenomena of the distant magnetosphere, interplanetary space and the ionosphere. The physics of large-scale geophysical phenomena is studied by coordinating the observations with those of the IPL, PPL, and GTL spacecraft. Microscopic processes are studied using in-situ plasma distribution measurements. High resolution three-dimensional distributions of ions and electrons are obtained by symmetric hemispherical electrostatic analyzers with 360-deg fields of view. An ion and electron detector set is mounted on opposite ends of two inertial booms. An identical but completely separate ion and electron detector set is mounted on the despun platform. Both the body mounted and the despun detector systems are microprocessor controlled. The energy range covered is 5 keV to 40 keV.

------- OPEN/EML, SCARF---------------------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- EML -08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - P.	RODRIGUEZ	US NAVAL RESEARCH LAB
CI - R.G.	STONE	NASA-GSFC
CI - P.J.	KELLOGG	U OF MINNESOTA
CI - H.	MATSUMOTO	KYOTO U
CI - E.J.	SMITH	NASA-JPL
CI - S.D.	SHAWHAN	U OF IOWA
CI - W.S.	KURTH	U OF IOWA
CI - M.C.	KELLEY	CORNELL U
CI - P.M.	KINTNER	CORNELL U
CI - R.A.	HELLIWELL	STANFORD U
CI - W.W.L.TAYLOR		TRW SYSTEMS GROUP

BRIEF DESCRIPTION

The objective of this investigation is to determine the dynamic behavior of the plasma trapped in the earth's magnetosphere, i.e., toroidal and poloidal currents, oscillations and waves in the plasmas, ion entrance and exit via the ionosphere and solar wind, and the extent of the plasmasheath. The instrument measures electric fields over the range 0.5 Hz to 400 kHz, and magnetic fields over the range 1 Hz to 10 kHz. Triaxial magnetic search coils are utilized in addition to a pair of electric dipole antennas. The instrument contains two sweep frequency receivers (12 Hz to 400 kHz and 12 Hz to 6.25 kHz), a multichannel analyzer (5.6 Hz to 311 kHz for the electric antenna and 5.6 Hz to 1.0 kHz for the magnetic), a low frequency waveform receiver (0.01 to 10 Hz), and a wideband waveform receiver (10 Hz to 16 kHz).

**************************** OPEN/GTL**************************

SPACECRAFT COMMON NAME- OPEN/GTL
ALTERNATE NAMES- GTL, GEOMAGNETIC TAIL LAB.

NSSDC ID- GTL

LAUNCH DATE- 08/00/89 WEIGHT- 584. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 118000 MIN INCLINATION- 23.5 DEG
PERIAPSIS- 13000. KM ALT APOAPSIS- 1.5E6 KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - L.F.	BURLAGA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

The GTL (Geomagnetic Tail Laboratory) is one of the four spacecraft in the OPEN (Origins of Plasmas in the Earth's Neighborhood) program. The OPEN program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ISPM (International Solar Polar Mission) and the UARS (Upper Atmosphere Research Satellite) program. The OPEN program may be expanded to include more extensive participation from ESA and/or ISAS. The OPEN program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has on-board propulsion systems and ample fuel supplies to achieve and maintain their different orbits. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high, with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin plane antennas, inertia booms, and spin plane appendages to support sensors. Prior to stabilization, all four spacecraft may have spin rates up to 60 rpm. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, the GTL, measures solar wind entry and acceleration, transport, and storage of plasma in the geomagnetic tail. Data are stored using on-board tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate for GTL is 8 kbps. GTL will be in an orbit near the ecliptic plane and uses lunar gravity assists to keep its apogee over the night hemisphere of the earth. The orbit parameters thus vary. The period is 1-4 months, perigee is 13,000-57,000 km, and apogee is 0.5-1.5 million km (78-235 earth radii). GTL weighs 584 kg and uses 273 W of power. The spin rate is 20 rpm around an axis within 1 deg of normal to the ecliptic.

------- OPEN/GTL, FRANK---------------------------------------

INVESTIGATION NAME- HOT PLASMA AND ION COMPOSITION

NSSDC ID- GTL -04 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
CI - F.V.	CORONITI	U OF CALIF, LA
CI - G.L.	SISCOE	U OF CALIF, LA

BRIEF DESCRIPTION

The objective of this investigation is to make comprehensive observations of the three-dimensional velocity distribution fucntions of electrons and positive ions, with identification of ion species. The instrument contains three sets of quadrispherical analyzers with channel electron multipliers. These three obtain three-dimensional measurements for hot plasma and solar wind electrons, solar wind ions, and for positive-ion composition measurements. The positive-ion composition measurement includes five miniature imaging mass spectrometers at the exit aperture of the analyzer. Sequencing of the energy analyzers and mass spectrometers, and other control functions, are provided by two microprocessors. The hot plasma analyzer measures electrons and ions in the range 1-50,000 eV/Q. The solar wind analyzer measures ions from 150 to 7,000 eV/Q. The positive ion composition measurement covers masses from 1 to 550 u/Q at 100 eV, and 1 to 55 u/Q at 10 keV.

------- OPEN/GTL, GURNETT---------------------------------------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- GTL -02 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - M.L.	KAISER	NASA-GSFC
CI - C.K.	GOERTZ	U OF IOWA
CI - R.R.	SHAW	U OF IOWA
CI - R.R.	ANDERSON	U OF IOWA
CI - S.D.	SHAWHAN	U OF IOWA
CI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - H.	MATSUMOTO	KYOTO U
CI - B.T.	TSURUTANI	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are to determine the role of wave-particle interactions in the plasma processes which occur in the distant geomagnetic tail and to evaluate the consequences of these interactions. The electric field sensors consist of two orthogonal electric dipoles with a nominal tip-to-tip length of 100 m, and the magnetic field sensors consist of a triaxial search coil magnetometer. The instrumentation consists of (1) a sweep frequency receiver for high frequency resolution spectrum measurements, (2) a multichannel spectrum analyzer for high time resolution spectrum measurements, and (3) a wideband waveform receiver for obtaining wideband frequency-time spectra and multi-antenna cross-correlation measurements over selected time periods. The sweep frequency receiver covers the range 12 Hz to 400 kHz for the electric antenna and 12 Hz to 6.25 kHz for the magnetic antenna. The spectrum analyzer covers 5.6 Hz to 311 kHz for the electric antenna and 5.6 Hz to 1.0 kHz for the magnetic. The wideband waveform receiver covers three bands, 10 to 250 Hz, 50 Hz to 2 kHz, and 500 Hz to 16 kHz. The low frequency waveform receiver has 5 simultaneous channels, 0.1-10 Hz. The sampling of the instrumentation is controlled by two microprocessors which can be reprogrammed in flight. The instrument also provides signals to other instruments indicating the occurrence of specific types of plasma wave events.

------- OPEN/GTL, LEPPING---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- GTL -01 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - R.P.	LEPPING	NASA-GSFC
CI - M.H.	ACUNA	NASA-GSFC
CI - K.W.	BEHANNON	NASA-GSFC
CI - D.H.	FAIRFIELD	NASA-GSFC
CI - N.F.	NESS	NASA-GSFC
CI - S.I.	AKASOFU	U OF ALASKA
CI - M.	DOBROWOLNY	CNR, SPACE PLASMA LAB
CI - F.	MARIANI	U OF ROME
CI - F.M.	NEUBAUER	U OF COLOGNE
CI - K.	SCHINDLER	U OF BOCHUM
CI - Y.C.	WHANG	CATHOLIC U OF AMERICA

BRIEF DESCRIPTION

The objectives of this investigation are (1) to determine the structure of the geomagnetic tail to approximately 250 earth radii distance, and (2) to investigate the dynamics of the distant magnetotail, in particular with regard to the role it plays in storm and substorm occurrence and in overall considerations of energy balance in the magnetosphere; specifically, to study the downstream effects of substorms to determine to what distance from earth the tail is important to substorm phenomena. The instrument is identical to the magnetometer flown on OPEN/IPL. It consists of a triaxial fluxgate magnetometer mounted remote from the spacecraft on a boom, a multiple resolution A/D converter, and a microprocessor-controlled range control logic and data processing system. Seven measurement ranges are included: plus or minus 16, 64, 256, 1024, 4096, 16,384, and 65,536 nT. Resolution ranges from 0.004 to 16 nT in normal mode and 2.5E-4 to 1 nT in high resolution mode.

------- OPEN/GTL, MOZER---------------------------------------

INVESTIGATION NAME- DC ELECTRIC FIELDS

NSSDC ID- GTL -05 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - W.J.	BURKE	USAF GEOPHYS LAB
CI - M.	SMIDDY	USAF GEOPHYS LAB
CI - R.J.L.	GRARD	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - A.	PEDERSEN	ESA-ESTEC
CI - L.P.	BLOCK	ROYAL INST OF TECH
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - A.	NISHIDA	ISAS

BRIEF DESCRIPTION

The objectives of this investigation are studies of (1) the large scale configuration of the electric field in the magnetotail, (2) tail electric field variations during substorms, (3) the electric field in the plasma sheet, (4) the electric field near the magnetopause and in the plasma mantle at locations tailward of those covered by similar measurements on ISEE 1, (5) micropulsation and low frequency wave measurements at frequencies covering the local gyrofrequency (<1Hz) and lower hybrid frequency (<10Hz) in the tail, (6) plasma density as deduced from measurement of the floating potential of the spacecraft, and (7) electric field comparisons (with the aid of the other spacecraft in the OPEN program) at different points along the same magnetic field line, at different points along a common boundary, or in different regions of the magnetosphere. The instrument consists of two orthogonal double probes, each of which is a pair of separated spheres on wire booms that are located in the satellite spin plane and whose difference of potential is measured. The separation distances between the pair of sensors are variable and as great as 160 m tip-to-tip. One operating mode involves length ratios of the two antennas of about 2:1 in order to verify instrument operation through showing that the electric field signature is proportional to the boom length. A second reason for two pairs of wire booms in the satellite spin plane is the requirement for measurements having a time resolution far better than the satellite spin period.

------- OPEN/GTL, WILLIAMS---------------------------------------

INVESTIGATION NAME- ENERGETIC PARTICLES AND ION COMPOSITION (EPIC)

NSSDC ID- GTL -03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - T.P.	ARMSTRONG	U OF KANSAS
CI - S.M.	KRIMIGIS	APPLIED PHYSICS LAB
CI - A.T.Y.	LUI	APPLIED PHYSICS LAB
CI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
CI - C.I.	MENG	APPLIED PHYSICS LAB
CI - E.C.	ROELOF	APPLIED PHYSICS LAB
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - E.T.	SARRIS	U OF THRACE
CI - A.	HASEGAWA	BELL TELEPHONE LAB
CI - K.	PAPADOPOULOS	U OF MARYLAND
CI - T.	SATO	U OF TOKYO

BRIEF DESCRIPTION

The principal objective of the EPIC (energetic particle and ion composition) investigation is to explore the distant magnetotail region and obtain information on the origin, transport, storage, acceleration and dynamics of suprathermal and non-thermal particle populations. The instrument performs three-dimensional distribution measurements by using both total energy (LEMS -- low energy composition system) and velocity/composition detectors (ICS -ion composition system), measuring ions and electrons with energies > 20 keV, and ions with energy > 8 keV/nucleon. Composition measurements are made by using a thin foil time-of-flight technique which resolves the H and He isotopes, and provides elemental resolution up to approximately argon. The instrument also measures the non-thermal components to 6 MeV for protons, 480 keV for electron, and 400 keV/nucleon for ions with Z > 2. Directional measurements with a time resolution < 1 second are possible.

**************************** OPEN/IPL **************************

SPACECRAFT COMMON NAME- OPEN/IPL
ALTERNATE NAMES- IPL, INTERPLAN. PHYSICS LAB.

NSSDC ID- IPL

LAUNCH DATE- 08/00/89 WEIGHT- 618. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- HELIOCENTRIC
ORBIT PERIOD- 365.26 DAYS INCLINATION- 23.5 DEG
PERIAPSIS- 0.99 AU RAD APOAPSIS- 0.99 AU RAD

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - L.F.	BURLAGA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION

The IPL (Interplanetary Physics Laboratory) is one of the four spacecraft in the OPEN (Origins of Plasmas in the Earth's Neighborhood) program. The OPEN program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations can be made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame are the ISPM (International Solar Polar Mission) and the UARS (Upper Atmosphere Research Satellite) program. The OPEN program may be expanded to include more extensive participation from ESA and/or ISAS. The OPEN program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has on-board propulsion systems and ample fuel supplies to achieve and maintain their different orbits. Spacecraft design lifetime is 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high, with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin plane antennas, inertia booms, and spin plane appendages to support sensors. Prior to stabilization, all four spacecraft may have spin rates up to 60 rpm. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, the IPL, measures the incoming solar wind, magnetic fields, and particles. Data are stored using on-board tape recorders and relayed to the Deep Space Network at a high rate, although the average real-time data rate of IPL is 3.6 kbps. Experiment booms are deployed along the z-axis in both directions. IPL will be in a "halo" orbit, a 1-year heliocentric orbit, remaining near the sunward sun-earth gravitational equilibrium point, varying from 1.2 to 1.7 million km from earth. Thus it gives an approximately 1-h warning to the other OPEN spacecraft of changes in the solar wind. IPL weighs 618 kg and uses 255 W of power. The spin rate is 20 rpm around an axis within 1 deg of normal to the ecliptic. During its first 9 months of operation, IPL has an earth orbit similar to GTL (Geomagnetic Tail Laboratory), and makes magnetospheric observations before being established in its sunward "halo" orbit.

------- OPEN/IPL, BEHANNON ---------------------------------------

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- IPL -04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY MAGNETIC FIELDS
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - K.W.	BEHANNON	NASA-GSFC
CI - M.H.	ACUNA	NASA-GSFC
CI - L.F.	BURLAGA	NASA-GSFC
CI - R.J.	FITZENREITER	NASA-GSFC
CI - J.H.	KING	NASA-GSFC
CI - R.P.	LEPPING	NASA-GSFC
CI - N.F.	NESS	NASA-GSFC
CI - K.H.	SCHATTEN	NASA-GSFC
CI - F.M.	NEUBAUER	U OF COLOGNE
CI - Y.C.	WHANG	CATHOLIC U OF AMERICA

BRIEF DESCRIPTION

The primary objective of this investigation is to establish the large-scale structure and fluctuation characteristics of the interplanetary magnetic field as functions of time throughout the mission, and through correlative studies to understand the physical mechanisms by which the observed phenomena relate to the dynamics of the magnetosphere. The instrument is identical to the magnetometer on OPEN/GTL. It consists of a triaxial fluxgate magnetometer mounted remote from the spacecraft on a boom, a multiple resolution A/D converter, and a microprocessor-controlled range control logic and data processing system. Seven measurement ranges are included: plus or minus 16, 64, 256, 1024, 4096, 16,384, and 65,536 nT. Resolution ranges from 0.004 to 16 nT in normal mode and 2.5E-4 to 1 nT in high resolution mode.

------- OPEN/IPL, CHAPPELL ---------------------------------------

INVESTIGATION NAME- COLD PLASMA IONS (TIDE)

NSSDC ID- IPL -03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - C.R.	CHAPPELL	NASA-MSFC
CI - D.L.	REASONER	NASA-MSFC
CI - N.H.	STONE	NASA-MSFC
CI - C.R.	BAUGHER	NASA-MSFC
CI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
CI - W.B.	HANSON	U OF TEXAS, DALLAS
CI - R.A.	HEELIS	U OF TEXAS, DALLAS
CI - P.M.	BANKS	STANFORD U
CI - W.J.	RAITT	UTAH STATE U
CI - A.F.	NAGY	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN
CI - J.L.	HORWITZ	U OF ALABAMA
CI - R.H.	COMFORT	U OF ALABAMA
CI - J.J.	BERTHELIER	CNRS-LGE
CI - M.	EJIRI	ISAS
CI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION

This investigation, TIDE (thermal ion dynamics experiment), is designed to study the origin, transport, energization, storage, and loss of low energy ions in the earth's magnetosphere. The instrument measures the distribution function of ions in the energy range 0-100 eV and the mass range 1 to 16 u. A complete ion distribution is obtained over each spin of the spacecraft (nominally 6 s). The instrument consists of two sensor assemblies and an electronics assembly. The two sensors are mounted on opposite edges of the spacecraft, and each has a field of view of 170 deg. Control of the instrument by an onboard microprocessor permits programmable sequences of angle, energy, and mass to be selected for specific studies. The angular acceptance is in 10 x 10 deg windows covering a 120-deg fan in the plane containing the spin axis, and in 2 x 2 deg windows on 4-deg centers covering a 30-deg fan in the plane containing the spin axis. Energy resolution is nominally 20%, and mass resolution is 25% for masses 1-4, 8% for masses 4-16, and 3% for masses 16-64.

------- OPEN/IPL, GLOECKLER-----------------------------------

INVESTIGATION NAME- SOLAR WIND AND SUPRATHERMAL ION COMPOSITION STUDIES

NSSDC ID- IPL -08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - G.	GLOECKLER	U OF MARYLAND
CI - H.	BALSIGER	U OF BERNE
CI - J.	GEISS	U OF BERNE
CI - L.A.	FISK	U OF NEW HAMPSHIRE
CI - F.O.	GLIEM	BRAUNSCHWEIG TECH U
CI - T.E.	HOLZER	HIGH ALTITUDE OBS
CI - F.M.	IPAVICH	U OF MARYLAND
CI - K.W.	OGILVIE	NASA-GSFC
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation is designed (1) to provide detailed measurements of the elemental and ionic-charge composition of the solar wind, (2) to provide the average speed, density, and temperature of solar wind 4He 2+, and the average speed of solar wind protons, and (3) to provide the energy distributions of selected ion species. The instrument consists of three separate subsystems, the SWICS (solar wind ion composition), the STICS (suprathermal ion composition), and the DPU (data processing unit). The SWICS unit contains a time-of-flight sensor and a proton/alpha telescope. The STICS unit contains a time-of-flight sensor. The DPU contains two redundant microprocessors. The fields of view of the two sensor units are separated by 22.5 deg in the plane perpendicular to the spin axis. The energy range covered is 0.1 to 1000 keV/Q.

------- OPEN/IPL, KAISER--------------------------------------

INVESTIGATION NAME- PLASMA AND RADIO WAVES

NSSDC ID- IPL -05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS
RADIO PHYSICS

PERSONNEL

PI - M.L.	KAISER	NASA-GSFC
CI - J.	FAINBERG	NASA-GSFC
CI - R.G.	STONE	NASA-GSFC
CI - P.	RODRIGUEZ	US NAVAL RESEARCH LAB
CI - J.L.	STEINBERG	PARIS OBSERVATORY
CI - S.	HOANG	PARIS OBSERVATORY
CI - C.C.	HARVEY	PARIS OBSERVATORY
CI - P.J.	KELLOGG	U OF MINNESOTA
CI - E.J.	SMITH	NASA-JPL
CI - D.A.	GURNETT	U OF IOWA
CI - H.	MATSUMOTO	KYOTO U
CI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - G.	DE GENOUILLAC	PARIS OBSERVATORY

BRIEF DESCRIPTION

This investigation is designed to measure the intensity and direction of arrival for both propagating and in-situ waves originating in the solar wind near the earth. These waves depict the state of the solar wind impinging on the earth's magnetosphere. The instrument contains five subsystems within the main electronics box, plus the antenna subsystems which include a spin axis and two spin plane electric antennas (all spacecraft supplied) and a triaxial search coil (supplied by the plasma wave consortium). The five subsystems in the main electronics box are the radio frequency receivers, the comb filter receiver, the fast envelope sampler, the waveform analyzer, and the power distribution subsystem. The radio frequency receivers sweep over the band from about 1.5 kHz to 1 MHz. The comb filters have selectable bandwidth of 0.5, 1, or 2 Hz, with a total frequency range of 5 to 150 kHz. The fast envelope sampler is designed to capture transient events over four possible commandable decade ranges: 0.2-2, 0.6-6, 2-20, and 6-60 kHz. The waveform analyzer operates in the frequency regime below 1 kHz.

------- OPEN/IPL, LIN---

INVESTIGATION NAME- HOT PLASMA AND CHARGED PARTICLES

NSSDC ID- IPL -01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - R.P.	LIN	U OF CALIF, BERKELEY
CI - C.W.	CARLSON	U OF CALIF, BERKELEY
CI - K.A.	ANDERSON	U OF CALIF, BERKELEY
CI - M.K.	HUDSON	U OF CALIF, BERKELEY
CI - K.P.	WENZEL	ESA-ESTEC
CI - T.R.	SANDERSON	ESA-ESTEC
CI - R.	REINHARD	ESA-ESTEC
CI - G.	PASCHMANN	MPI-EXTRATERR PHYS
CI - N.	SCKOPKE	MPI-EXTRATERR PHYS
CI - G.K.	PARKS	U OF WASHINGTON
CI - B.H.	MAUK	U OF WASHINGTON
CI - H.	REME	CESR
CI - J.M.	BOSQUED	PAUL SABATIER U
CI - A.	ST. MARC	PAUL SABATIER U

BRIEF DESCRIPTION

This investigation, a 3-D plasma analyzer, is designed to meet the following objectives: (1) to make the first detailed exploration of the interplanetary particle population in the suprathermal energy range between solar wind plasma energies and 100 keV; (2) to study particle acceleration at the sun, in the interplanetary medium, and upstream from the earth; (3) to study the transport of particles in the interplanetary medium in the critical transition energy range between solar wind plasma and cosmic rays; and (4) to study the basic plasma processes occurring in the interplanetary medium, such as the production of radio emission by beam-plasma processes (Type III bursts) and shock waves (Type II), soliton collapse, and solar wind flux. The instrument measures the three-dimensional distribution of plasma and energetic electrons and ions with high energy, angular, and temporal resolution, over the energy range 10 eV to 10 MeV (different ranges for different parts of the instrument). The instrument consists of three detector systems, SST, EESA, and PESA. The SST consists of two arrays of semiconductor detectors (electron and proton), each consisting of six separate telescopes covering an aperture of 108 x 36 degrees. EESA and PESA are quadrispherical analyzers (electron and proton, respectively), each mounted on a separate inertia boom. These analyzers, of novel design, provide significant measurements even at the lowest flux levels likely to be encountered by this spacecraft. The symmetrical quadrispherical electrostatic analyzers provide a large geometric factor, a uniform angular response at all polar angles, with about one-degree angular resolution, and a 360-degree field of view. Microprocessors are employed to provide physically meaningful onboard data processing and compression, as well as flexibility of operation. For example, ten moments of positive ion and electron distributions are computed every half spin period. In addition, the particles are sorted by pitch angle, using the magnetic field vector obtained directly from the magnetometer on board.

------- OPEN/IPL, OGILVIE-------------------------------------

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- IPL -06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - K.W.	OGILVIE	NASA-GSFC
CI - L.F.	BURLAGA	NASA-GSFC
CI - J.D.	SCUDDER	NASA-GSFC
CI - E.C.	SITTLER, JR.	NASA-GSFC
CI - H.S.	BRIDGE	MASS INST OF TECH
CI - A.J.	LAZARUS	MASS INST OF TECH
CI - J.W.	BELCHER	MASS INST OF TECH
CI - G.L.	SISCOE	U OF CALIF, LA
CI - M.M.	NEUGEBAUER	NASA-JPL
CI - J.F.	FEYNMAN	BOSTON COLLEGE
CI - V.M.	VASYLIUNAS	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation is designed to provide complete, accurate specification of solar wind flow parameters in real time. The instrument is a six-axis ion-electron spectrometer which provides three-dimensional velocity distribution functions for ions and electrons, with high time resolution. The energy range covered extends from 7 eV to 30 keV for electrons in 4 different modes, and from 30 eV to 30 keV in 4 different ion modes. In addition, two Faraday cups are used to obtain 3-dimensional measurements of ions in 15 s, in the energy range 5 eV to 5 keV.

------- OPEN/IPL, SCHARDT --

INVESTIGATION NAME- COSMIC RAYS (EPACT); ENERGETIC PARTICLE ACCELERATION-COMPOSITION-TRANSPORT

NSSDC ID- IPL -07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
COSMIC RAYS

PERSONNEL

PI - A.W.	SCHARDT	NASA-GSFC
CI - M.A.	FORMAN	STATE U OF NEW YORK
CI - J.A.	LOCKWOOD	U OF NEW HAMPSHIRE
CI - W.R.	WEBBER	U OF NEW HAMPSHIRE
CI - G.E.	MORFILL	MPI-EXTRATERR PHYS
CI - R.	RAMATY	NASA-GSFC
CI - D.V.	REAMES	NASA-GSFC
CI - J.H.	TRAINOR	NASA-GSFC
CI - M.A.I.	VAN HOLLEBEKE	U OF MARYLAND
CI - T.T.	VON ROSENVINGE	NASA-GSFC

BRIEF DESCRIPTION
The EPACT (energetic particle acceleration-composition-transport) experiment is designed to provide a comprehensive study of energetic particle acceleration and transport processes in solar flares, in the interplanetary medium and in planetary magnetospheres as well as the galactic cosmic rays and the anomalous cosmic ray component. The instrument provides a complete description of electrons and atomic nuclei of different charge and isotopic composition over an energy range from 0.1 to 500 MeV/nucleon, and extending up to Z=92 (uranium). The instrument is divided into three semi-autonomous subsystems, the low energy angular distribution telescopes (LEAD), the low energy matrix telescopes (LEMT), and the electron/isotope telescope (ELITE). There are four individual LEAD sensors, two which view the hemisphere above the spin plane, and two pointed below the spin plane. There are also three LEMT sensors which are oriented above, below, and into the spin plane, and a single ELITE sensor which is double ended.

------- OPEN/IPL, TEEGARDEN --

INVESTIGATION NAME- GAMMA RAY BURSTS AND EUV SPECTROSCOPY

NSSDC ID- IPL -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - B.J.	TEEGARDEN	NASA-GSFC
CI - T.L.	CLINE	NASA-GSFC
CI - R.	RAMATY	NASA-GSFC
CI - N.	GEHRELS	NASA-GSFC
CI - J.I.	TROMBKA	NASA-GSFC
CI - R.	PEHL	U OF CALIF, BERKELEY
CI - K.C.	HURLEY	CESR
CI - M.	NIEL	CESR
CI - G.	VEDRENNE	CESR

BRIEF DESCRIPTION
The objectives of this investigation are to provide the first high-resolution measurements of cosmic gamma-ray transients and solar flares, and to determine accurately the solar EUV input into the near-earth environment. The instrument consists of a coordinated set of three instruments. The germanium detector system covers the energy range 25 keV to 8 MeV in 8192 channels, with resolution of < 2 keV FWHM at 1 MeV. The silicon detector system covers the range 2.5-20 keV for solar flares and 4-20 keV for cosmic transients. The EUV system is a micro-channel plate with a mosaic of 8 filters covering the aperture. The wavelength range is 75 to 1500 A in 8 broad bands. The germanium detector system is isotropic except for the 15% of the sky obscured by the spacecraft. The silicon system has a 45-deg field of view for the sun, and the field of view for the EUV system is 28-deg FWHM.

**************************** OPEN/PPL ****************************

SPACECRAFT COMMON NAME- OPEN/PPL
ALTERNATE NAMES- PPL, POLAR PLASMA LABORATORY

NSSDC ID- PPL

LAUNCH DATE- 08/00/90 WEIGHT- 841. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SHTLE-PAMD

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 1356. MIN INCLINATION- 90. DEG
PERIAPSIS- 5000. KM ALT APOAPSIS- 64000. KM ALT

PERSONNEL

MG - D.S.	DILLER	NASA HEADQUARTERS
SC - M.J.	WISKERCHEN	NASA HEADQUARTERS
PM - K.O.	SIZEMORE	NASA-GSFC
PS - J.K.	ALEXANDER	NASA-GSFC
PS - M.H.	ACUNA	NASA-GSFC
PS - M.L.	KAISER	NASA-GSFC

BRIEF DESCRIPTION
The PPL (Polar Plasma Laboratory) is one of the four spacecraft in the OPEN (Origins of Plasmas in the Earth's Neighborhood) program. The OPEN program is a major new thrust in the study of solar-terrestrial relationships. Its goal, to obtain the first quantitative assessment of the global flow of energy through the earth's space environment above the upper atmosphere, is accomplished with a network of four spacecraft orbiting in key locations around the earth: two plasma source regions and two geospace storage regions. With a properly instrumented spacecraft laboratory in each of the four regions, simultaneous observations are made of the entry of plasma into the system, the storage and release of energy within the system, and the transfer of plasma and energy between those key regions as they change with time. Complementary programs being planned for the same time frame will be the ISPM (International Solar Polar Mission) and the UARS (Upper Atmosphere Research Satellite) program. The OPEN program may be expanded to include more extensive participation from ESA and/or ISAS. The OPEN program is designed to achieve three major scientific goals: (1) to assess the mass, momentum and energy flow and their time variability throughout the geospace environment; (2) to improve the understanding of plasma processes that control the collective behavior of geospace components and trace their cause-and-effect relationships through the system; and (3) to assess the importance to the terrestrial environment of variations in energy input to the atmosphere caused by geospace processes. The program has a flexible central data handling facility to which the investigators gain access by remote computer terminals. The spacecraft laboratories are launched from the Space Shuttle, with a PAM-D upper stage for final orbit insertion. Each has on-board propulsion systems and ample fuel supplies to achieve and maintain their different orbits. Spacecraft design lifetime will be 3-5 years, with redundant subsystems. All of the spacecraft are cylindrical, approximately 2.8 m in diameter by 1.25 m high (plus 1.25 m for its 2 despun platforms), with body-mounted solar cell arrays, and are spin-stabilized. They have long wire spin plane antennas, inertia booms, and spin plane appendages to support sensors. Prior to stabilization, all four spacecraft may have spin rates up to 60 rpm. The spacecraft are non-retrievable and non-serviceable. This particular spacecraft, the PPL, measures solar wind entry, ionospheric output, and the depositions of energy into the neutral atmosphere at high latitudes. Imaging instruments make possible the measurement of visible, ultraviolet, and X-ray spectra of the polar cap. The PPL has two despun gimballed instrument platforms, and booms are deployed out both Z-axes. Data are stored on on-board tape recorders and relayed to the Deep Space Network at a high rate (600 Kb max, 250 Kb nominal), although the average real-time data rate for PPL is 41.6 kbps. PPL will be in a 22.6-h polar orbit (90 deg inclination), with perigee and apogee of 5,000 by 64,000 km. It weighs 841 kg and uses 333 W of power. The spin rate is 10 rpm around an axis approximately normal to the orbit plane.

------- OPEN/PPL, CHAPPELL --

INVESTIGATION NAME- COLD PLASMA IONS (TIDE)

NSSDC ID- PPL -04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - C.R.	CHAPPELL	NASA-MSFC
CI - D.L.	REASONER	NASA-MSFC
CI - N.H.	STONE	NASA-MSFC
CI - C.R.	BAUGHER	NASA-MSFC
CI - J.H.	HOFFMAN	U OF TEXAS, DALLAS
CI - W.B.	HANSON	U OF TEXAS, DALLAS
CI - R.A.	HEELIS	U OF TEXAS, DALLAS
CI - P.M.	BANKS	STANFORD U
CI - W.J.	RAITT	UTAH STATE U
CI - A.F.	NAGY	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN
CI - J.L.	HORWITZ	U OF ALABAMA
CI - R.H.	COMFORT	U OF ALABAMA
CI - J.J.	BERTHELIER	CNRS-LGE
CI - M.	EJIRI	ISAS
CI - R.E.	GENDRIN	CNET

BRIEF DESCRIPTION

This investigation, TIDE (thermal ion dynamics experiment), is designed to study the origin, transport, energization, storage, and loss of low energy ions in the earth's magnetosphere. The instrument measures the distribution function of ions in the energy range 0-100 eV and the mass range 1 to 16 u. A complete ion distribution is obtained over each spin of the spacecraft (nominally 6 s). The instrument consists of two sensor assemblies and an electronics assembly. The two sensors are mounted on opposite edges of the spacecraft, and each has a field of view of 170 deg. Control of the instrument by an onboard microprocessor permits programmable sequences of angle, energy, and mass to be selected for specific studies. The angular acceptance is in 10 x 10 deg windows covering a 120-deg fan in the plane containing the spin axis, and in 2 x 2 deg windows on 4-deg centers covering a 30-deg fan in the plane containing the spin axis. Energy resolution is nominally 20%, and mass resolution is 25% for masses 1-4, 8% for masses 4-16, and 3% for masses 16-64.

------- OPEN/PPL, FELDMAN---------------------------------------

INVESTIGATION NAME- MULTI-SPECTRAL AURORAL IMAGING

NSSDC ID- PPL -10

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - P.D.	FELDMAN	JOHNS HOPKINS U
CI - W.G.	FASTIE	JOHNS HOPKINS U
CI - R.W.	MCENTIRE	APPLIED PHYSICS LAB
CI - C.I.	MENG	APPLIED PHYSICS LAB
CI - T.A.	POTEMRA	APPLIED PHYSICS LAB
CI - S.I.	AKASOFU	U OF ALASKA
CI - L.J.	LANZEROTTI	BELL TELEPHONE LAB
CI - G.C.	REID	NOAA-ERL

BRIEF DESCRIPTION

The objective of this investigation is to obtain simultaneously acquired global images of the aurora with good spatial and temporal resolutions at many selected wavelengths. The instrument consists of optical sensors and associated electronics located on the imaging despun platform. There are three optical channels: far ultraviolet, near ultraviolet, and visible, each with a separate detector system consisting of an intensified CCD. The far ultraviolet channel utilizes 6 broadband filters covering wavelengths from 122 to 1800 A, while the near UV channel utilizes narrowband or Fabry-Perot filters at 2461, 2470, 2972, 2976, and 3371 A. The field of view is 6 deg for the far UV and 8 deg for the near UV channel, corresponding to spatial resolution of 7 and 21 km, respectively, from 4 RE, or 40 and 120 km, respectively, from 12 RE. The nominal temporal resolution is 20 s, ranging up to 700 s for special features. Sensitivity is 1E-3 to 6E-3 counts/s per rayleigh per spatial element.

------- OPEN/PPL, FRANK---

INVESTIGATION NAME- OPTICAL AURORAL IMAGER

NSSDC ID- PPL -12

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
CI - K.L.	ACKERSON	U OF IOWA
CI - J.D.	CRAVEN	U OF IOWA
CI - P.B.	HAYS	U OF MICHIGAN
CI - W.E.	SHARP	U OF MICHIGAN

BRIEF DESCRIPTION

The major objective of this investigation is to obtain global auroral images at visible and UV wavelengths which provide multispectral images with time resolution of 1 minute, spatial resolution of 10 km at a spacecraft altitude of 9 RE, and sensitivities of 100-300 rayleighs per count in each pixel. This provides for global determination of energy deposition rates by charged particles into the earth's upper atmosphere, a global monitor of the interrelationship of major plasma regimes in the magnetosphere, a global monitor of coupling processes between the ionosphere and the magnetosphere, and a global reference system for the interpretation of in situ measurements by companion instruments in the OPEN mission. This investigation utilizes two optical channels in the visible wavelength region: a medium-resolution channel (VWM) and a low-resolution channel (VWL). The instrumental hardware is combined with that of the Ultraviolet Imager (PPL-11). The electronics subsystem is shared, as is the front-optics system used to point the instrument and to avoid the sunlit limb of the earth which is very bright in the visible. The combined instrument comprises primary and secondary optics, electromechanical devices for mirror and aperture control and filter selection, optical filters, image-intensified CCD sensor arrays with thermoelectric cooling, power converters and distribution circuits, and data, attitude and command processors. The instrument is mounted on the despun platform and normally directed in or near the nadir direction. The imaging field of view is directed by the earth-finding mirror to different sectors within the 20 x 36 deg instrument observing field. There are four optical channel sensors. The VWL and VWM, which are part of this investigation, cover 7 wavelengths from 391.0 to 732.0 nm. The Ultraviolet Imager (PPL-11) provides the other two channels, the VUV (vacuum ultraviolet) and the NUV (near ultraviolet).

------- OPEN/PPL, FRITZ---

INVESTIGATION NAME- CHARGE AND MASS MAGNETOSPHERIC ION COMPOSITION EXPERIMENT (CAMMICE)

NSSDC ID- PPL -06

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL

PI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD/APPLTON LAB
CI - B.K.G.	HULTQVIST	KIRUNA GEOPHYS INST
CI - G.	KREMSER	MPI-AERONOMY
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - W.N.	SPJELDVIK	NOAA-SEL
CI - T.	DOKE	WASEDA U
CI - J.M.	CORNWALL	AEROSPACE CORP
CI - M.	SCHULZ	AEROSPACE CORP
CI - C.K.	GOERTZ	U OF IOWA
CI - V.M.	VASYLIUNAS	MPI-AERONOMY
CI - L.R.	LYONS	NOAA-SEL

BRIEF DESCRIPTION

The objectives of this investigation (CAMMICE, charge and mass magnetospheric ion composition experiment) are the unambiguous determination of the composition of the earth's plasma populations, their original sources, and the mechanisms acting to energize and transport these populations within the closely coupled magnetosphere/ionosphere and magnetosphere/solar-wind systems, and in the two major geospace energy storage reservoirs - the near-earth plasma sheet and the ring current. The CAMMICE incorporates two types of sensor systems, MICS and HIT, which each perform a three-parameter measurement on the ion composition over a combined range from < 10 keV/Q to 15 MeV/Q for elements from hydrogen through iron. Each of the sensor systems is supported by its own independent data processing unit. These sensors are identical to those flown on the OPEN/EML spacecraft, although the mountings are different.

------- OPEN/PPL, HIGBIE--

INVESTIGATION NAME- ENERGETIC ELECTRONS AND IONS

NSSDC ID- PPL -05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - P.R.	HIGBIE	LOS ALAMOS NAT LAB
CI - D.N.	BAKER	LOS ALAMOS NAT LAB
CI - R.D.	BELIAN	LOS ALAMOS NAT LAB
CI - W.	STUDEMANN	MPI-AERONOMY
CI - E.	KIRSCH	MPI-AERONOMY
CI - A.	KORTH	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - H.D.	VOSS	LOCKHEED PALO ALTO
CI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - M.G.	KIVELSON	U OF CALIF, LA

BRIEF DESCRIPTION

This investigation (CEPPAD, comprehensive energetic particle pitch angle distribution) is designed to provide detailed pitch angle measurements of energetic particle fluxes, to cover the particle energy spectra over as wide a range as possible with statistically meaningful results, to separately identify ions and electrons, and to give information on high energy ion composition. This instrument is identical to the one flown on OPEN/EML. The instrument measures electrons with energies from 20 keV to 3000 keV and protons from 20 keV to 17 MeV. Alpha particles and the CNO group of nuclei are also uniquely identified with high time resolution in broad energy bands over the range 30 to 3300 keV/nucleon. Multiple detector heads on the body-mounted portion of the instrument (BEPS) provide detailed high-resolution three-dimensional measurement of the energetic particle distribution function at all angles outside the loss cone. The detectors mounted on the scan platform (SEPS) are designed to look along the local magnetic field direction. The major components of the body-mounted detectors (BEPS) are the three sensor types LEMS, HIST, and DPU. The scan platform energetic particle spectrometers (SEPS) are divided into three different spectrometers designated HARE, HARP, and HISS. Both the BEPS and the SEPS are controlled by microprocessors.

------- OPEN/PPL, IMHOF--

INVESTIGATION NAME- POLAR IONOSPHERIC X-RAY IMAGING EXPERIMENT (PIXIE)

NSSDC ID- PPL -07

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
UPPER ATMOSPHERE RESEARCH

PERSONNEL

PI - W.L.	IMHOF	LOCKHEED PALO ALTO
CI - D.L.	MCKENZIE	AEROSPACE CORP
CI - C.J.	RICE	AEROSPACE CORP
CI - P.F.	MIZERA	AEROSPACE CORP
CI - W.	CALVERT	U OF IOWA
CI - D.P.	CAUFFMAN	LOCKHEED PALO ALTO
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - M.	WALT	LOCKHEED PALO ALTO
CI - R.R.	VONDRAK	SRI INTERNATIONAL
CI - T.J.	ROSENBERG	U OF MARYLAND
CI - J.G.	LUHMANN	U OF CALIF, LA
CI - J.	STADSNES	U OF BERGEN

BRIEF DESCRIPTION

The objective of this investigation is to measure the spatial distribution and temporal variations of X-ray emissions from the earth's atmosphere. The instrument consists of two major subsystems, the multiple pinhole camera and signal-processing electronics, and the digital electronics. The detector in the camera is a position-sensitive multiwire proportional counter. The signal processing electronics identify events as X-ray interactions (or not), locate the events in three-dimensional space, and determine the X-ray energy. The energy range is 1-100 keV, with spectral resolution of 15% FWHM at 6 keV (inversely proportional to the square root of the energy). The field of view is variable, 8.5, 12, 16, or 33 deg, with spatial resolution of 0.35 to 1.0 deg. Temporal resolution is 1-30 minutes (typically 5 minutes).

------- OPEN/PPL, MOZER--

INVESTIGATION NAME- DC ELECTRIC FIELDS

NSSDC ID- PPL -09

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - R.B.	TORBERT	U OF CALIF, SAN DIEGO
CI - W.J.	BURKE	USAF GEOPHYS LAB
CI - M.	SMIDDY	USAF GEOPHYS LAB
CI - R.J.L.	GRARD	ESA-ESTEC
CI - K.	KNOTT	ESA-ESTEC
CI - A.	PEDERSEN	ESA-ESTEC
CI - T.L.	AGGSON	NASA-GSFC
CI - N.C.	MAYNARD	NASA-GSFC
CI - D.P.	STERN	NASA-GSFC
CI - L.P.	BLOCK	ROYAL INST OF TECH
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - K.	TSURUDA	ISAS

BRIEF DESCRIPTION

The objectives of this investigation are to study (1) large parallel and perpendicular electric fields in double layers and electrostatic shocks, (2) larger spatial scale parallel electric fields responsible for upgoing ions and inverted-V electron acceleration, (3) the high latitude convection electric field, (4) the electric field structure of the high latitude magnetosphere, polar cusp, and plasma mantle, and (5) the electric field comparisons (with other spacecraft in the OPEN program) at different points along the same magnetic field line, at different points along a common boundary, or in different regions of the magnetosphere. The instrument consists of three orthogonal double probes, each of which is a pair of separated conductors whose potential difference is measured. One pair consists of spheres located in the satellite spin plane and separated by 160 m at the ends of wire booms. A second pair consists of cylindrical wire boom elements located in the spin plane and separated by an effective distance of 350 km. The third pair consists of spheres that are oriented parallel to the satellite spin axis and are separated by 14 m at the ends of rigid booms.

------- OPEN/PPL, RUSSELL--

INVESTIGATION NAME- MAGNETIC FIELDS

NSSDC ID- PPL -08

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - C.T.	RUSSELL	U OF CALIF, LA
CI - M.	ASHOUR-ABDALLA	U OF CALIF, LA
CI - P.J.	COLEMAN, JR.	LOS ALAMOS NAT LAB
CI - J.G.	LUHMANN	U OF CALIF, LA
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - P.H.	REIFF	RICE U
CI - T.	SAKURAI	TOKAI U

BRIEF DESCRIPTION

The objective of this investigation is to make high precision measurements of the magnetic field in the high and low altitude polar magnetosphere (1) to study the morphology of the polar cusp; (2) to determine the site of reconnection; (3) to investigate the behavior of field-aligned current systems at high and low altitudes: how these currents communicate stresses within the magnetosphere, and the role they play in the acceleration of particles; (4) to examine the nature of waves and instabilities in the polar cusp; (5) to investigate the cusp magnetosheath interface and determine how magnetosheath plasma gains access to the magnetosphere; and (6) to provide accurate models of the magnetic field in the high latitude magnetosphere which depend on solar wind and magnetospheric conditions. The instrument consists of dual triaxial magnetometers with flippers. Dual microprocessors and random access memory are used to process the data so that the data sent to earth is immediately usable by all OPEN investigators without extensive calculations, as well as available on board the spacecraft to other instruments in final corrected form. One million bits of internal storage under microprocessor control provide snapshots with up to 4 ms resolution on command or triggered by changes in the data. The instrument ranges are plus and minus 256, 4096, and 65,536 nT, with corresponding resolutions of 0.004, 0.06, and 1 nT.

------- OPEN/PPL, SCUDDER--

INVESTIGATION NAME- HOT PLASMA

NSSDC ID- PPL -03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - J.D.	SCUDDER	NASA-GSFC
CI - T.J.	BIRMINGHAM	NASA-GSFC
CI - R.A.	HOFFMAN	NASA-GSFC
CI - E.C.	SITTLER, JR.	NASA-GSFC
CI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO
CI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO
CI - E.C.	WHIPPLE, JR.	U OF CALIF, SAN DIEGO
CI - C.S.	WU	U OF MARYLAND
CI - A.	KORTH	MPI-AERONOMY
CI - A.K.	RICHTER	MPI-AERONOMY
CI - K.W.	OGILVIE	NASA-GSFC

BRIEF DESCRIPTION

The objectives of this investigation are (1) to observe the expected kinetic and magnetohydrodynamic signatures of magnetic reconnection in the cusp region; to quantify the energy released to the plasma and the rate of mass flux into the magnetosphere implied; and to understand what external parameters control the rates of reconnection of magnetic flux; (2) to understand the role of field-aligned currents in the auroral zone, their relation to auroral forms and terrestrial kilometric radiation, and their response to magnetotail and solar wind stimuli as monitored by the other OPEN spacecraft; to ascertain the altitude dependence of the associated electrical potential and the parameters which control its size; and (3) to obtain a quantitative, high time resolution definition of the regions associated with the cusp and entry layer including a study of the momentum transfer between magnetosheath and entry layer plasmas. The instrument, named HYDRA, resolves electrons and ions in three dimensions with energies between 1 eV and 30 keV with 0.5-s time resolution. HYDRA consists of 8 pairs of 127-deg electrostatic analyzer heads. Six pairs are body mounted, and two are on the loss cone platform.

------- OPEN/PPL, SHAWHAN--

INVESTIGATION NAME- PLASMA AND RADIO WAVES

NSSDC ID- PPL -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
RADIO PHYSICS
SPACE PLASMAS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
CI - R.R.	ANDERSON	U OF IOWA
CI - C.K.	GOERTZ	U OF IOWA
CI - D.A.	GURNETT	U OF IOWA
CI - W.S.	KURTH	U OF IOWA
CI - B.T.	TSURUTANI	NASA-JPL
CI - T.	TEMERIN	U OF CALIF, BERKELEY
CI - J.K.	ALEXANDER, JR.	NASA-GSFC
CI - M.L.	KAISER	NASA-GSFC
CI - R.W.	FREDRICKS	TRW SYSTEMS GROUP
CI - M.C.	KELLEY	CORNELL U
CI - P.M.	KINTNER	CORNELL U
CI - C.G.	PARK	CORNELL U
CI - H.	MATSUMOTO	KYOTO U

BRIEF DESCRIPTION

The objectives of this investigation are to measure the spectrum, amplitude, and wave vector characteristics for naturally occurring electromagnetic and electrostatic plasma waves along the OPEN/PPL trajectory for a frequency range of 1 Hz to 400 kHz (magnetic), 1 Hz to 3.2 MHz (electric), and 1 Hz to 16 kHz (density fluctuations). The same characteristics are also measured for electromagnetic and electrostatic plasma waves resulting from ground-based or Shuttle-based active wave, particle, and chemical injection experiments. A unique feature of this instrument is the capability to recognize the presence of a desired phenomenon based on onboard microprocessor algorithms, and to capture the waveforms for six wave fields simultaneously. These waveforms provide simultaneous estimates for the electromagnetic wave normal, polarization, and Poynting vectors or for the electrostatic propagation and polarization vectors after ground processing.

------- OPEN/PPL, SHELLEY---------------------------------------

INVESTIGATION NAME- PLASMA ION COMPOSITION

NSSDC ID- PPL -01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS
SPACE PLASMAS

PERSONNEL

PI - E.G.	SHELLEY	LOCKHEED PALO ALTO
CI - B.A.	WHALEN	NATL RES COUNC OF CAN
CI - J.L.	BURCH	SOUTHWEST RES INST
CI - W.K.	PETERSON	LOCKHEED PALO ALTO
CI - R.D.	SHARP	LOCKHEED PALO ALTO
CI - R.G.	JOHNSON	LOCKHEED PALO ALTO
CI - S.M.	KAYE	LOCKHEED PALO ALTO
CI - O.W.	LENNARTSSON	LOCKHEED PALO ALTO
CI - C.W.	CARLSON	U OF CALIF, BERKELEY
CI - J.	GEISS	U OF BERNE
CI - H.	BALSIGER	U OF BERNE
CI - D.T.	YOUNG	LOS ALAMOS NAT LAB
CI - A.	GHIELMETTI	U OF BERNE
CI - G.	PASCHMANN	MPI-EXTRATERR PHYS
CI - H.R.	ROSENBAUER	MPI-AERONOMY

BRIEF DESCRIPTION

This investigation utilizes a toroidal ion mass spectrograph (TIMS) to fulfill its objectives, which are to study (1) the properties, location, and morphology of the principal source region for the entry of solar wind plasma into the magnetosphere, i.e., the polar cusp; (2) the properties, location, and morphology of the principal source region for hot ionospheric plasma in the magnetosphere, i.e., the auroral acceleration region; (3) the details of the processes by which the source plasmas are injected into trapped orbits, with special emphasis on the mass dependence of these processes; (4) details of the processes by which relatively cool source plasmas are energized into hot plasma, with special emphasis on the mass dependence of these processes; and (5) the details of the processes by which the hot magnetospheric plasma are lost, for example through wave-particle scattering and charge exchange, with special emphasis on the mass dependence of these processes. The instrument has a mass per charge range of 1 to 150 u/Q in 128 channels, with resolution (M/delta M) of 10, and an energy range of 0 to 40 keV/Q, with 32 energy steps logarithmically spaced and a resolution (delta E/E) of 0.08. The field of view covers 10 deg of azimuth and plus and minus 20 deg in elevation, with 5 elements of 8 deg each in elevation. The sample rate of 32 samples per second yields one mass-energy-angle spectrum per 4 spin periods. This instrument is identical to the instrument on OPEN/EML.

------- OPEN/PPL, TORR---------------------------------------

INVESTIGATION NAME- ULTRAVIOLET IMAGER

NSSDC ID- PPL -11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
UPPER ATMOSPHERE RESEARCH
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - M.R.	TORR	UTAH STATE U
CI - P.M.	BANKS	STANFORD U
CI - D.G.	TORR	UTAH STATE U
CI - J.G.	ROEDERER	U OF ALASKA
CI - K.C.	CLARK	U OF WASHINGTON
CI - G.K.	PARKS	U OF WASHINGTON
CI - K.D.	COLE	LA TROBE U
CI - E.	KANENDA	U OF TOKYO
CI - H.	OYA	U OF TOHOKU
CI - B.T.	TSURUTANI	NASA-JPL
CI - J.M.	AJELLO	NASA-JPL
CI - A.L.	LANE	NASA-JPL
CI - J.L.	MITCHELL	NASA-JPL

BRIEF DESCRIPTION

The ultraviolet imager is an ultraviolet imaging camera designed to obtain global images of the aurora at several selected wavelengths with time resolution of 1 minute, spatial resolution of 10 km at a spacecraft altitude of 9 RE, and sensitivities of 100-300 rayleighs per count in each pixel. The objective is to provide coherent information on the total energy influx to the atmosphere, the characteristic energy of the precipitating particles, the spatial extent and structure, and various other parameters such as activity indices. This investigation utilizes two UV optical channels, one in the near ultraviolet (NUV) and one in the vacuum ultraviolet (VUV). The instrumental hardware is combined with that of the Optical Auroral Imager (PPL-12). The electronics subsystem is shared, as is the front-optics system used to point the instrument and to avoid the sunlit limb of the earth which is very bright in the visible. The combined instrument comprises primary and secondary optics, electromechanical devices for mirror and aperture control and filter selection, optical filters, image-intensified CCD sensor arrays with thermoelectric cooling, power converters and distribution circuits, and data, attitude and command processors. The instrument is mounted on the despun platform and normally directed in or near the nadir direction. The imaging field of view is directed by the earth-finding mirror to different sectors within the 20 x 36 deg instrument observing field. There are four optical channel sensors. The VUV (vacuum ultraviolet) covers 6 wavelengths from 120.0 to 180.0 nm, and the NUV (near ultraviolet) covers 5 wavelengths from 247.0 to 337.1 nm. The VWL and VWM (visible wavelengths) are provided as part of the Optical Auroral Imager (PPL-12).

*************************** OSS-2***************************

SPACECRAFT COMMON NAME- OSS-2
ALTERNATE NAMES-

NSSDC ID- OSS-2

LAUNCH DATE- 03/00/88 WEIGHT- 3700. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90. MIN INCLINATION- 40. DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 300. KM ALT

PERSONNEL

MM - S.E.	BERGSON-WILLIS, JR.	NASA-GSFC
MS - J.F.	ORMES	NASA-GSFC

BRIEF DESCRIPTION

The OSS-2 system consists of the space segment and the ground segment. The space segment includes the Shuttle, the Spacelab Avionics (Igloo), and an experiment pallet upon which the four science instruments are mounted. The ground segment consists of the Tracking and Data Relay Satellite System (TDRSS) for data acquisition, the Payload Operations Control Center (POCC) for payload control, the Spacelab Data Processing Facility (SLDPF) for data capture and processing, and the data analysis facilities at various PI facilities. The investigations were selected to study the temperature and composition of high-temperature astrophysical plasmas on a scale of sizes and distances ranging from our own galaxy to clusters of galaxies. These investigations are part of the high-energy astrophysics program of multiple Spacelab flights and extended Space Platform observations.

------- OSS-2, GORENSTEIN --

INVESTIGATION NAME- LARGE AREA MODULAR ARRAY OF REFLECTORS (LAMAR)

NSSDC ID- OSS-2 -01 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - P. GORENSTEIN SAO

BRIEF DESCRIPTION
The Large Area Modular Array of Reflectors (LAMAR) investigation is designed to obtain a sensitive view of regions of the X-ray sky over a broad wavelength band. It makes photometric maps of extended X-ray sources on 5 to 10% of the sky. The instrument consists of X-ray telescopes of the Kirkpatrick-Baez design, with imaging proportional counters (IPC) as focal plane detectors. Specifically, the LAMAR consists of four basic array subassemblies (BAS), array structure, central electronics assembly, aspect sensor, thermal blanket system, and supporting hardware. An attitude sensor and a pointing capability for specific targets are also included. Each BAS includes four telescope/IPC systems, a gas system, signal processing electronics, a self-supporting structure, and a sun shield. A system of fiducial lines compensates for alignment changes that occur as a result of variations in temperature. The axes of the LAMAR telescopes do not have to be precisely co-aligned.

------- OSS-2, KRAUSHAAR --

INVESTIGATION NAME- DIFFUSE X-RAY SPECTROMETER (DXS)

NSSDC ID- OSS-2 -02 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - W. KRAUSHAAR U OF WISCONSIN

BRIEF DESCRIPTION
The objective of the Diffuse X-Ray Spectrometer (DXS) experiment is to make the first map of the temperature and composition of the medium over 1/40th of the celestial sphere, and LAMAR (OSS-2-01) supports these observations by indicating the contribution of point sources. This spectrometer contains four proportional counter X-ray detector assemblies which are operated in functionally identical pairs. The detector pairs are located on either side of the experiment pallet, and each is oscillated by an assembly about an axis parallel to the Orbiter roll axis. In each detector assembly, incident X-rays are Bragg-reflected from a curved crystal panel and passed through a collimator to the entrance window of a position-sensitive proportional counter. From a given position in the sky, only X-rays of a particular wavelength are detected. The detector oscillation provides the scan for the full wave length range of the detector for the given sky position. In the normal data acquisition mode, the oscillator drive rotates the detector pair back and forth through a selectable scan angle up to 180 deg, at a rate of 180 deg per min. A commandable X-ray tube source provides X rays of known energy for ground and in-orbit calibrations.

------- OSS-2, MEYER --

INVESTIGATION NAME- COSMIC RAY NUCLEI EXPERIMENT (CRNE)

NSSDC ID- OSS-2 -03 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) COSMIC RAYS

PERSONNEL
PI - P. MEYER U OF CHICAGO
PI - D. MULLER U OF CHICAGO

BRIEF DESCRIPTION
The Cosmic Ray Nuclei Experiment (CRNE) is a reflight of essentially the Spacelab-2 instrument (SPALAB-2-06), and extends observations of the cosmic ray nuclei in the approximate energy range from 100 to 1000 GeV per nucleon. The instrument measures the nuclear charge "Z" and the energy "E" of each cosmic ray particle. It consists of a combination of two gas Cerenkov counters and two transition radiation detectors. Charge detection is determined by use of two large-area scintillators. A particle must pass through both scintillators to register a measured charge. Particle energy is measured by Cerenkov counters in the lower energy range and by the transition-radiation detectors in the higher energy range. Each one of the two gas counters is viewed by 48 photomultiplier tubes. Each transition-radiation detector consists of three radiators and 3 gas-filled multiwire proportional chambers.

------- OSS-2, SERLEMITSOS --

INVESTIGATION NAME- BROAD BAND X-RAY TELESCOPE (BBXRT)

NSSDC ID- OSS-2 -04 INVESTIGATIVE PROGRAM CODE EZ-7

INVESTIGATION DISCIPLINE(S) X-RAY ASTRONOMY

PERSONNEL
PI - P.J. SERLEMITSOS NASA-GSFC

BRIEF DESCRIPTION
The objective of the Broadband X-Ray Telescope (BBXRT) investigation is to perform high resolution energy-dispersive spectrophotometry over the range 0.5 to 10 keV on X-ray sources selected from a list containing stars, supernovae remnants, neutron stars, white dwarfs, clusters of galaxies, and active galactic nuclei including quasars. The instrument package consists of two identical co-aligned grazing incidence telescopes with cooled Si(Li) detectors at each focal plane. Observations will be conducted in a pointing mode for typically 2000 s per source. Events will be processed by a micro-processor-controlled data system which places them individually in a 64-kbs telemetry stream with 62.5 microseconds temporal resolution and 40-eV energy resolution. The BBXRT represents the first attempt to extend high-resolution spectroscopy beyond the Einstein spacecraft instrument's 3.5-keV cutoff to include the iron K band. Each telescope has effective areas of approximately 500 sq cm and 100 sq cm at 1.5- and 7 keV, respectively, with a spatial accuracy of about 2 arc min. Background reduction schemes result in an estimated limiting spectral sensitivity for a 2000-s observation of 1.E-13 erg/sq cm s. The absolute pointing requirement is < or = to 4 arc min.

**************************** OSTA-3 ****************************

SPACECRAFT COMMON NAME- OSTA-3
ALTERNATE NAMES-

NSSDC ID- OSTA-3

LAUNCH DATE- 08/29/84 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 90.1 MIN INCLINATION- 57. DEG
PERIAPSIS- 229. KM ALT APOAPSIS- 337. KM ALT

PERSONNEL
MG - N. WIRMAN NASA HEADQUARTERS
SC - M. SETTLE NASA HEADQUARTERS

BRIEF DESCRIPTION
The OSTA-3 (Office of Space and Terrestrial Applications) is the second Space Shuttle payload designed for conducting experiments in remote sensing. This experiment payload consists of (1) a Shuttle imaging radar (SIR-B) for studies in geological explorations of the earth's surface, (2) a large format camera (LFC) for cartographic mappings of the earth, (3) a measurement of air pollution from satellite (MAPS) to provide the distributions of the CO abundance in the atmosphere, and (4) a feature identification and location experiment (FILE) for classification of surface materials. The SIR-B is an upgraded version of the SIR-A flown on the OSTA-1 payload during the STS-2 mission (NSSDC ID 81-111A-01). The MAPS and FILE sensors are the reflys of those on the same OSTA-1 payload (NSSDC ID 81-111A-04 and 81-111A-03).

------- OSTA-3, ELACHI --

INVESTIGATION NAME- SHUTTLE IMAGING RADAR-B (SIR-B)

NSSDC ID- OSTA-3 -01 INVESTIGATIVE PROGRAM CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S) EARTH RESOURCES SURVEY

PERSONNEL
PI - C. ELACHI NASA-JPL

BRIEF DESCRIPTION
The primary purpose of this experiment is to provide data for studies in geography, geology, hydrology, oceanography, vegetation, and ice applications. The SIR-B is a side-looking, synthetic aperture radar that illuminates the earth's surface with horizontally polarized (HH) microwave radiation transmitted at L-band frequency 1.28 GHz (wavelength 23 cm). The SIR-B antenna can be mechanically tilted while the Shuttle's payload bay is facing the earth. This enables researchers to obtain radar imagery of a specific area at up to six incident angles ranging from 15 to 60 deg. Multiple-incidence-angle radar imagery can potentially be used to distinguish surface materials on the basis of their roughness characteristics. With a 12-MHz bandwidth and 20%

degradation in the pulse, the ground range resolution is 17 m at 60-deg incidence angle and is 58 m at 15 deg. The azimuth resolution is 25 km. The swath width of the SIR-B imagery is 20-50 km. The SIR-B provides both digitally recorded and optically recorded data. The digital radar data are transmitted from the Shuttle through the Tracking And Data Relay Satellite System (TDRSS) to White Sands, New Mexico. White Sands relays the SIR-B data via Comsat to GSFC where the data are processed to CCT form. The digital tapes are then sent to JPL to be processed to imagery. The optical data are processed by an optical correlator at JPL.

------- OSTA-3, MOLLBERG---------------------------------------

INVESTIGATION NAME- LARGE FORMAT CAMERA (LFC)

NSSDC ID- OSTA-3 -02 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
GEODESY AND CARTOGRAPHY

PERSONNEL
PI - B. MOLLBERG NASA-JSC

BRIEF DESCRIPTION
The Large Format Camera (LFC) is a photographic camera with a 305-mm focal length, an f/6 aperture, and a film format of 23 by 46 cm. The camera's film platen moves horizontally along the Shuttle's line of flight when the shutter is open to minimize smearing effects. A ground resolution of 10 m is achieved at altitudes of 200 to 250 km with standard photographic films. The LFC is able to obtain overlapping stereoscopic coverage along the Shuttle's flight path with base-to-height ratios of 0.3, 0.6, 0.9 and 1.2. Its imagery is applicable to cartographic mapping at a scale of 1:50,000.

------- OSTA-3, REICHLE, JR.-----------------------------------

INVESTIGATION NAME- MEASUREMENT OF AIR POLLUTION FROM SATELLITES (MAPS)

NSSDC ID- OSTA-3 -03 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY

PERSONNEL
PI - H.G. REICHLE, JR. NASA-LARC

BRIEF DESCRIPTION
The primary purpose of this experiment is to measure the seasonal variations of carbon monoxide in the troposphere. The MAPS experiment consists of a two-channel gas filter radiometer that measures the intensity of upwelling thermal radiation at a wavelength of 4.67 micrometers. The instrument is designed to determine the concentration of CO in the earth's atmosphere at ambient pressures of 266 and 76 torr (corresponding roughly to altitudes of 7.5 and 11 km). An aerial camera, equipped with a light sensor, photographs the ground track during sunlit portions of the orbit.

------- OSTA-3, SIVERTSON, JR.---------------------------------

INVESTIGATION NAME- FEATURE IDENTIFICATION AND LOCATION EXPERIMENT (FILE)

NSSDC ID- OSTA-3 -04 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - W.E. SIVERTSON, JR. NASA-LARC
OI - R.G. WILSON NASA-LARC

BRIEF DESCRIPTION
The objective of this experiment is to develop the means to automatically classify surface materials into one of four categories: water, vegetation, bare ground, or clouds and snow. The FILE compares ratios of the reflected solar radiation in two wavelengths to make real-time classification decisions about the four primary features mentioned above. The FILE system has two imaging cameras; each contains a two-dimensional array of charge-coupled detectors. They are designed to measure surface reflectivity at wavelengths of 0.65 and 0.85 micrometer, respectively. A sunrise sensor activates the experiment under appropriate solar illumination conditions. The output of the two imaging cameras is sent to a decisionmaking electronics unit, where the ratio of the two camera measurements for each picture element is determined. FILE contains scene class counters to determine when the instrument has recorded an adequate number of scenes of each type and to suppress further data acquisition from such scenes. Similar sensors may be placed on future satellites to control the operation of other earth imaging instruments and avoid the collection of unwanted or unusable data.

*************************** PLANET-A***************************

SPACECRAFT COMMON NAME- PLANET-A
ALTERNATE NAMES-

NSSDC ID- PLANETA

LAUNCH DATE- 08/14/85 WEIGHT- 140. KG
LAUNCH SITE- KAGOSHIMA, JAPAN
LAUNCH VEHICLE- M-3S2-1

SPONSORING COUNTRY/AGENCY
JAPAN ISAS

PERSONNEL
PM - K. HIRAO ISAS
PS - M. SHIMIZU ISAS

BRIEF DESCRIPTION
Planet-A is planned to fly by the nucleus of Comet Halley on March 8, 1986, at a distance of several hundred thousand kilometers. The main objective of the mission is to take UV images of the hydrogen corona for about 30 days before and after Halley's descending crossing of the ecliptic plane. Solar wind parameters are measured for a much longer time period. The spacecraft weighs about 140 kg and is spin-stabilized at two different rates (5 and 0.2 rpm) during the mission. Hydrazine thrusters are used for attitude and velocity control; star and sun sensors are for attitude control; and a mechanically despun off-set parabolic dish is used for long range communication. A test spacecraft, MS-T5, launched earlier, will provide some measurements at the same time but at distances of 0.1 AU.

------- PLANET-A, KANEDA---------------------------------------

INVESTIGATION NAME- UV IMAGING TELESCOPIC CAMERA

NSSDC ID- PLANETA-01 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - E. KANEDA U OF TOKYO

BRIEF DESCRIPTION
This instrument is used to take UV images of the hydrogen corona of the comet by hydrogen Lyman-alpha line. It is composed of a mirror telescope, a UV intensifier, and a spin-synchronized camera that uses charge-coupled devices (CCD). During imaging, the spacecraft will be despun to 0.2 rpm.

------- PLANET-A, MUKAI--

INVESTIGATION NAME- ION ELECTRON ESAS

NSSDC ID- PLANETA-02 INVESTIGATIVE PROGRAM
SCIENTIFIC SATELLITE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
INTERPLANETARY PHYSICS

PERSONNEL
PI - T. MUKAI ISAS

BRIEF DESCRIPTION
Solar wind plasma measurements are made with 270-deg electrostatic analyzers (ESAs) in this investigation. Both ions and electrons in the energy range between 0.03 and 16 keV are measured with the ESAs employing micro-channel plates. Three dimensional distribution of the solar wind plasma within + or - 30 deg to the ecliptic plane will be measured.

*************************** ROSAT******************************

SPACECRAFT COMMON NAME- ROSAT
ALTERNATE NAMES- ROENTGENSATELLITE, GERMAN X-RAY SATELLITE

NSSDC ID- ROSAT

LAUNCH DATE- 07/30/87 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
FED REP OF GERMANY DFVLR
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 94. MIN INCLINATION- 57. DEG
PERIAPSIS- 475. KM ALT APOAPSIS- 475. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
MG - M.	OTTERBEIN	BMFT
SC - A.G.	OPP	NASA HEADQUARTERS
PM - G.W.	OUSLEY	NASA-GSFC
PM - K.	PFEIFFER	DFVLR
PS - S.S.	HOLT	NASA-GSFC
PS - J.	TRUEMPER	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The Roentgensatellite (ROSAT) is a US/German cooperative project with British participation. The prime objective, during the first 6 months of the mission, is to perform a complete sky survey in the energy range 0.041 to 2 keV utilizing proportional counters at the focal plane of a large X-ray telescope (LXT) provided by Germany and an XUV wide field camera (WFC) provided by the UK. After completion of the all sky survey the second scientific objective (during the following 12 months) will be the detailed observation of selected sources with respect to spatial structure, spectra, and time variability. This objective will be met by utilizing a high resolution imager (HRI), provided by the United States, which will alternate with the two position-sensitive proportional counters (PSPC) in the focal plane. ROSAT is a continuously operating three-axis stabilized S/C. The main telescope has focal length 240 cm, diameter 113 cm, and is surrounded by S/C electronics. The axis lies between two large solar panels and parallel to the WFC axis. The telescope resolution with the HRI is better than 10 arc s. ROSAT has an attitude control system using two advanced star trackers, reaction wheels, and magnetic coils, and a data system utilizing two tape recorders.

------- ROSAT, GERDES--

INVESTIGATION NAME- HIGH RESOLUTION IMAGER (HRI)

NSSDC ID- ROSAT -01 — INVESTIGATIVE PROGRAM: CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S): X-RAY ASTRONOMY

PERSONNEL

EM - J.	GERDES	SAO
ES - S.S.	HOLT	NASA-GSFC

BRIEF DESCRIPTION

The high resolution imager (HRI) is essentially a copy of the very successful HRI provided by SAO for the HEAO 2 mission, modified to comply with the electrical and mechanical interfaces of ROSAT. Incoming X-ray photons are converted to electrons at a photocathode. The electrons are multiplied in a pair of cascaded microchannel plates (MCP) with a gain of about 1E8. A crossed grid at the exit of the MCP collects the electron cloud, thereby yielding a measurement of the location of the incoming photon with an positional accuracy of about 25 micrometers. A radioactive calibration source is attached to the retractable vacuum door in front of the HRI. For inflight calibration, a UV source is integrated into the HRI.

------- ROSAT, TRUEMPER---------------------------------------

INVESTIGATION NAME- POSITION SENSITIVE PROPORTIONAL COUNTER (PSPC)

NSSDC ID- ROSAT -02 — INVESTIGATIVE PROGRAM: CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S): X-RAY ASTRONOMY

PERSONNEL

PI - J.	TRUEMPER	MPI-EXTRATERR PHYS
OI - H.	HIPPMANN	MPI-EXTRATERR PHYS

BRIEF DESCRIPTION

The position sensitive proportion counter (PSPC) is a thin window gas counter. Incoming photons are absorbed, producing an electron cloud proportional to the photon energy. The electron cloud drifts to the anode wire grid where a high voltage is applied. In the high electric field, close to the wires, gas amplification of about 5E4 takes place producing a charge signal at the anode wires which is proportional to the energy of the incoming photons. Simultaneous charge signals are induced in two cathode wire grids close to the anode. These signals are used to obtain the position of the photons with an accuracy of about 120 micrometers. A rotating filter wheel, in front of each PSPC, allows the selection of reduced photon energy bands. In one position, the filter wheel is utilized as a vacuum door containing three radioactive sources for calibration.

------- ROSAT, WELLS--

INVESTIGATION NAME- WIDE FIELD CAMERA

NSSDC ID- ROSAT -03 — INVESTIGATIVE PROGRAM: CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S): X-RAY ASTRONOMY

PERSONNEL

PI - A.	WELLS	U OF LEICESTER
OI - G.M.	COURTIER	RUTHERFORD/APPLTON LAB

BRIEF DESCRIPTION

The wide field camera (WFC) consists of three nested aluminum mirrors with an XUV sensitized microchannel plate (MCP) detector at the focus. A focal turret assembly is used to select one of two identical detector assemblies. The clear field of view is a 4-deg half-angle cone around the WFC axis. The energy range of the WFC is 0.21 to 0.041 keV.

*************************** SAN MARCO-D/L*********************

SPACECRAFT COMMON NAME- SAN MARCO-D/L
ALTERNATE NAMES-

NSSDC ID- SM-DL

LAUNCH DATE- 04/00/84 — WEIGHT- 230. KG
LAUNCH SITE- SAN MARCO PLATFORM, OFF COAST OF KENYA
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY

ITALY	CRA
UNITED STATES	NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC

ORBIT PERIOD-	100. MIN	INCLINATION-	2.9 DEG
PERIAPSIS-	260. KM ALT	APOAPSIS-	800. KM ALT

PERSONNEL

MG - M.B.	WEINREB	NASA HEADQUARTERS
SC - E.R.	SCHMERLING	NASA HEADQUARTERS
PM - R.E.	ADKINS	NASA-GSFC
PS - N.W.	SPENCER	NASA-GSFC

BRIEF DESCRIPTION

The primary purpose of the San Marco -D/L Spacecraft (S/C) is to explore the relationship between solar activity and meteorological phenomena, with emphasis on lower atmospheric winds and thermosphere-ionosphere phenomena. The S/C, to be launched by a scout vehicle, has a planned lifetime of 1.5 years. The science investigations use the following five flight sensors: a drag balance for determining neutral density, a wind and temperature spectrometer, an ion velocity instrument, an airglow-solar spectrometer, and an electric field meter. The satellite is a 96.5-cm-diameter sphere with four 48-cm canted monopole telemetry antennas and three orthogonal pairs of electric field probe sensors (one pair oriented along the spacecraft spin axis). An internal structural cylinder (26-cm diam) extends slightly through the sphere and is coincident with the satellite spin axis. The power supply consists of a solar-cell array split into two sections, two rechargeable nickel-cadmium batteries, and associated circuitry. The satellite attitude data are provided by a triaxial magnetometer, a horizon sensor, and a digital sun sensor. A magnetic torquing system is used to control spin rate and spacecraft attitude. A tape recorder records the PCM telemetry at 6000 bps for a maximum period of 50 min. The transmission to the ground is either in real time at 6000 bps or on recorder playback at 72 kbps.

------- SAN MARCO-D/L, BROGLIO--------------------------------

INVESTIGATION NAME- DRAG BALANCE AND AIR DENSITY

NSSDC ID- SM-DL -01 — INVESTIGATIVE PROGRAM: CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S): ATMOSPHERIC PHYSICS

PERSONNEL

PI - L.	BROGLIO	NATL RES COUNC ITALY

BRIEF DESCRIPTION

The drag balance instrument, which is an integral part of the satellite, consists of an inner mass, an elastic element, and an outer shell. The drag balance is the connecting elastic element between the outer light shell and the inner heavy body. The center of the balance is located at the satellite's geometric center, or that point which is the geometric center both of the inner body and the shell. This instrument measures the relative translations between the shell and the inner body both in value and direction, resolving any relative translation along three mutually orthogonal axes. These three axes are fixed to the body, one of them being coincident with the polar symmetry axis of the satellite. Being fixed to the satellite, the axis rotates with it in the free-precession motion around the center of gravity. The balance is designed in such a way that the maximum translation between the shell and the drum is generally of the order of 0.01 mm. In most cases the drag force at the apogee is negligible, and therefore the apogee data are used to get an in-flight calibration of the balance. The translation of the elastic system is changed into voltages that are amplified and demodulated to obtain dc signals.

------- SAN MARCO-D/L, HANSON ---------------------------------

INVESTIGATION NAME- ION VELOCITY INSTRUMENT (IVI) PLANAR RETARDING POTENTIAL ANALYZER

NSSDC ID- SM-DL -03

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - W.B.	HANSON	U OF TEXAS, DALLAS

BRIEF DESCRIPTION

This experiment is a planar retarding potential analyzer, designed to obtain measurements of relative thermal-ion velocity, plasma density, and ion temperature. The ion angle of arrival can be determined by use of a square aperture collimator and a split collector. Together with knowledge of spacecraft motion, this allows computation of the three-dimensional thermal-ion motion along the orbital path. Plasma density and temperature are calculated by interpretation of the voltage-amperage profile produced by the instrument for a given impressed voltage pattern on the grids and collector. Ion velocity measurements are obtained once each spacecraft spin period (10 s).

------- SAN MARCO-D/L, MAYNARD ---------------------------------

INVESTIGATION NAME- 3-AXIS ELECTRIC FIELD INSTRUMENT (EFI)

NSSDC ID- SM-DL -05

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI - N.C.	MAYNARD	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION

This experiment is designed to observe the three components of ambient electric field over the satellite trajectory. Three pairs of cylindrical probes are used, a pair for each component. For each component, the floating potential of each of the two symmetrically placed probes with respect to the spacecraft is measured. From these observations, the electric field can be calculated for known conditions of satellite motion, probe geometry, and magnetic field. Two pairs of probes extend from the satellite equator, and one pair is oriented along the spin axis.

------- SAN MARCO-D/L, SCHMIDTKE ---------------------------------

INVESTIGATION NAME- AIRGLOW-SOLAR SPECTROMETER

NSSDC ID- SM-DL -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
AERONOMY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - G.	SCHMIDTKE	INST FUR PHYS WELTRAUM
OI - F.	FISCHER	INST FUR PHYS WELTRAUM
OI - M.	KNOTHE	INST FUR PHYS WELTRAUM
OI - M.	MASCHEK	INST FUR PHYS WELTRAUM
OI - C.	MUNTHER	INST FUR PHYS WELTRAUM

BRIEF DESCRIPTION

This sensor measures the equatorial day and night airglow, the solar radiation reflected from the earth's surface and from clouds, and the radiation of interplanetary and intergalactic origin reaching the satellite in the spectral range from 20 to 700 nm with a spectral resolution of 0.7 to 4 nm. Four spectrometers, 4 gratings, and 17 multipliers are used. A toroidal concave grating, of radius equal to 115.5 mm, with holographically formed curved lines, was selected to achieve wavelength scanning. The scanning is performed by stepwise rotation of the grating within plus or minus 3 deg. Exit slits are positioned at optimum distances near the Rowland circle. The exit slits are followed by multipliers. A filter wheel provides three filters for each multiplier working above 130 nm.

------- SAN MARCO-D/L, SPENCER ---------------------------------

INVESTIGATION NAME- WIND AND TEMPERATURE SPECTROMETER (WATS)

NSSDC ID- SM-DL -04

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
PLANETARY ATMOSPHERES
ATMOSPHERIC PHYSICS

PERSONNEL

PI - N.W.	SPENCER	NASA-GSFC
OI - G.R.	CARIGNAN	U OF MICHIGAN

BRIEF DESCRIPTION

The objective of this investigation is to measure the in situ neutral winds, neutral particle temperatures, and the concentration of selected gases. Three components of the winds--one normal to the satellite direction--are measured. Two scanning baffles are used, one moving vertically in front of the sensor, such as that used on the Atmosphere Explorer-C (AE-C) neutral atmosphere temperature experiment (NATE), and one moving horizontally nearly identical in concept to the scanning baffles incorporated on the NATE for AE-D and -E. The magnitudes of the horizontal and vertical components of the wind normal to the spacecraft velocity vector are computed from measurements of the angular relationship between the neutral particle stream and the sensor. The component of the total stream velocity in the satellite direction is measured directly by the retarding potential quadrupole (RPQ) through determination of the required retarding potential. From these quantitative measurements, the wind vector is computed. The temperature technique used on the AE NATE provides the basis for the temperature measurements for this mission. It should be emphasized that the wind and temperature measurements can be performed in the same operating mode. For composition measurements, the RPQ mass spectrometer is used in a separate operating mode designed for that purpose.

*************************** SOLAR OPTICAL TELESCOPE**********

SPACECRAFT COMMON NAME- SOLAR OPTICAL TELESCOPE
ALTERNATE NAMES- SOT-1, SUNLAB

NSSDC ID- SOT-1

LAUNCH DATE- 09/00/89 WEIGHT- 3635. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 93.8 MIN INCLINATION- 57. DEG
PERIAPSIS- 460. KM ALT APOAPSIS- 460. KM ALT

PERSONNEL

MG - E.	REEVES	NASA HEADQUARTERS
SC - E.	CHIPMAN	NASA HEADQUARTERS
PM - G.	HOGAN	NASA-GSFC
PS - S.D.	JORDAN	NASA-GSFC

BRIEF DESCRIPTION

The main objective of the Space Optical Telescope (SOT) is to achieve the high spatial resolution required for the determination of density, temperature, magnetic field, and non-thermal velocity field in solar features on the scale at which many basic physical processes occur. Such processes include changes in magnetic field strength, waves, single pulses, and systematic mass flows. To understand the flow of energy and mass on a global scale over the surface of the sun, it is necessary to investigate structures only slightly larger than the photon mean free path. SOT consists of two major parts: the telescope facility, which remains essentially unchanged from mission to mission; and the scientific instruments (SIs) which, depending upon the objectives, may vary from mission to mission. The telescope uses an on-axis Gregorian configuration with primary mirror 1.3 m in diameter. The paraboloidal primary mirror focuses light through a hole in a heat-rejection mirror allowing only 3 arc m of the sun's 32-arc-m disk to be seen by the secondary mirror. The ellipsoidal secondary mirror reflects the image onto a flat tertiary mirror that directs the light beam off axis. Focal plane instruments, such as those selected for the SOT-1 mission, are positioned at the final or Gregorian focus. The telescope facility has an effective focal length of 31.25 m and a 151-micrometer arc s plate scale. The SOT Observatory remains shuttle-attached throughout the mission. It utilizes the Spacelab-provided instrument pointing system during on-orbit operations, and is mounted via launch locks directly to the orbiter cargo bay during launch and landing. Mission operations are conducted by dual interactive control, either from the payload specialist station in the orbiter aft flight deck or from ground-based stations in the payload operations control center.

------- SOLAR OPTICAL TELESCOPE, TITLE-------------------------

INVESTIGATION NAME- COORDINATED FILTERGRAPH-SPECTROGRAPH

NSSDC ID- SOT-1 -01 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - A.M. TITLE LOCKHEED PALO ALTO

BRIEF DESCRIPTION
The coordinated filtergraph spectrograph (CFS) consists of a narrow band, visible light, tunable filtergraph and a visible and UV spectrograph. The cameras for both systems use large CCD arrays. The instrument exploits the superior spatial resolution, spectral range, and temporal repeatability of the SOT to study hydrodynamic and magnetic processes on spatial scales rarely, if ever, resolved from the ground. The instrument has an active image motion stabilization system to enable diffraction-limited performance and a dedicated experiment processor for experiment control and data flow management. Near simultaneous visible and UV observations follow the flows, energy and magnetic fields continuously from the low photosphere into the corona. The co-investigators are listed in Appendix B.

------- SOLAR OPTICAL TELESCOPE, ZIRIN-------------------------

INVESTIGATION NAME- PHOTOMETRIC FILTERGRAPH

NSSDC ID- SOT-1 -02 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - H.	ZIRIN	CALIF INST OF TECH
OI - E.N.	FRAZIER	AEROSPACE CORP
OI - R.L.	MOORE	NASA-MSFC
OI - S.A.	MUSMAN	NASA-JPL
OI - J.H.	UNDERWOOD	NASA-JPL
OI - B.J.	LABONTE	MT WILSON+LAS CAMPANAS
OI - S.A.	SHEETMAN	MT WILSON+LAS CAMPANAS

BRIEF DESCRIPTION
The photometric filtergraph (PFG) for SOT consists of a pair of high-speed film cameras behind broad pass-band continuum filters. The PFG is combined with the CFS to form a single focal plane package for the SOT. The instrument exploits the superior spatial resolution, spectral range, and temporal repeatability of the SOT and records high resolution images of the solar atmosphere on photographic film. Filtergraphs are recorded in the visible and, as far as practicable, into the UV. The recorded data is for the study of granulation, surface flows, sunspots, and solar flares.

*************************** SPACE SHUTTLE LDEF-A**************

SPACECRAFT COMMON NAME- SPACE SHUTTLE LDEF-A
ALTERNATE NAMES- LONG DURATION EXPOS.FAC., LDEF
LDEF-A

NSSDC ID- SSLDEF

LAUNCH DATE- 04/13/84 WEIGHT- 9200. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 95.2 MIN INCLINATION- 28.5 DEG
PERIAPSIS- 527. KM ALT APOAPSIS- 527. KM ALT

PERSONNEL

MG - R.	GUALDONI	NASA HEADQUARTERS
PM - L.P.	DASPIT, JR.	NASA-LARC
PS - W.H.	KINARD	NASA-LARC

BRIEF DESCRIPTION
The Long Duration Exposure facility (LDEF) is being developed by the NASA office of Aeronautics and Space Technology and the NASA/Langley Research Center to accommodate, using the shuttle, a class of technology, science, and applications experiments that require a free-flying exposure in space and that benefit from post-flight laboratory studies with the retrieved experiment hardware. The LDEF is a simple reusable structure approximately 4.3 m in diameter and 9.1 m in length. The experiments are contained in trays mounted to the structure. The LDEF has no central power or data system. It does, however, provide initiation and termination signals at the start and end of the mission. Any required power and/or data systems are included by the experimenter in his respective tray. Standard Experiment Power and Data Systems have been designed for use in LDEF trays and these can be procured by the experimenters. The LDEF has a gravity-gradient stabilized orbit orientation. After an extended period in orbit, the LDEF is retrieved on a subsequent shuttle flight. It is planned to regularly launch and recover LDEF at approximately yearly intervals.

------- SPACE SHUTTLE LDEF-A, BLUE-----------------------------

INVESTIGATION NAME- EFFECTS OF LONG-DURATION EXPOSURE ON
ACTIVE OPTICAL SYSTEMS COMPONENTS

NSSDC ID- SSLDEF -26 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - M.D.	BLUE	GEORGIA INST OF TECH
OI - J.J.	GALLAGHER	GEORGIA INST OF TECH
OI - R.G.	SHACKELFORD	GEORGIA INST OF TECH

BRIEF DESCRIPTION
The effects of space exposure on the performance of lasers, radiation detectors, and other optical components are measured. From the results obtained, guides for component selection are established. The LDEF instrumentation includes 128 electro-optical samples mounted in a peripheral tray. Passive thermal control is used to keep the samples within the temperature range -50 deg C to 68 deg C. A set of 35 samples is maintained in the laboratory as controls. The experiment is passive and no electrical power is employed.

------- SPACE SHUTTLE LDEF-A, BOURRIEAU-------------------------

INVESTIGATION NAME- OPTICAL FIBERS AND COMPONENTS

NSSDC ID- SSLDEF -43 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J. BOURRIEAU CERT/ONERA

BRIEF DESCRIPTION
The objective of this experiment is to examine the radiation effects on fiber optic waveguides which are used as important components in new communication systems, optoelectronic circuits and data links. Comparisons of radiation-induced damage in flight and during laboratory tests are to determine the validity of irradiation tests with radioactive sources. The experimental approach is to passively expose two optic fiber waveguides (one step index and one graded index) to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupy a portion of a peripheral LDEF tray which also contains six other experiments from France. The instrumentation provides protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF-A, BRANDHORST, JR.------------------

INVESTIGATION NAME- ADVANCED PHOTOVOLTAIC EXPERIMENT

NSSDC ID- SSLDEF -02 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - H.W.	BRANDHORST, JR.	NASA-LERC
OI - A.F.	FORESTIERI	NASA-LERC

BRIEF DESCRIPTION
The objectives of this investigation are (1) to study the performance of advanced and conventional solar cells, (2) to improve reference standards for photovoltaic measurements, and (3) to measure the energy distribution in the extraterrestrial solar spectrum. The instrumentation is mounted in a standard LDEF tray and includes a large number of samples provided by 15 different agencies. A standard LDEF Experiment Power and Data System is used to operate the experiment and record the data. The required power is provided by lithium-sulfur dioxide batteries. Daily observations are planned for a period of 11 months.

------- SPACE SHUTTLE LDEF-A, BUCKER---------------------------

INVESTIGATION NAME- FREE FLYER BIOSTACK

NSSDC ID- SSLDEF -50 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL
PI - H. BUCKER — DFVLR

BRIEF DESCRIPTION
The experiment objective is to investigate the biological effect of the structured components of cosmic radiation during space flight, with emphasis on the effects of individual very heavy ions. Quantitative assessment of the hazards of heavy ion particles to man in space permits the establishment of suitable protection guidelines for man and biological experiments in future space flights. The flight hardware is composed of biological specimens and nuclear track detectors. Correlation of the biological and physical events is achieved by using a special sandwich construction of visual track detectors and monolayers of biological objects. The LDEF instrumentation consists of 12 passive detector units mounted in a tray on the earth-facing end of the LDEF and 8 units mounted in one-third of a peripheral tray.

------- SPACE SHUTTLE LDEF-A, CALHOUN--------------------------

INVESTIGATION NAME- CASCADE VARIABLE CONDUCTANCE HEAT PIPE

NSSDC ID- SSLDEF -39

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - L.D. CALHOUN — MCDON-DOUG ASTRONAUT
PI - M.G. GROTE — MCDON-DOUG ASTRONAUT

BRIEF DESCRIPTION
The objective of this experiment is to verify the capability of a cascade variable-conductance heat pipe system to provide precise temperature control of long-life spacecraft, without need of feedback heaters or other power sources for temperature adjustment, under conditions of widely varying power input and space environment. The instrumentation consists of two variable-conductance heat pipes connected in series and mounted in a peripheral tray. One pipe is for coarse control (+ or -3 deg C) and the other is for fine control (+ or -0.3 deg C). Solar energy is the heat source and space is the heat sink. The power and data system of experiment SSLDEF-12 is used for data collection and recording. Data are collected twice daily throughout the LDEF mission.

------- SPACE SHUTTLE LDEF-A, CALLEN---------------------------

INVESTIGATION NAME- SPACE TESTING OF HOLOGRAPHIC DATA STORAGE CRYSTALS

NSSDC ID- SSLDEF -08

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - W.R. CALLEN — GEORGIA INST OF TECH
OI - T.K. GAYLORD — GEORGIA INST OF TECH

BRIEF DESCRIPTION
The effect of long space exposure on electro-optic crystals for use in ultra-high capacity space data storage and retrieval systems is tested. The information obtained helps develop high-bit-capacity recorder and memory systems. The experimental approach is to expose passively five holographic data storage crystals, each 10 mm x 10 mm x 2 mm in size. The crystals for this experiment are located in the same peripheral tray as that used for Experiment 26 (Blue).

------- SPACE SHUTTLE LDEF-A, CARLSON--------------------------

INVESTIGATION NAME- BALLOON MATERIALS DEGRADATION

NSSDC ID- SSLDEF -38

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - L.A. CARLSON — TEXAS A+M

BRIEF DESCRIPTION
The objective of this experiment is to assess the effects of long-term exposure of candidate balloon films, tapes, and lines to the space environment. The instrumentation includes seven balloon material films, two seal tapes, and three lines, occupying one-third of a peripheral tray. Degradation of mechanical and radiometric properties is observed by a series of postflight tests on the exposed materials and on identical samples kept on the ground for comparison purposes.

------- SPACE SHUTTLE LDEF-A, CRIFO----------------------------

INVESTIGATION NAME- THIN METAL FILM AND EVAPORATED CATHODES PERFORMANCE IN SPACE

NSSDC ID- SSLDEF -40

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.F. CRIFO — CNRS-LPSP
OI - J.M. BERSET — CNRS-LPSP

BRIEF DESCRIPTION
This experiment is designed to test the space behavior of vacuum UV optical components (EUV thin films, UV gas filters, photocathodes, and UV crystal filters) and to provide data for the development and qualification of new components. The experimental approach is to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupy a portion of a peripheral LDEF tray which also contains six other experiments from France. The instrumentation provides protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF-A, DEIASI---------------------------

INVESTIGATION NAME- EFFECTS OF THE SPACE ENVIRONMENT ON THE PROPERTIES OF METALLIZED DIELECTRICS

NSSDC ID- SSLDEF -20

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.J. DEIASI — GRUMMAN AEROSPACE CORP
OI - F.J. KUEHNE — GRUMMAN AEROSPACE CORP
OI - M.L. ROSSI — GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION
The objective of this experiment is to evaluate the performance of a wide range of structural polymeric materials, both metallized plastics and graphite-reinforced composites, in a low-earth orbit environment. The experiment provides quantitative data on the degradation caused by thermal cycling, ultraviolet and electron irradiation, applied load, and high voltage plasma interaction. The specimens for this investigation are mounted in a corner tray divided into four quadrants. Three quadrants contain the passive parts of the experiment. The fourth quadrant contains the high-voltage part of the experiment.

------- SPACE SHUTTLE LDEF-A, FELBECK--------------------------

INVESTIGATION NAME- SPACE EXPOSURE INFLUENCE ON MECHANICAL PROPERTIES OF HI-TOUGHNESS GRAPHITE EPOXY

NSSDC ID- SSLDEF -06

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - D.K. FELBECK — U OF MICHIGAN

BRIEF DESCRIPTION
This experiment is flown to determine the effect of extended exposure to a space environment on the mechanical properties of a specially toughened T300/5208 graphite-epoxy composite material. Specimens made by recently developed techniques of intermittent interlaminar bonding are exposed and tested after flight for (1) fracture toughness, (2) tensile strength, and (3) elastic modulus. The LDEF instrumentation consists of test specimens occupying one-sixth of a peripheral LDEF tray.

------- SPACE SHUTTLE LDEF-A, FILZ-----------------------------

INVESTIGATION NAME- PASSIVE COSMIC RADIATION DETECTOR

NSSDC ID- SSLDEF -14

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - R.C. FILZ — USAF GEOPHYS LAB
OI - R. BEAUJEAN — U OF KIEL
OI - P.J. MCNULTY — CLARKSON COLL OF TECH
OI - C.L. PEACOCK — NASA-MSFC
OI - P.S. YOUNG — MISSISSIPPI STATE U
OI - G. SIEGMON — U OF KIEL
OI - W. ENGE — U OF KIEL
OI - B.E. WHITE — MITRE CORP

BRIEF DESCRIPTION

The objective of this experiment is to perform detailed differential energy spectral measurements of trapped protons integrated over the 6- to 12-month mission. In addition, measurements of heavy-ion components are made and neutron intensities are determined. The experimental approach is to provide four containers in which passive radiation detectors are arranged and oriented to best detect mirroring inner-zone trapped protons as the LDEF passes through the South Atlantic Anomaly.

------- SPACE SHUTTLE LDEF-A, GREGORY--------------------------

INVESTIGATION NAME- THE INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDES

NSSDC ID- SSLDEF -19 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - J.C.	GREGORY	U OF ALABAMA
OI - P.N.	PETERS	NASA-MSFC

BRIEF DESCRIPTION

The main objectives of this experiment are to determine the effects of high fluxes of atomic oxygen on various solid surfaces and to investigate the mechanisms of interaction. These objectives are accomplished by using a wide variety of materials, some not chemically affected by oxygen, and altering the exposure, angle of incidence, and temperature of the substrates by their position on the LDEF spacecraft and by experiment design. The instrumentation occupies one-sixth of a peripheral LDEF tray on both the leading and trailing edges of the LDEF. The flux of atomic oxygen is maximum on the leading edge and considerably smaller on the trailing edge.

------- SPACE SHUTTLE LDEF-A, HICKEY---------------------------

INVESTIGATION NAME- PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS

NSSDC ID- SSLDEF -27 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - J.R.	HICKEY	EPPLEY LAB, INC
OI - F.J.	GRIFFIN	EPPLEY LAB, INC

BRIEF DESCRIPTION

Earth radiation budget (ERB) experiments require accuracies in solar and earth flux radiation measurements in fractional percentages. This experiment exposes ERB channel components, then retrieves and resubmits them to radiometric calibration. Corrections are applied to ERB results. Information is obtained to help select components for future solar and ERB experiments. The instrumentation includes earth-flux channel components mounted in one-fourth of a tray on the earth-viewing end of the LDEF, and solar channel components mounted in one-sixth of a peripheral LDEF tray (in the direction of the velocity vector).

------- SPACE SHUTTLE LDEF-A, HORZ-----------------------------

INVESTIGATION NAME- CHEMISTRY OF MICROMETEOROIDS

NSSDC ID- SSLDEF -51 INVESTIGATIVE PROGRAM CODE EL-4

INVESTIGATION DISCIPLINE(S) INTERPLANETARY DUST

PERSONNEL

PI - F.	HORZ	NASA-JSC
OI - D.S.	MCKAY	NASA-JSC
OI - D.A.	MORRISON	NASA-JSC
OI - D.E.	BROWNLEE	U OF WASHINGTON
OI - R.M.	HOUSLEY	ROCKWELL INTL CORP

BRIEF DESCRIPTION

The objective of the experiment is to obtain chemical analysis of a statistically significant number of micrometeoroids. Information regarding their density, shape, and mass flux is also obtained. The LDEF instrumentation includes both active and passive collection units. The active units occupy one standard peripheral LDEF tray in which a clam shell arrangement is used to protect the collection units during ground handling, launch, LDEF deployment and retrieval. The passive units occupy two standard peripheral LDEF trays. These provide no protection against contamination.

------- SPACE SHUTTLE LDEF-A, HUMES----------------------------

INVESTIGATION NAME- SPACE DEBRIS IMPACT STUDY

NSSDC ID- SSLDEF -36 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - D.H.	HUMES	NASA-LARC

BRIEF DESCRIPTION

The experiment objective is to determine the type and degree of damage produced by meteoroid impacts on exposed targets of several different configurations. These data should help in the design of future spacecraft which, because of their sizes and expected lifetimes, would otherwise have high probabilities of damage caused by meteoroid impacts. The LDEF instrumentation occupies 19 peripheral trays, two trays on the earth-facing end, and one tray on the space-facing end of the LDEF.

------- SPACE SHUTTLE LDEF-A, JOHNSTON-------------------------

INVESTIGATION NAME- FIBER OPTICS EXPERIMENT

NSSDC ID- SSLDEF -03 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - A.R.	JOHNSTON	NASA-JPL
PI - L.A.	BERGMAN	NASA-JPL

BRIEF DESCRIPTION

This experiment determines long-term degradation of fiber optic data transmission equipment and qualifies designs for mounting techniques, terminal coupling, and sheaths. Fiber optic transmission lines are required for future satellites because of their large bandwidths, lack of electromagnetic interference problems, low weight and cost, and safety. The instrumentation, which occupies one whole peripheral LDEF tray, is designed to test four fiber links. Each link is about 100 m in length and arranged as a flat helical coil placed on a mounting plate. The links are tested one at a time (for a total time of 7 min once each 48 h) by transmitting a sequence of high-rate bits and measuring the error generation and loss within each link. A standard LDEF Experiment Power and Data System is used to operate the experiment and record the data. The experiment also includes four passive fiber links that are not connected to electronic measuring circuits. The degradation of the passive links is determined by postflight measurements.

------- SPACE SHUTTLE LDEF-A, LIND-----------------------------

INVESTIGATION NAME- GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY

NSSDC ID- SSLDEF -17 INVESTIGATIVE PROGRAM CODE RS/CO-OP

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - M.D.	LIND	ROCKWELL INTER SCI CTR
OI - K.F.	NIELSEN	TECH U OF DENMARK

BRIEF DESCRIPTION

This experiment tests a novel method for growing crystals from solutions. This method consists of allowing two or more reactant solutions to diffuse slowly towards each other in a region of pure solvent in which they react to form single crystals of a desired substance. Several types of crystals of importance in research and technology are studied. The experiment utilizes specially designed reactors having three or more compartments separated by valves for keeping the reactant solutions and solvent separated until the apparatus reaches low gravity. The reactors are enclosed in a vacuum-tight container and surrounded by thermal insulation. The temperature is maintained at 35 deg C.

------- SPACE SHUTTLE LDEF-A, LIND-----------------------------

INVESTIGATION NAME- INTERSTELLAR GAS

NSSDC ID- SSLDEF -48 INVESTIGATIVE PROGRAM CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S) ASTRONOMY

PERSONNEL

PI - D.L.	LIND	NASA-JSC
OI - J.	GEISS	U OF BERNE
OI - F.	BUEHLER	U OF BERNE

BRIEF DESCRIPTION

The objective of this experiment is to analyze the interstellar helium and neon atoms which penetrate the heliosphere to the vicinity of the earth. By collecting these particles at several locations in the earth's orbit, it is possible to study the dynamics of the interstellar wind as it flows through the heliosphere and interacts with the solar photon flux and solar wind. The experiment hardware acts as a set of simple "cameras" with high-purity copper-beryllium collecting foils serving as the "film." The experiment housing provides thermal control, establishes viewing angles and viewing direction, rejects ambient particles, sequences the collecting foils, and protects the foils during deployment and retrieval of the LDEF. The experiment uses two peripheral trays and two trays on the space-facing end of the LDEF. Power is provided by lithium-sodium dioxide batteries.

------- SPACE SHUTTLE LDEF-A, MALHERBE-------------------------

INVESTIGATION NAME- VACUUM DEPOSITED OPTICAL COATINGS

NSSDC ID- SSLDEF -41

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A. MALHERBE — MATRA/SFOM OPTICAL DIV

BRIEF DESCRIPTION

This experiment is designed to investigate the long-term stability of a wide range of vacuum-deposited optical coatings which are used in spacecraft optical and electro-optical instruments. The experimental approach is to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupy a portion of a peripheral LDEF tray which also contains six other experiments from France. The instrumentation provides protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF-A, MANDEVILLE-----------------------

INVESTIGATION NAME- STUDY OF MICROMETEOROID IMPACT CRATERS ON VARIOUS MATERIALS

NSSDC ID- SSLDEF -32

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - J.C. MANDEVILLE — CERT/ONERA

BRIEF DESCRIPTION

The main goal of this experiment is to study impact craters produced by micrometeoroids on selected materials (metals and glasses) in the form of thick targets. Interplanetary dust particles are expected to form well-defined craters upon impacting the exposed materials at very high velocity. The post-flight study of crater frequency and impact features primarily gives data on the mass-flux distribution of micrometeoroids, and to a lesser extent provides velocity information. The LDEF instrumentation, which is entirely passive, requires only one-sixth of a peripheral tray.

------- SPACE SHUTTLE LDEF-A, MANDEVILLE-----------------------

INVESTIGATION NAME- DUST DEBRIS COLLECTION WITH STACKED DETECTORS

NSSDC ID- SSLDEF -33

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY
DUST

PERSONNEL
PI - J.C. MANDEVILLE — CERT/ONERA

BRIEF DESCRIPTION

The primary aim of this experiment is to investigate the feasibility (for future missions) of using multilayer thin film detectors to collect micrometeoroids, if not in their original shape, at least as fragments suitable for chemical analysis. The LDEF instrumentation consists of targets made of one or two thin metal foils placed in front of a thicker plate. The experiment includes 31 targets with a total sampling surface area of 240 sq cm. The samples are mounted in a peripheral tray that contains six other experiments from France.

------- SPACE SHUTTLE LDEF-A, MCDONNELL-----------------------

INVESTIGATION NAME- MULTIPLE FOIL MICROABRASION PACKAGE

NSSDC ID- SSLDEF -31

INVESTIGATIVE PROGRAM
CODE EL-4/CO-OP

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - J.A.M.MCDONNELL — U OF KENT, CANTERBURY
OI - D.G. ASHWORTH — U OF KENT, CANTERBURY
OI - W.C. CAREY — U OF KENT, CANTERBURY
OI - R.P. FLAVILL — U OF KENT, CANTERBURY
OI - R.C. JENNISON — U OF KENT, CANTERBURY

BRIEF DESCRIPTION

The objective of this experiment is to measure the spatial distribution, size, velocity, and composition of microparticles in the near-earth environment. The measuring technique is based upon the penetration of micrometer-thick multiple-foil arrays. The detectors are located in four one-third trays spaced at 90-deg intervals around the LDEF periphery and in two-thirds of a tray on the space-facing end of the LDEF.

------- SPACE SHUTTLE LDEF-A, MCINTOSH-------------------------

INVESTIGATION NAME- LOW TEMPERATURE HEAT PIPE EXPERIMENT

NSSDC ID- SSLDEF -12

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R. MCINTOSH — NASA-GSFC
OI - S. OLLENDORF — NASA-GSFC
OI - C.R. MCCREIGHT — NASA-ARC

BRIEF DESCRIPTION

This experiment evaluates the performance characteristics in the space environment of a fixed conductance transporter heat pipe, a thermal diode heat pipe, and a low-temperature phase change material. The instrumentation is a self-contained and thermally isolated package fitting in a peripheral tray. A standard LDEF Experiment Power and Data System is used for data collection and recording. The recorded data are analyzed after flight.

------- SPACE SHUTTLE LDEF-A, MIRTICH--------------------------

INVESTIGATION NAME- ION BEAM TEXTURED AND COATED SURFACES

NSSDC ID- SSLDEF -01

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M.J. MIRTICH — NASA-LERC

BRIEF DESCRIPTION

This experiment measures the effect of the Space Shuttle launch and near-earth space environment exposure on (1) the optical properties of ion-beam textured high-absorptance solar thermal control surfaces and (2) the optical and electrical properties of ion-beam sputtered conductive solar thermal control surfaces. Verification of the durability of these surfaces is conducive to the acceptance of this technology on future Shuttle-launched space systems. The experimental approach is to passively expose 36 samples (representing a variety of materials and coatings) to all environments of the entire mission. The degradation is determined from a comparison between pre-launch and post-launch characteristics.

------- SPACE SHUTTLE LDEF-A, MOREAU---------------------------

INVESTIGATION NAME- RULED AND HOLOGRAPHIC GRATINGS

NSSDC ID- SSLDEF -42

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - M. MOREAU — INSTRUMENT SA/JOBIN-Y

BRIEF DESCRIPTION

The objective of this experiment is to investigate the long-term stability of various ruled and holographic gratings which are used in spacecraft optical and electro-optical instruments. The experimental approach is to passively expose these components to the space environment for postflight measurements and comparison with preflight measurements. The flight samples occupy a portion of a peripheral LDEF tray which also contains six other experiments from France. The instrumentation provides protection for the samples during the launch and reentry phases of the LDEF mission.

------- SPACE SHUTTLE LDEF-A, NICHOLS--------------------------

INVESTIGATION NAME- EFFECTS OF SOLAR RADIATION ON GLASSES

NSSDC ID- SSLDEF -44 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - R.L. NICHOLS NASA-MSFC
OI - D.L. KINSER VANDERBILT U

BRIEF DESCRIPTION
The objective of this experiment is to determine the effects of solar radiation and the space environment on the optical, mechanical, and chemical properties of various glasses. The instrumentation includes 68 cylindrical disk samples occupying one-sixth of a peripheral LDEF tray (where exposure to solar radiation is maximum) and 52 samples occupying one-fourth of a tray on the earth-facing end of LDEF (where exposure to solar radiation is minimum).

------- SPACE SHUTTLE LDEF-A, O'SULLIVAN-----------------------

INVESTIGATION NAME- HIGH RESOLUTION STUDY OF ULTRA HEAVY COSMIC RAYS

NSSDC ID- SSLDEF -49 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - D. O'SULLIVAN DUBLIN INST ADV STUDY
OI - C.O. CEALLAIGH DUBLIN INST ADV STUDY
OI - A. THOMPSON DUBLIN INST ADV STUDY
OI - K.P. WENZEL ESA-ESTEC
OI - V. DOMINGO ESA-ESTEC

BRIEF DESCRIPTION
The experiment objective is to study charge and energy spectra of ultra heavy cosmic ray nuclei. Since the flux of ultra heavy cosmic ray nuclei is very small (of the order of 1 per sq m per day) the instrumentation requires a large area-time exposure. Sixteen LDEF trays are used, each containing 12 stacks of passive nuclear track detectors. Both Lexan polycarbonate and CR-39 detectors are used. The information provided assists in understanding the physical processes of cosmic ray nuclei production and acceleration at the source in interstellar space. Information concerning nucleosynthesis is also obtained.

------- SPACE SHUTTLE LDEF-A, PAILLOUS-------------------------

INVESTIGATION NAME- THERMAL COATINGS AND STRUCTURAL MATERIAL

NSSDC ID- SSLDEF -34 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - A. PAILLOUS CERT/ONERA
OI - J.C. GUILLAUMON CNES/CST

BRIEF DESCRIPTION
The objective of this experiment is to examine the validity of ground simulations of the space environment for studies of degradation of thermal control coatings used on satellites. Comparisons are made of sample degradations from both ground tests and actual flight tests. The LDEF instrumentation consists of 30 samples located with 6 other experiments from France in a peripheral tray. The sample container is sealed in space and kept under vacuum until optical tests are completed on the ground.

------- SPACE SHUTTLE LDEF-A, POWELL---------------------------

INVESTIGATION NAME- GRAPHITE/POLYMIDE AND GRAPHITE/EPOXY MECHANICAL PROPERTIES IN SPACE

NSSDC ID- SSLDEF -35 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.H. POWELL ROCKWELL INTL CORP
OI - D.W. WELCH ROCKWELL INTL CORP

BRIEF DESCRIPTION
The primary objective of the graphite/polyimide and graphite/epoxy testing experiment is to accumulate actual operational data in the space environment over long periods of time. From these data, design criteria associated with mechanical properties of future lightweight space-oriented structural components are established. A secondary objective of the graphite/epoxy sandwich testing is to validate mechanical properties (knockdown factors) as applied to the design and analysis of the existing Space Shuttle graphite/epoxy payload bay doors. The LDEF instrumentation consists of test specimens mounted in two peripheral trays. A duplicate set of matched specimens is tested on the ground to provide baseline data.

------- SPACE SHUTTLE LDEF-A, PREUSS---------------------------

INVESTIGATION NAME- CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS

NSSDC ID- SSLDEF -46 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - L. PREUSS MBB SPACE DIV

BRIEF DESCRIPTION
The objectives of this experiment are (1) to investigate the combined effects of radiation and contamination on different thermal coatings and solar cells with and without conductive layers and (2) to provide design criteria, design techniques, and test methods to ensure control of combined space and spacecraft environmental effects. This experiment also provides qualifications for a number of new coatings and solar cells. The instrumentation includes both active and passive test samples mounted in a standard LDEF tray. An experiment exposure-control canister is used to limit the exposure of some samples to space and spacecraft environment only.

------- SPACE SHUTTLE LDEF-A, ROBERTSON------------------------

INVESTIGATION NAME- EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED DETECTORS

NSSDC ID- SSLDEF -18 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - J.B. ROBERTSON NASA-LARC
OI - I.O. CLARK NASA-LARC
OI - R.K. CROUCH NASA-LARC

BRIEF DESCRIPTION
The objective of this experiment is to determine the effects of long-duration space exposure and launch environment on the performance of infrared pyroelectric detectors. Performance parameters (responsivity, detectivity, and spectral response) and materials properties (pyroelectric coefficient and dielectric loss tangent) are measured before and after exposure. The detectors for this experiment are included with the various components of Experiment 26 (Blue) and located in the same experiment tray.

------- SPACE SHUTTLE LDEF-A, ROBINSON, JR.--------------------

INVESTIGATION NAME- TRANSVERSE FLAT PLATE HEAT PIPE PERFORMANCE

NSSDC ID- SSLDEF -37 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL
PI - G.A. ROBINSON, JR. NASA-MSFC
OI - F. EDELSTEIN GRUMMAN AEROSPACE CORP

BRIEF DESCRIPTION
The purpose of this experiment is to demonstrate the long-term operation of a high-capacity, lightweight, transverse flat-plate heat pipe in a sustained zero-gravity environment. The experiment also tests the ability of the heat pipe to reprime in zero gravity. The LDEF instrumentation consists of three transverse flat-plate heat pipe modules installed in a peripheral tray with a standard LDEF Experiment Power and Data System (EPDS) for data collection and recording. The EPDS power is provided by lithium-sulfur dioxide batteries. The experiment operates for three 15-hour periods, at 1 month, 3 months, and 6 months after launch.

------- SPACE SHUTTLE LDEF-A, SCHALL---------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS

NSSDC ID- SSLDEF -15 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - P.	SCHALL	AEROSPACE CORP
OI - E.N.	BORSON	AEROSPACE CORP
OI - E.G.	WOLFF	AEROSPACE CORP

BRIEF DESCRIPTION

Materials specimens are analyzed to understand changes in properties and structure after exposure to space environment. In general the experimental approach involves the comparison of preflight and postflight analyses. The specimens include various structural materials, solar power components, thermal control materials, laser communication components, laser mirror coatings, laser-hardened materials, antenna materials, and advanced composites. The investigation consists of 14 subexperiments involving a number of DOD laboratories and DOD-contractor organizations. The instrumentation requires four peripheral trays for the test specimens, two standard LDEF Experiment Power and Data Systems, two experiment control canisters, and lithium-sulfur dioxide batteries.

------- SPACE SHUTTLE LDEF-A, SCOTT, JR.-----------------------

INVESTIGATION NAME- ATOMIC OXYGEN STIMULATED OUTGASSING

NSSDC ID- SSLDEF -07

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - R.L.	SCOTT, JR.	SOUTHERN U
OI - R.C.	LINTON	NASA-MSFC

BRIEF DESCRIPTION

The effect of oxygen impingement on thermal control surfaces in near-earth orbit is investigated with regard to the production of optically damaging outgassing products. The bidirectional reflectance of selected coatings is measured before and after space exposure. Data help determine if atomic oxygen impingement was a major factor in unexplained Skylab contamination by providing an understanding of the effect of atomic oxygen on thermal control surfaces. The test samples are located in two packages, each occupying one-sixth of an exposure tray. One package is positioned on the leading edge of the LDEF, where it receives maximum (ram) exposure to oxygen. The other package is located on the trailing edge, where it receives minimum exposure to ambient oxygen.

------- SPACE SHUTTLE LDEF-A, SEELEY---------------------------

INVESTIGATION NAME- HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS-RADIATION EFFECTS

NSSDC ID- SSLDEF -23

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - J.S.	SEELEY	READING U
OI - A.	WHATLEY	READING U
OI - R.	HUNNEMAN	READING U
OI - D.R.	LIPSCOMBE	BRITISH AEROSPACE CORP

BRIEF DESCRIPTION

The objective of the multilayer filters experiment is to expose high-performance infrared multilayer filters to the space environment and recover them for subsequent analysis and comparison with laboratory control samples. Semiconductors, such as PbTe, Si, and Ge are investigated for evidence of degradation. ZnS and other dielectrics are also examined after flight for evidence of degradation. The materials technology experiment evaluates the degradation of spacecraft surface finishes. The two experiments require only one-sixth of a peripheral tray and one-fourth of a tray on the earth-facing end of the LDEF.

------- SPACE SHUTTLE LDEF-A, SHAPIRO-------------------------

INVESTIGATION NAME- HEAVY IONS IN SPACE

NSSDC ID- SSLDEF -13

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - M.M.	SHAPIRO(RETIRED)	US NAVAL RESEARCH LAB
OI - J.H.	ADAMS, JR.	US NAVAL RESEARCH LAB
OI - R.	SILBERBERG	US NAVAL RESEARCH LAB
OI - C.H.	TSAO	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

Eight stacks of passive track detectors are used to investigate the three components of heavy nuclei in space (low-energy N, O, and Ne nuclei, heavy nuclei of the Van Allen belts, and ultra-heavy nuclei, Z>30, of the galactic cosmic radiation). Lexan is used for the low-energy stacks and CR-39 is used for the cosmic ray stacks. The instrumentation requires two standard LDEF trays.

------- SPACE SHUTTLE LDEF-A, SINGER---------------------------

INVESTIGATION NAME- INTERPLANETARY DUST

NSSDC ID- SSLDEF -52

INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL

PI - S.F.	SINGER	U OF VIRGINIA
OI - P.	KASSEL, JR.	NASA-LARC
OI - J.	STANLEY	U OF VIRGINIA

BRIEF DESCRIPTION

The objective of this experiment is to measure the impact rate and direction of solid particles, with some discrimination as to their mass and velocity in low-earth orbit. The instrumentation consists of six groups of detectors mounted on the LDEF, permitting the detection of dust impacting from all directions. The total active area of the detectors is about 1 square meter. The instrumentation occupies two full LDEF trays and four partial (one-third) trays. A standard LDEF Experiment Power and Data System is used to record the impact data.

------- SPACE SHUTTLE LDEF-A, SLEMP----------------------------

INVESTIGATION NAME- THERMAL CONTROL SURFACES (PASSIVE)

NSSDC ID- SSLDEF -05

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - W.S.	SLEMP	NASA-LARC

BRIEF DESCRIPTION

This experiment determines the effects of space exposure on new coatings being developed for spacecraft thermal control. Samples of paints, other coatings, and second-surface mirrors are exposed; some to all environments of the mission and some to only specific environments. An exposure control canister is used to protect some of the test samples from exposure to launch and reentry environments. Spectral reflectance of the samples is measured before and after the mission.

------- SPACE SHUTTLE LDEF-A, SLEMP----------------------------

INVESTIGATION NAME- SPACE EXPOSURE OF COMPOSITE MATERIALS FOR LARGE SPACE STRUCTURES

NSSDC ID- SSLDEF -21

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - W.S.	SLEMP	NASA-LARC

BRIEF DESCRIPTION

The objective of this experiment is to evaluate the effects of the near-earth orbital environment on the physical and chemical properties of various composite materials. This investigation is aimed at determining the suitability of these materials for long-duration missions lasting 10 to 30 years. The experiment, which is passive, occupies one peripheral LDEF tray. The investigation also includes a series of ground-based tests to help isolate the effects of UV, vacuum and time exposure on the flight specimens.

------- SPACE SHUTTLE LDEF-A, TAYLOR---------------------------

INVESTIGATION NAME- SPACE PLASMA-HIGH VOLTAGE DRAINAGE

NSSDC ID- SSLDEF -09

INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - W.W.L.TAYLOR		TRW SYSTEMS GROUP
PI - G.K.	KOMATSU	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

This experiment is flown to determine the long-term current drainage properties of thin dielectric films subjected to high-level electric stress in the presence of the ambient plasma and solar radiation. Observed behavior of these films helps establish allowable long-term electric stress levels for such films, as applied to solar array and spacecraft thermal control coating materials. The instrumentation consists of a large number of dielectric samples, each having an associated battery and power processing unit, with the exception of "spectator" samples that are not electrically stressed in flight.

------- SPACE SHUTTLE LDEF-A, TAYLOR---------------------------

INVESTIGATION NAME- SPACE ENVIRONMENT EFFECTS ON FIBER OPTIC SYSTEMS

NSSDC ID- SSLDEF -16 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - E.W. TAYLOR USAF WEAPONS LAB

BRIEF DESCRIPTION
The objectives of this investigation are to qualify fiber optic links for future space applications, and to document and analyze the effect of the natural space environment on link and component performance. This investigation is located in a peripheral LDEF tray and it is composed of nine distinct experiments, consisting of both active and passive data links or components. Typical data rates for the active links range from 1 to 10 Megabits/s. Measurements performed in flight include bit error and fiber attenuation, in addition to fiber temperature and tray volume temperature. A standard LDEF Experiment Power and Data System is used to perform the active experiments.

------- SPACE SHUTTLE LDEF-A, TENNYSON------------------------

INVESTIGATION NAME- PROPERTIES OF POLYMER-MATRIX COMPOSITE MATERIALS, EFFECT OF SPACE ENVIRONMENT

NSSDC ID- SSLDEF -24 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - R.C. TENNYSON U OF TORONTO
OI - J.S. HANSEN U OF TORONTO

BRIEF DESCRIPTION
The objective of this experiment is to qualify various polymer-matrix composite materials for future spacecraft applications. By varying the times of exposure to the space environment, the changes in the mechanical properties of several lightweight composite materials, including graphite, boron, S-glass, and PRD-49 are studied. Property degradation caused by matrix breakdown, outgassing, thermal stresses, and internal void cracks are investigated for these materials. Actual specimen test results from space are correlated with ground test data at ambient conditions and in a thermal-vacuum chamber. The LDEF instrumentation consists of test specimens mounted in a peripheral tray.

------- SPACE SHUTTLE LDEF-A, VENABLES------------------------

INVESTIGATION NAME- RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS EXPERIMENT

NSSDC ID- SSLDEF -22 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - J.D. VENABLES MARTIN-MARIETTA LABS
OI - J.S. AHEARN MARTIN-MARIETTA LABS

BRIEF DESCRIPTION
This experiment measures the radiation sensitivity of quartz crystal oscillators. By measuring the frequency drift of these resonators before and after flight, and the frequency offset occurring during the flight, the drift caused by space radiation can be determined. The effects of exposure to an orbital radiation environment are compared with results of ground tests using a transmission electron microscope. Data obtained from LDEF and ground experiments provide guides to improve the radiation hardness of these components. The LDEF instrumentation occupies one-sixth of a peripheral tray and consists of 10 quartz resonators exposed to space radiation and 4 resonators shielded from radiation.

------- SPACE SHUTTLE LDEF-A, WHITAKER------------------------

INVESTIGATION NAME- SOLAR ARRAY MATERIALS (PASSIVE)

NSSDC ID- SSLDEF -45 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - A.F. WHITAKER NASA-MSFC
OI - C.F. SMITH, JR. NASA-MSFC
OI - L.E. YOUNG NASA-MSFC
OI - H.W. BRANDHORST, JR. NASA-LERC
OI - A.F. FORESTIERI NASA-LERC
OI - E.N. COSTOGUE NASA-JPL
OI - E.M. GADDY NASA-GSFC
OI - J.A. BASS NASA-GSFC
OI - W.A. HASBACH NASA-JPL

BRIEF DESCRIPTION
This experiment determines the effects of space on mechanical, electrical, and optical properties of candidate lightweight solar array materials such as those needed for a space station, a satellite power station, and solar electric propulsion solar arrays. Data obtained on the combined effects of the space environment on these material properties allow spacecraft manufacturers to design solar arrays with more predictable lifetimes. This investigation is passive. The LDEF instrumentation consists of a large number of NASA-supplied samples mounted in a peripheral tray. Over two-thirds of the tray is occupied by MSFC samples. The remaining space is occupied by samples from LeRC, GSFC, and JPL.

------- SPACE SHUTTLE LDEF-A, WILKES--------------------------

INVESTIGATION NAME- THERMAL CONTROL SURFACES

NSSDC ID- SSLDEF -04 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - D.R. WILKES NASA-MSFC
OI - H.M. KING NASA-MSFC

BRIEF DESCRIPTION
This experiment determines the effects of space exposure on new coatings developed for spacecraft thermal control. The experiment is designed to test 25 "active" samples (in calorimeter assemblies) and 24 "passive" samples. All samples are mounted on an indexing wheel (carousel) with a reflectometer that periodically records reflectance values in space. Each sample is measured 20 times during the LDEF mission. The carousel has an IN (or protected) and an OUT (or exposed) position. The samples are kept in the OUT position 23.5 h each day, and in the IN position 1/2 h per day. The IN position is used for emittance measurements and also for protection during launch, reentry, and the early flight period.

------- SPACE SHUTTLE LDEF-A, WILLIAMS------------------------

INVESTIGATION NAME- EVALUATION OF LOW SCATTER MIRRORS

NSSDC ID- SSLDEF -53 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL
PI - V.L. WILLIAMS WESTINGHOUSE ELEC CORP

BRIEF DESCRIPTION
The objective of this experiment is to obtain data on the effect of space environment on low scatter mirrors of the type proposed for next-generation meteorological satellites. The experiment requires one-third of a peripheral tray and involves the preflight and postflight measurements of the optical properties of 40 mirror samples. The samples are mounted in an experiment exposure control canister which prevents contamination of the optical surfaces during launch and reentry operations.

**************************** SPACELAB 1***********************

SPACECRAFT COMMON NAME- SPACELAB 1
ALTERNATE NAMES-

NSSDC ID- SPALAB1

LAUNCH DATE- 09/30/83 WEIGHT- 14500. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 89.4 MIN INCLINATION- 57. DEG
PERIAPSIS- 250. KM ALT APOAPSIS- 250. KM ALT

PERSONNEL
MM - J.A. DOWNEY, 3RD NASA-MSFC
MS - C.R. CHAPPELL NASA-MSFC
MG - M.J. SMITH NASA HEADQUARTERS
SC - M. WISKERCHEN NASA HEADQUARTERS
PM - H.G. CRAFT, JR. NASA-MSFC

BRIEF DESCRIPTION

The first Spacelab mission is a joint NASA and European Space Agency (ESA) mission. Spacelab 1 consists of a pressurized compartment (module) for housing equipment and flight personnel and a space-exposed platform to accommodate instruments. The compartment and platform are flown into space and returned inside the payload compartment of the Space Shuttle Orbiter. The mission is planned to last 7 days, and while in space, the Orbiter payload compartment doors are opened to allow viewing of the earth, sun, and deep space. Spacelab 1 is a multidiscipline mission comprising five broad areas of investigation: Atmospheric Physics and Earth Observations, Space Plasma Physics, Astronomy and Solar Physics, Material Sciences and Technology, and Life Sciences. The Atmospheric Physics investigations conduct studies of the earth's environment through surveys of temperature, composition, and motion of the atmosphere. The Earth Observations investigations use and evaluate the capability of advanced measuring systems for making topographic and thematic maps from high-resolution photographs and from remote-sensing data. Investigations in the Space Plasma Physics group study the charged particle or plasma environment of the earth. The Astronomy investigations study astronomical sources of radiation in the ultraviolet and X-ray wavelengths. The Solar Physics investigations measure the total energy output of the sun using three different methods with the instruments cross calibrated so that meaningful comparisons can be made. The Material Sciences and Technology investigations take advantage of the microgravity conditions to perform studies in such areas as crystal growth, metallurgy, tribology, fluid physics, and ceramics technology. The Life Sciences investigations are concerned with the effects of the space environment (zero gravity and high-energy radiation) on human physiology and on the growth, development, and organization of biological systems.

------- SPACELAB 1, ACKERMAN-----------------------------------

INVESTIGATION NAME- GRILLE SPECTROMETER

NSSDC ID- SPALAB1-18

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI -	M.	ACKERMAN	IASB
OI -	C.	LIPPENS	IASB
OI -	A.	GIRARD	ONERA
OI -	M.	BESSON	ONERA
OI -	J.	LAURENT	ONERA
OI -	M.P.	LEMAITRE	ONERA
OI -	J.	VERCHEVAL	IASB
OI -	C.	MULLER	IASB

BRIEF DESCRIPTION

The experiment objective is to determine the vertical distribution profiles of trace constituents in the stratosphere, mesosphere, and thermosphere in order to study the chemical and dynamical atmospheric processes. The equipment contains an infrared spectrometer with a telescope and a cooled infrared detector. The spectrometer operates in the wavelength range from 2.5 to 13 micrometers.

------- SPACELAB 1, ANDRESEN-----------------------------------

INVESTIGATION NAME- SPECTROSCOPY IN X-RAY ASTRONOMY

NSSDC ID- SPALAB1-28

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY

PERSONNEL

PI -	R.D.	ANDRESEN	ESA-ESTEC
OI -	S.J.	KELLOCK	MULLARD SPACE SCI LAB
OI -	L.	SCARSI	U OF PALERMO
OI -	G.	BOELLA	U OF MILAN

BRIEF DESCRIPTION

The experiment objective is the study of detailed features in cosmic X-ray sources and their associated temporal variations over a wide energy range. The equipment is a gas scintillation proportional counter having a 175-micrometer beryllium window, a xenon chamber, a photomultiplier detector, and a pulse-height analyzer. A more detailed description of this experiment may be found in R. D. Andersen et al., Adv. Space Res., v. 2, n. 4, p. 281, 1983.

------- SPACELAB 1, BEAUJEAN-----------------------------------

INVESTIGATION NAME- ISOTOPE STACK

NSSDC ID- SPALAB1-29

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI -	R.	BEAUJEAN	U OF KIEL
OI -	W.	ENGE	U OF KIEL
OI -	G.	SIEGMON	U OF KIEL

BRIEF DESCRIPTION

The experiment objective is to use a stack of plastic sheets to measure heavy cosmic-ray nuclei (nuclear charge equal to or greater than 3, energies in the range 20 MeV to 1 GeV per atomic mass unit) and to determine the source, acceleration, propagation, and age of cosmic rays. The equipment consists of a stack of layers of plastic visual track detectors housed in a sealed aluminum container.

------- SPACELAB 1, BEGHIN-----------------------------------

INVESTIGATION NAME- PHENOMENA INDUCED BY CHARGED PARTICLE BEAMS

NSSDC ID- SPALAB1-25

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES

PERSONNEL

PI -	C.	BEGHIN	CNRS, CTR FOR SPECTROM
OI -	B.	NARHEIM	NDRE
OI -	T.	MOE	NDRE
OI -	D.	HENRY	CNRS
OI -	J.Y.	DELAHAYE	CNRS-LGE
OI -	J.J.	BERTHELIER	CNRS-LGE
OI -	J.	LAVERGNAT	CNRS-LGE
OI -	B.N.	MAEHLUM	NDRE
OI -	J.	TROIM	NDRE
OI -	H.	ARENDS	ESA-ESTEC
OI -	D.	KLINGE	ESA-ESTEC
OI -	T.R.	SANDERSON	ESA-ESTEC

BRIEF DESCRIPTION

The experiment objectives are to use electron- and ion-beam guns (up to 10 keV), an associated wave receiver (up to 100 MHz), an electron-temperature probe, and three particle detectors (1) to study ionospheric neutralization processes by measuring the stability of the electronic potential of the gun with respect to the plasma, (2) to study plasma instabilities by measuring electric (up to 100 MHz) and magnetic (200 Hz up 1 to 20 MHz) wave components, (3) to use the Shuttle motion to perform ion-bounce experiments, and (4) to monitor the secondary electron flux. The equipment consists of an active package containing an electron gun, an ion gun, and a particle detector; and a passive package containing an electric antenna, a magnetic antenna, and two particle detectors.

------- SPACELAB 1, BENTON-----------------------------------

INVESTIGATION NAME- RADIATION ENVIRONMENT MAPPING

NSSDC ID- SPALAB1-11

INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
SPACE BIOLOGY

PERSONNEL

PI -	E.V.	BENTON	U OF CALIF, SAN FRANC.
OI -	C.D.	PETERSON	U OF CALIF, SAN FRANC.
OI -	R.M.	CASSOU	U OF CALIF, SAN FRANC.
OI -	A.L.	FRANK	U OF CALIF, SAN FRANC.

BRIEF DESCRIPTION

The objectives of this experiment are to provide baseline data for evaluation of radiation risk to man from high charge and energy (HZE) particles on this and future Spacelab missions, and to continue a program of documentation of HZE particle radiation inside manned spacecraft which has included Apollo, Skylab, and ASTP missions. The equipment consists of 12 small, lightweight, passive dosimeter packets and three thick multilayered stacks of plastic detector films attached at sites corresponding to a wide range of spacecraft shielding. Materials used in the dosimeter include plastic nuclear track detectors, AgCl crystal detectors, and thermoluminescent detector chips. The thick plastic stack consists of 200 Lexan polycarbonate plastic films.

------- SPACELAB 1, BERTAUX-----------------------------------

INVESTIGATION NAME- INVESTIGATION ON ATMOSPHERIC H AND D THROUGH THE MEASUREMENT OF LYMAN-ALPHA

NSSDC ID- SPALAB1-22

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
ATMOSPHERIC PHYSICS

PERSONNEL

PI - J.L.	BERTAUX	CNRS-SA
OI - G.	KOCKARTS	IASB
OI - F.	GOUTAIL	CNRS-SA

BRIEF DESCRIPTION

The experiment objective is to study various sources of Lyman-alpha emission in the atmosphere, in the interplanetary medium, and possibly in the galactic medium. The equipment consists of a spectrophotometer with an atomic hydrogen absorption cell and an atomic deuterium absorption cell, and a solar-blind photomultiplier for the detector.

------- SPACELAB 1, BOWYER -------

INVESTIGATION NAME- FAR UV ASTRONOMY USING THE FAUST TELESCOPE

NSSDC ID- SPALAB1-07

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - C.S.	BOWYER	U OF CALIF, BERKELEY
OI - G.C.	COURTES	CNRS-LAS
OI - J.M.	DEHARVENG	CNRS-LAS
OI - R.	MALINA	U OF CALIF, BERKELEY
OI - J.C.	BERGES	CNRS-LAS

BRIEF DESCRIPTION

The experiment objective is to search for UV stars and other astronomical UV sources in the 110 to 200 nm band. The equipment consists of a far ultraviolet space telescope (FAUST) and an electronic interface module. The instrument is an f/1.12 Wynne camera with an effective collecting area of 150 sq cm and a field of view of 7.5 deg. The imaging capability is better than 2 arc minutes in the entire field of view. The detector system uses a microchannel plate image intensifier in conjunction with a 60-exposure, 35-mm film pack of Kodak IIAO.

------- SPACELAB 1, BROWN -------

INVESTIGATION NAME- NUTATION OF HELIANTHUS ANNUUS

NSSDC ID- SPALAB1-12

INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - A.H.	BROWN	U OF PENNSYLVANIA
OI - A.O.	DAHL	U OF PENNSYLVANIA
OI - D.K.	CHAPMAN	U OF PENNSYLVANIA

BRIEF DESCRIPTION

The experiment objective is to determine whether or not nutation (spiral motion of growing plants) takes place in the absence of a gravitational force. The test plant is a dwarf sunflower seedling (Helianthus Annuus). The equipment consists of a dark box, within which four test plants illuminated by infrared light are located in the field of view of a video camera, rotor compartments, plant modules, battery pack, video tape data recorder, control electronics, and a carry-on module container of 28 plant modules. Plants at various stages of growth are kept in a rotor compartment under a 1-g acceleration until it is their turn to be tested in front of the camera.

------- SPACELAB 1, BUCKER -------

INVESTIGATION NAME- ADVANCED BIOSTACK EXPERIMENT

NSSDC ID- SPALAB1-32

INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.	BUCKER	DFVLR

BRIEF DESCRIPTION

The experiment objectives are to determine the biological importance of nuclear disintegration stars, to assess quantitatively the interference of high-atomic-number and high energy (HZE) particles with other biological studies in space, to determine the distribution of HZE particles at different locations in the module and on the pallet, and to establish radiation protection guidelines for humans and biological experiments in future space flights. The experimental packages consist of layers of different biological objects sandwiched between different types of HZE detectors. This arrangement permits correlations between HZE particle trajectories and biological injury.

------- SPACELAB 1, COGOLI -------

INVESTIGATION NAME- LYMPHOCYTE PROLIFERATION IN WEIGHTLESSNESS

NSSDC ID- SPALAB1-36

INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - A.	COGOLI	FEDERAL INST OF TECH
OI - M.	VALLUCHI	FEDERAL INST OF TECH
OI - A.	TSCHOPP	FEDERAL INST OF TECH

BRIEF DESCRIPTION

The objective of this experiment is to study the effect of weightlessness on white cell proliferation and to detect possible alteration to the cells responsible for the immune response. The instrumentation includes flasks containing human lymphocytes to which a mitogen is added in flight to induce cell division. Stimulated and control flasks are kept at 37 deg C by an incubator for 70 h, after which they are stored in a freezer for postflight analysis.

------- SPACELAB 1, COURTES -------

INVESTIGATION NAME- VERY WIDE FIELD GALACTIC CAMERA

NSSDC ID- SPALAB1-27

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
ZODIACAL LIGHT

PERSONNEL

PI - G.C.	COURTES	CNRS-LAS
OI - M.	VITON	CNRS-LAS
OI - J.P.	SIVAN	CNRS-LAS
OI - R.	DECHER	NASA-MSFC
OI - G.A.	GARY	NASA-MSFC

BRIEF DESCRIPTION

The experiment objective is to make a very general UV survey of a large part of the celestial sphere. A camera with a very wide field of view is used in two modes. In the photometric mode, observations are made at 155, 190, and 250 nanometers (nm) and the field of view is 54 deg. In the spectrometric mode, a narrow slit 10 deg by 10 arc min is used and measurements are obtained in the 130 to 270 nm range.

------- SPACELAB 1, CROMMELYNCK -------

INVESTIGATION NAME- ABSOLUTE MEASUREMENT OF THE SOLAR CONSTANT

NSSDC ID- SPALAB1-26

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - D.	CROMMELYNCK	ROY METEOROL INST BELG
OI - V.	DOMINGO	ESA-ESTEC

BRIEF DESCRIPTION

The experiment objectives are (1) to measure the absolute value of the solar constant to 0.1% accuracy using a self-calibrating radiometer, and (2) to measure any long-term variations in the solar constant. The equipment consists of an absolute radiometer with an inbuilt stability check. This radiometer has two channels which enable any degradation of the black surfaces to be detected and compensated. The radiation measurements are made by using a heat balance system driven automatically by a feedback system.

------- SPACELAB 1, DIETERLE -------

INVESTIGATION NAME- MICROWAVE REMOTE SENSING EXPERIMENT

NSSDC ID- SPALAB1-39

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
OCEANOGRAPHY
EARTH RESOURCES SURVEY

PERSONNEL

PI - G.	DIETERLE	ESA-TOULOUSE
PI - G.P.	DE LOOR	TNO PHYSICS LAB

BRIEF DESCRIPTION

The objectives of the microwave remote sensing experiment are to develop all-weather remote sensing methods, study sensor-object interaction by measurement of ocean surface wave spectra with a dual-frequency scatterometer, and verify synthetic aperture radar behavior. The microwave remote sensing experiment instrumentation is a radar facility. In the active modes, the instrument transmits microwave energy in X-band (9.65 GHz) to earth targets. A sensitive low-noise receiver detects the backscattered radar signals. The instrument operates in three modes: (1) a main mode as a two-frequency scatterometer (2FS), (2) a high-resolution mode as a synthetic aperture radar (SAR), and (3) a passive mode as a passive microwave radiometer. In the 2FS mode, the instrument measures the ocean surface wave spectra at wavelengths within a range of 5 to 500 m by using the complex backscattering of the ocean surface at two adjacent microwave frequencies. In the SAR mode, areas of the earth's surface are imaged. The backscattered data are coherently recorded and off-line processing provides imagery with a ground resolution of 25 by 25 m. The radiometer mode measures naturally emitted microwave radiation from the earth to provide ocean surface temperatures, and is used in time multiplex with other modes.

------- SPACELAB 1, GREEN--------------------------------------

INVESTIGATION NAME- ELECTRO-PHYSIOLOGICAL TAPE RECORDER

NSSDC ID- SPALAB1-35 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.L.	GREEN	CLINICAL RES CENTER
OI - F.D.	STOTT	CLINICAL RES CENTER
OI - H.S.	WOLFF	CLINICAL RES CENTER
OI - O.	QUADENS	U OF ANTWERP

BRIEF DESCRIPTION
The experiment objective is to study acclimatization of astronauts to zero gravity by means of electrocardiograms (ECG), electroencephalograms (EEG), and electro-oculograms (EOG) obtained before launch, throughout the mission, and after the flight. The equipment is a standard Oxford Instruments Medilog four-channel tape recorder with electrodes, spare batteries, and tape cassettes. The recorder is attached to the belt of a crew member.

------- SPACELAB 1, HERSE--------------------------------------

INVESTIGATION NAME- WAVES IN THE OH EMISSIVE LAYER

NSSDC ID- SPALAB1-19 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.	HERSE	CNRS-SA
OI - G.	MOREELS	CNRS-SA
OI - S.	PRAKASH	PHYSICAL RESEARCH LAB

BRIEF DESCRIPTION
The experiment objectives are to study the large-scale structure of the atmospheric OH emission, and to investigate possible relations between the OH emission structure and orography or meteorological phenomena. The equipment contains an image intensifier with a camera, filter, and 16-mm movie camera. The spectral part of the airglow is delimited on the short wavelength side by a Schott RG9 filter (50% cutoff at 730 nanometers) and on the IR side by the sensitivity of the photocathode (50% cutoff at 830 nanometers).

------- SPACELAB 1, HORNECK------------------------------------

INVESTIGATION NAME- MICRO-ORGANISMS AND BIOMOLECULES IN THE SPACE ENVIRONMENT

NSSDC ID- SPALAB1-34 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - G.	HORNECK	DFVLR
OI - C.	THOMAS-GARFIAS	DFVLR
OI - G.	REITZ	DFVLR

BRIEF DESCRIPTION
The experiment objectives are (1) to measure quantitatively the effects of space parameters (vacuum, solar UV-radiation) on microbial systems and biomolecules, using Bacillus Subtilis spores as the test specimens; (2) to evaluate the consequences of genetic and response alterations; and (3) to compare the results with simulation experiments performed on the ground. The equipment is a box accommodating 350 biological samples. The samples are exposed to selected combinations of space vacuum and solar radiation of various wavelengths and intensities.

------- SPACELAB 1, HUTH--------------------------------------

INVESTIGATION NAME- MATERIALS SCIENCE

NSSDC ID- SPALAB1-42 INVESTIGATIVE PROGRAM
CODE EN/CO-OP

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - U.	HUTH	ESA
OI - Y.	MALMEJAC	CEA-DMECN
OI - L.G.	NAPOLITANO	U OF NAPLES

BRIEF DESCRIPTION
The materials science facility includes 38 different experiments. Six of these experiments are individual, black-box type experiments which require only provision of power, data recording, and heat rejection. The 32 other experiments are performed with the help of multi-user facilities. The isothermal heating facility is a multi-user facility for different types of experiments, including solidification studies, diffusion fundamentals, casting of metals and composites, and preparation of new and/or improved glasses and ceramics. The gradient heating facility for low temperatures is a multipurpose facility for different types of experiments such as crystal growth and unidirectional solidification of eutectics. Vacuum and noble gas supply provisions are part of the facility. The mirror heating facility is an experimental facility which is particularly suitable for investigating crystal growth using the melt zone or traveling solvent methods. The fluid physics module consists mainly of a structure fitted with two disks which can be rotated separately, at the same or different speeds, and in either direction.

------- SPACELAB 1, KIRSCH------------------------------------

INVESTIGATION NAME- MEASUREMENT OF (CENTRAL) VENOUS PRESSURE BY PUNCTURING AN ARM VEIN

NSSDC ID- SPALAB1-31 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - K.	KIRSCH	U OF BERLIN
OI - R.	KOCH	U OF BERLIN
OI - F.	ROCKER	U OF BERLIN

BRIEF DESCRIPTION
The experiment objective is to investigate the severe engorgement of the cephalad circulation (characterized by distended neck veins, puffy face, and nasal congestion) that is experienced by astronauts upon entry into the weightlessness condition. For this experiment the central venous pressure is measured by puncturing an arm vein with a needle-manometer (strain gage).

------- SPACELAB 1, KIRSCH------------------------------------

INVESTIGATION NAME- COLLECTION BLOOD SAMPLES FOR DETERMINING A.D.H., ALDOSTERONE, AND OTHER HORMONES

NSSDC ID- SPALAB1-37 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - K.	KIRSCH	U OF BERLIN
OI - R.	KOCH	U OF BERLIN
OI - F.	STOBOY	U OF BERLIN

BRIEF DESCRIPTION
The experiment objective is to investigate gross deviations from normal fluid and mineral metabolism observed in weightlessness. This experiment measures the blood serum hormones that are responsible for the control of water and mineral balance. Blood samples, which are collected during flight with the same needles that are used in Experiment 31 (Kirsch), are analyzed subsequent to flight.

------- SPACELAB 1, LEACH-------------------------------------

INVESTIGATION NAME- INFLUENCE OF SPACEFLIGHT ON ERYTHROKINETICS IN MAN

NSSDC ID- SPALAB1-14 INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - C.S.	LEACH	NASA-JSC
OI - W.H.	CROSBY	SCRIPPS C+R FOUNDATION
OI - M.	TAVASSOLI	SCRIPPS C+R FOUNDATION
OI - P.C.	JOHNSON	BAYLOR U
OI - J.P.	CHEN	U OF TENNESSEE
OI - C.D.R.	DUNN	U OF TENNESSEE
OI - R.D.	LANGE	U OF TENNESSEE
OI - E.C.	LARKIN	V.A. HOSP, MARTINEZ

BRIEF DESCRIPTION
The experiment objective is to obtain new and specific information pertaining to the mechanism and site of action relative to the red blood cell mass and plasma volume reduction observed during space flight. The equipment consists of an inflight blood collection system.

------- SPACELAB 1, MENDE--------------------------------------

INVESTIGATION NAME- ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING

NSSDC ID- SPALAB1-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - S.B.	MENDE	LOCKHEED PALO ALTO
OI - R.H.	EATHER	BOSTON COLLEGE
OI - R.J.	NAUMANN	NASA-MSFC
OI - D.L.	REASONER	NASA-MSFC
OI - G.R.	SWENSON	NASA-MSFC
OI - B.J.	DUNCAN	NASA-MSFC
OI - K.S.	CLIFTON	NASA-MSFC

BRIEF DESCRIPTION
The experiment objectives are (1) to investigate upper atmospheric transport processes through the measurement of resonant scattered emissions from positive Mg ions, (2) to measure excitation cross sections of upper atmospheric constituents using injected particle beams and detection of the resulting emissions, (3) to investigate atmospheric composition and energy budget through observations of natural aurora, (4) to observe large- and small-scale auroral morphology and compare ultraviolet and visible auroral features, (5) to support the electron accelerator in conducting measurements of magnetospheric electric fields, and (6) to measure small particulate contamination around the Shuttle/ Spacelab. The equipment consists of (1) a dual-channel video system with associated optics and data handling electronics mounted on a stabilized platform for pointing and control, (2) SEC vidicon for high-sensitivity, high-resolution operation, (3) a low-resolution microchannel plate array operating in a photon counting mode, and (4) Command and Data Management Systems and onboard recorders utilized for data display and recording. The magnesium positive ion resonance line is imaged at 279.5 and 280.2 nanometers. For the atomic oxygen positive ion 2-p state study, simultaneous sensing at 731.9 and 247.0 nanometers is obtained.

------- SPACELAB 1, OBAYASHI-----------------------------------

INVESTIGATION NAME- SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS (SEPAC)

NSSDC ID- SPALAB1-02 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
IONOSPHERES
AERONOMY

PERSONNEL

PI - T.	OBAYASHI	U OF TOKYO
OI - W.W.L.	TAYLOR	TRW SYSTEMS GROUP
OI - J.L.	BURCH	SOUTHWEST RES INST
OI - C.R.	CHAPPELL	NASA-MSFC
OI - W.T.	ROBERTS	NASA-MSFC
OI - P.M.	BANKS	STANFORD U

BRIEF DESCRIPTION
The experiment objectives are to carry out active and interactive experiments in the earth's ionosphere to study (1) auroral production in the upper atmosphere, (2) ionospheric parameters such as anomalous resistivity, plasma coupling processes, electric and magnetic field morphology, vehicle charge neutralization, Shuttle/Spacelab induced environments, electron beam/ neutral plume interaction, the coupling between the earth's atmosphere and magnetosphere, and (3) the effects of particle interactions on atmospheric dynamics. The equipment consists of an electron beam accelerator, magneto plasma dynamic (MPD) arcjet, battery/capacitor bank to provide high discharge current, monitor and diagnostic devices, and control, display, and data management systems. The electron beam accelerator, MPD arcjet, and neutral gas ejector are contained in the accelerator subsystem. The electron beam accelerator is capable of operating at voltages from 1 to 7.5 kV at a maximum of 1.5 A and with a variable pulse width of from 10 ms to 1 s. The MPD arcjet uses argon gas and has an energy input of 2 kilojoules per pulse. The third accelerator component is a neutral gas plume generator which uses nitrogen as the gas.

------- SPACELAB 1, PAN--

INVESTIGATION NAME- BEARING LUBRICANT WETTING, SPREADING AND OPERATING CHARACTERISTICS IN ZERO-G

NSSDC ID- SPALAB1-09 INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - C.H.T.	PAN	COLUMBIA U
PI - A.F.	WHITAKER	NASA-MSFC
PI - R.L.	GAUSE	NASA-MSFC

BRIEF DESCRIPTION
The experiment objectives are (1) to determine the extent to which selected commercial lubricant wettability is affected by a zero-gravity environment, (2) to determine how bearing torque, bearing lubricant feeding, and bearing operating films are altered by operations in zero gravity, (3) to compare results with laboratory research of commercial applications, and (4) to provide data for applications in space hardware. The equipment consists of plates for lubricant wetting and spreading tests, various journal bearings, and a flight camera to record lubricant responses. Two types of experiments are planned: wetting and spreading on stationary surfaces, and two-phase boundary in a journal-bearing configuration. In each case, the fluid-surface combination will be the primary control parameter.

------- SPACELAB 1, RESCHKE------------------------------------

INVESTIGATION NAME- VESTIBULO-SPINAL REFLEX MECHANISMS

NSSDC ID- SPALAB1-16 INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - M.F.	RESCHKE	NASA-JSC
OI - J.L.	HOMICK	NASA-JSC
OI - D.J.	ANDERSON	U OF MICHIGAN

BRIEF DESCRIPTION
This investigation has three basic objectives: (1) to investigate vestibulo-spinal reflexes associated with an applied acceleration and concurrent activation of nerve tissue by a mild electrical shock; (2) to observe any incidental occurrence of motion sickness; and (3) to investigate the post-flight return to normal vestibulo-spinal reflexes. The instrumentation includes low-power electronic equipment to elicit and record the reflexes and the "hop and drop" equipment of Experiment 13 (Young) to provide the linear acceleration.

------- SPACELAB 1, REYNOLDS-----------------------------------

INVESTIGATION NAME- METRIC CAMERA EXPERIMENT

NSSDC ID- SPALAB1-38 INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL

PI - M.	REYNOLDS	ESA-TOULOUSE
PI - G.	KONECNY	TECH U OF HANNOVER

BRIEF DESCRIPTION
The purpose of the metric camera experiment is to test the mapping capability of high-resolution space photography. The experiment uses a Zeiss RMK A30/23 aerial survey camera and a Skylab optical window, having the following characteristics: f = 305 mm; f-stops available--f/5.6, f/8, f/11; shutter speeds--1/100, 1/250, 1/500, and 1/1000 s; negative size--23 x 23 cm (length for 550 photos per magazine); angle of field--56 deg; and ground resolution--20 m. Black-and-white, color, and color IR films can be used. To get 80% longitudinal overlap of subsequent photographs at a Spacelab velocity of 7.7 km per s, there is a time interval of about 5 s between two successive exposures. Strips 1800 to 2300 km can be covered on the ground in each sequence.

------- SPACELAB 1, ROSS---------------------------------------

INVESTIGATION NAME- MASS DISCRIMINATION DURING WEIGHTLESSNESS

NSSDC ID- SPALAB1-30 INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.	ROSS	U OF STIRLING
OI - H.S.	WOLFF	CLINICAL RES CENTER

BRIEF DESCRIPTION

The experiment objective is to compare mass discrimination when both the observer and the test objects are weightless, with weight discrimination under normal gravity. The equipment is a box containing 24 balls, each 3 cm in diameter. The mass of the balls varies from 50 to 64 grams. The crew member is directed to perform comparisons in which he must decide which of two specified balls is the heavier. This test is performed for 72 assigned pairs, and the result is recorded for each comparison.

------- SPACELAB 1, SCANO--------------------------------------

INVESTIGATION NAME- BALLISTOCARDIOGRAPHIC RESEARCH IN WEIGHTLESSNESS

NSSDC ID- SPALAB1-33

INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - A.	SCANO	U OF ROME

BRIEF DESCRIPTION

The experiment objectives are to record a three dimensional ballistocardiogram (BCG) in a resting weightless human subject and compare it with similar tracings recorded on the same subject in ground conditions, possibly to find BCG modifications in relation to cardiovascular adaptation to weightlessness, and to record other body accelerations under various physiological conditions. The equipment consists of three mini-accelerometers and a four-track miniature recorder.

------- SPACELAB 1, SCHMIDT-------------------------------------

INVESTIGATION NAME- DC AND LOW FREQUENCY VECTOR MAGNETOMETER

NSSDC ID- SPALAB1-23

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI

BRIEF DESCRIPTION

The experiment objectives are to use a three-axis fluxgate magnetometer to study (1) magnetic fields of the ionospheric polar electrojet and its return current, equatorial electrojet, and the solar quiet current, (2) the vector magnetic field as a plasma parameter, and (3) the Spacelab magnetic field background. The equipment consists of two separate three-axis fluxgate sensors.

------- SPACELAB 1, SULZMAN-------------------------------------

INVESTIGATION NAME- CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS

NSSDC ID- SPALAB1-15

INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - F.M.	SULZMAN	STATE U OF NEW YORK
OI - M.C.	MOORE	HARVARD U
OI - C.A.	FULLER	U OF CALIF, RIVERSIDE

BRIEF DESCRIPTION

The experiment objective is to test if circadian rhythms persist outside the earth's environment, and to determine if the circadian timing system is exogenous or endogenous. Common fungus Neurospora Crassa (which produces patches of extensive growth once each day) is used as the test subject. The equipment consists of a light-tight box containing the growth tubes.

------- SPACELAB 1, THUILLIER-----------------------------------

INVESTIGATION NAME- MEASUREMENT OF THE SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS

NSSDC ID- SPALAB1-21

INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.	THUILLIER	CNRS-SA
OI - J.E.	BLAMONT	CNRS-SA
OI - P.C.	SIMON	IASB
OI - R.	PASTIELS	IASB
OI - D.	LABS	LANDESSTERNWARTE
OI - H.	NECKEL	HAMBURGER STERNWARTE

BRIEF DESCRIPTION

The experiment objective is to measure the solar spectral irradiance between 170 and 3200 nanometers with an accuracy of 0.1% in order to determine the solar constant, variations in the solar constant with solar cycle using Spacelab/STS flights over a 10-year period, and variations of irradiance within each spectral region. The equipment consists of three grating spectrometers covering UV (170 to 370 nm), visible (350 to 900 nm), and IR (800 to 3200 nm).

------- SPACELAB 1, TORR--

INVESTIGATION NAME- AN IMAGING SPECTROMETRIC OBSERVATORY

NSSDC ID- SPALAB1-01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.R.	TORR	UTAH STATE U
OI - S.K.	ATREYA	U OF MICHIGAN
OI - G.R.	CARIGNAN	U OF MICHIGAN
OI - J.C.G.	WALKER	ARECIBO OBSERVATORY
OI - D.G.	TORR	UTAH STATE U
OI - T.M.	DONAHUE	U OF MICHIGAN

BRIEF DESCRIPTION

The experiment objectives are (1) to obtain the first daytime measurements of the airglow spectrum from the extreme ultraviolet to the infrared (20 to 1200 nm), (2) to monitor the shuttle-induced contamination, and (3) to serve as a precursor for future shuttle flights. It is planned to measure emissions from a large range of minor constituents, metastable and excited species of both atomic and molecular ions and neutrals in the atmosphere from the stratosphere to the upper thermosphere. The flight instrument is designed for high-speed operation as an imaging device, and is composed of five identical spectrometers, each of which is restricted to a given spectral range within the 20- to 1200-nm region. Each module is an imaging scanning spectrometer with coincident 0.5- x 0.007-deg fields of view. Imaging capability is obtained along the length of the observational field by use of an area array detector comprising 190 x 244 elements. Thus, a single measurement produces adjacent spectra in a given module obtained from adjacent observational fields. Wavelength resolution varies between 0.2 and 0.6 nm over the spectral range. A scan mirror is used, and a single exposure at one scan position covers a 250-nm region. The telescope is baffled, and it has several operating modes.

------- SPACELAB 1, VON BAUMGARTEN------------------------------

INVESTIGATION NAME- EFFECTS OF RECTILINEAR ACCELERATION, OPTOKINETIC AND CALORIC STIMULI IN SPACE

NSSDC ID- SPALAB1-41

INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - R.	VON BAUMGARTEN	JOHANNES GUTENBERG U
OI - J.	DICHGANS	U OF TUBINGEN
OI - T.	BRANDT	KRUPP KRANKEN-ANGSTALN
OI - H.	SCHERER	U OF MUNICH
OI - A.	BERTHOZ	CNRS-LPT

BRIEF DESCRIPTION

The experiment objective is to study the visuo-vestibular coordination and the integration of multisensory stimuli within the orientation centers of the brain by exposing the subject to short periods of linear acceleration in conjunction with optokinetic stimulation and caloric stimulation. A linear acceleration sled-like device called the "body restraint system" is used to hold and protect the test subject during exposure to motion stimuli. The subject's head is held by a helmet-like device that contains an optokinetic stimulation display, a caloric stimulation system, an optical target setting system, an eye-movement recorder, and various other recording systems.

------- SPACELAB 1, VOSS, JR.----------------------------------

INVESTIGATION NAME- EFFECTS OF PROLONGED WEIGHTLESSNESS ON THE HUMORAL IMMUNE RESPONSE OF HUMANS

NSSDC ID- SPALAB1-17

INVESTIGATIVE PROGRAM
CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - E.W.	VOSS, JR.	U OF ILLINOIS

BRIEF DESCRIPTION

The experiment objectives are (1) to obtain an evaluation of prolonged weightlessness as a stress factor on the humoral immune response of humans and (2) to establish the capability of humans to respond immunologically to potential foreign pathogens during future sustained space flight. The equipment includes a container for storing blood samples, sterile syringes, needles, and test tubes.

------- SPACELAB 1, WILHELM------------------------------------

INVESTIGATION NAME- STUDY OF LOW-ENERGY ELECTRON FLUX AND ITS REACTION TO ACTIVE EXPERIMENTATION

NSSDC ID- SPALAB1-24 INVESTIGATIVE PROGRAM CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - K.	WILHELM	MPI-AERONOMY
OI - W.	STUDEMANN	MPI-AERONOMY
OI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI

BRIEF DESCRIPTION

A 2-pi field-of-view electrostatic analyzer measures natural electron fluxes in the 0.1 to 12.0-keV range in order to study (1) the precipitation process in auroral emission, (2) the effects of the electron accelerator operations on the natural electron fluxes, (3) the influence of the Shuttle/Spacelab-generated atmosphere on the natural electron flux, and (4) the natural electron flux as a sensitive probe of the surface charge on the STS/Spacelab. The equipment consists of an electrostatic deflection device with a hemispheric field of view and with azimuth and pitch-angle resolution, and eight continuous-channel electron multipliers for detectors.

------- SPACELAB 1, WILLSON------------------------------------

INVESTIGATION NAME- ACTIVE CAVITY RADIOMETER SOLAR IRRADIANCE MONITOR

NSSDC ID- SPALAB1-04 INVESTIGATIVE PROGRAM CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - R.C.	WILLSON	NASA-JPL
OI - R.	BEER	NASA-JPL
OI - J.M.	KENDALL, SR.	NASA-JPL

BRIEF DESCRIPTION

The objective of the active cavity radiometer irradiance monitor experiment is to measure the total solar irradiance with state-of-the-art accuracy and precision. The solar irradiance from far ultraviolet through far infrared wavelengths is measured by three type-V active-cavity radiometer detectors. These detectors are electrically self-calibrated, cavity pyrheliometers each capable of defining the absolute radiation scale with an uncertainty of plus or minus 0.1%. The three detectors are independently shuttered, and their cycles of operation are different. The three detectors are used in various combinations to provide periodic cross references on the system's performance.

------- SPACELAB 1, YOUNG--------------------------------------

INVESTIGATION NAME- VESTIBULAR STUDIES

NSSDC ID- SPALAB1-13 INVESTIGATIVE PROGRAM CODE EB-3/CO-OP

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - L.R.	YOUNG	MASS INST OF TECH
OI - G.M.	JONES	MCGILL U
OI - R.E.	MALCOLM	D+C INST OF ENVIRN MED
OI - K.E.	MONEY	D+C INST OF ENVIRN MED
OI - C.M.	OMAN	MASS INST OF TECH
OI - D.G.D.	WATT	MCGILL U
OI - J.H.	BINSACK	MASS INST OF TECH
OI - E.A.	BOUGHAN	MASS INST OF TECH

BRIEF DESCRIPTION

The vestibular studies are designed to investigate (1) space motion sickness, (2) visual-vestibular-tactile interactions during weightlessness, and (3) post-flight carry-over of weightlessness effects. The instrumentation for these studies includes the body restraint system of Experiment 41 (Von Baumgarten), a rotating dome, a "hop and drop" station, and various recording devices.

*************************** SPACELAB 2***********************

SPACECRAFT COMMON NAME- SPACELAB 2
ALTERNATE NAMES-

NSSDC ID- SPALAB2

LAUNCH DATE- 03/16/85 WEIGHT- 14500. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.5 MIN INCLINATION- 50. DEG
PERIAPSIS- 390. KM ALT APOAPSIS- 400. KM ALT

PERSONNEL

MM - R.E.	PACE	NASA-MSFC
MS - E.W.	URBAN	NASA-MSFC
MG - R.A.	KENNEDY	NASA HEADQUARTERS
SC - E.	WEILER	NASA HEADQUARTERS
PM - O.C.	JEAN	NASA-MSFC

BRIEF DESCRIPTION

Spacelab 2 consists of three pallets and a unique structure (called the Igloo) on which various instruments are exposed to the space environment. Spacelab 2 is presently scheduled to be flown for 7 days on STS 23 in February 1985. Included in the payload is the instrument-pointing system built by the European Space Agency (ESA) and designed to point the instruments at targets of opportunity. The following investigations have been chosen to fly on this mission: vitamin D metabolites and bone demineralization, interaction of oxygen and gravity-influenced lignification, ejectable plasma diagnostics package, plasma depletion experiments for ionospheric and radio-astronomical studies, small helium-cooled infrared telescope, elemental composition and energy spectra of cosmic ray nuclei between 50 GeV per nucleon and several TeV per nucleon, hard X-ray imaging of clusters of galaxies and other extended X-ray sources, solar magnetic- and velocity-field measurement system, coronal helium abundance Spacelab experiment, high-resolution telescope and spectrograph, solar UV spectral irradiance monitor, in-orbit calibration of MESA low-gravity accelerometer, properties of superfluid helium in zero gravity, and vehicle charging and potential experiment.

------- SPACELAB 2, BANKS--------------------------------------

INVESTIGATION NAME- VEHICLE CHARGING AND POTENTIAL (VCAP)

NSSDC ID- SPALAB2-14 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - P.M.	BANKS	STANFORD U

BRIEF DESCRIPTION

This multiple experiment uses several instruments for the data acquisition. Its purpose is to measure the charge accumulation on the Orbiter and the resulting potential of the vehicle. The scientific objectives are (1) to probe electron beam interactions in space plasma (in conjunction with the PDP to assess its character of propagation, wave emissions, particle scattering, ion heating processes, and microscopic plasma phenomena) in the vicinity of the Orbiter using the RMS, and at greater distances during planned flyaround maneuvers; (2) to study electromagnetic wave generation processes by attempting to generate low frequency waves which can propagate to other scientific satellites and/or ground receiving sites; (3) to measure vehicle charging processes by variations of the Orbiter potential and surface return currents using the CCP and SRPA in modes developed during the STS-3 mission. Auroral electron precipitation as well as active electron emission are used to probe the vehicle electrical environment; (4) observe electrical processes associated with charging and discharging of vehicle dielectric surfaces; (5) to assess capabilities of measuring thermal plasma parameters from diagnostic instruments mounted in the pallet; and (6) to map the wave and particle distributions in the vicinity of the electron beam by joint experiments with the plasma diagnostics package (Spalab 2-03). The instruments to be used are (a) a charge and current probe (CCP), (b) a spherical retarding potential analyzer/Langmuir probe (SRPA-LP), (c) a fast-pulse electron gun (FPEG), and (d) a digital control and interface unit (DCIU).

------- SPACELAB 2, BRUECKNER----------------------------------

INVESTIGATION NAME- HIGH RESOLUTION TELESCOPE AND SPECTROGRAPH (HRTS)

NSSDC ID- SPALAB2-10 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE		US NAVAL RESEARCH LAB
OI - O.K.	MOE	US NAVAL RESEARCH LAB
OI - K.R.	NICOLAS	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB
OI - C.	JORDAN	OXFORD U

BRIEF DESCRIPTION

The objectives of this investigation follow: (1) the study of the energy transport and mass balance of the temperature minimum, chromosphere, transition zone, and corona in the quiet sun as well as in plages, flares, and sunspots; (2) the examination of the velocity field of the lower corona to study the origin of the solar wind; (3) the study of the structure and dynamics of spicules and superspicules in the UV spectrum; (4) the study of structure and dynamics of prominences; and (5) the study of pre-flare and flare phenomena. These objectives are obtained through intensity measurements, Doppler measurements, and line-profile analysis of high spatial resolution (1 arc s) and high spectral resolution (5 picometers) of UV spectra (wavelengths 117.6-170 nanometers) covering a wide variety of continua and emission lines that originate in different temperature regimes of the solar atmosphere. The instrumentation consists of a stigmatic spectrograph with a slit that covers the full solar radius simultaneously with 1000 resolution elements. Thus, the slit covers many different solar features at the same time. One spectrum contains enough information for a statistical analysis. Photographs of a series of spectra over a period of at least 15 min are made in order to follow the changes in the intensity, Doppler velocities, and line profiles as they are caused by disturbances moving through the solar atmosphere. Spectroheliograms of two dimensions as a function of time are constructed in order to investigate the 3-dimensional structure of the chromosphere and transition zone. A systematic mapping of the coronal velocity field over the whole sun is also made, along with a series of limb spectra at different altitudes for studies of the structure and dynamics of spicules. The slit is pointed within a tolerance of half a slit width for a duration of at least 15 min. The slit of the high-resolution telescope and spectrograph (HRTS) is stepped in rapid sequence over a small area of the sun (plus or minus 5 arc s), which allows the spectroheliograms to be made. The HRTS consists of a 30-cm Gregorian telescope of 90-cm focal length, a UV spectrograph, a 160 nanometer broad-band spectroheliograph, and an H-alpha split-display system housed in a thermal control canister mounted on the instrument pointing system (IPS). The telescope has an occulting mirror at the primary focus that reflects away all but a 5 x 15 arc-min portion of the solar image that then passes through an aperture to strike a secondary mirror that re-images it onto the UV Wadsworth spectrographic slit plate. The secondary mirror receives less than one solar constant of illumination. The spectral resolution is 50 milliangstroms, and the spatial resolution is 1 arc s. The roll film camera holds 1000 exposures of type 101 film.

------- SPACELAB 2, BRUECKNER---------------------------------

INVESTIGATION NAME- SOLAR UV SPECTRAL IRRADIANCE MONITOR (SUSIM)

NSSDC ID- SPALAB2-11 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - G.E.	BRUECKNER	US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE		US NAVAL RESEARCH LAB
OI - D.K.	PRINZ	US NAVAL RESEARCH LAB
OI - M.E.	VAN HOOSIER	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to improve the accuracy of knowledge of the absolute solar fluxes; (2) to provide a highly accurate traceability of solar fluxes to a variety of UV radiation standards to establish long-term (solar cycle) variations; and (3) to measure the variability of solar fluxes in the wavelength range of 120-400 nanometers during several time periods, ranging from flare-produced changes to the variability from solar rotation. It is desired to (a) improve the absolute accuracy of solar continuum irradiance measurements in this wavelength range with a goal of plus or minus 6 to 10% (wavelength-dependent), (b) measure with high accuracy the intensities of the continuum below 208 nanometers relative to the intensities of the continuum above 208 nanometers with a goal of plus or minus 1%, (c) perform high-accuracy measurements of the intensities of solar emission lines relative to the stable solar continuum above 208 nanometers with a goal of plus or minus 1 to 5% (wavelength-dependent), and (d) improve the absolute accuracy of solar emission line irradiance measurements in the 120- to 400-nanometer region with a goal of plus or minus 6 to 10% (wavelength-dependent). The instrumentation consists of a solar UV spectral irradiance monitor. The monitor consists of two identical double-dispersion scanning spectrometers, seven detectors (five photodiodes and two photon counters), and a UV calibration light source. They are sealed in a canister filled with 1.1 atm of argon to eliminate the effects of contamination from high vacuum outgassing. One spectrometer is used almost continuously during the daylight portion of the solar-pointed orbit for measuring short-time variations of the UV solar flux (flare-related and slowly varying component). The other spectrometer is used only once a day to track any change in sensitivity of the first spectrometer. Two of the five photodiodes are used only once a day. A deuterium lamp calibrated in spectral irradiance is used as the transfer standard source for daily inflight calibration and stability tracking of both spectrometers and all seven detectors. The two photon counters obtain a spectral resolution of 0.1 nanometer over the whole wavelength range, while 5-nanometer resolution is obtained with the five photodiodes. A microprocessor controls all instrument functions by program instruction. Channels monitor the 121.6-nanometer line (Lyman alpha) and seven segments of the continuum from 145 to 390 nanometers. Eight narrow-band channels (0.1-nanometer resolution) are monitored continuously and scanned in five 0.1-nanometer steps. In the spectral scan mode (once a day) the spectrum from 120 to 400 nanometers is scanned at 0.1-nanometer resolution. In the narrow-band mode the solar spectrum and the deuterium lamp are scanned with both spectrometers; both are monitored in the broad-band mode.

------- SPACELAB 2, COWLES-------------------------------------

INVESTIGATION NAME- INTERACTION OF OXYGEN AND GRAVITY INFLUENCED LIGNIFICATION

NSSDC ID- SPALAB2-02 INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - J.R.	COWLES	U OF HOUSTON
OI - H.W.	SCHELD	U OF HOUSTON

BRIEF DESCRIPTION

The objectives of this investigation are to establish the effect of oxygen on lignin formation in plant tissue subjected to a weightless environment and to measure the relative amount of aromatic biosynthesis under different oxygen environments. The investigation distinguishes between two known factors, oxygen and gravity, that influence lignification in plants. Selected pregerminated seeds are planted in metabolic chambers and germinated just prior to launch. The chambers are closed and the atmospheric composition is adjusted by flushing known gas mixtures through rubber septa in the chamber walls. The O2 concentrations are 21% (for the control), 10% , and 3%. Each oxygen concentration is duplicated in another chamber module. Mercury vapor lamps are used to simulate sunlight during programmed day/night cycles throughout the mission. The investigation is also duplicated on earth at 1-g gravity and on a clinostat (ground controls).

------- SPACELAB 2, FAZIO--------------------------------------

INVESTIGATION NAME- SMALL, HELIUM-COOLED INFRARED TELESCOPE

NSSDC ID- SPALAB2-05 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
DUST
ZODIACAL LIGHT
ASTRONOMY

PERSONNEL

PI - G.G.	FAZIO	SAO
OI - W.F.	HOFFMANN	U OF ARIZONA
OI - D.E.	KLEINMANN	SAO
OI - F.J.	LOW	U OF ARIZONA
OI - G.H.	RIEKE	U OF ARIZONA
OI - W.A.	TRAUB	SAO
OI - E.W.	URBAN	NASA-MSFC

BRIEF DESCRIPTION

The scientific objectives are as follows: (1) measurement and mapping of extended low-surface brightness infrared emission from the galaxy. The experiment is 500 times more sensitive than current balloon experiments at 500 micrometers, thus making possible extensive measurement of quantity, distribution, and temperatures of galactic dust and structure; (2) measurement of diffuse emission from intergalactic material and/or galaxies and quasars; (3) measurement of the zodiacal dust emission, especially if the H2O column density can be held to less than 1.E+12 molecules/sq cm; and (4) measurement of a large number of discrete infrared sources that overlap with the IRAS results. Spatial filtering provides measurements of the flux, spectral characteristics, positions, and sizes of discrete sources with high sensitivity. Technical objectives concerned with the measurement of the natural and spacecraft-induced infrared background and the determination of suitable techniques for the in-space use of superfluid helium and cryogenic telescopes are as follows: (1) to take environmental measurements of H2O, CO2, other infrared-active molecules, dust particles, the effects of molecular deposition and cosmic rays, and the effects from the shuttle environment on the performance of cooled infrared telescopes; (2) to prove the design of cooled infrared telescopes; and (3) to demonstrate the performance of a large superfluid helium Dewar system and measure some of its properties in space. The instrumentation consists of a small Herschelian telescope (15 cm in diameter with an f/4 off-axis) cooled to 3 deg K. It scans at the rate of 6 deg/s and covers a 90-deg arc across the sky. The focal plane contains 10 detectors, 9 of which cover the region from 4 to 120 micrometers in three non-overlapping broad bands (4 to 9, 12 to 24, and 50 to 120 micrometers). One detector has a narrow-band response at the H2O and CO2 band locations (6 to 7 and 14 to 16 micrometers). The detectors cover a full 3 deg perpendicular to the scan direction. There is also a movable cold shutter to provide an absolute zero flux reference for each band. The stored liquid helium cooling system is composed of a liquid helium Dewar containing liquid helium at 1.5 deg K, a transfer line assembly, a vapor-cooled telescope cryostat, and a cryostat vacuum cover.

------- SPACELAB 2, GABRIEL--

INVESTIGATION NAME- SOLAR CORONAL HELIUM ABUNDANCE

NSSDC ID- SPALAB2-09   INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - A.H.	GABRIEL	RUTHERFORD/APPLTON LAB
PI - J.L.	CULHANE	U COLLEGE LONDON
OI - B.E.	PATCHETT	RUTHERFORD/APPLTON LAB
OI - K.	STRONG	U COLLEGE LONDON
OI - K.	NORMAN	MULLARD SPACE SCI LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to determine the relative abundance of helium to hydrogen in the solar corona from the measurement of the photoexcitation of hydrogen Lyman alpha at 121.6 nanometers and helium II at 30.4 nanometers; (2) to determine the fundamental parameters of the coronal plasma such as electron density, temperature, and ionization balance as a function of radial distance above the limb; and (3) to construct a contour map in the intensity of selected extreme UV lines and in physical parameters (electron temperature and density) of coronal features with 15-arc-s resolution, both on the disk and above the limb of the sun. The instrumentation is composed of a 1-m, grazing-incidence spectrometer using a 1200-line/mm ruled grating. The sun's image is focused onto the entrance slit plane by means of a 28-cm focal length, grazing-incidence telescope of Wolter type 1 sector design. The slit is oriented tangentially to the solar limb, and can be stepped radially in steps of 1 arc min from a position on the solar disk to 8 arc min above the limb by a servo-driven linear traverse on the telescope mirror. Twelve channel electron multipliers are positioned behind different exit slits at pre-selected spectral positions on the Rowland circle. Two positions are at 121.6 nanometers and 30.4 nanometers (for H/He abundances). The other slits cover associated parameters, such as the temperature and density of the solar atmosphere. Some slits have attenuating filters for dynamic range of the ratio of the disk intensity to that of the corona at the distance of 3.5E5 km. Filters are removed for limb measurements. A small oscillatory rotation of the grating about an axis through the entrance slit permits a small wavelength scan to discriminate against scattered stray light. An auxiliary instrument monitors changes in He II 30.4 nanometer intensity caused by atmospheric absorption effects resulting from spacecraft height or changes of line of sight to the sun. A zero-order detector monitors the solar limb crossings and gives data on short-term intensity variations in stars for wavelengths shorter than 140 nanometers. Signals are counted, multiplexed, and interfaced with the Spacelab telemetry system for transmission to the ground. The pointing accuracy is 15 arc s and the pointing stability is 5 arc s.

------- SPACELAB 2, MASON--

INVESTIGATION NAME- PROPERTIES OF SUPERFLUID HELIUM IN ZERO-G

NSSDC ID- SPALAB2-13   INVESTIGATIVE PROGRAM
CODE RS

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - P.V.	MASON	NASA-JPL
OI - D.J.	COLLINS	NASA-JPL
OI - D.D.	ELLEMAN	NASA-JPL
OI - D.	PETRAC	NASA-JPL
OI - M.M.	SAFFREN	NASA-JPL
OI - T.G.	WANG	NASA-JPL

BRIEF DESCRIPTION

The objectives of this investigation are to determine the fluid and thermal properties required for the design of planned space experiments using superfluid helium (2.2 deg K) as a cryogen, to advance scientific understanding of the interactions between superfluid and normal liquid helium, and to demonstrate the use of superfluid helium as a cryogen in zero gravity. Specifically, the objectives are (1) to take detailed measurements of low-frequency slosh modes of superfluid helium; (2) to take precise measurements of the thermal fluctuations and distributions in superfluid helium in zero gravity (the investigation performs at the microKelvin level over a frequency range of 0-100 Hz); (3) to develop an apparatus to measure the velocities and attenuation of quantized surface waves in superfluid films at frequencies so high that surface tension forces dominate over gravity forces and attenuation effects preclude their measurement on earth; and (4) to obtain superfluid helium cryostat performance data for future space applications. The instrumentation consists of an instrumented cryostat (containing an investigation package inside) and a support electronics package. The cavity is surrounded by a 90-liter superfluid helium toroid and a multilayer super insulation system spaced by helium vapor-cooled shields. The Dewar operates in both upright and horizontal configurations. The cryostat is instrumented with germanium and thermocouple temperature sensors to monitor the chamber temperatures and the superfluid plug and insulation performance. Accelerometers monitor vibration effects in order to cross-correlate with the bulk behavior observations.

------- SPACELAB 2, MENDILLO--

INVESTIGATION NAME- PLASMA DEPLETION EXPERIMENTS FOR IONOSPHERIC + RADIO ASTRONOMICAL STUDIES

NSSDC ID- SPALAB2-04   INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - M.	MENDILLO	BOSTON U
PI - P.A.	BERNHARDT	LOS ALAMOS NAT LAB
OI - M.D.	PAPAGIANNIS	BOSTON U
OI - M.C.	KELLEY	CORNELL U
OI - R.A.	HELLIWELL	STANFORD U
OI - M.B.	PONGRATZ	LOS ALAMOS NAT LAB
OI - G.M.	SMITH	LOS ALAMOS NAT LAB
OI - D.J.	BAKER	UTAH STATE U
OI - R.D.	HARRIS	UTAH STATE U
OI - C.T.	FARLEY	CORNELL U
OI - D.	ANDERSON	NOAA-SEL

BRIEF DESCRIPTION

The objectives of this investigation are (1) to study the ionospheric (F-region) depletion and related effects caused by Shuttle thruster firings in mid-latitudes, (2) to determine the nature of the physical processes governing the ionospheric structure, including diffusion coefficients, chemical reaction rates, neutral wind velocities, electric fields, electron cooling rates, and limiting fluxes, (3) to produce controlled perturbations in the plasmasphere to examine the formation of artificial VLF ducts and the equatorial spread F, and (4) to use the ionospheric depletion region (hole) to conduct ground-based, high-resolution, radio astronomical studies. During flight, thrust firings from the orbital maneuvering system release a minimum of 200 kg of exhaust vapors over each of the radio astronomical sites of Westford, Mass.; Arecibo, Puerto Rico; Roberval, Quebec; Jicamarca, Peru; and Hobart, Tasmania, Australia. A study of airglow emissions is another of the scientific and technical goals.

------- SPACELAB 2, MEYER--

INVESTIGATION NAME- ELEMENTAL COMPOSITION AND ENERGY SPECTRA OF COSMIC RAY NUCLEI

NSSDC ID- SPALAB2-06   INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - P.	MEYER	U OF CHICAGO
PI - D.	MULLER	U OF CHICAGO
OI - J.E.	LAMPORT	U OF CHICAGO
OI - J.	L'HEUREUX	U OF CHICAGO

BRIEF DESCRIPTION

The objective of this investigation is to make a precise determination of the charge composition and individual energy spectra of cosmic ray nuclei from lithium to iron, covering the energy range from 50 to 2000 GeV/nucleon. The investigation exposes to deep space an instrument of large volume and considerable mass for an extended time period (without the influence of an overlying atmosphere). The instrument for charge composition is a telescope of two plastic scintillators; for the energy measurements, two gas Cerenkov counters covering the range from 50 to 150 GeV/nucleon and a transition radiation detector system for the region from 400 to 2000 GeV/nucleon are used. The detector elements are contained in a cylindrical pressurized shell with hemispherical top and bottom covers (2.8 m in diameter with a maximum height of 3.7 m). All detector elements comprise areas of 2 x 2 m. The transition radiation detector consists of six radiators (with a total of 10,000 plastic foils of 5-micrometer thickness) and six xenon-filled multiwire proportional chambers, and is positioned in the center of the instrument. Two scintillators are adjacent to both ends, and are housed in light integration boxes. The two gas Cerenkov counters fill the remaining space between the scintillators and hemispherical lids of the pressurized container. They are filled with gases at atmospheric pressure, and the inner walls are coated with white highly reflective paint. There is a geometric factor of .5 sq m-sr for the transition detector and 1 sq m-sr for the Cerenkov counter telescope. To detect the light of an incident particle, 24 photomultiplier tubes with photocathodes 12.7 cm in diameter are used. Fast 5.08-cm photomultipliers are coupled directly to the scintillators, which are used for time delays between responses recorded by each scintillator; particles must penetrate both. Cerenkov radiation is detected by 50 tubes with 12.7-cm windows. An electronics package collects the information from the various sensors and formats it for ground transmission.

------- SPACELAB 2, SCHNOES------------------------------------

INVESTIGATION NAME- VITAMIN D METABOLITES AND BONE DEMINERALIZATION

NSSDC ID- SPALAB2-01 INVESTIGATIVE PROGRAM CODE EB-3

INVESTIGATION DISCIPLINE(S)
SPACE BIOLOGY

PERSONNEL

PI - H.K.	SCHNOES	U OF WISCONSIN
OI - H.F.	DE LUCA	U OF WISCONSIN
OI - E.	HOLTON	NASA-ARC

BRIEF DESCRIPTION

This experiment measures quantitatively the blood levels of biologically active Vitamin D metabolites of the Shuttle flight crew members to establish whether derangements of mineral (specifically calcium) metabolism reflect themselves in any way in a modulation of Vitamin D metabolism to its various metabolites. The experiment is composed of a developmental phase and a final phase. As part of the developmental phase, existing analysis methods for the Vitamin D metabolites are refined and new methods developed. The final phase consists of the quantitative analysis of the Vitamin D metabolites in plasma samples of the Spacelab 2 crew collected prior to, during, and post flight. Flight hardware consists of two blood collection kits, a centrifuge to prepare the plasma, and a -20 deg C freezer for sample storage. All the equipment is located in the Orbiter mid-deck.

------- SPACELAB 2, SHAWHAN------------------------------------

INVESTIGATION NAME- EJECTABLE PLASMA DIAGNOSTICS PACKAGE

NSSDC ID- SPALAB2-03 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - S.D.	SHAWHAN	U OF IOWA
OI - L.A.	FRANK	U OF IOWA
OI - D.A.	GURNETT	U OF IOWA
OI - N.	D'ANGELO	U OF IOWA
OI - H.C.	BRINTON	NASA HEADQUARTERS
OI - D.L.	FORTNA	NASA-GSFC
OI - D.L.	REASONER	NASA-MSFC
OI - N.H.	STONE	NASA-MSFC

BRIEF DESCRIPTION

The Plasma Diagnostic Package (PDP) is a fully instrumented ejectable subsatellite. During the mission it will operate within the payload bay, on the remote manipulator system (RMS), and as a free flyer. The objectives include the following: (1) to study Orbiter-magnetoplasma interactions in terms of density wakes, dc electric fields, energized plasma, and a variety of possible wave-particle instabilities; (2) to provide in situ measurements of the ionospheric plasma "holes" induced by the Orbiter engine burns in support of the ground radar observations of Spacelab 2 experiment 4 (Spalab 2-04); (3) to measure fields, waves, and plasma modifications induced by the Orbiter/Spacelab operating systems in the Spacelab bay and out to distances of 10 km; and (4) to observe natural waves, fields, and plasmas in the unperturbed magnetosphere. Instruments to be flown include the following: (1) a quadrispherical low-energy proton and electron differential analyzer to provide electron and proton distribution functions from 2 eV to 50 keV; (2) a plasma wave analyzer/electric dipole and magnetic search coil sensors to give components of electrostatic and electromagnetic waves from 5 Hz to 30 MHz; (3) a dc electric field meter for sensing components of the dc electric field over the range from 2 to 2000 mV/m; (4) a triaxial fluxgate magnetometer to measure the dc magnetic field distribution in the vicinity of the Orbiter; (5) a Langmuir probe to measure electron density in the region 1.E4 to 1.E7 per cc and electron temperature from 500 to 5000 deg K; (6) a retarding potential analyzer and differential flux analyzer to determine the energy distribution and streaming velocity direction for plasma ions with energies less than 16 eV, number densities of 1.E2 to 1.E7 per cc, temperatures from 500 to 1.E6 deg K, and velocities up to 15 km/s within plus or minus 50 deg of the instrument plane; and (7) an ion mass spectrometer for measuring from 1 to 64 u and densities of 20 to 2.E6 per cc.

In addition to the PDP, the experiment consists of a special purpose end effector, a release mechanism, a receiver and data processing assembly, and an rf antenna assembly.

------- SPACELAB 2, TITLE------------------------------------

INVESTIGATION NAME- SOLAR MAGNETIC AND VELOCITY FIELD MEASUREMENT SYSTEM

NSSDC ID- SPALAB2-08 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.M.	TITLE	LOCKHEED PALO ALTO
OI - H.E.	RAMSEY	LOCKHEED PALO ALTO
OI - R.C.	SMITHSON	LOCKHEED PALO ALTO
OI - S.A.	SCHOOLMAN	LOCKHEED PALO ALTO
OI - T.D.	TARBELL	LOCKHEED PALO ALTO
OI - L.W.	ACTON	LOCKHEED PALO ALTO
OI - W.L.	LIVINGSTON	KITT PEAK NATL OBS
OI - J.W.	HARVEY	KITT PEAK NATL OBS
OI - R.W.	MILKEY	KITT PEAK NATL OBS
OI - G.W.	SIMON	USAF GEOPHYS LAB
OI - S.P.	WORDEN	USAF GEOPHYS LAB
OI - J.B.	ZIRKER	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objectives of this investigation are (1) to measure magnetic and velocity fields in the solar atmosphere with high spatial resolution and deduce the small-scale structure and evolution of these fields on the 10- to 20-min time scale of solar granulation; (2) to follow the evolution of solar magnetic structures over periods of 20 to 40 h in order to determine how the magnetic elements couple to the supergranule velocity patterns and by what mechanisms field diffusion and disappearance occur; (3) to study with high temporal and spatial resolution the magnetic field changes associated with transient events such as flares, and to isolate and follow the birth of sunspots, pores, and ephemeral regions; (4) to develop the elements of an H-alpha magnetograph/telescope that can be reflown; and (5) to provide a test of the pointing accuracy and stability of the instrument pointing system (IPS) to subarc-second accuracy. The instrumentation consists of a solar optical universal polarimeter mounted on the IPS. The polarimeter is composed of a tunable birefringent filter with a bandpass of 60 milliangstroms using associated blocking filters to permit the filter to operate in eight spectral bands, each about 0.8 nanometer wide. A film camera takes direct filtergrams through the tunable filter. A charge injection device (CID)-array camera takes photoelectric filtergrams with a high signal-to-noise ratio through the tunable filters. A video processor stores images in digital memory and a high-resolution, white-light system with film camera and video display is used for acquisition of accurate pointing data. The filter systems are interfaced to a 30-cm Cassegrain telescope with offset pointing capability. Rotatable wedges are placed in front of the telescope to allow it to observe any desired point on the sun. A guider assembly compensates for high-speed image motion. To record a complete line profile, filtergrams are taken in orthogonal polarizations at 15 wavelengths spaced 2 to 3.5 picometers apart and in the near continuum. They are recorded on SO115 film with a resolution element of 50 micrometers per side.

------- SPACELAB 2, WILLMORE------------------------------------

INVESTIGATION NAME- HARD X-RAY IMAGING OF CLUSTERS OF GALAXIES AND OTHER EXTENDED X-RAY SOURCES

NSSDC ID- SPALAB2-07 INVESTIGATIVE PROGRAM CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY
X-RAY ASTRONOMY

PERSONNEL

PI - A.P.	WILLMORE	U OF BIRMINGHAM
OI - D.K.	BEDFORD	U OF BIRMINGHAM
OI - G.F.	CARPENTER	U OF BIRMINGHAM
OI - C.J.	EYLES	U OF BIRMINGHAM
OI - J.R.H.	HERRING	U OF BIRMINGHAM
OI - G.M.	SIMNETT	U OF BIRMINGHAM
OI - G.K.	SKINNER	U OF BIRMINGHAM
OI - J.W.G.	WILSON	U OF BIRMINGHAM

BRIEF DESCRIPTION

The purpose of this investigation is to examine the X-ray emission from clusters of galaxies in order to study the mechanisms involved in their emission and the possible presence of an intergalactic gas. The spatial and spectral distribution of X-ray flux from these clusters in the energy range from 2 to 20 keV is studied. The investigation is also used on other X-ray sources, such as those occurring at the center of our galaxy. These sources are extremely weak and require a pointing system to acquire sufficient observing time. The instrument is a double X-ray telescope that uses a technique to produce X-ray images of small regions of the sky at higher X-ray energies than is possible using conventional methods. It uses a coded binary mask and a position-sensitive detector that produces an X-ray map of the sky. The mask uses a special case of the random pinhole mask, which produces an image by deconvolving the pattern of the mask holes that produce a shadowgram on the position-sensitive detector when illuminated by radiation from the object. The two telescopes have different resolutions. One has a coarse resolution to detect faint sources and an extended region of stronger sources, while the other has a fine resolution that resolves fine details in more intense regions. The resolution values are 12 x 12 arc min and 3 x 3 arc min, respectively, at full width half maximum of the response and do not necessarily imply the limits to the fineness of the detail that can be deduced. The detectors are composed of multiwire position-sensitive proportional counters. Anti-coincidence techniques are used to reject cosmic-ray events. A motorized gimbal system is used to point the telescope to within 0.5 deg of any orientation with respect to the Shuttle. A microprocessor system accepts the nominal vehicle attitude to select a preprogrammed list of targets and to drive the telescopes. A gyro package for pointing, star sensors for determination of absolute directions to within 1 arc min, and star field cameras for long-term drift motion are also part of the instrumentation.

*************************** SPACELAB 3***********************

SPACECRAFT COMMON NAME- SPACELAB 3
ALTERNATE NAMES-

NSSDC ID- SPALAB3

LAUNCH DATE- 10/26/84 WEIGHT- 14500. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.0 MIN INCLINATION- 57. DEG
PERIAPSIS- 370. KM ALT APOAPSIS- 370. KM ALT

PERSONNEL

MG - S.	SMITH	NASA HEADQUARTERS
SC - J.S.	THEON	NASA HEADQUARTERS
PM - J.	CREMIN	NASA-MSFC
PS - G.H.	FICHTL	NASA-MSFC

BRIEF DESCRIPTION
Spacelab 3 consists of a Spacelab long module and a pallet. The primary objective of the mission is to conduct application, science, and technology experimentation requiring the low-gravity environment of earth orbit and extended-duration (7 days) stable vehicle attitude with emphasis on materials processing. Payload specialists will be used in-orbit to conduct the scientific investigations. Investigations have been selected to fly aboard the Spacelab 3 mission from the United States, India, and France. The experiments represent a total of five different disciplines, including materials-processing in space, environmental observations, life sciences, plasma physics, and technology research. Some of the experiments are located in the module, some on the pallet in the payload bay, and one in mid-deck. This is the first Spacelab mission in which a low-gravity environment will be strictly maintained in orbit.

------- SPACELAB 3, BISWAS--------------------------------------

INVESTIGATION NAME- IONIZATION STATES OF SOLAR AND GALACTIC COSMIC RAY HEAVY NUCLEI STUDIES (IONS)

NSSDC ID- SPALAB3-15 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS
PARTICLES AND FIELDS

PERSONNEL
PI - S. BISWAS TATA INST OF FUND RES

BRIEF DESCRIPTION
This experiment was designed to study the recently discovered anomalous component of low-energy galactic cosmic-ray ions of C, N, O, Ne, and Ca to Fe of energy 5 to 10 MeV per u in regard to their ionization states, composition and intensity, and to study the ionization states of heavy elements from oxygen to iron in energetic solar particles emitted during flare events. The detector system serves for both studies, and consists of stacks of thin sheets of cellulose nitrate (CN) and lexan polycarbonate which are efficient low-noise detectors for heavy nuclei. The stacks are in the shape of a cylindrical module with a diameter of 40 cm and a height of approximately 5 cm.

------- SPACELAB 3, CADORET--------------------------------------

INVESTIGATION NAME- MERCURY IODIDE CRYSTAL

NSSDC ID- SPALAB3-22 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - R. CADORET CNES

BRIEF DESCRIPTION
The experiment objective is to grow near-perfect single crystals of mercury iodide (HgI_2) in a microgravity environment which will decrease the convection effects on crystal growth. High-quality crystals of this composition can lead to improved radiation detectors.

------- SPACELAB 3, CALLAHAN-------------------------------------

INVESTIGATION NAME- RESEARCH ANIMAL HOLDING FACILITY (RAHF)

NSSDC ID- SPALAB3-11 INVESTIGATIVE PROGRAM
CODE EB-3

INVESTIGATION DISCIPLINE(S)
PLANETARY BIOLOGY

PERSONNEL

PI - P.X.	CALLAHAN	NASA-ARC
OI - J.W.	TREMOR	NASA-ARC

BRIEF DESCRIPTION
The objectives of the Research Animal Holding Facilities Verification Test (RAHF-VT) are to evaluate operational requirements and procedures for the preflight preparation, launch, in orbit, de-orbit, landing and postflight handling and care of selected animal specimens (rats and primates); to provide a final biocomparability assessment between animals and the RAHF under weightless conditions and closed life support systems of the space transport system (STS); to obtain operational experience as a precursor for more complex dedicated missions; and to perform a study of the physiological, behavioral, and morphological changes that may occur as a consequence of containment in the RAHF during spaceflight. A total of 24 rats will be flown in one RAHF unit. Primates (4 monkeys) will be flown in the other. Other than visual and photographic observation of the animals, no interface with the animal payload will be required except normal housekeeping operations. RAHF operation and animal/RAHF interfaces are fully documented by visual means, by taped verbal comments, by written notes, and photographically by using 16mm motion and 35mm still cameras. After recovery of animals, behavior is monitored, and physiological and morphological data are obtained to compare with inflight data and ground controls. In conjunction with the RAHF experiment there are two measuring technique systems, the Dynamic Environment System (DEMS) and the Biotelemetry System (BTS). The primary application of both systems will be to provide supporting data for interpreting and assembling the results of the RAHF-VT. The DEMS is designed to measure noise, vibration, and acceleration forces. The unit is mounted between the two RAHF units. The BTS is designed to measure basic physiological functions in experimental animals. It will measure the deep body temperature and heart rate and ECG pattern for four squirrel monkeys and four rats which will be contained in the RAHFs. The sensors and transmitter package are implanted in the animals preflight.

------- SPACELAB 3, FARMER---------------------------------------

INVESTIGATION NAME- ATMOSPHERIC TRACE MOLECULES OBSERVED BY SPECTROSCOPY (ATMOS)

NSSDC ID- SPALAB3-14 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY

PERSONNEL

PI - C.B.	FARMER	NASA-JPL
OI - O.	RAPER	NASA-JPL
OI - R.	NORTON	NASA-JPL
OI - R.	BEER	NASA-JPL
OI - F.W.	TAYLOR	OXFORD U
OI - M.T.	CHAHINE	NASA-JPL
OI - R.	TOTH	NASA-JPL
OI - R.	SCHINDLER	NASA-JPL
OI - J.	BRECKINRIDGE	NASA-JPL
OI - J.H.	SHAW	OHIO STATE U
OI - W.	SUSSKIND	NASA-GSFC
OI - J.M.	RUSSELL, 3RD	NASA-LARC
OI - R.	ZANDER	U OF LIEGE

BRIEF DESCRIPTION

The primary purpose of the Atmospheric Trace Molecules observed by spectroscopy (ATMOS) SL 3 experiment is to demonstrate the capability to monitor environmental quality by surveying the atmosphere for trace constituents and identifying their sources, flow patterns, and decay mechanisms. In its most general form, the ATMOS experiment objective is to determine concentration profiles through stratospheric altitudes (20 to 80 km) at a vertical resolution of 2 km. The ATMOS instrument views the sun through the stratosphere and measures the spectral absorption of solar energy. Each data-taking run is initiated prior to the sun emerging from or disappearing behind the earth. Data from the instrument for these sunrise and sunset limb encounters are interferograms that, when processed on the ground, provide absorption spectra. The instrument is a continuous-scanning Fourier spectrometer operating in the 2- to 16- micrometer wavelength region and capable of generating one interferogram each second with a spectral resolution of 0.01 (1/cm). It is comprised of four major elements: a sun tracker, a telescope, an interferometer, and a data-handling system. The sun tracker automatically locks onto the sun and corrects for any orientation change within predetermined limits. The energy from the sun tracker is directed into the optical system and is collected by an infrared detector. The detector signal is amplified and sent to the electronics. These data in conjunction with engineering and housekeeping data are converted into a serial PCM bit stream in a format compatible with the Spacelab high-rate multiplexer.

------- SPACELAB 3, HART ---------------------------------------

INVESTIGATION NAME- GEOPHYSICAL FLUID FLOW CELL (GFFC)

NSSDC ID- SPALAB3-10 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - J.E.	HART		U OF COLORADO
OI - P.A.	GILMAN		HIGH ALTITUDE OBS
OI - G.H.	FICHTL		NASA-MSFC
OI - W.	FOWLIS		NASA-MSFC
OI - J.	TOOMRE		U OF COLORADO
OI - F.W.	LESLIE		NASA-MSFC

BRIEF DESCRIPTION

The purposes of this experiment are to simulate baroclinic flows which occur naturally in the atmospheres of rotating planets and stars, and to gain insights and answers to crucial questions concerning large-scale, nonlinear mechanics of global flows, especially those conditions related to fluid viscosity, rotation, gravity, etc., which allow qualitatively different modes of instability or waves in the model. Simulation will be accomplished through the use of a dielectric fluid that is temperature-dependent and confined between concentric, rotating, electrically conductive spherical shells. The apparatus includes a convection cell, temperature controllers, rotation drive, and a high voltage supply. A camera will be used to view the flow pattern made visible by injection of dyes, or from the distortion of a set of ruled lines on the outer shell caused by refractive index changes in the fluid. This experiment has applications to the atmospheric flows of the sun, Jupiter, Saturn, earth, and any other rapidly rotating celestial object.

------- SPACELAB 3, LAL ---------------------------------------

INVESTIGATION NAME- FLUID EXPERIMENT SYSTEMS (FES)

NSSDC ID- SPALAB3-01 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - R.B.	LAL	ALABAMA A+M U
PI - R.L.	KROES	NASA-MSFC

BRIEF DESCRIPTION

A series of experiments are performed in which triglycine sulfate (TGS) crystals are grown by a low-temperature solution growth technique in the microgravity environment of the orbital Spacelab. The objectives are (1) to develop a technique for solution crystal growth in a low-gravity environment, (2) to characterize the growth environment and to determine the influence of the environment on growth behavior, and (3) to determine how growth in a low-gravity environment influences the properties of a resultant TGS crystal. Growth is accompanied by slowly extracting heat at a controlled rate through a seed crystal of TGS suspended on an insulated string in a saturated solution of TGS in a test cell. Variations in the liquid density, solution concentration, and temperature around the growing crystal are studied using schlieren, shadowgraph, and interferometric techniques. Growth in earth gravity is also studied similarly. It is expected that convective flow, found in earth-based studies, is minimized in space, allowing a slow, uniform growth resulting in a higher degree of perfection. Such crystals have practical applications as infrared detectors.

------- SPACELAB 3, SCHNEIDER ---------------------------------------

INVESTIGATION NAME- URINE MONITORING

NSSDC ID- SPALAB3-18 INVESTIGATIVE PROGRAM CODE EB-3

INVESTIGATION DISCIPLINE(S) PLANETARY BIOLOGY

PERSONNEL

PI - H.	SCHNEIDER	NASA-JSC

BRIEF DESCRIPTION

The primary objectives of the Urine Monitoring Investigation (UMS) are (1) to verify the operation of the UMS in the collection and sampling of urine, (2) to perform inflight measurement calibration of the UMS, (3) to develop and use a feasible procedure for monitoring crew water intake, using the existing galley water supply and Shuttle food system, and (4) to verify the system for preparing urine samples for postflight analysis. Measurements on the urine samples include indices of renal function and electrolyte, protein, and hormone levels. The unit, stowed in Orbiter mid-deck lockers, accommodates 8 crew members. Measurement calibration is accomplished by comparisons with premeasured aliquots injected into the urinal during flight.

------- SPACELAB 3, SCHNEPPLE ---------------------------------------

INVESTIGATION NAME- VAPOR CRYSTAL GROWTH SYSTEM (VCGS)

NSSDC ID- SPALAB3-02 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - W.F.	SCHNEPPLE	EG+G INC
OI - L.	VON DEN BERG	EG+G INC
OI - M.M.	SCHIEBER	EG+G INC

BRIEF DESCRIPTION

The purpose of this experiment is to grow more perfect mercuric oxide (HgI_2) crystals in a low-gravity environment by diffusion-controlled growth conditions and avoiding strain dislocations produced by the crystal's weight. This crystal has practical importance as a sensitive gamma-ray detector and energy spectrometer that can operate at an ambient temperature rather than liquid nitrogen temperature, as in present detectors. The crystals are grown by vaporization and recondensation at 120 deg C in a specially designed furnace in the Vapor Crystal Growth System (VCGS). Provisions are made to reverse the growth procedure if polycrystalline growth begins (which is a common problem on the ground). Growth is observed through an optical assembly.

------- SPACELAB 3, WANG ---------------------------------------

INVESTIGATION NAME- DROP DYNAMICS MODULE (DROP) EXPERIMENTS

NSSDC ID- SPALAB3-09 INVESTIGATIVE PROGRAM CODE RS

INVESTIGATION DISCIPLINE(S) TECHNOLOGY

PERSONNEL

PI - T.G.	WANG	NASA-JPL

BRIEF DESCRIPTION

The experiment objective is to perform basic experiments on the dynamics of rotating and oscillating drops, with a view toward confirming specific theoretical predictions and gaining insight and direction relative to those dynamical processes not currently accessible by theory. Specifically, the experiment objectives are the study of the equilibrium figures of a rotating drop and the large-amplitude oscillations of a liquid drop. Detailed objectives are to determine (1) bifurcation points, (2) instability at bifurcation points, (3) hysteresis of bifurcation points, (4) equilibrium shapes of drops, and (5) oscillations of the rotating drops. Objectives concerning oscillations of rotating drops are to determine (1) frequency of large-amplitude oscillations, (2) damping of large-amplitude oscillations, (3) shaping of these oscillations, (4) mode coupling in oscillations, (5) effect of turbulent flow on relationships between amplitude and frequency/damping of a mode, and (6) shape at the Bohr-Wheeler saddle point.

**************************** SPOT-1 ****************************

SPACECRAFT COMMON NAME- SPOT-1
ALTERNATE NAMES- SPOT-A

NSSDC ID- SPOT

LAUNCH DATE- 01/00/85 WEIGHT- 1750. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE

SPONSCRING COUNTRY/AGENCY
FRANCE CNES

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.3 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 815. KM ALT APOAPSIS- 829.6 KM ALT

PERSONNEL
PM - M. COUILLAND CNES

BRIEF DESCRIPTION
The SPOT-1 (Systeme Probatoire d'Observation de la Terre) spacecraft is an earth observation satellite with a ground resolution better than that of the Landsat series satellites. The main applications for the images returned by the first SPOT mission are land-use studies, agriculture and forestry resources, mineral and oil resources, and cartography. The three-axis stabilized satellite operates in a circular sun-synchronous near-polar orbit for a design lifetime of 2 years. The spacecraft dimensions are 2 x 2 x 3.5 m and 15.60 m for the overall length of the deployed solar panel. SPOT-1 consists of two parts: (1) the bus, a standard multipurpose platform, and (2) the payload. The bus provides housekeeping information and an onboard computer. The payload is mounted on one of the side panels of the bus. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV imaging instrument observes in three spectral bands (in the visible and near infrared regions) with a ground resolution of 20 m, and in a broader spectral band (panchromatic black and white) with a ground resolution of 10 m. The pattern of successive ground tracks is repeated exactly at 26-day intervals. The SPOT-1 instrument package has the provision for off-nadir viewing which should be particularly useful for monitoring localized phenomena evolving on a relatively short timescale. It also gives the capability for recording, during successive satellite passes, stereoscopic pairs of images of a given area.

------- SPOT-1, CRIS-STAFF------------------------------------

INVESTIGATION NAME- HIGH RESOLUTION VISIBLE IMAGER

NSSDC ID- SPOT -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - CRIS-STAFF CNES

BRIEF DESCRIPTION
The SPOT-1 High Resolution Visible (HRV) imager provides acquisition of high-resolution data of the earth's surface on a global basis. The HRV experiment is designed to operate in either of two modes, in the visible and near infrared spectral regions: (1) a panchromatic (black and white) mode corresponding to observation over a broad spectral band (0.51 - 0.73 micrometer) and (2) a multispectral (color) mode corresponding to observation in three narrower spectral bands (0.50 - 0.59, 0.61 - 0.68, and 0.79 - 0.89 micrometer). The instrument's sampling mesh corresponds to a ground element (pixel) that is 10 m x 10 m in the first case and 20 m x 20 m in the second, for nadir viewing. The detectors are of the CCD (charge-coupled device) type. Each array consists of 6000 detectors without any mechanical scanning. Light from the scene being viewed enters the HRV instrument via a plane mirror that is steerable by ground control. The viewing axis can thus be oriented as required in the plane perpendicular to the orbit. This off-nadir viewing capability covers a range of plus or minus 27 deg relative to the vertical (in 45 steps of 0.6 deg each). This allows the instrument to image any point within a strip extending 475 km to either side of the satellite ground track. The width of the swath actually observed varies between 60 km for nadir viewing and 80 km for extreme off-nadir viewing. With this special feature of off-nadir viewing, the two HRV instruments can be pointed to cover adjacent fields in order to obtain complete earth coverage. Among other possibilities introduced by this feature are increased revisit coverage at intervals ranging from one to several days and the recording of stereoscopic pairs of images of a given area during successive satellite passes. The observation sequence is loaded every day into the onboard computer by the Toulouse ground-control station while the satellite is within its range. The operation sequences for the two HRV instruments are entirely independent. Data will be processed at the Centre de Rectification des Images Spatiales (CRIS) which will be jointly set up by the Centre Nation d'Etudes Spatiales (CNES) and the Institut Geographique National (IGN). CRIS is responsible for archiving SPOT-1 raw data received at Toulouse and for carrying out image data processing.

*************************** SPOT-2***************************

SPACECRAFT COMMON NAME- SPOT-2
ALTERNATE NAMES- SPOT-B

NSSDC ID- SPOT-2

LAUNCH DATE- 01/00/86 WEIGHT- 1750. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY
FRANCE CNES

PLANNED CRBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 101.3 MIN INCLINATION- 98.7 DEG
PERIAPSIS- 815. KM ALT APOAPSIS- 829. KM ALT

PERSONNEL
PM - M. COUTLLAND CNES

BRIEF DESCRIPTION
The SPOT-2 (Systeme Probatoire d'Observation de la Terre) spacecraft is an earth observation satellite with a ground resolution better than that of the Landsat series satellites. The main applications for the images returned by the second SPOT mission are land-use studies, agriculture and forestry resources, mineral and oil resources, and cartography. The three-axis stabilized satellite operates in a circular sun-synchronous near-polar orbit for a design lifetime of 2 years. The spacecraft dimensions are 2 x 2 x 3.5 m and 15.60 m for the overall length of the deployed solar panel. SPOT-2 consists of two parts: (1) the bus, a standard multipurpose platform, and (2) the payload. The bus provides housekeeping information and an onboard computer. The payload is mounted on one of the side panels of the bus. It consists of two identical high-resolution visible (HRV) imaging instruments and a package comprising two magnetic-tape data recorders and a telemetry transmitter. The HRV imaging instrument observes in three spectral bands (in the visible and near infrared regions) with a ground resolution of 20 m, and in a broader spectral band (panchromatic black and white) with a ground resolution of 10 m. The pattern of successive ground tracks is repeated exactly at 26-day intervals. The SPOT-2 instrument package has the provision for off-nadir viewing which should be particularly useful for monitoring localized phenomena evolving on a relatively short timescale. It also gives the capability for recording, during successive satellite passes, stereoscopic pairs of images of a given area.

------- SPOT-2, CRIS-STAFF------------------------------------

INVESTIGATION NAME- HIGH RESOLUTION VISIBLE IMAGER

NSSDC ID- SPOT-2 -01 INVESTIGATIVE PROGRAM
APPLICATIONS

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - CRIS-STAFF CNES

BRIEF DESCRIPTION
The SPOT-2 High Resolution Visible (HRV) imager provides acquisition of high-resolution data of the earth's surface on a global basis. The HRV experiment is designed to operate in either of two modes, in the visible and near infrared spectral regions: (1) a panchromatic (black and white) mode corresponding to observation over a broad spectral band (0.51 - 0.73 micrometer) and (2) a multispectral (color) mode corresponding to observation in three narrower spectral bands (0.50 - 0.59, 0.61 - 0.68, and 0.79 - 0.89 micrometer). The instrument's sampling mesh corresponds to a ground element (pixel) that is 10 m x 10 m in the first case and 20 m x 20 m in the second, for nadir viewing. The detectors are of the CCD (charge-coupled device) type. Each array consists of 6000 detectors without any mechanical scanning. Light from the scene being viewed enters the HRV instrument via a plane mirror that is steerable by ground control. The viewing axis can thus be oriented as required in the plane perpendicular to the orbit. This off-nadir viewing capability covers a range of plus or minus 27 deg relative to the vertical (in 45 steps of 0.6 deg each). This allows the instrument to image any point within a strip extending 475 km to either side of the satellite ground track. The width of the swath actually observed varies between 60 km for nadir viewing and 80 km for extreme off-nadir viewing. With this special feature of off-nadir viewing, the two HRV instruments can be pointed to cover adjacent fields in order to obtain complete earth coverage. Among other possibilities introduced by this feature are increased revisit coverage at intervals ranging from one to several days and the recording of stereoscopic pairs of images of a given area during successive satellite passes. The observation sequence is loaded every day into the onboard computer by the Toulouse ground-control station while the satellite is within its range. The operation sequences for the two HRV instruments are entirely independent. Data will be processed at the Centre de Rectification des Images Spatiales (CRIS) which will be jointly set up by the Centre Nation d'Etudes Spatiales (CNES) and the Institut Geographique National (IGN). CRIS is responsible for archiving SPOT-2 raw data received at Toulouse and for carrying out image data processing.

****************************** ST ******************************

SPACECRAFT COMMON NAME- ST
ALTERNATE NAMES- LARGE SPACE TELESCOPE, SPACE TELESCOPE

NSSDC ID- LST

LAUNCH DATE- 06/00/86 WEIGHT- 11000. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
INTERNATIONAL	ESA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 94.5 MIN INCLINATION- 28.8 DEG
PERIAPSIS- 500. KM ALT APOAPSIS- 500. KM ALT

PERSONNEL

MG - M.	BENSIMON	NASA HEADQUARTERS
SC - E.J.	WEILER	NASA HEADQUARTERS
PM - J.B.	ODOM	NASA-MSFC
PM - F.A.	CARR	NASA-GSFC
PS - C.R.	O'DELL	NASA-MSFC
PS - A.	BOGGESS	NASA-GSFC

BRIEF DESCRIPTION
The Space Telescope (ST) is a spaceborne, diffraction-limited Ritchey-Chretien telescope with the following parameters: an effective aperture of 2.4 m, a spatial resolution of 0.1 arc s, and a wavelength coverage from 0.1 to 1000 micrometers. The expected limiting magnitude is between 27 and 28. This is 10 times better resolution with greater wavelength coverage than that of ground-based telescopes; detectable objects can be 50 times fainter than those observable with the largest earth-based telescopes. The telescope is capable of accommodating five different instruments at its focal plane. The Space Shuttle is to be used for the initial launch, in-orbit servicing, and for return of the ST to the ground for maintenance. The anticipated minimum operational lifetime, excluding downtime for periodic maintenance and updating, is greater than 15 yr. The ST system serves as an international astronomical space observatory facility. The use of the onboard instrumentation is open to scientists of all countries. Its design is flexible to allow for the replacement of scientific instrumentation when necessary, to incorporate technological advances, and to satisfy changes in the observational interests of the astronomical community. Instrumentation updating, repair, or replacement can be accomplished either by return of the ST to the ground, or by using suited astronauts for in-orbit work.

------- ST, BLESS -------

INVESTIGATION NAME- HIGH-SPEED PHOTOMETER

NSSDC ID- LST -06 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - R.C.	BLESS	U OF WISCONSIN
OI - G.W.	VAN CITTERS	U OF TEXAS, AUSTIN
OI - E.L.	ROBINSON	U OF TEXAS, AUSTIN
OI - J.L.	ELLIOT	CORNELL U
OI - A.D.	CODE	U OF WISCONSIN

BRIEF DESCRIPTION
The high-speed photometer (HSP) investigation makes fast-time-resolution (1 millisecond and slower) photometric observations of rapidly varying objects in the spectral range 1150 to 8500 A and linear polarimetric observations from 2100 to 7000 A of a wide variety of objects. It establishes an accurate link between observations made on existing visual and UV photometric systems and the corresponding observations of the faint objects observed by the space telescope. The instrument consists of two image dissectors: one sensitive in the UV and solar blind, the other sensitive in the visible and near infrared. A wide variety of bandpasses is formed by broadband and interference filters arranged in strips across the dissector tube's photocathode. Some of the filters are coated with a polarizing material. Diaphragms provide a choice of three fields of view: 0.7, 1.4, and 2.8 arc s. The dissectors can be commanded to receive photoelectrons from any of the approximately 100 filter-diaphragm-polarizer combinations available. The two detectors can be located inside or outside of an axial instrument bay, with no additional optics required.

------- ST, BRANDT -------

INVESTIGATION NAME- HIGH-RESOLUTION SPECTROGRAPH (HRS)

NSSDC ID- LST -02 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.C.	BRANDT	NASA-GSFC
OI - A.	BOGGESS, 3RD	NASA-GSFC
OI - E.A.	BEAVER	U OF CALIF, SAN DIEGO
OI - S.R.	HEAP	NASA-GSFC
OI - J.B.	HUTCHINGS	DOMINION ASTROPHYS OBS
OI - M.A.	JURA	U OF CALIF, LA
OI - J.L.	LINSKY	U OF COLORADO
OI - S.P.	MARAN	NASA-GSFC
OI - B.D.	SAVAGE	U OF WISCONSIN
OI - A.M.	SMITH	NASA-GSFC
OI - L.M.	TRAFTON	U OF TEXAS, AUSTIN
OI - R.J.	WEYMANN	U OF ARIZONA

BRIEF DESCRIPTION
This investigation uses an ultraviolet spectrograph capable of obtaining high-quality spectra at two resolving powers: 20,000 and 120,000. The lower dispersion is achieved with four gratings that cover the spectral range 1100 to 3200 A so that each grating is used only near its maximum blaze efficiency. The higher dispersion utilizes an echelle arrangement. The sensor is a multi-channel pulse-counting device, the digicon. This detector operates functionally like an image-dissector tube and can be used as an image dissector to perform star centering and field mapping of the entrance aperture, eliminating the need for a separate star tracker or slit camera. There are two detectors, one with a CsTe photocathode and one with CsI. The two target entrance apertures have fields of view of 1 sq arc s and 0.3 sq arc s, respectively. There are no significant time constraints. The high-resolution spectrograph (HRS) operates in sunlight so that it can be utilized at all times, except when the source is occulted by the earth or moon. The high dynamic range and choice of dispersions make it possible to observe a large range of stellar magnitudes, from very bright to moderately faint. The HRS bridges the gap between objects observed by rocket-borne spectrographs, Copernicus, IUE, and the faint-object spectrograph (FOS).

------- ST, HARMS -------

INVESTIGATION NAME- FAINT-OBJECT SPECTROGRAPH (FOS)

NSSDC ID- LST -03 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - R.J.	HARMS	U OF CALIF, SAN DIEGO
OI - F.	BARTKO, JR.	MARTIN-MARIETTA AEROSP
OI - E.A.	BEAVER	U OF CALIF, SAN DIEGO
OI - H.C.	FORD	SPACE TELESCOPE SCI IN
OI - B.	MARGON	U OF WASHINGTON
OI - A.F.	DAVIDSEN	JOHNS HOPKINS U
OI - E.M.	BURBIDGE	U OF CALIF, SAN DIEGO
OI - J.R.	ANGEL	U OF ARIZONA
OI - R.C.	BOHLIN	SPACE TELESCOPE SCI IN

BRIEF DESCRIPTION
The faint-object spectrograph (FOS) investigation obtains spectra of astronomical objects at the faintest possible limiting magnitude in ultraviolet and visible wavelengths. The spectrograph covers a broad spectral range and is intended for spectroscopy primarily at modest spectral resolution. The spectral profiles of broad emission and absorption features and continuum flux distributions are observed in both extended and point sources. The FOS is a fixed-slot spectrograph with the capability of selecting either of two spectral resolving powers (100 or 1000) over the wavelength range 1140 to 7000 A. A nondispersive mode is also available, providing camera images for scientific and target acquisition purposes. A polarization-analyzer capability is provided over the wavelength range 1200 to 3500 A. The FOS uses a 512-diode linear array of photon-counting digicons as detectors. To cover the full wavelength range, two detectors are used. The ultraviolet/visible sensor has a magnesium fluoride faceplate and a bi-alkali photocathode. The visible/near-IR sensor has the same window material and an extended-red tri-alkali photocathode. For the faintest objects, integration times are long.

------- ST, JEFFERYS -------

INVESTIGATION NAME- ASTROMETRY SCIENCE

NSSDC ID- LST -09 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - W.H.	JEFFERYS	U OF TEXAS, AUSTIN
OI - G.F.	BENEDICT	U OF TEXAS, AUSTIN
OI - P.D.	HEMENWAY	U OF TEXAS, AUSTIN
OI - P.J.	SHELUS	U OF TEXAS, AUSTIN
OI - R.L.	DUNCOMBE	U OF TEXAS, AUSTIN
OI - W.F.	VAN ALTENA	YALE U
OI - O.G.	FRANZ	LOWELL OBSERVATORY
OI - L.W.	FREDRICK	U OF VIRGINIA

BRIEF DESCRIPTION

This investigation uses the facilities of the optical telescope assembly, instead of requiring a separate instrument. The space telescope (ST) guidance system consists of three identical fine guidance sensors (FGS) distributed in an annulus centered on the optical axis of the ST. Each sensor has its own field of view (FOV). In normal operations, two of the sensors are used for fine pointing the ST. The sensor that is not used for telescope pointing is the primary astrometric instrument at that particular time. An FGS consists of a set of gimbaled mirrors such that any star within its FOV can be placed on an image dissector/interferometer combination. The encoder readings of the gimbaled mirror axes supply the object position in the FOV; the output of each of the pairs of interferometers supplies a fine error signal. Each sensor contains a set of movable filters, plus temperature, voltage, and other monitors. The astrometry experimenter observes stars in an approximate magnitude range of 4 to 20.

------- ST, VAN DE HULST--------------------------------------

INVESTIGATION NAME- FAINT-OBJECT CAMERA

NSSDC ID- LST -08 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

TL - H.C.	VAN DE HULST	HUYGENS LAB
TM - I.R.	KING	U OF CALIF, BERKELEY
TM - P.	CRANE	EUROP SO OBS, SWIZR
TM - R.	ALBRECHT	SPACE TELESCOPE SCI IN
TM - C.	BARBIERI	INST DI ASTRONOMIA
TM - A.	BOKSENBERG	U COLLEGE LONDON
TM - M.J.	DISNEY	U COLLEGE CARDIFF
TM - T.M.	KAMPERMAN	ASTRONOMICAL INST
TM - C.D.	MACKAY	U OF CAMBRIDGE
TM - R.N.	WILSON	EUROP SO OBS, SWIZR
TM - J.M.	DEHARVENG	CNRS-LAS

BRIEF DESCRIPTION

The faint-object camera (FOC) investigation uses an imaging camera with a two-dimensional photon-event counting detector, operating at a high focal ratio, which fully exploits the spatial resolving power of the ST, and is able to detect objects that are 50 times fainter than those observable with the most powerful earthbound telescope. The FOC has a minimum format of 64 by 64 pixels. Based on a pixel size of 25 by 25 micrometers, a focal ratio of approximately f/96 is required to exploit the spatial resolving power of the ST. At that focal ratio, the pixel size is 0.022 by 0.022 sq arc s. For imagery and photometry of very faint stars and extended sources, cumulative exposures are required to obtain a useful signal-to-noise ratio. The wavelength range is 1200 to 7000 A and the dynamic range is from 21st to 28th visual magnitude for point sources, and from 15th to 22nd visual magnitude/sq arc s for extended sources.

------- ST, WESTPHAL--

INVESTIGATION NAME- WIDE-FIELD CAMERA

NSSDC ID- LST -07 INVESTIGATIVE PROGRAM
CODE EZ-7/CO-OP

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - J.A.	WESTPHAL	CALIF INST OF TECH
OI - W.A.	BAUM	LOWELL OBSERVATORY
OI - D.G.	CURRIE	U OF MARYLAND
OI - G.E.	DANIELSON	CALIF INST OF TECH
OI - B.A.	SMITH	U OF ARIZONA
OI - A.D.	CODE	U OF WISCONSIN
OI - J.E.	GUNN	CALIF INST OF TECH
OI - J.	KRISTIAN	CALIF INST OF TECH
OI - C.R.	LYNDS	KITT PEAK NATL OBS
OI - P.K.	SEIDELMANN	US NAVAL OBSERVATORY

BRIEF DESCRIPTION

The wide-field camera (WFC) investigation uses two cameras of different focal lengths housed in a single planetary radial bay. One is a wide-field camera and the other is a planetary camera. Each camera uses a simple optical mosaic technique in conjunction with four charge-coupled devices (CCD) as detectors, each having 800 by 800 picture elements. Each CCD is thinned for back-side illumination, and their spectral responses are extended from the visible to the vacuum ultraviolet by special processing. The overall quantum efficiency of the instrument is about 10% from Lyman alpha (121.6 nm) to 350 nm, rising rapidly to about 50% from 450 to 800 nm, then gradually decreasing into the infrared. The combination of the optical mosaic and CCD detectors provides a contiguous field with an overall size of 1600 by 1600 pixels. Focal ratios of f/12.9 and f/30 give field sizes of 2.67 sq arc min at a resolution of 0.1 arc s/pixel for the wide-field camera and 68.7 sq arc s at 0.043 arc s/pixel for the planetary camera. The instrument contains space for 50 filters as well as polarizers/filters and transmission gratings.

*************************** STP P80-1***********************

SPACECRAFT COMMON NAME- STP P80-1
ALTERNATE NAMES- SPACE TEST PROGRAM P80-1, P80-1
TEAL RUBY SATELLITE(TRS)

NSSDC ID- P80-1

LAUNCH DATE- WEIGHT- 1940. KG
LAUNCH SITE-
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 99.6 MIN INCLINATION- 72.5 DEG
PERIAPSIS- 740.8 KM ALT APOAPSIS- 740.8 KM ALT

PERSONNEL

PM - W.A.	WISDOM	USAF SPACE DIVISION
PS - I.	RZEPNICK	AEROSPACE CORP

BRIEF DESCRIPTION

Space Test Program P80-1 is a DOD satellite which has essentially a rectangular parallelepiped shape and approximate dimensions 2.4 x 2.4 x 0.7 m. The S/C is three-axis stabilized to maintain one 2.4 x 2.4 m surface vector pointing at the nadir. The spacecraft serves as a stable platform reference for three experiment telescopes. Telemetry capability is PCM and uses onboard tape recorders with up to 6 hours storage.

------- STP P80-1, BOWYER--------------------------------------

INVESTIGATION NAME- EXTREME ULTRAVIOLET PHOTOMETER

NSSDC ID- P80-1 -03 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
EARTH RESOURCES SURVEY
ASTRONOMY

PERSONNEL

PI - C.S.	BOWYER	U OF CALIF, BERKELEY
OI - D.	FINLEY	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

The extreme-ultraviolet (EUV) photometer investigation consists of an imaging grazing-incidence telescope with several broadband filters sensitive to extreme and far UV radiation. The telescope is zenith-looking. The orbital motion of the spacecraft provides a scanning function, resulting in a mapping of the sky in the wavelength regions of interest throughout the mission.

------- STP P80-1, POWER---------------------------------------

INVESTIGATION NAME- ION AUXILIARY PROPULSION SYSTEM

NSSDC ID- P80-1 -02 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
TECHNOLOGY

PERSONNEL

PI - J.L.	POWER	NASA-LERC

BRIEF DESCRIPTION

The ion auxiliary propulsion system will test two mercury ion thrusters, each producing 1 mlb of thrust. These are configured on the spacecraft to be representative of the thruster's use for stationkeeping and maneuvering. Instrumentation provides thruster performance and measures the effects of the thrusters on other spacecraft components and functions.

------- STP P80-1, QUELLE--------------------------------------

INVESTIGATION NAME- STELLAR HORIZON ATMOSPHERIC DISPERSION EXPERIMENT

NSSDC ID- P80-1 -04 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
NAVIGATION

PERSONNEL
PI - F. QUELLE UNKNOWN

BRIEF DESCRIPTION

------- STP P80-1, STEARS------------------------------------

INVESTIGATION NAME- TEAL RUBY

NSSDC ID- P80-1 -01 INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM

INVESTIGATION DISCIPLINE(S)
EARTH RESOURCES SURVEY

PERSONNEL
PI - H. STEARS DARPA

BRIEF DESCRIPTION

This investigation uses an IR telescope and detection system which has a multispectral mosaic focal plane to measure signal strength in a variety of spectral bands in the infrared. It gathers earth background data and tests techniques for IR detection and data reduction.

*************************** UARS ****************************

SPACECRAFT COMMON NAME- UARS
ALTERNATE NAMES- UPPER ATMOSPH.RESEAR.SAT

NSSDC ID- UARS-1

LAUNCH DATE- 4 QTR 89 WEIGHT- 5455. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 97. MIN INCLINATION- 57. DEG
PERIAPSIS- 600. KM ALT APOAPSIS- 600. KM ALT

PERSONNEL
MG - D.B. BROOME NASA HEADQUARTERS
SC - R.J. MCNEAL NASA HEADQUARTERS
PM - P.T. BURR NASA-GSFC
PS - C.A. REBER NASA-GSFC

BRIEF DESCRIPTION

The Upper-Atmosphere Research Satellite UARS will be launched as part of the upper-atmosphere research program. The basic objectives of the UARS mission are to conduct research in the atmosphere above the tropopause by measuring the global budget of constituent trace gases and their chemical, dynamical, and radiative behavior. Specifically, the objectives are (1) to study energy input and loss in the upper atmosphere; (2) to study global atmospheric photochemistry; (3) to study dynamics of the upper atmosphere; and (4) to study the coupling among processes and between atmospheric regions. The UARS has two major components. The first is the Multimission Modular Spacecraft (MMS), designed as a standard bus for NASA spacecraft missions (e.g., SMM and Landsat-D), and consisting of three basic modules: attitude control subsystem; power subsystem; and communications and data handling subsystem. The second major component is an instrument module which provides mounting accommodations for the scientific instruments. The MMS maintains a precise orientation to the local vertical and to the velocity vector. There are two on-board tape recorders. Three NASA standard 50-amp-hour nickel-cadmium batteries will fly along with the solar cell array. The planned lifetime for the mission is 18 months, limited by the finite amount of stored cryogen needed for one of the instruments. The data are returned to earth through the TDRSS. A central data processing and storage facility at NASA-GSFC, linked to remote analysis and display computers at the investigators' institutions, facilitates the timely processing and analysis of the data. In addition to the Investigators who are providing instruments, the UARS Science Team includes ten theoretical investigator groups.

------- UARS, BRUECKNER------------------------------------

INVESTIGATION NAME- SOLAR ULTRAVIOLET SPECTRAL IRRADIANCE
MONITOR 120-400 NM

NSSDC ID- UARS-1 -08 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
SOLAR PHYSICS

PERSONNEL
PI - G.E. BRUECKNER US NAVAL RESEARCH LAB
OI - M.E. VAN HOOSIER US NAVAL RESEARCH LAB
OI - D.K. PRINZ US NAVAL RESEARCH LAB
OI - J.D.F.BARTOE US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The main objective of this investigation is to improve the existing accuracy of solar flux measurements in the 120- to 400-nm region of the spectrum, and to help determine the variations of this flux over a solar cycle. The full-sun spectral irradiance is measured with two spectral resolutions, 0.15 and 5 nm, with an absolute accuracy of plus or minus 6 to 10% (wavelength dependent). The accuracy of the measurements below 210 nm relative to measurements of the more stable solar continuum above 210 nm is plus or minus 1 to 5% (wavelength dependent). The solar ultraviolet spectral irradiance monitor (SUSIM) consists of two identical double-dispersion scanning spectrometers, seven detectors, and three deuterium calibration lamps. The spectrometers and detectors are sealed in a canister filled with 1.1 atm of argon gas. One spectrometer is used almost continuously; the second is used infrequently to track the stability of the first. The deuterium lamps serve as secondary standards for inflight calibration.

------- UARS, CHANG------------------------------------

INVESTIGATION NAME- THEORETICAL ANALYSIS-CHEMICAL,RADIATIVE,
AND DYNAMICAL PROCESSES-MIDDLE ATMOSPHERE

NSSDC ID- UARS-1 -24 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL
PI - J.S. CHANG LAWRENCE LIVERMORE LAB
PI - F.M. LUTHER LAWRENCE LIVERMORE LAB
OI - J.E. PENNER LAWRENCE LIVERMORE LAB
OI - D.J. WUEBBLES LAWRENCE LIVERMORE LAB

BRIEF DESCRIPTION

This theoretical investigation studies the mechanisms that control upper atmosphere structure variability, and the response of the upper atmosphere to natural and anthropogenic perturbations. The focus is on the chemical, radiative, and dynamical processes in the middle atmosphere using time-dependent transport-kinetics models.

------- UARS, CUNNOLD------------------------------------

INVESTIGATION NAME- PREDICTION OF THE DYNAMICAL IMPACT OF
CHANGES IN STRATOSPHERIC OZONE

NSSDC ID- UARS-1 -18 INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL
PI - D.M. CUNNOLD GEORGIA INST OF TECH
OI - F.N. ALYEA MASS INST OF TECH

BRIEF DESCRIPTION

A principal goal of this modeling activity is to estimate the dynamical response of the atmosphere to chemical perturbations, particularly the nature of transport in the stratosphere. This theoretical investigation uses the UARS data to test and update a three-dimensional photochemical dynamical model of the stratosphere. A 32-level model, extending from the ground to 87 km and containing a horizontal resolution approximately equivalent to planetary wave-number 18, is used in this study. It contains the prediction of between three and six long-lived chemical species.

------- UARS, FREDERICK------------------------------------

INVESTIGATION NAME- INSTRUMENT OF OPPORTUNITY-SOLAR
BACKSCATTER UV SPECTRAL RADIOMETER

NSSDC ID- UARS-1 -26 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
EM - J.E. FREDERICK NASA-GSFC
ES - J.E. FREDERICK NASA-GSFC

BRIEF DESCRIPTION

The objective of this experiment is to measure on a global scale the total ozone content and ozone vertical profiles. An Ebert-Fastie monochromator is used to analyze the backscatter of solar UV due to ozone in the atmosphere. It has a fixed field of view in the nadir direction, a solar reference mode, and it includes a cloud cover radiometer.

------- UARS, GADD -------

INVESTIGATION NAME- THEORETICAL INVESTIGATION PHYSICS, CHEMISTRY, AND DYNAMICS-STRATOSPHERE

NSSDC ID- UARS-1 -25

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - A.	GADD	METEOROLOGICAL OFFICE
OI - A.F.	TUCK	METEOROLOGICAL OFFICE

BRIEF DESCRIPTION

The objectives of this theoretical investigation are to further the understanding of the stratosphere, and to study its interactions with the troposphere. These objectives are achieved through two primary activities, analysis and diagnosis. A comprehensive three-dimensional numerical model of the troposphere and stratosphere is used.

------- UARS, GELLER -------

INVESTIGATION NAME- OBSERV.ANALYSIS-THEORETICAL MODELLING INVESTIGATIONS OF DYNAMICS FOR UARS

NSSDC ID- UARS-1 -20

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PLANETARY ATMOSPHERES
METEOROLOGY
ATMOSPHERIC PHYSICS

PERSONNEL

PI - M.A.	GELLER	NASA-GSFC

BRIEF DESCRIPTION

The major goals of this theoretical investigation are (1) to construct a simulation of upper-atmosphere flow regimes and utilize the UARS observed parameters to study the resolvability of upper-atmosphere dynamics by the UARS instruments and subsequent data analysis; (2) to use pre-UARS limb scanning data of the stratosphere and mesosphere for general circulation studies; and (3) to assess the extent to which upper-atmosphere data must be included in studies of tropospheric climate and in extended-range forecasting.

------- UARS, GROSE -------

INVESTIGATION NAME- STRATOSPHERIC TRANSPORT PROCESSES,BUDGET OF MINOR CONSTITUENTS,AND ENERGETICS

NSSDC ID- UARS-1 -22

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - W.L.	GROSE	NASA-LARC
OI - W.T.	BLACKSHEAR	NASA-LARC
OI - K.V.	HAGGARD	NASA-LARC
OI - E.E.	REMSBERG	NASA-LARC
OI - R.E.	TURNER	NASA-LARC
OI - R.J.	KURZEJA	GEORGE WASHINGTON U

BRIEF DESCRIPTION

This theoretical investigation is a coordinated program of theoretical model studies, data analysis, and interpretation designed to study transport processes, budgets of trace chemicals, and energetics of the stratosphere. The first part of this effort is devoted to the study of the transport of minor constituents, heat, momentum, and potential vorticity in the stratosphere. The second part utilizes UARS data to study budgets of trace chemicals by determining bulk mass-transfer rates within the stratosphere and among the stratosphere, troposphere, and mesosphere. The last part of this effort is an analysis of stratospheric energetics.

------- UARS, HAYS -------

INVESTIGATION NAME- HIGH RESOLUTION DOPPLER IMAGER (HRDI)

NSSDC ID- UARS-1 -02

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - P.B.	HAYS	U OF MICHIGAN
OI - G.	HERNANDEZ	NOAA-ERL
OI - D.	REES	U COLLEGE LONDON
OI - R.G.	ROBLE	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The objective of this investigation is to use a high-resolution, Doppler-imaging, Fabry-Perot interferometer to detect sharp features in the spectrum of light emitted or scattered from the earth's atmosphere, and to obtain the temperature and vector wind field directly. The information obtained is used to study a series of problems associated with the dynamics of the atmosphere and the transport of minor constituents within the atmosphere. There is a single sensor containing the spectral filters and the main objective telescope. The telescope is gimballed to view the horizon at two orthogonal directions, and to scan in the zenith direction for altitude coverage.

------- UARS, HOLTON -------

INVESTIGATION NAME- WAVE DYNAMICS AND TRANSPORT IN THE MIDDLE ATMOSPHERE

NSSDC ID- UARS-1 -17

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.R.	HOLTON	U OF WASHINGTON
OI - J.M.	WALLACE	U OF WASHINGTON
OI - D.L.	HARTMANN	U OF WASHINGTON
OI - R.E.	YOUNG	NASA-ARC
OI - C.B.	LEOVY	U OF WASHINGTON

BRIEF DESCRIPTION

This theoretical investigation uses a program of observational analysis using UARS data and numerical modeling designed to elucidate: the nature of the general circulation of the middle atmosphere, the role of dynamics in controlling the distribution and variability of various trace constituents, and the nature and extent of dynamical interactions between the lower and middle atmosphere. Emphasis is placed on the roles which large-scale wave motions play in maintaining the budgets of momentum, heat, and trace constituent concentrations on a global basis in the middle atmosphere.

------- UARS, LONDON -------

INVESTIGATION NAME- RESPONSE OF UPPER ATMOSPHERE PARAMETERS TO VARIATIONS OF SOLAR ACTIVITY

NSSDC ID- UARS-1 -19

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - J.	LONDON	U OF COLORADO

BRIEF DESCRIPTION

This theoretical investigation deals with the natural variability of the thermal structure and ozone concentration of the upper atmosphere with emphasis on their response to significant solar variability. It provides definitive tests, from analysis of retrieved data, of specified mechanisms by which ozone variations are in response to variations in solar activity. A two-fold approach is used: data analysis and statistical evaluation of the pertinent upper atmosphere parameters as they relate to various forms of solar activity; and theoretical study of the sensitivity of realistic models of the ozone photochemical equilibrium system as related to observed and suggested solar variability.

------- UARS, MILLER -------

INVESTIGATION NAME- SYNOPTIC ANALYSIS+DYNAMICAL INTERPRETA. OF UARS METEOROLOGICAL INFORMATION

NSSDC ID- UARS-1 -16

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.J.	MILLER	NOAA-NMC
PI - R.S.	QUIROZ	NOAA-NMC

BRIEF DESCRIPTION

The objective of this theoretical investigation is to merge temperature and wind measurements in the stratosphere and mesosphere with the Operational National Weather Service analyses. Energy budget terms are evaluated, and height and temperature fields (planetary waves) are analyzed by Fourier analysis. The interlayer dynamic coupling among the troposphere, stratosphere, and mesosphere is studied also.

------- UARS, REBER---

INVESTIGATION NAME- ANALYTIC-EMPIRICAL MODELING OF UPPER ATMOSPHERE PARAMETERS

NSSDC ID- UARS-1 -21

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI - C.A.	REBER	NASA-GSFC
OI - F.T.	HUANG	COMPUTER SCIENCES CORP
OI - A.E.	HEDIN	NASA-GSFC
OI - J.E.	FREDERICK	NASA-GSFC
OI - E.	HILSENRATH	NASA-GSFC

BRIEF DESCRIPTION

The primary objectives of this theoretical investigation are the organization, empirical modeling, and geophysical interpretation of the various data acquired from the UARS. A secondary objective is the acquisition of complementary data from other sources (e.g., the operational NOAA satellites) for use in this analysis and for use by the UARS Science Team. A substantial part of the investigation is the calculation of a time-dependent, three-dimensional, analytic-empirical model using data on atmospheric temperature, minor species mixing ratios, etc. The modeling technique is a direct follow-up to the OGO Model and the Mass Spectrometer-Incoherent Scatter (MSIS) Model which have proven quite successful for thermospheric research, and to the current empirical Ozone Model, all of which were developed and are available at the Goddard Space Flight Center, Code 690, Greenbelt, Md. 20771.

------- UARS, ROCHE---

INVESTIGATION NAME- ALTITUDE DISTRIBUTION OF ATMOSPHERIC MINOR SPECIES AND TEMP.IN 10-60KM RANGE

NSSDC ID- UARS-1 -05

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES

PERSONNEL

PI - A.E.	ROCHE	LOCKHEED PALO ALTO
OI - J.B.	KUMER	LOCKHEED PALO ALTO
OI - R.D.	SEARS	LOCKHEED PALO ALTO
OI - T.C.	JAMES	LOCKHEED PALO ALTO
OI - L.R.	MEGILL	UTAH STATE U
OI - K.D.	BAKER	UTAH STATE U
OI - D.G.	MURCRAY	U OF DENVER
OI - A.	GOLDMAN	U OF DENVER
OI - J.C.	GILLE	NATL CTR FOR ATMOS RES

BRIEF DESCRIPTION

The investigation objectives are to remotely measure the stratospheric composition (H2O, N2O, NOX, HNO3, CL2, ClO, HCl, O3, CO2, and CH4) and temperature in the 10- to 60-km altitude range. The composition and temperature are determined from measurements of limb emission spectra in the 3.5-to 12-micrometer infrared wavelength range. The necessary high sensitivity, background flux discrimination, and spectral resolution are provided by a cryogenically cooled solid-etalon spectrometer using a linear detector array to simultaneously cover the 10- to 60-km range with 2-km resolution. The spectral resolution is 0.25 inverse cm. Three days are required to achieve global coverage within the 75-deg latitude for the 57-deg orbit.

------- UARS, ROTTMAN---

INVESTIGATION NAME- ULTRAVIOLET SOLAR SPECTRAL IRRADIANCE EXPERIMENT

NSSDC ID- UARS-1 -04

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
SOLAR PHYSICS

PERSONNEL

PI - G.J.	ROTTMAN	U OF COLORADO
OI - J.	LONDON	U OF COLORADO

BRIEF DESCRIPTION

The objective of this investigation is to measure the solar spectrum at wavelengths between 120 and 500 nm with an absolute accuracy better than 10%. Temporal variations of the solar radiation are followed to within 1 to 2% during these missions. The investigation utilizes a 1/8 m Ebert-Fastie spectrometer with approximately 0.15-nm spectral resolution. It has three separate data channels, each using a phototube optimized for different, but overlapping, portions of the instrument spectral range. Solar data are taken on a daily basis and analyzed to establish correlations of the spectral irradiance with solar rotation and with solar activity (10.7-cm flux levels, sunspot number, calcium plage area, solar flares, etc.). The normal mode of operation involves a 4-h duty cycle per day. Of this total time, 1 h is spent observing the sun and the remainder of the time is spent in calibration activities. Ten to 15 stars are chosen for the calibration program.

------- UARS, RUSSELL, 3RD-----------------------------------

INVESTIGATION NAME- HALOGEN OCCULTATION EXPERIMENT (HALOE)

NSSDC ID- UARS-1 -09

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - J.M.	RUSSELL, 3RD	NASA-LARC
OI - J.	PARK	COLL OF WILLIAM + MARY
OI - S.R.	DRAYSON	U OF MICHIGAN
OI - P.J.	CRUTZEN	MPI-CHEMISTRY
OI - R.J.	CICERONE	NATL CTR FOR ATMOS RES
OI - P.L.	HANST	ENVIRON PROTECT AGENCY

BRIEF DESCRIPTION

The objective of this investigation is to measure, using solar occultation techniques, the upper-atmospheric vertical concentration profiles of H2O, O3, HCl, HF, NO, CH4, HNO3, and CO2. Pressure in the altitude range from 10 to 55 km is measured also. The measurements are used to study trace gas sources and sinks and upper-atmosphere transport, and to validate photochemical and atmospheric dynamics models. A four-channel gas-filter correlation radiometer and a five-channel filter radiometer mounted on a common chassis with azimuth and elevation scan capability are used. The gas filter correlation radiometry is used to measure HCl, HF, CH4, NO, and CO2, and broadband filter spectroscopy is used to measure H2O, O3, HNO3, and CO2. The CO2 data are used to obtain the atmospheric pressure profile.

------- UARS, TAYLOR---

INVESTIGATION NAME- AN IMPROVED STRATOSPHERIC AND MESOSPHERIC SOUNDER (ISAMS)

NSSDC ID- UARS-1 -11

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI - F.W.	TAYLOR	OXFORD U
OI - R.	HUNNEMAN	READING U
OI - H.	HADLEY	RUTHERFORD/APPLTON LAB
OI - K.H.	DAVIES	RUTHERFORD/APPLTON LAB
OI - G.D.	PESKETT	OXFORD U
OI - C.D.	RODGERS	OXFORD U
OI - E.J.	WILLIAMSON	OXFORD U
OI - J.J.	BARNETT	OXFORD U
OI - J.G.	WHITNEY	OXFORD U
OI - C.A.	BAILEY	OXFORD U
OI - G.R.	THORTON	OXFORD U
OI - J.S.	SEELEY	READING U
OI - J.M.	RUSSELL, 3RD	NASA-LARC

BRIEF DESCRIPTION

The investigation objective is to make global measurements of radiation from CO2, H2O, CO, NO, N2O, and CH4. These measurements yield: (1) the kinetic temperature, vibrational temperature, and altitude distribution for CO2; (2) the H2O concentration from 15 to 110 km; (3) the CO altitude distribution; (4) the NO altitude distribution; (5) the N2O altitude distribution; and (6) the CH4 altitude distribution. These parameters are obtained as a function of time and location. The improved Stratospheric and Mesospheric Sounder is an infrared radiometer observing thermal emission and resonance fluorescence of solar radiation from the atmospheric limb by gas correlation spectroscopy. The spectral range covered is 2.7 to 100 micrometers. The altitude range extends from 15 to 140 km, depending upon the particular species measured. For most channels, vertical profiles of temperature (to approximately 1 deg K accuracy) and composition (to approximately 10% accuracy) can be made with a vertical resolution better than 4 km and a horizontal resolution of 400 km (limited by geometry of limb path).

------- UARS, THUILLIER--

INVESTIGATION NAME- TEMPERATURE AND WIND MEASUREMENT IN THE MESOSPHERE AND LOWER THERMOSPHERE

NSSDC ID- UARS-1 -01

INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	G.	THUILLIER	CNRS-SA
OI -	P.	CONNES	PARIS OBSERVATORY
OI -	H.	TEITELBAUM	CNRS-SA
OI -	M.L.	DUBOIN	CNET
OI -	P.	BLUM	U OF BONN
OI -	S.S.	CHANDRA	NASA-GSFC

BRIEF DESCRIPTION
The investigation objectives are to measure simultaneously the wind and temperature in the high mesosphere and low thermosphere, using a remote sensing method, and to derive the eddy diffusion coefficient. Absolute line intensities of the wavelengths listed below are also measured. The flight instrument is composed of two main units. The upper part is a Cassegrain-type telescope. The lower part consists of a field-compensated Michelson interferometer and associated optics, detectors, laser unit, electromechanisms, and electronics. The wavelengths measured (in Angstroms) are 5577, 6300, 7278, 7319, and 7371. The spectral scanning is achieved by a small-angle prism, changing the optical path by approximately 1 wavelength in 16 steps. The limb is scanned in steps from 400 to 70 km. The field of view is 2 deg in a horizontal plane and the vertical field of view varies from 16 arc min in the thermosphere to 4 arc min for mesospheric observations. The duration of a complete scan for a given line is 1.6 s.

------- UARS, WATERS--

INVESTIGATION NAME- MICROWAVE LIMB SOUNDER (MLS)

NSSDC ID- UARS-1 -13

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
METEOROLOGY
PLANETARY ATMOSPHERES

PERSONNEL

PI -	J.W.	WATERS	NASA-JPL

BRIEF DESCRIPTION
The objective of the Microwave Limb Sounder (MLS) investigation is to measure O3, ClO, H2O2, and the magnetic field and pressure in the upper atmosphere. The spectral region covered is from 63 to 205 GHz. The sampled altitude range extends from 15 to 110 km. The instrument has a 2-s integration time with longer integrations performed as appropriate during data reduction. Absolute accuracy of the MLS is approximately 5% for composition, and approximately 2 deg K for temperature. Vertical resolution for profile measurements is 3 to 6 km; horizontal resolution is 30 km across and 300 km along the observation direction. Complete profiles are obtained in less than 50 s.

------- UARS, WILLSON--

INVESTIGATION NAME- INSTRUMENT OF OPPORTUNITY-ACTIVE CAVITY RADIOMETER

NSSDC ID- UARS-1 -27

INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

EM -	R.C.	WILLSON	NASA-JPL
ES -	R.C.	WILLSON	NASA-JPL

BRIEF DESCRIPTION
The objective of this experiment is the measurement of the total solar irradiance with state-of-the-art accuracy and precision. This experiment is part of a long-term program of extra-atmospheric observations to determine the magnitude and direction of variations in the output of the total solar-optical energy. The instrument measures solar output from the far UV through the far IR wavelengths using three, electrically self-calibrated, cavity detector pyrheliometers each capable of defining the absolute irradiance with an uncertainty of plus or minus 0.1%, and with a resolution of plus or minus 0.02%.

------- UARS, WINNINGHAM--

INVESTIGATION NAME- PARTICLE ENVIRONMENT MONITOR (PEM)

NSSDC ID- UARS-1 -07

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
IONOSPHERES
PLANETARY ATMOSPHERES
PARTICLES AND FIELDS

PERSONNEL

PI -	J.D.	WINNINGHAM	SOUTHWEST RES INST
OI -	P.M.	BANKS	STANFORD U
OI -	J.L.	BURCH	SOUTHWEST RES INST
OI -	H.D.	VOSS	LOCKHEED PALO ALTO
OI -	W.L.	IMHOF	LOCKHEED PALO ALTO
OI -	J.B.	REAGAN	LOCKHEED PALO ALTO
OI -	M.H.	REES	U OF ALASKA
OI -	G.C.	REID	NOAA-ERL
OI -	R.G.	ROBLE	NATL CTR FOR ATMOS RES
OI -	P.J.	CRUTZEN	MPI-CHEMISTRY
OI -	T.A.	POTEMRA	APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The objective of this investigation is to determine the global input of charged-particle energy into the earth's stratosphere, mesosphere, and thermosphere, and to understand the atmospheric processes involved. Direct in situ measurements of precipitation electrons in the energy range from 100 eV to 5 MeV and of protons in the energy range from 100 eV to 200 MeV are made with a medium-energy particle spectrometer (MEPS) and a high-energy particle spectrometer (HEPS). In addition, global images and energy spectra of atmospheric X-rays produced by electron precipitation are performed over the energy range from 6 to 150 keV with an atmospheric X-Ray imaging spectrometer. The data from these instruments are used as input to computational models.

------- UARS, ZUREK--

INVESTIGATION NAME- RADIATIVE-DYNAMIC BALANCES IN THE MESOSPHERE

NSSDC ID- UARS-1 -23

INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS
PLANETARY ATMOSPHERES
METEOROLOGY

PERSONNEL

PI -	R.W.	ZUREK	NASA-JPL

BRIEF DESCRIPTION
The overall objective of this theoretical investigation is to construct a comprehensive and consistent climatology model of the mesosphere as observed by UARS. From the mesospheric data, this analysis produces (1) the radiative budget based on O3 and O2 absorption of solar radiance and CO2 emission, including the effects on the latter of non-thermodynamic equilibrium; and (2) the dynamical climatology features of the mesosphere, showing the relative contributions to the heat and momentum budgets by adiabatic heating, by the mean meridional circulation, and by eddies (waves). The eddy contribution is separated into standing and transient components which include dynamical fluxes due to atmospheric tides.

****************************** VEGA 1 ******************************

SPACECRAFT COMMON NAME- VEGA 1
ALTERNATE NAMES- VENERA-HALLEY 1

NSSDC ID- HALLEY1

LAUNCH DATE- 12/22/84 WEIGHT- 125. KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE-

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- VENUS FLYBY

PERSONNEL

PM -	UNKNOWN
PS -	UNKNOWN

BRIEF DESCRIPTION
This spacecraft mission combines a Venus swingby and a comet Halley flyby. Two identical spacecraft are scheduled to be launched during the period December 22-28, 1984. After carrying Venus entry probes to the vicinity of Venus (arrival and deployment of probes are scheduled for June 14-22, 1985), the two spacecraft are to be retargetted using Venus gravity field assistance to intercept comet Halley in March 1986. The first spacecraft is to encounter Halley on March 8, 1986, and the second about a week later. The flyby velocity is to be 77.7 km/s. Although the spacecraft can be targetted with a

precision of 100 km, the position of the spacecraft relative to the comet nucleus is estimated to be known only to within a few thousand kilometers. This, together with the problem of dust protection, leads to estimated flyby distances of 10,000 km for the first spacecraft and 3000 km for the second. The spacecraft is three-axis stabilized. Its main features are large solar panels, a high-gain antenna dish, and an automatic pointing platform carrying those experiments that require pointing at the comet nucleus. The automatic platform can rotate through + or -110 deg and + or -40 deg in two perpendicular directions with a pointing accuracy of 5 min and a stability of 1 (arc min)/s. It carries the narrow- and the wide-angle camera, the three-channel spectrometer, and the infrared sounder. All other experiments are body mounted, with the exception of two magnetometer sensors and various plasma probes and plasma wave analyzers which are mounted on a 5-m boom. The total scientific payload weighs 125 kg and has a data rate of 65 kbit/s. The comet-encounter science data take is from 2.5 h before until 0.5 h after the closest approach, with several periods of data take before and after, each lasting about 2 h. Continuous coverage for plasma instruments is provided by an onboard memory (5-Mbit tape recorder). The spacecraft is shielded from hypervelocity dust impacts by a shield consisting of a 100-micron multilayer sheet 20 to 30 cm from the spacecraft, and a 1-mm Al sheet 5 to 10 cm from the spacecraft. No information is presently available on the Venus entry probes. The information here was obtained from the ESA Bulletin, No. 29, p. 64, February 1982.

------- VEGA 1, GRINGAUZ---------------------------------------

INVESTIGATION NAME- ION MASS SPECTROMETER / ELECTRON ANALYZER

NSSDC ID- HALLEY1-07 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI -	K.I.	GRINGAUZ	SOVIET ACAD OF SCI
OI -	L.I.	DENSHCHIKOVA	SOVIET ACAD OF SCI
OI -	I.N.	KLIMENKO	SOVIET ACAD OF SCI
OI -	A.P.	REMIZOV	SOVIET ACAD OF SCI
OI -	G.A.	SKURIDIN	SOVIET ACAD OF SCI
OI -	M.I.	VERIGIN	SOVIET ACAD OF SCI
OI -	G.A.	VLADIMIROVA	SOVIET ACAD OF SCI
OI -	G.I.	VOLKOV	SOVIET ACAD OF SCI
OI -	I.	APATHY	HUNGARIAN ACAD OF SCI
OI -	T.I.	GOMBOSI	HUNGARIAN ACAD OF SCI
OI -	A.J.	SOMOGYI	HUNGARIAN ACAD OF SCI
OI -	L.	SZABO	HUNGARIAN ACAD OF SCI
OI -	I.	SZEMEREY	HUNGARIAN ACAD OF SCI
OI -	S.	SZENDRO	HUNGARIAN ACAD OF SCI
OI -	E.	KEPPLER	MPI-AERONOMY
OI -	A.K.	RICHTER	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument consists of two ion spectrometers and a single-channel electron analyzer. The electron analyzer has an angular aperture of + and - 5 deg, and measures electrons in the energy range 3-5000 eV. One ion spectrometer is oriented parallel to the relative velocity vector and covers the energy range 15 eV to 25 keV with a resolution E/(delta E) of 25 and an angular aperture of 40 deg. Provided that the thermal velocities of the cometary ions are considerably lower than the encounter velocity, a mass spectrum in the range 1-100 u can be obtained. The ion density threshold is 1E-3 /cu cm, and the dynamic range is 1E6. The second ion spectrometer is oriented towards the sun and covers the energy range 40 eV to 25 keV with a resolution E/(delta E) of 25 and an angular aperture of 40 deg. This sensor is intended for measuring basic parameters of the solar wind ion flows and the transition layer plasma. The flow threshold value is 1E5 /(sq cm s sr) and the dynamic range is 1E5.

------- VEGA 1, RIEDLER---------------------------------------

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- HALLEY1-09 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI -	W.W.	RIEDLER	AUSTRIAN ACAD OF SCI
OI -	K.	SCHWINGENSCHUH	AUSTRIAN ACAD OF SCI
OI -	R.	SCHMIDT	AUSTRIAN ACAD OF SCI
OI -	YE.G.	YEROSHENKO	IZMIRAN
OI -	V.A.	STJAZHKIN	IZMIRAN

BRIEF DESCRIPTION

This instrument is designed to measure the constant component of the magnetic field and its low-frequency fluctuations in the cometary and solar wind interaction zone and in interplanetary space. The instrument consists of two sensor units mounted 1.5 m apart on a 5-m boom.

------- VEGA 1, UNKNOWN---------------------------------------

INVESTIGATION NAME- WIDE- AND NARROW-ANGLE CAMERAS

NSSDC ID- HALLEY1-01 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

The wide-angle camera is used for large-scale coma imaging and as a guide for the narrow-angle camera. Both cameras use CCDs (charge-coupled devices) with about 500 x 500 pixels each as detecting devices in the focal plane. The combined data rate for the two cameras is 48 kbps, which is not sufficient to transmit the full contents of the CCDs. Only a "window" one-tenth of the area of the CCD, around the center of brightness, is transmitted. The exposure time must be kept short to keep image blur to a minimum, but it cannot be less than 0.01 s if good sensitivity is to be achieved. The narrow-angle camera can resolve nucleus surface structures down to 200 m from a distance of 10,000 km. A set of six replaceable filters with a relatively wide (80 nm) passband are used in the narrow-angle camera. The wide-angle camera has a focal length of 100 mm, an f-number of f/2, and a 4-deg field of view. For the narrow-angle camera these parameters are 1200 mm, f/6, and 0.5 deg. In addition to the purely scientific objectives of imaging the nucleus, the cameras also have the task of providing the information needed to guide the platform and determine the spacecraft's trajectory relative to the nucleus.

------- VEGA 1, UNKNOWN---------------------------------------

INVESTIGATION NAME- THREE-CHANNEL SPECTROMETER

NSSDC ID- HALLEY1-02 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

This experiment is intended for (1) spectral and polarization studies of the dust, (2) spectral mapping of the coma, and (3) determination of the outflow rates of various gases and their content. The instrument has a Cassegrain telescope with a focal length of 500 mm and an objective diameter of 140 mm. The light flux passes through three 1-deg slits located in the focal plane to three independent spectroscopic channels in the UV, visible, and infrared. The UV channel covers the range 120 to 350 nm, with spectral resolution of 0.5 nm, spatial resolution of 3 x 6 arc minutes, and sensitivity of 3 rayleighs. The visible channel covers 350 to 900 nm, with spectral resolution of 1 nm, spatial resolution of 3 x 6 arc minutes, and sensitivity of 10 rayleighs. The infrared channel covers 900 to 2000 nm, with spectral resolution of 10-12 nm, spatial resolution of 6 x 60 arc minutes, and sensitivity of 3E4 rayleighs. The UV and visible channels use micro-channeltrons for detectors, while the infrared channel uses a germanium photodiode.

------- VEGA 1, UNKNOWN---------------------------------------

INVESTIGATION NAME- INFRARED SOUNDER

NSSDC ID- HALLEY1-03 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION

The objectives for this instrument are to determine (1) the size, radiation capacity, and temperature of the nucleus, (2) the nature, density, distribution, and temperature of the dust, and (3) the nature, relative content, and temperature of the parent molecules. The instrument has a Cassegrain telescope with a focal length of 500 mm, a diameter of 140 mm, and a field of view of 1 deg. The radiation flux is separated into three beams, each of which passes through its own filter located on a wheel spinning at up to 20 rpm. Two of the channels are devoted to the spectrosopic mode in the wavelength intervals 4000-8000 and 8000-16,000 nm. The third channel is devoted to nucleus imaging at 7000-14,000 nm. Three Hg-Cd-Te photoconductors cooled to 80 deg K by liquid nitrogen are used as detecting devices.

------- VEGA 1, UNKNOWN---------------------------------------

INVESTIGATION NAME- DUST MASS SPECTROMETER

NSSDC ID- HALLEY1-04 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument is mounted parallel to the relative velocity vector and analyzes the chemical and isotopic composition of individual dust particles. Impact of a dust particle on the instrument's target area causes a plasma to be formed consisting of dust and target material, from which ions are extracted by a 1.5-kV electric field. The ions travel through a time-of-flight tube (actually two tubes with an electrostatic reflector between, with total length of 1 m) where they are separated according to their mass before being recorded by an electron multiplier. The mass range is 1-100 u, with resolution M/(delta M) of 200. The instrument observes the spectra of the most common dust particles, which are expected to be in the size range 100-10,000 nm.

------- VEGA 1, UNKNOWN--

INVESTIGATION NAME- DUST IMPACT COUNTER

NSSDC ID- HALLEY1-05 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument consists of three piezo-element detectors mounted on a special metallic plate to measure the amplitude of the wave generated by dust particles heavier than 1E-10 g impacting on the plate. The amplitude is proportional to the mass of the dust particle. From the arrival time of the pulse at the three detectors, the coordinates of the impact point can be determined. This method can be improved if instead of one plate the multilayer system used for spacecraft protection is used with three detectors in each layer to increase the range of measurable mass distribution. The dead time of the instrument depends on the acoustic decay of the signal in the piezo-elements and can turn out to be significant.

------- VEGA 1, UNKNOWN--

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER

NSSDC ID- HALLEY1-06 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument measures the elemental and isotopic compositions of the neutral gases in the coma.

------- VEGA 1, UNKNOWN--

INVESTIGATION NAME- ENERGETIC PARTICLES EXPERIMENT

NSSDC ID- HALLEY1-08 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument measures accelerated cometary ions in the energy range 20 keV to 20 MeV. The field of view is 30 deg, and the detector is oriented in the ecliptic plane.

------- VEGA 1, UNKNOWN--

INVESTIGATION NAME- WAVE ANALYZERS

NSSDC ID- HALLEY1-10 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This experiment is designed to study (1) the mechanism of anomalously high ionization of cometary gas, (2) the shock-front structure, and (3) the phenomena in the region of the contact surface (ionopause). There are two analyzers, which are designed to monitor waves excited in the cometary environment, in particular the lower hybrid waves (10 Hz), ion cyclotron waves (1 Hz), and plasma waves (100kHz). One analyzer has a frequency range 0.1 to 1000 Hz. A twin-probe technique is used to measure the potential difference between two probes placed on the 5-m boom isolated from the spacecraft. The plasma flow fluctuations are measured with a Faraday cup at the boom's tip. The second wave instrument has a frequency range 0 to 300 kHz and a dynamic range of 70 dB.

------- VEGA 1, UNKNOWN--

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- HALLEY1-11 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument is designed to measure the cometary plasma density in the range 10 to 1E5 /cu cm, and the temperature in the range 0.1 to 10 eV.

************************** VEGA 2**************************

SPACECRAFT COMMON NAME- VEGA 2
ALTERNATE NAMES- VENERA-HALLEY 2

NSSDC ID- HALLEY2

LAUNCH DATE- 12/22/84 WEIGHT- 125. KG
LAUNCH SITE- UNKNOWN, U.S.S.R.
LAUNCH VEHICLE-

SPONSORING COUNTRY/AGENCY
U.S.S.R. SAS

PLANNED ORBIT PARAMETERS
ORBIT TYPE- VENUS FLYBY

PERSONNEL
PM - UNKNOWN
PS - UNKNOWN

BRIEF DESCRIPTION
This spacecraft mission combines a Venus swingby and a comet Halley flyby. Two identical spacecraft are scheduled to be launched during the period December 22-28, 1984. After carrying Venus entry probes to the vicinity of Venus (arrival and deployment of probes are scheduled for June 14-22, 1985), the two spacecraft are to be retargetted using Venus gravity field assistance to intercept comet Halley in March 1986. The first spacecraft is to encounter Halley on March 8, 1986, and the second about a week later. The flyby velocity is to be 77.7 km/s. Although the spacecraft can be targetted with a precision of 100 km, the position of the spacecraft relative to the comet nucleus is estimated to be known only to within a few thousand kilometers. This, together with the problem of dust protection, leads to estimated flyby distances of 10,000 km for the first spacecraft and 3000 km for the second. The spacecraft is three-axis stabilized. Its main features are large solar panels, a high-gain antenna dish, and an automatic pointing platform carrying those experiments that require pointing at the comet nucleus. The automatic platform can rotate through + or -110 deg and + or -40 deg in two perpendicular directions with a pointing accuracy of 5 min and a stability of 1 (arc min)/s. It carries the narrow- and the wide-angle camera, the three-channel spectrometer, and the infrared sounder. All other experiments are body mounted, with the exception of two magnetometer sensors and various plasma probes and plasma wave analyzers which are mounted on a 5-m boom. The total scientific payload weighs 125 kg and has a data rate of 65 kbit/s. The comet-encounter science data take is from 2.5 h before until 0.5 h after the closest approach, with several periods of data take before and after, each lasting about 2 h. Continuous coverage for plasma instruments is provided by an onboard memory (5-Mbit tape recorder). The spacecraft is shielded from hypervelocity dust impacts by a shield consisting of a 100-micron multilayer sheet 20 to 30 cm from the spacecraft, and a 1-mm Al sheet 5 to 10 cm from the spacecraft. No information is presently available on the Venus entry probes. The information here was obtained from the ESA Bulletin, No. 29, p. 64, February 1982.

------- VEGA 2, GRINGAUZ--

INVESTIGATION NAME- ION MASS SPECTROMETER / ELECTRON ANALYZER

NSSDC ID- HALLEY2-07 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - K.I.	GRINGAUZ	SOVIET ACAD OF SCI
OI - L.I.	DENSHCHIKOVA	SOVIET ACAD OF SCI
OI - I.N.	KLIMENKO	SOVIET ACAD OF SCI
OI - A.P.	REMIZOV	SOVIET ACAD OF SCI
OI - G.A.	SKURIDIN	SOVIET ACAD OF SCI
OI - M.I.	VERIGIN	SOVIET ACAD OF SCI
OI - G.A.	VLADIMIROVA	SOVIET ACAD OF SCI
OI - G.I.	VOLKOV	SOVIET ACAD OF SCI
OI - I.	APATHY	HUNGARIAN ACAD OF SCI

OI - T.I.	GOMBOSI	HUNGARIAN ACAD OF SCI
OI - A.J.	SOMOGYI	HUNGARIAN ACAD OF SCI
OI - L.	SZABO	HUNGARIAN ACAD OF SCI
OI - I.	SZEMEREY	HUNGARIAN ACAD OF SCI
OI - S.	SZENDRO	HUNGARIAN ACAD OF SCI
OI - E.	KEPPLER	MPI-AERONOMY
OI - A.K.	RICHTER	MPI-AERONOMY

BRIEF DESCRIPTION

This instrument consists of two ion spectrometers and a single-channel electron analyzer. The electron analyzer has an angular aperture of + and - 5 deg, and measures electrons in the energy range 3-5000 eV. One ion spectrometer is oriented parallel to the relative velocity vector and covers the energy range 15 eV to 25 keV with a resolution E/(delta E) of 25 and an angular aperture of 40 deg. Provided that the thermal velocities of the cometary ions are considerably lower than the encounter velocity, a mass spectrum in the range 1-100 u can be obtained. The ion density threshold is 1E-3 /cu cm, and the dynamic range is 1E6. The second ion spectrometer is oriented towards the sun and covers the energy range 40 eV to 25 keV with a resolution E/(delta E) of 25 and an angular aperture of 40 deg. This sensor is intended for measuring basic parameters of the solar wind ion flows and the transition layer plasma. The flow threshold value is 1E5 /(sq cm s sr) and the dynamic range is 1E5.

------- VEGA 2, RIEDLER---

INVESTIGATION NAME- MAGNETOMETER

NSSDC ID- HALLEY2-09 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - W.W.	RIEDLER	AUSTRIAN ACAD OF SCI
OI - K.	SCHWINGENSCHUH	AUSTRIAN ACAD OF SCI
OI - R.	SCHMIDT	AUSTRIAN ACAD OF SCI
OI - YE.G.	YEROSHENKO	IZMIRAN
OI - V.A.	STJAZHKIN	IZMIRAN

BRIEF DESCRIPTION

This instrument is designed to measure the constant component of the magnetic field and its low-frequency fluctuations in the cometary and solar wind interaction zone and in interplanetary space. The instrument consists of two sensor units mounted 1.5 m apart on a 5-m boom.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- WIDE- AND NARROW-ANGLE CAMERAS

NSSDC ID- HALLEY2-01 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - UNKNOWN

BRIEF DESCRIPTION

The wide-angle camera will be used for large-scale coma imaging and as a guide for the narrow-angle camera. Both cameras use CCDs (charge-coupled devices) with about 500 x 500 pixels each as detecting devices in the focal plane. The combined data rate for the two cameras is 48 kbps, which is not sufficient to transmit the full contents of the CCDs. Only a "window" one tenth of the area of the CCD, around the center of brightness, is transmitted. The exposure time must be kept short to keep image blur to a minimum, but it cannot be less than 0.01 s if good sensitivity is to be achieved. The narrow-angle camera can resolve nucleus surface structures down to 200 m from a distance of 10,000 km. It is planned to use a set of six replaceable filters with a relatively wide (80 nm) passband in the narrow-angle camera. The wide-angle camera has a focal length of 100 mm, an f-number of f/2, and a 4-deg field of view. For the narrow-angle camera these parameters are 1200 mm, f/6, and 0.5 deg. In addition to the purely scientific objectives of imaging the nucleus, the cameras also have the task of providing the information needed to guide the platform and information about the spacecraft's trajectory relative to the nucleus.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- THREE-CHANNEL SPECTROMETER

NSSDC ID- HALLEY2-02 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - UNKNOWN

BRIEF DESCRIPTION

This experiment is intended for (1) spectral and polarization studies of the dust, (2) spectral mapping of the coma, and (3) determination of the outflow rates of various gases and their content. The instrument has a Cassegrain telescope with a focal length of 500 mm and an objective diameter of 140 mm. The light flux passes through three 1-deg slits located in the focal plane to three independent spectroscopic channels in the UV, visible, and infrared. The UV channel covers the range 120 to 350 nm, with spectral resolution of 0.5 nm, spatial resolution of 3 x 6 arc minutes, and sensitivity of 3 rayleighs. The visible channel covers 350 to 900 nm, with spectral resolution of 1 nm, spatial resolution of 3 x 6 arc minutes, and sensitivity of 10 rayleighs. The infrared channel covers 900 to 2000 nm, with spectral resolution of 10-12 nm, spatial resolution of 6 x 60 arc minutes, and sensitivity of 3E4 rayleighs. The UV and visible channels use micro-channeltrons for detectors, while the infrared channel uses a germanium photodiode.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- INFRARED SOUNDER

NSSDC ID- HALLEY2-03 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - UNKNOWN

BRIEF DESCRIPTION

The objectives for this instrument are to determine (1) the size, radiation capacity, and temperature of the nucleus, (2) the nature, density, distribution, and temperature of the dust, and (3) the nature, relative content, and temperature of the parent molecules. The instrument has a Cassegrain telescope with a focal length of 500 mm, a diameter of 140 mm, and a field of view of 1 deg. The radiation flux is separated into three beams, each of which passes through its own filter located on a wheel spinning at up to 20 rpm. Two of the channels are devoted to the spectrosopic mode in the wavelength intervals 4000-8000 and 8000-16,000 nm. The third channel is devoted to nucleus imaging at 7000-14,000 nm. Three Hg-Cd-Te photoconductors cooled to 80 deg K by liquid nitrogen are used as detecting devices.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- DUST MASS SPECTROMETER

NSSDC ID- HALLEY2-04 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - UNKNOWN

BRIEF DESCRIPTION

This instrument is mounted parallel to the relative velocity vector and analyzes the chemical and isotopic composition of individual dust particles. Impact of a dust particle on the instrument's target area causes a plasma to be formed consisting of dust and target material, from which ions are extracted by a 1.5-kV electric field. The ions travel through a time-of-flight tube (actually two tubes with an electrostatic reflector between, with total length of 1 m) where they are separated according to their mass before being recorded by an electron multiplier. The mass range is 1-100 u, with resolution M/(delta M) of 200. The instrument observes the spectra of the most common dust particles, which are expected to be in the size range 100-10,000 nm.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- DUST IMPACT COUNTER

NSSDC ID- HALLEY2-05 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL

PI - UNKNOWN

BRIEF DESCRIPTION

This instrument consists of three piezo-element detectors mounted on a special metallic plate to measure the amplitude of the wave generated by dust particles heavier than 1E-10 g impacting on the plate. The amplitude is proportional to the mass of the dust particle. From the arrival time of the pulse at the three detectors, the coordinates of the impact point can be determined. This method can be improved if instead of one plate the multilayer system used for spacecraft protection is used with three detectors in each layer to increase the range of measurable mass distribution. The dead time of the instrument depends on the acoustic decay of the signal in the piezo-elements and can turn out to be significant.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- NEUTRAL MASS SPECTROMETER

NSSDC ID- HALLEY2-06 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument measures the elemental and isotopic compositions of the neutral gases in the coma.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- ENERGETIC PARTICLES EXPERIMENT

NSSDC ID- HALLEY2-08 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument measures accelerated cometary ions in the energy range 20 keV to 20 MeV. The field of view is 30 deg, and the detector is oriented in the ecliptic plane.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- WAVE ANALYZERS

NSSDC ID- HALLEY2-10 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This experiment is designed to study (1) the mechanism of anomalously high ionization of cometary gas, (2) the shock-front structure, and (3) the phenomena in the region of the contact surface (ionopause). There are two analyzers, which are designed to monitor waves excited in the cometary environment, in particular the lower hybrid waves (10 Hz), ion cyclotron waves (1 Hz), and plasma waves (100kHz). One analyzer has a frequency range 0.1 to 1000 Hz. A twin-probe technique is used to measure the potential difference between two probes placed on the 5-m boom isolated from the spacecraft. The plasma flow fluctuations are measured with a Faraday cup at the boom's tip. The second wave instrument has a frequency range 0 to 300 kHz and a dynamic range of 70 dB.

------- VEGA 2, UNKNOWN---

INVESTIGATION NAME- LANGMUIR PROBE

NSSDC ID- HALLEY2-11 INVESTIGATIVE PROGRAM

INVESTIGATION DISCIPLINE(S)

PERSONNEL
PI - UNKNOWN

BRIEF DESCRIPTION
This instrument is designed to measure the cometary plasma density in the range 10 to 1E5 /cu cm, and the temperature in the range 0.1 to 10 eV.

*************************** VENUS RADAR MAPPER***************

SPACECRAFT COMMON NAME- VENUS RADAR MAPPER
ALTERNATE NAMES- VRM

NSSDC ID- VRM

LAUNCH DATE- 03/00/88 WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- VENUS ORBITER
ORBIT PERIOD- 222. MIN INCLINATION- 90. DEG
PERIAPSIS- 250. KM ALT APOAPSIS- 10300. KM ALT

PERSONNEL
MG - R. MILLS NASA HEADQUARTERS
SC - NONE ASSIGNED
PM - NONE ASSIGNED
PS - NONE ASSIGNED

BRIEF DESCRIPTION
The Venus Radar Mapper (VRM) is a low-cost mission developed by JPL. The science objectives are (1) to map more than 70% of Venus at resolutions equivalent to 1 km/line pair, or better; (2) to obtain 100-m vertical resolution altimeter data over as much of the planet as possible; and (3) make gravity field measurements over areas not covered by Pioneer Venus Orbiter. The spacecraft uses protoflight units from Voyager preflight testing. Electric power is supplied by two large solar panels that have 1 deg of freedom for their motion. The Synthetic Aperture Radar (SAR) electronics are contained between the bus portion of the spacecraft and a 3.7-m antenna. The interplanetary trajectory, which will be Type I, will bring the spacecraft to Venus in late July 1988. The nominal mission will last 243 days and will observe 360 deg of Venus longitude.

------- VENUS RADAR MAPPER, NONE ASSIGNED----------------------

INVESTIGATION NAME- SYNTHETIC APERATURE RADAR

NSSDC ID- VRM -01 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - NONE ASSIGNED

BRIEF DESCRIPTION
The VRM Synthetic Aperture Radar (SAR) is able to operate between altitudes of 1,900 and 250 km, with look angles ranging between 51 deg for the lowest altitudes and 24 deg for the maximum. Data can be taken from higher altitudes at the cost of reduced signal-to-noise ratio. The SAR is designed to map a long and narrow strip of Venus on every orbit. It does this by rotating so that the 3.7-m antenna points at the planet and then activates the SAR system when the spacecraft altitude falls below 1,900 km. A continuous swath of Venus images can be obtained and stored on a tape recorder. The SAR look angle constantly changes as the spacecraft moves toward periapsis. It continues mapping until the altitude again reaches 1,900 km and then stops. When a mapping pass is completed, the spacecraft points the antenna toward earth and transmits the image swath at a data rate of 250 kbps. When the data have been transmitted, the spacecraft is near the point where the next swath must be taken and the whole process is repeated. Swath overlap varies, but averages 5 km. Swath width ranges between 17 to 28 km. The SAR is built by Hughes using advanced SAR engineering techniques.

------- VENUS RADAR MAPPER, NONE ASSIGNED----------------------

INVESTIGATION NAME- ALTIMETER

NSSDC ID- VRM -02 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY

PERSONNEL
PI - NONE ASSIGNED

BRIEF DESCRIPTION
The objective of this investigation is to obtain 100-m vertical resolution altimeter data over as much of the planet as possible. The instrumentation for this investigation consists of standard NASA off-the-shelf components and electronics.

------- VENUS RADAR MAPPER, NONE ASSIGNED----------------------

INVESTIGATION NAME- GRAVITY FIELD MEASUREMENT

NSSDC ID- VRM -03 INVESTIGATIVE PROGRAM
CODE EL-4

INVESTIGATION DISCIPLINE(S)
GEODESY
PLANETOLOGY

PERSONNEL
PI - NONE ASSIGNED

BRIEF DESCRIPTION
The objective of this investigation is to make gravity field measurements over the surface of Venus above areas that were not covered by the Pioneer Venus Orbiter. The instrumentation for this investigation consists of standard NASA off-the-shelf components and electronics.

****************************** VIKING SWEDEN********************

SPACECRAFT COMMON NAME- VIKING SWEDEN
ALTERNATE NAMES- VIKING

NSSDC ID- VIKING

LAUNCH DATE- 05/00/84 WEIGHT- 270. KG
LAUNCH SITE- KOUROU (CENTRE SPATIAL GUYANAIS), FRANCE
LAUNCH VEHICLE- ARIANE

SPONSORING COUNTRY/AGENCY

SWEDEN	SBSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 530. MIN INCLINATION- 98.7 DEG
PERIAPSIS- 822. KM ALT APOAPSIS- 15000. KM ALT

PERSONNEL

PM - P.	ZETTERQUIST	SWEDISH SPACE CORP
PS - K.	FREDGA	SWEDISH SPACE SCI COMM

BRIEF DESCRIPTION

Viking Sweden, the first Swedish national satellite, is a polar-orbiting research satellite for exploration of magnetospheric phenomena which take place in the altitude range of 1-2 earth radii above the auroral zones. The objective of the mission is to investigate the interactions between the hot collisionless plasmas and the cold collisionless plasmas on auroral zone magnetic field lines and to relate these processes to the detailed auroral characteristics. To investigate these phenomena, Viking Sweden is instrumented for simultaneous in situ measurements of fields, particles, plasmas, and waves. In addition, an ultraviolet imager records the auroras. The payload instruments measure the following: the electrostatic vector field, the geomagnetic vector field, the cold plasma density, the hot plasma distribution function from 1 eV to 300 keV energy, the hot ion composition, all three components of electric waves of frequencies up to 500 kHz, magnetic waves of frequencies up to 10 kHz, and ultraviolet images of auroral forms. Coordinated observations from sounding rockets and with ground-based facilities such as EISCAT are expected to provide important complementary data. The Viking Sweden satellite is to be launched together with the French remote sensing satellite SPOT, a project in which Norway participates. Initially, Viking Sweden is placed in the same orbit as SPOT, but it is to be injected into its final orbit by means of a separate boost motor. Acquisition of telemetry data and operation of the satellite take place at the Esrange ground station (67 deg, 52 min, 35 s North latitude, 21 deg, 3 min, 49 s East longitude) with a 9-m S-band facility. Only real-time telemetry is used, and the experiments are operated only when the satellite is within view of Esrange. The data rate is 55 kbps. The main body of the spacecraft has a flat octagonal shape, 0.5 m high and with a diagonal of 1.8 m. For the wave and electric measurements there are three probe pairs, one axial probe pair 8 m tip-to-tip and two orthogonal radial pairs on wire booms 80 m tip-to-tip. There are also extendable booms for the magnetometer, and a loop antenna. The satellite is spin stabilized at 3 rpm, with the spin axis perpendicular to the orbit plane. The spin axis direction is controlled to within 5 deg, and is to be determined afterwards to better than 1 deg accuracy. Magnetic torquing is used for attitude and spin control, and thermal control is passive. An average power of 80 W is provided by 2.2 sq m of solar cells on the satellite body. Design lifetime is 8 months, although the lifetime in orbit will be far greater than that.

------- VIKING SWEDEN, ANGER-----------------------------------

INVESTIGATION NAME- ULTRAVIOLET AURORAL IMAGER

NSSDC ID- VIKING -01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL

PI - C.D.	ANGER	U OF CALGARY
CI - A.V.	JONES	HERZBERG INST OF ASTRO
CI - G.G.	SHEPHERD	YORK U
CI - A.L.	BROADFOOT	U OF SOUTHERN CALIF
CI - G.	GUSTAFSSON	KIRUNA GEOPHYS INST
CI - L.L.	COGGER	U OF CALGARY
CI - F.	CREUTZBERG	HERZBERG INST OF ASTRO
CI - R.L.	GATTINGER	HERZBERG INST OF ASTRO
CI - F.R.	HARRIS	HERZBERG INST OF ASTRO
CI - J.W.	HASLETT	U OF CALGARY
CI - E.J.	LLEWELLYN	U OF SASKATCHEWAN
CI - J.C.	MCCONNELL	YORK U
CI - D.J.	MCEWEN	U OF SASKATCHEWAN
CI - J.S.	MURPHREE	U OF CALGARY
CI - E.H.	RICHARDSON	DOMINION ASTROPHYS OBS
CI - G.	ROSTOKER	U OF ALBERTA
CI - D.	VENKATESAN	U OF CALGARY
CI - G.	WITT	U OF STOCKHOLM

BRIEF DESCRIPTION

The purpose of this investigation (V5) is to determine the state of substorm activity in the magnetosphere at the times during which the on-board particle and field detectors are measuring signatures worthy of study. The ultraviolet imager obtains images which show the pattern of auroral electron energy deposited in the ionosphere, viewed simultaneously over the entire auroral region and polar cap, in two wavelength regions. With an image repetition rate of once per min, or sometimes once every 20 s, the time history of this energy input can be followed as the satellite traverses the magnetospheric acceleration regions, and the foot of the field line passing through the satellite moves across the imaged ionospheric region. Images can be studied both individually and as movie sequences, thus yielding information on the detailed spatial and temporal structure of the aurora. Two optical emissions are measured, one from the atomic oxygen resonance line at 1304 A, the other from the N2 Lyman-Berge-Hopfield (LBH) bands in the 1400 - 1600 A region. The ratio of the intensities of these emissions depends on the O:N2 density ratio in the atmosphere and on the mean energy of the precipitating electrons. Detection of auroras should be possible even in the sunlit hemisphere due to the low intensity of backscattered ultraviolet light from the atmosphere. However, scattering of direct sunlight by the instrument will restrict somewhat the possibilities for viewing at the foot of the spacecraft field lines in the midnight auroral zone. The instrument is designed to obtain images with a ground resolution of better than 50 km. Reflecting optics are used to form a 25 x 20 deg image on an image intensifier which is coupled to a CCD array image detector by means of fiber optics. The line of sight of the instrument is perpendicular to the spin axis, and consequently the image of a fixed point on the earth moves across the detector at a rate depending on the spin period. The signal charges on a CCD imager are normally read out by shifting rows of charges until they reach the edge of the detector. In this instrument, the clock rate which determines the movement of the charges is adjusted so that the motion remains in step with the movement of the image. In this way an exposure time of about 1 s can be attained despite the rotation of the spacecraft. Two almost identical cameras are used. One has a calcium fluoride filter with a potassium bromide photo-cathode which results in a pass band from 1250 to approximately 1600 A. For the other, the outer filter is barium fluoride and the photo-cathode is of cesium iodide, which together gives a pass band from 1350 to 1900 A. Exposure sequence control, data transfer to telemetry, and housekeeping functions are carried out by a special purpose bit-slice microcomputer. The electronics are designed to provide complete flexibility as to the size and shape of the telemetered image, and the type of averaging carried out on the pixels during readout, so that the optimum choice can be made as to image size, spectral resolution, and temporal resolution in using the available telemetry bandwidth at a particular time. Control of the exposure time and sequencing is done entirely through clocking the CCD array, using reference pulses from the earth-limb sensor on the spacecraft. No mechanical shutter is employed.

------- VIKING SWEDEN, BAHNSEN---------------------------------

INVESTIGATION NAME- HIGH FREQUENCY WAVE EXPERIMENT

NSSDC ID- VIKING -02 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
ATMOSPHERIC PHYSICS
IONOSPHERES AND RADIO PHYSICS

PERSONNEL

PI - A.	BAHNSEN	DANISH SPACE RES INST
CI - M.	JESPERSEN	DANISH SPACE RES INST
CI - E.	UNGSTRUP	DANISH SPACE RES INST
CI - B.	HOLBACK	UPPSALA IONOSPHER OBS
CI - R.E.	GENDRIN	CNET
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS

BRIEF DESCRIPTION

The wave instrument (V4) is divided into two parts, one for high frequencies (V4H) and one for low (V4L). Although the investigation is divided into two parts, these are closely related as many components of the instrument are common, such as sensors, the micro-processor, differential amplifiers, etc. The objectives of this investigation are to gather information about plasma instabilities and wave-particle interactions, and to measure the plasma density and electron temperature. This part (V4H) of the investigation is designed to cover the frequency range 4 to 500 kHz. It uses the same probes (on two 40-m booms) as V1 (VIKING -04) to measure the ac electric field in the 10- to 500-kHz range. V4H measures simultaneously the amplitudes of one electric (Ey or Ez) and one magnetic (Bx) field component as functions of frequency in the range 4 to 500 kHz. It is possible to switch between Ey and Ez up to 15 times per spin, thus providing measurements in two orthogonal directions, but this comparative measurement is limited to frequencies below 200 kHz, as the Ez sensor has this frequency limitation. The magnetic field sensor is an air-core loop antenna with an area of 0.1 sq m, mounted on a 2-m boom with the loop axis parallel to the spacecraft spin axis, and it measures the spin-independent magnetic field component Bx. The field strength is measured by two methods that operate in parallel. In one method the magnetic field sensor and one of the electric field sensors are each connected to a filterbank having 8 frequency channels, and all 16 filters are sampled within 37.5 ms. The other method employs a stepped frequency analyzer (SFA) with two channels, one for the magnetic component and one for an electric component. In each channel the signal amplitude within the same narrow frequency band is measured. The band can be stepped through the whole or part of the range 10 to 500 kHz. The frequency stepping is controlled by the micro-processor. The whole range is covered in 256 steps, which takes 1.2 s in fast mode (one sample per step). Two "active" experiments (a resonance sounder at SFA frequencies, and a mutual impedance measurement) will also be operated approximately 10% of the time. The resonance sounder operates by exciting the plasma (using two 38-m booms) with a strong alternating electric field at a frequency that is swept through the high frequency range. Resonances occur as the frequency sweep passes the characteristic plasma frequencies, resulting in strong signals on the electric sensors connected to the SFA. In this way the electron gyro, plasma, and upper hybrid frequencies can be determined with good precision (a few percent). By coupling the signal to the DFT spectrum analyzer of V4L (VIKING -03) approximately 10 times higher precision is obtained. The mutual impedance measurement of the plasma density is performed by emitting a rather weak alternating current (using electrostatic probes on two 2-m booms) and measuring the voltage on the electric sensors. In particular, the electron plasma frequency appears as a large variation in the impedance around this frequency. The shape of the impedance variation may be analyzed in terms of the Debye length, giving information about the electron temperature. The measurement range for the electron density is 1 to 3000 per cu cm, and for the electron temperature, 0.5 to 50 eV at apogee. The magnetic field threshold level is 3E-15 T per (Hz**0.5), and the electric field threshold level is 3E-8 V/m per (Hz**0.5).

------- VIKING SWEDEN, BLOCK-----------------------------------

INVESTIGATION NAME- VECTOR ELECTRIC FIELD EXPERIMENT

NSSDC ID- VIKING -04 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.P.	BLOCK	ROYAL INST OF TECH
CI - C.G.	FALTHAMMAR	ROYAL INST OF TECH
CI - F.S.	MOZER	U OF CALIF, BERKELEY
CI - A.	PEDERSEN	ESA-ESTEC

BRIEF DESCRIPTION

The purpose of this investigation (V1) is to measure the quasi-static electric field vector, and to use swept electric field probes for plasma density measurements. The instrument measures potential differences between probes on booms extending in different directions from the spacecraft. The probes do not normally assume the same potential as the surrounding plasma, but they can be operated in such a way that the probe-plasma potential drops are accurately accounted for, even when their exact values are unknown. The instrument is controlled by a micro-processor. There are two pairs of orthogonal radial probes, each pair consisting of a probe at the end of each of two 40-m wire booms (80 m tip-to-tip). These wire booms are extended in the spin plane and are kept straight by centrifugal force. Two 4-m stiff booms extending along the spin axis carry the two axial probes. Thus, there are three orthogonal probe pairs which measure three vector components. Each probe is a sphere of 10 cm diameter, and each has adjacent electrodes (guard, inner tip, and outer tip) to minimize measurement errors; the lengths of these electrodes are 50, 150, and 15 cm, respectively, for the radial probes. For the axial probes, all three electrodes are 10 cm long. The accuracy of the measurements depends critically on the probe guard and tip potentials relative to the surrounding plasma potential. For negative potential, probe current is essentially saturated to the photo-emission current carried by electrons leaving the probe; the plasma ion current is negligible in comparison. At several volts positive potential, there is again almost saturation current when all plasma electrons arriving in the vicinity are attracted and caught by the positive probe. The probes will be electronicly biased, with currents that are as equal as possible, to an operating point on the probe characteristic which is midway between these two saturation regions, and where the dynamic conductance dI/dV is nearly maximum. To find the desired operating point, one probe will be subjected to a current pulse sweep with simultaneous measurement of the probe-satellite voltage for each pulse, so that the probe characteristic corresponding to the ambient plasma conditions is obtained. The bias current for the following electric field measurements will then be automatically kept at the operating point current until the next current pulse sweep is initiated. This sequence is called the Langmuir mode, and the electron temperature and density can be calculated from the probe characteristic. The electron density is measured more accurately and with better time resolution by the V4L experiment (VIKING -03) than by this experiment. Therefore, this experiment mode is normally employed only once every few minutes, or even less frequently. The whole sequence of current pulses takes a few hundred milliseconds. During the strongest current pulses, when plasma electron saturation current is obtained, the satellite potential will be driven to perhaps 10 to 50 V negative. That will cause some easily identifiable disturbances for the low energy particle experiments. Each electric field component in the spin plane can be measured in the range 0.05 to 400 mV/m, with accuracy of 0.2 mV/m for fields stronger than 50 mV/m and 0.025 mV/m for weaker fields. For the axial component, the range is 0.5 to 4000 mV/m, with accuracy of 2 mV/m for fields stronger than 500 mV/m, and 0.25 mV/m for weaker fields. The sampling rate for each of the components is 53 Hz in normal mode and 106 Hz in fast mode. The probes are shared with the V4 instrument (VIKING -02 and -03), which will process the ac signals with frequencies greater than 1 Hz. The V1 dc and V4 ac measurements can be made simultaneously, but when V4 is using one of the radial probes it cannot then be used for electric field measurements.

------- VIKING SWEDEN, HOLBACK-----------------------------------

INVESTIGATION NAME- LOW FREQUENCY WAVE EXPERIMENT

NSSDC ID- VIKING -03 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - B.	HOLBACK	UPPSALA IONOSPHER OBS
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS
CI - G.	HOLMGREN	UPPSALA IONOSPHER OBS
CI - H.	KOSKINEN	UPPSALA IONOSPHER OBS
CI - A.	BAHNSEN	DANISH SPACE RES INST
CI - M.	JESPERSEN	DANISH SPACE RES INST
CI - E.	UNGSTRUP	DANISH SPACE RES INST
CI - M.C.	KELLEY	CORNELL U
CI - P.M.	KINTNER	CORNELL U
CI - A.	PEDERSEN	ESA-ESTEC

BRIEF DESCRIPTION

The wave instrument (V4) is divided into two parts, one for high frequencies (V4H) and one for low (V4L). Although the investigation is divided into two parts, these are closely related as many components of the instrument are common, such as sensors, the micro-processor, differential amplifiers, etc. The objectives of this investigation are to gather information about plasma instabilities and wave-particle interactions, and to measure the plasma density and electron temperature. This part (V4L) of the investigation is designed to cover the frequency range 0 to 15 kHz. Two instruments are used, a wave analyzer and a plasma density instrument. The wave analyzer treats the data in three branches: (1) the discrete Fourier transform (DFT) analyzer, operating in the range 0 to 15.6 kHz, giving power spectra in 256 points; (2) the filterbank, with 3 broadband filters covering 200 Hz to 3.5 kHz which are sampled every telemetry frame (18.75 ms); and (3) the wave form (WF) branch for frequencies below 200 Hz, where two wave signals are sampled and transmitted with a bandwidth of 214 Hz or, alternatively, 428 Hz. The DFT performs power spectrum analysis of one wave signal at a time. There are six different signals that can be analyzed, and the selection is controlled by the experiment controller, which can be commanded from the ground. In a special mode the DFT is used to analyze the data from the SFA part of V4H (VIKING -02). This is possible as the higher frequencies are first mixed to lower frequencies which fit the frequency range of the DFT. The spectrum analysis of the DFT then gives a factor of 10 better frequency resolution than what is achieved originally by the SFA. The plasma density instrument consists of two independent units with probes and electronics that can be operated separately or in parallel. The probes, which are mounted on two 40-m booms, are shared with the V1 instrument (VIKING -04). When operated in the density mode, i.e., at low input impedance, the probes are biased positively and thus work on the saturation portion of the current-voltage probe characteristic. To avoid problems caused by a varying spacecraft potential, the bias voltage is referred to the electric field probes which are part of the V1 experiment (VIKING -04). The quantity of interest for the wave measurements is the relative fluctuation of the electron density. In addition to the relative current fluctuations, the dc level is measured, which is used to calculate the total plasma density. The data from the resonance sounder part of V4H (VIKING -02) will be used for calibration of the density probe measurement.

------- VIKING SWEDEN, LUNDIN-----------------------------------

INVESTIGATION NAME- HOT PLASMA EXPERIMENT

NSSDC ID- VIKING -05 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.	LUNDIN	KIRUNA GEOPHYS INST
CI - L.	ELIASSON	KIRUNA GEOPHYS INST
CI - I.	SANDAHL	KIRUNA GEOPHYS INST
CI - F.	SORAAS	U OF BERGEN
CI - W.	STUDEMANN	MPI-AERONOMY
CI - B.	WILKEN	MPI-AERONOMY
CI - J.B.	BLAKE	AEROSPACE CORP
CI - J.F.	FENNELL	AEROSPACE CORP
CI - D.A.	BRYANT	RUTHERFORD/APPLTON LAB
CI - T.A.	FRITZ	LOS ALAMOS NAT LAB
CI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - A.	KORTH	MPI-AERONOMY
CI - J.B.	REAGAN	LOCKHEED PALO ALTO
CI - R.D.	SHARP	LOCKHEED PALO ALTO

BRIEF DESCRIPTION

The objectives of this investigation (V3) are (1) to study the magnetic field-aligned acceleration mechanisms associated with discrete aurora; (2) to measure the energy input and output from the ionosphere due to charged particles; (3) to identify the charge carriers in the field-aligned (Birkeland) currents; (4) to study the escape processes for upward flowing ion events and their atmospheric implications; (5) to study the bulk motion, including convection, of low energy ions (1 to 10 keV); (6) to study the solar wind versus the ionospheric contribution to the hot magnetospheric plasma during various magnetospheric disturbance levels; and (7) to study various morphological features of the hot magnetospheric plasma. This large plasma experiment, utilizing 7 sensor units, is subdivided into three categories: the low energy particle spectrometers (LEPS), the ion composition spectrometers (ICS), and the high energy magnetospheric ion composition spectrometers (MICS/V). The LEPS measures (1) the energy spectrum of electrons from 10 eV to 40 keV with (delta E)/E of 0.05; (2) the pitch angle distribution of electrons from 0.1 to 300 keV with 2-deg resolution; (3) the energy spectrum and pitch angle distribution of positive ions in the range 40 eV to 40 keV with (delta E)/E < 0.08 and angular resolution of 6 deg; and (4) the three-dimensional distribution function of positive ions from 1 eV to 10 keV for determining possible directional flow velocities down to 1 km/s. For the LEPS unit, 8 spectrometers are used, with channeltrons, (or channelplates) for sensor elements. The ICS fulfills these main functions: (1) provides detailed composition measurements of positive ions in the energy range 0.01 to 70 keV/Q and mass per unit charge range 0.7 to 150 u/Q; (2) identifies and separates the minor constituents 3 He 2+, 16 O 6+, and 16 C 3+ from the major constituents H+, 4 He 2+, 4 He+, and 16 O+ in the energy range 0.01 to 15 keV; (3) provides complete mass separation of the major constituents up to 70 keV; and (4) provides pitch angle and energy distribution function measurements of the major ion constituents H+, 4 He 2+, 4 He+, and O+ in the energy range 50 eV to 20 keV within half a spin period. Three spectrometers are used for the ICS measurements, all with toroidal-shaped electrostatic analyzers placed in front of crossed field velocity analyzers. The MICS/V fulfills the following functions: (1) determines the composition of magnetospheric ions over the energy range from 10 keV/Q to 10 MeV/Q and mass range 1 to 56 u; (2) identifies and separates most of the "rare" magnetospheric ions constituents including isotopic identification of 3 He and 4 He, and makes separate carbon, nitrogen, and oxygen measurements at various charge states within the given energy range; and (4) provides pitch angle and energy distribution function measurements of the major ion constituents in the energy range 10 keV to 10 MeV within half a spin period. This instrument combines an electrostatic analyzer (ESA), time-of-flight (TOF) measurement, residual energy sensors (solid state detectors), and a heavy ion telescope (HIT). The ESA/TOF goes up to 300 keV/Q, and the HIT provides composition measurements of positive ions from 400 keV/nucleon to 10 MeV/nucleon using a dE/dx and E measuring technique. The field of view of the ESA/TOF is 2 x 2 deg, and that of the HIT is 20 deg, FWHM. Cycle times are 1.2 to 4.8 s for the ESA/TOF and 0.6 s for the HIT.

------- VIKING SWEDEN, POTEMRA---------------------------------

INVESTIGATION NAME- MAGNETIC FIELD EXPERIMENT

NSSDC ID- VIKING -06   INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - T.A.	POTEMRA	APPLIED PHYSICS LAB
CI - R.	BOSTROM	UPPSALA IONOSPHER OBS
CI - G.	GUSTAFSSON	KIRUNA GEOPHYS INST
CI - M.H.	ACUNA	NASA-GSFC
CI - D.P.	STERN	NASA-GSFC
CI - M.	SUGIURA	NASA-GSFC
CI - L.	ZANETTI	APPLIED PHYSICS LAB
CI - A.	BYTHROW	APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The objectives of this investigation are to measure the characteristics of field-aligned (Birkeland) currents, to measure plasma waves and turbulence, to identify localized instabilities and plasma processes, and to provide the local magnetic field reference frame for other experiments on board. The instrument is a single wide-range triaxial fluxgate magnetometer mounted remotely from the spacecraft on a deployable boom. There are four dynamic ranges, which are switched automatically. The ranges (both positive and negative) and resolutions are 1024 nT with 0.125 nT resolution; 4096 nT with 0.5 nT resolution; 16384 nT with 2 nT resolution; and 65,536 nT with 8 nT resolution. The sampling rate is such that 53.3 complete vector samples are obtained per second. ULF waves with frequencies up to 26 Hz are also measured.

*************************** X-RAY TIMING EXPLORER************

SPACECRAFT COMMON NAME- X-RAY TIMING EXPLORER
ALTERNATE NAMES- XTE

NSSDC ID- XTE

LAUNCH DATE- 08/00/89   WEIGHT- KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SHUTTLE

SPONSORING COUNTRY/AGENCY
UNITED STATES   NASA-OSSA

PLANNED ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 92.6 MIN   INCLINATION- 28.5 DEG
PERIAPSIS- 409. KM ALT   APOAPSIS- 409. KM ALT

PERSONNEL

MG - D.	WRUBLIK	NASA HEADQUARTERS
SC - L.	KALUZIENSKI	NASA HEADQUARTERS
PM - W.D.	HIBBARD	NASA-GSFC
PS - S.S.	HOLT	NASA-GSFC

BRIEF DESCRIPTION

X-ray Timing Explorer (XTE) is an Explorer S/C planned to carry three X-ray instruments into orbit to make observations of variable X-ray stellar sources. Emissions in the range 15 to 200 keV are observed with time scales of microseconds to years. The S/C can point a large area proportional counter (LAPC) and a high energy scintillator array (HESA) at any desired target to an accuracy of 0.1 deg. In addition, an all sky monitor (ASM) observes the entire sky once per orbit to provide near-continuous observations of all sources and to alert the narrow-field instruments to fortuitous transient X-ray phenomena.

------- X-RAY TIMING EXPLORER, BRADT---------------------------

INVESTIGATION NAME- X-RAY SKY MONITOR

NSSDC ID- XTE -01   INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - H.V.	BRADT	MASS INST OF TECH
PI - S.S.	HOLT	NASA-GSFC
OI - J.E.	MCCLINTOCK	MASS INST OF TECH
OI - C.R.	CANIZARES	MASS INST OF TECH
OI - J.H.	SWANK	NASA-GSFC
OI - F.E.	MARSHALL	NASA-GSFC

BRIEF DESCRIPTION

The ASM provides all-sky X-ray coverage, to a sensitivity of a few percent of the Crab Nebula intensity in one day, in order to provide both flare alarms and long-term intensity records of celestial X-ray sources.

------- X-RAY TIMING EXPLORER, HOLT----------------------------

INVESTIGATION NAME- LARGE AREA X-RAY PROPORTIONAL COUNTER

NSSDC ID- XTE -02   INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - S.S.	HOLT	NASA-GSFC
PI - H.V.	BRADT	MASS INST OF TECH
OI - J.H.	SWANK	NASA-GSFC
OI - F.E.	MARSHALL	NASA-GSFC
OI - C.R.	CANIZARES	MASS INST OF TECH
OI - J.E.	MCCLINTOCK	MASS INST OF TECH

BRIEF DESCRIPTION

The LAPC provides approximately 1 sq m of net X-ray detector area, in the energy range 2 to 60 keV, for the study of temporal/spectral effects in the X-ray emission from galactic and extragalactic sources.

------- X-RAY TIMING EXPLORER, ROTHSCHILD ----------------------

INVESTIGATION NAME- HARD X-RAY SCINTILLATOR ARRAY

NSSDC ID- XTE -03

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
X-RAY ASTRONOMY

PERSONNEL

PI - R.E.	ROTHSCHILD	U OF CALIF, SAN DIEGO
OI - R.M.	PELLING	U OF CALIF, SAN DIEGO
OI - D.E.	GRUBER	U OF CALIF, SAN DIEGO
OI - J.L.	MATTESON	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION

The HESA studies the temporal and temporal/spectral effects of the hard X-ray (20 to 200 keV) emission from galactic and extragalactic sources.

4

INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

4. INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS

This index contains the names of all spacecraft and experiments that were either active sometime between June 1, 1981, and May 31, 1983, or planned as of May 31, 1983. The spacecraft are listed alphabetically by both common name and alternate names. The alternate names are printed with a reference to the NSSDC spacecraft common name. Next to the NSSDC spacecraft common name are the sponsoring country and agency, actual or projected launch date, orbit type, NSSDC ID code, and the current status. The current status includes the epoch date, operating status, and data rate of all launched spacecraft and experiments. The epoch date indicates when a particular operating status and data rate were reached. Some experiments may be included in this publication which have a status of inoperable with an epoch data earlier than June 1, 1981 because this status information was not known by NSSDC when the last report was published. For prelaunch spacecraft, only the overall mission status is shown; there is no status information shown for prelaunch spacecraft experiments. An explanation of the terms used in these columns may be found in Appendix C. The experiments are listed following the associated spacecraft common name or planned Space Shuttle onboard experiment package common name and are ordered alphabetically by the principal investigator's, lead investigator's, or team leader's last name. The experiment name, NSSDC ID code, and current status are also given for each experiment. Finally, each name is followed by a page number referencing the description of the spacecraft or experiment found in this report.

INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
BY SPACECRAFT NAMES AND PRINCIPAL INVESTIGATOR

INDEX OF ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
BY SPACECRAFT NAMES AND PRINCIPAL INVESTIGATOR

SPACECRAFT NAME / PRINC. INVEST. NAME	COUNTRY AND AGENCY / EXPERIMENT NAME		LAUNCH DATE	ORBIT TYPE	NSSDC ID	EPOCH MMDDYY	STATUS	DATA RATE	PAGE NO.
SAGALYN	IONOSPHERIC/SCINTILLATION MONITOR (SSI/ES)				DMSPF10-03				120
DMSP 5D-2/F6	UNITED STATES	DOD-USAF	12/21/82	GEOCENTRIC	82-118A	12/21/82	NORMAL	STND	17
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)				82-118A-01	12/25/82	NORMAL	STND	17
AFGWC STAFF	VERTICAL TEMPERATURE PROFILE RADIOMETER (SSH-2)				82-118A-02	12/27/82	INOPERABLE	ZERO	17
KOLASINSKY	SCANNING X-RAY SPECTROMETER (SSB/A)				82-118A-03	12/24/82	NORMAL	STND	17
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)				82-118A-05	12/28/82	NORMAL	STND	18
SAGALYN	IONOSPHERIC PLASMA MONITOR (SSI/E)				82-118A-04	12/28/82	NORMAL	STND	18
DMSP 5D-2/F7	UNITED STATES	DOD-USAF		GEOCENTRIC	DMSP-F7		APPROVED MISSION		120
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)				DMSP-F7-01				120
AFGWC STAFF	VERTICAL TEMPERATURE PROFILE RADIOMETER (SSH-2)				DMSP-F7-02				121
AFGWC STAFF	MICROWAVE TEMPERATURE SOUNDER (SSM/T)				DMSP-F7-03				121
AFGWC STAFF	MAGNETOMETER (SSM)				DMSP-F7-06				121
AFGWC STAFF	SPACE RADIATION DOSIMETER (SSJ*)				DMSP-F7-07				121
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)				DMSP-F7-05				121
SAGALYN	IONOSPHERIC PLASMA MONITOR (SSI/E)				DMSP-F7-04				121
DMSP 5D-2/F8	UNITED STATES	DOD-USAF		GEOCENTRIC	DMSP-F8		APPROVED MISSION		121
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)				DMSP-F8-01				122
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)				DMSP-F8-03				122
SAGALYN	IONOSPHERIC/SCINTILLATION MONITOR (SSI/ES)				DMSP-F8-02				122
DMSP 5D-2/F9	UNITED STATES	DOD-USAF		GEOCENTRIC	DMSP-F9		APPROVED MISSION		122
AFGWC STAFF	OPERATIONAL LINESCAN SYSTEM (OLS)				DMSP-F9-01				123
AFGWC STAFF	MICROWAVE TEMPERATURE SOUNDER (SSM/T)				DMSP-F9-02				123
AFGWC STAFF	MICROWAVE IMAGER (SSM/I)				DMSP-F9-05				123
ROTHWELL	PRECIPITATING ELECTRON/ION SPECTROMETER (SSJ/4)				DMSP-F9-04				123
SAGALYN	IONOSPHERIC/SCINTILLATION MONITOR (SSI/ES)				DMSP-F9-03				123
DMSP 5D-2/S10	SEE DMSP 5D-2/F10								
DMSP 5D-2/S6	SEE DMSP 5D-2/F6								
DMSP 5D-2/S7	SEE DMSP 5D-2/F7								
DMSP 5D-2/S8	SEE DMSP 5D-2/F8								
DMSP 5D-2/S9	SEE DMSP 5D-2/F9								
DMSP BLOCK 5D-1	SEE DMSP 5D-1/F3								
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F6								
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F7								
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F8								
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F9								
DMSP BLOCK 5D-2	SEE DMSP 5D-2/F10								
DMSP-F10	SEE DMSP 5D-2/F10								
DMSP-F3	SEE DMSP 5D-1/F3								
DMSP-F6	SEE DMSP 5D-2/F6								
DMSP-F7	SEE DMSP 5D-2/F7								
DMSP-F8	SEE DMSP 5D-2/F8								
DMSP-F9	SEE DMSP 5D-2/F9								
DMSP5D1	SEE DMSP 5D-1/F3								
DYNAMICS EXPLORER 1	UNITED STATES	NASA-OSSA	08/03/81	GEOCENTRIC	81-070A	08/03/81	NORMAL	STND	18
BURCH	HIGH ALTITUDE PLASMA INSTRUMENT				81-070A-05	12/01/81	INOPERABLE	ZERO	18
CHAPPELL	RETARDING ION MASS SPECTROMETER				81-070A-04	08/09/81	PARTIAL	STND	18
FRANK	GLOBAL AURORAL IMAGING AT VISIBLE AND ULTRAVIOLET WAVELENGTHS				81-070A-03	09/14/81	NORMAL	STND	19
HELLIWELL	CONTROLLED AND NATURALLY OCCURING WAVE PARTICLE INTERACTIONS				81-070A-08	08/03/81	NA	NA	19
MAGGS	AURORAL PHYSICS				81-070A-07	08/03/81	NA	NA	19
SHAWHAN	PLASMA WAVES				81-070A-02	09/13/81	NORMAL	STND	19
SHELLEY	HOT PLASMA COMPOSITION				81-070A-06	08/13/81	NORMAL	STND	20
SUGIURA	MAGNETIC FIELD OBSERVATIONS				81-070A-01	08/24/81	NORMAL	STND	20

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EXPLORER 50	SEE IMP-J							
EXTREME UV EXPLORER	SEE EUVE							
GALILEO	SEE GALILEO PROBE							
GALILEO	SEE GALILEO ORBITER							
GALILEO ORBITER	UNITED STATES NASA-OSSA	05/30/86	JUPITER ORBITER	JOPO		APPROVED MISSION		126
ANDERSON	GRAVITY, CELESTIAL MECHANICS AND RADIO PROPAGATION			JOPO -11				126
BELTON	IMAGING SCIENCE			JOPO -10				126
CARLSON	NEAR INFRARED MAPPING SPECTROSCOPY (NIMS)			JOPO -01				126
FANALE	FORMATION AND EVOLUTION OF THE GALILEAN SATELLITES (IDS)			JOPO -12				127
FRANK	PLASMA (PLS)			JOPO -04				127
GIERASCH	JOVIAN ATMOSPHERIC DYNAMICS (IDS)			JOPO -13				127
GRUEN	DUST (DDS)			JOPO -09				127
GURNETT	PLASMA WAVE (PWS)			JOPO -07				127
HANSEN	PHOTOPOLARIMETERY/RADIOMETER (PPR)			JOPO -08				127
HORD	ULTRAVIOLET SPECTROSCOPY (UVS)			JOPO -02				128
HOWARD	RADIO PROPAGATION			JOPO -27				128
HUNTEN	STRUCTURE + AERONOMY OF THE ATMOSPHERES OF JUPITER AND ITS SATELLITES (IDS)			JOPO -14				128
KIVELSON	MAGNETOMETER (MAG)			JOPO -03				128
MASURSKY	GEOLOGY OF THE GALILEAN SATELLITES (IDS)			JOPO -15				128
MCELROY	INVESTIGATION OF JOVIAN UPPER ATMOSPHERE AND OF SATELLITE ATMOSPHERES (IDS)			JOPO -16				128
MORRISON	JOVIAN ATMOSPHERIC STUDIES (IDS)			JOPO -25				128
ORTON	GROUND-TRUTH ANALYSIS OF RADIATIVE-TRANSFER IN ATMOSPHERE OF JUPITER (IDS)			JOPO -17				129
OWEN	COMPOSITION OF THE JOVIAN ATMOSPHERE (IDS)			JOPO -18				129
POLLACK	THERMAL AND DYNAMICAL PROPERTIES OF THE JOVIAN ATMOSPHERE (IDS)			JOPO -19				129
RUSSELL	JUPITER MAGNETOSPHERE AND SATELLITE MAGNETOSPHERE INTERACTIONS (IDS)			JOPO -20				129
SAGAN	ORGANIC CHEMISTRY OF THE JOVIAN ATMOSPHERE (IDS)			JOPO -21				129
SCARF	WAVE-PARTICLE INTERACTION PHENOMENA AT JUPITER (IDS)			JOPO -22				129
SCHUBERT	JOVIAN ATMOSPHERIC STRUCTURE AND CIRCULATION (IDS)			JOPO -23				129
SONETT	GALILEAN SATELLITE MAGNETIC PROPERTIES + JOVIAN MAGNETOSPHERE INTERACTION (IDS)			JOPO -24				129
VAN ALLEN	DYNAMICS ENERGETIC PARTICLES, ROLE OF GALILEAN SATELLITES			JOPO -26				129
WILLIAMS	ENERGETIC PARTICLES-ORBITER (EPD)			JOPO -06				130
GALILEO PROBE	UNITED STATES NASA-OSSA	05/30/86	JUPITER PROBE	JOP		APPROVED MISSION		130
BOESE	NET FLUX RADIOMETER (NFR)			JOP -04				130
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RAGENT	NEPHELOMETRY (NEP)			JOP -05				131
SIEFF	ATMOSPHERIC STRUCTURE (ASI)			JOP -02				131
VON ZAHN	HELIUM ABUNDANCE (HAD)			JOP -01				131
GAMMA-RAY OBSERVATORY	UNITED STATES NASA-OSSA	05/00/88	GEOCENTRIC	GRO		APPROVED MISSION		131
FICHTEL	HIGH-ENERGY GAMMA-RAY TELESCOPE			GRO -04				131
FISHMAN	TRANSIENT-EVENT MONITOR			GRO -05				132
KURFESS	SCINTILLATION SPECTROMETER			GRO -02				132
SCHONFELDER	IMAGING COMPTON TELESCOPE			GRO -03				132
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GEOMAGNETIC TAIL LAB.	SEE OPEN/GTL							
GEOPOTENTIAL RES MISS-A1	SEE GRM-A1							
GEOPOTENTIAL RES MISS-A2	SEE GRM-A2							
GEOS 3	UNITED STATES NASA-OSSA	04/09/75	GEOCENTRIC	75-027A	04/09/75	NORMAL	STND	27
ANDERLE	US NAVY DOPPLER SYSTEM			75-027A-05	12/01/78	PARTIAL	SUBS	27
JACKSON	C-BAND SYSTEM			75-027A-03	12/01/78	PARTIAL	SUBS	27
PURDY	RADAR ALTIMETER SYSTEM			75-027A-01	12/01/78	PARTIAL	ZERO	27
SALZBERG	S-BAND TRACKING SYSTEM			75-027A-02	12/01/78	PARTIAL	STND	28
STEPHANIDES	LASER TRACKING REFLECTOR			75-027A-04	04/09/75	NORMAL	STND	28
GEOS-C	SEE GEOS 3							
GEOSTATION.METEORO.SAT.2	SEE GMS-2							
GEOSTATION.METEOROL.SAT.	SEE GMS							

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GIOTTO	INTERNATIONAL	ESA	07/15/85	HELIOCENTRIC	GIOTTO		APPROVED MISSION		132
BALSIGER	ION MASS SPECTROMETER (IMS)				GIOTTO -03				132
JOHNSTONE	COMETARY PLASMA ION MASS AND ENERGY PER CHARGE ANALYZERS				GIOTTO -05				133
KELLER	HALLEY NUCLEUS IMAGING (HMC)				GIOTTO -01				133
KISSEL	DUST IMPACT MASS SPECTROMETER (PIA)				GIOTTO -04				133
KRANKOWSKY	NEUTRAL MASS SPECTROMETER (NMS)				GIOTTO -02				134
LEVASSEUR-REGOURD	HALLEY OPTICAL PROBE (HOPE)				GIOTTO -09				134
MCDONNELL	DUST IMPACT DETECTOR (DID)				GIOTTO -08				134
MCKENNA-LAWLOR	ENERGETIC PARTICLES ONSET ADMONITOR (EPONA)				GIOTTO -10				134
NEUBAUER	MAGNETOMETER (MAG)				GIOTTO -07				135
REME	ELECTRON ESA AND POSITIVE ION CLUSTER COMPOSITION ANALYZER (RPA)				GIOTTO -06				135
GMS	JAPAN	NASDA	07/14/77	GEOCENTRIC	77-065A	08/15/77	NORMAL	STND	28
	UNITED STATES	NASA-OSSA							
JMA STAFF	VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)				77-065A-01	12/00/82	PARTIAL	STND	28
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				77-065A-03	12/00/82	PARTIAL	STND	29
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				77-065A-02	12/00/82	PARTIAL	STND	29
GMS-2	JAPAN	NASDA	08/10/81	GEOCENTRIC	81-076A	12/01/81	NORMAL	STND	29
JMA STAFF	VISIBLE AND INFRARED SPIN-SCAN RADIOMETER (VISSR)				81-076A-01	12/01/81	NORMAL	STND	29
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				81-076A-03	12/01/81	NORMAL	STND	29
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				81-076A-02	12/01/81	NORMAL	STND	29
GMS-3	JAPAN	NASDA	03/00/84	GEOCENTRIC	GMS-3		APPROVED MISSION		135
JMA STAFF	VISIBLE AND INFRARED SPIN-SPAN RADIOMETER (VISSR)				GMS-3 -01				135
JMA STAFF	WEATHER COMMUNICATIONS FACILITY				GMS-3 -03				135
KOHNO	SPACE ENVIRONMENT MONITOR (SEM)				GMS-3 -02				135
GOES 1	UNITED STATES	NOAA-NESS	10/16/75	GEOCENTRIC	75-100A	06/18/80	NORMAL	SUBS	29
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				75-100A-02	06/01/78	PARTIAL	ZERO	30
LEINBACH	SOLAR X-RAY MONITOR				75-100A-03	06/01/78	NORMAL	ZERO	30
LEINBACH	MAGNETIC FIELD MONITOR				75-100A-04	06/18/80	NORMAL	ZERO	30
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)				75-100A-01	06/30/79	PARTIAL	SUBS	30
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				75-100A-05	11/30/79	NORMAL	ZERO	30
GOES 2	UNITED STATES	NOAA-NESS	06/16/77	GEOCENTRIC	77-048A	06/16/77	NORMAL	STND	30
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				77-048A-02	07/20/77	NORMAL	STND	31
LEINBACH	SOLAR X-RAY MONITOR				77-048A-03	07/20/77	NORMAL	STND	31
LEINBACH	MAGNETIC FIELD MONITOR				77-048A-04	04/24/82	PARTIAL	SUBS	31
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				77-048A-05	10/04/79	NORMAL	STND	31
GOES 3	UNITED STATES	NOAA-NESS	06/16/78	GEOCENTRIC	78-062A	08/14/79	NORMAL	STND	31
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				78-062A-02	07/13/78	NORMAL	STND	32
LEINBACH	SOLAR X-RAY MONITOR				78-062A-03	07/13/78	NORMAL	STND	32
LEINBACH	MAGNETIC FIELD MONITOR				78-062A-04	07/13/78	NORMAL	STND	32
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER (VISSR)				78-062A-01	03/05/81	INOPERABLE	ZERO	32
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				78-062A-05	07/13/78	NORMAL	STND	32
GOES 4	UNITED STATES	NOAA-NESS	09/09/80	GEOCENTRIC	80-074A	09/10/80	NORMAL	STND	32
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				80-074A-02	12/15/80	PARTIAL	SUBS	33
LEINBACH	SOLAR X-RAY MONITOR				80-074A-03	09/10/80	NORMAL	STND	33
LEINBACH	MAGNETIC FIELD MONITOR				80-074A-04	04/23/82	INOPERABLE	ZERO	33
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				80-074A-01	11/26/82	INOPERABLE	ZERO	33
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				80-074A-05	09/27/80	NORMAL	STND	33
GOES 5	UNITED STATES	NOAA-NESS	05/22/81	GEOCENTRIC	81-049A	08/05/81	NORMAL	STND	34
LEINBACH	ENERGETIC PARTICLE MONITOR				81-049A-02	08/05/81	NORMAL	STND	34
LEINBACH	SOLAR X-RAY MONITOR				81-049A-03	08/05/81	NORMAL	STND	34
LEINBACH	MAGNETIC FIELD MONITOR				81-049A-04	08/05/81	NORMAL	STND	34
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				81-049A-01	08/05/81	NORMAL	STND	34
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				81-049A-05	08/05/81	NORMAL	STND	35
GOES 6	UNITED STATES	NOAA-NESS	04/28/83	GEOCENTRIC	83-041A	06/01/83	NORMAL	STND	35
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				83-041A-02	06/01/83	NORMAL	STND	35
LEINBACH	SOLAR X-RAY MONITOR				83-041A-03	06/01/83	NORMAL	STND	35
LEINBACH	MAGNETIC FIELD MONITOR				83-041A-04	06/01/83	NORMAL	STND	35
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				83-041A-01	06/01/83	NORMAL	STND	35
NESS STAFF	DATA COLLECTION SYSTEM (DCS)				83-041A-05	06/01/83	NORMAL	STND	36

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GOES-A	SEE GOES 1								
GOES-B	SEE GOES 2								
GOES-C	SEE GOES 3								
GOES-D	SEE GOES 4								
GOES-E	SEE GOES 5								
GOES-F	SEE GOES 6								
GOES-G	UNITED STATES	NOAA-NESS	05/00/86	GEOCENTRIC	GOES-G		APPROVED MISSION		136
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				GOES-G -02				135
LEINBACH	SOLAR X-RAY MONITOR				GOES-G -03				136
LEINBACH	MAGNETIC FIELD MONITOR				GOES-G -04				136
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				GOES-G -01				136
NESS STAFF	DATA COLLECTION SYSTEM				GOES-G -05				137
GOES-H	UNITED STATES	NOAA-NESS	08/00/86	GEOCENTRIC	GOES-H		APPROVED MISSION		137
	UNITED STATES	NASA-OSSA							
LEINBACH	ENERGETIC PARTICLE MONITOR				GOES-H -02				137
LEINBACH	SOLAR X-RAY MONITOR				GOES-H -03				137
LEINBACH	MAGNETIC FIELD MONITOR				GOES-H -04				137
NESS STAFF	VISIBLE INFRARED SPIN-SCAN RADIOMETER ATMOSPHERIC SOUNDER (VAS)				GOES-H -01				137
NESS STAFF	DATA COLLECTION SYSTEM				GOES-H -05				138
GOES-I	SEE GOES 1								
GRM-A1	UNITED STATES	NASA-OSSA	1990	GEOCENTRIC	GRM-A1		PROPOSED MISSION		138
ACUNA	VECTOR MAGNETOMETER				GRM-A1 -03				138
FARTHING	SCALAR MAGNETOMETER				GRM-A1 -02				138
SMITH	SST (S/C-TO-S/C TRACKING)				GRM-A1 -01				139
GRM-A2	UNITED STATES	NASA-OSSA	1990	GEOCENTRIC	GRM-A2		PROPOSED MISSION		139
SMITH	SST (S/C-TO-S/C TRACKING)				GRM-A2 -01				139
GTL	SEE OPEN/GTL								
HAKUCHO	JAPAN	ISAS	02/21/79	GEOCENTRIC	79-014A	02/21/79	NORMAL	STND	35
MAKINO	DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES				79-014A-02	03/00/79	NORMAL	STND	36
MIYAMOTO	MONITOR OF X-RAY SOURCES				79-014A-01	03/00/79	NORMAL	STND	36
HELIOCENTRIC	SEE ISEE 3								
HELIOS 1	SEE HELIOS-A								
HELIOS-A	FED REP OF GERMANY	BMWF	12/10/74	HELIOCENTRIC	74-097A	12/10/74	NORMAL	STND	36
	UNITED STATES	NASA-OSSA							
FECHTIG	MICROMETEOROID DETECTOR AND ANALYZER				74-097A-12	12/10/74	NORMAL	STND	37
GURNETT	SOLAR WIND PLASMA WAVE				74-097A-04	03/10/75	PARTIAL	STND	37
GURNETT	FINE FREQUENCY, COARSE TIME RESOLUTION SPECTRUM ANALYSIS				74-097A-05	03/10/75	PARTIAL	STND	37
GURNETT	26.5-KHZ TO 3-MHZ RADIO WAVE				74-097A-06	03/10/75	PARTIAL	STND	37
KEPPLER	ENERGETIC ELECTRON AND PROTON DETECTOR				74-097A-10	12/10/74	NORMAL	STND	38
KUNDT	CELESTIAL MECHANICS				74-097A-14	12/00/80	INOPERABLE	ZERO	38
KUNOW	COSMIC-RAY PARTICLES				74-097A-07	12/10/74	NORMAL	STND	38
LEINERT	ZODIACAL LIGHT PHOTOMETER				74-097A-11	12/10/74	NORMAL	STND	38
NESS	FLUXGATE MAGNETOMETER FOR AVERAGE FIELDS				74-097A-02	12/10/74	NORMAL	STND	38
NEUBAUER	FLUXGATE MAGNETOMETER FOR FIELD FLUCTUATIONS				74-097A-01	12/10/74	NORMAL	STND	38
NEUBAUER	SEARCH COIL MAGNETOMETER				74-097A-03	12/04/80	INOPERABLE	ZERO	39
ROSENBAUER	PLASMA DETECTORS				74-097A-09	12/10/74	NORMAL	STND	39
TRAINOR	GALACTIC AND SOLAR COSMIC RAYS				74-097A-08	12/10/74	NORMAL	STND	39
HELOS	SEE EXOSAT								
HI.ECCEN LUN OCCULT.SAT.	SEE EXOSAT								
HILAT	UNITED STATES	DOD-USAF	06/27/83	GEOCENTRIC	83-063A	06/27/83	NORMAL	STND	39
	CANADA	NRC							
HARDY	ELECTRON SPECTROMETER				83-063A-04	06/27/83	NORMAL	STND	39
HUFFMAN	AURORAL IONOSPHERIC MAPPER				83-063A-05	06/27/83	PARTIAL	STND	40
POTEMRA	THREE-AXIS FLUXGATE MAGNETOMETER				83-063A-03	06/27/83	NORMAL	STND	40
RICH	PLASMA MONITOR				83-063A-02	06/27/83	NORMAL	STND	40
RINO	COHERENT BEACON				83-063A-01	06/27/83	NORMAL	STND	40
HIMAWARI	SEE GMS								
HIMAWARI-2	SEE GMS-2								

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HIMAWARI-3	SEE GMS-3								
HINOTORI	JAPAN	ISAS	02/21/81	GEOCENTRIC	81-017A	02/21/81	NORMAL	STND	40
HIRAO	PLASMA PROBES				81-017A-06	10/13/82	NORMAL	SUBS	40
KONDO	SOLAR FLARE GAMMA-RAY DETECTOR IN 0.2-9.0 MEV RANGE				81-017A-04	10/13/82	NORMAL	SUBS	41
MATSUOKA	TIME PROFILE AND SPECTRA OF X-RAY FLARES IN THE 2-20 KEV RANGE				81-017A-03	10/13/82	NORMAL	SUBS	41
TAKAKURA	SOLAR FLARE 5-40 KEV X-RAYS USING ROTATING MODULATION COLLIMATOR IMAGING				81-017A-01	10/13/82	NORMAL	SUBS	41
TAKEUCHI	ELECTRON FLUX ABOVE 100 KEV PARTICLE DETECTOR MONITOR				81-017A-05	10/13/82	NORMAL	SUBS	41
TANAKA	SOLAR FLARE X-RAY BRAGG SPECTROSCOPY IN 1.7-2.0 A RANGE				81-017A-02	10/13/82	NORMAL	SUBS	41
HIPPARCOS	INTERNATIONAL	ESA	04/00/88	GEOCENTRIC	HIPPA		APPROVED MISSION		139
IK BULGARIA 1300	BULGARIA U.S.S.R.	BAS INTERCOS	08/07/81	GEOCENTRIC	81-075A				41
ARSHINKOV	TRIAXIAL FLUXGATE MAGNETOMETERS				81-075A-11	08/07/81	NORMAL	STND	41
BANKOV	ION DRIFT METER AND RETARDING POTENTIAL ANALYZER				81-075A-01	08/07/81	NORMAL	STND	41
DACHEV	LOW-ENERGY ELECTRON-PROTON ELECTROSTATIC ANALYZER ARRAY IN 3 ORTHOGONAL DIRECTIONS				81-075A-05	05/01/82	INOPERABLE	ZERO	42
GOGOSHEV	VISIBLE AIRGLOW PHOTOMETERS				81-075A-08	08/07/81	NORMAL	STND	42
GOGOSHEV	WAVELENGTH SCANNING UV PHOTOMETER				81-075A-09	05/01/82	INOPERABLE	ZERO	42
IVANOVA	SPHERICAL ELECTROSTATIC ION TRAP				81-075A-02	08/07/81	NORMAL	STND	42
IVANOVA	CYLINDRICAL LANGMUIR PROBE				81-075A-03	08/07/81	NORMAL	STND	42
KAZAKOV	PROTON SOLID-STATE TELESCOPE				81-075A-07	08/07/81	NORMAL	STND	42
MARKOV	DOUBLE SPHERICAL ELECTRON TEMPERATURE PROBES				81-075A-04	08/07/81	PARTIAL	STND	42
NENOVSKI	ION ENERGY-MASS COMPOSITION ANALYZERS				81-075A-06	08/07/81	PARTIAL	STND	43
STANEV	TRIAXIAL SPHERICAL VECTOR ELECTRIC FIELD PROBES				81-075A-10	08/07/81	NORMAL	STND	43
IME-D	SEE ISEE 2								
IME-H	SEE ISEE 3								
IMP 8	SEE IMP-J								
IMP-J	UNITED STATES	NASA-OSSA	10/26/73	GEOCENTRIC	73-078A	10/26/73	NORMAL	STND	43
AGGSON	ELECTROSTATIC FIELDS				73-078A-11	10/26/73	NORMAL	STND	43
BAME	SOLAR PLASMA ELECTROSTATIC ANALYZER				73-078A-10	10/26/73	NORMAL	STND	43
BRIDGE	SOLAR PLASMA FARADAY CUP				73-078A-02	10/26/73	NORMAL	STND	44
FRANK	MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS				73-078A-04	10/26/73	NORMAL	STND	44
GLOECKLER	SOLID-STATE DETECTORS				73-078A-03	12/15/78	PARTIAL	STND	44
GURNETT	ELECTROSTATIC WAVES AND RADIO NOISE				73-078A-12	10/26/73	NORMAL	STND	44
KRIMIGIS	CHARGED PARTICLE MEASUREMENTS EXPERIMENT				73-078A-08	11/05/73	NORMAL	STND	44
MCDONALD	SOLAR AND COSMIC-RAY PARTICLES				73-078A-09	10/26/73	NORMAL	STND	44
NESS	MAGNETIC FIELD EXPERIMENT				73-078A-01	10/26/73	NORMAL	STND	45
SIMPSON	SOLAR FLARE HIGH-Z/LOW-E AND LOW-Z ISOTOPE				73-078A-07	10/26/73	NORMAL	STND	45
STONE	ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES				73-078A-06	10/26/73	NORMAL	STND	45
WILLIAMS	ENERGETIC ELECTRONS AND PROTONS				73-078A-05	10/26/73	NORMAL	STND	45
IMP-K	SEE ISEE 1								
IMP-K PRIME	SEE ISEE 2								
INDIAN NATIONAL SAT.	SEE INSAT-1A								
INDIAN NATIONAL SAT.	SEE INSAT-1B								
INFRA-RED ASTRONOM SAT	SEE IRAS								
INSAT-1A	INDIA UNITED STATES	ISRO NASA-OSTO	04/10/82	GEOCENTRIC	82-031A	10/00/82	INOPERABLE	ZERO	45
UNKNOWN	VERY HIGH RESOLUTION RADIOMETER (VHRR)				82-031A-01	10/00/82	INOPERABLE	ZERO	45
UNKNOWN	TELECOMMUNICATIONS PACKAGE				82-031A-02	10/00/82	INOPERABLE	ZERO	46
UNKNOWN	DATA COLLECTION AND TRANSMISSION RELAY				82-031A-03	10/00/82	INOPERABLE	ZERO	45
INSAT-1B	INDIA	ISRO	08/00/83	GEOCENTRIC	INSAT1B		APPROVED MISSION		140
UNKNOWN	TELECOMMUNICATIONS PACKAGE				INSAT1B-02				140
UNKNOWN	DATA COLLECTION AND TRANSMISSION RELAY				INSAT1B-03				140
INT ULTRAVIOLET EXPL	SEE IUE								
INTERCOSMOS 19	U.S.S.R.	INTERCOS	02/27/79	GEOCENTRIC	79-020A	08/00/81	INOPERABLE	ZERO	46
GOGOSHEV	ELECTROPHOTOMETER (EMO-1)				79-020A-02	08/00/81	INOPERABLE	ZERO	46
UNKNOWN	TOPSIDE SOUNDER				79-020A-01	08/00/81	INOPERABLE	ZERO	45
UNKNOWN	PLASMA EXPERIMENT				79-020A-03	08/00/81	INOPERABLE	ZERO	46
UNKNOWN	WAVE EXPERIMENT				79-020A-04	08/00/81	INOPERABLE	ZERO	46

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UNKNOWN	PARTICLE EXPERIMENT				79-020A-05	08/00/81	INOPERABLE	ZERO	46
INTERCOSMOS BULGAR 1300	SEE IK BULGARIA 1300								
INTERNATIONL SOLAR POLAR	SEE ISPM								
INTERPLAN. PHYSICS LAB.	SEE OPEN/IPL								
INTNL SUN EARTH EXPL-A	SEE ISEE 1								
INTNL SUN EARTH EXPL-C	SEE ISEE 3								
ION RELEASE MODULE	SEE AMPTE/IRM								
IONO-IK	SEE INTERCOSMOS 19								
IONOSONDE-IK	SEE INTERCOSMOS 19								
IONOSP SOUNDING SAT 2	SEE ISS-B								
IPL	SEE OPEN/IPL								
IR ASTRON. SAT.	SEE IRAS								
IRAS	THE NETHERLANDS	NIVR	01/25/83	GEOCENTRIC	83-004A	01/26/83	NORMAL	STND	47
	UNITED STATES	NASA-OSSA							
	UNITED KINGDOM	SRC							
SCIENCE WORKING TEAM	IR TELESCOPE				83-004A-01	01/26/83	NORMAL	STND	47
SCIENCE WORKING TEAM	LOW RESOLUTION SPECTROMETER				83-004A-02	01/26/83	NORMAL	STND	47
IRM	SEE AMPTE/IRM								
ISEE 1	UNITED STATES	NASA-OSSA	10/22/77	GEOCENTRIC	77-102A	10/22/77	NORMAL	STND	47
ANDERSON	ELECTRONS AND PROTONS				77-102A-10	10/22/77	NORMAL	STND	47
BAME	FAST PLASMA AND SOLAR WIND IONS				77-102A-01	01/00/79	PARTIAL	STND	48
CLINE	GAMMA-RAY BURSTS				77-102A-14	10/22/77	NORMAL	STND	48
FRANK	HOT PLASMA				77-102A-03	10/22/77	NORMAL	STND	48
GURNETT	PLASMA WAVES				77-102A-07	10/22/77	NORMAL	STND	48
HARVEY	PLASMA DENSITY				77-102A-08	10/22/77	NORMAL	STND	48
HELLIWELL	VLF WAVE PROPAGATION				77-102A-13	10/22/77	NORMAL	STND	49
HEPPNER	DC ELECTRIC FIELD				77-102A-11	10/22/77	NORMAL	STND	49
HOVESTADT	LOW-ENERGY COSMIC RAYS				77-102A-05	08/07/78	PARTIAL	STND	49
MOZER	QUASI-STATIC ELECTRIC FIELDS				77-102A-06	10/22/77	NORMAL	STND	49
OGILVIE	FAST ELECTRONS				77-102A-02	10/22/77	NORMAL	STND	49
RUSSELL	FLUXGATE MAGNETOMETER				77-102A-04	10/22/77	NORMAL	STND	49
SHARP	ION COMPOSITION				77-102A-12	04/13/78	PARTIAL	STND	50
ISEE 2	INTERNATIONAL	ESA	10/22/77	GEOCENTRIC	77-102B	10/22/77	NORMAL	STND	50
	UNITED STATES	NASA-OSSA							
ANDERSON	ELECTRONS AND PROTONS				77-102B-08	05/01/79	PARTIAL	STND	50
EGIDI	SOLAR WIND IONS				77-102B-02	10/22/77	NORMAL	STND	50
FRANK	HOT PLASMA				77-102B-03	01/10/78	PARTIAL	STND	50
GURNETT	PLASMA WAVES				77-102B-05	10/22/77	NORMAL	STND	51
HARVEY	RADIO PROPAGATION				77-102B-06	10/22/77	NORMAL	STND	51
RUSSELL	FLUXGATE MAGNETOMETER				77-102B-04	10/22/77	NORMAL	STND	51
WILLIAMS	ENERGETIC ELECTRONS AND PROTONS				77-102B-07	10/22/77	NORMAL	STND	51
ISEE 3	UNITED STATES	NASA-OSSA	08/12/78	HELIOCENTRIC	78-079A	08/12/78	NORMAL	STND	51
ANDERSON	INTERPLANETARY AND SOLAR ELECTRONS				78-079A-09	11/22/79	INOPERABLE	ZERO	52
BAME	SOLAR WIND PLASMA				78-079A-01	03/19/80	PARTIAL	STND	52
HOVESTADT	LOW-ENERGY COSMIC RAYS				78-079A-03	08/15/78	NORMAL	STND	52
HYNDS	ENERGETIC PROTONS				78-079A-08	08/15/78	NORMAL	STND	52
MEYER	COSMIC-RAY ELECTRONS AND NUCLEI				78-079A-06	08/15/78	NORMAL	STND	52
OGILVIE	SOLAR WIND ION COMPOSITION				78-079A-11	08/18/78	NORMAL	STND	52
SCARF	PLASMA WAVES				78-079A-07	08/12/78	NORMAL	STND	53
SMITH	MAGNETIC FIELDS				78-079A-02	08/12/78	NORMAL	STND	53
STEINBERG	RADIO MAPPING				78-079A-10	08/13/78	NORMAL	STND	53
STONE	HIGH-ENERGY COSMIC RAYS				78-079A-12	01/15/79	PARTIAL	STND	53
TEEGARDEN	GAMMA-RAY BURSTS				78-079A-15	01/15/79	PARTIAL	STND	53
VON ROSENVINGE	MEDIUM ENERGY COSMIC RAY				78-079A-04	08/15/78	NORMAL	STND	53
WIEDENBECK	HIGH-ENERGY COSMIC RAY				78-079A-05	04/04/81	PARTIAL	STND	54
WILCOX	GROUND BASED SOLAR STUDIES				78-079A-13		NA	NA	54
ISEE-A	SEE ISEE 1								
ISEE-B	SEE ISEE 2								
ISEE-C	SEE ISEE 3								
ISIS 1	CANADA	DRB-DRTE	01/30/69	GEOCENTRIC	69-009A	01/30/70	PARTIAL	SUBS	54
	UNITED STATES	NASA-OSSA							
BARRINGTON	VLF RECEIVER				69-009A-03	01/30/70	NORMAL	SUBS	54
BRACE	CYLINDRICAL ELECTROSTATIC PROBES				69-009A-07	01/30/70	NORMAL	SUBS	54
CALVERT	FIXED-FREQUENCY SOUNDER				69-009A-02	01/30/70	NORMAL	SUBS	55
HARTZ	COSMIC RADIO NOISE				69-009A-10	01/30/70	NORMAL	SUBS	55
MCDIARMID	ENERGETIC PARTICLE DETECTORS				69-009A-04	01/30/70	NORMAL	SUBS	55

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NELMS	SWEEP-FREQUENCY SOUNDER				69-009A-01	01/30/70	NORMAL	SUBS	55
SAGALYN	SPHERICAL ELECTROSTATIC ANALYZER				69-009A-08	01/30/70	NORMAL	SUBS	55
ISIS 2	ÇANADA	DOC-CRC	04/01/71	GEOCENTRIC	71-024A	02/04/73	PARTIAL	SUBS	56
	UNITED STATES	NASA-OSSA							
ANGER	3914- AND 5577-A PHOTOMETER				71-024A-11	02/04/73	NORMAL	SUBS	56
BARRINGTON	VLF RECEIVER				71-024A-03	02/04/73	NORMAL	SUBS	56
BRACE	CYLINDRICAL ELECTROSTATIC PROBES				71-024A-07	00/00/81	PARTIAL	SUBS	56
CALVERT	FIXED-FREQUENCY SOUNDER				71-024A-02	02/04/73	NORMAL	SUBS	56
HARTZ	COSMIC RADIO NOISE				71-024A-10	02/04/73	NORMAL	SUBS	57
MAIER	RETARDING POTENTIAL ANALYZER				71-024A-08	02/04/73	NORMAL	SUBS	57
MCDIARMID	ENERGETIC PARTICLE DETECTORS				71-024A-04	02/04/73	PARTIAL	SUBS	57
SHEPHERD	6300-A PHOTOMETER				71-024A-12	02/04/73	NORMAL	SUBS	57
WHITTEKER	SWEEP-FREQUENCY SOUNDER				71-024A-01	02/04/73	NORMAL	SUBS	57
ISIS-A	SEE ISIS 1								
ISIS-B	SEE ISIS 2								
ISP	SEE ISPM								
ISPM	INTERNATIONAL	ESA	05/23/86	HELIOCENTRIC	ISPESA		APPROVED MISSION		140
BAME	PLASMA SPECTROMETER				ISPESA -05				140
BERTOTTI	RADIO SCIENCE				ISPESA -11				141
GLOECKLER	SOLAR WIND ION COMPOSITION SPECTROMETER				ISPESA -04				141
GRUEN	COSMIC DUST				ISPESA -07				141
HEDGECOCK	MAGNETIC FIELD				ISPESA -08				141
HURLEY	SOLAR-FLARE X-RAYS AND COSMIC GAMMA RAY BURSTS				ISPESA -01				141
KEPPLER	ENERGETIC PARTICLE COMPOSITION AND NEUTRAL GAS				ISPESA -12				141
LANZEROTTI	LOW ENERGY PARTICLE SPECTRUM, COMPOSITION, AND ANISOTROPY				ISPESA -03				142
SIMPSON	COSMIC RAY AND CHARGED PARTICLE				ISPESA -02				142
STONE	UNIFIED RADIO AND PLASMA WAVE				ISPESA -06				142
VOLLAND	CORONAL SOUNDING				ISPESA -10				142
ISPM-B	SEE ISPM								
ISPM/CENTAUR	SEE ISPM								
ISS-2	SEE ISS-B								
ISS-B	JAPAN	RRL	02/16/78	GEOCENTRIC	78-018A	04/01/83	INOPERABLE	ZERO	58
AIKYO	SWEEP FREQUENCY TOPSIDE IONOSPHERIC SOUNDER (TOP)				78-018A-01	04/01/83	INOPERABLE	ZERO	58
IWAMOTO	ION MASS SPECTROMETER				78-018A-04	04/01/83	INOPERABLE	ZERO	58
KATOH	RADIO NOISE NEAR 2.5, 5, 10, AND 25 MHZ				78-018A-02	04/01/83	INOPERABLE	ZERO	58
SAGAWA	RETARDING POTENTIAL TRAP				78-018A-03	04/01/83	INOPERABLE	ZERO	58
IUE	UNITED STATES	NASA-OSSA	01/26/78	GEOCENTRIC	78-012A	01/26/78	NORMAL	STND	58
	INTERNATIONAL	ESA							
	UNITED KINGDOM	SRC							
GUEST INVESTIGATORS	LOW-/HIGH-RESOLUTION, ULTRAVIOLET SPECTROGRAPH PACKAGE				78-012A-01	01/26/78	NORMAL	STND	59
NONE ASSIGNED	PARTICLE FLUX MONITOR (SPACECRAFT)				78-012A-02	01/26/78	NORMAL	STND	59
JIKIKEN	JAPAN	ISAS	09/16/78	GEOCENTRIC	78-087A	01/00/83	INOPERABLE	ZERO	59
EJIRI	IMPEDANCE AND ELECTRIC FIELD (IEF)				78-087A-04	01/00/83	INOPERABLE	ZERO	59
KAWASHIMA	CONTROLLED ELECTRON BEAM EMISSIONS (CBE)				78-087A-07	01/00/83	INOPERABLE	ZERO	59
KIMURA	VLF DOPPLER PROPAGATION (DPL)				78-087A-03	01/00/83	INOPERABLE	ZERO	60
KUBO	ENERGY SPECTRUM OF PARTICLES (ESP)				78-087A-06	01/00/83	INOPERABLE	ZERO	60
OYA	STIMULATED PLASMA WAVE (SPW)				78-087A-01	01/00/83	INOPERABLE	ZERO	60
OYA	NATURAL PLASMA WAVES (NPW)				78-087A-02	01/00/83	INOPERABLE	ZERO	60
JOP	SEE GALILEO PROBE								
JOP	SEE GALILEO ORBITER								
JUPITER ORBITER PROBE	SEE GALILEO PROBE								
JUPITER ORBITER PROBE	SEE GALILEO ORBITER								
LAND SATELLITE-E	SEE LANDSAT-D1								
LANDSAT 2	UNITED STATES	NASA-OSSA	01/22/75	GEOCENTRIC	75-004A	05/06/80	NORMAL	SUBS	60
BALLA	MULTISPECTRAL SCANNER (MSS)				75-004A-02	01/07/82	NORMAL	ZERO	60
LANDSAT 3	UNITED STATES	NASA-OSSA	03/05/78	GEOCENTRIC	78-026A	03/05/78	NORMAL	STND	61
BALLA	MULTISPECTRAL SCANNER (MSS)				78-026A-02	09/30/82	PARTIAL	STND	61
GILBERT	DATA COLLECTION SYSTEM (DCS)				78-026A-03	03/05/78	NORMAL	STND	61
WEINSTEIN	RETURN BEAM VIDICON CAMERA (RBV)				78-026A-01	04/14/82	PARTIAL	SUBS	62
LANDSAT 4	UNITED STATES	NASA-OSSA	07/16/82	GEOCENTRIC	82-072A	02/15/83	PARTIAL	SUBS	62
	UNITED STATES	NOAA-NESS							
BANKS	MULTISPECTRAL SCANNER (MSS)				82-072A-02	08/01/82	NORMAL	STND	62

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FEINBERG	GLOBAL POSITIONING SYSTEM (GPS)				82-072A-03	03/01/83	PARTIAL	ZERO	62
LINSTROM	THEMATIC MAPPER (TM)				82-072A-01	02/15/83	PARTIAL	ZERO	62
LANDSAT-C	SEE LANDSAT 3								
LANDSAT-D	SEE LANDSAT 4								
LANDSAT-D1	UNITED STATES	NASA-OSSA	06/00/85	GEOCENTRIC	LAND-E		APPROVED MISSION		142
	UNITED STATES	NOAA-NESS							
BANKS	MULTISPECTRAL SCANNER (MSS)				LAND-E -02				143
FEINBERG	GLOBAL POSITIONING SYSTEM (GPS)				LAND-E -03				143
WEINSTEIN	THEMATIC MAPPER (TM)				LAND-E -01				143
LARGE SPACE TELESCOPE	SEE ST								
LDEF	SEE SPACE SHUTTLE LDEF-A								
LDEF-A	SEE SPACE SHUTTLE LDEF-A								
LFO-A	SEE LANDSAT 4								
LONG DURATION EXPOS.FAC.	SEE SPACE SHUTTLE LDEF-A								
MAGION	U.S.S.R.	INTERCOS	10/24/78	GEOCENTRIC	78-099C	09/10/81	INOPERABLE	ZERO	63
	CZECHOSLOVAKIA	CAS							
TRISKA	ELF AND VLF RECEIVERS				78-099C-01	09/10/81	INOPERABLE	ZERO	63
TRISKA	ENERGETIC PARTICLE DETECTORS				78-099C-02	09/10/81	INOPERABLE	ZERO	63
MARINER 77A	SEE VOYAGER 1								
MARINER 77B	SEE VOYAGER 2								
MARINER JUPITER/SATURN A	SEE VOYAGER 1								
MARINER JUPITER/SATURN B	SEE VOYAGER 2								
ME02	SEE SMS 2								
METEOROLOGICAL SAT-A	SEE METEOSAT 1								
METEOROLOGICAL SAT-B	SEE METEOSAT 2								
METEOSAT 1	INTERNATIONAL	ESA	11/23/77	GEOCENTRIC	77-108A	11/24/79	PARTIAL	STND	63
PERA	DATA COLLECTION PLATFORM (DCP)				77-108A-02	11/23/77	NORMAL	STND	63
METEOSAT 2	INTERNATIONAL	ESA	06/19/81	GEOCENTRIC	81-057A	07/02/81	NORMAL	ZERO	64
PERA	DATA COLLECTION PLATFORM (DCP)				81-057A-02	07/06/81	INOPERABLE	ZERO	64
SERENE	IMAGING RADIOMETER				81-057A-01	11/08/81	NORMAL	ZERO	64
METEOSAT-B	SEE METEOSAT 2								
MJS 77A	SEE VOYAGER 1								
MJS 77B	SEE VOYAGER 2								
MOTHER	SEE ISEE 1								
MS-T5	JAPAN	ISAS	01/00/85		MS-T5		APPROVED MISSION		143
OYA	PLASMA WAVE SPECTRAL RECEIVERS				MS-T5 -01				143
OYAMA	ION RETARDING POTENTIAL ANALYZER				MS-T5 -02				143
SAITO	TRIAXIAL RING-CORE MAGNETOMETERS				MS-T5 -03				143
NIMBUS 5	UNITED STATES	NASA-OSSA	12/11/72	GEOCENTRIC	72-097A	03/31/83	INOPERABLE	ZERO	64
HOUGHTON	SELECTIVE CHOPPER RADIOMETER (SCR)				72-097A-02	03/31/83	INOPERABLE	ZERO	64
WILHEIT, JR.	ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)				72-097A-04	03/31/83	INOPERABLE	ZERO	65
NIMBUS 6	UNITED STATES	NASA-OSSA	06/12/75	GEOCENTRIC	75-052A	01/00/76	PARTIAL	STND	65
HOUGHTON	PRESSURE MODULATED RADIOMETER (PMR)				75-052A-09	03/02/81	PARTIAL	ZERO	65
JACOBOWITZ	EARTH RADIATION BUDGET (ERB)				75-052A-05	03/02/81	PARTIAL	ZERO	65
JULIAN	TROPICAL WIND ENERGY CONVERSION AND REFERENCE LEVEL (TWERLE)				75-052A-01	03/02/81	PARTIAL	SUBS	65
WILHEIT, JR.	ELECTRICALLY SCANNING MICROWAVE RADIOMETER (ESMR)				75-052A-03	03/02/81	PARTIAL	ZERO	66
NIMBUS 7	UNITED STATES	NASA-OSSA	10/24/78	GEOCENTRIC	78-098A	10/24/78	NORMAL	STND	66
GLOERSEN	SCANNING MULTISPECTRAL MICROWAVE RADIOMETER (SMMR)				78-098A-08	10/24/78	NORMAL	STND	66
HEATH	SOLAR BACKSCATTER ULTRAVIOLET/TOTAL OZONE MAPPING SPECTROMETER (SBUV/TOMS)				78-098A-09	10/24/78	NORMAL	STND	67
HOUGHTON	STRATOSPHERIC AND MESOSPHERIC SOUNDER (SAMS)				78-098A-02	09/30/82	PARTIAL	STND	67
HOVIS	COASTAL ZONE COLOR SCANNER (CZCS)				78-098A-03	10/29/78	NORMAL	STND	67
HWANG	TEMPERATURE/HUMIDITY INFRARED RADIOMETER (THIR)				78-098A-10	10/24/78	NORMAL	STND	67
JACOBOWITZ	EARTH RADIATION BUDGET (ERB)				78-098A-07	06/22/80	PARTIAL	STND	68

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MCCORMICK	STRATOSPHERIC AEROSOL MEASUREMENT-II (SAM-II)			78-098A-06	10/24/78	NORMAL	STND	68
NIMBUS-E	SEE NIMBUS 5							
NIMBUS-F	SEE NIMBUS 6							
NIMBUS-G	SEE NIMBUS 7							
NOAA 6	UNITED STATES NOAA-NESS	06/27/79	GEOCENTRIC	79-057A	06/27/79	NORMAL	STND	68
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)			79-057A-04	06/27/79	NORMAL	STND	69
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			79-057A-01	02/23/82	PARTIAL	SUBS	69
NESS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)			79-057A-02	06/27/79	NORMAL	STND	69
NESS STAFF	DATA COLLECTION SYSTEM (DCS)			79-057A-03	06/27/79	NORMAL	STND	69
NOAA 7	UNITED STATES NOAA-NESS	06/23/81	GEOCENTRIC	81-059A	06/23/81	NORMAL	STND	69
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)			81-059A-04	04/08/82	PARTIAL	SUBS	70
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			81-059A-01	07/13/81	NORMAL	STND	70
NESS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)			81-059A-02	07/13/81	NORMAL	STND	70
NESS STAFF	DATA COLLECTION SYSTEM (DCS)			81-059A-03	07/13/81	NORMAL	STND	70
NOAA 8	UNITED STATES NOAA-NESS UNITED STATES NASA-OSSA	03/28/83	GEOCENTRIC	83-022A	05/09/83	NORMAL	STND	70
LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)			83-022A-04	05/09/83	NORMAL	STND	71
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			83-022A-01	05/09/83	NORMAL	STND	71
NESS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)			83-022A-02	05/09/83	NORMAL	STND	71
NESS STAFF	DATA COLLECTION SYSTEM (DCS)			83-022A-03	05/09/83	NORMAL	STND	71
NESS STAFF	SEARCH AND RESCUE (SAR)			83-022A-05	05/09/83	NORMAL	STND	71
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LEINBACH	SPACE ENVIRONMENT MONITOR (SEM)			NOAA-D -04				144
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			NOAA-D -01				144
NESS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)			NOAA-D -02				144
NESS STAFF	DATA COLLECTION SYSTEM (DCS)			NOAA-D -03				144
NOAA-E	SEE NOAA 8							
NOAA-F	UNITED STATES NOAA-NESS UNITED STATES NASA-OSSA	03/00/84	GEOCENTRIC	NOAA-F		APPROVED MISSION		145
BROOME	EARTH RADIATION BUDGET EXPERIMENT (ERBE)			NOAA-F -05				145
NESS STAFF	ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR)			NOAA-F -01				145
NESS STAFF	TIROS OPERATIONAL VERTICAL SOUNDER (TOVS)			NOAA-F -02				145
NESS STAFF	DATA COLLECTION SYSTEM (DCS)			NOAA-F -03				145
NESS STAFF	SEARCH AND RESCUE (SAR)			NOAA-F -06				146
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PIONEER 6	UNITED STATES NASA-OSSA	12/16/65	HELIOCENTRIC	65-105A	02/07/71	NORMAL	SUBS	71
ANDERSON	CELESTIAL MECHANICS			65-105A-07	12/16/65	NORMAL	STND	72
ANDERSON	RELATIVITY INVESTIGATION			65-105A-10	12/16/65	NORMAL	STND	72
BRIDGE	SOLAR WIND PLASMA FARADAY CUP			65-105A-02	12/03/74	PARTIAL	SUBS	72
GOLDSTEIN	SPECTRAL BROADENING			65-105A-09	12/08/68	NORMAL	ZERO	72
MCCRACKEN	COSMIC-RAY ANISOTROPY			65-105A-05		PARTIAL	ZERO	72
SIMPSON	COSMIC-RAY TELESCOPE			65-105A-03	12/03/74	NORMAL	SUBS	73
WOLFE	ELECTROSTATIC ANALYZER			65-105A-06	12/03/74	NORMAL	SUBS	73
PIONEER 9	UNITED STATES NASA-OSSA	11/08/68	HELIOCENTRIC	68-100A	05/19/69	NORMAL	SUBS	73
ANDERSON	CELESTIAL MECHANICS			68-100A-08	11/08/68	NORMAL	STND	73
BERG	COSMIC DUST DETECTOR			68-100A-04		INOPERABLE	ZERO	74
ESHLEMAN	TWO-FREQUENCY BEACON RECEIVER			68-100A-03	12/03/74	NORMAL	SUBS	74
MCCRACKEN	COSMIC-RAY ANISOTROPY			68-100A-05		NORMAL	ZERO	74
SCARF	ELECTRIC FIELD DETECTOR			68-100A-07	05/19/69	NORMAL	SUBS	74
SONETT	TRIAXIAL MAGNETOMETER			68-100A-01	05/19/69	NORMAL	SUBS	74
WEBBER	COSMIC-RAY GRADIENT			68-100A-06	05/19/69	NORMAL	SUBS	75
WOLFE	SOLAR PLASMA DETECTOR			68-100A-02	12/03/74	NORMAL	SUBS	75
PIONEER 10	UNITED STATES NASA-OSSA	03/03/72	JUPITER FLYBY	72-012A	03/03/72	NORMAL	STND	75
ANDERSON	CELESTIAL MECHANICS			72-012A-09	03/03/72	NORMAL	STND	75
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GEHRELS	IMAGING PHOTOPOLARIMETER (IPP)			72-012A-07	06/01/80	NORMAL	ZERO	76
JUDGE	ULTRAVIOLET PHOTOMETRY			72-012A-06	03/03/72	NORMAL	STND	75
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KLIORE	S-BAND OCCULTATION			72-012A-10	12/05/73	NORMAL	ZERO	76
MCDONALD	COSMIC-RAY SPECTRA			72-012A-12	03/03/72	NORMAL	STND	77
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VAN ALLEN	JOVIAN CHARGED PARTICLES			72-012A-11	03/03/72	NORMAL	STND	77
WOLFE	PLASMA			72-012A-13	03/03/72	NORMAL	STND	77
PIONEER 11	UNITED STATES NASA-OSSA	04/06/73	SATURN FLYBY	73-019A	04/06/73	NORMAL	STND	77
ANDERSON	CELESTIAL MECHANICS			73-019A-09	04/06/73	NORMAL	STND	78
FILLIUS	JOVIAN TRAPPED RADIATION			73-019A-05	04/06/73	NORMAL	STND	78
GEHRELS	IMAGING PHOTOPOLARIMETER (IPP)			73-019A-07	06/01/80	NORMAL	ZERO	78
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KLIORE	S-BAND OCCULTATION			73-019A-10	09/02/79	NORMAL	ZERO	79
MCDONALD	COSMIC-RAY SPECTRA			73-019A-12	04/06/73	NORMAL	STND	79
SIMPSON	CHARGED PARTICLE COMPOSITION			73-019A-02	04/06/73	NORMAL	STND	79
SMITH	MAGNETIC FIELDS			73-019A-01	04/06/73	NORMAL	STND	79
VAN ALLEN	JOVIAN CHARGED PARTICLES			73-019A-11	04/06/73	NORMAL	STND	80
WOLFE	PLASMA			73-019A-13	12/04/77	NORMAL	STND	80
PIONEER VENUS 1	UNITED STATES NASA-OSSA	05/20/78	VENUS ORBITER	78-051A	05/20/78	NORMAL	STND	80
BARNES	SOLAR WIND PLASMA ANALYZER (OPA)			78-051A-18	05/20/78	NORMAL	STND	80
BRACE	ELECTRON TEMPERATURE PROBE (OETP)			78-051A-01	12/05/78	NORMAL	STND	80
CROFT	GAS-PLASMA ENVIRONMENT-DUAL FREQUENCY EXPERIMENT (OGPE)			78-051A-03	05/20/78	NORMAL	STND	81
DONAHUE	INTERDISCIPLINARY SCIENTIST			78-051A-04		NA	NA	81
EVANS	GAMMA BURST DETECTOR (OGBD)			78-051A-05	05/20/78	NORMAL	STND	81
KEATING	ATMOSPHERIC DRAG (OAD)			78-051A-19	12/00/78	NORMAL	STND	81
KLIORE	RADIO OCCULTATION (ORO)			78-051A-20	12/00/78	NORMAL	STND	81
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NAGY	INTERDISCIPLINARY SCIENTIST			78-051A-10		NA	NA	82
NIEMANN	NEUTRAL MASS SPECTROMETER (ONMS)			78-051A-11	12/05/78	NORMAL	STND	82
PETTENGILL	RADAR MAPPER (ORAD)			78-051A-02	00/00/81	INOPERABLE	ZERO	82
PHILLIPS	INTERNAL DENSITY DISTRIBUTION (OIDD)			78-051A-23				82
RUSSELL	MAGNETOMETER (OMAG)			78-051A-12	05/20/78	NORMAL	STND	82
SCARF	ELECTRIC FIELD DETECTOR (OEFD)			78-051A-13	05/20/78	NORMAL	STND	82
SCHUBERT	INTERDISCIPLINARY SCIENTIST			78-051A-14		NA	NA	83

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SHAPIRO	CELESTIAL MECHANICS (OCM)				78-051A-21	12/00/78	NORMAL	STND	83
STEWART	PROGRAMMABLE ULTRAVIOLET SPECTROMETER (OUVS)				78-051A-15	12/05/78	NORMAL	STND	83
TAYLOR, JR.	ION MASS SPECTROMETER 1-60AMU (OIMS)				78-051A-17	12/05/78	NORMAL	STND	83
TRAVIS	CLOUD PHOTOPOLARIMETER				78-051A-06	05/20/78	NORMAL	STND	83
WOO	ATMOSPHERIC AND SOLAR CORONA TURBULENCE (OTUR)				78-051A-22	12/00/78	NORMAL	STND	83
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POLAR PLASMA LABORATORY	SEE OPEN/PPL								
PPL	SEE OPEN/PPL								
PROGNOZ 8	U.S.S.R.	SAS	12/25/80	GEOCENTRIC	80-103A	12/25/80	NORMAL	STND	83
LICKIN	SOLAR X-RAY SPECTROMETER				80-103A-01	12/26/80	NORMAL	STND	84
ROENTGENSATELLITE	SEE ROSAT								
ROSAT	FED REP OF GERMANY UNITED STATES	DFVLR NASA-OSSA	07/30/87	GEOCENTRIC	ROSAT		APPROVED MISSION		162
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SAGE	UNITED STATES	NASA-OSTA	02/18/79	GEOCENTRIC	79-013A	04/15/82	INOPERABLE	ZERO	84
MCCORMICK	STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE)				79-013A-01	04/15/82	INOPERABLE	ZERO	84
SAN MARCO-D/L	ITALY UNITED STATES	CRA NASA-OSSA	04/00/84	GEOCENTRIC	SM-DL		APPROVED MISSION		163
BROGLIO	DRAG BALANCE AND AIR DENSITY				SM-DL -01				163
HANSON	ION VELOCITY INSTRUMENT (IVI) PLANAR RETARDING POTENTIAL ANALYZER				SM-DL -03				164
MAYNARD	3-AXIS ELECTRIC FIELD INSTRUMENT (EFI)				SM-DL -05				164
SCHMIDTKE	AIRGLOW-SOLAR SPECTROMETER				SM-DL -02				164
SPENCER	WIND AND TEMPERATURE SPECTROMETER (WATS)				SM-DL -04				164
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SAT. FOR EARTH OBS.-2	SEE BHASKARA 2								
SCATHA	SEE STP P78-2								
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SESP P78-2A	SEE STP P78-2								
SHUTTLE OFT-2	SEE STS-2								
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SME	UNITED STATES	NASA-OSSA	10/06/81	GEOCENTRIC	81-100A	10/06/81	NORMAL	STND	84
BARTH	UV OZONE				81-100A-01	10/06/81	NORMAL	STND	84
BARTH	INFRARED RADIOMETER (4 CHANNELS)				81-100A-02	10/06/81	NORMAL	STND	85
BARTH	1.27 MICROMETER AIRGLOW				81-100A-03	10/06/81	NORMAL	STND	85
BARTH	VISIBLE NITROGEN DIOXIDE				81-100A-04	10/06/81	NORMAL	STND	85
BARTH	SOLAR UV MONITOR				81-100A-05	10/06/81	NORMAL	STND	85
BARTH	SOLAR PROTON ALARM				81-100A-06	10/06/81	NORMAL	STND	85
SMM	UNITED STATES	NASA-OSSA	02/14/80	GEOCENTRIC	80-014A	08/01/80	PARTIAL	SUBS	86
ACTON	SOFT X-RAY POLYCHROMATOR (XRP)				80-014A-04	11/23/80	NORMAL	ZERO	86
CHUPP	GAMMA-RAY SPECTROMETER (GRE)				80-014A-07	02/17/80	NORMAL	STND	86
DE JAGER	HARD X-RAY IMAGING SPECTROMETER (HXIS)				80-014A-05	11/02/82	INOPERABLE	ZERO	86
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UK 6	UNITED KINGDOM	SRC	06/02/79	GEOCENTRIC	79-047A	06/02/79	PARTIAL	ZERO	98
	UNITED STATES	NASA-OSSA							
BOYD	X-RAY GRAZING INCIDENCE SYSTEM				79-047A-03	02/24/82	PARTIAL	ZERO	98
FOWLER	COSMIC RAY				79-047A-01	02/24/82	PARTIAL	ZERO	98
POUNDS	X-RAY PROPORTIONAL COUNTER SPECTROMETER				79-047A-02	02/24/82	PARTIAL	ZERO	98
UK SUBSATELLITE	SEE AMPTE/UKS								
UKS	SEE AMPTE/UKS								
UME 2	SEE ISS-B								
UNITED KINGDOM SUBSAT	SEE AMPTE/UKS								
UNITED KINGDOM-6	SEE UK 6								
UOSAT	UNITED STATES	AMSAT	10/06/81	GEOCENTRIC	81-100B	10/06/81	NORMAL	STND	98
	UNITED KINGDOM	U OF SURR							
ACUNA	TRIAXIAL FLUXGATE MAGNETOMETER				81-100B-01	02/00/82	NORMAL	STND	99
FEREBEE	CHARGED PARTICLE				81-100B-03	02/00/82	NORMAL	STND	99
SMITHERS	HIGH FREQUENCY BEACON				81-100B-04	05/00/83	PARTIAL	STND	99
SWEETING	EARTH IMAGING				81-100B-02	01/00/82	NORMAL	STND	99
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UPPER ATMOSPH.RESEAR.SAT	SEE UARS								
USAF OPERATIONAL SAT-76	SEE 1976-059A								
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UNKNOWN	NEUTRAL MASS SPECTROMETER				HALLEY1-06				191
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UNKNOWN	WAVE ANALYZERS				HALLEY1-10				191
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RIEDLER	MAGNETOMETER				HALLEY2-09				192
UNKNOWN	WIDE- AND NARROW-ANGLE CAMERAS				HALLEY2-01				192
UNKNOWN	THREE-CHANNEL SPECTROMETER				HALLEY2-02				192
UNKNOWN	INFRARED SOUNDER				HALLEY2-03				192
UNKNOWN	DUST MASS SPECTROMETER				HALLEY2-04				192
UNKNOWN	DUST IMPACT COUNTER				HALLEY2-05				192
UNKNOWN	NEUTRAL MASS SPECTROMETER				HALLEY2-06				193

5

INVESTIGATOR NAME INDEX

5. INVESTIGATOR NAME INDEX

This index contains an alphabetical listing of the names of the investigators or team members associated with each experiment described in Sections 2 and 3. The current organizational affiliation of the person is also shown. Listed under each person's name are the associated experiments. Each experiment contains the spacecraft and experiment name, NSSDC ID code, and the page number referencing the description of the experiment. An asterisk preceding an experiment name identifies the person as the principal investigator, lead investigator, or team leader for that experiment.

APPENDIXES

APPENDIX A - OTHER RELEVANT SPACECRAFT

Spacecraft relevant to the purpose of this report and not included elsewhere are listed in this appendix. Also listed here are missions which were planned to be launched during the reporting period but failed at launch. The spacecraft include those that have been published in earlier reports of this series and now have a status of canceled, failed at launch, or mission being rescoped. Also included are essentially dormant spacecraft which are used to provide new science and technology information incorporating ground-based facilities and techniques. In this latter group are the air density studies using air drag effects and ground-based photography, radio beacon receptions, celestial mechanics studies using spacecraft motions and radio transmissions, and laser retroreflector studies. In addition, some spacecraft that were turned off but which are still operable may be listed; it is unlikely these will ever be re-activated. The spacecraft are listed alphabetically by the NSSDC spacecraft common name. Listed with each spacecraft are the sponsoring country and agency, the actual launch date, the NSSDC ID code, and the current status.

Spacecraft Name	Sponsoring Country and Agency		Launch Date	NSSDC ID	Current Status
ATS 5	United States	NASA-OSTA	08/12/69	69-069A	Radio Beacon
BE-B	United States	NASA-OSSA	10/10/64	64-064A	Laser Retroreflector
BE-C	United States	NASA-OSSA	04/29/65	65-032A	Laser Retroreflector
Diademe 1	United States	NASA-OSSA	02/08/67	67-011A	Laser Retroreflector
Diademe 2	United States	NASA-OSSA	02/15/67	67-014A	Laser Retroreflector
ECHO 1	United States	NASA-OSSA	08/12/60	60-009A	Laser Retroreflector
ECHO 2	United States	NASA-OSSA	01/25/64	64-004A	Laser Retroreflector
GEOS 1	United States	NASA-OSSA	11/06/65	65-089A	Laser Retroreflector
GEOS 2	United States	NASA-OSSA	01/11/68	68-002A	Laser Retroreflector
ISPM/NASA	United States	NASA-OSSA	N/A	ISPM/NASA	Canceled Mission
LAGEOS	United States	NASA-OSTA	05/04/76	76-039A	Laser Retroreflector
Pageos 1	United States	NASA-OSSA	06/24/66	66-056A	Laser Retroreflector
Pioneer 7	United States	NASA-OSSA	08/17/66	66-075A	Celestial Mechanics
Pioneer 8	United States	NASA-OSSA	12/13/67	67-123A	Celestial Mechanics
San Marco-D/M	United States	NASA-OSSA	N/A	SM-DM	Canceled Mission
Seasat 1	United States	NASA-OSSA	06/27/78	78-064A	Laser Retroreflector
Sirio 2	Italy	ESA	N/A	Sirio-2	Failed at Launch
SPOT	France	CNES	N/A	SPOT	Rescoped Mission
Starlette	France	CNES	02/06/75	75-010A	Laser Retroreflector
UARS 2	United States	NASA-OAST	N/A	UARS-2	Canceled Mission
VOIR	United States	NASA-OSSA	N/A	N/A	Rescoped Mission

APPENDIX B - SPECIAL INVESTIGATORS

B1. The COS-B Caravane Collaboration

The gamma-ray astronomy experiment for COS-B was built, operated, and the data analyzed by a collaboration of six European research groups. Group members that have played a significant role in the implementation of the program are listed along with their affiliations.

B2. Individual Galileo Investigators

The Galileo Orbiter imaging and radio science investigations include special individual studies. The individual investigators, investigator affiliations, study names, and objectives are listed.

B3. ISPM Theoretical and Interdisciplinary Scientists

The names and affiliations of the ISPM theoretical and interdisciplinary scientists are listed.

B4. Joint IRAS Science Working Group

The Infrared Astronomy Satellite (IRAS), like IUE, does not have individual principal investigators or team leaders associated with each experiment. The operation of the spacecraft is by the Joint IRAS Science Working Group. Members of this Working Group and their affiliations are listed.

B5. NASA-Selected Earth Radiation Budget Experiment (ERBE) Investigators

The NASA-selected ERBE investigators and their affiliations are listed along with the subjects of their investigations.

B6. OPEN Theoretical Investigators

The OPEN theoretical investigators are listed along with their affiliations.

B7. OPEN Ground-Based Investigators

The OPEN ground-based investigators are listed along with their affiliations.

B8. Solar Optical Telescope Coordinated Filtergraph-Spectrometer Co-Investigators.

The Solar Optical Telescope coordinated filtergraph-spectrometer co-investigators are listed here rather than in the section 3.3 because of the large number of co-investigators for this experiment.

B1. THE (COS-B) CARAVANE COLLABORATION

Member	Affiliation
Bennett, K.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
Bignami, G. F.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Boella, G.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Buccheri, R.	Università di Palermo, Italy
Burger, J. J.	Scientific Projects Department, ESA-ESTEC Noordwijk, The Netherlands
D'Amico, N.	Università di Palermo, Italy
Hermsen, W.	Huygens Laboratorium Leiden, The Netherlands
Kanbach, G.	Max-Planck-Institut für Physik und Astrophysik, Garching bei Munchen, Federal Republic of Germany
Koch, L.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Labeyrie, J.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Lichti, G. G.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
Lüst, R.	Max-Planck-Institut für Physik und Astrophysik, Garching bei Munchen, Federal Republic of Germany
Masnou, J.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Mayer-Hasselwander, H. A.	Max-Planck-Institut für Physik und Astrophysik, Garching bei Munchen, Federal Republic of Germany

B1 concluded

Member	Affiliation
Occhialini, G. P.	Istituto di Scienze Fisiche dell'Università di Milano, Italy
Paul, J. A.	Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, France
Pinkau, K.	Max-Planck-Institut für Physik und Astrophysik, Garching bei München, Federal Republic of Germany
Sacco, B.	Università di Palermo, Italy
Scarsi, L.	Università di Palermo, Italy
Swanenburg, B. N.	Huygens Laboratorium Leiden, The Netherlands
Taylor, B. G.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands
van de Hulst, H. C.	Huygens Laboratorium Leiden, The Netherlands
Wills, R. D.	Space Science Department, ESA-ESTEC Noordwijk, The Netherlands

B2. GALILEO IMAGING AND RADIO SCIENCE INVESTIGATORS

Galileo Imaging investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Auroral Studies	To search for and investigate Jupiter's auroras; to use auroral imaging to obtain information on the configuration and dynamics of the Jovian magnetosphere; to search for luminous phenomena on the dark sides of the Galilean satellites	Clifford D. Anger University of Calgary/ Canada
Structure and Dynamics of the Jovian Atmosphere	To investigate the physical structure and dynamical regimes of the Jovian atmosphere, including cloud motion, heat transfer, cloud composition and scattering properties, and atmospheric wave motions	Michael J. S. Belton Kitt Peak National Observatory
Geological Histories of the Galilean Satellites	To investigate the geologic histories of the Galilean satellites by photogeologic techniques to determine surface morphology and measure local elevations and height contours, and by the preparation of contour maps and geological maps	Michael H. Carr U.S. Geological Survey

B2 continued

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Atmospheric Dynamics and Satellite Histories	To study dynamics of the upper atmosphere of Jupiter by determining cloud motions and evolution; to synthesize Galileo imagery with previous imagery, including ground-based patrol photography; to study surface histories of the Galilean satellites, particularly by crater density and morphology; and to investigate possibilities to make imaging studies of smaller Jovian satellites and of asteroid targets of opportunity	Clark R. Chapman Planetary Science Institute
Geodetics of the Galilean Satellites	To establish a geodetic net on the Galilean satellites and determine their radii, shapes, and rotational poles; to provide satellite control nets for precision cartography	Merton E. Davies Rand Corporation
Geological Exploration of the Galilean Satellites	To investigate the geology of the Galilean satellites using photogeological techniques, with emphasis on cratering, tectonic processes, and the discovery of new geological processes associated with the presence of icy crusts on the satellites	Ronald Greeley Arizona State University

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Dynamical Properties of the Galilean Satellites	To study the internal structure and past history of the Galilean satellites from dynamical studies of shape and rotation; to investigate impact cratering and chronology; to search for previously undiscovered satellites in the Jovian system	Richard Greenberg Planetary Science Institute
Geology of the Galilean Satellites	To investigate surface morphology and infer geologic histories of the Galilean satellites, with emphasis on impact cratering processes and comparative studies with the terrestrial planets	James W. Head, III Brown University
Photogeology of the Galilean Satellites	To investigate the geology of the Galilean satellites with emphasis on impact cratering processes; to develop a multispectral image processing capability and imaging data library in Europe	Gerhard Neukum Munich University, Federal Republic of Germany
Photometry and Imaging of Jupiter and the Galilean Satellites	To investigate the Jovian atmosphere and cloud properties by multispectral photometry and polarimetry; to study surface composition of the Galilean satellites with emphasis on the role of volatiles; to search for auroral emissions from the interaction of satellite atmospheres with the Jovian magnetosphere	Carl B. Pilcher University of Hawaii

B2 continued

Galileo Imaging Investigators

Investigation Name	Objectives	Investigator and Affiliation
Jovian Atmospheric Circulation	To investigate the nature of the thermal and dynamical processes responsible for the atmospheric circulation of Jupiter and the ways that these processes are influenced by the structure of the cloud layers	Gerald Schubert University of California, Los Angeles
Imaging, Spectrophotometry, and Polarimetry of the Galilean Satellites and Jupiter	To investigate the surface morphology and spectrophotometric properties of the Galilean satellites; to identify compositional units of the satellites; to obtain photometry of Jovian belts and zones to investigate cloud properties and energy balance; to investigate possibilities for making photo-polarimetric observations of the smaller Jovian satellites	Joseph Veverka Cornell University
Multispectral Radiometric Imaging of Jupiter and the Galilean Satellites	To participate closely in the development of a multispectral radiometric imaging capability for Galileo, including design of the camera system, its calibration, and development of image processing software; to use these multispectral images to study compositional differences on the surfaces of the Galilean satellites and in the atmosphere of Jupiter	John B. Wellman Jet Propulsion Laboratory

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Celestial Mechanics Measurements of Jupiter and Its Satellites	To use closed-loop radiometric data from the Galileo orbiter (1) to determine the structure of the gravitational fields of Jupiter and the Galilean satellites; (2) to determine the relativistic time delay during the solar conjunction of Jupiter; and (3) to improve the determination of the orbits of Jupiter and its satellites. Also, to measure the general relativistic redshift in the gravitational field of Jupiter (by using one-way Doppler data)	John D. Anderson Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to measure the vertical pressure and temperature profiles and atmospheric absorptivity on Jupiter, the Jovian ionospheric structure and dynamics, and the plasma environment of the Galilean satellites; to use phase and intensity scintillation data to study atmospheric turbulence and convection on Jupiter; and to investigate the use of bistatic radar techniques to study the surfaces of the Galilean satellites	Von R. Eshleman Stanford University

B2 continued

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Search for Gravitational Radiation	To use high-precision Doppler monitoring during cruise to conduct a systematic search for very low frequency gravitational waves incident on the solar system, to a level of strain amplitude of about 1.E-15	Frank B. Estabrook Jet Propulsion Laboratory
Jupiter Radio Astronomy	To study relativistic electrons in the Jovian magnetosphere by measuring the integrated radio flux near 400 MHz (using the Probe relay antenna) over a large range in time and geometry	Eric Gerard Meudon Observatory Paris, France
Microwave Investigation of Jupiter	To use the Probe relay antenna to study the trapped radiation belts of Jupiter and to measure the thermal microwave radiation from the planet with high spatial resolution. Also, to measure the thermal microwave brightness of the Galilean satellites in order to study their surface properties	Samuel Gulkis Jet Propulsion Laboratory

Galileo Radio Science Investigators

Investigation Name	Objectives	Investigator and Affiliation
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on the neutral atmospheres. For Jupiter, the occultation data determine temperature, pressure, and density profiles down to the 100 mb pressure level. In addition, deviations of the local vertical direction from the predicted value will be determined and used to study zonal wind velocities in the Jovian atmosphere	Arvydas J. Kliore Jet Propulsion Laboratory
Atmospheres and Ionospheres of Jupiter and Its Satellites	To use S-X band occultation techniques to study the atmospheres and ionospheres of Jupiter and the Galilean satellites, with emphasis on ionospheric measurements. In the ionosphere, the occultation data yield electron number density and plasma scale height profiles	Gunnar Lindal Jet Propulsion Laboratory
Radio Scintillation in the Jovian Atmosphere	To use spacecraft radio scintillations to measure and study turbulence in the Jovian atmosphere, and electron density irregularities, magnetic field direction, and winds in the Jovian ionosphere. Also, where possible, to take similar measurements of the Galilean satellites	Richard Woo Jet Propulsion Laboratory

B3. ISPM THEORETICAL AND INTERDISCIPLINARY SCIENTISTS

Member	Affiliation
W. I. Axford	Victoria University of Wellington, New Zealand
J. Lemaire	Institute d'Aeronomie Spatiale de Belgique, Belgium
G. Noci	Arcetri Observatory, Italy

B4. JOINT IRAS SCIENCE WORKING GROUP

Member	Affiliation
Aumann, H. H.	NASA-Jet Propulsion Laboratory
Beintema, D.	University of Groningen, The Netherlands
Borgman, J.	University of Groningen, The Netherlands
Clegg, P.	Queen Mary College, London University, UK
Dejong, T.	University of Leiden, The Netherlands
Gillette, F.	Kitt Peak National Observatory
Habing, A.	University of Leiden, The Netherlands
Hauser, M.	NASA-Goddard Space Flight Center
Houck, J.	Cornell University
Jennings, R.	University College, London University, UK
Low, F.	University of Arizona
Marsden, P.	University of Leeds, UK
Neugebauer, G.	California Institute of Technology (U.S. Principal Scientist, Co-Chairman)
Pottasch, S.	University of Groningen, The Netherlands
Soifer, T.	California Institute of Technology
Van Duinen, R.	University of Groningen, The Netherlands (European Principal Scientist, Co-Chairman)
Walker, R.	NASA-Ames Research Center

B5. NASA-SELECTED ERBE INVESTIGATORS

Principal Investigator	Affiliation	Description of Investigations
B. Barkstrom (ERBE Scientist and Science Team Leader)	National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC)	Instrument thermal modeling and cloud variability algorithm development
A. Berroir	Laboratoire de Meteorologie Dynamique, France	Improvement of radiation modelizations in a general circulation model
R. Cess	State University of New York, Stonybrook	Validation of models which predict radiation budget variations and investigate climatic feedback effects.
R. Curran	NASA/Goddard Space Flight Center (GSFC)	The effect of clouds on satellite albedo measurements
C. Duncan	NASA/GSFC	Calibration and evaluations of ERBE Sensors
A. Gruber	National Oceanic and Atmospheric Administration (NOAA) National Earth Satellite Service (NESS)	Development of angular models and intercomparison of ERBE data with atmospheric constituents and operational satellite measurements
E. Harrison	NASA/LaRC	Studies of diurnal variation of cloudiness and Earth radiation budget
D. Hartmann	University of Washington, Seattle	Investigation of the diurnal cycle of radiation budget and the effects of cloudiness on net radiation
F. House	Drexel University, Philadelphia	Application of optimal estimation techniques to data use investigations
F. Huck	NASA/LaRC	Assessment of sensor performance and measurement accuracy

B5. concluded

Principal Investigator	Affiliation	Description of Investigations
G. Hunt	University College London, England	Investigation of regional radiation budgets compared to those from geostationary data and use of HALOE and SAGE II data to understand effects of other atmospheric constituents
R. Kandel	Centre National de la Recherche Scientifique, France	Diurnal variations and the Earth radiation measurements
A. Miller	NOAA/National Meteorological Center (NMC)	The dynamical interpretation of ERBE measurements
V. Ramanathan	National Center for Atmospheric Research	Use of ERBE measurements to validate and improve radiation models and general circulation climate models
E. Raschke	University of Cologne, West Germany	Investigation of surface and regional radiation budgets and improvement of model parameterizations
G. Smith	NASA/LaRC	Algorithm development and investigation of radiation budget variability
W. Smith	University of Wisconsin, Madison	Investigation of time/space lag of radiation budget compared to other meteorological variables
T. Vonder Haar	Colorado State University, Fort Collins	Algorithm development for averaging ERBE data over time and space and synergistic investigations using SAGE II data

B6. OPEN THEORETICAL INVESTIGATORS

Member	Affiliation	Investigation
M. K. Hudson (PI)	Univ. of Calif., Berkeley	A Theoretical Study of Wave-Particle Interactions in the Earth's Neighborhood
M. A. Temerin	Univ. of Calif., Berkeley	
R. L. Lysak	Univ. of Calif., Berkeley	
C. A. Cattell	Univ. of Calif., Berkeley	
M. H. Rees (PI)	University of Alaska	Modeling of the Atmosphere-Magnetosphere-Ionosphere System (MAMI)
R. G. Roble	National Center for Atmospheric Research	
C. P. Sonett (PI)	University of Arizona	Theoretical Investigations
P. E. Krider	University of Arizona	
L. L. Hood	University of Arizona	
B. R. Lichtenstein	University of Arizona	
F. Herbert	University of Arizona	
K. Papadopoulos (PI)	University of Maryland	Modeling and Theoretical Investigations
A. Hasegawa	Bell Laboratories	
J. B. McBride	Science Applications Inc.	
H. Okuda	Princeton Plasma Physics Laboratory	
P. J. Palmadesso	U.S. Navy Research Laboratory	
M. Ashour-Abdalla (PI)	Univ. of Calif., LA	The Development of Theoretical Technology for the OPEN Mission
P. J. Coleman, Jr.	Univ. of Calif., LA	
C. F. Kennel	Univ. of Calif., LA	
C. T. Russell	Univ. of Calif., LA	
R. J. Walker	Univ. of Calif., LA	
F. V. Coroniti	Univ. of Calif., LA	
J. M. Dawson	Univ. of Calif., LA	
V. Decyk	Univ. of Calif., LA	
R. W. Huff	Univ. of Calif., LA	
J. N. Leboeuf	Univ. of Calif., LA	
T. A. Lin	Univ. of Calif., LA	
L. A. Frank	University of Iowa	
D. A. Gurnett	University of Iowa	
T. Sato	University of Tokyo	

B7. OPEN GROUND-BASED INVESTIGATORS

Member	Affiliation	Investigation
J. D. Kelley (PI) V. B. Wickwar	SRI International SRI International	High Latitude Incoherent-Scatter Radar Measurements
R. A. Greenwald (PI) R. D. Hunsucker J. G. Roederer T. B. Jones	Johns Hopkins University University of Alaska University of Alaska University of Leicester	Dual Auroral Radar Network (DARN)
M. J. Rycroft (PI) J. Dudeney D. Jones A. J. Smith	Natural Environment Research Council of the UK Natural Environment Research Council of the UK Natural Environment Research Council of the UK Natural Environment Research Council of the UK	OPEN Satellite Exploration Simultaneously with Antarctic Measurements (OPEN SESAME)
A. Vallance-Jones (PI)	National Research Council of Canada	Canadian Auroral Network for the OPEN Program Unified Study (CANOPUS)

B8. SOLAR OPTICAL TELESCOPE COORDINATED FILTERGRAPH-SPECTROMETER CO-INVESTIGATORS

Member	Affiliation
L. W. Acton	Lockheed Palo Alto
U. Anzer	MPI-Phys Astrophys
E. C. Bruner	Lockheed Palo Alto
L. Cram	Sacramento Peak Obs
R. B. Dunn	Sacramento Peak Obs
R. R. Fisher	High Altitude Obs
D. Galloway	MPI-Phys Astrophys
B. Haisch	Lockheed Palo Alto
J. W. Harvey	Kitt Peak Natl Obs
J. T. Jefferies	U of Hawaii
S. Keil	USAF Geophys Lab
J. W. Leibacher	Lockheed Palo Alto
W. L. Livingston	Kitt Peak Natl Obs
F. Meyer	MPI-Phys Astrophys
B. Mihalas	Sacramento Peak Obs
D. Mihalas	Sacramento Peak Obs
R. W. Milkey	Kitt Peak Natl Obs
F. Orrall	U of Hawaii
H. E. Ramsey	Lockheed Palo Alto
W. J. Rosenberg	Lockheed Palo Alto
H. W. Schmidt	MPI-Phys Astrophys
S. A. Schoolman	Lockheed Palo Alto
G. W. Simon	USAF Geophys Lab
R. C. Smithson	Lockheed Palo Alto
H. Spruit	MPI-Phys Astrophys
T. D. Tarbel	Lockheed Palo Alto
J. Toomre	U of Colorado
R. Wegman	MPI-Phys Astrophys
O. R. White	High Altitude Obs
C. J. Wolfson	Lockheed Palo Alto
S. P. Worden	USAF Geophys Lab
J. B. Zirker	Sacramento Peak Obs

APPENDIX C - DEFINITIONS

Certain words and phrases are used in this report in a precise and specific sense. These terms are defined here to clarify the intended meaning.

ACTIVE	A spacecraft/experiment pertinent to this report that has been launched and was reported to NSSDC to have either a "normal" or "partial" status.
APOAPSIS	The distance from the center or the altitude from the surface of the reference body to the farthest orbit point. Distance is used in astronomical units for heliocentric orbits and altitude is used in kilometers for all other orbits.
APPROVED MISSION	A spacecraft mission has been approved and funding is available for it.
BRIEF DESCRIPTION	A concise summary of the spacecraft mission, specifically outlining overall mission objectives and the scientific studies being performed. Also, a concise summary of experiment purposes and instrument characteristics, emphasizing those relevant to scientific use of the resulting data.
CANCELED MISSION	A mission was canceled and no funds are expected to become available to carry it out.
FAILED MISSION	A spacecraft failed to achieve a suitable orbit, or the experiments failed to function after achieving orbit.
INCLINATION	The angle (in degrees) between the satellite orbital plane and the equatorial plane of the primary gravitational body. For satellites with heliocentric orbits, the ecliptic plane is used in lieu of the equatorial plane.
INOPERABLE	A spacecraft/experiment can no longer produce useful scientific data because of malfunction or failure of the spacecraft/experiment systems or critical parts thereof; completion of the spacecraft trajectory in which useful measurements could be taken; or discontinuation of network support (tracking, command, and telemetry).
MISSION BEING RESCOPED	A mission has been redefined to an extent that the original mission plan and experiments are no longer valid and a new mission plan and experiments are under study.
NA	Status information not applicable.
NORMAL	Spacecraft/experiment systems are capable of working so that the data would be suitable for all planned scientific studies for the spacecraft/experiments when they are turned on and the data are recorded.

NSSDC ID CODE	An identification code used in the NSSDC information system. In this system, each successfully launched spacecraft/experiment is assigned a code based on the launch sequence of the spacecraft. Subsequent to 1962, this code (e.g., 72-012A for the spacecraft Pioneer 10) corresponds to the COSPAR international designation. The experiment codes are based on the spacecraft code. For example, the experiments carried aboard the spacecraft 73-019A (Pioneer 11) are numbered 73-019A-01, 73-019A-02, etc. Each prelaunch spacecraft and experiment is also assigned an NSSDC ID code based on the name of the spacecraft. For example, the approved NASA launch COBE would be coded COBE. The experiments to be carried aboard this spacecraft would be coded COBE -01, COBE -02, etc. Once a spacecraft is launched, its prelaunch designation is changed to a postlaunch one; e.g., Pioneer G, which was launched April 6, 1973, was given the NSSDC ID code of 73-019A, corresponding to the launch spacecraft common name, Pioneer 11.
ORBIT TYPE	A word or phrase indicating the most important phase of the trajectory of a given spacecraft mission. The orbit type may be geocentric, geocentric commensurate, selenocentric, heliocentric, Hermocentric (Mercury), Cythereanocentric (Venus), Aerocentric (Mars), Zenocentric (Jupiter), Chronocentric (Saturn), lunar lander, Venus lander, Mars lander, Jupiter probe, Venus probe, lunar flyby, Venus flyby, Mars flyby, Mercury flyby, Jupiter flyby, or Saturn flyby.
PARTIAL	Spacecraft/experiment systems are working, but not all are working as well as the design required. If the spacecraft/experiments were turned on and the data recorded, the data would be suitable for only a portion of the planned scientific studies.
PERIAPSIS	The distance from the center or the altitude from the surface of the reference body to the nearest orbit point. Distance is measured in astronomical units (AU) for heliocentric orbits and altitude is measured in kilometers (km) for all other orbits.
PLANNED	A spacecraft mission was last reported to NSSDC as either "approved" or "proposed." This designation is also used for an experiment that is expected to fly on a planned spacecraft mission.
PROPOSED MISSION	Spacecraft design and experiments have been selected but funding has not been approved.
RETURNED TO EARTH	The status given to those experiments which have been carried onboard the Space Shuttle (not deployed), which have performed successfully, and which have been returned to earth with the Shuttle.

STANDARD	Data that can be processed and made available to the experimenters are being acquired at the rate or percentage of coverage required to accomplish the planned studies.
SUBSTANDARD	Data that can be processed and made available to the experimenters are <u>not</u> being acquired at the rate or percentage of coverage required to continue all planned studies.
UNKNOWN	Information is either unknown or unavailable at NSSDC.
ZERO	Applied to data acquisition rates, indicates a spacecraft/experiment has been turned off except for state-of-health measurements and is in a standby condition capable of being returned to its previous status. In the case of Space Shuttle experiments, a zero data rate indicates that the experiment has been returned to earth by the Shuttle.

APPENDIX D - ABBREVIATIONS AND ACRONYMS

A	angstrom; ampere
ac	alternating current
ACAD	academy
ACIC	Aeronautical Chart and Information Center (now Defense Mapping Agency Aerospace Center)
ACS	attitude control system
A/D	analog to digital
AE	Atmosphere Explorer (satellite, NASA)
AEC	Atomic Energy Commission
AFB	Air Force Base
AFCRL	Air Force Cambridge Research Laboratories (now US Air Force Geophysics Laboratory)
AFGL	Air Force Geophysics Laboratory
AFO	Announcements of Flight Opportunities
AFSC	Air Force Systems Command
AGC	automatic gain control
AGCY	agency
A-h	amp-hour; ampere-hour
ALT	altitude
AM	amplitude modulation
a.m.	ante meridien
AMPTE	Active Magnetosphere Particle Tracer Experiment (NASA satellite program)
AMS	Army Map Service (now Defense Mapping Agency Topographic Center)
AMSAT	Radio Amateur Satellite Corporation
amu	atomic mass unit (also see u)
AMU	astronaut maneuvering unit
Ap	magnetic activity index Ap
APL	Applied Physics Laboratory of Johns Hopkins University
APPL	application
ARC	Ames Research Center (NASA)
arc-min	arc-minute
arc-s	arc-second
AT	atomic
atm	atmosphere
ATS	Applications Technology Satellite (NASA)
AU	astronomical unit
AUST	Australia
avg	average
AVHRR	advanced very high resolution radiometer
AWRE	Atomic Weapons Research Establishment (Australia)
AXAF	Advanced X-ray Astrophysics Facility

b	barn
B	bel; magnetic field strength
BaF	barium fluoride
bcd	binary coded decimal
BCG	ballistocardiogram
Be	beryllium
BE	Beacon Explorer (satellite, NASA)
bpi	bits per inch

bps	bits per second
Btu	British thermal unit
BUV	backscatter ultraviolet
B/W	black and white
BWF	Bundesminister fur Wissenschaftliche Forschung (Fed Rep of Germany)
C	Celsius; coulomb
CaF	calcium fluoride
cal	calorie
CAN	Canada; Canadian satellites
cc	cubic centimeter
CCD	charged-coupled device
CCE	Charge Composition Explorer (satellite, AMPTE program)
Cd	cadmium; candela
CD	crystal detector
CDA	command and data acquisition (station)
CDAW	Coordinated Data Analysis Workshop
C&DH	control and data handling
CDHP	command and data handling package
CdS	cadmium sulfide
CEM	channel electron multipliers
CENS	Centre d'Etudes Nucleaires de Saclay (France)
CEP	cylindrical electrostatic probe
CFA	crossed electric and magnetic field analyzer
CG	center of gravity
CHEM	charge and energy mass spectrometer; chemical
Ci	curie
CID	cathode imaging detector
CMD	command
CNES	Centre National d'Etudes Spatiales (French space agency)
CNET	Centre National d'Etudes des Telecommunications (France)
CNRS	Centre National de la Recherche Scientifique (France)
COBE	Cosmic Background Explorer (satellite, NASA)
COMM	commission
CONIE	Comision Nacional de Investigacion del Espacio (Spain)
COS	Cosmic-Ray Satellite (ESA); cosmic
COSPAR	Committee on Space Research
CO2	carbon dioxide
cp	candlepower
CPA	comprehensive particle analysis; curved plate analyzer
cpi	characters per inch
CPT	charged-particle telescope
CPU	central processing unit
CRA	Centro Ricerch Aerospaziali (Italy)
CRC	Communications Research Centre (Canada)
CRIS	Centre de Rectification des Images Spatiales
CRIE	cosmic-ray isotope experiment
CRRES	Combined Release and Radiation Effects Satellite (joint NASA/USAF mission)
CRS	Commission for Space Research (Italy)
CRT	cathode ray tube
CsI	cesium iodide
CsTe	cesium telluride

CTR	center
CZCS	coastal zone color scanner
d	day
DAN	Danish
DAPP	Defense Acquisition and Processing Program (DOD)
DASA	Defense Atomic Support Agency
dB	decibel
dBu	decibel unit
dc	direct current
DCP	data collection platform
DCS	direct couple system; data collection system
DE	Dynamics Explorer (satellite, NASA)
DEF	defense
deg	degree
DFVLR	Deutsche Forschungs-und Versuchanstalt fur Luft-und Raumfahrt (Research Laboratory for Aeronautics and Astronautics, Fed Rep of Germany)
DIAM	diameter
DMA	Defense Mapping Agency
DMSP	Defense Meteorological Satellite Program (DOD)
DOD	Department of Defense
DPU	data processing unit
dr	dram
DRB-DRTE	Defence Research Board - Defence Research Telecommunications Establishment (Canada)
DSN	Deep Space Network
DUS	data utilization stations
dyn	dyne
DYN	dynamic
E	energy; east; electric field strength
ECG	electrocardiograph
EDPS	Experiment Data and Power System
EDS	Environmental Data Service (NOAA)
EEA	Electrostatic Energy Analyzer
EEG	electroencephalogram
ELEC	electric
ELF	extremely low frequency
EML	Equatorial Magnetospheric Laboratory (OPEN S/C)
EOF	end of file
EOS	Earth Observation Satellite (NASA)
EPDS	Experiment Power and Data Systems
E/Q	energy per unit charge
E/S LIB PT	The earth/sun libration point
ERBE	earth radiation budget experiment
ERBS	Earth Radiation Budget Satellite (NASA)
ERDC	Earth Resources Data Center
ERL	Environmental Research Laboratory (NOAA)
EROS	Earth Resources Observation Service
ESA	European Space Agency; electrostatic analyzer
ESA-GEOS	Geostationary Earth-Orbiting Satellite (ESA)

ESOC	European Space Operations Centre (ESA)
ESRO	European Space Research Organization (now ESA)
ESSA	Environmental Science Services Administration (now NOAA)
ESTEC	European Space Technology Center (ESA)
ETR	Eastern Test Range (also referred to as Cape Canaveral)
Eu	europium
EURECA	European Retrievable Carrier (spacecraft)
EUV	extreme ultraviolet
EUVE	Extreme Ultraviolet Explorer (satellite, NASA)
eV	electron volt
EVA	extravehicular activity
EXOS	Exospheric Satellite (Japan)
EXOSAT	European X-ray Observation Satellite (ESA)
F	farad; Fahrenheit
fc	footcandle
Fe	iron
FIRAS	far infrared absolute spectrophotometer
fL	footlambert
FM	frequency modulation
FMDM	flex multiplexer/demultiplexer
FOC	faint object camera
FOF2	frequency of F2
FOV	field of view
FPI	Fabry-Perot Interferometer
FRC	Flight Research Center (NASA)
FRG	Federal Republic of Germany
ft	foot (feet)
FWHM	full width at half maximum
g	gram
G	earth gravity; geometry factor; gauss
GAC	global area coverage
gal	gallon
GARP	Global Atmospheric Research Program
GEOPHYS	geophysical
GEOS	Geodetic Earth-Orbiting Satellite (NASA); Geostationary Earth-Orbiting Satellite (ESA)
GEOS 3	Geodesic Satellite 3
GES FUR WELTRAUM-FORSCH	Gesellschaft fur Weltraumforschung (Center for Space Research, Fed Rep of Germany)
G.E.T.	ground elapsed time
GeV	giga electron volts (10^9 eV)
GHz	gigahertz
GISS	Goddard Institute for Space Studies (NASA)
GM	Geiger-Mueller
GMS	Geostationary Meteorological Satellite (Japan)
GMT	Greenwich mean time
GOES	Geosynchronous Operational Environmental Satellite (NASA-NOAA)
GPS	global positioning system
GRARR	Goddard range and range rate

GRM	Geopotential Research Mission
GRO	Gamma-Ray Observatory
GSE	geocentric solar ecliptic (coordinate system); ground support equipment
GSFC	Goddard Space Flight Center (NASA)
GSM	geocentric solar magnetospheric (coordinate system)
GSPC	gas scintillation proportional counter
GSTDN	ground spaceflight tracking and data network
GTL	Geomagnetic Tail Laboratory (OPEN S/C)
GUGMS	Glavnoye Upravleniye Gidrometeorologicheskoi Sluzhby (Main Administration of the Hydrometeorological Service, USSR)
GV	gigavolt
GVHRR	geosynchronous very high resolution radiometer
h	hour
H	hydrogen; henry
HAC	half-angle collimator
HCMM	Heat Capacity Mapping Mission (satellite, NASA)
HCO	Harvard College Observatory
He	helium
HEAO	High-Energy Astrophysical Observatory (satellite, NASA)
HEPAD	high-energy proton alpha detector (or telescope)
HF	high frequency
Hg	mercury
HgI2	mercuric iodide
HILAT	High Latitude Satellite (DOD)
H2O	water
HR	high resolution
HXIS	hard X-ray imaging spectrometer
HXRBS	hard X-ray burst spectrometer
Hz	hertz (cycles per second)
HZE	high-charge and high-energy particle
IAP	Institute of Atmospheric Physics (USSR)
ICEX	ice and climate experiment
ICSU	International Council of Scientific Unions
ID	identification
IDC	image dissector camera
IDM	ion drift meter
IGN	Institut Geographique National
IGRF	International Geomagnetic Reference Field
IGY	International Geophysical Year
IKI	Institute for Space Research (USSR)
IMP	Interplanetary Monitoring Platform (satellite, NASA)
IMS	International Magnetospheric Study; ion mass spectrometer
in.	inch
INOP	inoperable
INSAT	Indian National Satellite (ISRO-USSR)
InSb	indium/antimony
INST	institute
INTA	Instituto Nacional de Tecnica Aerospacial (Spain); the National Institute of Aerospace Science

ION COMP	ionospheric composition
IPA	Institute for Physics of the Atmosphere (SAS)
IPL	Interplanetary Physics Laboratory (OPEN S/C)
IPP	imaging photopolarimeter
IPS	instrument pointing system
IQSY	International Quiet Sun Year
IR	infrared
IRAS	Infrared Astronomy Satellite (The Netherlands-NASA-UK)
IRIG	Inter-Range Instrumentation Group
IRIS	infrared-interferometer spectrometer; Italian Research Interim Stage S/C
IRM	Ion Release Module (AMPTE S/C)
IRR	infrared radiometry
ISAS	Institute of Space and Aeronautical Science (Japan)
ISEE	International Sun-Earth Explorer (satellite, NASA-ESA)
ISIS	International Satellite for Ionospheric Studies (NASA-Canada)
ISPM	International Solar Polar Mission (ESA)
ISRO	Indian Space Research Organization
ISS	Ionospheric Sounding Satellite (Japan)
ITOS	Improved TIROS Operational Satellite (NOAA)
ITSA	Institute for Telecommunication of Sciences and Aeronomy (formerly a subdivision of ESSA; now NOAA-ERL)
IUE	International Ultraviolet Explorer (satellite, NASA-UK-ESA)
IUS	intermediate upper stage
IUWDS	International URSIGRAM and World Days Service
IZMIRAN	Institute of Terrestrial Magnetism and Aeronomy of the Academy of Sciences (USSR)
J	joule
JHU	Johns Hopkins University
JOP	Jupiter Orbiter Probe (Galileo Probe)
JPL	Jet Propulsion Laboratory (NASA)
JSC	Johnson Space Center (NASA)
Jy	jansky (1E-26 W/sq m Hz)
K	degree Kelvin
kbs	kilobits per second
kbps	kilobits per second
keV	kiloelectron volt
kg	kilogram
kHz	kilohertz
km	kilometer
K_p	magnetic activity index K_p
KPNO	Kitt Peak National Observatory
KSC	Kennedy Space Center (NASA)
l	liter
L	lambert
LAB	laboratory
LAC	local area coverage
LAGEOS	Laser Geodetic Earth-Orbiting Satellite (NASA)
LAMAR	large area modular array of reflectors
LAMMR	large antenna multifrequency microwave radiometer

LANG	Langmuir probe instrument
LARC	Langley Research Center (NASA)
LASL	Los Alamos Scientific Laboratory
LASSII	Low Altitude Satellite Studies of Ionospheric Irregularities (NRL study mission)
lb	pound
LDEF	Long-Duration Exposure Facility
LED	light-emitting diode
LEE	low-energy electron
LEPAT	low-energy proton alpha telescope
LEPEDEA	low-energy proton and electron differential energy analyzer
LERC	Lewis Research Center (NASA)
LET	low-energy telescope
LF	light fine; low frequency
LFC	large format camera
Li	lithium
LiF	lithium fluoride
LL	Lincoln Laboratory (MIT)
lm	lumen
LMD	Laboratory of Meteorological Dynamics
LP	Langmuir probe
LPSP	Laboratoire de Physique Stellaire et Planetaire (CNRS)
LR	labeled release; low resolution
LRIR	limb radiance inversion radiometer; low-resolution infrared radiometer
LS	light smoothed
lsb	least significant byte
LST	Large Space Telescope (satellite, NASA; now called Space Telescope)
lx	lux
m	meter; milli- (prefix)
MAG	magnetic field; magnetometer
MAGSAT	Magnetic Fields Monitor Satellite
MAPS	Measurement of Air Pollution from Satellite
MAS	Ministry of Aviation Supply (UK)
MCC	Mission Control Center
M/Q	mass-to-charge ratio
MEA	materials experiment assembly
MED	medicine; medical
MEPED	medium energy proton and electron detector
MESA	miniature electrostatic accelerometer
MeV	million electron volts
mg	milligram
Mg	magnesium
MHz	megahertz
min	minute
MIT	Massachusetts Institute of Technology
MJS	Mariner Jupiter/Saturn (spacecraft, NASA)
mm	millimeter
MMS	Multimission Modular Spacecraft
mol	mole
MPD	magneto-plasma dynamic

MPI	Max Planck Institute (Fed Rep of Germany)
MR	medium resolution
msb	most significant bit
MSC	Manned Spacecraft Center (now Johnson Space Center)
MSFC	Marshall Space Flight Center (NASA)
MSL	Material Science Laboratory
MUSE	monitor of ultraviolet solar energy
mV	millivolt
mW	milliwatt
Mx	maxwell
N	nucleon; north; newton
NA	not applicable; not available
NASA	National Aeronautics and Space Administration (Washington, D.C., Headquarters)
NASC	National Aeronautics and Space Council
NASCOM	NASA Communications Network
NASDA	National Space Development Agency (Japan)
NATL	national
NATO	North Atlantic Treaty Organization
NBS	National Bureau of Standards
NCAR	National Center for Atmospheric Research
NCC	National Climatic Center (NOAA)
NDRE	Norwegian Defense Research Establishment
NESC	National Environmental Satellite Center (now NESS)
NESS	National Environmental Satellite Service (NOAA)
NETH	Netherlands spacecraft
NHC	National Hurricane Center
NI	ion density (concentration)
NIH	National Institutes of Health
NMC	National Meteorological Center
NNSS	Navy Navigational Satellite System
NOAA	National Oceanic and Atmospheric Administration (formerly ESSA)
NORAD	North American Air Defense Command
NORW	Norwegian
NOS	National Ocean Survey (NOAA)
NOSS	National Oceanic Satellite System
NOTS	Naval Ordnance Test Station
NRC	National Research Council
NRL	Naval Research Laboratory
NSA	National Security Agency
NSF	National Science Foundation
NSSDC	National Space Science Data Center
nT	nanotesla
NUCL	nuclear
NWL	Naval Weapons Laboratory
NWRC	National Weather Records Center (presently NCC)
OMSF	Office of Manned Space Flight (NASA)
ONERA	Office National d'Etudes et de Recherches Aerospatiales
ONR	Office of Naval Research
OPEN	Origins of Plasmas in the Earth's Neighborhood (NASA program)
OSCAR	Orbiting Satellite Carrying Amateur Radio
OSSA	Office of Space Science and Applications (NASA)

OSTA	Office of Space and Terrestrial Applications
oz	ounce
P	poise; phosphorus
Pa	pascal
PAGEOS	Passive Geodetic Earth-Orbiting Satellite (NASA)
PAM	pulse amplitude modulation
PAM-A	payload assist module - emulates Agena upper stage
PAM-D	payload assist module - emulates Delta upper stage
PAM-D2	payload assist module - emulates Delta upper stage with additional boost
pc	parsec
PC	proportional counter
PCM	pulse-coded modulation
PDP	plasma diagnostic package; passive dosimeter packet
PFM	pulse frequency modulation
PHA	pulse height analyzer
PHYS	physics
PI	principal investigator
PICNO	picture number
PIXEL	picture element
PM	pulse modulation; photomultiplier
p.m.	post meridien
PMEL	Pacific Marine Environmental Laboratory (NOAA)
PMR	pressure modulation radiometer; Pacific Missile Range
PMT	photomultiplier tube
P-N	positive-negative (junction)
POCC	Payloads Operations Control Center
PPL	Polar Plasma Laboratory (OPEN S/C)
PPR	photopolarimeter radiometer
PPS	pulses per second
PRC	Peoples Republic of China
psia	pounds per square inch, absolute
psig	pounds per square inch, gauge
pt	pint
q	quart
Q	charge
Ra	radium
rad	radian
RAD	radiation
RAHF	research animal holding facility
RAM	random access memory (system)
RBV	return beam vidicon (camera)
RC	resistance capacitor
RE	earth radii
REP	republic
RES	research
rf	radio frequency
rfI	radio frequency interference

rms	root mean square
RMS	remote manipulator system
ROSAT	Roentgen Satellite (German X-ray research satellite)
RPA	retarding potential analyzer
rpm	revolutions per minute
rps	revolutions per second
RRL	Radio Research Laboratories (Japan)
RSRS	Radio and Space Research Station (England)
RTD	Research Technology Division (USAF)
RTG	radioisotope thermoelectric generator
s	second
S	south; siemens
SAGE	Stratospheric Aerosol and Gas Experiment (S/C or Exp.)
SAMSO	Space and Missile Systems Organization (USAF)
SAO	Smithsonian Astrophysical Observatory
SAR	synthetic aperture radar; search and rescue
SAS	Soviet Academy of Science
SBUV/TOMS	solar backscatter ultraviolet/total ozone mapping system
S/C	spacecraft
SCATHA	Spacecraft Charging at High Altitudes (satellite)
SCI	science
SCR	selective chopper radiometer
SDPF	Sensor Data Processing Facility
SEA	spherical electrostatic analyzer
SEC	secondary electron conduction (vidicon tube)
SEM	space environment monitor
SERC	Space and Engineering Research Council (UK)
SFA	sweep frequency analyzer
SHS	Soviet Hydrometeorological Service
SIDS	Space Investigations Documentation System (NASA)
SIG	selenide isotope generator
SIR-A	Shuttle Imaging Radar - A
SM	San Marco (satellite, Italian); also Italian Indian Ocean launch site
SME	Solar Mesosphere Explorer (satellite, NASA)
SMM	Solar Maximum Mission (satellite, NASA)
SMMR	scanning multispectral microwave radiometer
S/N	signal to noise
SNAP	systems for nuclear auxiliary power
SOT	Solar Optical Telescope (satellite)
SPAS	Shuttle Payload Satellite (deployable/retrievable German low cost commercial spacecraft)
SPOT	Systeme Probatoire d'Observation de la Terre
sq	square
sr	steradian
SRI	Stanford Research Institute
SRPA	spherical retarding potential analyzer
SRT	supporting research and technology
SS	Space Shuttle
SSC	Satellite Situation Center
SSCC	spin-scan cloudcover camera
SSD	Space Science Division (JPL)

SSLDEF	Space Shuttle Long-Duration Exposure Facility
SSPP	Shuttle Spacelab Payloads Project
SST	satellite-to-satellite tracking
SSUS-A	solid spinning upper stage - emulates Atlas upper stage
SSUS-D	solid spinning upper stage - emulates Delta upper stage
St	stokes
ST	Space Telescope (satellite, NASA)
STD	standard
STDN	Spaceflight Tracking and Data Network (NASA)
STP	Solar Terrestrial Probe (satellite, NASA); solar terrestrial physics; Space Test Program
STS	Space Transportation System
STS/SSUS	Spinning Upper Stage - launched from the STS
SW	southwest
t	tonne (1000 kg)
T	tesla
TAC	Technology Application Center
TBD	to be determined
TDRS	Tracking and Data Relay Satellite
TDRS-MA	multiple access mode of operation with TDRS
TDRS-SA	single access mode of operation with TDRS
TDRSS	Tracking and Data Relay Satellite System
Te	tellurium
TE	electron temperature
TEC	total electron content
TECH	technical; technology
TED	total energy detector
TEMP	temporal; temperature
TeV	tetra electron volts
THIR	temperature/humidity infrared radiometer
TIP	Tracking Impact Prediction (satellite, DOD)
TIROS	Television and Infrared Observations Satellite (NASA)
TL	team leader
TM	team member; thematic mapper
T/M	telemetry
TOF	time of flight
TOPEX	topography experiment - GEOS class S/C
TOPO	topographic
TOS	TIROS Operational Satellite (or System) (NASA)
TOVS	TIROS operational vertical sounder
TRF	technical reference file (NSSDC)
TSS	Tethered Satellite System
TWERLE	tropical wind energy conversion and reference level experiment
u	atomic mass unit
U	university
UA	unified abstract
UARS	Upper Atmosphere Research Satellite
UCLA	University of California at Los Angeles
UHF	ultra-high frequency

UK	United Kingdom
UKS	United Kingdom Spacecraft (AMPTE S/C)
ULEWAT	ultralow-energy wide-angle telescope
ULEZEQ	ultralow-energy, Z, E, and Q experiment
U.S.	United States
USA	United States of America
USAF	United States Air Force
USGS	United States Geological Survey
USN	United States Navy
USSR	Union of Soviet Socialist Republics
UT	universal time
UV	ultraviolet
V	volt
VAR	variation
VAS	VISSR atmospheric sounder
VCO	voltage controlled oscillator
VDC	volts DC
VHF	very high frequency
VHRR	very high resolution radiometer
VIS	visual imaging spectrometer
VISSR	visible infrared spin-scan radiometer
VLF	very low frequency
VLF/MF	very low frequency/multi frequency
VOIR	Venus Orbiting Imaging Radar (satellite)
VRM	Venus Radar Mapper
vs	versus
W	watt; west
WATS	wind and temperature spectrometer
Wb	weber
WBM	wide-band module
WBVTR	wide-band video tape recorder
WDC	World Data Center
WDC-A-R&S	World Data Center A for Rockets and Satellites
WEFAX	weather facsimile
WFC	Wallops Flight Center (NASA); wave form channel
WMO	World Meteorological Organization
WS	Wallops Station (NASA; now Wallops Flight Center)
WSIR	wide swath imaging radar
WSMR	White Sands Missile Range
WTR	Western Test Range (also referred to as Vandenberg AFB)
WWW	World Weather Watch
XTE	X-ray Timing Mission
XUV	extreme ultraviolet
yd	yard
yr	year
Z	atomic number

Introduction

Descriptions of Active Spacecraft and Experiments

Descriptions of Planned Spacecraft and Experiments

Index of Active and Planned Spacecraft and Experiments

Investigator Name Index

Appendixes

NASA
National Space Science Data Center
World Data Center-A for Rockets and Satellites
Code 601
Goddard Space Flight Center
Greenbelt, Maryland 20771
U.S.A.

POSTAGE AND FEES PAID
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NASA
National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771