NSSDC

WDC-A-R&S

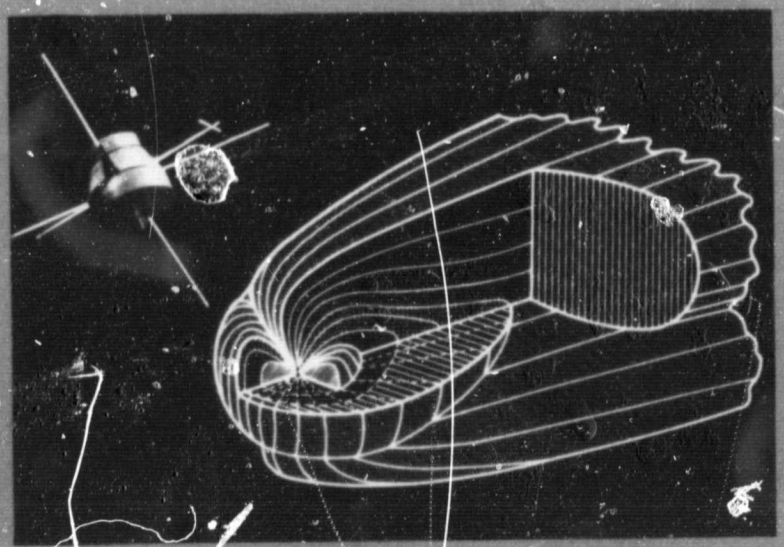
82-22

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

DATA CATALOG SERIES FOR SPACE SCIENCE AND APPLICATIONS FLIGHT MISSIONS

Volume 2A

Descriptions of Geostationary and High-Altitude Scientific Spacecraft and Investigations



September 1982

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DATA CATALOG SERIES FOR SPACE SCIENCE AND APPLICATIONS FLIGHT MISSIONS

Volume 2A

DESCRIPTIONS OF GEOSTATIONARY AND HIGH-ALTITUDE SCIENTIFIC SPACECRAFT AND INVESTIGATIONS

Edited by

H. Kent Hills
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September 1982

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

PREFACE

This volume is part of a series which will describe data sets and related spacecraft and investigations from space science and applications flight investigations. The series will describe tha data sets held by NSSDC, some of the data sets held by NASA-funded investigators, and some of those held by foreign investigators; and the series will serve as pointer documents for extensive data sets held and serviced by other government agencies.

We would like to acknowledge and thank the many spacecraft experimenters and their colleagues who have submitted their data for archiving at NSSDC. The cooperation of the investigators in supplying current status information is gratefully acknowledged. Thanks also are extended to the other NSSDC personnel, employees of the on-site contractor, M/A-COM Sigma Data, Inc., who have been involved in the information handling necessary to produce this volume. Special acknowledgment is given to Mary Elsen for her extensive editorial assistance.

The Data Center is continually striving to increase the usefulness of its data holdings, supporting indexes, and documentation. Scientists are invited to submit their space science data and comments to NSSDC. Catalog recipients are urged to inform potential data users of its availability.

H. Kent Hills
Ronald G. Littlefield
Norman J. Schofield
James I. Vette

September 1982

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Introduction

1.1 PURPOSE

The National Space Science Data Center (NSSDC) was established by the National Aeronautics and Space Administration (NASA) to provide data and information from space science and applications flight investigations in support of additional studies beyond those performed as the principal part of any flight mission. This volume is one of a series of eleven that will describe (1) the holdings of all spacecraft flight investigations for which NSSDC possesses data or can direct people to the data source, (2) all data sets held by NSSDC, (3) some of the data sets held and serviced by NASA-funded investigators, and (4) some of the data sets held and serviced by foreign investigators; and the series will serve as pointer documents for extensive data sets held and serviced by other government agencies, particularly the National Oceanographic and Atmospheric Administration (NOAA). There is one major omission from this series: the extensive set of data obtained from the lunar missions conducted by NASA, supplemented by a few small photographic data sets from Soviet missions. These are described in the *Catalog of Lunar Mission Data* (NSSDC/WDC-A-R&S 77-02) and will not be repeated in this series, except for a few cases. The data from IMP-E, Apollo 15 subsatellite, and Apollo 16 subsatellite are included in the series, since these data are important to disciplines other than those connected with lunar studies. Some of the experiments of the Apollo ALSEP missions also yielded useful data for magnetospheric and interplanetary physics, but these are not included in the series, since the instruments were confined to the surface of the moon. Readers should consult the *Catalog of Lunar Mission Data* if they are interested in such data sets.

The series consists of (1) five volumes that describe the spacecraft and their associated investigations (experiments) separated, mainly, into various orbit categories, (2) five corresponding volumes that describe the various orbital information and investigation data sets, and (3) a master index volume. In some cases certain data sets appear in more than one data set volume, since they are important to a discipline not normally related to most of the investigations on a given spacecraft. The five categories of spacecraft are (i) Planetary and Heliocentric, which include planetary flybys and probes, (ii) Meteorology and Terrestrial Applications, (iii) Astronomy, Astrophysics, and Solar Physics, which are all geocentric except the selenocentric RAE-B, (iv) Geostationary and High-Altitude Scientific, and (v) Low- and Medium-Altitude Scientific. It is impossible to provide an organization of categories that separates the investigations cleanly into scientific disciplines, since many missions were multidisciplinary.

Each volume is organized in a way that is believed to be most useful to the user and is described for each such volume in the Organization Section. For standard types of orbital information, i.e., predicted, refined, and definitive, the information is given in a tabular form to avoid repeating the same brief description an inordinate number of times. The standard description of a data set from an investigation is a free text brief description, since the wide variety of instruments precludes using a tabular format in most cases.

This catalog series has been prepared following a two-year survey and follow-up activity by NSSDC personnel to obtain information about the completeness of the NSSDC holdings and to solicit the description of data sets that will be serviced by individual investigators; these latter data sets are referred to as directory data sets. This survey was conducted only for NASA missions launched after December 31, 1962, but it includes the majority of NSSDC holdings. Unfortunately, of the 100 investigators surveyed, representing 346 inactive (no longer associated with an active science working team or equivalent) experiments, a small percentage failed to respond in 17 months of concerted solicitation of information. Consequently, there are now 20 investigations for which NSSDC has no data that will be dropped from this catalog series, since it would be irresponsible for NSSDC to send requesters to a possible data source that no longer has data or is nonresponsive. The investigations that are being dropped from the NSSDC catalogs are identified in the appropriate volumes in the series. A small, but nontrivial, number of investigations were identified for which data no longer exist or for which the instrument failed at launch. These investigations are included in the spacecraft/investigation volumes so that users will know that it is fruitless to try to obtain such data anywhere.

The main purpose of this series is to identify the data and the contact from whom the data can be obtained within the scope previously defined. In addition, we have tried to identify the personnel involved with the investigation, so that a user will know whom to contact for an obscure or detailed piece of information relative to a given data set that NSSDC may not possess. Consequently, we have tried to provide the current affiliation of the investigators. In some cases we know that people have retired or have gone into different areas of endeavor. The latter case is treated by showing the last affiliation of such an individual and denoting that he is no longer affiliated by printing NLA after the individual's name. Since this series is oriented toward helping interested persons to obtain data from flight investigations and helping NSSDC to serve as an effective switching center, the spacecraft/mission personnel are identified at the institution where they performed their relevant duties. The term NLA is printed with the names of these personnel if they are no longer associated with the given institution.

It is hoped that this series will serve for many years as the source documents for data in the disciplines that NSSDC handles. The annual *NSSDC Data Listing* will be used to update the time intervals for which data are available and to identify in brief form the new data sets that become available in the future. The annual *Report of Active and Planned Spacecraft and Experiments* will be used to describe the new spacecraft and experiments which are placed in orbit.

1.2 ORGANIZATION

This volume of the NSSDC Data Catalog Series deals with earth-orbiting spacecraft and investigations mainly at geostationary and higher altitudes. Also included are three lunar-orbiting spacecraft and some others whose apogees did not attain the geostationary altitude. Section 2 contains descriptions of only those investigations for which NSSDC has data sets, knows of their location and has descriptions of them, or has notice that data no longer exist. As noted above, there are several investigations for which NSSDC has no data sets and for which no description or information on availability of data could be obtained. These investigations are as follows:

Spacecraft	NSSDC ID of Investigation	Investigation Name	Principal Investigator
Hawkeye 1	74-040A-01	Triaxial Fluxgate Magnetometer	J. A. Van Allen
IMP-B	64-060A-04	Cosmic Rays	F. B. McDonald
IMP-C	65-042A-04	Cosmic Rays	F. B. McDonald
IMP-H	72-073A-09	Solar and Cosmic Ray Particles	F. B. McDonald
IMP-I	71-019A-16	Electrostatic Waves and Radio Noise	T. L. Aggson
IMP-I	71-019A-08	Solar and Galactic Cosmic Ray Studies	F. B. McDonald
OGO 1	64-054A-17	Cosmic Ray Isotopic Abundance	F. B. McDonald
OGO 3	66-049A-06	Plasma Probe, Faraday Cup	H. S. Bridge
OGO 3	66-049A-02	Cosmic Ray Isotopic Abundance	F. B. McDonald
OGO 5	68-014A-10	Galactic and Solar Cosmic Ray Studies	F. B. McDonald

The organization of the descriptions of the spacecraft in Section 2 is mainly alphabetical by the NSSDC spacecraft common name. Those few spacecraft whose names start with numbers are arranged numerically and placed before the alphabetical listings. Under each spacecraft heading, the appropriate investigation descriptions are arranged alphabetically by name of the principal investigator. Each spacecraft description entry in Section 2 includes the spacecraft alternate names, NSSDC ID number, launch information, sponsoring country and agency, initial orbital parameters, project personnel, and a textual description of the mission. Each investigation description entry in Section 2 includes the investigation name (as used by NSSDC), NSSDC ID number, the experiment personnel, the pertinent scientific discipline, and a textual description of the investigation.

The Index of Spacecraft and Investigations in Section 3 lists the spacecraft and investigations described in this volume. Spacecraft common names and alternate names are in numerical and alphabetical order. Included with each spacecraft common name are the sponsoring country and agency, launch date, orbit type, NSSDC ID number, and the page where the spacecraft description may

be found in this volume. Grouped under each spacecraft name are the particular investigations for that spacecraft which are to be dealt with in this volume, arranged alphabetically by principal investigator's name. Each of these entries also includes the investigation name, NSSDC ID number, and the page where the investigation description may be found in this volume.

Certain words, phrases, and acronyms used in this volume are defined in Appendix A.

In this volume the principal subject areas are magnetospheric physics, space plasmas, and fields and particles, but the spacecraft selection is based on the orbit category. No attempt has been made here to reference investigations related to the above subject areas carried on other spacecraft, which are described in other volumes of this series.

1.3 NSSDC PURPOSE, FACILITIES, AND SERVICES

The National Space Science Data Center (NSSDC) was established by the National Aeronautics and Space Administration (NASA) to provide data and information from space science and applications investigations in support of additional studies beyond those performed by principal investigators. As part of that support, NSSDC has prepared this series of volumes providing descriptions of archived data, divided into five categories as presented in Section 1.1 (and see inside front cover). In addition to its main function of providing selected data and supporting information for further analysis of space science flight experiments, NSSDC produces other publications. Among these are a report on active and planned spacecraft and experiments and various users guides.

Virtually all the data available at or through NSSDC result from individual experiments carried on board individual spacecraft. The Data Center has developed an information system utilizing a spacecraft/investigation/data identification hierarchy. This catalog is based on the information contained in that system.

NSSDC provides facilities for reproduction of data and for onsite data use. Resident and visiting researchers are invited to study the data while at the Data Center. The Data Center staff will assist users with additional data searches and with the use of equipment. In addition to spacecraft data, the Data Center maintains some supporting information and other supporting data that may be related to the needs of the researchers.

The Data Center's address for information (for U.S. researchers) follows:

National Space Science Data Center
Code 601.4
Goddard Space Flight Center
Greenbelt, Maryland 20771
Telephone: (301) 344-6695
Telex No.: 89675
TWX No.: 7108289716

Researchers who reside outside the U.S. should direct requests for information to the following address:

World Data Center A for Rockets and Satellites
Code 601
Goddard Space Flight Center
Greenbelt, Maryland 20771 U.S.A.
Telephone: (301) 344-6695
Telex No.: 89675
TWX No.: 7108289716

1.4 DATA ACQUISITION

NSSDC invites members of the scientific community involved in spaceflight investigations to submit data to the Data Center or to provide information about the data sets that they prefer to handle directly. The Data Center assigns a discipline specialist to work with each investigator or science working team to determine the forms of data that are likely to be most useful to the community of users that obtain data from NSSDC. The pamphlet *Guidelines for Submitting Data to the National Space Science Data Center* can be provided on request.

Spacecraft and Investigation Descriptions

********** 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.

********** APOLLO 15 SUBSATELLITE **********

SPACECRAFT COMMON NAME- APOLLO 15 SUBSATELLITE
ALTERNATE NAMES- APOLLO 15P, 05377
P + F S

NSSDC ID- 71-063D

LAUNCH DATE- 08/04/71 WEIGHT- 41. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SATURN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-ONSF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SELENOCENTRIC EPOCH DATE- 08/05/71
ORBIT PERIOD- 119.75 MIN INCLINATION- 151.28 DEG
PERIAPSIS- 103.49 KM ALT APOAPSIS- 135.90 KM ALT

PERSONNEL
PM - J.H. JOHNSON NASA-JSC
PS - NONE ASSIGNED

BRIEF DESCRIPTION
The subsatellite of the Apollo 15 mission carried experiments designed to study interplanetary magnetic fields and solar flares. The subsatellite was deployed from the Command Service Module's scientific instrument module bay while Apollo 15 was in lunar orbit. The spin axis was approximately perpendicular to the ecliptic plane. The spin rate stabilized at about 12 rpm after boom deployment. The subsatellite had three equally spaced, folded booms mounted around its base. These booms extended automatically at deployment to a length of about 1.5 m. The subsatellite provided about 6 months of data coverage before two successive electronic failures in February 1972 caused the loss of most of the data channels. The surviving data channels were monitored intermittently until June 1972 and then more or less continuously until January 1973, when ground support was terminated.

------- APOLLO 15 SUBSATELLITE, ANDERSON -------

INVESTIGATION NAME- LUNAR PARTICLE SHADOWS AND BOUNDARY LAYER

NSSDC ID- 71-063D-01 INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE

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

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - L.M. CHASE U OF CALIF, BERKELEY
OI - R.P. LIN U OF CALIF, BERKELEY
OI - J. MCCOY NASA-JSC
OI - G. SCHUBERT U OF CALIF, LA

BRIEF DESCRIPTION
This experiment was designed to study the plasma regimes through which the moon moves, the interaction of the moon and plasmas, and some features of the structure and dynamics of the magnetosphere. Two 2-element solid-state particle telescopes and four electrostatic analyzers were used. The two telescopes, which were aligned along the spacecraft spin axis, differed in that one had an organic foil in which incident electrons lost relatively little energy and protons lost relatively much energy. Each telescope was operated at six discrimination levels, which corresponded on both telescopes to electron threshold energies of approximately 20, 40, 85, 155, 320, and 520 keV. The unshielded telescope was sensitive to protons of approximately the same energies as electrons in the six discrimination states, but the shielded telescope was sensitive to protons with six thresholds between about 340 and 700 keV. Species resolution was determined from the relative responses of the two telescopes. The electrostatic analyzers were oriented perpendicular to the spacecraft spin axis and measured both large fluxes of electrons in the energy windows 0.53 to 0.68, 1.75 to 2.25, and 5.5 to 6.5 keV, and small fluxes of electrons in the windows 5.5 to 6.5 and 13.5 to 15.0 keV. These analyzers did not count protons. Spin-integrated counts were obtained for all energy windows except the 13.5 to 15.0 keV window in which four-sectored data were obtained. Except for an apparent temperature-dependent gain shift in one telescope and a high-temperature-induced malfunction of this telescope between October and December 1971, the experiment worked as planned.

------- APOLLO 15 SUBSATELLITE, COLEMAN, JR.----------

INVESTIGATION NAME- BIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 71-063D-02
INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE
INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - P.J. COLEMAN, JR. U OF CALIF, LA

BRIEF DESCRIPTION
Physical and electrical properties of the moon and the interactions of the solar plasma with the moon were determined using a boom-deployed biaxial fluxgate magnetometer. One sensor was parallel to the spacecraft spin axis and was sampled once every 2 s or about two times per revolution, and the other was perpendicular to this axis and was sampled once per second. A sun-pulse generator was used to provide spin-phase information needed for vector field calculations. The two dynamic ranges of each sensor were plus or minus 50 nT and plus or minus 200 nT. Data were obtained in real time at a high information bit rate and in recorded mode once every 12 or 24 s. Failure of the telemetry system on February 3, 1972, terminated the useful life of the experiment.

------- APOLLO 15 SUBSATELLITE, SJOGREN----------

INVESTIGATION NAME- S-BAND TRANSPONDER

NSSDC ID- 71-063D-03
INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE
INVESTIGATION DISCIPLINE(S)
CELESTIAL MECHANICS
PLANETOLOGY

PERSONNEL
PI - W.L. SJOGREN NASA-JPL

BRIEF DESCRIPTION
The purpose of this experiment was to measure the lunar gravitational field based on dynamical motion of the spacecraft in free-fall orbit by precise earth-based radio tracking measurements. A stable frequency of 2115 MHz obtained from a cesium reference was transmitted to the subsatellite which transponded the received signal, after multiplying it by the constant 240/221 (to avoid self-lockup), back to earth. At the earth receiver, the initial transmitted frequency was multiplied by 240/221 and subtracted, and the resulting cycle-count differences were accumulated for data reduction. Because the fractional part of a cycle count was measured, the resolution was 0.01 Hz, or 0.6 mm s.

********** APOLLO 16 SUBSATELLITE**********

SPACECRAFT COMMON NAME- APOLLO 16 SUBSATELLITE
ALTERNATE NAMES- APOLLO 16D, C6009

NSSDC ID- 72-031D

LAUNCH DATE- 04/24/72 WEIGHT- 36. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- SIM

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OMSF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SELENOCENTRIC EPOCH DATE- 04/25/72
ORBIT PERIOD- 119. MIN INCLINATION- 169.281 DEG
PERIAPSIS- 91.026 KM ALT APOAPSIS- 130.780 KM ALT

PERSONNEL
PM - J.H. JOHNSON NASA-JSC
PS - NONE ASSIGNED

BRIEF DESCRIPTION
The subsatellite of the Apollo 16 mission carried experiments designed to study interplanetary magnetic fields and energetic solar particles. The subsatellite was deployed from the Command Service Module's scientific instrument module bay while Apollo 16 was in lunar orbit. The subsatellite spin axis was approximately perpendicular to the ecliptic plane. Its spin rate stabilized at about 12 rpm after boom deployment. The subsatellite had three equally spaced, folded booms mounted around its base. These booms extended automatically at deployment to a length of about 1.5 m. The subsatellite prematurely impacted with the moon on May 29, 1972, after 34 days (425 revolutions) in orbit.

------- APOLLO 16 SUBSATELLITE, ANDERSON----------

INVESTIGATION NAME- LUNAR PARTICLE SHADOWS AND BOUNDARY LAYER

NSSDC ID- 72-031D-01
INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE
INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - L.M. CHASE U OF CALIF, BERKELEY
OI - P.J. COLEMAN, JR. U OF CALIF, LA
OI - R.P. LIN U OF CALIF, BERKELEY
OI - J. MCCOY NASA-JSC
OI - G. SCHUBERT U OF CALIF, LA

BRIEF DESCRIPTION
This experiment was designed to study the plasma regimes through which the moon moves, the interaction of the moon and plasmas, and some features of the structure and dynamics of the magnetosphere. Two 2-element solid-state particle telescopes and four electrostatic analyzers were used. The two telescopes, which were aligned along the spacecraft spin axis, differed in that one had an organic foil in which incident electrons lost relatively little energy and protons lost relatively much energy. Each telescope was operated at six discrimination levels which corresponded on both telescopes to electron threshold energies of approximately 20, 40, 85, 155, 320, and 520 keV. The unshielded telescope was sensitive to protons of approximately the same energies as electrons in the six discrimination states, but the shielded telescope was sensitive to protons with six thresholds between about 340 and 700 keV. Species resolution was determined from the relative responses of the two telescopes. The electrostatic analyzers were oriented perpendicular to the spacecraft spin axis and measured both large fluxes of electrons in the energy windows 0.53 to 0.68, 1.9 to 2.1, and 5.9 to 6.4 keV, and small fluxes of electrons in the windows 5.8 to 6.5 and 13.5 to 15.0 keV. These analyzers did not count protons. Spin-integrated counts were obtained for all energy windows except the 13.5 to 15.0 keV window in which four-sectored data were obtained. The instruments worked as planned for the life of the spacecraft.

------- APOLLO 16 SUBSATELLITE, COLEMAN, JR.----------

INVESTIGATION NAME- BIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 72-031D-02
INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE
INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - P.J. COLEMAN, JR. U OF CALIF, LA

BRIEF DESCRIPTION
The Apollo 16 lunar-orbiting subsatellite magnetometer was a boom-deployed biaxial fluxgate instrument. One of its axes lay along the satellite spin axis. The other lay in the spin plane. A sun-pulse generator provided the phase information needed to obtain the direction of the magnetic vector. The spin period was 5.175 s. The dynamic ranges of each sensor were plus or minus 50 nT and plus or minus 100 nT. Otherwise it was identical to the Apollo 15 subsatellite magnetometer (71-063D-02). The instrument's useful life was terminated on May 29, 1972, when the satellite impacted the moon.

------- APOLLO 16 SUBSATELLITE, SJOGREN----------

INVESTIGATION NAME- S-BAND TRANSPONDER

NSSDC ID- 72-031D-03 INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE

INVESTIGATION DISCIPLINE(S)
PLANETOLOGY
CELESTIAL MECHANICS

PERSONNEL
PI - W.L. SJOGREN NASA-JPL

BRIEF DESCRIPTION
The purpose of this experiment (S-164) was to measure the lunar gravitational field based on dynamical motion of the spacecraft in free-fall orbit by precise earth-based radio tracking measurements. A stable frequency of 2115 MHz obtained from a cesium reference was transmitted to the subsatellite which transponded the received signal, after multiplying it by the constant 240/221 (to avoid self-lockup), back to earth. At the earth receiver, the initial transmitted frequency was multiplied by 240/221 and subtracted, and the resulting cycle-count differences were accumulated for data reduction. Because the fractional part of a cycle count was measured, the resolution was 0.01 Hz, or 0.6 mm s. For a 5-day period after May 9, 1972, subsatellite periapsis altitudes near 12 km provided new detailed gravity measurements of many near-side features such as Copernicus, Sinus Medii, and Mare Fecunditatis.

********** ATS 1**********

SPACECRAFT COMMON NAME- ATS 1
ALTERNATE NAMES- ATS-B, 02608

NSSDC ID- 66-110A

LAUNCH DATE- 12/07/66 WEIGHT- 352. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/10/67
ORBIT PERIOD- 1436.1 MIN INCLINATION- 0.1 DEG
PERIAPSIS- 35782. KM ALT APOAPSIS- 35793. KM ALT

PERSONNEL
PM - R.J. DARCEY(NLA) NASA-GSFC
PM - C.M. MACKENZIE NASA-GSFC
PS - T.L. AUGSON NASA-GSFC

BRIEF DESCRIPTION
ATS 1 (Applications Technology Satellite) was designed and launched for the purpose of (1) testing new concepts in spacecraft design, propulsion, and stabilization, (2) collecting high-quality cloudcover pictures and relaying processed meteorological data via an earth-synchronous satellite, (3) providing in situ measurements of the aerospace environment, and (4) testing improved communication systems. The spin-stabilized spacecraft was cylindrically shaped and measured 135 cm long and 142 cm in diameter. The primary structural members were a honeycombed equipment shelf and thrust tube. Support rods extended radially outward from the thrust tube. Solar panels were affixed to the support rods and formed the outer walls of the spacecraft. Equipment components and payload were mounted in the annular space between the thrust tube and solar panels. In addition to solar panels, the spacecraft was equipped with two rechargeable nickel-cadmium batteries to provide electrical power. Eight 150-cm-long VHF experiment whip antennas were mounted around the aft end of the spacecraft, while eight telemetry and command antennas were placed on the forward end. Spacecraft guidance and orbital corrections were accomplished by 2.3-kg hydrogen peroxide and hydrazine thrusters, which were activated by ground command. The satellite was initially placed at 151.16 deg W longitude over the Pacific Ocean in a geostationary equatorial orbit. In general, most of the experiments were successful. Data coverage was high until about 1970, after which limited real-time data acquisition was carried out by NOAA until the May 1974 launch of SMS 1. Limited ATS 1 data acquisition was begun by NASA at about that time for ATS 1 - ATS 6 correlative studies. The spacecraft has served as a communications satellite for a number of state, federal, and public organizations up to the present. It is planned to continue operations at its final longitude of 164 deg E until September 1983 and then move the spacecraft out of the geostationary orbit.

------- ATS 1, BROWN----------

INVESTIGATION NAME- PARTICLE TELESCOPE

NSSDC ID- 66-110A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN BELL TELEPHONE LAB
CI - L.J. LANZEROTTI BELL TELEPHONE LAB

BRIEF DESCRIPTION
The instrumentation for the experiment consisted of a six-element semiconductor particle telescope mounted behind a collimator with a half-angle of about 20 deg. The six elements operated in nine modes with five energy intervals per mode. The instrument could detect protons from 0.6 to 100 MeV, alpha particles from 2.4 to 400 MeV, and electrons from 0.4 to 3 MeV. Species discrimination was possible over most of the energy ranges. One of the nine modes provided data on detector noise and particle background. One experimental mode was monitored during one telemetry sequence. The complete experiment sequence readout required 16 telemetry sequences and was repeated every 5.46 min. Once every 5.8 h the counters and electronics were calibrated.

------- ATS 1, COLEMAN, JR.----------

INVESTIGATION NAME- BIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 66-110A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.J. COLEMAN, JR. U OF CALIF, LA

BRIEF DESCRIPTION
This biaxial fluxgate magnetometer measured vector magnetic fields at synchronous altitude. One sensor was mounted in the spin plane of the spacecraft and one along the spin axis. Using the onboard sun sensor, triaxial vector measurements were deduced. As the sensor was mounted on only a 15-cm boom, it has suffered from serious spacecraft interference. Though measurement precision was about 0.5 nT, interference fields were of the order of the ambient fields. Procedures for offset corrections have been developed and implemented for about 95% of the interference sources to a 15-s time resolution. Also, spectral analyses of wave modes present were possible to a 0.32-s time resolution. Thus dc fields were obtainable from this data up to 15-s time resolution, and wave data up to 1.5 Hz. Certain nonmachine-correctable offsets still plague reduced data from this experiment, but these are identifiable and hand correctable. The onboard sun sensor failed November 2, 1969. However, the sun caused a noise modulation of the spinning spacecraft so that even after this time, with some effort, vector data were extractable from the telemetered data. Data coverage was about 90% through August 1968. During August 1968 to November 1969, coverage dropped to 40%. Data were recorded by NOAA, Boulder, starting in October 1970. Coverage was about 80%.

------- ATS 1, FREEMAN----------

INVESTIGATION NAME- SUPRATHERMAL ION DETECTOR

NSSDC ID- 66-110A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.W. FREEMAN RICE U

BRIEF DESCRIPTION
The ATS 1 Suprathermal Ion Detector was designed to search for convective fluxes of low-energy ions in the magnetosphere. The detector system consisted of a planar retarding potential analyzer, which fed into a channeltron. The analyzer operated in the differential mode for 20 energy windows from 0 to 50 eV and in an integral mode for two windows, greater than 0 and greater than 50 eV. The system was sensitive to ions from 0 to 50 eV, electrons greater than 3 keV, and ultraviolet radiation. The satellite spin rate was about 97 rpm. The accumulated counts from the channeltron were segmented in time so the direction of arrival of incoming particles was divided into 30 discrete 12-deg (by 25-deg wide) angular sectors. The time required for a complete set of energy-angular scan data was 112.6 s, with 0.64 s every 5.120 s required for each energy window scan, and 0.02 s required for each angular window per energy window scan. The detector was pointed in a direction normal to the spacecraft spin axis. Channeltrons suffered degradation by high counting fluxes. Because of the nature of its mission, the instrument was designed to accept large fluxes of particles, thereby sacrificing longevity. The experiment was successful, having detected fluxes of ions on several occasions during its 50 days of continuous operation. NSSDC has all the data from this investigation. For further details of this experiment, see J.

W. Freeman, et al., "On the variety of particle phenomena discernible at geostationary orbit via the ATS 1 satellite," Extrait des Annales de Geophysique, Tome 24, 1968 (TRF B02199).

------- ATS 1, PAULIKAS----------

INVESTIGATION NAME- OMNIDIRECTIONAL SPECTROMETER

NSSDC ID- 66-110A-03
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - G.A.	PAULIKAS	AEROSPACE CORP
OI - J.B.	BLAKE	AEROSPACE CORP
OI - S.C.	FREDEN	NASA-GSFC

BRIEF DESCRIPTION
The objectives of the omnidirectional spectrometer were to study (1) the dynamics of the trapped and quasi-trapped electron population at the synchronous orbit, and (2) the penetration of energetic solar protons to the synchronous altitude. The instrument was designed by Aerospace Corporation personnel and consisted of three small (1-mm, 2-mm, and 3-mm cubes) solid-state detectors. Each was surrounded by a hemispherical shield of a different thickness. Using the various shield thicknesses, electronic biases, and discriminator levels, the instrument measured the omnidirectional fluxes of electrons with thresholds of 0.38, 0.45, 1.05, and 1.90 MeV (channels E1, E2, E3, and E4, respectively), and of protons in the energy ranges 5 to 21 MeV, and 21 to 70 MeV (channels P1 and P2, respectively). The quality of channels E1, E2, and P1 became suspect in early 1969 due to radiation damage, and no data from any electron channel were obtained after July 1, 1970. Useful proton data were obtained whenever data were acquired from the spacecraft. NSSDC has all the reduced data from launch to December 1968 except the microfilmed data plots mounted on aperture cards.

------- ATS 1, SUOMI----------

INVESTIGATION NAME- SPIN-SCAN CLOUDCOVER CAMERA (SSCC)

NSSDC ID- 66-110A-09
INVESTIGATIVE PROGRAM
CODE EE-8, APPLICATIONS

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL

PI - V.E.	SUOMI	U OF WISCONSIN
OI -	NESS STAFF	NOAA-NESS

BRIEF DESCRIPTION
The ATS 1 Spin-Scan Cloudcover Camera (SSCC) was designed to provide nearly continuous observations of cloudcover patterns over the whole sunlit earth disk. The optical system consisted of a two-element Cassegrain-type telescope. Light entering the system was reflected from a 13.7-cm-diameter (25.4-cm focal length) primary parabolic mirror onto a flat secondary quartz mirror to produce an image on the face of an aperture plate. The light then passed through the 0.025-mm-diameter aperture and a haze filter to impinge on a photocathode in front of a photomultiplier tube. The telescope photomultiplier assembly could be tilted in discrete steps from +7.5 to -7.5 deg to produce a north-south scan, corresponding to an earth coverage from 52 deg N to 52 deg S. The east-to-west scan was provided by the spin of the satellite itself. Twenty minutes were required to scan one picture, and 2 min to retrace it at a nominal satellite rotation of 100 rpm. From its geostationary equatorial orbit (approximately 35,000 km above the earth), the camera system had a ground resolution of better than 4 km at the subsatellite point. The experiment was highly successful. For a listing and description of the different forms of photographic data available from this experiment and their location, see the "Meteorological data catalog for the Applications Technology Satellites" (TRF B09264), available through NSSDC.

------- ATS 1, WINCKLER----------

INVESTIGATION NAME- ELECTRON SPECTROMETER

NSSDC ID- 66-110A-04
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.R.	WINCKLER	U OF MINNESOTA

BRIEF DESCRIPTION
This experiment was designed to measure the trapped electron component at 6.6 earth radii in the energy range from 50 to 1000 keV. The instrument was a high-time-resolution magnetic spectrometer, where the electromagnet stepped repeatedly through four field values allowing determination of background-corrected electron flux measurements in each of three channels at 50 to 150 keV, 150 to 500 keV, and 500 to 1000 keV. The flux in each channel was sampled for 40 ms once every 160 ms. The detector system consisted of a shielded plastic scintillator coupled to a photomultiplier, whose signal passed through a pulse-height analyzer to an appropriate scaling circuit. The look direction made an angle of 74 deg to the spacecraft spin axis and the collimator had a half-angle of about 7 deg. The stored digital counts were converted to analog signals prior to telemetry interrogation. The instrument measured electron fluxes from 0.4E0 to 1.0E+6 particles/(sq cm s sr keV). Typically the background correction to the data was less than 1%. NSSDC has data through December 30, 1967.

********** ATS 2**********

SPACECRAFT COMMON NAME- ATS 2
ALTERNATE NAMES- ATS-A, 02743

NSSDC ID- 67-031A

LAUNCH DATE- 04/06/67 WEIGHT- 319.11 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/09/67
ORBIT PERIOD- 218.9 MIN INCLINATION- 28.40 DEG
PERIAPSIS- 178. KM ALT APOAPSIS- 11124. KM ALT

PERSONNEL

PM - J.M.	THOLE(NLA)	NASA-GSFC
PM - R.J.	DARCEY(NLA)	NASA-GSFC
PS - T.L.	AGGSON	NASA-GSFC

BRIEF DESCRIPTION
ATS 2 (Applications Technology Satellite) was a medium altitude, gravity-gradient-stabilized spacecraft designed to (1) test new concepts in spacecraft design, propulsion, and stabilization, (2) take high-quality cloudcover pictures, (3) provide in situ measurements of the aerospace environment, and (4) test improved communication systems. The cylindrically shaped spacecraft measured 142 cm in diameter and 183 cm in length. The spacecraft structure consisted primarily of a corrugated thrust tube with honeycombed bulkheads secured to each end. Equipment components and payload were externally mounted on the outer surface of the thrust tube as well as on a structure that slid into the interior of the thrust tube. Electric power was provided by two solar arrays mounted on either end of the spacecraft's outer shell and by two rechargeable nickel-cadmium batteries. Extending radially outward from the side of the spacecraft were four 26.2-m, adjustable gravity-gradient booms. The spacecraft telemetry system consisted of four 2.1-w transmitters (two at 136.47 MHz and two at 137.35 MHz), in addition to a microwave communications experiment. ATS 2 was programmed to be launched into an 11,000-km circular earth orbit. However, the second stage of the launch vehicle failed to ignite, and this resulted in an elliptical orbit. Stresses induced by this unplanned orbit eventually induced spacecraft tumbling. In spite of these conditions, useful data were obtained from some of the experiments, most notably the cosmic-ray and particle experiments and the field detection experiments. The satellite reentered the atmosphere on September 2, 1969.

------- ATS 2, MCILWAIN----------

INVESTIGATION NAME- OMNIDIRECTIONAL PROTON AND ELECTRON DETECTORS

NSSDC ID- 67-031A-05
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - C.E.	MCILWAIN	U OF CALIF, SAN DIEGO
CI - R.W.	FILLIUS	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
This experiment was designed primarily to measure fluctuations in 12-MeV protons on the time scale of their azimuthal drift period. The particle fluxes were measured by three spherical plastic scintillators, each of which had five associated electronic discrimination states. Each of two scintillators, differing in their geometrical factors, separately measured omnidirectional fluxes of protons above 12 MeV and of electrons above 0.44, 0.63, and 1.31 MeV. The third scintillator separately measured omnidirectional fluxes of protons above 20 MeV and of electrons above 1.10, 1.27, and 1.93 MeV. The fifth discrimination level of each scintillator was used to check the relative setting of the main proton level and to check for electron contamination in the proton level. Every 5.12 s, counts were accumulated for 4.46 s in the proton discrimination state of each of the three detectors and were then telemetered. Every 81.92 s, counts were accumulated during one or two 4.46-s intervals in each of the other discrimination states (and once in a calibration mode) of each of the three detectors and were telemetered. Useful data were

obtained from launch until October 23, 1967.

------- ATS 2, STONE----------

INVESTIGATION NAME- RADIO ASTRONOMY

NSSDC ID- 67-031A-01 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
ASTRONOMY

PERSONNEL
PI - R.G. STONE NASA-GSFC

BRIEF DESCRIPTION
This experiment utilized a 76-m dipole to observe radio noise at 0.45, 0.7, 0.9, 1.1, 1.6, 2.2, and 3.8 MHz. The radiometer was of the Ryle-Vonberg type and it was stepped through the seven frequencies plus an antenna capacitance measuring channel in 40 s. Since the antenna was shared with another experiment, this experiment was turned on only for alternate 10-min periods. The detector functioned normally, although interference was often present in the 0.9-MHz channel. NSSDC has all the useful data that now exist from this investigation.

********** ATS 5**********

SPACECRAFT COMMON NAME- ATS 5
ALTERNATE NAMES- PL-692B, ATS-E
[illegible]

NSSDC ID- 69-069A

LAUNCH DATE- 08/12/69 WEIGHT- 821. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/01/69
ORBIT PERIOD- 1435.9 MIN INCLINATION- 2.5 DEG
PERIAPSIS- 35777. KM ALT APOAPSIS- 35790. KM ALT

PERSONNEL
PM - C.M. MACKENZIE NASA-GSFC
PM - D.V. FORDYCE(NLA) NASA-GSFC
PS - NONE ASSIGNED

BRIEF DESCRIPTION
ATS 5 was an equatorial-orbiting, synchronous-altitude technology satellite intended to test various communications and earth observational systems. Also included on board were particle, electric field, and magnetic field experiments. Because of a malfunction, the intended gravity-gradient stabilization mechanism could not be deployed, and ATS 5 was stabilized in a spinning mode about the spacecraft Z axis at approximately 71 rpm. All experiments that depended on the planned gravity-gradient stabilization were adversely affected to varying degrees, and the mission was declared a failure. However, some of the science experiments, including the magnetic field monitor and the particle experiments, returned usable data. ATS 5 was positioned at about 105 deg W longitude over the eastern Pacific Ocean.

------- ATS 5, AGGSON----------

INVESTIGATION NAME- ELECTRIC FIELDS MEASUREMENT

NSSDC ID- 69-069A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - T.L. AGGSON NASA-GSFC

BRIEF DESCRIPTION
The purpose of this experiment was to make measurements of the electric field in the magnetosphere by using the spacecraft's gravity-gradient booms as long cylindrical Langmuir probes. Owing to failure of the gravity-gradient stabilization system, the electric field antenna booms were not deployed. No useful data were obtained from this experiment.

------- ATS 5, MCILWAIN----------

INVESTIGATION NAME- OMNIDIRECTIONAL HIGH-ENERGY PARTICLE DETECTOR

NSSDC ID- 69-069A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - C.E. MCILWAIN U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
Three plastic scintillator detectors, each with a 2-pi-sr solid-angle field of view, measured electrons in 12 intervals in the energy range 0.5 to 5 MeV. Solar cosmic rays with energies greater than 12, 16, and 24 MeV were also measured. The spacecraft spin did not degrade the experiment data.

------- ATS 5, MCILWAIN----------

INVESTIGATION NAME- BIDIRECTIONAL LOW-ENERGY PARTICLE DETECTOR

NSSDC ID- 69-069A-11 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - C.E. MCILWAIN U OF CALIF, SAN DIEGO
OI - R.W. FILLIUS U OF CALIF, SAN DIEGO
OI - S.E. DEFOREST(NLA) U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
This detector measured electrons and protons in 62 logarithmically equispaced intervals in the energy range 50 eV to 50 keV. Four curved-plate electrostatic analyzers and channeltron multipliers were used. Two apertures with 5-deg by 8-deg view-angles looked parallel to, and perpendicular to, the spacecraft spin axis. The deflection voltage was programmed for either a scan mode (one step per frame) or a peak-tracking mode. In the scan mode, a complete sequence (62 steps) was obtained in 26.5 s.

------- ATS 5, MOZER----------

INVESTIGATION NAME- TRI-DIRECTIONAL, MEDIUM-ENERGY PARTICLE DETECTOR

NSSDC ID- 69-069A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - F.S. MOZER U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment consisted of three essentially identical scintillation photomultiplier detectors. Each detector measured both electrons in three energy windows centered at 40, 75, and 120 keV and protons in three energy windows centered at 60, 120, and 165 keV. Two detectors, looking in opposite directions, were tilted by 12 deg from the satellite Z axis and one was oriented perpendicular to this configuration. Over most of its data-collecting lifetime, the satellite was spinning about its Z axis, with a spin period of 0.78 s. Due to an unplanned spacecraft spin soon after launch, a shutter system was activated that rendered the perpendicular detector ineffective. Therefore, measurements were made only in directions approximately parallel and antiparallel to the local magnetic field. The species analysis was performed by a three-channel pulse-height analyzer, and particle counts were telemetered in both analog and digital modes. The integration time for each channel was 0.01 s, while the readout rate for any one channel varied from 0.2 to 5.12 s, depending on a commandable readout mode. For information regarding experiment design and construction, consult Mozer, F. S., F. H. Bogott, and C. W. Bates, Jr., "Development of a double-layered scintillator for separating and detecting low-energy protons and electrons," IEEE Trans. on Nucl. Sci., v. NS-15, n. 3, p. 144, 1968. NSSDC has all the useful data that now exist from this investigation.

------- ATS 5, SUGIURA----------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 69-069A-13 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - M. SUGIURA NASA-GSFC
OI - R.A. LANGEL NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to study the processes taking place on the auroral magnetic shells. It was also intended to provide correlative data for the other experiments on the satellite. The experiment was part of the magnetic stabilization system that was the backup for the gravity-gradient stabilization system. The sensor system consisted of a triaxial fluxgate magnetometer. The system

measured the magnetic field along three axes by combining a fine range (plus or minus 25 nT) and a coarse range of 32 increments (32.8 nT each) to give a total range of plus and minus 500 nT. The fine and coarse readings were sampled on the PFM telemetry at 5.12-s intervals. The fine readings only were recorded on the PCM telemetry at 2.97-s intervals. The PCM ccarse readings were subcommutated at 95-s intervals. A 10-nT calibration pulse was initiated twice a day for 5.6 min. The fast spin rate of the satellite, the slow sample rate of the data, and the resulting aligning problems degraded the data in the spin plane. NSSDC has all the useful data that now exist from this investigation.

********** ATS 6**********

SPACECRAFT COMMON NAME- ATS 6
ALTERNATE NAMES- PL-71A, ATS-F
7318

NSSDC ID- 74-039A

LAUNCH DATE- 05/30/74 WEIGHT- 930. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 05/31/74
ORBIT PERIOD- 1436.3 MIN INCLINATION- 1.8 DEG
PERIAPSIS- 35763.0 KM ALT APOAPSIS- 35818.0 KM ALT

PERSONNEL

PM - J.M. THOLE(NLA) NASA-GSFC
PS - E.A. WOLFF(NLA) NASA-GSFC

BRIEF DESCRIPTION
The primary objectives of ATS 6 (Applications Technology Satellite) were to erect in orbit a large high-gain steerable antenna structure capable of providing a good-quality TV signal to a ground-based receiver and to measure and evaluate the performance of such an antenna. A secondary objective was to demonstrate new concepts on space technology in the areas of aircraft control, laser communications, and visual and infrared mapping of the earth/atmosphere system. The spacecraft was also capable of (1) measuring radio frequency interference in shared frequency bands and propagation characteristics of millimeter waves, (2) performing spacecraft-to-spacecraft communication and tracking experiments, and (3) making particle and radiation measurements of the geosynchronous environment. Configured somewhat like an open parasol, the ATS 6 spacecraft consisted of four major assemblies: (1) a 9.15-m-diameter dish antenna, (2) two solar cell paddles mounted at right angles to each other on opposite sides of an upper equipment module, (3) an earth-viewing equipment module (EVM) connected by a tubular mast to the upper ecuipment module, and (4) an attitude control and stabilization system. The EVM, in addition to housing the earth-viewing experiments, provided support for the propulsion system and tanks, batteries, a multifrequency transponder, and the telemetry, command, and thermal control systems. The upper equipment module provided a platform for the space-viewing experiments. Inertia wheels were the prime means for torquing the spacecraft, with both hydrazine and ammonia multijet thruster systems included to provide the necessary torques for unloading the wheels. Also included was a small environment measurement package containing a magnetometer and several particle experiments. The satellite was moved out of its geostationary orbit on June 30, 1979. For detailed descriptions of the spacecraft and of the individual experiments, see the IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, November, 1975, and also the "ATS-6 Final Engineering Performance Report," NASA, RP-1080, Wash., D.C., November, 1981 (TRF 833477).

------- ATS 6, ARNOLDY----------

INVESTIGATION NAME- LOW-ENERGY PROTON/ELECTRON EXPERIMENT

NSSDC ID- 74-039A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - R.L. ARNOLDY U OF NEW HAMPSHIRE

BRIEF DESCRIPTION
This investigation was designed to monitor spectra and pitch angle distributions of both electrons and protons from 0 to 22 keV. Electron and proton data from the same direction were obtained simultaneously using four double 90-deg cylindrical electrostatic analyzers and eight Bendix channel electron multipliers. Sweep mode detectors viewed pitch angles of 0 and 90 deg, while the pitch mode detectors viewed 45- and 165-deg pitch angles. The four pitch mode detectors stepped through eight energy levels at one level/s. The four sweep mode detectors swept from approximately 16 keV to 0 energy once per second, and could be commanded to dwell at any of 16 levels up to approximately 22 keV. The sweep mode detectors had two high speed accumulators that read out eight times/frame, and two accumulators that read out once/frame. Four permutations of detectors with accumulators were possible by command. When the detectors were sweeping, the slow accumulators provided data integrated over the spectrum. Background count rates were obtained for 8 s approximately every 94 min by application of approximately 10 V of constant reverse polarity on the electrostatic analyzers. Gain level stability of the channel electron multipliers could be checked by command to lower the preamplifier threshold discriminator settings. For further details, see Arnoldy, R. L., IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, pp. 1155-1157, November 1975.

------- ATS 6, COLEMAN, JR.----------

INVESTIGATION NAME- MAGNETOMETER EXPERIMENT

NSSDC ID- 74-039A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.J. COLEMAN, JR. U OF CALIF, LA
OI - W.D. CUMMINGS GRAMBLING COLLEGE

BRIEF DESCRIPTION
A three-axis, boom-mounted fluxgate magnetometer system obtained measurements of the ambient magnetic field at synchronous altitude. The detector was similar to that flown by UCLA on OGO 5 and ATS 1. It consisted of a basic magnetometer with a dynamic range of -16 to +16 nT, and a resolution of 1/16 nT. Coils were used to null the ambient field such that the resultant was within the dynamic range of the basic magnetometer. This offset field generator permitted fields from -512 to +512 nT to be measured (in 16 steps). The magnetometer was sampled at 8 vectors-per-s, and the offset field state was sampled at 4 vectors-per-s. The electronics and sensor system was equipped with an 'aliasing' filter, with an upper limit of 2.25 Hz. At 4 Hz, rejection was 20 dB. Offset stability was estimated to be 1 nT per 6 months. The spacecraft field was estimated, during a roll maneuver, to be less than 2 nT transverse and less than 5 nT earthward. The nominal instrument noise level was estimated to be slightly in excess of the 1/16-nT digital resolution of the magnetometer. For further details, see McPherron, R. L., P. J. Coleman, and R. C. Snare, IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p. 1110, November 1975.

------- ATS 6, FRITZ----------

INVESTIGATION NAME- MEASUREMENT OF LOW-ENERGY PROTONS

NSSDC ID- 74-039A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.A. FRITZ NOAA-ERL
OI - A. KONRAD NASA-JSC
OI - D.J. WILLIAMS APPLIED PHYSICS LAB

BRIEF DESCRIPTION
This experiment consisted of four two-element solid-state telescopes, mounted in a plane such that two (A and H) looked radially away from the earth. The third telescope (B) was at 90 deg relative to A and H and looked 13 deg east of south, and the fourth telescope (C) looked northward, 45 deg from A and H. Telescopes A, B, and C had geometric factors (G) of 6.6E-4 through 7E-4 sq cm-sr, and telescope H had a G of 1E-3 sq cm-sr. The aperture of each telescope was a conical opening of 11-deg full-angle. Once every 4 s, telescopes A, B, and C each measured proton fluxes in six contiguous, logarithmically spaced energy channels between 25.5 and 234 keV and once every 16 s, 0.234 to 2.6-MeV proton fluxes. These modes had no electron or higher energy proton background. From the H telescope, dE/dx vs E fluxes of 1.2- to 1.8-, and 1.8- to 3.6-MeV alpha particles and of heavier particles in the Z ranges 3 through 6 and 6 through 8 were obtained once each 128 s. In addition, five fluxes were determined from output of the first H sensor only, but at five discrimination levels. These corresponded mainly to alpha particles in the 0.9- to 1.8-, and 1.8- to 2.7-MeV ranges and to heavier particles with Z values greater than 2, 5, and 8. Proton fluxes in seven additional channels between 0.362 and 1.1 MeV were also determined once each 5.3 s by use of appropriate H-telescope discrimination levels. For further details, see Fritz, T. A., and J. R. Cessna, IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p. 1145, November 1975.

------- ATS 6, MASLEY----------

INVESTIGATION NAME- SOLAR COSMIC RAYS AND GEOMAGNETICALLY TRAPPED RADIATION

NSSDC ID- 74-039A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - A.J. MASLEY — TRW SYSTEMS GROUP
OI - P.R. SATTERBLOM — MCDONNELL-DOUGLAS CORP

BRIEF DESCRIPTION
The experiment contained two solid-state telescopes, one directed perpendicular to, and the other directed parallel to the local magnetic field direction. Each telescope measured protons from 0.2 to 300 MeV in 12 energy intervals and alpha particles from 1.2 to 180 MeV in 10 energy intervals. Also, two magnetic electron spectrometers, oriented parallel to the two telescopes, measured electrons from 50 to 860 keV in four energy intervals. For more detail see Masley, A. J., P. R. Satterblom, and K. A. Pfitzer, IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p.1116, November 1975.

------- ATS 6, MCILWAIN----------

INVESTIGATION NAME- AURORAL PARTICLES EXPERIMENT

NSSDC ID- 74-039A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - C.E. MCILWAIN — U OF CALIF, SAN DIEGO
OI - R.W. FILLIUS — U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
The objective of this experiment was to determine the processes that accelerate charged particles near the earth, with particular emphasis on processes associated with the formation of auroras and substorms. Five electrostatic analyzers were capable of measuring particles of energy less than 1 eV to 81 keV in 64 channels with an energy resolution of about 0.2E+2 eV. The geometric factor was approximately 2.4E-4 sq cm-sr for protons and 1.6E-4 sq cm-sr for electrons. These were different because half of each electron aperture and one-fourth of each ion aperture were covered in order to avoid interfering equipment within the field of view. Four of the analyzers were mounted in two rotating heads in sets of two each, one of which was sensitive to electrons and one to positive ions. The heads were mounted mutually perpendicular to each other and could be rotated through 220 deg each. The experiment had many modes of operation. For more detail see Mark, D. H., and C. E. McIlwain, IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p. 1125, November 1975.

------- ATS 6, PAULIKAS----------

INVESTIGATION NAME- OMNIDIRECTIONAL SPECTROMETER

NSSDC ID- 74-039A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - G.A. PAULIKAS — AEROSPACE CORP
OI - J.B. BLAKE — AEROSPACE CORP

BRIEF DESCRIPTION
This experiment consisted of four solid-state instruments. One of these was a two-element telescope with a 30-deg cone-angle and the other three were omnidirectional detectors. Particles measured were electrons between 140 and 600 keV, electrons above 0.7, 1.55, and 3.9 MeV, protons in the intervals from 2.3 to 5.3, 3.4 to 5.3, 12 to 26, 20 to 52, and 40 to 90 MeV, and alpha particles in the intervals from 9.4 to 21.2, 13.4 to 21.2, and 46 to 100 MeV. The lowest energy electron mode and the two lowest energy proton and alpha particle modes were directional. All other modes were omnidirectional. Counts were accumulated over 0.25 s every 4 s for each electron mode and over 1 s every 8 s for each proton mode. For more details see Paulikas, G. A., J. B. Blake, and S. S. Imamoto, "ATS 6 energetic particle radiation measurements at synchronous altitude," IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p. 1138, November 1975.

------- ATS 6, SHENK----------

INVESTIGATION NAME- GEOSYNCHRONOUS VERY HIGH RESOLUTION RADIOMETER (GVHRR)

NSSDC ID- 74-039A-08

INVESTIGATIVE PROGRAM
CODE EC-4

INVESTIGATION DISCIPLINE(S)
METEOROLOGY

PERSONNEL
PI - W.E. SHENK — NASA-GSFC
OI - A.W. MCCULLOCH — NASA-GSFC
OI - I.L. GOLDBERG — NASA-GSFC

BRIEF DESCRIPTION
The Geosynchronous Very High Resolution Radiometer (GVHRR) experiment provided both day and night cloudcover data for determining cloud motions, tropical and extratropical storm life cycles, and mesoscale phenomena. They were also used for cloud climatology studies. The GVHRR had one infrared channel (10.5 to 12.5 micrometers) and one visible channel (0.55 to 0.75 micrometers). The instantaneous field of view was 3.0E-4 rad for the infrared channel (10.8-km resolution at subsatellite point) and 1.5E-4 rad for the visible channel (5.4-km resolution at subsatellite point). The dynamic range for the infrared channel was from 0 to 340 deg K and 1 to 100% albedo for the visible channel. The infrared channel had a noise equivalent temperature difference of 1.5 deg C at 200 deg K and 0.8 deg C at 300 deg K. Data from this experiment were used to determine surface temperatures and horizontal wind vectors based on cloud motions derived from sequential images formed by both channels of the GVHRR. For further details see Shenk, W. E., et al., IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, p. 1095, November 1975.

------- ATS 6, WINCKLER----------

INVESTIGATION NAME- PARTICLE ACCELERATION MECHANISMS AND DYNAMICS OF THE OUTER TRAPPING REGION

NSSDC ID- 74-039A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.R. WINCKLER — U OF MINNESOTA
OI - G.K. PARKS — U OF WASHINGTON

BRIEF DESCRIPTION
The instrument consisted of two nearly identical detector assemblies to investigate the origin and dynamics of energetic electrons and protons in the outer radiation belt and the near-earth plasma sheet. Each of the detector assemblies was a magnetic spectrometer containing four gold-silicon surface-barrier detectors. Lower energy electrons were deflected into two of these detectors depending on their momentum. More energetic electrons, and protons, moved directly through the 10-deg angular aperture to a two-detector telescope in which the front detector measured protons and the rear detector sensed higher energy protons. Using pulse-height analysis, the following nominal ranges of particles were measured: protons, 30 to 50 keV, 50 to 160 keV, and 120 to 514 keV; electrons, 30 to 50 keV, 150 to 214 keV, and >500 keV. One detector assembly was mounted in a fixed position and the other was rotated through a 180-deg range. Data were transmitted from the experiment at rates as high as eight measurements per second. The 150 to 214 keV electron channel provided no data for the whole mission. Higher than anticipated temperatures caused the proton detector in the fixed spectrometer to fail about 9 months after launch. In addition, the lower threshold channels could be operated only during cooler periods as the mission progressed. Additional details on this experiment may be found in Walker, R. J., et al., IEEE Trans. on Aerosp. Electron. Syst., v. AES-11, n. 6, pp. 1131-1137, November 1975.

********** EPE-A**********

SPACECRAFT COMMON NAME- EPE-A
ALTERNATE NAMES- 1961 UPSILON 1, EXPLORER 12
S 3, 00170

NSSDC ID- 61-020A

LAUNCH DATE- 08/16/61 — WEIGHT- 37.6 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 01/30/62
ORBIT PERIOD- 1587. MIN — INCLINATION- 33.4 DEG
PERIAPSIS- 790. KM ALT — APOAPSIS- 76620. KM ALT

PERSONNEL
PM - P. BUTLER(RETIRED) NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 12 was a spin-stabilized, solar-cell-powered spacecraft instrumented to measure cosmic-ray particles, trapped particles, solar wind protons, and magnetospheric and interplanetary magnetic fields. It was the first of the S 3 series of spacecraft, which also included Explorers 14, 15, and 26. A 16-channel PFM/PM time-division multiplexed telemeter was used. The time required to sample the 16 channels (one frame period) was 0.324 s. Half of the channels were used to convey eight-level digital information, and the other channels were used for analog information. During ground processing of the telemetered data, the analog information was digitized with an accuracy of 1/100th of full scale. One analog channel was subcommutated in a 16-frame-long pattern and was used to telemeter spacecraft temperatures, power system voltages, currents, etc. A digital solar aspect sensor measured the spin period and phase, digitized to 0.041 s, and the angle between the spin axis and sun direction to about 3-deg intervals. The spacecraft functioned well until December 6, 1961, when it ceased transmitting data apparently as a result of failures in the power system. Good data were recorded for approximately 90% of the active lifetime of the spacecraft. The initial spin rate was 28.0 rpm, and the spin axis direction was right ascension 48 deg, declination -28 deg. The direction was nearly constant with time, and the spin rate slowly increased with time to 34.3 rpm. Apogee direction varied from about 1200 h to 0600 h local time.

------- EPE-A, CAHILL, JR.----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETERS

NSSDC ID- 61-020A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.J. CAHILL, JR. U OF MINNESOTA

BRIEF DESCRIPTION
This experiment was designed to measure the magnitude and direction of the earth's magnetic field between 3 and 13 earth radii. It consisted of three orthogonal fluxgate magnetometers mounted on the end of an 86.4-cm boom. One magnetometer axis was within 2 deg of the spacecraft spin axis. Each of the three sensors had a range of -1000 to +1000 nT with a digitization uncertainty of 12 nT. The three components of the magnetic field were all measured within a 50-ms time period once every 327 ms. An inflight calibration system applied a known magnetic field to each sensor in turn once every 115 s. This experiment performed normally from launch through December 6, 1961. For additional experiment details, see Cahill, L. J., and P. G. Amazeen, J. Geophys. Res., v. 68, n. 7, p. 1835, 1963.

------- EPE-A, DAVIS----------

INVESTIGATION NAME- PROTON-ELECTRON SCINTILLATION DETECTOR

NSSDC ID- 61-020A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.R. DAVIS(RETIRED) NASA-GSFC
OI - J.M. WILLIAMSON NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to measure the directional fluxes and spectra of low-energy trapped and auroral protons and electrons. It employed a 5-mg-thick powder phosphor scintillator covered with a 1000-A aluminum coating. Additional absorbers were inserted in the detector aperture by a 16-position stepped wheel. The aperture was pointed at 45 deg to the spin axis. Due to the thinness and type of phosphor, the detector in the pulse mode would respond only to low-energy ions, and, therefore, essentially measured the flux of protons that penetrated the absorbers and stopped in the phosphor. Both the pulse counting rate and the phototube current were telemetered once each frame period. Sixteen readings were telemetered in each wheel position, and thus one complete set of data was obtained every 256 frames (one wheel revolution = 80 s). Protons in seven energy ranges were measured. The high energy limit was about 10 MeV for all ranges, and the low-energy cutoffs were 100, 135, 186, 251, 512, 971, and 1668 keV. The energy fluxes of electrons in three ranges were measured separately using scatter geometry, absorbers, and the phototube current. The low-energy cutoffs were 15, 26, and 31 keV, and the high-energy cutoff was about 100 keV for all three ranges. Except for saturation of some of the proton channels in the heart of the outer belt, the experiment worked properly throughout the life of the spacecraft.

------- EPE-A, MCDONALD----------

INVESTIGATION NAME- COSMIC RAYS

NSSDC ID- 61-020A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
The instrumentation for the Cosmic-Ray Experiment consisted of (1) a double scintillation counter that measured 55- to 500-MeV protons in six energy intervals and protons above 500 MeV, (2) a single scintillator that measured 1.4- to 22-MeV protons at five energy thresholds and electrons above 150 keV, and (3) a GM counter telescope that measured proton fluxes above 30 MeV. A complete set of measurements was made every 6.8 min. The experiment operated throughout the active lifetime of the spacecraft. For further details, see Bryant, D. A., et al., Ap. J., v. 141, p. 478, 1965.

------- EPE-A, VAN ALLEN----------

INVESTIGATION NAME- CHARGED PARTICLES

NSSDC ID- 61-020A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA
OI - L.A. FRANK U OF IOWA
OI - D.J. O'BRIEN DEPT OF ENVIRON PROT
OI - C.D. LAUGHLIN MCDONALD OBS
OI - J.W. FREEMAN RICE U

BRIEF DESCRIPTION
The experiment was designed to measure the flux and energy spectrum of charged particles and cosmic rays and to determine their spatial and temporal distribution over the spacecraft orbit. The detectors included (1) a shielded Anton type 302 omnidirectional Geiger-Mueller tube, which detected protons with E>23 MeV and electrons with E>1.6 MeV, (2) an electron magnetic spectrometer utilizing three thin-windowed Anton type 213 directional Geiger-Mueller tubes sensitive to electrons with energies from 40 to 100 keV, and (3) three directional cadmium sulfide crystals for measurements of the total flux of protons with energies from 1 keV to 10 MeV and electrons with energies from 200 eV to 500 keV. All directional detectors were mounted so that the axes of their fields of view were perpendicular to the satellite spin axis. (The initial spin period was 2.2 s.) Counts in each detector were accumulated for 10.24 s, and the contents of the accumulators were telemetered at the end of each sampling interval. The encoder accumulators were time shared so that each detector response was sampled once every 79 s. The experiment operated satisfactorily from launch until spacecraft failure on December 6, 1961. For further details, see Frank, L. A., J. Geophys. Res., v. 71, p. 4631, 1966.

********** EPE-B**********

SPACECRAFT COMMON NAME- EPE-B
ALTERNATE NAMES- 1962 BETA GAMMA 1, EXPLORER 14
S 3A, 00432

NSSDC ID- 62-051A

LAUNCH DATE- 10/02/62 WEIGHT- 40.0 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 02/15/64
ORBIT PERIOD- 2184.6 MIN INCLINATION- 42.6 DEG
PERIAPSIS- 2601. KM ALT APOAPSIS- 96189. KM ALT

PERSONNEL
PM - P.G. MARCOTTE NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 14 was a spin-stabilized, solar-cell-powered spacecraft instrumented to measure cosmic-ray particles, trapped particles, solar wind protons, and magnetospheric and interplanetary magnetic fields. It was the second of the S 3 series of spacecraft, which also included Explorers 12, 15, and 26. A 16-channel PFM/PM time-division multiplexed telemeter was used. The time required to sample the 16 channels (one frame period) was 0.323 s. Half of the channels were used to convey eight-level digital information, and the others were used for analog information. During ground processing of the telemetered data, the analog information was digitized with an

accuracy of 1/100th of full scale. One analog channel was subcommutated in a 16-frame-long pattern and was used to telemeter spacecraft temperatures, power system voltages, currents, etc. A digital solar aspect sensor measured the spin period and phase, digitized to 0.041 s, and the angle between the spin axis and sun direction to about 3-deg intervals. The spacecraft functioned well except for the period from January 10 to 24, 1963, and after August 11, 1963, when the encoder malfunctioned terminating the transmission of usable data. Good data were recorded for approximately 85% of the active lifetime of the spacecraft. The spacecraft was coning (37-deg maximum half-angle) until January 10, 1963. After January 24, 1963, it was spin-stabilized at a rate of 10 rpm. This rate slowly decreased to 1 rpm on July 8, 1963. Initially, the local time of apogee was 0700 h.

------- EPE-B, CAHILL, JR.----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETERS

NSSDC ID- 62-051A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.J. CAHILL, JR. U OF MINNESOTA

BRIEF DESCRIPTION
This experiment was designed to measure the magnitude and direction of the earth's magnetic field between 3 and 13 earth radii. It consisted of three orthogonal fluxgate magnetometers mounted on the end of an 86.4-cm boom. One magnetometer axis was within 2 deg of the spacecraft spin axis. Each of the three sensors had a range of -500 to +500 nT with a sensitivity of 1 nT. The three components of the magnetic field were all measured within a 50-ms time period once every 327 ms. An inflight calibration system applied a known magnetic field to each sensor in turn once every 115 s. For further details, see Cahill, L. J., Space Research VI, P. 662, 1966.

------- EPE-B, DAVIS----------

INVESTIGATION NAME- PROTON-ELECTRON SCINTILLATION DETECTOR

NSSDC ID- 62-051A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.R. DAVIS(RETIRED) NASA-GSFC
OI - J.M. WILLIAMSON NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to measure the directional fluxes and spectra of low-energy trapped and auroral protons and electrons. It employed a 5-mg-thick powder phosphor scintillator covered with a 1000-A aluminum coating. Additional absorbers were inserted in the detector aperture by a 16-position stepped wheel. The aperture was pointed at 45 deg to the spin axis. Due to the thinness and type of phosphor, the detector in the pulse mode would respond only to low-energy ions, and, therefore, essentially measured the flux of protons that penetrated the absorbers and stopped in the phosphor. Both the pulse counting rate and the phototube current were telemetered once each frame period. Sixteen readings were telemetered in each wheel position, and thus one complete set of data was obtained every 256 frames (one wheel revolution = 50 s). Protons in seven energy ranges were measured. The high-energy limit was about 10 MeV for all ranges, and the low-energy cutoffs were 97, 125, 168, 295, 495, 970, and 1700 keV. The energy fluxes of electrons in three ranges were measured separately using scatter geometry, absorbers, and the phototube current. The low-energy cutoffs were 13, 21, and 25 keV, and the high-energy cutoff was about 100 keV for all three ranges. The electron measurements worked throughout the life of the satellite. The proton channel slowly became intermittent and by mid-December 1962 was inoperative. Due to the spacecraft coning, it was difficult to obtain the directional intensities.

------- EPE-B, MCDONALD----------

INVESTIGATION NAME- COSMIC RAYS

NSSDC ID- 62-051A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
The instrumentation for the cosmic-ray experiment consisted of (1) a double scintillation counter telescope that measured 55- to 500-MeV protons in six energy intervals and protons above 680 MeV, (2) a single scintillator that measured 1.4- to 22-MeV protons at five energy thresholds and electrons above 150 keV, and (3) a GM counter telescope that measured proton fluxes above 30 MeV. A complete set of measurements was made every 6.3 min. The experiment worked throughout the useful life of the spacecraft, October 2, 1962, to August 11, 1963.

------- EPE-B, VAN ALLEN----------

INVESTIGATION NAME- TRAPPED PARTICLE RADIATION

NSSDC ID- 62-051A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA
OI - L.A. FRANK U OF IOWA

BRIEF DESCRIPTION
The experiment was designed to obtain separately definitive values of the absolute intensities of geomagnetically trapped electrons (E>40 keV and E>230 keV) and protons (E>500 keV) particularly in the outer zone. The experiment used an array of three thin-windowed Anton type 213 directional GM counters. The detectors were oriented perpendicular to the spacecraft spin axis. (The spacecraft had an initial spin period of about 6 s on January 24, 1963.) The experiment was also designed to study the physical phenomena near the boundary of the magnetosphere. An omnidirectional 302 GM detector was used to gather data for comparison with measurements obtained with the 302 type GM detectors on earlier satellites. Each detector was sampled for 10.24 s, and the accumulated counts were transmitted redundantly every 76.8 s. The trapped particles experiment operated satisfactorily until August 11, 1963, when modulation of the telemetry signal ceased.

********** EPE-C**********

SPACECRAFT COMMON NAME- EPE-C
ALTERNATE NAMES- 1962 BETA LAMBDA 1, S 3B
EXPLORER 15, 00445

NSSDC ID- 62-059A

LAUNCH DATE- 10/27/62 WEIGHT- 44.4 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 08/09/64
ORBIT PERIOD- 311.4 MIN INCLINATION- 18.0 DEG
PERIAPSIS- 300. KM ALT APOAPSIS- 17438. KM ALT

PERSONNEL
PM - J.W. TOWNSEND(NLA) NASA-GSFC
PS - W.N. HESS(NLA) NASA-GSFC

BRIEF DESCRIPTION
Explorer 15 was a spin-stabilized, solar-cell-powered spacecraft instrumented to study the artificial radiation belt produced by the Starfish high-altitude nuclear burst of July 1962. The backup payload for Explorer 14 was modified and used for Explorer 15. The instrumentation included three sets of particle detectors to study both electrons and protons, and a two-axis fluxgate magnetometer to determine magnetic aspect. A 16-channel PFM/PM time-division multiplexed telemeter was used. The time required to sample the 16 channels (one frame period) was 0.323 s. Half of the channels were used to convey eight-level digital information, and the others were used for analog information. During ground processing of the telemetered data, the analog information was digitized with an accuracy of 1/100th of full scale. One analog channel was subcommutated in a pattern 16 frames long and was used to telemeter spacecraft temperatures, power system voltages, currents, etc. A digital solar aspect sensor measured the spin period and phase, digitized to 0.041 s, and the angle between the spin axis and the sun direction to about 3-deg intervals. During launch the spacecraft failed to despin. The spin rate ranged from 72.9 to 73.2 rpm during the life of the spacecraft. The spin axis pointed at right ascension 80.97 deg and declination 20.9 deg.

------- EPE-C, BROWN----------

INVESTIGATION NAME- ELECTRON AND PROTON SOLID-STATE DETECTORS

NSSDC ID- 62-059A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN — BELL TELEPHONE LAB
OI - U.D. DESAI — NASA-GSFC

BRIEF DESCRIPTION
Six diffused silicon p-n junction semiconductor diodes were used to measure the energy spectrum of electrons and protons in the artificial radiation belt. Detector A was sensitive to electrons in the energy range 0.5 to 2.8 MeV and to protons in the range 2.1 to 4.0 MeV. Detectors B through F were sensitive to electrons in the range 0.5 to 2.9 MeV and to protons in the range 2.1 to 22 MeV. The detectors were operated in high and low bias modes, enabling discrimination of protons from electrons. Detectors B and C were located on protruding omnidirectional mounts with a look angle of about 2 pi sr. The other four detectors looked perpendicular to the spin axis of the satellite. The detectors fed through prescalers and log rate meters to 16 analog telemetry channels. Counts were accumulated for 0.15 s every 0.3 s. All data transmission was in real time. Useful data were obtained from the experiment from launch through December 23, 1962.

------- EPE-C, DAVIS----------

INVESTIGATION NAME- PROTON-ELECTRON SCINTILLATION DETECTOR

NSSDC ID- 62-059A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.R. DAVIS(RETIRED) — NASA-GSFC
OI - J.M. WILLIAMSON — NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to measure the directional fluxes and spectra of low-energy trapped and auroral protons and electrons. It employed a 5-mg-thick powder phosphor scintillator covered with a 1000-A aluminum coating. Additional absorbers were inserted in the detector aperture by a 16-position stepped wheel. The aperture was pointed at 45 deg to the spin axis. Due to the thinness and type of phosphor, the detector in the pulse mode would respond only to low-energy ions, and, therefore, essentially measured the flux of protons that penetrated the absorbers and stopped in the phosphor. Both the pulse counting rate and the phototube current were telemetered once each frame period. Sixteen readings were telemetered in each wheel position, and thus one complete set of data was obtained every 256 frames (one wheel revolution = 80 s). Protons in seven energy ranges were measured. The high-energy limit was about 10 MeV for all ranges, and the low-energy cutoffs were 105, 140, 177, 254, 512, 971, and 1668 keV. The energy fluxes of electrons in three ranges were measured separately using scatter geometry, absorbers, and the phototube current. The low-energy cutoffs were 15, 21, and 27 keV, and the high-energy cutoff was about 100 keV for all three ranges. The experiment worked well throughout the life of the spacecraft. However, the directional resolution was poor because the spin rate was higher than planned.

------- EPE-C, MCILWAIN----------

INVESTIGATION NAME- DIRECTIONAL AND OMNIDIRECTIONAL ENERGETIC PROTONS AND ELECTRONS

NSSDC ID- 62-059A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - C.E. MCILWAIN — U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
The UCSD Particle Experiment consisted of two plastic scintillator detectors. There was a two-level pulse-height discriminator associated with each detector. One detector was oriented perpendicular to the spacecraft spin axis and had a 16-deg full-angle aperture. Counting rates from the two discrimination levels of this detector yielded information on directional fluxes of electrons with energies above 0.5 MeV. The second detector was omnidirectional, and it separately measured fluxes of protons with energies from 40 MeV to 110 MeV and of electrons with energies above about 4 MeV. Counts in each of the four discrimination states were accumulated for 9.3 s once each 69-s telemetry sequence. In connection with the directional fluxes, it is significant that 9.3 s is about 11.3 times the spacecraft spin period. The detectors functioned normally from October 27, 1962, until January 30, 1963, after which no further data were obtained.

********** EPE-D**********

SPACECRAFT COMMON NAME- EPE-D
ALTERNATE NAMES- EXPLORER 26, S 3C
00963

NSSDC ID- 64-086A

LAUNCH DATE- 12/21/64 — WEIGHT- 45.8 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 11/01/76
ORBIT PERIOD- 184.5 MIN — INCLINATION- 1K.1 DEG
PERIAPSIS- 171. KM ALT — APOAPSIS- 6545. KM ALT

PERSONNEL
PM - G.L. LONGANECKER — NASA-GSFC
PS - L.R. DAVIS(RETIRED) — NASA-GSFC

BRIEF DESCRIPTION
Explorer 26 was a spin-stabilized, solar-cell-powered spacecraft instrumented to measure trapped particles and the geomagnetic field. A 16-channel PFM/PM time-division multiplexed telemeter was used. The time required to sample the 16 channels (one frame period) was 0.29 s. Half of the channels were used to convey eight-level digital information. The other channels were used for analog information. During ground processing, the analog information was digitized with an accuracy of 1/800th of full scale. One analog channel was subcommutated in a 16-frame-long pattern and used to telemeter spacecraft temperatures, power system voltages, currents, etc. A digital solar aspect sensor measured the spin period and phase, digitized to 0.036 s, and the angle between the spin axis and sun direction to about 3-deg intervals. The spacecraft systems functioned well, except for some undervoltage turnoffs, until May 26, 1967, when the telemeter failed. The initial spin rate was 33 rpm, and the spin axis direction was right ascension 272.6 deg and declination 21.5 deg. The spin rate decreased with time to 2 rpm on September 9, 1965. For the balance of its life, the spacecraft was coning or tumbling at a rate of about 1 rpm.

------- EPE-D, BROWN----------

INVESTIGATION NAME- SOLID-STATE ELECTRON DETECTOR

NSSDC ID- 64-086A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN — BELL TELEPHONE LAB
OI - L.J. LANZEROTTI — BELL TELEPHONE LAB
OI - L. MEDFORD — BELL TELEPHONE LAB

BRIEF DESCRIPTION
Trapped electrons and protons in the earth's Van Allen belts were measured using a combination of six omnidirectional and directional solid-state particle detectors (silicon p-n junctions). Electrons were analyzed in the energy ranges E>1 MeV, E>3.5 MeV, and E>2.5 MeV with the three omnidirectional detectors (E1, E2, E3), and in the ranges E>0.3 MeV, E>0.45 MeV, and E>1.7 MeV with the three directional detectors (E5, E6, E7). Protons were analyzed in the energy ranges E>10 MeV, E>27 MeV, and E>21 MeV with the omnidirectional detectors, and in the ranges E>1.5 MeV, E>5.0 MeV, and E>16 MeV with the directional detectors. Species discrimination was not always possible. Omnidirectional data were accumulated and telemetered every 1.43 s. Directional data were accumulated for 0.145 s and telemetered every 0.29 s. The spacecraft spin period increased from 0.03 min to 0.5 min during the spacecraft life. Proton data were primarily useful in identifying proton contamination of electron counting rates. The instrument behaved well throughout the spacecraft life. NSSDC has all the data that exist from this investigation.

------- EPE-D, CAHILL, JR.----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETERS

NSSDC ID- 64-086A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.J. CAHILL, JR. — U OF MINNESOTA

BRIEF DESCRIPTION
The purpose of this experiment was to measure the magnitude and direction of the earth's magnetic field over the spacecraft orbit. Three orthogonal components were measured by a boom-mounted biaxial magnetometer during each spacecraft revolution. Each axis had a range of plus and minus 2000 nT and an accuracy of 5 nT. The sampling rate was 3.13 Hz. The experiment provided useful data from launch until June 30, 1965, after which spacecraft tumble rendered field direction determination impractical.

------- EPE-D, DAVIS----------

INVESTIGATION NAME- PROTON-ELECTRON SCINTILLATION DETECTOR

NSSDC ID- 64-086A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - L.R. DAVIS(RETIRED) NASA-GSFC
OI - J.M. WILLIAMSON NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to measure the directional fluxes and spectra of low-energy trapped and auroral protons and electrons. It employed a 5-mg-thick powder phosphor scintillator with a 1000-A aluminum coating. Additional absorbers were inserted in the detector aperture by a 16-position stepped wheel. The aperture was pointed at 45 deg to the spin axis. Due to the thinness and type of phosphor, the detector in the pulse mode would respond only to low-energy ions, and, therefore, essentially measured the flux of protons that penetrated the absorbers are stopped in the phosphor. Both the pulse counting rate and the phototube current were telemetered once each frame period. Sixteen readings were telemetered in each wheel position, and thus one complete set of data was obtained every 256 frames (one wheel revolution = 80 s). Protons in seven energy ranges were measured. The high-energy limit was about 10 MeV for all ranges, and the low-energy cutoffs were 97, 125, 168, 295, 495, 970, and 1700 keV. The energy fluxes of electrons in three ranges were measured separately using scatter geometry, absorbers, and the phototube current. The low-energy cutoffs were 17, 33, and 75 keV, and the high-energy cutoff was about 100 keV for all three ranges.

------- EPE-D, MCILWAIN----------

INVESTIGATION NAME- OMNIDIRECTIONAL AND UNIDIRECTIONAL ELECTRON AND PROTON FLUXES

NSSDC ID- 64-086A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - C.E. MCILWAIN U OF CALIF, SAN DIEGO
OI - R.W. FILLIUS U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
Omnidirectional fluxes of 40- to 110-MeV protons and of electrons greater than about 4 MeV were separably measured by a plastic scintillator. A second plastic scintillator with an 8-deg half-angle aperture and a look direction perpendicular to the spacecraft spin axis separably measured protons above 5.2 MeV and electrons above 0.5 MeV. The ability to distinguish between the particle types was due to the presence of two discrimination levels associated with each detector. High-quality data transmission from this experiment was essentially continuous from launch until about the middle of 1966, and then intermittent. NSSDC has all the data that exist from this investigation.

********** ERS 13**********

SPACECRAFT COMMON NAME- ERS 13
ALTERNATE NAMES- TRS 6, TRS 2(B)
00836

NSSDC ID- 64-040C

LAUNCH DATE- 07/17/64 WEIGHT- 2.0 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/17/64
ORBIT PERIOD- 2854. MIN INCLINATION- 36.7 DEG
PERIAPSIS- 250. KM ALT APOAPSIS- 120317. KM ALT

PERSONNEL
PM - J.M. DENNEY(NLA) TRW SYSTEMS GROUP
PS - J.I. VETTE(NLA) AEROSPACE CORP

BRIEF DESCRIPTION
ERS 13 was a spin-stabilized tetrahedron that weighed 2.1 kg and measured 22.86 cm along each triangular edge. The spin rate was approximately 10 rpm, and power was obtained by solar cells. The satellite carried a scintillation counter and a solid-state detector to measure electrons and protons in the radiation belts. Because of the low (100 mW) transmitter power at 136 MHz, no data were obtained beyond 6 earth radii (40,280 km). The transmission was normal from launch until October 20, 1964, when the transmitter became intermittent. A PAM/FM/PM telemetry system using IRIG (Inter-Range Instrumentation Group) channel 5 was employed.

------- ERS 13, VETTE----------

INVESTIGATION NAME- CHARGED PARTICLE DETECTORS

NSSDC ID- 64-040C-01

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.I. VETTE NASA-GSFC
OI - J.B. GARDNER TRW SYSTEMS GROUP

BRIEF DESCRIPTION
The experiment consisted of (1) a lithium-drifted silicon detector to measure separately electrons above 700 keV and protons between 12 and 23 MeV, and (2) a plastic scintillation counter to measure separately electrons above 3.5 MeV and protons between 39 and 50 MeV in the radiation belts. The photomultiplier tube used with the scintillation counter showed a change in gain around September 27, 1964. Both detector systems were omnidirectional and used logarithmic count rate meters to convert rates into analog signals. Two pulse-height discriminators were used with each detector to provide the four measurements. NSSDC has all the data that now exist from this investigation.

********** ERS 17**********

SPACECRAFT COMMON NAME- ERS 17
ALTERNATE NAMES- ORS 3, ORS 3(A)
01460

NSSDC ID- 65-058C

LAUNCH DATE- 07/20/65 WEIGHT- 5.5 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/20/65
ORBIT PERIOD- 2591. MIN INCLINATION- 34.4 DEG
PERIAPSIS- 207. KM ALT APOAPSIS- 112012. KM ALT

PERSONNEL
PM - J.M. DENNEY(NLA) TRW SYSTEMS GROUP
PS - J.I. VETTE(NLA) AEROSPACE CORP

BRIEF DESCRIPTION
The Environmental Research Satellite 17 carried a set of five radiation detectors designed to measure charged particles, X rays, gamma rays, and cosmic rays in the near-earth environment. The satellite was spin stabilized with a spin rate of approximately 6 rpm. A 16-channel PAM/FM/PM telemeter using a subcommutator and IRIG (Inter-Range Instrumentation Group) FM channel 5 was employed. Each channel was sampled for 4.5 s every 72 s. Data coverage was obtained at about an 86% level for the initial 4 weeks of operation and at about a 26% level thereafter until November 3, 1965, when the transmitter ceased. Approximately 1500 h of data were obtained.

------- ERS 17, VETTE----------

INVESTIGATION NAME- CHARGED PARTICLE DETECTORS

NSSDC ID- 65-058C-01

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.I. VETTE NASA-GSFC

BRIEF DESCRIPTION
Detectors sensitive to trapped particles included a lithium-drifted silicon device for detecting electrons above 320 keV and protons from 6 to 21 MeV, a plastic scintillation counter for electrons above 100 keV and protons from 3.5 to 27 MeV, and a shielded sodium iodide scintillation counter for electrons above 3.2 MeV and protons above 35 MeV. The pulse signal from each of the three detectors was fed to two internal pulse-height discriminators. The pulse outputs of the lower level discriminators measured electrons, and those from the higher level discriminators measured protons. Four of the six outputs were fed separately into two logarithmic count rate meters, one for high and one for low count rates. The lithium and sodium high-level discriminator outputs were each fed into two single-rate meters. The 10 analog voltages from the rate meters and a quasi-digital output from the lithium high-level discriminator were each telemetered on a separate channel and sampled for 4.5 s every 72 s. The low-count-rate channel for electrons greater than 3.2 MeV failed on July 23, 1965. All other channels of this experiment operated until the cessation of telemetry. All of these detector systems were omnidirectional except for the plastic scintillation counter, which had a conical field of view with a 45-deg half-angle. NSSDC has all the data that now exist from this investigation.

------- ERS 17, VETTE----------

INVESTIGATION NAME- X-RAY DETECTORS

NSSDC ID- 65-058C-02

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL
PI - J.I. VETTE NASA-GSFC
OI - L.E. PETERSON U OF CALIF, SAN DIEGO
OI - J.L. MATTESON U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
Three EON 6213 Geiger tubes were mounted along three mutually perpendicular axes. The conical field of view of each detector was approximately a 50-deg half-angle. The outputs of these three detectors were added together and converted by a logarithmic count rate meter into an analog voltage. A quasi-digital output for low rates was obtained by measuring a summed scale of 4 and scale of 64. The analog and quasi-digital channels were sampled for 4.5 s every 72 s. The detector system was sensitive to solar X rays in the 1- to 14-A range and to electrons above 40 keV. This system failed on September 15, 1965. The sum of the output of the three orthogonal solar cells, with the same look angles as the detectors, was used to give crude solar aspect information. NSSDC has all the data that now exist from this investigation.

------- ERS 17, VETTE----------

INVESTIGATION NAME- GAMMA-RAY DETECTOR

NSSDC ID- 65-058C-03

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
HIGH ENERGY ASTROPHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - J.I. VETTE NASA-GSFC
OI - L.E. PETERSON U OF CALIF, SAN DIEGO
OI - J.L. MATTESON U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
An omnidirectional phoswich-type scintillation counter was used to measure gamma rays between 30 keV and 10 MeV and also to provide a measure of the total cosmic-ray flux for protons greater than 30 MeV. The five-level differential analyzer provided an energy loss spectrum in the 0.03- to 0.1-MeV, 0.1- to 0.3-MeV, 0.3- to 1-MeV, 1- to 3-MeV, and 3- to 10-MeV ranges. An integral discriminator provided a cosmic-ray channel for energy losses above 10 MeV. The lowest level channel was converted to an analog voltage using a logarithmic count rate meter. This channel was sampled for 4.5 s every 72 s. The integral cosmic-ray channel was converted to an analog voltage in a similar fashion but was sampled for 4.5 s every 576 s. All other channels were scaled down, and the summed output of scalers was sampled every 576 s. The charged particle rejection feature of the phoswich circuit failed at launch, and the integral discriminator channel rate decreased to nearly zero by August 5, 1965, because of an amplifier saturation. The interpretation of the data from this detector is difficult because of the various malfunctions. NSSDC has all the data that now exist from this investigation.

********** ESA-GEOS 1**********

SPACECRAFT COMMON NAME- ESA-GEOS 1
ALTERNATE NAMES- GEOS, ESGEO
09931, ESA GEOS
GECS 1

NSSDC ID- 77-029A

LAUNCH DATE- 04/20/77 WEIGHT- 273.6 KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC COMMENSURAT EPOCH DATE- 04/25/77
ORBIT PERIOD- 720.06 MIN INCLINATION- 26.25 DEG
PERIAPSIS- 2110. KM ALT APOAPSIS- 36357. KM ALT

PERSONNEL
PP - D.E. PULLINGER ESA-ESTEC
PS - K. KNOTT ESA-ESTEC

BRIEF DESCRIPTION
The ESA-GEOS 1 spacecraft was to have been the first satellite placed in the equatorial geostationary orbit that was dedicated completely to scientific measurements. Unfortunately, a launch vehicle failure made it impossible to achieve this orbit and resulted in the decision to place the spacecraft in a 12-h, commensurate, final orbit where the instruments could make the planned measurements for about 6 h each revolution between 5 and 7 earth radii. In this orbit the mission was still able to serve as a core or reference spacecraft for the International Magnetospheric Study (IMS), and carried out planned correlative measurements with extensive ground-based networks in Scandinavia and conjugate point measurements between a station in Iceland and in Antarctica. In addition, because of a second daily apogee at a different geographic position, correlative measurements with IMS ground-based networks in Alaska and western Canada were also carried out. The payload consisted of instruments to measure (1) dc and ac electric and magnetic fields; (2) gradients 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 following NSSDC experiment descriptions, ESA Exp. S-300 was divided into five separate experiments: 77-029A-05, -06, -07, -10, and -11. A detailed description of the payload can be found in K. Knott, ESA Scientific and Technical Review, v. 1, pp. 173-199, 1975. The spacecraft was cylindrical with a height of 1.321 m. The total mass exclusive of propellants was 273.6 kg. There were four telescopic axial booms of 2.5-m 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 of 3-m length for a variety of instruments. There were six hydrazine thrusters; two were to tilt and precess the spacecraft, two were used to modify the orbit so the longitude of the apogee could be moved to different geographic locations, and two were used for spin up and spin down. The spin rate was nominally 10 rpm. Since this mission was planned for the geostationary orbit, no storage of data was provided. 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, dual infrared earth sensor, and accelerometers. Power was supplied by 7200 solar cells mounted on the cylindrical spacecraft surface. To prevent spacecraft differential charging, 96% of the surface was made electrically conductive. Because of the importance of the magnetic field measurements, the spacecraft residual field at the magnetometer was made less than 0.3 nT. More detailed information on the spacecraft can be found in ESA Bulletin, n. 9, May 1977.

------- ESA-GEOS 1, BEGHIN----------

INVESTIGATION NAME- WAVE FIELD IMPEDANCE

NSSDC ID- 77-029A-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 (part of ESA Exp. S-300) made use of one set of electric mesh spheres mounted on the end of the axial booms (part of 77-029A-10, Ungstrup) and the two vitreous carbon spheres mounted on the end of the 20-m radial booms (77-029A-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 could be telemetered directly, and sweep-frequency analyzers and a digital correlation could be employed to obtain auto-correlation and/or cross-correlation up to 77 kHz with selectable bandwidths of 2.5, 5.0, or 10.0 kHz.

ESA-GEOS 1, GEISS

INVESTIGATION NAME- LOW-ENERGY ION COMPOSITION

NSSDC ID- 77-029A-03

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.	GEISS	U OF BERNE
PI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - P.W.	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 followed by a crossed electric and magnetic field analyzer 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 electrostatic analyzer in its lowest energy step, where both analyzers were transparent. The device viewed perpendicular to the spin (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 electrostatic analyzer were counted by a channeltron. The remaining 97% entered the crossed electric and magnetic field analyzer 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. Early in the life of the satellite, a correlative experiment with the cesium ion neutralization gun on ATS 6 was performed when the two satellites were within several km and on the same magnetic field line. The ATS 6 gun was fired for some period commencing about 1 h prior to the ESA-GEOS 1 satellite crossing the magnetic field line so that cesium ions would have time to populate the flux tube and, subsequently, be detected by this experiment. This was the first of this type of controlled active experiment between two satellites.

ESA-GEOS 1, GENDRIN

INVESTIGATION NAME- MAGNETIC WAVE FIELDS

NSSDC ID- 77-029A-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 (part of ESA Exp. S-300) 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 6 m from the spacecraft. Typical sensitivities of these sensors in units of nT per sq root of Hz were 1.0E-1 at 0.1 Hz, 2.0E-4 at 10 Hz, and about 3.0E-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, comprise part of the ESA wave experiment S-300. These components were employed for the sensors described in 77-029A-07 (Pedersen) and 77-029A-10 (Ungstrup), and also the investigations described in 77-029A-05 (Petit) and 77-029A-11 (Beghin). Six analog channels of 450 Hz bandwidth and the digital correlator output were transmitted via 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. Cross-correlograms between two sensors could be provided. The correlator could also operate in a time-sharing mode between auto-correlation and cross-correlation.

ESA-GEOS 1, HULTQVIST

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

NSSDC ID- 77-029A-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 experiment of Wilken (77-029A-01) was complementary to this one and extended both electron and proton observations to higher energy ranges. The purpose of this 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 of the instrument was provided to study wave-particle interactions. 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 a geometric factor (G) of 3.0E-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 1.0E-3 sq cm sr. Aperture angular widths refer to elevation and azimuth, respectively, in relation to the spacecraft spin axis. This experiment planned to rely heavily on real-time ground computer control. This was possible over the eastern longitude apogee in view of the ESA-GEOS 1 ground station antenna at Michelstadt, Federal Republic of Germany, but not for the other daily apogee over the Pacific Ocean.

ESA-GEOS 1, MARIANI

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 77-029A-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 was 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 of plus or minus 480 nT with a constant quantization error of plus or minus 0.125 nT using a 9-bit digitization was obtained. The noise level of the sensors was comparable to this quantization error. This instrument became saturated at geocentric distances less than about 4.5 earth radii.

------- ESA-GEOS 1, PEDERSEN----------

INVESTIGATION NAME- DC FIELDS BY DOUBLE PROBE

NSSDC ID- 77-029A-07

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
IONOSPHERES AND RADIO 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 whereas 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 were made available for analysis by the sweep-frequency analyzers and digital correlator as part of the 77-029A-05 (Petit), 77-029A-10 (Ungstrup), and 77-029A-01 (Beghin) investigations. The sensitivity of this probe was about 1.0E-4 V/m at dc and 1.0E-8 volts per meter per square root of hertz for ac.

------- ESA-GEOS 1, PETIT----------

INVESTIGATION NAME- VLF PLASMA RESONANCES

NSSDC ID- 77-029A-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 77-029A-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 resonance frequencies of the plasma. The ambient plasma density could be 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-correlations 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 1, UNGSTRUP----------

INVESTIGATION NAME- ELECTRIC WAVE FIELDS

NSSDC ID- 77-029A-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 (part of the ESA S-300 wave experiment) 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 could be analyzed with the sweep-frequency analyzer and the digital correlator. Frequencies up to 450 Hz could be telemetered directly, and auto-correlation and/or cross-correlation of the sensor outputs up to 77 kHz could be accomplished with selectable bandwidths of 2.5, 5.0, or 10.0 kHz. The sensitivity of the mesh sphere probes at 10 kHz was 1.0E-6 volts per meter per square root of Hz.

------- ESA-GEOS 1, WILKEN----------

INVESTIGATION NAME- ELECTRON AND PROTON PITCH ANGLE DISTRIBUTION

NSSDC ID- 77-029A-01

INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

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 the experiment of Hultqvist (77-029A-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 served to focus 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 deflector 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 1.0E-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 on 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 1, WRENN----------

INVESTIGATION NAME- THERMAL PLASMA FLOW

NSSDC ID- 77-029A-02

INVESTIGATIVE PROGRAM
SCIENCE

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

PERSONNEL

PI - G.L.	WRENN	U COLLEGE LONDON
OI - R.L.F.BOYD		U COLLEGE LONDON
OI - K.	NORMAN	U COLLEGE LONDON
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 6.0E-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 5.0E-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 -26 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.

********** 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= 35618.5 KM ALT APOAPSIS= 35774.1 KM ALT

PERSONNEL
PM = D.L. 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 are its instruments were identical to ESA-GEOS 1 (77-039A). 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 SPECTRON
OI = P. DECREAU CNRS, CTR FOR SPECTRON

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.M. ROSENBAUER MPI-AERONOMY
OI = P.M. 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 0.83 and a mass range of 1 to 140 u in 64 logarithmically spaced steps. There was a thermal mode 1, 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 5E-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 (6 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, 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 witreous 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 1F 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	U COLLEGE LONDON
OI - R.L.F.	BOYD	U COLLEGE LONDON
OI - K.	NORMAN	U COLLEGE LONDON
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.

********** EXPLORER 6**********

SPACECRAFT COMMON NAME- EXPLORER 6
ALTERNATE NAMES- ABLE 3, 1959 DELTA 1
[illegible]

NSSDC ID- 59-004A

LAUNCH DATE- 08/07/59 WEIGHT- 64. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY

UNITED STATES	NASA-OSSA
UNITED STATES	DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/19/59
ORBIT PERIOD- 754. MIN INCLINATION- 47.0 DEG
PERIAPSIS- 237.000 KM ALT APOAPSIS- 41900.0 KM ALT

PERSONNEL

PM - J.C.	LINDSAY(DECEASED)	NASA-GSFC
PS - J.C.	LINDSAY(DECEASED)	NASA-GSFC

BRIEF DESCRIPTION
Explorer 6 was a small, spheroidal satellite designed to study trapped radiation of various energies, galactic cosmic rays, geomagnetism, radio propagation in the upper atmosphere, and the flux of micrometeorites. It also tested a scanning device designed for photographing the earth's cloud cover. The satellite was launched into a highly elliptical orbit with an initial local time of apogee of 2100 h. The satellite was spin stabilized at 2.8 rps, with the direction of the spin axis having a right ascension of 217 deg and a declination of 23 deg. Four solar cell paddles mounted near its equator recharged the storage batteries while in orbit. Each experiment except the television scanner had two outputs, digital and analog. A UHF transmitter was used for the digital telemetry and the TV signal. Two VHF transmitters were used to transmit the analog signal. The VHF transmitters were operated continuously. The UHF transmitter was operated for only a few hours each day. Only three of the solar cell paddles fully erected, and this occurred during spin up rather than prior to spin up as planned. Consequently, initial operation of the payload power supply was 63% nominal, and this decreased with time. The decreased power caused a lower signal-to-noise ratio affecting most of the data, especially near apogee. One VHF transmitter failed on September 11, 1959, and the last contact with the payload was made on October 6, 1959, at which time the solar cell charging current had fallen below that required to maintain the satellite equipment. A total of 827 h of analog and 23 h of digital data was obtained.

------- EXPLORER 6, SIMPSON----------

INVESTIGATION NAME- PROPORTIONAL COUNTER TELESCOPE

NSSDC ID- 59-004A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
OI - C.Y.	FAN	U OF ARIZONA
OI - P.	MEYER	U OF CHICAGO

BRIEF DESCRIPTION
A triple-coincidence omnidirectional proportional counter telescope was used to observe protons (with E>75 MeV) and electrons (with E>15 MeV) in the terrestrial trapped radiation region. Several magnetic storms occurred during the active life of the experiment. The date of transmission of the last useful information was October 6, 1959, after which the transmitter failed to operate. NSSDC has all the useful data that now exist.

------- EXPLORER 6, SONETT----------

INVESTIGATION NAME- SCINTILLATION COUNTER

NSSDC ID- 59-004A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - C.P.	SONETT	U OF ARIZONA
OI - A.	ROSEN	TRW SYSTEMS GROUP
OI - T.A.	FARLEY(NLA)	U OF CALIF, LA

BRIEF DESCRIPTION
The scintillation counter experiment was designed to make direct observations of electrons in the earth's radiation belts with a detector insensitive to bremsstrahlung. This experiment consisted of a cylindrical plastic scintillator cemented to a photomultiplier tube. The instrument viewed space through a foil-covered window in the payload shell, but the instrument also responded to more energetic particles passing through the payload shell. The minimum energies detectable were 200 keV for electrons and 2 MeV for protons. For electrons between 200 and 500 keV, the detector efficiency times the omnidirectional geometric factor was 0.0008 sq cm count per electron; whereas for electrons of energy greater than 500 keV, it was 0.16 sq cm count per electron. For very penetrating particles, the geometrical factor rose to its maximum value of 3.5 sq cm. The scintillation counter was sampled continuously for analog transmission and intermittently (every 2 min, 15 s, or 1.9 s, depending upon the satellite bit rate) for digital transmission. The transmitter broadcasting the analog data for this experiment failed on September 11, 1959. Data were received on a limited-duty cycle from the digital transmitter until early October, 1959. NSSDC has all the useful data that now exist.

------- EXPLORER 6, SONETT----------

INVESTIGATION NAME- SEARCH-COIL MAGNETOMETER

NSSDC ID- 59-004A-04

INVESTIGATIVE PROGRAM
CODE EE-3, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - C.P.	SONETT	U OF ARIZONA
OI - E.J.	SMITH	NASA-JPL
OI - D.L.	JUDGE	U OF SOUTHERN CALIF
OI - P.J.	COLEMAN, JR.	U OF CALIF, LA

BRIEF DESCRIPTION

This experiment was designed to survey the gross magnetic field of the earth, to investigate the interplanetary magnetic field, and to detect evidence of any lunar magnetic field. No interplanetary or lunar magnetic fields could be measured, however, because of the spacecraft's low apogee. The instrument was similar to that flown on Pioneer 1 and consisted of a single search coil mounted so that it measured the magnetic field perpendicular to the spacecraft spin axis. The instrument had a range of 0.6 nT to 1200 nT. No inflight calibration was provided. Some degradation of the telemetry signal occurred due to ionospheric effects. Insufficient ground observations on the electron content of the ionosphere prevented correcting the data for these effects. The experiment had both digital and analog outputs. The magnetometer amplitude and phase were sampled continuously for analog transmission and intermittently (every 2 min, 15 s, or 1.9 s, depending on satellite bit rate) for digital transmission. The magnetometer worked until loss of the telemetry signal in early October, 1959. For further details, see Judge and Coleman, J. Geophys. Res., v. 67, p. 5071, 1962. NSSDC has all the useful data that now exist.

------- EXPLORER 6, WINCKLER----------

INVESTIGATION NAME- ION CHAMBER AND GM COUNTER

NSSDC ID- 59-004A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.R.	WINCKLER	U OF MINNESOTA
OI - R.A.	HOFFMAN	NASA-GSFC
OI - R.L.	ARNOLDY	U OF NEW HAMPSHIRE

BRIEF DESCRIPTION

The instrumentation for this experiment consisted of a Neher-type integrating ionization chamber and an Anton 302 Geiger-Mueller tube. Due to the complex nonuniform shielding of the detectors, only approximate energy threshold values were available. The ion chamber responded omnidirectionally to electrons and protons with energies greater than 1.5 and 23.6 MeV, respectively. The GM tube responded omnidirectionally to electrons and protons with energies greater than 2.9 and 36.4 MeV respectively. Counts from the GM tube and pulses from the ion chamber were accumulated in separate registers and telemetered by the analog system. The time that elapsed between the first two ion chamber pulses following a data transmission and the accumulation time for 1024 GM-tube counts were telemetered digitally. Very little digital data were actually telemetered. The ion chamber operated normally from launch through August 25, 1959. The GM tube operated normally from launch through October 6, 1959. NSSDC has all the useful data that now exist.

********** HAWKEYE 1**********

SPACECRAFT COMMON NAME- HAWKEYE 1
ALTERNATE NAMES- INJUN-F, NEUTRAL POINT EXPLORER
EXPLORER 52

NSSDC ID- 74-040A

LAUNCH DATE- 06/03/74 WEIGHT- 22.7 KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/04/74
ORBIT PERIOD- 3032.4 MIN	INCLINATION- 89.8 DEG
PERIAPSIS- 469.0 KM ALT	APOAPSIS- 125570. KM ALT

PERSONNEL

PM - J.E.	ROGERS	U OF IOWA
PP - C.W.	COFFEE, JR.	NASA-LARC
PS - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

The primary mission objective was to conduct particles and fields investigations of the polar magnetosphere of the earth out to 21 earth radii. Secondary objectives were to make magnetic field and plasma distribution measurements in the solar wind, and to study Type-3 radio emissions caused by solar electron streams in the interplanetary medium. To accomplish these objectives, the spacecraft was instrumented with a magnetometer, an energetic plasma analyzer, and an ELF-VLF wave instrument. The spacecraft was spin stabilized with a nominal rotational period of 11 s. In celestial coordinates, the positive spin axis coordinates were right ascension 299.4 deg (plus or minus 1.1 deg) and declination 8.6 deg (plus or minus 1.5 deg). There was no onboard orientation or spin rate control, but the orientation of the spin axis was stable. An optical aspect system operated from launch until September 3, 1974. After this period, aspect had to be determined from magnetometer measurements. The complete spacecraft with instruments had a mass of 22.65 kg. Power of 22 to 36 W, depending on solar aspect, was obtained from solar cells. Hawkeye 1 participated in the International Magnetospheric Study (IMS) and during the first half of 1977 data acquisition was confined to IMS special intervals. Data were obtained in real time only at frequencies of 136 MHz and 400 MHz at 100 bps (or 200 bps with convolutional coding) plus wideband VLF data. For more details see "Hawkeye 1," U. of Iowa 77-6, January 1977 (IRF E29176).

------- HAWKEYE 1, FRANK----------

INVESTIGATION NAME- LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 74-040A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - J.D.	CRAVEN	U OF IOWA
OI - D.M.	YEAGER	U OF IOWA

BRIEF DESCRIPTION

This particle spectrometer (Low-Energy Proton and Electron Differential Energy Analyzer - LEPEDEA) employed two electrostatic analyzers to measure protons and electrons simultaneously. A GM tube was an additional detector sensitive to protons above 600 keV and electrons above 45 keV. The sensors were mounted normal to the spacecraft spin axis. Angular distributions of particles were determined with a sector resolution of 90 deg for analyzer voltage steps and 10 deg for analyzer voltage sweeps of its whole range. The electrostatic analyzers had a field of view of 6 deg by 30 deg and measured protons and electrons from 0.05 to 40 keV. The GM tube had a conical field of view of 15-deg half-angle. Two modes of operation were used: one instrument cycle of 156 intensity measurements every 46 s, or one cycle of 312 intensity measurements every 92 s. Data from this investigation are available from the Principal Investigator. For more details of the LEPEDEA instrument see Frank, L. A., J. Geophys. Res., v. 72, n. 1, p. 185, January 1967.

------- HAWKEYE 1, GURNETT----------

INVESTIGATION NAME- ELF/VLF RECEIVERS

NSSDC ID- 74-040A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - G.W.	PFEIFFER	U OF IOWA

BRIEF DESCRIPTION

This experiment measured electric and magnetic fields using a 42.7-m electric dipole (tip-to-tip) and a search coil antenna deployed 1.58 m from the spacecraft. The electric field spectrum measurements were made in 16 logarithmically spaced frequency channels extending from 1.78 Hz to 178 kHz, and dc electric fields were also measured. The bandwidth of these channels varied from 7.5% to 30% depending on center frequency. Channel sensitivity and dynamic range were 1E-6 V/m and 100 dB, respectively. A wideband receiver was also used, with two selectable bandwidth ranges: 0.15 to 10 kHz or 1 to 45 kHz. The magnetic field spectrum was measured in eight discrete, logarithmically spaced channels from 1.78 Hz to 5.62 kHz. The bandwidth of these channels varied from 7.5% to 30% depending on frequency. The dynamic range was 100 dB, and the sensitivity ranged from 0.1 nT at 1.78 Hz to 3.4E-4 nT at 5.62 kHz. The wideband receiver described above could be used with the magnetic antenna. Each discrete channel was sampled once every 11.52 s. Data are available from the PI.

********** HEOS 1**********

SPACECRAFT COMMON NAME- HEOS 1
ALTERNATE NAMES- HEOS-A1, HEOS-A
C3595

NSSDC ID- 68-109A

LAUNCH DATE- 12/05/68 WEIGHT- 105. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 12/24/69
ORBIT PERIOD- 6690. MIN INCLINATION- 28.1 DEG
PERIAPSIS- 6804. KM ALT APOAPSIS- 227099. KM ALT

PERSONNEL
PM - J. VANDENKERCKHOVE ESA-ESTEC
PS - B.G. TAYLOR ESA-ESTEC

BRIEF DESCRIPTION
HEOS 1 was an earth-orbiting, spin-stabilized satellite that was launched by ESA. It was basically cylindrical with an axial boom supporting the antennas and the magnetometers. The spin-axis attitude and spin rate were changed by onboard gas jets. The spacecraft objectives were to study interplanetary magnetic fields, cosmic rays, the solar wind, and the magnetosheath. The spacecraft operation was fully satisfactory for 16 months, after which intermittent loss of some solar gate pulses (attitude reference) occurred. By 1974, spacecraft telemetry coverage was 50% and only the magnetic field experiment was operational. The spacecraft reentered the earth's atmosphere on October 28, 1975.

------- HEOS 1, BAROUCH----------

INVESTIGATION NAME- COSMIC-RAY PARTICLE FLUX

NSSDC ID- 68-109A-06
INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
COSMIC RAYS

PERSONNEL
PI - E.A. BAROUCH CENS
OI - L. KOCH CENS
OI - J. ENGELMANN CENS
OI - P. MASSE CENS
OI - M. GROS CENS

BRIEF DESCRIPTION
This experiment was designed to measure solar and galactic protons in several energy ranges between 3.8 and 22.8 MeV. The instrument consisted of a four-sensor (lithium-drifted silicon) solid-state telescope with an anticoincidence shield. The telescope look direction was along the spacecraft spin axis (which was changed by commands at various times). A complete data collection cycle required 128 s. Five pulse-height discrimination levels were applied to the signal coming from the first sensor (one level for each of five successive 24-s intervals). During each 24-s interval, four count rates were obtained. These were counts in sensor 1, and coincident counts in sensors 1 and 2, 1 and 3, and 1 and 4. The last count rate was not reliable, because the counter rolled over after 16 counts. The instrument performed normally until June 1971, when the anticoincidence element failed.

------- HEOS 1, ELLIOT----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 68-109A-02
INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - H. ELLIOT IMPERIAL COLLEGE
OI - P.C. HEDGECOCK IMPERIAL COLLEGE

BRIEF DESCRIPTION
This experiment was designed to measure magnetic field components up to 64 nT with an accuracy of 0.25 nT using a boom-mounted triaxial fluxgate magnetometer. The HEOS 1 spacecraft was launched into a highly eccentric orbit so that the magnetometer measured magnetic fields within the magnetosphere and the transition and interplanetary regions. The magnetometer operated continuously in two modes. One gave a continuous series of vectors sampled at 48-s intervals. The other operated via a 16-kb data store with a variety of measurement programs and options including command or automatic replay, shock type event detection, etc. The experiment operation was normal until spacecraft reentry (October 28, 1975). However, data acquisition became intermittent late in the spacecraft life, and data accuracy decreased somewhat. For further details, see Hedgecock, Sp. Sci. Instrum., v. 1, p. 53, 1975.

********** HEOS 2**********

SPACECRAFT COMMON NAME- HEOS 2
ALTERNATE NAMES- HEOS-A2, 05814

NSSDC ID- 72-005A

LAUNCH DATE- 01/31/72 WEIGHT- 166. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- THOR

SPONSORING COUNTRY/AGENCY
INTERNATIONAL ESA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 01/31/72
ORBIT PERIOD- 7477. MIN INCLINATION- 90.23 DEG
PERIAPSIS- 397. KM ALT APOAPSIS- 245098. KM ALT

PERSONNEL
PM - J. VANDENKERCKHOVE ESA-ESTEC
PS - B.G. TAYLOR ESA-ESTEC

BRIEF DESCRIPTION
HEOS 2 was a spin-stabilized spacecraft with a highly eccentric orbit whose apogee occurred at high latitude. Its primary scientific mission was the investigation of interplanetary space and the high-latitude magnetosphere and its boundary in the region around the northern neutral point. HEOS 2 provided new data on the sources and acceleration mechanisms of particles found in the trapped radiation belts and in the polar precipitation regions and auroral zones. It also monitored solar activity and cosmic radiation. The satellite carried a magnetometer and particle detectors which covered a broad range from thermal to cosmic-ray energies. The satellite had three antennas to study extreme low-frequency (ELF) waves and carried a sensitive micrometeorite detector. The spacecraft functioned normally until it reentered the earth's atmosphere on August 5, 1974.

------- HEOS 2, ELLIOT----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 72-005A-01
INVESTIGATIVE PROGRAM
CODE EE-8/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - H. ELLIOT IMPERIAL COLLEGE
OI - P.C. HEDGECOCK IMPERIAL COLLEGE

BRIEF DESCRIPTION
A three-axis fluxgate magnetometer was used to measure magnetic field components of up to 16 nT with a digital resolution of 0.125 nT and from 16 nT to 150 nT with 1 nT resolution. Continuous field sampling occurred at a rate of one vector per 32 s. Faster rates were available in a limited duty cycle when core buffer storage was used. Rms noise measurements for one field component in a frequency band from 1 to 5 Hz were also made. The instrument was similar to that used for experiment 68-109A-02 carried on HEOS 1. The instrument worked normally until spacecraft reentry on August 5, 1974.

------- HEOS 2, ROSENBAUER----------

INVESTIGATION NAME- SOLAR WIND MEASUREMENTS (230 EV-16 KEV)

NSSDC ID- 72-005A-06
INVESTIGATIVE PROGRAM
SCIENCE

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

PERSONNEL
PI - H.R. ROSENBAUER MPI-AERONOMY

BRIEF DESCRIPTION
A quadispherical electrostatic analyzer with 11 channel multipliers was used to study the velocity distribution function of the positive solar wind ions. Energy per unit charge was measured in 28 channels spread logarithmically between 230 eV and 16 keV. A complete spectrum was determined every 4 min. Detailed information on the direction of incident particles was obtained with 11 channels in elevation and 18 channels in azimuth. A second sensor was used for measurements within the magnetosphere. Measurements were performed in 13 energy channels covering the range 100 eV to 50 keV for both protons and electrons. Angular measurements were also performed.

********** IMP-A**********

SPACECRAFT COMMON NAME- IMP-A
ALTERNATE NAMES- EXPLORER 18, IMP 1
00693, S 74

NSSDC ID- 63-046A

LAUNCH DATE- 11/27/63 WEIGHT- 138. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/08/65
ORBIT PERIOD- 5606. MIN INCLINATION- 35.2 DEG
PERIAPSIS- 4395. KM ALT APOAPSIS- 192003. KM ALT

PERSONNEL
PM - P. HUTLER(RETIRED) NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 18 (IMP 1) was a solar-cell and chemical-battery powered spacecraft instrumented for interplanetary and distant magnetospheric stucies of energetic particles, cosmic rays, magnetic fields, and plasmas. Initial spacecraft parameters included a local time of apogee of 1020 h, a spin rate of 22 rpm, and a spin direction of 115 deg right ascension and -25 deg declination. Each normal telemetry sequence of 81.9 s duration consisted of 795 data bits. After every third normal sequence there was an 81.9-s interval of rubidium vapor magnetometer analcg data transmission. The spacecraft performed normally until May 30, 1964, then intermittently until May 10, 1965, when it was abandoned. The principal periods of data coverage were November 27, 1963 to May 30, 1964; September 17, 1964 to January 7, 1965; and February 21, 1965 to March 25, 1965; however, only the first of these periods was very useful.

------- IMP-A, ANDERSON----------

INVESTIGATION NAME- ION CHAMBER AND GM COUNTERS

NSSDC ID- 63-046A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The instrumentation for this experiment, designed to measure fluxes of geomagnetically trapped particles, consisted of a 7.6-cm-diameter, Neher-type ionization chamber and two Anton 223 Geiger-Mueller (GM) tubes. The ion chamber responded to electrons and protons with E>1 and E>17 MeV, respectively. Both GM tubes were mounted parallel to the spacecraft spin axis. One GM tube detected electrons, with E>45 keV, scattered off a gold foil. The acceptance cone for these electrons had a 61-deg full-angle, and its axis of symmetry made an angle of 59.5 deg with the spacecraft spin axis. This GM tube responded omnidirectionally to electrons and protons with E>6 and E>52 MeV, respectively. The second GM tube had no direct access to the spin environment and responded omnidirectionally to background electrons and protons with E>6 and E>52 MeV, respectively. Pulses from the ion chamber were accumulated for 326.08 s and read out once every 327.68 s. Counts from the first GM tube were accumulated for 39.36 s and read out six times every 327.68 s. Counts from the second GM tube were accumulated for 39.36 s and read out five times every 327.68 s. This experiment performed normally from launch through May 10, 1965. For further details, see Anderson et al., J. Geophys. Res., v. 70, p. 1039, 1965. NSSDC has all the useful data that now exist.

------- IMP-A, BRIDGE----------

INVESTIGATION NAME- FARADAY CUP

NSSDC ID- 63-046A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - H.S. BRIDGE MASS INST OF TECH

BRIEF DESCRIPTION
A five-element, split-collector Faraday cup was used to measure solar wind particles in the following sequence: positive ions from 45 to 105 eV, positive ions from 95 to 235 eV, positive ions from 220 to 640 eV, positive ions from 560 to 1800 eV, electrons from 65 to 210 eV, and positive ions from 1700 to 5400 eV. The split plane of the collector was in the spin equatorial plane of the spacecraft. Measurements consisted of 22 instantaneous current samples, each separated by 0.16 s (spanning more than one satellite rotation). These measurements represented the sum of the current to the split collector, the maximum difference in current encountered during spacecraft rotation, and an identification of which half of the collector was maximum. The entire sequence required 2.6 min and was repeated every 5.5 min. The entrance cone for this Faraday cup had a half-angle of about 80 deg. Interference was encountered from refracted particles (with the most pronounced effect at about 70 deg incidence to cup normal), from secondary electrons, and from ultraviolet radiation. For further details, see E. F. Lyon, "Explorer-18 plasma measurements," The Solar Wind, edited by Mackin and Neugebauer, Pergamon Press, 1966.

------- IMP-A, MCDONALD----------

INVESTIGATION NAME- COSMIC RAYS

NSSDC ID- 63-046A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
This experiment consisted of two detector systems. The first was a dE/dx vs E telescope with thin and thick CsI scintillators (one each) and an anticoincidence plastic scintillation counter. The telescope axis was normal to the spacecraft spin axis. Counts of particles penetrating the thin CsI scintillator and stopping in the thick CsI scintillator were accumulated during one 39.36-s interval every 5.46 min. The relative contribution to the count rate of various species (electrons between 3 and 12 MeV, ions with charge = 1 or 2, atomic mass = 1, 2, 3 or 4, and energy between 18.7 and 81.6 MeV/nucleon) and energy spectral information were determined by 512-channel pulse-height analysis performed simultaneously on the output of both CsI scintillators six times every 5.46 min. The second detector system consisted of two Geiger-Mueller tube telescopes oriented parallel to and perpendicular to the spacecraft spin axis. Each telescope consisted of two colinear GM tubes. The parallel and perpendicular telescopes measured, respectively, (1) the sum of counts due to protons above 70 MeV and electrons above 6.5 MeV and (2) the sum of counts due to protons above 65 MeV and electrons above 6 MeV. Counts registered in any one of the four GM tubes were also accumulated. These omnidirectional counts were due to protons above 50 MeV plus electrons above 4 MeV. The parallel, perpendicular, and omnidirectional count rates were obtained for one 40-s accumulation interval during successive normal 81.9-s telemetry sequences. Thus, any one count rate was measured for 40 s once each 5.46 min. Both detector systems worked well from launch until May 26, 1964. For further details, see McDonald et al., J. Geophys. Res., v. 67, p. 2119, 1962, or Balasubrahmanyan et al., J. Geophys. Res., v. 70, p. 2005, 1965.

------- IMP-A, NESS----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 63-046A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - N.F. NESS NASA-GSFC

BRIEF DESCRIPTION
Each of two uniaxial fluxgate magnetometers, having dynamic ranges of plus or minus 40 nT, sampled the magnetic field 30 times within each of six 4.8-s intervals every 5.46 min. Detector sensitivities were plus or minus 0.25 nT, and digitization uncertainty was plus or minus 0.40 nT. A rubidium vapor magnetometer was used to calibrate the instruments but did not produce any independently useful data sets. The instruments functioned normally throughout the useful life of the satellite and provided usable data through May 30, 1964. See Ness et al., J. Geophys. Res., v. 69, pp. 3531-3569, 1964. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file. NSSDC has all the useful data that exist from this investigation.

------- IMP-A, SERBU----------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 63-046A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - G.P. SERBU NASA-GSFC
OI - E.J. MAIER NASA-GSFC

BRIEF DESCRIPTION
The retarding potential analyzer was a three-element planar Faraday cup. It was mounted normal to the spacecraft spin axis and had an effective look angle of 5 sr. Coarse and fine resolution modes were programmed for both ions and electrons. These modes consisted of 15 steps each for retarding voltages of 0 to 28 V and 0 to 100 V. The entire ion and electron sequence was repeated once every 10.92 min, and each 15-step spectral analysis required 5.4 s. The experiment operated for about 20 h after launch, until a failure of a mechanical programmer switch terminated operations. The data were adversely affected by secondary electrons and no longer exist. For further details, see G. P. Serbu, "Results from the IMP-1 retarding potential analyzer," Space Research V, 1965.

------- IMP-A, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY RANGE VS ENERGY LOSS

NSSDC ID- 63-046A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO
OI - C.Y. FAN U OF ARIZONA
OI - G. GLOECKLER U OF MARYLAND

BRIEF DESCRIPTION
A charged-particle, solid-state telescope was used to measure the range and energy loss of galactic and solar cosmic rays. The experiment was designed to study particle energies (energy per nucleon intervals approximately proportional to Z squared/A) and charge spectra (Z<=6). The detector was oriented normal to the spacecraft spin axis. The detector accumulators for each energy interval were telemetered six times every 5.46 min. Each accumulation period was about 40 s (the initial spacecraft spin period was about 2 s). The output from two 128-channel pulse-height analyzers was obtained for one incident particle every 41 s and read out along with the detector accumulations. A malfunction limited alpha studies to particles with E>30 MeV. For further details, see Fan et al., J. Geophys. Res., v. 70, p. 3515, 1965.

------- IMP-A, WOLFE----------

INVESTIGATION NAME- SOLAR WIND PROTONS

NSSDC ID- 63-046A-06 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS

PERSONNEL
PI - J.H. WOLFE NASA-ARC
OI - R.W. SILVA TRW SYSTEMS GROUP

BRIEF DESCRIPTION
A quadrispherical electrostatic analyzer with a current collector and an electrometer amplifier was used to detect and analyze the positive ion component of the incident plasma and to study its gross flow characteristics. Protons were analyzed in 14 energy channels between 0.025 and 16 keV. The instrument was mounted on the satellite equatorial plane and had a view angle of 15 deg in this plane and of 90 deg in the plane containing the spin axis. The satellite's equatorial plane was divided into three contiguous sectors (111.8 deg, 111.8 deg, and 136.4 deg) by use of an optical aspect sensor. The peak flux in one sector was recorded at one analyzer plate potential per revolution of the satellite (no information about the position within the sector in which the peak flux occurred was retained). After 14 revolutions, all energy channels had been scanned, and the process was repeated for the next sector. A complete scan in energy and sector was repeated every 5.46 min. No data were obtained for the brief periods when the satellite was in the magnetosphere. The instrument operated well until April 1964 when it started operating intermittently. Its operation continued to degrade thereafter. For further details, see J. H. Wolfe et al., J. Geophys. Res., v.71, p. 1319, 1966. NSSDC has all the useful data that now exist.

********** IMP-B**********

SPACECRAFT COMMON NAME- IMP-B
ALTERNATE NAMES- IMP 2, EXPLORER 21
S 74A, 00889

NSSDC ID- 64-060A

LAUNCH DATE- 10/04/64 WEIGHT- 135. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/15/65
ORBIT PERIOD- 2080. MIN INCLINATION- 33.7 DEG
PERIAPSIS- 917. KM ALT APOAPSIS- 94288. KM ALT

PERSONNEL
PM - P. BUTLER(RETIRED) NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 21 (IMP 2) was a solar-cell and chemical-battery powered spacecraft instrumented for interplanetary and distant magnetospheric studies of energetic particles, cosmic rays, magnetic fields, and plasmas. Each normal telemetry sequence of 81.9 s in duration consisted of 795 data bits. After every third normal sequence there was an 81.9-s interval of rubidium vapor magnetometer analog data transmission. Initial spacecraft parameters included a local time of apogee at noon, a spin rate of 14.6 rpm, and a spin direction of 41.4-deg right ascension and 47.4-deg declination. The significant deviation of the spin rate and direction from the planned values and the achievement of an apogee of less than half the planned value adversely affected data usefulness. Otherwise, spacecraft systems performed well, with nearly complete data transmission for the first 4 months and for the sixth month after launch. Data transmission was intermittent for other times, and the final transmission occurred on October 13, 1965.

------- IMP-B, ANDERSON----------

INVESTIGATION NAME- ION CHAMBER AND GM COUNTERS

NSSDC ID- 64-060A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment, designed to measure fluxes of geomagnetically trapped particles, consisted of a 7.6-cm-diameter, Neher-type ionization chamber and two Anton 223 Geiger-Mueller (GM) tubes. The ion chamber responded to electrons and protons with energies greater than 1 and 17 MeV, respectively. Both GM tubes were mounted parallel to the spacecraft spin axis. GM tube A detected electrons greater than 45 keV scattered off a gold foil. The acceptance cone for these electrons had a full-angle of 61 deg, and its axis of symmetry made an angle of 59.5 deg with the spacecraft spin axis. GM tube A responded omnidirectionally to electrons and protons with energies greater than 6 and 52 MeV, respectively. GM tube B looked directly into space through a hole in the spacecraft skin. The acceptance cone for GM tube B had a full-angle of 38 deg, and its axis of symmetry was parallel to the spacecraft spin axis. Omnidirectionally, GM tube B responded to electrons and protons with energies greater than 6 and 52 MeV, respectively. Directionally, GM tube B responded to electrons and protons with energies greater than 40 and 500 keV, respectively. Pulses from the ion chamber were accumulated for 326.08 s and read out once every 327.68 s. Counts from GM tube A were accumulated for 39.36 s and read out six times every 327.68 s. Counts from GM tube B were accumulated for 39.36 s and read out five times every 327.68 s. For further details, see Lin and Anderson, J. Geophys. Res., v. 71, p. 1827, 1966. NSSDC has all the useful data that now exist.

------- IMP-B, BRIDGE----------

INVESTIGATION NAME- FARADAY CUP

NSSDC ID- 64-060A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - H.S. BRIDGE MASS INST OF TECH
OI - J.H. BINSACK MASS INST OF TECH

BRIEF DESCRIPTION
The five-element Faraday cup on Explorer 21 measured electrons between 130 and 265 eV and ions in the following five energy windows: 40 to 90, 95 to 230, 260 to 650, 700 to 2000, and 1700 to 5400 eV. For each 5.46-min interval, 22 usable, instantaneous current samples were recorded for each energy window, separated by 0.16 s each. Two collector plates were used to yield information about the angular variation out of the satellite spin plane. The sum and difference of the currents on the two plates and the direction with maximum current were telemetered. The effect of secondary electrons has not been eliminated and could be very significant within the earth's plasmasphere.

------- IMP-B, NESS-----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 64-060A-C2 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - N.F. NESS NASA-GSFC

BRIEF DESCRIPTION
Each of two uniaxial fluxgate magnetometers, having dynamic ranges of plus or minus 40 nT, sampled the magnetic field 30 times within each of six 4.8-s intervals every 5.46 min. Detector sensitivities were plus or minus 0.25 nT, and digitization uncertainty was plus or minus 0.40 nT. A rubidium vapor magnetometer was used to calibrate the fluxgate magnetometers but did not produce an independently useful data set. The magnetometers functioned normally throughout the useful life of the satellite. For further details, see Fairfield and Ness, J. Geophys. Res., v. 72, p. 2379, 1967. NSSDC has all the data that now exist.

------- IMP-B, SERBU-----------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 64-060A-C1 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - G.P. SERBU NASA-GSFC
OI - E.J. MAIER NASA-GSFC

BRIEF DESCRIPTION
The retarding potential analyzer was a four-element Faraday cup. It was mounted normal to the spacecraft spin axis and had an effective look angle of 5 sr. The experiment operated for 5.2 s in each of four modes once every 646 s. In two modes, 15-step spectra for ions were determined for retarding potentials in the ranges of minus 5 V to plus 15 V and minus 5 V to plus 45 V. In the other two modes, similar information for electrons was obtained by changing the signs of the potentials. The instrument experienced secondary electron contamination but returned essentially continuous data until April 5, 1965. For further details, see G. P. Serbu, J. Geophys. Res., v. 71, p. 3755, 1966. NSSDC has all the data that now exist.

------- IMP-B, SIMPSON-----------

INVESTIGATION NAME- COSMIC-RAY RANGE VS ENERGY LOSS

NSSDC ID- 64-060A-C3 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO
OI - C.Y. FAN U OF ARIZONA
OI - G. GLOECKLER U OF MARYLAND

BRIEF DESCRIPTION
A charged-particle, solid-state telescope was used to measure range and energy loss of galactic and solar cosmic rays. The experiment was designed to study particle energies (energy per nucleon intervals approximately proportional to Z squared/A, for protons 0.9 to 190 MeV, 6.5 to 19 MeV, 19 to 90 MeV, and 90 to 190 MeV) and charge spectra (Z<=6). The detector was oriented normal to the spacecraft spin axis. The detector accumulators for each energy interval were telemetered six times every 5.46 min. Each accumulation period was about 40 s long (initial spacecraft spin period was about 4.1 s). The output from two 128-channel, pulse-height analyzers was obtained for one incident particle every 41 s and read out along with the detector accumulations. Useful data were obtained from launch until April 9, 1965. Data coverage was intermittent throughout the life of the spacecraft due to frequent spacecraft shutoffs and sporadic failure of some detectors. For more details, see Fan et al., J. Geophys. Res., v. 70, p. 3515, 1965, or G. Gloeckler, J. Geophys. Res., v. 70, p. 5333, 1965.

------- IMP-B, WOLFE-----------

INVESTIGATION NAME- SOLAR WIND PROTONS

NSSDC ID- 64-060A-06 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - J.H. WOLFE NASA-ARC

BRIEF DESCRIPTION
A quadrispherical electrostatic analyzer with a current collector and an electrometer amplifier was intended to detect and analyze the positive ion component of the incident plasma and to study its gross flow characteristics. The planned monitoring of the interplanetary medium was not accomplished because the apogee that the satellite achieved was lower than expected. Protons were analyzed in 12 energy channels between 0.7 and 8 KeV. The instrument was mounted on the satellite equatorial plane and had a view angle of 15 deg in this plane and of 90 deg in the plane containing the spin axis. The satellite equatorial plane was divided into three contiguous sectors (61 deg, 95 deg, and 204 deg) by use of an optical aspect sensor. The peak flux in one sector was recorded at one analyzer plate potential per revolution of the satellite (no information as to the position within the sector in which the peak flux occurred was retained). After 12 revolutions, all the energy channels had been scanned, and the process was repeated for the next sector. A complete scan in energy and sector was repeated every 5.46 min. Because the instrument was not capable of observing magnetospheric plasma, no data were obtained for the time when the satellite was in the magnetosphere. The data may be useful in identifying the magnetopause and bow shock. For further details, see J. H. Wolfe et al., "Preliminary results from the Ames Research Center plasma probe observations of the solar wind geomagnetic field region on IMP II and OGO 1," Space Research VI, London, Macmillan & Co. Ltd., 1966. NSSDC has all the useful data that now exist.

********** IMP-C**********

SPACECRAFT COMMON NAME- IMP-C
ALTERNATE NAMES- EXPLORER 28, IMP 3
S 748, 01388

NSSDC ID- 65-042A

LAUNCH DATE- 05/29/65 WEIGHT- 126. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/03/67
ORBIT PERIOD- 8341.9 MIN INCLINATION- 33.6 DEG
PERIAPSIS- 32290. KM ALT APOAPSIS- 227456. KM ALT

PERSONNEL
PM - P. BUTLER(RETIRED) NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 28 (IMP 3) was a solar-cell and chemical-battery powered spacecraft instrumented for interplanetary and distant magnetospheric studies of energetic particles, cosmic rays, magnetic fields, and plasmas. Initial spacecraft parameters included a local time of apogee of 2020 h, a spin rate of 23.7 rpm, and a spin direction of 64.9-deg right ascension and -10.9-deg declination. Each normal telemetry sequence was 81.9 s in duration and consisted of 795 data bits. After every third normal telemetry sequence there was an 81.9-s interval of rubidium vapor magnetometer analog data transmission. Performance was essentially normal until late April 1967, then intermittent until May 12, 1967, after which no further data were acquired.

------- IMP-C, ANDERSON-----------

INVESTIGATION NAME- ION CHAMBER AND GM COUNTERS

NSSDC ID- 65-042A-05 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - G.H. PITT U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment, designed to measure fluxes of geomagnetically trapped particles, consisted of a 7.6-cm-diameter, Neher-type ionization chamber and two Anton 223 Geiger-Mueller (GM) tubes. The ion chamber responded to electrons and protons with energies greater than 1 and 17 MeV, respectively. Both GM tubes were mounted parallel to the spacecraft spin axis. GM tube A detected electrons greater than 45 keV scattered off a gold foil. The acceptance cone for

these electrons had a full-angle of 61 deg, and its spin axis of symmetry made an angle of 59.5 deg with the spacecraft spin axis. GM tube A responded omnidirectionally to electrons and protons with energies greater than 6 and 52 MeV, respectively. GM tube B looked directly into space through a hole in the spacecraft skin. The acceptance cone for GM tube B had a full-angle of 38 deg, and its axis of symmetry was parallel to the spacecraft spin axis. Omnidirectionally, GM tube B responded to electrons and protons with energies greater than 6 and 52 MeV, respectively. Directionally, GM tube B responded to electrons and protons with energies greater than 40 and 500 keV, respectively. Pulses from the ion chamber were accumulated for 326.08 s and read out once every 327.68 s. Counts from GM tube A were accumulated for 39.36 s and read out six times every 327.68 s. Counts from GM tube B were accumulated for 39.36 s and read out five times every 327.68 s. This experiment performed normally from launch through May 11, 1967, the date of the last useful data transmission. NSSDC has all the useful data that now exist.

------- IMP-C, BRIDGE----------

INVESTIGATION NAME- PLASMA, FARADAY CUP

NSSDC ID- 65-042A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - H.S. BRIDGE — MASS INST OF TECH

BRIEF DESCRIPTION
The Faraday cup was a multi-element split collector instrument intended to make differential energy spectrum measurements of interplanetary and magnetospheric ions and electrons. The experiment failed at launch.

------- IMP-C, NESS----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 65-042A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - N.F. NESS — NASA-GSFC

BRIEF DESCRIPTION
Each of two uniaxial fluxgate magnetometers had a dynamic range of plus or minus 40 nT and a sensitivity of plus or minus 0.25 nT. One fluxgate magnetometer failed at launch, but the other performed normally, sampling the magnetic field 30 times within each of six 4.8-s intervals every 5.46 min. Uncertainties in data were plus or minus 1.0 nT. Useful data were transmitted until May 11, 1967. A rubidium vapor magnetometer was included in the experiment package, but it produced no useful data. The instrumentation and analysis were similar to those of Explorers 18 and 21, described in J. Geophys. Res., v. 69, p. 3531, 1964, and in J. Geophys. Res., v. 72, p. 2379, 1967. NSSDC has all the useful data that exist from this investigation. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

------- IMP-C, SERBU----------

INVESTIGATION NAME- RETARDING POTENTIAL ANALYZER

NSSDC ID- 65-042A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - G.P. SERBU — NASA-GSFC

BRIEF DESCRIPTION
The retarding potential analyzer was a four-element Faraday cup. It was mounted normal to the spacecraft spin axis and had an effective look angle of 5 sr. The experiment operated for 5.2 s in each of six modes once every 648 s. In two modes, 15-step spectra for ions were determined for retarding potentials in the ranges -5 V to +5 V and -5 V to +45 V. In two other modes, similar information for electrons was obtained by changing the signs of the potentials. The remaining two modes were net current modes with zero potential applied to all elements for 15 measurements. The instrument experienced secondary electron contamination, but operated without degradation during the spacecraft lifetime. For further details, see G. P. Serbu, "Thermal plasma measurements within the magnetosphere," Space Research VII, 1966. NSSDC has all the useful data that now exist.

------- IMP-C, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY RANGE VS ENERGY LOSS

NSSDC ID- 65-042A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON — U OF CHICAGO
OI - C.Y. FAN — U OF ARIZONA
OI - G. GLOECKLER — U OF MARYLAND

BRIEF DESCRIPTION
A charged-particle, solid-state telescope was used to measure range and energy loss of galactic and solar cosmic rays. The experiment was designed to study particle energies (energy per nucleon intervals approximately proportional to Z squared /A; for protons 2.6 to 190 MeV, 13.3 to 26 MeV, 26 to 94 MeV, and 94 to 190 MeV) and charge spectra (Z<=6). The detector was oriented normal to the spacecraft spin axis. The detector accumulators for each energy interval were telemetered six times every 5.46 min. Each accumulation was about 40 s long (initial spacecraft spin period was about 3.3 s). The output from two 128-channel, pulse-height analyzers was obtained for one incident particle every 41 s and was read out along with the detector accumulators. The experiment performed normally until April 21, 1966, after which several problems with the instrumentation developed, causing spikes in the count rate data, especially in the lowest energy channel. The date of transmission of the last useful information was April 29, 1967.

------- IMP-C, WOLFE----------

INVESTIGATION NAME- SOLAR WIND PROTONS

NSSDC ID- 65-042A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - J.H. WOLFE — NASA-ARC

BRIEF DESCRIPTION
A quadrispherical electrostatic analyzer with a current collector and an electrometer amplifier was intended to detect and analyze the positive ion component of the incident plasma and to study its gross flow characteristics as a function of radial distance from the earth. The instrument failed at launch and thus produced no useful data.

********** IMP-D**********

SPACECRAFT COMMON NAME- IMP-D
ALTERNATE NAMES- EXPLORER 33, AIMP 1
03258, ANCHORED IMP 1

NSSDC ID- 66-058A

LAUNCH DATE- 07/01/66 — WEIGHT- 212. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 07/01/71
ORBIT PERIOD- 38792. MIN — INCLINATION- 24.4 DEG
PERIAPSIS- 265680. KM ALT — APOAPSIS- 480763. KM ALT

PERSONNEL
PM - P.G. MARCOTTE — NASA-GSFC
PS - N.F. NESS — NASA-GSFC

BRIEF DESCRIPTION
Explorer 33 was a spin-stabilized (spin axis parallel to the ecliptic plane, spin period varying between 2.2 and 3.6 s) spacecraft instrumented for studies of interplanetary plasma, energetic charged particles (electrons, protons, and alphas), magnetic fields, and solar X rays at lunar distances. The spacecraft failed to achieve lunar orbit but did achieve mission objectives. The initial apogee occurred at about 1600 h local time. Over the first 3-yr period, perigee varied between 6 and 44 earth radii. Apogee varied between 70 and 135 earth radii, and the inclination with respect to the equator of the earth varied between 7 and 60 deg. Periods of principal data coverage (essentially 100%) are July 1, 1966 (launch), to January 14, 1970; February 21, 1970, to March 6, 1970; July 31, 1970, to September 14, 1970; January 15, 1971, to February 28, 1971; March 23, 1971, to May 31, 1971; and August 23, 1971, to September 15, 1971. No data were obtained after September 21, 1971.

------- IMP-D, ANDERSON-------

INVESTIGATION NAME- ION CHAMBER AND GM COUNTERS

NSSDC ID- 66-058A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment consisted of a 10.2-cm, Neher-type ionization chamber and two Lionel type 205 HT Geiger-Mueller (GM) tubes. The ion chamber responded omnidirectionally to electrons above 0.7 MeV and protons above 12 MeV. Both GM tubes were mounted perpendicular to the spacecraft spin axis. GM tube A detected electrons above 45 keV which were scattered off a gold foil. The acceptance cone for these electrons had a full-angle of 61 deg and axis of symmetry which was perpendicular to the spacecraft spin axis. GM tube B responded to electrons and protons above 22 and 300 keV, respectively, in an acceptance cone of 45-deg full-angle with axis of symmetry perpendicular to the spacecraft spin axis. Both GM tubes responded omnidirectionally to electrons and protons of energies above 2.5 and 35 MeV, respectively. Pulses from the ion chamber and counts from each GM tube were accumulated for 39.72 s and read out every 40.96 s. The time between the first two ion-chamber pulses in an accumulation period was also telemetered. The ion chamber operated normally from launch through September 2, 1966. From September 2, 1966, the ion chamber operated at a lower threshold voltage. For further details, see Lin, Solar Physics, v. 12, p. 266, 1970. NSSDC has all the useful data that now exist.

------- IMP-D, BRIDGE-------

INVESTIGATION NAME- PLASMA PROBE

NSSDC ID- 66-058A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - H.S. BRIDGE MASS INST OF TECH

BRIEF DESCRIPTION
A split-collector Faraday cup mounted on the spacecraft equator was used to study the directional intensity of solar wind ions and electrons. The following 25-s sequence was executed three times for ions and once for electrons each 328 s. Twenty-seven directional current samples from the two collectors were taken in the energy per charge (E/Q) window from 80 to 2850 eV. The currents in the two collectors were then sampled in eight E/Q windows between 50 and 5400 eV at the azimuth at which peak current appeared in the previous 27 measurements. Due to telemetry limitations, only the following data were returned to earth every 328 s: for ions, the sums of currents measured on the two collector plates twice and the difference once, and for electrons, the sums once. The experiment worked well from launch until the final spacecraft data transmission. For further details, see Lyon et al., J. Geophys. Res., v. 72, p. 6113, 1967.

------- IMP-D, NESS-------

INVESTIGATION NAME- GSFC MAGNETOMETER

NSSDC ID- 66-058A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - N.F. NESS NASA-GSFC
OI - K.W. BEHANNON NASA-GSFC

BRIEF DESCRIPTION
The instrumentation for this experiment consisted of a boom-mounted triaxial fluxgate magnetometer. Each of the three sensors had a range of minus to plus 64 nT and a digitization resolution of minus to plus 0.25 nT. Zero-level drift was checked by periodic reorientation of the sensors. Spacecraft fields at the sensors were not greater than the digitization uncertainty. One vector measurement was obtained each 5.12 s. The bandpass of the magnetometer was 0 to 5 Hz, with a 20-dB per decade decrease for higher frequencies. The detector functioned well between launch and October 10, 1968, when the dc power converter failed. No useful data were obtained after that date. For further details, see Behannon, J. Geophys. Res., v. 73, p. 907, 1968. NSSDC has all the useful data that now exist from this investigation. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

------- IMP-D, SERBU-------

INVESTIGATION NAME- LOW-ENERGY INTEGRAL SPECTRUM MEASUREMENT EXPERIMENT

NSSDC ID- 66-058A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL
PI - G.P. SERBU NASA-GSFC
OI - E.J. MAIER NASA-GSFC

BRIEF DESCRIPTION
A wide-aperture, multi-grid potential analyzer was used to observe the intensity of the electron and ion components of the low-energy plasma in interplanetary space and near earth. Integral spectra were obtained for both ions and electrons in the energy ranges from 0 to 45 eV (15 steps) and 0 to 15 eV (15 steps). Complete spectra for protons and electrons were obtained every 80 s. The experiment operated until June 29, 1967. Data no longer exist.

------- IMP-D, SONETT-------

INVESTIGATION NAME- AMES MAGNETIC FIELDS

NSSDC ID- 66-058A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS

PERSONNEL
PI - C.P. SONETT U OF ARIZONA
OI - J.H. WOLFE NASA-ARC
OI - R.B. SILVA TRW SYSTEMS GROUP
OI - W.J. KERWIN NASA-ARC

BRIEF DESCRIPTION
The Ames magnetometer experiment consisted of a boom-mounted triaxial fluxgate magnetometer and an electronics package. The sensors were orthogonally mounted with one sensor oriented along the spin axis of the spacecraft. A motor interchanged a sensor in the spin plane with the sensor along the spin axis every 24 h, allowing inflight zero-level determination. The instrument package included a circuit for spin-demodulating the outputs from the sensors in the spin plane. The noise threshold was about 0.2 nT. The instrument had three ranges covering plus or minus 20, 60, and 200 nT full scale for each vector component. The digitization accuracy for each range was 1% of the entire range covered. The magnetic field vector was measured instantaneously, and the instrument range was changed after each measurement. A period of 2.05 s elapsed between adjacent measurements and 6.14 s between measurements using the same range. For further details, see Mihalov et al., J. Geophys. Res., v. 73, p. 943, 1968. NSSDC has all the useful data that now exist.

------- IMP-D, VAN ALLEN-------

INVESTIGATION NAME- ELECTRON AND PROTON DETECTORS

NSSDC ID- 66-058A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA

BRIEF DESCRIPTION
Three EON type 6213 Geiger-Mueller (GM) tubes (GM1, GM2, and GM3) and a silicon solid-state detector (SSD) provided measurements of solar X rays (Geiger tubes only, between 2 and 12A) and of solar, galactic, and magnetospheric charged particles. The Geiger-Mueller tubes measured electrons of energies greater than 45 to 50 keV and protons of energies greater than 730 to 830 keV. The SSD output was discriminated at four thresholds: (1) PN1, which detected protons between .31 and 10 MeV and alphas between .59 and 225 MeV, (2) PN2, which detected protons between .50 and 4 MeV and alphas between .78 and 98 MeV, (3) PN3, which detected protons between .82 and 1.9 MeV and alphas between 1.13 and 46 MeV, and (4) PN4, which detected alphas between 2.1 and 17 MeV. GM1 and the SSD were oriented parallel to the spin axis, and GM3 was oriented antiparallel to the spin axis. Data from GM1 and PN1 were divided into data from quadrants oriented with respect to the sun (sectors I, II, III, and IV were centered 180, 270, 0 and 90 deg from the sun, respectively). Data were read out in either 82-s or 164-s intervals. High temperatures adversely affected the SSD particle data during the periods from September 16 to January 14 and from March 16 to July 14 of each year following September 16, 1966. However, the alpha particle data are believed to be unaffected. On rare occasions (less than 10), a GM tube would produce a high, spurious count rate for a period of several hours. This effect apparently was produced only during periods of extremely high particle and

X-ray fluxes. Accumulator failures occurred on July 21, 1967, and September 24, 1967. For further details, see Van Allen and Ness, J. Geophys. Res., v. 72, p. 935, 1967.

********** IMP-E **********

SPACECRAFT COMMON NAME- IMP-E
ALTERNATE NAMES- EXPLORER 35, AIMP 2
AIMP-E, 02884

NSSDC ID- 67-070A

LAUNCH DATE- 07/19/67 WEIGHT- 230. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- SELENOCENTRIC EPOCH DATE- 00/00/67
ORBIT PERIOD- 692.3 MIN INCLINATION- 146.3 DEG
PERIAPSIS- 746. KM ALT APOAPSIS- 7744. KM ALT

PERSONNEL
PM - P.G. MARCOTTE NASA-GSFC
PS - N.F. NESS NASA-GSFC

BRIEF DESCRIPTION
Explorer 35 was a spin-stabilized spacecraft instrumented for interplanetary studies, at lunar distances, of the interplanetary plasma, magnetic field, energetic particles, and solar X rays. It was launched into an elliptical lunar orbit. The spin axis direction was nearly perpendicular to the ecliptic plane, and the spin rate was 25.6 rpm. Mission objectives were achieved. After successful operation for 6 years, the spacecraft was turned off on June 24, 1973.

------- IMP-E, ALEXANDER-------

INVESTIGATION NAME- MICROMETEORITE FLUX

NSSDC ID- 67-070A-05 INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL
PI - W.M. ALEXANDER BAYLOR U
OI - J.L. BOHN TEMPLE U

BRIEF DESCRIPTION
This experiment was designed to measure the ionization, momentum, speed, and direction of micrometeorites, using thin film charged detectors, induction devices, and microphones. Data from this investigation no longer exist.

------- IMP-E, ANDERSON-------

INVESTIGATION NAME- ENERGETIC PARTICLE

NSSDC ID- 67-070A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - G.H. PITT U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment consisted of a 12-cm Neher-type ionization chamber and two Lionel type 205 HT Geiger-Mueller (GM) tubes. The ion chamber responded omnidirectionally to electrons above 0.7 MeV and protons above 12 MeV. Both GM tubes were mounted parallel to the spacecraft spin axis. GM tube 1 detected electrons above 45 keV that were scattered off a gold foil. The acceptance cone for these electrons had a 70-deg full-angle and an axis of symmetry that was 20 deg off the spacecraft spin axis. GM tube 2 responded to electrons and protons above 22 and 300 keV, respectively, in an acceptance cone of 70-deg full-angle centered at the spacecraft spin axis. Both GM tubes responded omnidirectionally to electrons and protons of energies above 2.5 and 50 MeV, respectively. Pulses from the ion chamber and counts from each GM tube were accumulated for 39.72 s and read out every 40.96 s. In addition, the time between the first ion chamber pulses in an accumulation period was also telemetered. This experiment performed well initially. For further details, see Anderson, J. Geophys. Res., v. 74, p. 95, 1969. NSSDC has all the useful data that now exist.

------- IMP-E, BRIDGE-------

INVESTIGATION NAME- PLASMA PROBE

NSSDC ID- 67-070A-06 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS

PERSONNEL
PI - H.S. BRIDGE MASS INST OF TECH

BRIEF DESCRIPTION
A multigrid, split-collector Faraday cup mounted on the equator of the spacecraft was used to study the directional intensity of solar wind positive ions and electrons with particular emphasis on the interaction of the solar wind with the moon. Twenty-seven integral current samples (requiring about 4.3 s) were taken in an energy-per-charge window from 80 to 2850 eV. Then the current was sampled in eight differential energy-per-charge windows between 50 and 5000 eV at the azimuth where the peak current appeared in the previous series of integral measurements. These measurements (integral and differential) took about 25 s. Both the sum and difference of collector currents were obtained for positive ions. Only the sum was obtained for electrons. A complete set of measurements (two collector plate sums and one difference for protons, and one collector plate sum for electrons) required 328 s. The experiment worked well from launch until its failure in July 1968. For further details, see Lyon et al., J. Geophys. Res., v. 72, p. 6113, 1967.

------- IMP-E, NESS-------

INVESTIGATION NAME- GSFC MAGNETOMETER

NSSDC ID- 67-070A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - N.F. NESS NASA-GSFC
OI - K.W. BEHANNON NASA-GSFC

BRIEF DESCRIPTION
The experiment consisted of a boom-mounted triaxial fluxgate magnetometer. Each sensor had dual ranges of minus to plus 24 nT and 64 nT, with digitization resolutions of minus to plus 0.094 nT and 0.25 nT, respectively. Zero level drift was checked by periodic reorientation of the sensors until May 20, 1969, when the flipper mechanism failed. Past this point, data analysis was more difficult as the zero level drift of the sensor parallel to the spacecraft spin axis was not readily determined. Spacecraft interference was less than 0.125 nT. One vector measurement was obtained each 5.12 s. The bandpass of the magnetometer was 0 to 5 Hz, with a 20-dB per decade decrease for higher frequencies. Except for the flipper failure, the experiment functioned normally from launch to spacecraft turnoff (June 24, 1973). For further details, see Ness et al., J. Geophys. Res., v. 72, p. 5769, 1969. NSSDC has all the useful data that exist from this investigation. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

------- IMP-E, SERBU-------

INVESTIGATION NAME- LOW-ENERGY INTEGRAL SPECTRUM MEASUREMENT EXPERIMENT

NSSDC ID- 67-070A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL
PI - G.P. SERBU NASA-GSFC
OI - E.J. MAIER NASA-GSFC

BRIEF DESCRIPTION
A planar multi-grid sensor programmed as a retarding potential analyzer was used to observe the intensity of the electron and ion components of the low energy plasma near the moon. Integral spectra were obtained for both ions and electrons in the energy range from 1 to 500 eV. A complete spectrum was obtained every 80 s. Data from this investigation no longer exist.

------- IMP-E, SONETT-------

INVESTIGATION NAME- AMES MAGNETIC FIELDS

NSSDC ID- 67-070A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
PLANETARY MAGNETIC FIELD

PERSONNEL
PI - C.P. SONETT — U OF ARIZONA
OI - J.H. WOLFE — NASA-ARC
OI - R.W. SILVA — TRW SYSTEMS GROUP
OI - W.J. KERWIN — NASA-ARC

BRIEF DESCRIPTION
The Ames magnetometer experiment consisted of a boom-mounted triaxial fluxgate magnetometer and an electronics package. The sensors were orthogonally mounted, with one sensor oriented along the spin axis of the spacecraft. A motor interchanged a sensor in the spin plane with the sensor along the spin axis every 24 h, allowing inflight calibration. The instrument package included a circuit for demodulating the outputs from the sensors in the spin plane. The noise threshold was about 0.2 nT. The instrument had three ranges covering plus or minus 20, 60, and 200 nT full scale for each vector component. The digitization accuracy for each range was 1% of the entire range covered. The magnetic field vector was measured instantaneously, and the instrument range was changed after each measurement. A period of 2.05 s elapsed between adjacent measurements and a period of 6.14 s elapsed between measurements using the same range. The instrument performance was normal. For further details, see Mihalov et al., J. Geophys. Res., v. 73, p. 943, 1968. NSSDC has all the useful data that now exist.

------- IMP-E, VAN ALLEN----------

INVESTIGATION NAME- ELECTRON AND PROTON DETECTORS

NSSDC ID- 67-07CA-C1

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS

PERSONNEL
PI - J.A. VAN ALLEN — U OF IOWA

BRIEF DESCRIPTION
Three EON type 6213 Geiger-Mueller (GM) tubes (GM1, GM2, and GM3) and a silicon solid-state detector (SSD) provided measurements of solar X rays (GM1 only, between 2 and 12 A) and charged particles in the vicinity of the moon. GM1 and GM3 measured electrons of energies greater than 45 to 50 keV and protons of energy greater than 740 to 820 keV, while GM2 was shielded by a cap with approximately 1 gram per sq cm (limiting its response to protons of energies greater than about 55 MeV). The SSD output was discriminated at four thresholds: (1) PN1, which detected protons between .32 and 6.3 MeV, (2) PN2, which detected protons between .48 and 3.0 MeV, (3) PN4, which detected alphas between 2 and 10.2 MeV, and (4) PN3, which was sensitive to particles of Z greater than 3, including carbon 12 between .58 and 9.5 MeV per nucleon, nitrogen 14 between .514 and 13.9 MeV per nucleon, and oxygen 16 between .466 and 18.8 MeV per nucleon. GM1 and SSD were oriented perpendicular to the spacecraft spin axis, GM2 was oriented parallel to the spin axis, and GM3 was oriented antiparallel to the spin axis. Data from GM1, PN1, and PN4 were divided into data from quadrants oriented with respect to the sun (sectors I, II, III, and IV were centered 180, 270, 0, and 90 deg away from the sun, respectively). Data were read out every 82 or 164 s, and the experiment performance was normal. For more details, see Van Allen and Ness, J. Geophys. Res., v. 74, p. 71, 1969, but note the revised SSD energy levels.

********** IMP-F**********

SPACECRAFT COMMON NAME- IMP-F
ALTERNATE NAMES- EXPLORER 34, IMP 4
02817

NSSDC ID- 67-051A

LAUNCH DATE- 05/24/67 — WEIGHT- 163. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES — NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 02/15/69
ORBIT PERIOD- 6218.3 MIN — INCLINATION- 68.5 DEG
PERIAPSIS- 2031. KM ALT — APOAPSIS- 209242. KM ALT

PERSONNEL
PM - P. BUTLER(RETIRED) — NASA-GSFC
PS - F.B. MCDONALD — NASA-GSFC

BRIEF DESCRIPTION
This spacecraft was placed into a high-inclination, highly eccentric earth orbit. The apogee point was located near the ecliptic plane and had an initial local time of about 1900 h. The spacecraft was spin-stabilized and had an initial spin period of 2.6 s. The spin vector was approximately perpendicular to the ecliptic plane. Like the earlier IMPs, this spacecraft was instrumented to study interplanetary magnetic fields, energetic particles, and plasma. The spacecraft optical aspect system failed on March 4, 1969. Otherwise, useful data were acquired until just before spacecraft reentry, which occurred on May 3, 1969.

------- IMP-F, ANDERSON----------

INVESTIGATION NAME- ION CHAMBER

NSSDC ID- 67-051A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K.A. ANDERSON — U OF CALIF, BERKELEY
OI - G.H. PITT — U OF CALIF, BERKELEY

BRIEF DESCRIPTION
The instrumentation for this experiment consisted of a 4-in., Neher-type ionization chamber and two Lionel type 205 HT Geiger-Mueller (GM) tubes. The ion chamber responded omnidirectionally to electrons above 0.7 MeV and protons above 12 MeV. Both GM tubes were mounted parallel to the spacecraft spin axis. GM tube A detected electrons above 45 keV that were scattered from a gold foil. The acceptance cone for these electrons had a 70-deg full-angle and an axis of symmetry that was 20 deg off the spacecraft spin axis. GM tube B responded to electrons and protons above 22 and 300 keV, respectively, in an acceptance cone of 70-deg full-angle centered at the spin direction. Both GM tubes responded omnidirectionally to electrons and protons of energies above 2.5 and 50 MeV, respectively. Pulses from the ion chamber and counts from each GM tube were accumulated for 9.92 s and read out every 16.24 s. The time between the first two ion chamber pulses in an accumulation period was also telemetered. This experiment performed normally from launch through September 8, 1967, when GM tube A failed. On November 5, 1967, GM tube B failed and the experiment was terminated. For further details, see Lin, Solar Physics, v. 12, p. 266, 1970. NSSDC has all the useful data that now exist.

------- IMP-F, BOSTROM----------

INVESTIGATION NAME- SOLAR PROTON MONITORING EXPERIMENT

NSSDC ID- 67-051A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - C.O. BOSTROM — APPLIED PHYSICS LAB
OI - D.J. WILLIAMS — APPLIED PHYSICS LAB
OI - D.E. HAGGE(NLA) — NASA-GSFC
OI - F.B. MCDONALD — NASA-GSFC

BRIEF DESCRIPTION
The solar proton monitoring experiment used four separate detectors, each of which used one or more solid-state sensors. Three detectors measured the omnidirectional fluxes of protons and alpha particles with energy per nucleon values above 10, 30, and 60 MeV. Alpha particle contributions to the total count rates were generally less than 10%. These detectors were also sensitive to electrons above approximately 0.7, 2, and 8 MeV, respectively. The 10-MeV channel was sampled for two 19.2-s intervals every 163.8 s and the 30- and 60-MeV channels for one 19.2-s interval every 163.8 s. Resultant hourly averaged fluxes have been published in Solar-Geophysical Data (NOAA, Boulder) on a rapid basis. The fourth detector had a 60-deg full look angle normal to the spacecraft spin axis and measured fluxes of 1- to 10-MeV protons for two 19.2-s intervals every 163.8 s. Data were obtained from the first three detectors between launch and May 3, 1969. Data from the fourth detector were obtained between launch and June 12, 1968. NSSDC has all the useful data that now exist.

------- IMP-F, BROWN----------

INVESTIGATION NAME- LOW-ENERGY SOLID-STATE TELESCOPE

NSSDC ID- 67-051A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN — BELL TELEPHONE LAB
OI - G.L. MILLER — BELL TELEPHONE LAB
OI - C.S. ROBERTS — BELL TELEPHONE LAB

BRIEF DESCRIPTION
A four-element solid-state telescope with an acceptance cone half-angle of 20 deg was mounted normal to the spacecraft spin axis. During each 2.73-min interval, 9.82-s accumulations were obtained in each of 16 distinct counting modes. These modes involved protons in five energy intervals covering 0.6 to 15 MeV, alpha particles in four intervals covering 1.7 to 80 MeV, and electrons, deuterons, tritons, and helium-3 nuclei in the intervals 0.3 to 3, 5 to 20, 5.5 to 25, and 11 to 72 MeV, respectively. Onboard calibration checks were performed every 6 h. The experiment performed normally from launch to the

spacecraft reentry date, May 3, 1969. For further details, see Lanzerotti, J. Geophys. Res., v. 74, p. 2851, 1969, and references contained therein.

------- IMP-F, HARRISON----------

INVESTIGATION NAME- SPHERICAL ELECTROSTATIC ANALYZER

NSSDC ID- 67-051A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - F.B. HARRISON(NLA) TRW SYSTEMS GROUP

BRIEF DESCRIPTION
This experiment used a spherical electrostatic analyzer with an electron multiplier to study the directional properties, absolute intensity, time variations, and energy spectrum of protons, electrons, and alpha particles in the energy range below 10 keV. At launch, it was questionable whether the door on the experiment had opened. Within a week (and before the question of the door had been resolved), the experiment failed. No useful data were obtained.

------- IMP-F, MCCRACKEN----------

INVESTIGATION NAME- COSMIC-RAY ANISOTROPY

NSSDC ID- 67-051A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
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 was designed to study solar particle anisotropy and its variation with time. A telescope, consisting of three aligned detectors -- (A) solid state, (B) plastic scintillator, and (C) CsI scintillator-- and a plastic scintillator anticoincidence shield (D), were used to measure protons from 0.6 to 7.0 MeV -- counts in (A) but not in (B)-- and from 35 to 110 MeV -- coincident counts in (B), measuring dE/dx, and (C), measuring total energy, but not in (D). Pulse-height analysis yielded six-point spectra within each of these two energy intervals. Protons from 7 to 55 MeV -- counts in (A) and (B)-- were also recorded without spectral information. In addition, a proportional counter provided directional measurements of X rays with energies above 2 keV and electrons above 70 keV. Counts in each particle-counting mode were obtained in each of eight octants in the ecliptic plane. X-ray counts were obtained in the solar octant. A complete set of count rates and spectral data was obtained every 81.9 s. For a more detailed description, see Solar Physics, v. 17, p. 218, 1971.

------- IMP-F, MCDONALD----------

INVESTIGATION NAME- LOW-ENERGY PROTON AND ALPHA DETECTOR

NSSDC ID- 67-051A-09

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - F.B. MCDONALD NASA-GSFC
OI - G.H. LUDWIG NOAA-ERL

BRIEF DESCRIPTION
This experiment used a dE/dx versus E telescope with one thin and two thick surface-barrier, solid-state detectors and an anticoincidence plastic scintillator counter. The two thick detectors acted together as one detector. The telescope axis was perpendicular to the spacecraft spin axis. Counts of particles penetrating the thin detector and stopping in a thick detector were accumulated for two 4.48-s intervals every 2.73 min. The relative contributions to the count rate of protons and alpha particles with energies between 4.2 and 19.1 MeV/nucleon and energy spectral information were determined by 1024-channel pulse-height analysis, which was performed simultaneously on the output of the solid-state detectors eight times every 2.73 min. Protons stopping in the thin detector (and particles penetrating it) were measured by passing the output signal through an eight-level energy threshold discriminator. The eight corresponding proton energies ran from 1.1 to about 4 MeV. Data from any one level were transmitted once every 2.73 min. The anticoincidence scintillator failed in March 1968. This resulted in somewhat higher background count rates, which rendered isotopic (but not charge) separation more difficult. Except as already noted, the experiment performed well from launch until May 3, 1969 (spacecraft reentry date).

------- IMP-F, MCDONALD----------

INVESTIGATION NAME- COSMIC-RAY ENERGY VS ENERGY LOSS

NSSDC ID- 67-051A-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - F.B. MCDONALD NASA-GSFC
OI - G.H. LUDWIG NOAA-ERL

BRIEF DESCRIPTION
This experiment used a dE/dx vs E telescope with thin and thick CsI scintillators (one each) and an anticoincidence plastic scintillation counter. The telescope axis was parallel to the spacecraft spin axis. Counts of particles penetrating the thin CsI scintillator and stopping in the thick CsI scintillator were accumulated for a 4.48-s interval twice every 2.73 min. The relative contribution to the count rate of various species (electrons between 2.7 and 21.5 MeV, nuclei with charge 1 and 2, atomic mass 1, 2, 3, and 4, and energy between 18.7 and 81.6 MeV/nucleon) and energy spectral information were determined by 1024-channel pulse-height analysis performed simultaneously on the output of both CsI scintillators 16 times every 2.73 min. Counts of electrons between 0.3 and 0.9 MeV stopping in the thin scintillator were also obtained once each 2.73 min. Except as noted above, the experiment performed well from launch until May 3, 1969 (spacecraft reentry date).

------- IMP-F, NESS----------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 67-051A-11

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - N.F. NESS NASA-GSFC
OI - D.H. FAIRFIELD NASA-GSFC

BRIEF DESCRIPTION
This experiment used a triaxial fluxgate magnetometer. Each sensor had dual ranges of minus to plus 32 nT and 128 nT and digitization errors of minus to plus 0.16 and 0.64 nT, respectively. The operating range could be changed by ground command. The sensor parallel to the spin axis was on a 1.8-m boom and was flipped every 3.9 d to check the zero level. The other two sensors were on a separate boom. Vector measurements were returned each 2.56 s. An onboard autocorrelation computer was included. Autocorrelation data based on 240 samplings were returned on alternate components each 20.45 s. The experiment worked well throughout the life of the spacecraft. However, failure of the spacecraft optical aspect system on March 4, 1969, rendered impossible the determination of the magnetic field direction over the last 2 months of data acquisition. For further details, see Fairfield, J. Geophys. Res., v. 74, p. 3541, 1969. NSSDC has all the useful data that now exist from this investigation. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

------- IMP-F, OGILVIE----------

INVESTIGATION NAME- ELECTROSTATIC ANALYZER

NSSDC ID- 67-051A-08

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - K.W. OGILVIE NASA-GSFC
OI - T.D. WILKERSON U OF MARYLAND

BRIEF DESCRIPTION
An electrostatic analyzer and an E-cross-B velocity selector normal to the spacecraft spin axis were used to separately determine proton and alpha particle spectra in the solar wind. For each species, measurements in the energy per charge range 310 to 5100 eV were made at 14 points logarithmically equispaced in energy. During individual spacecraft rotations, counts were obtained in each of sixteen 22.5-deg sectors for a given species and energy. The sum of these counts, the sum of the squares of these counts, and the sector number of maximum counting were telemetered to earth. After successive 61.44-s spectral determinations for protons and alpha particles, 15 consecutive readings for protons at 1408 eV were obtained. A period of 3.07 min separated two spectra of the same species. The instrument operated normally until January 30, 1968. At that time, it was turned off as spacecraft apogee had moved into the magnetotail. Later attempts to reactivate the sensor failed. NSSDC has all the

useful data that now exist.

------- IMP-F, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY PROTON (R VS DE/DX)

NSSDC ID- 67-051A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO

BRIEF DESCRIPTION
The experiment was designed to measure separately the contributions of solar nuclei and of galactic nuclei (Z<=14) using a solid-state cosmic ray telescope designed for energy-loss vs range or total energy measurements. The particle energy per nucleon intervals were approximately proportional to Z squared/A. For example, protons had intervals of 0.8 to 9.6 MeV, 9.6 to 18.8 MeV, 29.5 to 94.2 MeV, and 94.2 to 170 MeV and above. The detector viewing angle was perpendicular to the satellite spin axis. A second, smaller, solid-state telescope mounted parallel to the spacecraft spin axis was used to detect electrons in the ranges 80 to 130 keV and 175 to 390 keV. The electron detector was designed to provide information concerning the shape and intensity of the magnetospheric electron spectra. The detector accumulators for each energy interval were telemetered four times every 20.48 s. Each accumulation was 4.8 s long (spacecraft initial spin period was about 2.6 s). The output from three 256-channel nuclear-particle telescope pulse-height analyzers was obtained every 5.12 s and was telemetered along with the detector accumulators. The D3 element of the first telescope began to be intermittently noisy November 16, 1967, necessitating a more complex analysis to maintain data usefulness. After September 1968, no useful data above 30 MeV/nucleon were obtained. Otherwise, this telescope functioned until spacecraft reentry. The electron telescope provided useful data for only the first six days after launch. The instrument and its performance are discussed in detail in Garcia-Munoz, et al., Astrophys. J., v. 184, pp. 967-994, 1973.

------- IMP-F, VAN ALLEN----------

INVESTIGATION NAME- LOW-ENERGY PROTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER (LEPEDEA)

NSSDC ID- 67-051A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN U OF IOWA
OI - L.A. FRANK U OF IOWA

BRIEF DESCRIPTION
This experiment was designed to separately measure low-energy electron and proton intensities inside the magnetosphere and in the interplanetary region. The instrumentation system consisted of a cylindrical electrostatic analyzer (LEPEDEA or low-energy) proton and electron differential energy analyzer) and a Bendix continuous channel multiplier (channeltron) array, and, in addition, an Anton 213 GM tube designed to survey the intensities of electrons with energies >40 keV in the outer magnetosphere. The electrostatic analyzer was capable of measuring the angular distributions and differential energy spectra of proton (25 eV to 47 keV) and electron (33 eV to 57 keV) intensities, separately, within 15 contiguous energy intervals. The analyzer accumulators were read out four times every 20.48 s. Each accumulation was about 480 ms long (spacecraft spin period was initially 2.6 s). A complete scan of the spectrum for four directions in a plane perpendicular to the spacecraft spin axis required 307.2 s for each energy interval. The detector responses for four approximately 60-deg segments of the angular distribution were slaved to the spacecraft telemetry system. The viewing direction of the segments was calculated from the spacecraft optical aspect information. The instruments performed normally from launch until the satellite decayed on May 3, 1969. For further details, see Frank, J. Geophys. Res., v. 75, p. 707, 1970.

********** IMP-G**********

SPACECRAFT COMMON NAME- IMP-G
ALTERNATE NAMES- PL-691K, IMP 5
EXPLORER 41, 03990

NSSDC ID- 69-053A

LAUNCH DATE- 06/21/69 WEIGHT- 175. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/16/71
ORBIT PERIOD- 4840.9 MIN INCLINATION- 65.1 DEG
PERIAPSIS- 3920. KM ALT APOAPSIS- 172912. KM ALT

PERSONNEL
PM - P. BUTLER(RETIRED) NASA-GSFC
PS - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
Explorer 41 (IMP-G) was a spin-stabilized spacecraft placed into a high-inclination, highly elliptic orbit to measure energetic particles, magnetic fields, and plasma in cislunar space. The line of apsides and the satellite spin vector were within a few degrees of being parallel and normal, respectively, to the ecliptic plane. Initial local time of apogee was about 1300 h. Initial satellite spin rate was 27.5 rpm. The basic telemetry sequence was 20.48 s. The spacecraft functioned very well from launch until it decayed from orbit on December 23, 1972. Data transmission was nearly 100% for the spacecraft life except for the interval from November 15, 1971, to February 1, 1972, when data acquisition was limited to the vicinity of the magnetotail neutral sheet.

------- IMP-G, ANDERSON----------

INVESTIGATION NAME- ION CHAMBER

NSSDC ID- 69-053A-02 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - G.H. PITT U OF CALIF, BERKELEY
OI - R.P. LIN U OF CALIF, BERKELEY

BRIEF DESCRIPTION
This experiment was designed to measure energetic charged particle populations in and beyond the earth's outer magnetosphere and the dynamic processes that influence these populations. The instrumentation consisted of a 4-in-diameter Neher-type integrating ionization chamber and three pairs of GM tubes. The ionization chamber responded omnidirectionally to electrons above 700 keV, protons above 12 MeV, and X rays above 20 keV. Each pair of GM tubes had one member normal to, and the other parallel to, the spacecraft spin axis. All but one tube had 70-deg full-width acceptance cones. The members of one pair of GM tubes responded to electrons above 80 keV and protons above 1.5 MeV. The second pair of GM tubes responded to electrons above 45 keV scattered from gold foils. The third tube, normal to the spin axis, responded to electrons above 1.3 keV, protons above 2.3 MeV, and X rays from 3 to 20 keV (0.1% efficiency). The other member of the third set of GM tubes responded to electrons above 18 keV and protons above 250 keV. Pulses from the ionization chamber and counts from each of the GM tubes were accumulated for 9.92 s and read out four times each 40.96 s. The experiment performed normally from launch until the spacecraft decayed from orbit on December 23, 1972, except that the ionization chamber operated intermittently throughout the mission. NSSDC has all the useful data that now exist.

------- IMP-G, BOSTROM----------

INVESTIGATION NAME- SOLAR PROTON MONITORING EXPERIMENT

NSSDC ID- 69-053A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - C.O. BOSTROM APPLIED PHYSICS LAB
OI - D.J. WILLIAMS APPLIED PHYSICS LAB
OI - D.E. HAGGE(NLA) NASA-GSFC
OI - F.B. MCDONALD NASA-GSFC

BRIEF DESCRIPTION
The solar proton monitoring experiment utilized four separate detectors, each of which used one or more solid-state sensors. Three detectors measured the omnidirectional fluxes of protons and alpha particles with energy per nucleon values above 10, 30, and 60 MeV. Alpha particle contributions to the total count rates were generally less than 10%. These detectors were also sensitive to electrons above approximately 0.7, 2.0, and 8.0 MeV, respectively. The 10-MeV channel was sampled for two 19.2-s intervals every 163.8 s and the 30- and 60-MeV channels for one 19.2-s interval every 163.8 s. Resultant hourly averaged fluxes have been published in Solar-Geophysical Data (NOAA, Boulder) on a rapid basis. The fourth detector had a 60-deg full look angle normal to the spacecraft spin axis. Each of two discrimination levels was sampled for two 19.2-s intervals every 163.8 s. Fluxes of 1- to 10-MeV/nucleon protons and alpha particles were measured in the lower and upper discrimination states, respectively. All detectors functioned normally from launch until the spacecraft

decayed from orbit (from June 21, 1969, to December 23, 1972). NSSDC has all the useful data that now exist.

-------- IMP-G, BROWN----------

INVESTIGATION NAME- LOW-ENERGY SOLID-STATE TELESCOPE

NSSDC ID- 69-053A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - W.L.	BROWN	BELL TELEPHONE LAB
CI - C.S.	ROBERTS	BELL TELEPHONE LAB
CI - G.L.	MILLER	BELL TELEPHONE LAB

BRIEF DESCRIPTION

In this experiment, a four-element solid-state telescope with an acceptance cone half angle of 20 deg was mounted normal to the spacecraft spin axis. During each 2.73-min interval, 9.82-s accumulations were obtained in each of 16 distinct counting modes. These modes involved protons in ten energy intervals covering 0.5 to 20 MeV, alpha particles in six intervals covering 4 to 70 MeV, and electrons, deuterons, tritons, and helium-3 nuclei in the intervals 0.3 to 3, 5 to 20, 5.5 to 25, and [illegible] to 72 MeV, respectively. Onboard calibration checks were performed every 6 h. The experiment performed normally until January 30, 1970, when a GSFC power supply failure limited the useful data gathered to protons between 0.5 and 5 MeV, alpha particles between 4 and 18 MeV, and electrons between 0.3 and 3 MeV. No further experiment degradation occurred until the spacecraft decayed from orbit on December 23, 1972. This instrument was essentially the same as that flown by the Bell Lab group on Explorer 34, and is described further in J. Geophys. Res., v. 74, p. 2851, 1969, by Lanzerotti and the references contained therein.

-------- IMP-G, LIN----------

INVESTIGATION NAME- CHANNELTRON ELECTRON DETECTOR

NSSDC ID- 69-053A-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.P.	LIN	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

The instrumentation for this experiment consisted of a parallel-plate electric-field analyzer and two funnel-shaped channel multipliers. The parallel-plate analyzer was used as a discriminatory device. One of the channel multipliers responded to electrons with energies between 2.8 and 7.5 keV, and the other responded to electrons with energies between 7.5 and 12.5 keV. The acceptance cones for the channel multipliers had full-angles of approximately 30 deg with axes of symmetry 60 deg off the spacecraft spin axis. Due to high background count rates, only data of low quality were obtained. Useful data no longer exist.

-------- IMP-G, MCDONALD----------

INVESTIGATION NAME- LOW-ENERGY PROTON AND ALPHA DETECTOR

NSSDC ID- 69-053A-09

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA-GSFC
CI - G.H.	LUDWIG	NOAA-ERL

BRIEF DESCRIPTION

This experiment used a dE/dx vs E telescope with one thin and two thick surface-barrier, solid-state detectors and an anticoincidence plastic scintillator counter. The two thick detectors acted together as one detector. The telescope axis was perpendicular to the spacecraft spin axis. Counts of particles penetrating the thin detector and stopping in a thick detector were accumulated for a 4.48-s interval once each 2.73 min for each of two counting modes (counting modes are defined with respect to the energy deposited in the thin dE/dx detector). Good separation of protons and alpha particles was achieved by this mode distinction. The relative contribution to each count rate of protons and alpha particles with energies between 4.2 and 19.1 MeV/nucleon and energy spectral information were determined by 1024-channel pulse-height analysis performed simultaneously on the output of the solid-state detectors four times every 2.73 min for each of the two threshold modes. Protons stopping in the thin detector (and particles penetrating it) were measured by passing the output signal through an eight-level energy threshold discriminator. The eight corresponding proton energies ran from 0.6 to about 4 MeV. Data from any one level were transmitted once every 2.73 min. There were also two solid-state detectors that looked along the spacecraft spin axis and that were identical except for differences in the covering foil thicknesses. Both detectors responded to electrons in the 80-to 280-keV range. One responded to protons between 83 keV and 2 MeV and the other to protons between 200 keV and 2 MeV. Spectral information was gathered by subjecting the output signals from each detector to eight-level energy threshold discrimination. Data from each of the eight levels and each of the two detectors were transmitted once each 5.46 min. Except for a 2-week period in March 1970 when the telescope data were noisy, all the detectors functioned normally.

-------- IMP-G, MCDONALD----------

INVESTIGATION NAME- COSMIC-RAY ENERGY VS ENERGY LOSS

NSSDC ID- 69-053A-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - F.B.	MCDONALD	NASA-GSFC
CI - G.H.	LUDWIG	NOAA-ERL

BRIEF DESCRIPTION

This experiment used a dE/dx vs E telescope with thin and thick CsI scintillators (one each) and an anticoincidence plastic scintillation counter. The telescope axis was parallel to the spacecraft spin axis. Counts of particles penetrating the thin CsI scintillator and stopping in the thick CsI scintillator were accumulated for two 4.48-s intervals each 2.73 min. The relative contribution to the count rate of various species (electrons between 2.7 and 21.5 MeV, nuclei with charge = 1 or 2, atomic mass = 1, 2, 3, or 4, and energy between 18.7 and 81.6 MeV/nucleon) and energy spectral information were determined by 1024-channel pulse-height analysis performed simultaneously on the output of both CsI scintillators 16 times every 2.73 min. In addition, counts of electrons between 0.3 and 0.9 MeV stopping in the thin scintillator were also obtained once each 2.73 min. The experiment functioned well.

-------- IMP-G, NESS----------

INVESTIGATION NAME- TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 69-053A-11

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
CI - D.H.	FAIRFIELD	NASA-GSFC

BRIEF DESCRIPTION

A boom-mounted triaxial fluxgate magnetometer measured magnetic fields in the interplanetary medium, in the magnetosheath, and in the geomagnetic tail. The magnetometer had dynamic ranges of plus or minus 40 nT and plus or minus 200 nT with respective sensitivities of plus or minus 0.2 nT and plus or minus 1.0 nT. Automatic onboard range selection was included. Measurement of the energy spectra of magnetic field fluctuations was accomplished through a computation of the autocorrelation function in an onboard digital processor. The experiment functioned normally from launch until the spacecraft decayed from orbit (June 21, 1969 to December 23, 1972). NSSDC has all the useful data that exist from this investigation. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

-------- IMP-G, OGILVIE----------

INVESTIGATION NAME- ELECTROSTATIC ANALYZER

NSSDC ID- 69-053A-08

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - K.W.	OGILVIE	NASA-GSFC
CI - T.D.	WILKERSON	U OF MARYLAND

BRIEF DESCRIPTION

An electrostatic analyzer and an E-cross-B velocity selector normal to the spacecraft spin axis were used to separately determine proton and alpha particle spectra in the solar wind. For each species, measurements in the energy per charge range 310 to 8100 eV were made at 14 points logarithmically equispaced in energy. During individual spacecraft rotations, counts were obtained in each of sixteen 22.5-deg sectors for a given species and energy. The sum of these counts, the sum of the squares of these counts, and the sector number of maximum counting were telemetered to earth. After successive 61.44-s spectral determinations for protons

and alpha particles, 15 consecutive readings for protons at 1408 eV were obtained. A period of 3.07 min separated two spectra of the same species. The instrument operated intermittently. Data no longer exist and were not considered useful.

------- IMP-G, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY PROTON (R VS DE/DX)

NSSDC ID- 69-053A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON — U OF CHICAGO

BRIEF DESCRIPTION
This experiment was designed to measure separately the contributions of solar nuclei and galactic nuclei (Z<14) using a combination solid-state and Cerenkov counter cosmic ray telescope. The detector was designed for energy loss vs range or total energy measurements for protons (differential measurements between 0.8 to 119 MeV and an integral measurement between 119 MeV and 1 GeV). Similar differential energy measurements of He and higher Z nuclei were made between 3 MeV/nucleon and 1 GeV/nucleon. The detector was oriented perpendicular to the satellite spin axis. The detector accumulators were telemetered four times every 20.48 s. Each accumulation was 4.8 s long (spacecraft initial spin period was about 2.2 s). The output from the three 256-channel pulse-height analyzers was obtained every 5.12 s and was telemetered along with the detector accumulators. The instrument and its performance are discussed in detail in Garcia-Munoz et al., Astrophys. J., v. 184, pp. 967-994, 1973. The D3 element of the telescope became noisy on September 29, 1969, and the condition continued until the spacecraft emerged from first shadow on January 5, 1970. Otherwise the experiment performed normally until the spacecraft decayed from orbit on December 23, 1972.

------- IMP-G, VAN ALLEN----------

INVESTIGATION NAME- LOW-ENERGY PROTON AND ELECTRON DIFFERENTIAL ENERGY ANALYZER (LEPEDEA)

NSSDC ID- 69-053A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN — U OF IOWA
OI - L.A. FRANK — U OF IOWA

BRIEF DESCRIPTION
This experiment, which was similar to the University of Iowa experiment on Explorer 34, was designed to measure separately low-energy electron and proton intensities inside the magnetosphere and in the interplanetary region. The detector system consisted of a cylindrical electrostatic analyzer (LEPEDEA detector) and Bendix continuous channel multiplier (channeltron) array, and an Anton 213 GM tube designed to survey the intensities of electrons with E>40 keV in the outer magnetosphere. The electrostatic analyzer was capable of measuring the angular distributions and differential energy spectra of proton and electron intensities, separately, within 15 contiguous energy intervals over the energy ranges 25 eV to 47 keV and 33 eV to 57 keV. The analyzer accumulators were read out four times every 20.48 s. Each accumulation was about 480 ms long (spacecraft spin period was initially 2.2 s). A complete scan of the spectrum for four directions in a plane perpendicular to the spacecraft spin axis required 307.2 s. For each energy interval, the detector response for four approximately 60-deg swaths of the angular distribution was telemetered. The instruments performed normally until the spacecraft decayed from orbit on December 23, 1972.

********** IMP-H**********

SPACECRAFT COMMON NAME- IMP-H
ALTERNATE NAMES- PL-713A, EXPLORER 47
IMP 7, 06197

NSSDC ID- 72-073A

LAUNCH DATE- 09/23/72 — WEIGHT- 390. 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- 09/25/72
ORBIT PERIOD- 17702. MIN — INCLINATION- 17.2 DEG
PERIAPSIS- 201599. KM ALT — APOAPSIS- 235639. KM ALT

PERSONNEL
PM - W.R. LIMBERIS(NLA) — NASA-GSFC
PS - J.H. KING — NASA-GSFC
PS - F.B. MCDONALD — NASA-GSFC

BRIEF DESCRIPTION
IMP-H continued the study begun by earlier IMP spacecraft of the interplanetary and magnetotail regions from a nearly circular orbit, near 37 earth radii. This 16-sided drum-shaped spacecraft was 157 cm high and 135 cm in diameter. It was designed to measure energetic particles, plasma, and electric and magnetic fields. The spin axis was normal to the ecliptic plane, and the spin period was 1.3 s. The spacecraft was powered by solar cells and a chemical battery. Scientific data were telemetered at 1600 bps (with a secondary 400-bps rate available). The spacecraft was turned off on October 31, 1978.

------- IMP-H, BAME----------

INVESTIGATION NAME- SOLAR PLASMA ELECTROSTATIC ANALYZER

NSSDC ID- 72-073A-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

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

BRIEF DESCRIPTION
A hemispherical electrostatic analyzer was used to study 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 2 keV (30% spacing, 15% 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-H, BRIDGE----------

INVESTIGATION NAME- SOLAR PLASMA FARADAY CUP

NSSDC ID- 72-073A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
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
CI - E.F. LYON — MASS INST OF TECH

BRIEF DESCRIPTION
A modulated split-collector Faraday cup, which was 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 measured in eight logarithmically equispaced channels between 17 eV and 7 keV. Positive ions were measured 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-H, CLINE----------

INVESTIGATION NAME- STUDY OF COSMIC-RAY, SOLAR, AND MAGNETOSPHERIC ELECTRONS

NSSDC ID- 72-073A-13

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
COSMIC RAYS
PARTICLES AND FIELDS
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - T.L. CLINE NASA-GSFC

BRIEF DESCRIPTION
This experiment studied galactic and solar electrons and positrons in the kinetic energy range 50 keV to 2 MeV. Information on protons between 0.5 and 4.0 MeV was also obtained. A collimated stilbene crystal scintillator looking perpendicular to the spacecraft spin axis served as the principal detector. A similar fully shielded crystal served to determine the contribution to the principal detector count rate of electrons and protons generated within the principal detector by gamma rays and neutrons, respectively. A fully shielded CsI crystal served as a gamma-ray spectrometer and was used in coincidence with the principal detector to distinguish electrons from positrons. Count rates from each detector obtained in eight angular sectors per revolution were telemetered. In addition, the amplitude and shape of the pulse generated in the principal detector by the first stopping particle in each appropriate telemetry frame was studied. Pulse amplitude and shape yielded energy (10% resolution) and particle species information.

------- IMP-H, FRANK----------

INVESTIGATION NAME- MEASUREMENT OF LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 72-073A-04 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - L.A. FRANK U OF IOWA

BRIEF DESCRIPTION
This experiment measured the energy spectra of low-energy electrons and protons in the geocentric range 30 to 40 earth radii to further understand 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 in four directions perpendicular to the spacecraft spin axis. The detector was 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) one providing good temporal resolution in which the entire energy range in four directions was measured every 68 s. For further details, see Frank, L. A. et al., J. Geophys. Res., v. 82, p. 129, 1977.

------- IMP-H, GLOECKLER----------

INVESTIGATION NAME- IONS AND ELECTRONS IN THE ENERGY RANGE 0.1 TO 2 MEV

NSSDC ID- 72-073A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
INTERPLANETARY PHYSICS
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 associated with solar activity and interplanetary processes. The detectors used were (1) an electrostatic analyzer (to select particles of the designated energy per charge) combined with an array of windowless solid-state detectors (to measure the energy loss) and surrounded by an anticoincicerce shieldirg, and (2) a particle telescope consisting of a silicon surface-barrier detector and a flat two-chamber proportional counter enclosed in an anticoincidence scintillator cup. The experiment measured particle energies from 0.1 to 2 MeV per charge in 12 bands and uniquely identified positrons and electrons as well as nuclei with charges of Z from 1 to 8 (and charge group resolution for Z between 9 and 28). Two 1000-channel pulse-height analyzers, one for each element of the telescope, were included in the experiment payload. The telescope failed on November 25, 1972, when the window on the proportional counter weakened and burst due to exposure to UV radiation.

------- IMP-H, KRIMIGIS----------

INVESTIGATION NAME- CHARGED PARTICLE MEASUREMENTS EXPERIMENT

NSSDC ID- 72-073A-08 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

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 atomic numbers 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 particles per (sq cm s sr). Particles and X rays (primarily of solar origin) were studied, but the dynamic range and resolution of the instrument permitted cosmic rays and magnetotail particles to be observed. Additional data can be obtained from the PI. For further details, see Armstrong, T. F. and S. M. Krimigis, J. Geophys. Res., v. 81, p. 677, 1976.

------- IMP-H, NESS----------

INVESTIGATION NAME- MAGNETIC FIELDS EXPERIMENT

NSSDC ID- 72-073A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY 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; plus or minus 12, plus or minus 36, and plus or minus 108 nT. With the aid of a bit compaction scheme (delta modulation), 25 vector measurements were made and telemetered per second. Full-word vectors were telemetered with 320-ms resolution. The instrument functioned normally from turn-on (September 23, 1972) to December 28, 1972, when the flipper mechanism failed. This rendered somewhat more difficult the determination of zero-level drift in the spin-axis sensor. The instrument continued in this state until April 4, 1973, when instrument malfunction caused a series of spacecraft under-voltage turnoffs. Data were not obtained after this time. Hourly averaged interplanetary data also exist as part of data sets in the NSSDC supplementary data file. Additional data are presently being retained by the PI.

------- IMP-H, OGILVIE----------

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 72-073A-12 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL
PI - K.W. OGILVIE NASA-GSFC

BRIEF DESCRIPTION
An electrostatic analyzer and Wien-type velocity selector were used to gain exploratory data on heavy ion composition in the solar wind. The bulk velocities of 4 He++, 4 He+, 3 He++, and C (isotopes indistinguishable) ions in all ionization states were separately studied. During 30 successive spacecraft spin periods, ions of a given species were studied in 30 logarithmically equispaced bulk velocity channels from 200 to 600 km/s. A complete set of measurements required about 10 min and consisted of 30 one-step sequences for 4 He++ ions and five 30-step sequences for each of the three other species. This was an experimental detector, and the data were considered not useful.

------- IMP-H, SCARF----------

INVESTIGATION NAME- PLASMA WAVE

NSSDC ID- 72-073A-11

INVESTIGATIVE PROGRAM
CODE EE-H, SCIENCE

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

PERSONNEL

PI - F.L.	SCARF	TRW SYSTEMS GROUP
CI - G.M.	CROOK	GAINES M. CROOK ASSOC
CI - L.M.	GREEN	TRW SYSTEMS GROUP
CI - R.W.	FREDERICKS	TRW SYSTEMS GROUP

BRIEF DESCRIPTION

Electric field components perpendicular to the spacecraft spin axis and the magnetic field component parallel to that axis were measured by an electric dipole antenna and a search coil magnetometer. Both sensors were mounted on a 3.05-m boom. Data were obtained in eight frequency channels from 10 Hz to 100 kHz in either the normal mode or the snapshot mode. Two channels, centered at 67 and 600 Hz, had 10-dB fall-off points of 17 and 150 Hz, and 270 and 810 Hz, respectively. The remaining six channels were narrow-bandwidth channels centered at 1.5, 2.3, 5.4, 10.5, 30, and 70 kHz. In the normal mode, the antenna was first sampled in a given frequency channel many times during a given measurement period (comparable to the spacecraft spin period). During the next period, the search coil was sampled many times in the same frequency channel. Next, the antenna was sampled in the next frequency channel, followed by the search coil in that channel. The frequency channels were incremented, and the sampled sensors were alternated until a full set of data was obtained in 16 measurement periods (approximately 20 s). In the snapshot mode, only electric field data were transmitted, as follows. The antenna was first sampled in a given frequency channel many times during a given measurement period. In the next period, the antenna was sampled in two sequences of eight frequency channels. This two-period measurement was executed eight times, each time incrementing the frequency channel studied in every other period by one. Thus, a full set of data again required 16 measurement periods. In addition, an analog mode, sampling the antenna and search coil from 10 to 100 Hz, was used in conjunction with the special purpose analog telemetry test that was to be conducted. Unfortunately, this telemetry system did not work well, and no usable data were obtained in this mode of operation. For the digital modes, some interference was experienced from the asymmetric plasma sheath associated with the solar cell arrays. This interference limited the sensitivity of the magnetic field measurements and introduced complexity into analysis of the electric field measurements. Data from IMP-I are recommended by the PI to be used whenever possible.

------- IMP-H, SIMPSON----------

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

NSSDC ID- 72-073A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - J.A.	SIMPSON	U OF CHICAGO
CI - 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 colinear elements (three solid state, one CsI, and one Cerenkov sapphire) 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 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-H, STONE----------

INVESTIGATION NAME- ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES

NSSDC ID- 72-073A-06

INVESTIGATIVE PROGRAM
CODE EE-H, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

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

BRIEF DESCRIPTION

This experiment was designed to measure solar and galactic electrons, positrons, and nuclei, and to separate isotopes from hydrogen through oxygen. The energy ranges covered were 0.16 to 5 MeV (electrons), 0.16 to 2 MeV (positrons), and about 1 to 40 MeV/nucleon for nuclei. The instrument was a telescope consisting of 11 colinear, fully depleted, silicon surface-barrier detectors inside a plastic scintillator anticoincidence shield. Four of the top five sensors were annular while the remainder were solid disks. This arrangement gave narrow geometry (anticoincidence in annular sensors) and wide geometry modes with half-angle acceptance cones of about 24 and 36 deg. The telescope axis was perpendicular to the spacecraft spin axis. Data returned consisted of 8-sectored and spin-integrated count rates for 8 different coincidence/anticoincidence modes and 2 parameter pulse-height analyses for 32 particles every 20.48 s. The coincidence mode chosen for pulse-height analysis in any 0.64 s interval was fixed by a five-level priority system. The principal contributors to each coincidence mode rate were (1) 0.16- to 5-MeV electrons and 1- to 43-MeV/nucleon nuclei, (2) 1- to 5-MeV electrons and 13- to 43-MeV/nucleon nuclei, (3) neutrals and gamma rays, (4) 0.2- to 1-MeV electrons, (5) 1- to 3-MeV electrons, (6) 1.2- to 2.4-MeV/nucleon nuclei, (7) 4- to 13-MeV/nucleon nuclei, and (8) electrons above 3 MeV and nuclei above 30 MeV/nucleon. Additional data can be obtained from the PI.

------- IMP-H, WILLIAMS----------

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 72-073A-05

INVESTIGATIVE PROGRAM
CODE EE-H, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - D.J.	WILLIAMS	APPLIED PHYSICS LAB
CI - C.O.	BOSTROM	APPLIED PHYSICS LAB
CI - 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 sidemounted detectors were used to measure the deflected electrons. The experiment was designed to measure: (1) proton fluxes from 30 keV to >8.6 MeV in six ranges; (2) electron fluxes from 30 keV to >450 keV in three ranges; (3) charged particles with E>15 keV; (4) alpha particles >0.5 MeV, >1.6 MeV, 2.2 to 6.6 MeV, and 6.6 to 35 MeV; and (5) charged particles of Z>2 and E>5 MeV. A description of the instrument is given by D. J. Williams in NOAA Technical Report ERL 393-SEL 40, October 1977.

********** IMP-I**********

SPACECRAFT COMMON NAME- IMP-I
ALTERNATE NAMES- EXPLORER 43, IMP G
05043

NSSDC ID- 71-019A

LAUNCH DATE- 03/13/71 WEIGHT- 635. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-GSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/14/71
ORBIT PERIOD- 5626. MIN INCLINATION- 28.7 DEG
PERIAPSIS- 242. KM ALT APOAPSIS- 196574. KM ALT

PERSONNEL

PP - F.	BUTLER(RETIRED)	NASA-GSFC
PS - F.B.	MCDONALD	NASA-GSFC

BRIEF DESCRIPTION

IMP-I continued the study, begun by earlier IMPs, of the interplanetary and outer magnetospheric regions by measuring energetic particles, plasma, and electric and magnetic fields. A radio astronomy experiment was also included in the spacecraft payload. The 16-sided spacecraft was 182.12 cm high by 135.64 cm in diameter. The spacecraft spin axis was normal to the ecliptic plane, and its spin rate was 5 rpm. The initial apogee point lay near the earth-sun line. The solar-cell and chemical-battery powered spacecraft carried two transmitters. One continuously transmitted PCM encoder data at a 1600-bps information bit rate. The second transmitter was used for transmission of VLF data and for ranging information. Three orthogonal pairs of dipole antennas were used for the electric fields experiments, and one of these pairs was also used for the radio astronomy experiment. The members of the antenna pair along the spacecraft spin axis extended 2.9 m, the members of the pair used in both the electric field and radio astronomy experiments extended 45.5 m, and the members of the third pair were slightly unbalanced, extending 29.4 and 27.6 m, respectively. All four elements perpendicular to the spin axis were to have extended 45.5 m. The spacecraft reentered the earth's atmosphere October 2, 1974, after a highly successful mission.

-------- IMP-I, AGGSON----------

INVESTIGATION NAME- ELECTROSTATIC FIELDS

NSSDC ID- 71-019A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

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

BRIEF DESCRIPTION

Two dipole antennas were mounted orthogonally in the spin plane of the spacecraft while a third dipole antenna was mounted along the spacecraft spin axis. Antenna element lengths were -X, 27.6 m; +X, 29.4 m; -Y and +Y, 45.5 m; -Z and +Z (spin axis), 2.9 m. Electrometers measured the analog potential difference between the elements in each pair of antennas simultaneously every 5.12 s. The potential differences were sampled digitally through a 14-bit analog/digital converter every 0.64 s. The dc sensitivity was 100 microvolts per meter.

-------- IMP-I, ANDERSON----------

INVESTIGATION NAME- MEDIUM-ENERGY SOLAR PROTONS AND ELECTRONS

NSSDC ID- 71-019A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
COSMIC RAYS

PERSONNEL

PI - K.A. ANDERSON		U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This experiment, which was used to study the acceleration of electrons at the sun and their ejection into interplanetary space, consisted of four detectors. Two of these were GM tubes with viewing directions of 120 deg with respect to the spacecraft spin axis. One tube responded to electrons with energies greater than 20 keV that were backscattered off a gold foil. The 20-keV electron data were accumulated and read out every 10.24 s. The other GM tube directly observed electrons and protons with energies greater than 18 and 250 keV, respectively. This type of data was accumulated and read out every 5.12 s. The third detector, a telescope consisting of three semiconductors, had a viewing direction of 120 deg with respect to the spacecraft spin axis. This detector responded to electrons and protons in the energy intervals 18 to 450 keV and 0.04 to 2 MeV, respectively. Electron data from this detector were accumulated in four contiguous logarithmically equispaced energy channels for 5.12 s and read out at the end of each time interval. In addition, a 64-channel, pulse-height analysis was performed on the detector counts, and this information was telemetered every 163.84 s. Proton data from this detector was accumulated and read out every 20.48 s. The fourth detector consisted of two semiconductors with a viewing direction perpendicular to the spacecraft spin axis. This detector responded to electrons with energies between 47 and 350 keV that were backscattered off a gold foil. Counts of 47- to 350-keV electrons and 80- to 350-keV electrons were accumulated in each of 16 arc 4 equiangular sectors, respectively, during successive 20.48-s intervals, and they were read out at the end of each interval. The experiment functioned normally. NSSDC has all of the available data.

-------- IMP-I, HAME----------

INVESTIGATION NAME- MEASUREMENT OF SOLAR PLASMA

NSSDC ID- 71-019A-11

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

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

BRIEF DESCRIPTION

A hemispherical electrostatic analyzer was used to extend descriptions of the particle (electron and positive ion) populations in the solar wind, magnetosheath, and magnetotail. Energy spectral analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. The analyzer had four commandable modes. The first mode was designed for the measurement of solar wind protons and alpha particles. During eight spacecraft revolutions, 32-level energy spectra were obtained in eight angular ranges centered on the sun. The energy levels extended from 100 eV to 8 keV. The second mode was designed for the measurement of solar wind heavy ions. This cycle was the same as the first except that the energy per charge levels were limited to 900 eV to 8 keV, and the efficiency of counting heavy ions was increased relative to protons and alpha particles. The third mode was designed for the measurement of solar wind and magnetosheath electrons and magnetosheath positive ions. This was a combination cycle in which electron and positive ion spectral sweeps were alternated. During a cycle of nine spacecraft revolutions, eight electron spectra and eight positive ion spectra were obtained. The combined data for electrons in this mode consisted of 16-level energy spectra taken in 32 evenly spaced angular ranges. The spectra extended from 4 to 1000 eV. The data for positive ions consisted of 32-level spectra taken in the same 32 angular ranges. The energy per charge spectra extended from 100 eV to 8 keV. The fourth mode was designed for magnetotail electrons and positive ions. Electrons and positive ions were studied with 16-level spectra in 32 evenly-spaced angular ranges for both electrons and positive ions. The energy per charge ranges were 6 eV to 24 keV for electrons and 45 eV to 34 keV for positive ions.

-------- IMP-I, BOSTROM----------

INVESTIGATION NAME- SOLAR PROTON MONITORING EXPERIMENT

NSSDC ID- 71-019A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - C.C. BOSTROM		APPLIED PHYSICS LAB
OI - D.J. WILLIAMS		APPLIED PHYSICS LAB
OI - D.S. BEALL		APPLIED PHYSICS LAB

BRIEF DESCRIPTION

The solar proton monitoring experiment consisted of five separate detectors, each using one or more solid-state detector elements. Three detectors, each with a 2-pi-sr field of view and a 5.12-s accumulation time, measured protons with energies greater than 10, 30, and 60 MeV. Resultant hourly averaged fluxes were published on a rapid basis in "Solar-Geophysical Data." The fourth detector, a two-element telescope, measured directional fluxes of protons in the energy intervals from 0.2 to 0.5, 0.5 to 2.0, and 2.0 to 7.5 MeV and directional fluxes of alpha particles in the energy interval from 8 to 20 MeV. The fifth detector measured directional fluxes of electrons above 10 keV. For the last two detectors, counts were obtained in 45-deg sectors as the spacecraft spun. Onboard calibration capability for the first four detectors was included.

-------- IMP-I, CLINE----------

INVESTIGATION NAME- STUDY OF COSMIC RAY, SOLAR, AND MAGNETOSPHERIC ELECTRONS

NSSDC ID- 71-019A-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS

PERSONNEL

PI - T.L. CLINE		NASA-GSFC
OI - K.A. BRUNSTEIN		UNKNOWN

BRIEF DESCRIPTION

This experiment was designed to study galactic and solar electrons and positrons in the kinetic energy range 100 keV to 1.5 MeV. Information on protons between 9.5 and 41.0 MeV was also obtained. A collimated stilbene crystal scintillator looking perpendicular to the spacecraft spin axis was the principal detector. A similar, fully shielded crystal served to determine the contribution to the principal detector count

rate of electrons and protons generated within the principal detector by gamma rays and neutrons, respectively. A fully shielded CsI crystal served as a gamma-ray spectrometer and was used in coincidence with the principal detector to distinguish electrons from positrons. Count rates from each detector obtained in eight angular sectors per revolution were telemetered. In addition, the amplitude and shape of the pulse generated in the principal detector by the first stopping particle in each appropriate telemetry frame were studied. Pulse amplitude and shape yielded energy (10% resolution) and particle species information. Initial experiment performance was normal. An experiment malfunction prevented the acquisition of useful data between the 7th and 12th weeks after launch. Marginal operation of part of the apparatus made it difficult to determine positron to electron ratios. Otherwise, the instrument performance was normal until September 26, 1972, when the experiment could not be turned on after a 4-h spacecraft turnoff.

------- IMP-I, ERICKSON----------

INVESTIGATION NAME- INTERPLANETARY LONG WAVELENGTH RADIO ASTRONOMY EXPERIMENT, TIME RESOLUTION

NSSDC ID- 71-019A-15

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - W.C.	ERICKSON	U OF MARYLAND
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to study the radio spectra of the galaxy, the sun, and Jupiter with relatively high time resolution. Two stepped-frequency radiometers, attached to a single 91-m dipole antenna (also used in the electric field experiments), stepped through the frequency range of 30 kHz to 2 MHz in 32 steps. NSSDC has all the useful data that now exist.

------- IMP-I, FRANK----------

INVESTIGATION NAME- LOW-ENERGY PROTONS AND ELECTRONS

NSSDC ID- 71-019A-05

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 conduct comprehensive observations of the differential energy spectra, angular distributions, spatial distributions and temporal variations of electrons and protons over the geocentric radial distance range from 1.03 to 30 earth radii. Two arrays of curved-plate cylindrical electrostatic analyzers and continuous channel multipliers were used for this purpose. One analyzer, the LEPEDEA (low-energy proton and electron differential energy analyzer), was to measure the energy spectra and angular distribution of protons and electrons separately in the energy range 24 eV to 50 keV (16 energy intervals for protons and electrons separately). The other analyzer, the LEPEDEA (low energy proton differential energy analyzer) measured the energy spectra and angular distribution of protons in the energy range 1.7 to 550 eV (eight energy intervals). The analyzers were mounted perpendicular to the spacecraft spin axis. An EON type 213 GM counter, whose collimated field of view of 15-deg half angle was oriented approximately parallel to that of the LEPEDEA, was used to measure the intensity of electrons of energies greater than 45 keV and protons of energies greater than 570 keV and to provide background measurements for the LEPDEA. One continuous channel electron multiplier failed on August 10, 1974, so that no useful electron data were collected for the last 7 weeks of the spacecraft life. Otherwise, the experiment functioned normally over the spacecraft lifetime.

------- IMP-I, GURNETT----------

INVESTIGATION NAME- ELECTROSTATIC WAVES AND RADIO NOISE -- IOWA

NSSDC ID- 71-019A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - D.A.	GURNETT	U OF IOWA
OI - P.J.	KELLOGG	U OF MINNESOTA
OI - T.L.	AGGSON	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION
Three orthogonal loop antennas and the three orthogonal (nearly balanced) dipoles gained simultaneous E and B field data in 16 logarithmically equispaced narrow channels from 20 Hz to 200 kHz. These detectors were also used in the dc electric field (71-019A-02) experiment. The spectral frequency resolution was about 30%. Each E-B channel was sampled every 5.12 s. A short back-up dipole antenna (about 1 m tip to tip) was also used to detect very short wavelength plasma phenomena. Analog B or E data from 0 to 30 kHz in three segments were also telemetered on the special purpose 4-W analog channel. This experiment was designed to be used in conjunction with the low-energy proton and electron differential energy analyzer (LEPEDEA). Some data are presently retained by the PI.

------- IMP-I, HADDOCK----------

INVESTIGATION NAME- INTERPLANETARY LONG-WAVELENGTH RADIO ASTRONOMY EXPERIMENT, FLUX RESOLUTION

NSSDC ID- 71-019A-13

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ASTRONOMY

PERSONNEL

PI - F.T.	HADDOCK	U OF MICHIGAN
OI - W.C.	ERICKSON	U OF MARYLAND
OI - R.G.	STONE	NASA-GSFC

BRIEF DESCRIPTION
The objective of this experiment was to study the spectra of the galaxy, the sun, and Jupiter with high flux resolution (about 1%). A radiometer, operating in either a stepping mode (eight frequencies) or at a single frequency, was connected to a 91-m dipole antenna, which was also used in the electric field experiments. The frequency range covered was 0.05 to 3.5 MHz. NSSDC has all the useful data that now exist.

------- IMP-I, KELLOGG----------

INVESTIGATION NAME- ELECTROSTATIC WAVES AND RADIO NOISE -- MINN

NSSDC ID- 71-019A-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - P.J.	KELLOGG	U OF MINNESOTA
OI - D.A.	GURNETT	U OF IOWA
OI - T.L.	AGGSON	NASA-GSFC
OI - J.P.	HEPPNER	NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to determine the polarization, direction of propagation, flux, and direction of the wave normal surface for plasma waves. The time-averaged correlation at one channel frequency from any combination of the six antenna elements could be simultaneously calculated by six onboard analog computers. There were 64 logarithmically equispaced frequency channels centered from 23 Hz to 200 kHz with a 15% bandwidth at 3 dB. Averaging time was 2.5 s at the high bit rate. The combinations of elements and the sequence of frequencies to be measured were controlled either by an onboard computer or from the ground.

------- IMP-I, NESS----------

INVESTIGATION NAME- MEASUREMENT OF MAGNETIC FIELDS

NSSDC ID- 71-019A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - N.F.	NESS	NASA-GSFC
CI - J.B.	SEEK	NASA-GSFC
OI - D.H.	FAIRFIELD	NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to measure accurately the vector magnetic field in the interplanetary medium and in the earth's magnetosphere, magnetotail, and magnetosheath. The detector was a boom-mounted triaxial fluxgate magnetometer with four ranges: minus to plus 16, 48, 144, and 432 nT, respectively. Corresponding sensitivities were plus or minus 0.06, 0.19, 0.56, and 1.69 nT, respectively. Automatic range selection capability was included. A flipping mechanism permitted inflight calibration of the three sensor zero levels.

The vector sampling rate was 12.5 samples per second. The experiment functicrec normally tfrcugh the spacecraft life. for further details, see D. H. Fairfield, J. Geophys. Res., v. 79, p. 1368, 1974. Hourly averagec interplanetary data also exist as part of data sets in the NSSDC supplementary data file.

------- IMP-I, OGILVIE----------

INVESTIGATION NAME- MEASUREMENT OF SOLAR PLASMA

NSSDC ID- 71-019A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - K.W. OGILVIE NASA-GSFC

BRIEF DESCRIPTION
This experiment consisted of two oppositely directed plasma detectors, both of which were normal to the spacecraft spin axis. An electrostatic analyzer measured protons and alpha particles with deflection voltages between 170 and 6400 V. An electrostatic analyzer and velocity selector measured only alpha particles with deflection voltages between 640 and 7200 V. During successive spacecraft revolutions, each of the two electrostatic analyzer deflection voltages was advanced through one of 20 logarithmically equispaced steps in the above stated intervals. Complete spectra were thus obtained in 240 s. Experiment performance was normal for the first month. A short circuit in the high-voltage portion caused the experiment to fail. NSSDC has all of the useful data that exist.

------- IMP-I, SIMPSON----------

INVESTIGATION NAME- NUCLEAR COMPOSITION OF COSMIC AND SOLAR PARTICLE RADIATIONS

NSSDC ID- 71-019A-09

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
OI -	S.	VERMA	LOUISIANA STATE U
OI -	J.	HSIEH	U OF ARIZONA
OI -	G.M.	MASON	U OF CHICAGO

BRIEF DESCRIPTION
This experiment was designed to measure the spectra and composition of solar and galactic cosmic rays and of magnetotail particles, to serve as a prototype of instruments to be flown on the deep space probes Pioneers 10 and 11, and to provide reference 1-AU data for comparison with the Pioneer data in gradient studies. The experiment consisted of a composition telescope (which failed approximately 10 days after launch), a second telescope (from which virtually all the useful data of this experiment were obtained), an electron current detector (electrons above 1.8 MeV plus protons above 21 MeV), and a fission cell (protons above 120 MeV). The latter two instruments were specifically included as prototypes of Pioneer instruments designed to measure very high fluxes of Jovian trapped particles. As such they were not optimized for measurements of the relatively low fluxes in the earth's radiation belt. The successful telescope consisted of six colinear sensors (five lithium-drifted silicon sensors and one CsI (Tl) scintillator) and an anticoincidence scintillator. This telescope had a look direction that was normal to the spacecraft spin axis and had an angular aperture between 48 and 64 deg (depending on coincidence mode considered). Coincidence mode rates (5.12 s accumulations, corresponding to protons in the ranges 0.5 to 10.6, 10.6 to 19.6, 29.3 to 66.7 and above 66.7 MeV) were obtained each 10.24 s. Pulse-height analysis (one event every 20.48 s) was used with these rates to study charge composition (up to Z of 8), isotopic composition (for Z of 1 and 2), and electron fluxes. The spacecraft onboard computer was used to permit some of the objectives assigned to the composition telescope to be achieved through the smaller successful telescope. Except for the failure of the composition telescope, the experiment worked as planned throughout the spacecraft life.

********** 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

PM -	J.F.	CORRIGAN	NASA-GSFC
PM -	W.R	LIMBERIS(NLA)	NASA-GSFC
PS -	J.H.	KING	NASA-GSFC
PS -	F.B.	MACDONALD	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, 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.N. 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, 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 6 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+5 (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-GSFC
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

ir 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 1.8 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.

********** 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

PM - J.P.	CORRIGAN	NASA-GSFC
PM - J.J.	MADDEN	NASA-GSFC
PS - K.W.	OGILVIE	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-B/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	CESR
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 250 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-B/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	RUHR-U BOCHUM
OI - J.R.	ASBRIDGE	LOS ALAMOS NAT LAB
OI - H.R.	ROSENBAUER	MPI-AERONOMY
OI - H.	VOLK	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-C1) 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-B/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-B/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-B/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.	FREDERICKS	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-B/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 received 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 quasistatic 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 3, 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 banc 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 for 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.H.	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 1, WILLIAMS----------

INVESTIGATION NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 77-102A-09

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 -	C.O.	BOSTROM	APPLIED PHYSICS LAB
OI -	B.	WILKEN	MPI-AERONOMY
OI -	T.A.	FRITZ	NOAA-ERL
OI -	G.H.	WIBBENENZ	U OF KIEL
OI -	E.	KEPPLER	MPI-AERONOMY

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 spectrum and angular distributions. These detectors used silicon surface-barrier, totally depleted solid-state devices of various thicknesses, areas, and configurations. Protons in 8 or 16 channels between 20 keV and 1.2 MeV, and electrons in 8 or 16 channels between 20 keV and 1 MeV, were measured. A separate solid-state detector system measured the energy spectra and pitch-angle distributions of alpha particles and heavy ions in the energy range above 125 keV per nucleon.

********** 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

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 19.6 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	CESR
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 300 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-B/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		CNR, SPACE PLASMA LAB
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-B/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>40 keV, and to protons with E>600 keV.

------- ISEE 2, GURNETT----------

INVESTIGATION NAME- PLASMA WAVES

NSSDC ID- 77-102B-05

INVESTIGATIVE PROGRAM
CODE EE-B/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.	FREDERICKS		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-B/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, PASCHMANN----------

INVESTIGATION NAME- FAST PLASMA

NSSDC ID- 77-102B-01

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

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - G.	PASCHMANN		MPI-EXTRATERR PHYS
OI - W.C.	FELDMAN		LOS ALAMOS NAT LAB
OI - E.G.	HONES, JR.		LOS ALAMOS NAT LAB
OI - K.	SCHINDLER		RUHR-U BOCHUM
OI - H.	MIGGENRIEDER		MPI-EXTRATERR PHYS
OI - S.J.	BAME		LOS ALAMOS NAT LAB
OI - H.	VOLK		MPI-NUCLEAR PHYS
OI - H.R.	ROSENBAUER		MPI-AERONOMY
OI - M.D.	MONTGOMERY		LOS ALAMOS NAT LAB
OI - J.R.	ASBRIDGE		LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment was designed to study plasma velocity distributions and their spatial and temporal variations in the solar wind, bow shock, magnetosheath, magnetopause, and magnetotail (within the magnetosphere). One-, two-, and three-dimensional velocity distributions for positive ions and electrons were measured using two 90-deg spherical electrostatic analyzers with channeltron electron multipliers as detectors. In conjunction with similar instrumentation (77-102A-01) provided by S. J. Bame/LANL for the mother spacecraft, protons from 50 eV to 40 keV (and electrons from 5 eV to 20 keV) were measured with 10% energy resolution in two ranges each.

------- ISEE 2, RUSSELL----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETER

NSSDC ID- 77-102B-04

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

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
PARTICLES AND FIELDS

PERSONNEL

PI - D.J. WILLIAMS		APPLIED PHYSICS LAB
OI - T.A. FRITZ		NOAA-ERL
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 26 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

PM - J.P. CORRIGAN		NASA-GSFC
PM - J.J. MADDEN		NASA-GSFC
PS - T.T. VON ROSENVINGE		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.

------- ISEE 3, ANDERSON----------

INVESTIGATION NAME- INTERPLANETARY AND SOLAR ELECTRONS

NSSDC ID- 78-079A-09

INVESTIGATIVE PROGRAM
CODE EE-B/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 (2-16 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, ANDERSON----------

INVESTIGATION NAME- X- AND GAMMA-RAY BURSTS

NSSDC ID- 78-079A-14

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

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
GAMMA-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL

PI - K.A. ANDERSON		U OF CALIF, BERKELEY
OI - S.R. KANE		U OF CALIF, BERKELEY
OI - W.D. EVANS		LOS ALAMOS NAT LAB
OI - R.W. KLEBESADEL		LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to provide continuous coverage of solar-flare X rays and transient cosmic gamma-ray bursts. Detectors were a xenon-filled proportional counter (5-14 keV in 6 channels) and a NaI scintillator (12-1250 keV in 12 channels). There were four operating modes: normal, flare-1, flare-2, and gamma-burst. In the normal mode, the time resolution was 0.5 to 4 s, depending on the channel. In the gamma-burst mode, the best time resolution was 0.25 to 125 ms and used stored data.

------- ISEE 3, BAME----------

INVESTIGATION NAME- SOLAR WIND PLASMA

NSSDC ID- 78-079A-01

INVESTIGATIVE PROGRAM
CODE EE-B/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, HECKMAN----------

INVESTIGATION NAME- HIGH-ENERGY COSMIC RAY

NSSDC ID- 78-079A-05

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

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - D.H.	HECKMAN	LAWRENCE BERKELEY LAB
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, HOVESTADT----------

INVESTIGATION NAME- LOW-ENERGY COSMIC RAYS

NSSDC ID- 78-079A-03

INVESTIGATIVE PROGRAM
CODE EE-S/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. ULEZA (ultralow-energy charge analyzer) was an electrostatic analyzer with solid-state detectors. Its energy range was approximately 3 to 560 keV/charge. ULEWAI (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-S/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.F.	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 6 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-04

INVESTIGATIVE PROGRAM
CODE EE-S/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 GR-014A-09 for OGO 5.

------- ISEE 3, OGILVIE----------

INVESTIGATION NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 78-079A-11

INVESTIGATIVE PROGRAM
CODE EE-S/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 1.8 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-S/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.	FREDERICKS	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 eight 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 5.8 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-S/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-S/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 - P.	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-S/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-S/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. 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. Detector 3 consisted of the smaller cesium iodide crystal in experiment 78-079A-03. 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-S/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-GSFC
OI - J.H.	TRAINOR	NASA-GSFC
OI - M.A.	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.

********** OGO 1**********

SPACECRAFT COMMON NAME- OGO 1
ALTERNATE NAMES- EOGO 1, OGO-A
00879, S 49

NSSDC ID- 64-054A

LAUNCH DATE- 09/05/64 WEIGHT- 487. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 09/07/64
ORBIT PERIOD- 3839. MIN	INCLINATION- 31.2 DEG
PERIAPSIS- 281. KM ALT	APOAPSIS- 149385. KM ALT

PERSONNEL

PM - W.E.	SCULL(NLA)	NASA-GSFC
PS - G.H.	LUDWIG(NLA)	NASA-GSFC

BRIEF DESCRIPTION

The purpose of the OGO 1 spacecraft, the first of a series of six Orbiting Geophysical Observatories, was to conduct diversified geophysical experiments to obtain a better understanding of the earth as a planet and to develop and operate a standardized observatory-type satellite. OGO 1 consisted of a main body that was parallelepipedal in form, two solar panels, each with a solar-oriented experiment package (SOEP), two orbital plane experiment packages (OPEP) and six appendages EP-1 through EP-6 supporting the boom experiment packages. One face of the main body was designed to point toward the earth (+Z axis), and the line connecting the two solar panels (X axis) was intended to be perpendicular to the earth-sun-spacecraft plane. The solar panels were able to rotate about the X axis. The OPEPs were mounted on and could rotate about an axis which was parallel to the Z axis and attached to the main body. Due to a boom deployment failure shortly after orbital injection, the spacecraft was put into a permanent spin mode of 5 rpm about the Z axis. This spin axis remained fixed with a declination of about -10 deg and right ascension of about 40 deg at launch. The initial local time of apogee was 2100 h. OGO 1 carried 20 experiments. Twelve of these were particle studies and two were magnetic field studies. In addition, there was one experiment for each of the following types of studies: interplanetary dust, VLF, Lyman-alpha, gegenschein, atmospheric mass, and radio astronomy. Real-time data were transmitted at 1, 8, or 64 kbs depending on the distance of the spacecraft from the earth. Playback data were tape recorded at 1 kbs and transmitted at 64 kbs. Two wideband transmitters, one feeding into an

omnidirectional antenna and the other feeding into a directional antenna, were used to transmit data. A special-purpose telemetry system, feeding into either antenna, was also used to transmit wideband data in real time only. Tracking was accomplished by using radio beacons and a range and range-rate S-band transponder. Because of the boom deployment failure, the best operating mode for the data handling system was the use of one of the wideband transmitters and the directional antenna. All data received from the omnidirectional antenna were noisy. During September 1964, acceptable data were received over 70% of the orbital path. By June 1969, data acquisition was limited to 10% of the orbital path. The spacecraft was placed in a standby status November 25, 1969, and all support was terminated November 1, 1971. By April 1970 the spacecraft perigee had increased to 46,000 km and the inclination had increased to 58.6 deg.

------- OGO 1, ANDERSON----------

INVESTIGATION NAME- SOLAR COSMIC RAYS

NSSDC ID- 64-054A-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - G.W.	PITT	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This instrumentation consisted of a cesium iodide crystal surrounded by a plastic anticoincidence shield and optically coupled to a photomultiplier tube. The system also contained a 32-channel pulse-height analyzer. Although the principal objective of this experiment was to measure 3- to 90-MeV solar protons, the detector had no ability to discriminate between different kinds of particles. The system was mounted in one of the two SOEPs and had a 38-deg acceptance cone angle. Inflight calibration was provided. Counts in groups of four channels, accumulated over 31/32 of the telemetry frame time (1.152, 0.144, or 0.018 s), were read out during successive telemetry frames. Some time before the experiment was turned on, the anticoincidence system failed. This resulted in high background rates due to galactic cosmic rays. Thus, the data were useful for studies of event morphology but not for determination of absolute fluxes. Although the detector axis was intended to point toward the sun, a malfunction in the OGO 1 attitude control system prevented this. For further details, see Kahler, S. W., et al., Solar Physics, v. 2, p. 179, 1967. NSSDC has all the useful data that exist from this investigation.

------- OGO 1, BOHN----------

INVESTIGATION NAME- INTERPLANETARY DUST PARTICLES

NSSDC ID- 64-054A-07

INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL

PI - J.L.	BOHN	TEMPLE U
OI - W.M.	ALEXANDER	BAYLOR U

BRIEF DESCRIPTION

This experiment was designed to measure the velocity and mass distributions of interplanetary dust particles with diameters of the order of 1 micrometer. The experiment extended the mass distribution curve out to the radiation pressure limit and measured the fluctuations in the velocity distribution, mass distribution, and spatial densities of micrometer size dust particles. The instrumentation consisted of four nearly identical meteoroid sensors located in a container mounted on the end of the 1.8-m EP-3 boom. Each sensor tube consisted of two thin films (1000-A thick aluminum and aluminum oxide), a grid, and a microphone. The sensors had openings in the plus or minus X, plus Y, and minus Z directions. Penetration of the aluminum film by a micrometeoroid produced a plasma cloud that was collected by the aluminum oxide film and started a 2-MHz clock. A plasma cloud was also produced when the micrometeoroid struck the microphone plate. The plasma cloud was collected by the grid, which stopped the clock and provided a measurement of the particle's velocity. The resulting pulse height signal from the grid provided information on the kinetic energy and/or momentum of the particle. The plus Y sensor had an apparent failure. Moreover, the directionality of the particles could not be determined owing to the spin of OGO 1 and the low data sampling rate. The actual flux was so much lower than expected that only several micrometeroid events were observed. More details regarding experiment design may be found in Alexander, W. A., et al., Nature, v. 208, p. 673, November 13, 1965. No useful data now exist from this experiment.

------- OGO 1, BRIDGE----------

INVESTIGATION NAME- PLASMA PROBE, FARADAY CUP

NSSDC ID- 64-054A-14

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - H.S.	BRIDGE	MASS INST OF TECH
OI - A.M.	BONETTI	INST OF PHYSICS
OI - B.	ROSSI	MASS INST OF TECH
OI - A.J.	LAZARUS	MASS INST OF TECH
OI - F.	SCHERB	U OF WISCONSIN
OI - V.M.	VASYLIUNAS	MPI-AERONOMY

BRIEF DESCRIPTION

Two multi-grid faraday cups were used to study the directional intensity of positive ions and electrons of the solar wind, magnetosheath, and magnetotail. One single collector Faraday cup was used to study electrons in four energy windows between 125 eV and 2 keV. Currents in all four energy windows were measured every 9.2 s. One split-collector Faraday cup was to be used to study positive ions, but due to the unexpected spin-up of the satellite, the data collected were useless and no longer exist.

------- OGO 1, CLINE----------

INVESTIGATION NAME- POSITRON SEARCH AND GAMMA RAY SPECTRUM

NSSDC ID- 64-054A-15

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
HIGH ENERGY ASTROPHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - T.L.	CLINE	NASA-GSFC
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to determine whether low-energy (0 to 3 MeV) positrons are trapped temporarily or permanently in the Van Allen radiation region and whether low-energy solar and interplanetary positrons exist at the edge of the earth's magnetic field. It was also designed to detect gamma-ray bursts from the sun in the energy interval from 80 keV to 1 MeV. The experimental apparatus consisted of three cesium iodide (CsI) crystals surrounded by a plastic anticoincidence shield, with the output of the whole unit being monitored by three photomultipliers. It was primarily designed to search for interplanetary positrons by measuring the spectra of single or paired X rays produced by the stopping of a positron. In another possible mode of data acquisition, single X rays were monitored in one of the CsI spectrometers with 4-pi particle anticoincidence, which was virtually X-ray transparent above 80 keV. Once every 18.5 seconds, integral intensity measurements were made in each of the 16 energy levels equally spaced between 80 keV and 1 MeV, allowing for both temporal and spectral analysis of the data. Inflight calibration of the spectrometer was accomplished by monitoring the 511-keV annihilation line. The experiment did not achieve the desired objectives, but did obtain useful data. The basic difficulties were electrical interference and secular degradation of the photomultipliers' response. No important papers were produced using the data. More details regarding experiment design may be found in Cline, T. L., et al., "A double gamma-ray spectrometer to search for positrons in space," Inst. of Radio Engr., IRE Trans. on Nucl. Sci., v. NS-9, n. 3, pp. 370-375, June 1962. No data sets now exist from this investigation.

------- OGO 1, HADDOCK----------

INVESTIGATION NAME- RADIO ASTRONOMY

NSSDC ID- 64-054A-09

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - F.T.	HADDOCK	U OF MICHIGAN

BRIEF DESCRIPTION

This experiment was designed to measure the dynamic radio spectrum of solar radio noise bursts by observing frequency drift rate, frequency bandwidth, duration of fast-drift solar bursts, cosmic noise intensity, ionospheric electron densities (50 to 500 electrons/cc), atmospherics, auroral noise from the earth to satellite, and radio noise generated in the terrestrial ionosphere and in interplanetary plasmas. The experiment was also capable of observing radio bursts from the planet Jupiter. The instrumentation consisted of a 9-m monopole antenna and a sweep frequency superheterodyne receiver. The receiver had automatic repetitive tuning from 2 to 4 MHz with a 2-s sweep period. Automatic amplitude and

frequency calibration was provided by a crystal calibrator that provided controlled amplitude pulses at 500-kHz intervals across the 2- to 4-MHz band. The antenna was a rolled beryllium copper strip that extended to about 9 m in a 1.27-cm tubular configuration. It was stored in a flat shape on a drum prior to the flight and was supposed to be deployed by a shunt-wound motor upon ground command after launch. However, problems were experienced with the deployment of the antenna, and although a number of attempts were made, no indications of full deployment were ever received. Even though the antenna did not fully deploy, data were obtained because the experiment was not affected by the spin of OGO 1. The data, however, were of little value because of the antenna problem and the high-noise environment. Data from this experiment no longer exist. More details regarding experiment design may be found in Haddock, F. T., and R. G. Peltzer, "Instrumentation for radio astronomy measurements aboard the OGO-1 and OGO-3 spacecraft. Part 2: Technical," Final Report, University of Michigan, Ann Arbor, December 31, 1969 (TRF 016030).

------- OGO 1, HELLIWELL----------

INVESTIGATION NAME- WIDEBAND AND NARROW-BAND STEP FREQUENCY VLF RECEIVERS

NSSDC ID- 64-054A-04 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

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

PERSONNEL

PI - R.A.	HELLIWELL	STANFORD U
OI - J.J.	ANGERAMI	STANFORD U
OI - L.H.	RORDEN	DEVLCO INC

BRIEF DESCRIPTION

This experiment consisted of four VLF radio receivers to be used for study of natural VLF noise occurrences at orbital altitudes. The receiver systems consisted of an inflatable 2.9-m loop antenna, a preamplifier stage at the end of a long boom, and the receiver electronics packages in the main body of the satellite. Three step-frequency receivers, covering frequency ranges of 0.2 to 1.6 kHz, 1.6 to 12.5 kHz, and 12.5 to 100 kHz, each observed a complete spectrum of 256 signal strength values once every 2.3, 18.4, or 147.2 s depending upon the selected mode of operation. Observations from these three receivers were tape recorded at 1 kbs or observed in real time at 1, 8, or 64 kbs. The tape was read out upon command at the 64 kbs rate. The other receiver was a broadband receiver observing signals from 0.3 to 12.5 kHz. These data were not tape recorded, but observed only in real time on the special purpose telemetry channel. Data from the three receivers (called PCM data) were recorded for over half the time in orbit with high bit rate usually used when the satellite was near perigee, and low bit rate near apogee. Broadband resolution depended upon the spectrum analyzer used to process the tape. This Rayspan equipment could provide up to 10-ms time resolution and up to 30 Hz frequency resolution. The broadband data were available only for relatively short portions of the satellite operating lifetime since they were received only when the satellite was scheduled to transmit within range of a telemetry station. This experiment operated nominally during the active satellite lifetime. Satellite operation was restricted to spring (approximately March, April, and May) and fall (approximately September, October, and November) due to spacecraft power supply limitations. A May 1966, Stanford Research Institute Instrument Report by L. H. Rorden et al. (TRF 001944), gives a complete description of this experiment.

------- OGO 1, HEPPNER----------

INVESTIGATION NAME- MAGNETIC SURVEY USING TWO MAGNETOMETERS

NSSDC ID- 64-054A-02 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

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

PERSONNEL

PI - J.P.	HEPPNER	NASA-GSFC
OI - B.G.	LEDLEY	NASA-GSFC
OI - M.	SUGIURA	NASA-GSFC
OI - R.M.	CAMPBELL(NLA)	NASA-GSFC
OI - T.L.	SKILLMAN(NLA)	NASA-GSFC

BRIEF DESCRIPTION

OGO 1 was equipped with a three-axis, dual range, fluxgate magnetometer for measuring vector fields up to 30 and 500 nT full-scale, and a four-cell rubidium vapor magnetometer for measuring scalar fields of 3 to 14,000 nT with programmed bias fields incorporated for vector measurements in weak fields. The instrument was intended to measure magnetospheric, transition region, and interplanetary magnetic fields. The sensors were to be located on 6.7-m booms. At launch two booms failed to deploy, and as a result the spacecraft went into an uncontrolled spin. The rubidium vapor magnetometer was left in a high-gradient field where it could not operate, and the fluxgate magnetometer was left in a position where spacecraft fields limited its accuracy to about 3 nT. In the 1-kbs mode, each fluxgate was sampled 1.7 times per second and 8 and 64 times faster in the other modes. Data from this experiment are held by the PI.

------- OGO 1, KONRADI----------

INVESTIGATION NAME- TRAPPED RADIATION SCINTILLATION COUNTER

NSSDC ID- 64-054A-16 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S) PARTICLES AND FIELDS MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.	KONRADI	NASA-JSC
OI - L.R.	DAVIS(RETIRED)	NASA-GSFC
OI - R.A.	HOFFMAN	NASA-GSFC
OI - J.M.	WILLIAMSON	NASA-GSFC

BRIEF DESCRIPTION

The objectives of this experiment were (1) to study the temporal and spatial variations of the trapped particle intensities, pitch angle distributions, and energy spectra of electrons (10 to 100 keV) and protons (120 to 4500 keV), and (2) to determine particle lifetimes, isolate processes by which trapped particles are lost, and define the sources and accelerating mechanisms of trapped particles. The experiment, located in UMEP 2, consisted of a filter wheel, wheel stepping motor, phosphor scintillator, photomultiplier tube, electrometer, and count rate meter. The detector had two entrance apertures for particles, one aligned with the phototube axis and one at 90 deg to this axis. Both protons and electrons could enter the aligned opening and reach the phosphor. Only electrons could enter the 90-deg opening, scatter off a gold disk, and reach the phosphor. The counting rate in the aligned opening measured proton flux, and the current therein measured the total energy flux of electrons, protons, etc. The current in the 90-deg opening measured the electron energy flux. Different thickness absorbers on the wheel provided spectral information. The experiment worked until the absorber wheel stopped on December 2, 1964. Data recorded after this date were unusable.

------- OGO 1, MANGE----------

INVESTIGATION NAME- GEOCORONAL LYMAN-ALPHA SCATTERING

NSSDC ID- 64-054A-10 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S) ATMOSPHERIC PHYSICS

PERSONNEL

PI - P.W.	MANGE	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

The objective of this experiment was to measure the intensity of hydrogen Lyman-alpha radiation (1216 A) scattered by neutral hydrogen at 5 to 20 earth radii. This wavelength is the fundamental resonance line of neutral atomic hydrogen, and these intensity measurements, therefore, provided a measure of the density of neutral hydrogen in the hydrogen geocorona. The instrumentation consisted of four ion chambers mounted on the antiearth door of OGO 1. Each ion chamber was filled with nitric oxide gas and had lithium fluoride windows. The ion chambers were sensitive in the 1050- to 1350-A band. The instrumentation faced the sun steadily for more than 4 months before viewing the sun-free sky, causing detector degradation. The maximum intensities observed were lower than those measured by the OGO 3 ion chambers by a factor of more than 30. This difference has been attributed primarily to the spurious response of the damaged detectors to radiation belt particles. The data obtained from the experiment were not a measure of the Lyman-alpha intensity because of the detector degradation. Data from this investigation no longer exist.

------- OGO 1, SAGALYN----------

INVESTIGATION NAME- SPHERICAL ION AND ELECTRON TRAP

NSSDC ID- 64-054A-03 INVESTIGATIVE PROGRAM CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S) SPACE PLASMAS MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - R.C.	SAGALYN	USAF GEOPHYS LAB
OI - M.	SMIDDY	USAF GEOPHYS LAB

BRIEF DESCRIPTION

The objective of this experiment was to measure the flux, temperature, and energy distribution of electrons and positive ions having energies ranging from thermal up to 1000 eV, as a function of position (altitude, L shell, etc.) and of time (due to solar and magnetic activity). Two spherical electrostatic sensors, used as omnidirectional plasma probes, were mounted on a short boom. One sensor was designed for electron measurements and consisted of two concentric spheres. The

outer sphere was a grid that allowed the ambient electrons to pass through and be collected by the inner sphere. The second sensor, which was designed to measure positive ions, consisted of three concentric spheres, an outer aperture grid, an inner collecting sphere, and a suppressor grid between them. Collector currents were measured with electrometers. Logic circuits controlled the sequence of the measurement operations, so that different potentials were applied between the spheres in prescribed patterns. A complete measurement cycle took 25.6 min. Essentially, the experiment was designed to cycle in three major modes of operation to provide data on the flux of charged particles, the mean particle temperatures, and the energy distributions of the plasma particles. The output currents from each sensor were calibrated once per experiment cycle. More details can be obtained from Sagalyn, R. C., and M. Smiddy, "Results of charged particle measurements in the energy range 0 to 1000 electron volts, OGO-A," Space Research 6, 1966. Data from this investigation no longer exist.

------- OGO 1, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY SPECTRA AND FLUXES

NSSDC ID- 64-054A-18

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON — U OF CHICAGO
OI - C.Y. FAN — U OF ARIZONA

BRIEF DESCRIPTION
Three solid-state particle telescopes were used to measure the intensity and energy distribution of cosmic rays. A dE/dx vs E telescope resolved the nuclear composition of cosmic rays in the energy range from 22 to 103 MeV/nucleon (charge resolution ranged through Z=26, energy per nucleon intervals approximately proportional to Z squared/A). A dE/dx vs range telescope (proton-alpha telescope) detected protons and alpha particles in the energy range from 1.4 to 33 MeV/nucleon, and a single-element low-energy proton telescope (OPEP telescope) was primarily sensitive to protons in the energy range from 1.4 to 3.7 MeV. The composition and proton-alpha telescopes were oriented parallel to the spacecraft Z axis. Pulse-height information was obtained from the composition telescope using one 256-channel and two 512-channel pulse-height analyzers. This allowed pulse-height analysis of particles in four energy intervals, for protons 5 to 11 MeV, 11 to 22 MeV, 22 to 103 MeV, and greater than 103 MeV. Pulse-height information sent back from the proton-alpha telescope allowed pulse-height analysis of particles in two energy ranges, protons 1.4 to 8.6 MeV and 8.6 to 33 MeV. This transmission used one 256-channel pulse-height analyzer while count rate information was sent back from all three telescopes. The time resolution ranged from about one measurement per 0.02 s to about one measurement per 147 s depending on the counting mode and the telemetry bit rate. The spacecraft unintended initial spin period about the Z axis was about 12 s. For further details, see Comstock, G. M., et al., Ap. J., v. 146, p. 51, 1966.

------- OGO 1, SMITH----------

INVESTIGATION NAME- TRIAXIAL SEARCH-COIL MAGNETOMETER

NSSDC ID- 64-054A-01

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - E.J. SMITH — NASA-JPL
OI - R.E. HOLZER — U OF CALIF, LA

BRIEF DESCRIPTION
The OGO 1 Triaxial Search Coil Magnetometer was designed to measure the magnetic field fluctuations from 0.01 to 1 kHz. Due to a spacecraft malfunction, the OGO satellite assumed a spin-stabilized mode with a 12-s period. This meant the magnetometer output was modulated with an approximately sinusoidal signal, providing a measure of the dc component of the magnetic field perpendicular to the spin axis as well as the ac data. The magnetometer assembly was on a 6.1-m boom, and the electronics were in the body of the spacecraft. The sensitivity was 10 microvolts/nT-s. The low-frequency channel was sampled five times every 1.152 s by the telemetry system when the data rate was 1 kbs, and proportionally faster for the higher telemetry rates of 8 and 64 kbs. However, due to the spacecraft spin, the highest bit rate could not be used when the satellite was more than 10 earth radii away. The upper frequency cutoff (to avoid aliasing in the data) was 2 Hz for the 1- and 8-kbs telemetry rates, and 130 Hz for the 64-kbs rate. The high-frequency channel provided spectral analysis information for frequencies from 1 to 16 kHz in five steps. The experiment operated satisfactorily, averaging about 4000 h of data per year. More details regarding experiment design may be found in Francsen, A. M. A., IEEE Trans. on Aerosc. Electron., v. AE-7, n. 2, pp. 61-74, April 1969.

------- OGO 1, TAYLOR, JR.----------

INVESTIGATION NAME- POSITIVE ION COMPOSITION

NSSDC ID- 64-054A-06

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H.A. TAYLOR, JR. — NASA-GSFC
OI - N.W. SPENCER — NASA-GSFC

BRIEF DESCRIPTION
The instrumentation for this experiment consisted of two ceramic Bennett radio-frequency mass spectrometers to measure thermal atmospheric positive ions in the range 1 to 45 u. The low-range mass spectrometer measured ions with mass-to-charge ratios (M/Q) from 1 to 6 u, with a resolution of 0.5 u. The high-range mass spectrometer measured ions with M/Q values from 7 to 45 u, with a resolution of 1 in 20 u. Ion concentrations from 5 to 1.0E6 ions per cc could be measured. The time required for a complete scan of the mass range was 64 s, which corresponded to a spatial resolution of about 300 km. The successful operation of the experiment provided the first high-resolution, in situ, direct measurements of the positive ion composition, from an altitude of less than 1000 km to interplanetary space and beyond the boundary of the magnetosphere. The instrumentation is described in Taylor, H. A., et al., "Positive ion composition in the magnetoionosphere obtained from the OGO-A satellite," J. Geophys. Res., v. 70, n. 23, p. 5769, December 1965. Data sets are no longer available from this investigation.

------- OGO 1, VAN ALLEN----------

INVESTIGATION NAME- TRAPPED RADIATION AND HIGH-ENERGY PROTONS

NSSDC ID- 64-054A-19

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - J.A. VAN ALLEN — U OF IOWA
OI - L.A. FRANK — U OF IOWA

BRIEF DESCRIPTION
This experiment was designed to detect charged particles and measure omnidirectional intensities of outer belt electrons in order to understand the origin of the belts and the fluctuations in the belts. A detector composed of 6M tubes and solid-state junction devices was capable of measuring electrons of energies greater than 40, 150, and 1600 keV and protons of energies greater than 0.5, 3.5, and 16 MeV. More details regarding experiment design may be found in Van Allen, J. A., and G. Crossett, Jr., ed., "Instrument report for a trapped radiation experiment for EGO (S-49)(OGO-1)," State Univ. of Iowa, Iowa City, January 29, 1963 (TRF 813005).

------- OGO 1, WHIPPLE----------

INVESTIGATION NAME- PLANAR ION AND ELECTRON TRAP

NSSDC ID- 64-054A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - E.C. WHIPPLE — U OF CALIF, SAN DIEGO
OI - B.E. TROY, JR. — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
This experiment was flown to measure densities and energy distributions of thermal ions and electrons over the altitude range from below the F-maximum region of the ionosphere to several earth radii. In addition, the experiment yielded some data concerning ion masses, fluxes and directions of quasi-energetic particles, and the polarity and magnitude of the vehicle potential. The sensor was an electron and ion trap that consisted of four parallel circular plane grids in front of a collecting plate. The current to the collector was measured by a vibrating reed electrometer with an automatic range change for each decade of current from 1.0E-13 to 1.0E-6 A. The four modes of experiment operation used were a low-resolution and a high-resolution mode for both ions and electrons. In each mode, a variable potential was applied to one grid in the trap, while the potentials on each of the other grids and the collector were held constant. The average time to complete a mode was between 12 and 15 s, and the complete cycle of four modes averaged less than 1 min. The measured current and applied varied voltage were digitized and stored in the experiment shift register until read out to the spacecraft telemetry system. Further details regarding experiment design and operation can be found in "A satellite ion-electron collector, experimental effects of grid transparency,

photoemission, and secondary emission," by E. C. Whipple, J. W. Hirman, and R. Ness, ESSA Tech. Report, ERL 99-AL1, December 1968 (TRF B02033). Data sets no longer exist from this investigation.

------- OGO 1, WINCKLER----------

INVESTIGATION NAME- IONIZATION CHAMBER

NSSDC ID- 64-054A-20 INVESTIGATIVE PROGRAM
CODE EE-R, SCIENCE

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

PERSONNEL

PI - J.R.	WINCKLER	U OF MINNESOTA
OI - S.H.	KANE	U OF CALIF, BERKELEY
OI - R.L.	ARNOLDY	U OF NEW HAMPSHIRE

BRIEF DESCRIPTION
This experiment, designed to measure the ionization due to energetic particles, consisted of a 17.78-cm integrating ionization chamber with a resetting drift-type electrometer. The system was mounted on a 1.2-m boom extending from the main body of the spacecraft along the Y axis. The chamber responded to electrons and protons with energies greater than 0.6 and 12 MeV, respectively, and to 10- to 50-keV X rays. The ionization current was measured by a vacuum tube electrometer whose output, as a function of time, was an automatically resetting sawtooth ramp voltage between 0 and 5 V. Data were telemetered in three independent forms through three digital words and one analog word, each of which was telemetered once every 1.152 s when the OGO system was operating at 1 kbs. The sampling rate linearly increased with the telemetry rate. More details regarding experiment design may be found in Kane, S. R., "Application of an integrating type ionization chamber to measurements of radiation in space," Ph.D. thesis, University of Minnesota, Minneapolis, Minn., September 1967 (TRF B01017). NSSDC has all the data that exist, except for data set 64-054A-20L.

------- OGO 1, WINCKLER----------

INVESTIGATION NAME- ELECTRON SPECTROMETER

NSSDC ID- 64-054A-21 INVESTIGATIVE PROGRAM
CODE EE-M, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.R.	WINCKLER	U OF MINNESOTA
OI - K.A.	PFITZER	MCDONNELL-DOUGLAS CORP
OI - R.L.	ARNOLDY	U OF NEW HAMPSHIRE

BRIEF DESCRIPTION
The objective of this experiment was to measure the electron energy spectrum in the radiation belts for the energy range from 50 keV to 4 MeV. The experiment consisted of a five-channel electron spectrometer containing an analyzing electromagnet, a plastic scintillator crystal, a photomultiplier tube, and a pulse-height analyzer. The analyzing electromagnet was used to define the five energy channels. The pulse-height analyzer accepted only pulses corresponding to the particular energy channel being sampled. In this way, the background due to bremsstrahlung and penetrating particles was reduced because only those background pulses in the narrow energy band being analyzed were counted. This system was mounted in the main body of the spacecraft and looked out in a direction 10 deg off the spacecraft Z axis, with a 15-deg acceptance cone. Since OGO 1 was spin stabilized (about its Z axis) shortly after launch, the acceptance cone was effectively increased to 35 deg. Directional measurements of electrons were made in five contiguous, logarithmically equispaced energy channels between 50 and 4000 keV. Background particles were counted by operating the spectrometer without the electromagnet. The system sampled the five spectral intervals and five background intervals every 2.304 s when the OGO 1 system was operating at 1 kbs. The sampling rate increased linearly with the telemetry bit rate. Data from each of the five channels were telemetered as one digital word. More details regarding experiment design may be found in Pfitzer, K. A., "An experimental study of electron fluxes from 50 keV to 4 MeV in the inner radiation belt," Ph.D. thesis, University of Minnesota, Minneapolis, Minn., August 1968 (TRF B01850). NSSDC has all the data sets that now exist from this investigation, except the highest time resolution ion chamber ramp data.

------- OGO 1, WOLFE----------

INVESTIGATION NAME- ELECTROSTATIC PLASMA ANALYSIS (PROTONS .1-18KEV).

NSSDC ID- 64-054A-13 INVESTIGATIVE PROGRAM
CODE EE-B, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL

PI - J.H.	WOLFE	NASA-ARC

BRIEF DESCRIPTION
This experiment was designed to study the positive ion component of the solar wind plasma. Three quadrispherical electrostatic analyzers, two looking into the orbital plane and one solar oriented, were to be used to detect protons in 30 steps in the range 100 to 18,000 eV. Owing to the unintended spacecraft spin, little useful data were obtained. The sensors could serve as a detector for the magnetopause and bow shock, however. More details regarding experiment design may be found in Beck, C. W., II, et al., "Solar wind measurement techniques. Part 2: solar plasma energy spectrometers," Proceedings of 17th National Aerospace Electronics Conference, Dayton, Ohio, pp. 82-94, May 10-12, 1965 (TRF B01227-000B). Data from this investigation no longer exist.

------- OGO 1, WOLFF----------

INVESTIGATION NAME- GEGENSCHEIN PHOTOMETRY

NSSDC ID- 64-054A-11 INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ZODIACAL LIGHT

PERSONNEL

PI - C.L.	WOLFF(NLA)	NASA-GSFC
OI - K.L.	HALLAM	NASA-GSFC
CI - S.F.	WYATT	U OF ILLINOIS

BRIEF DESCRIPTION
This experiment was designed to measure the amount of solar light that is scattered by particles in space (dust, etc.) in the neighborhood of the anti-solar point. This light contribution to the night sky is called the gegenschein. The basic data from this experiment were to be pictures of the sky at the antisolar point taken by a TV camera and telemetered to earth as a 22 x 32 matrix. The experimental package was a photoelectric camera which formed images of the sky in the visible and near-visible light. The data from this assembly were transmitted back to earth, where they were reconstructed into pictures. Each of these pictures covered about 100 square degrees of sky with a resolution of 0.5 degrees. The package consisted of (1) a four-element f/1.5 objective lens, (2) a filter wheel containing five filters that covered the range from 3000 to 7000 A, (3) an S-20 cathode deposited on a thin, curved window of Corning 9741 ultraviolet-transmitting glass, (4) an image dissector tube named the Star Tracker Fw 143B made by the ITT Corporation, and (5) an electronic unit that amplified and counted the current pulses coming from the tube due to the individual photons arriving at the photocathode. The system was designed to operate at low light levels. Its overall quantum efficiency was of the order of 5%. Unfortunately, upon attaining orbit OGO 1 went into an uncontrolled spin, and the experiment failed to achieve its experimental objective. In addition, after three months in orbit the filter wheel refused to rotate due to an electrical failure in the wheel drive circuit. Despite the failure to achieve the initial goals of the experiment, an interesting study was made determining the effects of the Van Allen belt particle fluxes on the scientific package. These results were published by C. L. Wolff in Applied Optics, v. 5, n. 11, p. 1838, 1966. Data from this investigation no longer exist.

********** OGO 3**********

SPACECRAFT COMMON NAME- OGO 3
ALTERNATE NAMES- OGO-B, EOGO 3
02195, S 49A

NSSDC ID- 66-049A

LAUNCH DATE- 06/07/66 WEIGHT- 515. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 06/07/66
ORBIT PERIOD- 2913. MIN INCLINATION- 31.4 DEG
PERIAPSIS- 295. KM ALT APOAPSIS- 122219. KM ALT

PERSONNEL

PM - W.E.	SCULL(NLA)	NASA-GSFC
PS - G.H.	LUDWIG(NLA)	NASA-GSFC

BRIEF DESCRIPTION

The purpose of the OGO 3 spacecraft, the third of a series of six Orbiting Geophysical Observatories, was to conduct many diversified geophysical experiments to obtain a better understanding of the earth as a planet. OGO 3 consisted of a main body that was parallelepipedal in form, two solar panels, each with a solar-oriented experiment package (SOEP), and two orbital plane experiment packages (OPEP). One face of the main body was designed to be earth pointing (Z axis), and the line connecting the two solar panels (X axis) was intended to be perpendicular to the earth-sun-spacecraft plane. The solar panels were able to rotate about the X axis. The OPEPs were mounted on, and could rotate about, an axis which was parallel to the Z axis and attached to the main body. Due to a failure in the attitude control subsystem on July 23, 1966, the spacecraft was put into a permanent spin mode about the Z axis. Both the orientation of the spin axis and the spin period were variable, the latter usually in the range 90 s to 125 s. At launch, the local time of apogee was 2300 h. OGO 3 carried 21 experiments. Thirteen of these were particle studies, and two were magnetic field studies. In addition, there was one each of the following types of experiments: interplanetary dust, VLF, Lyman-alpha, gegenschein, atmospheric composition, and radio astronomy. Real-time data were transmitted at 1, 8, or 64 kbs depending on the distance from the spacecraft to earth. Playback data were tape recorded at 1 kbs and transmitted at 64 kbs. Two wideband transmitters, one feeding into an omnidirectional antenna and the other feeding into a directional antenna, were used to transmit data. A special purpose telemetry system, feeding into either antenna, was also used to transmit wideband data in real time only. Tracking was accomplished by using radio beacons and a range and range-rate S-band transponder. Routine spacecraft operation was discontinued on December 1, 1969, after which only data from Heppner's experiment (E-11) was acquired. All spacecraft support terminated on February 29, 1972. By March 1971 spacecraft perigee had increased to 16,400 km and the inclination had increased to 75.8 deg.

------- OGO 3, ANDERSON----------

INVESTIGATION NAME- SOLAR COSMIC RAYS

NSSDC ID- 66-049A-01

INVESTIGATIVE PROGRAM
CODE EE-6, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - K.A.	ANDERSON	U OF CALIF, BERKELEY
OI - G.H.	PITT	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

The instrumentation for this experiment consisted of a cesium iodide crystal surrounded by a plastic anticoincidence shield and optically coupled to a photomultiplier tube. The system also contained a 32-channel pulse-height analyzer. Although the principal objective of this experiment was to measure 3- to 90-MeV solar protons, the detector had no ability to discriminate between different kinds of particles. The system was mounted in one of the two SOEPs and had a 38-deg acceptance cone angle. Inflight calibration was provided. Counts in groups of four channels, accumulated over 31/32 of the telemetry frame time (1.152, 0.144, or 0.018 s), were read out during successive telemetry frames. Thus, complete spectral analysis required eight frames. Although the detector axis was intended to point toward the sun, a malfunction in the OGO 3 attitude control system prevented this. Shortly before launch, it was determined that channel 1 failed to operate. Shortly after launch, it was found that counts in channels 4n+1 (n = 1, 2, 3, 4, 5, 6, 7) were incorrect (high). NSSDC has all the useful data that exist from this investigation.

------- OGO 3, BOHN----------

INVESTIGATION NAME- INTERPLANETARY DUST PARTICLES

NSSDC ID- 66-049A-21

INVESTIGATIVE PROGRAM
CODE EL-4, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY DUST

PERSONNEL

PI - J.L.	BOHN	TEMPLE U
OI - W.M.	ALEXANDER	BAYLOR U

BRIEF DESCRIPTION

The objective of this experiment was to measure over a long period of time the velocity and mass distributions of interplanetary dust particles with diameters on the order of 1 micrometer. The experiment extended the mass distribution curve out to the radiation pressure limit and measured the fluctuations in the velocity distribution, mass distribution, and spatial densities of micrometer-size dust particles. The instrumentation was very similar to that of the dust particle experiment flown on OGO 1 and consisted of a combination of acoustical and ionization sensors. The basic detector was a 2.54-cm tube containing three sensor elements. The first element was a thin film (1500 A), the second was a metallic disk to which a piezoelectric ceramic transducer was bonded, and the third was a metallic grid in front of the disk. Penetration of the front film by a micrometeoroid produced a plasma cloud that was detected and activated a 2-MHz clock. If the particle then impacted on the metallic disk, the impulse was sensed by the ceramic transducer. The ionization produced by this collision was detected by the grid, which in turn stopped the clock, providing measurement of the particle velocity. The pulse-height signal produced by the grid provided information on the kinetic energy and/or momentum of the particle. The total exposed area was 15 sq cm. The experiment incorporated automatic inflight continuous calibration that enabled a distinction to be made between events, noise, and normal signals. All events occurred at an altitude between 56,000 and 110,000 km. The data were obtained from both real-time and tape storage/playback modes. Only the real-time data, however, were considered reliable. Although micrometeoroid directionality was difficult to determine owing to the spin of OGO 3 and the low data sampling rate, good data were obtained from the front film counters and the grid over an extended period of time. Some further details regarding experiment design may be found in Bohn, J. L., "OGO-3 dust particle experiment: data reduction and analysis," Final Report, Temple University, Philadelphia, Pa., 1971 (TNF 809663). Data from this investigation no longer exist.

------- OGO 3, CLINE----------

INVESTIGATION NAME- POSITRON SEARCH AND GAMMA-RAY SPECTROMETER

NSSDC ID- 66-049A-04

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
HIGH ENERGY ASTROPHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL

PI - T.L.	CLINE	NASA-GSFC
OI - E.W.	HONES, JR.	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to determine whether low-energy (0- to 3-MeV) positrons are trapped temporarily or permanently in the Van Allen radiation region, and whether low-energy, solar-interplanetary positrons exist at the edge of the earth's magnetic field. It was also designed to detect gamma-ray bursts from the sun in the energy interval from 80 keV to 1.0 MeV. The arrangement was virtually identical to that flown on OGO 1, except that the photomultipliers used were of an improved variety. The experimental apparatus consisted of three cesium iodide (CsI) crystals surrounded by a plastic anti-coincidence shield. The entire unit's output was monitored by three photomultipliers. It was primarily designed to search for interplanetary positrons by measuring the spectra of single or paired X rays produced by the stopping of a positron. In another possible mode of data acquisition, single gamma rays were monitored in one of the CsI spectrometers, with 4-pi particle anticoincidence, which was virtually gamma-ray transparent above 80 keV. Once every 18.5 s, integral intensity measurements were made in each of the 16 energy levels equally spaced between 80 keV and 1 MeV, allowing for both temporal and spectral analysis of the data. Inflight calibration of the spectrometer was accomplished by monitoring the 511-keV annihilation line. Data sets are no longer available from this investigation.

------- OGO 3, EVANS----------

INVESTIGATION NAME- LOW ENERGY PROTON MEASUREMENT

NSSDC ID- 66-049A-07

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - D.S.	EVANS	NOAA-ERL
OI - L.R.	DAVIS(RETIRED)	NASA-GSFC

BRIEF DESCRIPTION

This experiment was designed to measure the intensity and energy spectrum of 5- to 100-keV protons. It employed channeltron detectors, cylindrical electrostatic analyzers, and a brook magnetic analyzer to reject electrons. It was designed to replace the Geiger counter portion of the cosmic ray isotopic abundance experiment (E-02) and utilized a power supply and data accumulators from experiment E-02. An unexpected and unexplained high background counting rate resulted in no useful data being obtained.

------- OGO 3, FRANK----------

INVESTIGATION NAME- LOW-ENERGY ELECTRONS AND PROTONS

NSSDC ID- 66-049A-08

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - L.A.	FRANK	U OF IOWA
OI - J.A.	VAN ALLEN	U OF IOWA

BRIEF DESCRIPTION

This experiment was designed to measure the differential energy spectra of protons and electrons over the energy range 50 eV to 49 keV (subdivided into 15 energy intervals) within and in the vicinity of the earth's magnetosphere. The instrumentation consisted of two cylindrical electrostatic analyzers (Low Energy Proton and Electron Differential Energy Analyzers or LEPEDEAs) and two Bendix continuous channel multipliers (channeltrons). The accumulation time per channel was about 1 s. Approximately 5 min were required to complete a scan of the entire energy range. After the spacecraft attitude control system failed on July 23, 1966, one of the LEPEDEAs was oriented parallel to the spacecraft spin axis, and the other was oriented perpendicular to the spin axis. (The spin period varied from about 91 to 122 s.) More details regarding experiment design may be found in Frank, L. A., "Low-energy proton and electron experiment for the Orbiting Geophysical Observatories B and E," Dept. of Physics and Astronomy, State Univ. of Iowa, Iowa City, Iowa, July 1965 (TRF B00609).

------- OGO 3, HADDOCK----------

INVESTIGATION NAME- RADIO ASTRONOMY

NSSDC ID- 66-049A-18

INVESTIGATIVE PROGRAM
CODE E2-7

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - F.T.	HADDOCK	U OF MICHIGAN

BRIEF DESCRIPTION

A sweep-frequency receiver measured radio noise of flux densities between 2.3E-9 and 1.0E-15 W/Hz-sq m. The observed bursts were attributed to a solar origin. Forty-five days after launch, a malfunction occurred in the sweeping trigger pulse, intermittently causing the sweep to change from a 4- to 2-MHz sweep once every 2 seconds to a 4- to 3-MHz sweep every second. By October 10, 1966, the experiment operated in the 1-s sweep mode (4 to 3 MHz) only. More details regarding experiment design may be found in Graedel, T. E., "Dynamic spectra of 4-2 MHz solar bursts: results from Orbiting Geophysical Observatory 3," Final Report, Part 1: Scientific; Ph.D. Thesis, University of Michigan, Ann Arbor, 1968 (TRF B03177). NSSDC has all the data that now exist from this investigation.

------- OGO 3, HELLIWELL----------

INVESTIGATION NAME- VLF NOISE AND PROPAGATION

NSSDC ID- 66-049A-17

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - R.A.	HELLIWELL	STANFORD U
OI - L.H.	RORDEN	DEVLCO INC

BRIEF DESCRIPTION

This experiment measured naturally occurring VLF noise phenomena within the satellite orbit region, such as terrestrial noise produced below 70 km, emissions from charged particles trapped in the earth's magnetic field, cosmic noise, and proton and helium whistlers. The instrumentation consisted of a loop antenna and preamplifier at the end of a long boom, and the receiver electronics package in the satellite main body. The receiver system provided a wide frequency coverage, from 0.2 to 100.0 kHz contiguous narrow-band measurements and from 0.015 to 12.5 kHz broadband measurements. It had a dynamic range of about 80 dB. The antenna bias capability was lost in July 1968, and for one month (August 1969) the spacecraft was shut down due to a power loss. Observations were made for a total of 27,810 h during the active spacecraft lifetime of about 3-1/2 years. The PI holds data sets in digital, microfilm, and photographic forms. More details regarding experiment design may be found in Ficklin, B. P., et al., "Instrumentation for the Stanford University / Stanford Research Institute VLF experiment (B-17) on the OGO-3 satellite," Supplemental Report, Stanford Research Inst., California, May 1967 (TRF B01265).

------- OGO 3, HEPPNER----------

INVESTIGATION NAME- MAGNETIC SURVEY USING TWO MAGNETOMETERS

NSSDC ID- 66-049A-11

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - J.P.	HEPPNER	NASA-GSFC
OI - N.G.	LEDLEY	NASA-GSFC
OI - R.M.	CAMPBELL(NLA)	NASA-GSFC
OI - T.L.	SKILLMAN(NLA)	NASA-GSFC
OI - M.	SUGIURA	NASA-GSFC

BRIEF DESCRIPTION

The primary objective of this experiment was to study the geomagnetic field and its interactions with the environment. The detector system consisted of a boom-mounted, triaxial, dual range, fluxgate magnetometer and two boom-mounted, dual cell, optically pumped, self-oscillating, rubidium vapor magnetometers. The triaxial fluxgate magnetometer provided simultaneous measurements of the three magnetic field vector components in two different ranges, plus or minus 30 nT and plus or minus 300 nT. The sampling rates, which were dependent on telemetry bit rate, for the 30-nT range were 1.7, 14, and 110 samples per second per axis. The sampling rates for the 300-nT range were 0.85, 7, and 55 samples per second per axis. The accuracy for the fluxgate magnetometer was plus or minus 2 nT in field intensities up to 30 nT and reached a maximum of 10 nT in field intensities of 300 nT (checked by means of inflight comparison with the rubidium magnetometer). The rubidium vapor magnetometers provided scalar measurements of the magnetic field magnitude. However, a triaxial coil system was built into the sphere surrounding the rubidium magnetometers to allow vector measurements. On command every 300 s, each coil applied a plus 10-nT field and then minus 10-nT field to the rubidium magnetometers. Resultant changes in the scalar field being measured made it possible to compute the field direction. This value was used to monitor the output of the fluxgate magnetometer as a check on zero drifts. The rubidium vapor magnetometers had an accuracy of plus or minus 0.1 nT. For relative changes in field magnitude the absolute accuracy for high fields, including errors due to spacecraft offsets, was within 2 nT. The instrument was not reliable for small fields (about 10 nT). The rubidium vapor magnetometer system had two outputs. The first output phase modulated the 40-kHz subcarrier on the OGO 3 special purpose transmitter. The range of this output was from 5 to 55.7 nT. The second output directly modulated the OGO 3 special-purpose transmitter. The range of this output was from 42.8 to 14,000 nT. The sampling rate of the special-purpose telemetry data was arbitrary. Usually a rate of 6.94 samples per second was used in ground data processing. The fluxgate and rubidium sensors returned nominal data until about July 23, 1966, when the spacecraft attitude control system failed, causing spacecraft spin-up. Fluxgate data taken after this date were of poor-to-useless quality due to the difficulty in despinning these data. The vector data from the rubidium instrument suffered from this same problem. However, the field magnitudes obtained by the rubidium magnetometers remained useful, with about 50% data coverage from July 1966 to August 1968. These data are held by the PI on microfilm.

------- OGO 3, KONRADI----------

INVESTIGATION NAME- TRAPPED RADIATION SCINTILLATION COUNTER

NSSDC ID- 66-049A-10

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - A.	KONRADI	NASA-JSC
OI - L.R.	DAVIS(RETIRED)	NASA-GSFC
OI - R.A.	HOFFMAN	NASA-GSFC
OI - J.M.	WILLIAMSON	NASA-GSFC

BRIEF DESCRIPTION

The objectives of this experiment were (1) to study the temporal and spatial variations of the trapped particle intensities, pitch angle distributions, and energy spectra of electrons (10 to 100 keV) and protons (100 to 1000 keV) and (2) to determine particle lifetimes, processes by which trapped particles are lost, and the sources and accelerating mechanisms of trapped particles. The experiment, located in OPEP 2, consisted of a filter wheel, wheel-stepping motor, phosphor scintillator, photomultiplier tube, electrometer, and count rate meter. The detector had two entrance apertures for particles, one aligned with the phototube axis and one at 90 deg to this axis. Both protons and electrons could enter the aligned opening and reach the phosphor. Only electrons could enter the 90-deg opening, scatter off a gold disk, and reach the phosphor. The counting rate with the aligned opening measured proton flux, and the current measured the total energy flux of electrons, protons, etc. The current with the 90-deg opening measured the electron energy flux. Different thickness

absorbers on the wheel provided spectral information. The experiment worked well until the absorber wheel stopped in January 1967. The NSSDC has all the useful data that now exist from this investigation.

------- OGO 3, MANGE----------

INVESTIGATION NAME- GEOCORONAL LYMAN-ALPHA SCATTERING

NSSDC ID- 66-049A-19

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL
PI - P.W. MANGE — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
This experiment was designed to measure the intensity of hydrogen Lyman-alpha radiation (1216 A) scattered by neutral hydrogen at 5 to 19 earth radii. This wavelength is the fundamental resonance line of neutral atomic hydrogen, and these intensity measurements, therefore, provided a measure of the density of neutral hydrogen in the hydrogen geocorona. The instrumentation consisted of four ion chambers mounted on the antiearth door of OGO 3. Each ion chamber was filled with nitric oxide gas and had lithium fluoride windows. The ion chambers were sensitive in the 1050- to 1350-A band. Data from this investigation no longer exist.

------- OGO 3, SAGALYN----------

INVESTIGATION NAME- SPHERICAL ION AND ELECTRON TRAP

NSSDC ID- 66-049A-13

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.C. SAGALYN — USAF GEOPHYS LAB
OI - M. SMIDDY — USAF GEOPHYS LAB

BRIEF DESCRIPTION
Two independent spherical electrostatic analyzers were used to measure the flux, energy distribution, temperature, and density of ions and electrons from perigee at 700 km up to spacecraft apogee. Electron and ion densities were measured in the range 1.0E0 to 1.0E6 per cc. The range of measurements of thermal ion and electron temperatures was from 700 to approximately 100,000 deg K. The data obtained were used to study the low-energy plasma properties of the magnetosphere during quiet and disturbed solar periods. Each analyzer, composed of a mesh ball surrounding a collector, was mounted on a boom that extended 2.4 m from the vehicle surface. The experiment had a basic cycle time of 25.6 min. Density, satellite potential, and differential energy distribution were measured repeatedly for approximately 13 min during a cycle. High-energy flux and energy distribution were measured during the remaining 13 min. Inflight calibrations were applied to the electrometers of both sensors once per cycle. The measurements were judged to be accurate to approximately 30%. The experiment performance and scientific results obtained during the first 3 months of operation were described in Sagalyn, R. C., and M. Smiddy, "Magnetosphere plasma properties during a period of rising solar activity -OGO-III," Space Research VIII, North-Holland Publishing Company, Amsterdam, 1968. The data from this investigation no longer exist.

------- OGO 3, SIMPSON----------

INVESTIGATION NAME- COSMIC-RAY SPECTRA AND FLUXES

NSSDC ID- 66-049A-03

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON — U OF CHICAGO
OI - C.Y. FAN — U OF ARIZONA
OI - P. MEYER — U OF CHICAGO

BRIEF DESCRIPTION
Three solid-state particle telescopes were used to measure the intensity and energy distribution of cosmic rays. A dE/dx vs E telescope (composition telescope) resolved the nuclear composition of cosmic rays in the energy range from 30 to 100 MeV/nucleon (charge resolution range through Z=26, energy per nucleon intervals approximately proportional to Z squared/A), a dE/dx vs range telescope (proton-alpha telescope) detected protons and alpha particles in the energy range from 1.6 to 33 MeV/nucleon, and a single-element, low-energy proton telescope (OPEP telescope) was primarily sensitive to protons in the energy range from 1.4 to 3.7 MeV. The composition and proton-alpha telescopes were oriented parallel to the spacecraft Z axis, whereas the OPEP telescope was oriented perpendicular to the Z axis. Pulse-height information was obtained from the composition telescope using one 256-channel and two 512-channel pulse-height analyzers. This allowed pulse-height analysis of particles in four energy intervals: for protons 5 to 11 MeV, 11 to 22 MeV, 22 to 103 MeV, and greater than 103 MeV. Pulse height information was sent back from the proton-alpha telescope using one 256-channel pulse-height analyzer. This allowed pulse-height analysis of particles in two energy ranges: for protons 1.6 to 8.6 MeV and 8.6 to 33 MeV. Count rate information was obtained from all three telescopes. The time resolution ranged from about one measurement per 0.02 s to about one measurement per 147 s depending on the counting mode and the telemetry bit rate. The unintended initial spin period of the spacecraft varied from about 91 to 122 s about the Z axis.

------- OGO 3, SMITH----------

INVESTIGATION NAME- TRIAXIAL SEARCH-COIL MAGNETOMETER

NSSDC ID- 66-049A-12

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - E.J. SMITH — NASA-JPL
OI - R.E. HOLZER — U OF CALIF, LA

BRIEF DESCRIPTION
In this experiment, magnetic field variations were measured triaxially from 0.01 to 800 Hz by a boom-mounted search coil magnetometer with high-permeability core. Two digitally sampled and one analog broadband channel mapped the vector wave data. The two digital channels covered frequencies from 0.01 to 0.6 Hz or 0.01 to 75 Hz, depending on telemetry rate. The analog channel, transmitted via the FM special-purpose telemetry, covered from 1 to 1000 Hz. Also included was a five-channel spectrum analyzer with center frequencies at 10, 32, 100, 320, and 800 Hz. These channels overlapped at the -12 dB points. The time required for a triaxial spectrum analysis varied with telemetry rate from 147 s to 18.4 s to 2.3 s for the 1, 8, and 64 kbs rates, respectively. The instrument performed throughout the operational life of the spacecraft, but the usefulness of the three broadband channels was greatly reduced by interference from the digital spectrum analyzer channels. More details regarding experiment design may be found in Frandsen, A. M. A., et al., "OGO search coil magnetometer experiments," IEEE Trans. on Geosci. Electron., v. GE-7, n. 2, pp. 61-74, April 1969.

------- OGO 3, TAYLOR, JR.----------

INVESTIGATION NAME- POSITIVE ION CONCENTRATION

NSSDC ID- 66-049A-15

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - H.A. TAYLOR, JR. — NASA-GSFC
OI - N.W. SPENCER — NASA-GSFC

BRIEF DESCRIPTION
This experiment was flown to learn more about the global nature of the thermal ions surrounding the earth. The experiment contained two ceramic Bennett RF mass spectrometers mounted in the orbital plane experiment package (OPEP). Each tube contained 17 grids, a collector, and an external guard ring. Voltages on the guard ring and on some of the grids were set at fixed or controlled negative dc voltage levels. When positive ions of proper mass and velocity were resonant with the rf voltage, passed the final positive grid and struck the collector, these impinging positive ions caused a current flow that was converted by an electrometer to a voltage directly proportional to the current. The resultant voltage was processed by the decade amplifier into analog data outputs for each tube, one output for each decade of collector current between 1.0E-14 and 1.0E-8 A. The low mass spectrometer measured ions with mass-to-charge ratios (M/Q) from 1 to 6 u with a resolution of 0.5 u. The high-mass spectrometer measured M/Q values from 7 to 45 u with a resolution of 1 in 20. A complete mass scan took 64 s. The instruments had a dynamic range from 5 ions per cc to 1.0E6 ions per cc. NSSDC has all the useful data that exist from this investigation.

------- OGO 3, WHIPPLE----------

INVESTIGATION NAME- PLANAR ION ELECTRON TRAP

NSSDC ID- 66-049A-14

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - E.C. WHIPPLE		U OF CALIF, SAN DIEGO
OI - W.E. TROY, JR.		US NAVAL RESEARCH LAB

BRIEF DESCRIPTION

This experiment was flown to obtain measurements needed for a description of the distributions of charged particles near thermal energy from the perigee height of 280 km to an apogee altitude of 122,000 km. Specifically, the density and energy distributions of ions and electrons were measured. The data also specified the magnitude and polarity of the spacecraft charge. The instrumentation consisted of a plasma detector and an electrometer, counted together on the OPEP and ancillary electronics that included logic and detection circuits. The plasma sensor contained three parallel circular grids and a collector. The aperture grid was 3.3 cm in diameter and the two interior grids were 7.3 cm in diameter. A gold-plated magnesium collector was mounted behind the grids. The detector shell provided a ground plane flush with the spacecraft skin. The experiment was operated in both low-resolution and high-resolution modes for electrons and ions. Depending on the mode of operation, electrons or ions having energies exceeding a specified energy level reached the collector. The average time to complete an observation in any one mode was 15 s. The collector current was measured with a vibrating reed electrometer which measured 1.0E-13 to 1.0E-6 A. Fewer data were obtained from this experiment than from other OGO 3 spacecraft experiments because the experiment operated on a reduced schedule to minimize interference with the triaxial search coil magnetometer experiment. Experiment description is available in greater detail in Whipple, E. C., Jr., J. W. Hirean, and R. Ross, "A satellite ion-electron collector -- experimental effects of grid transparency, photoemission, and secondary emission," ESSA Tech. Report No. ERL 99-AL 1, December 1968 (TRF B02033). Data sets no longer exist from this investigation.

-------- OGO 3, WINCKLER----------

INVESTIGATION NAME- ELECTRON SPECTROMETER

NSSDC ID- 66-049A-22

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - J.R. WINCKLER		U OF MINNESOTA
OI - R.L. ARNOLDY		U OF NEW HAMPSHIRE
OI - K.A. PFITZER		MCDONNELL-DOUGLAS CORP

BRIEF DESCRIPTION

The objective of this experiment was to measure the electron energy spectrum in the radiation belts for the range from 50 keV to 4 MeV. The experiment consisted of a five-channel electron spectrometer containing an analyzing electromagnet, a plastic scintillator crystal, a photomultiplier tube, and a pulse-height analyzer. The analyzing electromagnet was used to define the five energy channels. The pulse-height analyzer accepted only the pulses corresponding to the particular energy channel being sampled. In this way, the background due to bremsstrahlung and penetrating particles was reduced because only those background pulses in the narrow energy band being analyzed were counted. This system was mounted in a direction 10 deg off the spacecraft Z axis with a 15-deg acceptance cone. Since OGO 3 was spin stabilized about its Z axis shortly after launch, the acceptance cone was effectively increased to 35 deg. Directional measurements of electrons were made in five contiguous, logarithmically equispaced energy channels between 50 and 4000 keV. Background particles were counted by operating the spectrometer without the electromagnet. The system sampled the five spectral intervals and five background intervals every 2.304 s when the OGO 3 system was operating at 1 kbs. The sampling rate increased linearly with the telemetry bit rate. Data from each of the five channels were telemetered as one digital word. NSSDC has all the data that now exist from this investigation.

-------- OGO 3, WINCKLER----------

INVESTIGATION NAME- IONIZATION CHAMBER

NSSDC ID- 66-049A-23

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - J.R. WINCKLER		U OF MINNESOTA
OI - R.L. ARNOLDY		U OF NEW HAMPSHIRE
OI - K.A. PFITZER		MCDONNELL-DOUGLAS CORP

BRIEF DESCRIPTION

This experiment was designed to measure the ionization due to energetic particles. The instrumentation consisted of a 17.78-cm-diameter integrating ionization chamber with a resetting drift-type electrometer. The system was mounted on a 12-m boom extending from the main body of the spacecraft along the Y axis. The chamber responded to electrons and protons with energies greater than 0.6 and 12 MeV, respectively, and to X rays in the range 10 to 50 keV. The ionization current was measured by a vacuum tube electrometer whose output, as a function of time, was an automatically resetting sawtooth ramp voltage between 0 and 5 V. Data were telemetered in three independent forms through three digital words and one analog word, each of which was telemetered once every 1.152 s when the OGO 3 system was operating at 1 kbs. The sampling rate linearly increased with the telemetry rate. NSSDC has all the data that exist from this investigation except for data set 66-049A-23M. More details regarding experiment design may be found in Kane, S. R., "Application of an integrating type ionization chamber to measurements of radiation in space," Ph.D. Thesis, University of Minnesota, Minneapolis, September 1967 (TRF B01817).

-------- OGO 3, WOLFE----------

INVESTIGATION NAME- ELECTROSTATIC PLASMA ANALYSIS (PROTONS .1-20KEV).

NSSDC ID- 66-049A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
SPACE PLASMAS

PERSONNEL

PI - J.H. WOLFE		NASA-ARC

BRIEF DESCRIPTION

This experiment was designed to study the positive ion component of the solar wind plasma. Three quadrispherical electrostatic analyzers, two looking into the orbital plane and one solar oriented, were used to detect protons in 30 steps in the range 100 to 18,000 eV. Owing to the unintended spacecraft spin, little useful data were obtained. The data could be used to indicate the location of the magnetopause and bow shock. More details regarding experiment design may be found in Beck, C. W., II, et al., "Solar wind measurement techniques. Part 2: Solar plasma energy spectrometers," in Proceedings of 17th National Aerospace Electronics Conference, Dayton, Ohio, pp. 82-94, May 10-12, 1965 (TRF B01227-0000). The data from this investigation no longer exist.

-------- OGO 3, WOLFF----------

INVESTIGATION NAME- GEGENSCHEIN PHOTOMETRY

NSSDC ID- 66-049A-20

INVESTIGATIVE PROGRAM
CODE EZ-7

INVESTIGATION DISCIPLINE(S)
ZODIACAL LIGHT

PERSONNEL

PI - C.L. WOLFF(NLA)		NASA-GSFC
OI - K.L. HALLAM		NASA-GSFC
OI - S.P. WYATT		U OF ILLINOIS

BRIEF DESCRIPTION

This experiment was designed to measure the amount of solar light that is scattered by particles in space (dust, etc.) in the neighborhood of the antisolar point. This light contribution to the night sky is called the gegenschein. The data from the experiment were to be pictures of the sky at the antisolar point taken by a TV camera and telemetered to earth in the form of a matrix of pulse counts. The apparatus was similar, except in minor details, to that flown on OGO 1 (64-054A-11). The experimental package was a photoelectric camera which formed images of the sky in the visible and near-infrared regions of the spectrum. The data from this assembly were transmitted back to earth where they were reconstructed into pictures. Each of these pictures covered less than 100 square deg of the sky with a resolution on the order of 0.25 deg. The package consisted of (1) an f/1.5 objective lens, (2) a filter wheel containing three filters centered at 3000, 5000, and 7000 A with passbands of 500 A, (3) an S-20 cathode deposited on a thin, curved ultraviolet-transmitting glass, (4) an image dissector named the Star Tracker FW 143B made by the ITT Corporation, and (5) an electronic unit that amplified and counted the current pulses coming from the tube due to the individual photons arriving at the photocathode. The experiment failed to achieve its initial objective for the following reasons: (1) during the first 6 weeks of orbit the antisolar point was within the Milky Way and could not be detected, (2) after the first 6 weeks of orbit the spacecraft was spun up, making it impossible to take pictures, and (3) the signal-to-noise ratio was not so large as expected, due to scattered sunlight from other parts of the spacecraft. Despite the failure to achieve the original goals, an interesting study on the optical environment about the satellite was made. An upper limit to the brightness of the daytime sky near the satellite was obtained and shown to be thirty times less than the darkest daytime sky reported by an astronaut. However, it was pointed out that this background

light would interfere with observations of the solar corona and zodiacal light. These results were given by C. L. Wolff in the November 24, 1967, issue of "Science." Data from this investigation no longer exist.

********** OGO 5**********

SPACECRAFT COMMON NAME- OGO 5
ALTERNATE NAMES- OGO-E, EGO 5
EOGO 5, 03138
S 59

NSSDC ID- 68-014A

LAUNCH DATE- 03/04/68 WEIGHT- 611. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 03/04/68
ORBIT PERIOD- 3796. MIN INCLINATION- 31.1 DEG
PERIAPSIS- 272. KM ALT APOAPSIS- 148228. KM ALT

PERSONNEL
PM - W.E. SCULL(NLA) NASA-GSFC
PS - J.P. HEPPNER NASA-GSFC

BRIEF DESCRIPTION
The objectives of the OGO 5 spacecraft, the fifth of a series of six Orbiting Geophysical Observatories, were to conduct many diversified geophysical experiments for a better understanding of the earth as a planet and to develop and operate a standardized observatory-type spacecraft. OGO 5 consisted of a main body that was parallelepipedal in form, two solar panels, each with a solar-oriented experiment package (SOEP), and two orbital plane experiment packages (OPEP). One face of the main body was earth pointing (Z-axis), and the line connecting the two solar panels (X-axis) was perpendicular to the earth-sun-spacecraft plane. The solar panels were able to rotate about the X-axis. The OPEPs were mounted on and could rotate about an axis that was parallel to the Z-axis that was attached to the main body. At launch, the initial local time of apogee was 0944 h. OGO 5 carried 25 experiments, 17 of which were particle studies, and two were magnetic field studies. In addition, there was one each of the following types of experiments: radio astronomy, UV spectrum, Lyman-alpha, solar X ray, plasma waves, and electric field. Real-time data were transmitted at 1, 8, and 64 kbs depending on the distance from the spacecraft to the earth. Playback data were tape recorded at 1 kbs and transmitted at 64 kbs. Two wide-band transmitters, one feeding into an omnidirectional antenna and the other feeding into a directional antenna, were used to transmit data. A special purpose telemetry system, feeding into either antenna, was also used to transmit wide-band data in real time only. Tracking was accomplished by using radio beacons and a range and range-rate, S-band transponder. The spacecraft attitude control failed on August 6, 1971, after 41 months of normal operation. The spacecraft was placed in a standby status on October 8, 1971. Four experiments (Meyer, Blamont, Thomas, and Simpson) were reactivated for the period from June 1 to July 13, 1972, after which all operational support terminated. Spacecraft orbit parameters changed significantly over the spacecraft life. By April 1971, spacecraft perigee had increased to 26,400 km and inclination had increased to 54 deg.

------- OGO 5, AGGSON----------

INVESTIGATION NAME- ELECTRIC FIELD MEASUREMENT

NSSDC ID- 68-014A-26
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - T.L. AGGSON NASA-GSFC
OI - N.C. MAYNARD NASA-GSFC
OI - J.P. HEPPNER NASA-GSFC

BRIEF DESCRIPTION
This experiment was designed to observe electric fields in the outer regions of the magnetosphere, in the transition region, and in the solar wind. The experiment technique used was that of double floating probes, the probes being the plus and minus X-axis antennas. Electric field measurements were normal from launch until June 1968, when a preamplifier failed. From that time until December 1968 some useful ac field data were obtained. No data were obtained after December 1968. No useful data now exist from this experiment.

------- OGO 5, ANDERSON----------

INVESTIGATION NAME- ENERGETIC RADIATIONS FROM SOLAR FLARES

NSSDC ID- 68-014A-04
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
INTERPLANETARY PHYSICS
COSMIC RAYS

PERSONNEL
PI - K.A. ANDERSON U OF CALIF, BERKELEY
OI - S.R. KANE U OF CALIF, BERKELEY
OI - H. MARK NASA HEADQUARTERS

BRIEF DESCRIPTION
This experiment was designed to study the time dependence and the spectrum of energetic X rays, protons, alpha particles, and electrons emitted by the sun in association with solar flares. The experiment used three separate detecting systems. First, an omnidirectional sodium iodide (thallium activated) scintillation counter measured solar X rays in eight energy channels from 9.6 to 19.2, 19.2 to 32, 32 to 48, 48 to 64, 64 to 80, 80 to 104, 104 to 128, and greater than 128 keV. These data were sampled for 1.152 s once every 2.304 s. Second, a particle telescope composed of seven solid-state detectors (D1, D2, D3, D4, D5, D6, D7, and an anticoincidence shield) measured protons in the six energy channels from 7 to 20, 20 to 45, 45 to 80, 80 to 130, 130 to 200, and greater than 200 MeV. These channels had a nonseparable alpha particle component. The lowest energy channel was sampled once every 147 s, while all other channels were sampled once every 0.216 s. The third system consisted of a directional Geiger-Mueller tube magnetic spectrometer that measured electrons in two channels, 22 to 27 and 50 to 90 keV. These data were sampled once every 147 s. In order to reduce the possible contribution of magnetospheric radiation to the background counting rates of the detectors, the experiment only operated at spacecraft altitudes above 80,000 km; i.e., about 48 h or 67% of each orbit. The X-ray detector operated satisfactorily. The D7 detector element in the proton alpha telescope was found to be very noisy just prior to launch. It was therefore disabled electronically, hence no data were available for protons or alpha particles above 200 MeV/nucleon. The rest of this telescope performed normally. The electron spectrometer performed normally from launch until September 23, 1969, when the 22 to 27 keV channel became erratic and later stopped counting completely. The other electron channel performed normally. More details regarding experiment design may be found in Anderson, K. A., "Energetic radiations from solar flares," Final Report, Mar. 1968-Aug. 1971, University of California, Berkeley, August 1971 (TRF 814923). NSSDC has all the useful data that exist from this investigation.

------- OGO 5, BARTH----------

INVESTIGATION NAME- ULTRAVIOLET AIRGLOW

NSSDC ID- 68-014A-21
INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL
PI - C.A. BARTH U OF COLORADO
OI - G.E. THOMAS U OF COLORADO
OI - J.B. PEARCE SCIENCE APPL, INC
OI - E.F. MACKEY PACKARD-BELL CORP

BRIEF DESCRIPTION
The UV Photometer experiment on OGO 5 was flown to measure the distribution of terrestrial airglow in the hydrogen line at 1216 A and the atomic oxygen line at 1304 A. Three-axis earth stabilization of the main spacecraft body during normal operation permitted the photometer to view the airglow in the local zenith. The field of view was 3 deg at half maximum. Radiation measurements between 1050 and 1800 A were obtained with this two-channel photometer experiment. 'B' channel data (from 1250 to 1800 A) were used to remove the contribution of non-Lyman-alpha radiation from the 'A' channel (1050 to 1800 A) data. Each photometer had its own amplifier and high-voltage servo control system. The high voltage across the photomultiplier tube was logarithmically proportional to the UV source intensity. Inflight calibration checks and automatic drift corrections were incorporated in the flight experiment. A lens cover, mounted at the edge of the photometer aperture and operated on ground command, not only fulfilled the original design objective of providing increased protection of the photomultiplier surfaces from incident sunlight, but on several occasions it enabled the experimenter to identify spurious signals such as those received when the spacecraft passed through the radiation belt. Both channels had a nominal sensitivity of 10 rayleighs. In this experiment, the earth's 1216-A airglow was measured against the extraterrestrial background radiation. Therefore, the spatial variation of this Lyman-alpha background needed to be determined to obtain a description of the altitude distribution of the 1216-A emission. To achieve this survey of the background radiation, the OGO 5 spacecraft was put into a spinning mode when it was at distances beyond the geocoronal scattering region; i.e., at altitudes greater than 80,000 km.

Time intervals in which the spacecraft was spinning to obtain background measurements included September 12 to 14 and December 15 to 17, 1969; April 1 to 3 and September 1 to 6, 1970; and March 18 to 22, 1971. NSSDC has all the useful data that exist from this investigation.

------- OGO 5, BLAMONT----------

INVESTIGATION NAME- GEOCORONAL LYMAN-ALPHA MEASUREMENT

NSSDC ID- 68-014A-22

INVESTIGATIVE PROGRAM
CODE EE-6/CO-OP, SCIENCE

INVESTIGATION DISCIPLINE(S)
ATMOSPHERIC PHYSICS

PERSONNEL
PI - J.E. BLAMONT — CNRS-SA

BRIEF DESCRIPTION
The objective of this experiment was to determine the hydrogen (H) distribution in the geocorona and the geocorona's temperature from the measurements of the intensity and line shape of the emerging Lyman-alpha radiation. In addition, the experiment provided data on extraterrestrial sources of Lyman-alpha, such as interstellar wind, comets, planets, and numerous stars. The sensor was a photometer with a field of view (FOV) of 40 min of arc and a bandwidth of 60 A centered at Lyman-alpha (1216 A). Specifically, a plane mirror which could rotate about a horizontal axis was used to move the FOV in 1/2-deg steps. Leaving this mirror, the radiation struck a spherical mirror that focused it onto a diaphragm. Subsequently the image of the diaphragm was focused on the entrance window of a photomultiplier via a system consisting of an aspherical mirror and a plane grating. A hydrogen cell, filled with H gas at a pressure of 0.5 mm Hg and containing two magnesium fluoride windows, was placed in front of the photomultiplier and provided the measurement of line width. Pulses produced by the photomultiplier were counted for 0.432 s, a time span during which the plane mirror position did not change. The number of pulses in this time interval was a measurement of intensity. A shutter was closed every third minute to measure the dark current level of the photometer. The experiment was mounted in the OPEP. Instrument scanning caused the FOV axis to move inside a cone of 16-deg half-angle, with the local vertical as axis. Two modes of operation were possible and the choice was made by ground command. In the scanning mode the plane mirror would scan continuously; in the stepping mode this mirror would be placed in a specified position. More experiment details and some data appear in Bertaux, J. L., et al., "Interpretation of OGO 5 Lyman-alpha measurements in the upper geocorona," J. Geophys. Res., v. 78, n. 1, p. 80, 1973.

------- OGO 5, CLINE----------

INVESTIGATION NAME- STUDY OF PROTONS, ELECTRONS, POSITRONS, AND GAMMA RAYS

NSSDC ID- 68-014A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS
PARTICLES AND FIELDS
HIGH ENERGY ASTROPHYSICS
GAMMA-RAY ASTRONOMY

PERSONNEL
PI - T.L. CLINE — NASA-GSFC

BRIEF DESCRIPTION
This experiment was intended primarily to study solar and galactic electrons and positrons in the energy range from 2 to 9.5 MeV. It also measured solar electrons above several hundred keV, solar X rays above 80 keV, and medium-energy galactic and solar protons and alpha particles. The boom-mounted instrument was a telescope consisting of dE/dx and residual-E plastic scintillators surrounded by an anticoincidence plastic scintillator. Between the residual-E sensor and the anticoincidence sensor was a cesium iodide (CsI) scintillator that observed gamma rays associated with electrons and positrons stopping in the residual-E sensor. Analysis of the CsI scintillator output permitted differentiation between electrons and positrons. Pulse height analysis of the dE/dx and residual-E sensor outputs was performed, as was inflight calibration. The experiment functioned normally from launch to September 14, 1969, after which no further useful data were obtained. Data from this investigation no longer exist.

------- OGO 5, COLEMAN, JR.----------

INVESTIGATION NAME- PARTICLE WAVE STUDY

NSSDC ID- 68-014A-13

INVESTIGATIVE PROGRAM
CODE EE-6, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - P.J. COLEMAN, JR. — U OF CALIF, LA
OI - T.A. FARLEY — U OF CALIF, LA
OI - D.L. JUDGE — U OF SOUTHERN CALIF

BRIEF DESCRIPTION
This experiment consisted of six plastic scintillator detectors to measure the unidirectional flux of electrons in eight energy intervals between 50 keV and 1.2 MeV. Two of the detectors pointed in opposite directions while the remainder pointed in various other directions. The experiment was designed to determine the magnetohydrodynamic properties of the disturbances in the magnetosphere and beyond. It was conducted in conjunction with the UCLA Fluxgate Magnetometer experiment (68-014A-14). A thermal problem adversely affected the data quality for the second half of 1969. However, prior to that time and afterward, the experiment performed normally. By the nature of the instrument, these electron data were contaminated by an ambient energetic proton population. These data are useful for simultaneous studies of the variation of flux with pitch angle as determined by the UCLA Fluxgate Magnetometer.

------- OGO 5, COLEMAN, JR.----------

INVESTIGATION NAME- UCLA TRIAXIAL FLUXGATE MAGNETOMETER

NSSDC ID- 68-014A-14

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL
PI - P.J. COLEMAN, JR. — U OF CALIF, LA
OI - T.A. FARLEY — U OF CALIF, LA
OI - D.L. JUDGE — U OF SOUTHERN CALIF
OI - C.T. RUSSELL — U OF CALIF, LA

BRIEF DESCRIPTION
This experiment consisted of a triaxial fluxgate magnetometer mounted on a 6.1-m boom. The range of each sensor was minus to plus 16 nT, with 0.125-nT digitization windows. For a given ambient field, a known offset field could be applied to the sensor by a surrounding current-carrying coil. In this way, ambient fields of minus to plus 64,000 nT per axis were measurable with 0.125-nT digitization accuracy. The sensor output signals were passed through a filter that removed frequency components higher than the sampling frequency. The filtered signals were then sampled in real time at 0.67, 6.96, or 55.5 vector measurements per second, depending on the satellite bit rate, and at 0.67 vector measurements per second in the tape recorded channel. As the instrument shifted offset field ranges, the first six data points taken after the shift were affected in an understood, and therefore correctable, way. Also, the instrument housing was equipped with an electric heater that introduced a correctable offset field when it came on. Further, the zero offset on each sensor drifted slowly (on timescales compared to 6 hours) as a function of sensor electronic temperature. By using simultaneous fluxgate and rubidium magnetometer data from the GSFC experiment (68-014A-15), this offset correction could be determined within plus or minus 3 nT over most of the spacecraft orbit. Temperature plots are available from NSSDC for orbits 38 and thereafter. During low-temperature times, offsets were as much as 10 nT. More details regarding experiment design may be found in Benjamin, C. R., and R. C. Snare, "A magnetic field instrument for the OGO-E spacecraft," IEEE Trans. on Nucl. Sci., v. NS-13, n. 6, pp. 333-340, December 1966.

------- OGO 5, CROOK----------

INVESTIGATION NAME- PLASMA WAVE DETECTOR

NSSDC ID- 68-014A-24

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - G.M. CROOK — GAINES M. CROOK ASSOC
OI - F.L. SCARF — TRW SYSTEMS GROUP
OI - R.W. FREDERICKS — TRW SYSTEMS GROUP
OI - L.M. GREEN — TRW SYSTEMS GROUP

BRIEF DESCRIPTION
The plasma wave detector included five electric dipoles and three orthogonal search-coil magnetometers mounted on a 6.7-m boom. The three 0.5-m orthogonal electric dipoles were normal to the planes of the magnetometers. Each of the orthogonal components of the dipole and magnetometer was sampled simultaneously for 9.2 s through 15% bandpass filters in the following sequence: 0.56, 1.3, 3.0, 7.35, 14.5, 30.0, and 70.0 kHz for each dipole concurrent with 0.56, 0.56, 0.56, 0.56, 70.0, 70.0, and 70.0 kHz for each magnetometer. Repeat time for this sequence was 3.26 min. Onboard autocorrelation was performed between each electric field and magnetic field measurement. The remaining two boom-mounted dipoles were collinear, differing only in length. Each dipole was monitored through a 200-Hz 10% filter for 2 s once every 9.2 s. In addition to the digital data, 1- to 22-kHz electric field data

taken from one main dipole and yielding power spectrum information for that axis were continuously monitored by a special purpose analog telemetry system. Threshold sensitivity of these measurements was telemetered with the digital data. Intense emissions below 1 kHz and above 22 kHz may still have been detectable. The experiment operated normally, but much of the data returned after April 1968 were of poor quality due to a transmitter failure. More details regarding experiment design may be found in Crook, G. M., et al., "The OGO-5 plasma wave detector - instrumentation and in-flight operation," IEEE Trans. on Geosci. Electron., v. GE-7, n. 2, pp. 120-135, April 1969. NSSDC has all the useful data that exist from this investigation.

------- OGO 5, HADDOCK----------

INVESTIGATION NAME- 50 KHZ TO 3.5 MHZ SOLAR RADIO ASTRONOMY IN EIGHT STEPS

NSSDC ID- 68-014A-20

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - F.T.	HADDOCK	U OF MICHIGAN

BRIEF DESCRIPTION

This experiment, used primarily to observe Type-3 solar radio bursts, consisted of a 9.12-m monopole antenna and a step-frequency superheterodyne receiver tunable through the eight frequencies of 0.05, 0.10, 0.20, 0.35, 0.60, 0.90, 1.80, and 3.50 MHz in 9.2 s (1.152 s at each frequency, regardless of spacecraft telemetry rate). This experiment operated both during real-time coverage and during tape-recorded coverage. The experiment package was located in solar oriented experiment package (SOEP) number 1, with the monopole antenna oriented perpendicular to the earth-spacecraft-sun plane (+X direction). The receiver bandwidth was 10 kHz (6-dB points), and the intermediate frequency stage had an automatic gain control yielding a dynamic range of 44 dB. The output of the detector was filtered with a time constant of 0.21 s. A solid-state four-level noise generator was connected in place of the antenna for inflight calibration every 9.85 min (36.9 s were required for calibration). The receiver operated in either of two modes. During normal operation, the receiver was stepped through the eight frequencies. In a nonstepping mode, the receiver was locked on only one of the available frequency channels. The radiometer operated in the stepping mode except for the periods April 25 to June 18, 1968 (3.5 MHz), September 12 to 14, 1968 (0.6 MHz), and December 15 to 17, 1969 (0.6 MHz). When the receiver was in the stepping mode, the eight frequency steps constituted a subcycle of 9.2-s intervals. When the spacecraft was operating at the 1-kbs telemetry rate, three data samples were taken during each frequency step. These data samples were taken for intervals of 3.31 or 4.37 postdetector time constants. Once during a main cycle (64 subcycles of 9.83 min each), a calibration cycle (four subcycles of eight frequency steps each) was run. Both impulsive and nonimpulsive interference occurred, with the four lowest frequency channels usually being affected by some impulsive interference assumed because of other experiments onboard the spacecraft. Nonimpulsive interference, manifested as permanent noise levels higher than preflight receiver noise, occurred in the case of the 1.80- and 0.35-MHz channels. The system stability was checked approximately every 2 months from March 1968 through December 1969, and the output levels were found to be essentially constant, with a few percent variation. More details regarding experiment design may be found in Mac Rae, B. D., "Instrumentation for radio astronomy measurements aboard the OGO-5 spacecraft," Report, University of Michigan, Ann Arbor, September 20, 1968 (TRF 802270).

------- OGO 5, HEPPNER----------

INVESTIGATION NAME- MAGNETIC SURVEY USING TWO MAGNETOMETERS

NSSDC ID- 68-014A-15

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

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

PERSONNEL

PI - J.P.	HEPPNER	NASA-GSFC
OI - B.G.	LEDLEY	NASA-GSFC
OI - M.	SUGIURA	NASA-GSFC
OI - T.L.	SKILLMAN(NLA)	NASA-GSFC
OI - R.M.	CAMPBELL(NLA)	NASA-GSFC

BRIEF DESCRIPTION

The primary objective of this experiment was to study the geomagnetic field and its interactions with the environment. The detector system consisted of a triaxial fluxgate magnetometer and two dual-cell, optically pumped, self-oscillating, rubidium-87 vapor magnetometers. Both magnetometers were mounted on booms to minimize effects of spacecraft fields. The triaxial fluxgate magnetometer provided simultaneous measurements of the three magnetic field vector components in the range 0 to plus or minus 4000 nT (over a frequency range of 0 to 120 Hz). A 10-nT inflight calibration was applied on command as a check on sensitivity changes. The accuracy was plus or minus 1 nT (checked by means of inflight comparison with the rubidium magnetometers). The sampling rates were 1.7, 7, 55, and 111 samples per second per axis. The fluxgate magnetometer worked properly, with no degradation, throughout the active life of the spacecraft. The rubidium vapor magnetometers provided scalar measurements of the magnetic field magnitude. However, a triaxial coil system was built into the sphere surrounding the rubidium magnetometers to allow vector measurements to be made. On command every 295 s, each coil applied a +10-nT field, then a -10-nT field to the rubidium magnetometers. Resultant changes in the scalar field being measured made it possible to compute the field direction. This was used to monitor the output of the fluxgate magnetometer as a check on zero drifts. The rubidium vapor magnetometers had an absolute accuracy of plus or minus 0.5 nT. The magnetometer system had three outputs. The first output phase-modulated the 40-kHz subcarrier on the OGO 5 special purpose transmitter. The range of this output was 3 to 85.7 nT over the frequency range 20 to 600 Hz. The second output directly modulated the OGO special purpose transmitter. The range of this output was 42.8 to 14,000 nT over the frequency range 300 to 100,000 Hz. The third output consisted of mainframe digitized data. The range of this output was 3 to 50,000 nT over a frequency range of 20 to 350,000 Hz. The sampling rate of the mainframe rubidium data was 1.7 samples per second. The sampling rate of the special purpose telemetry data was arbitrary. Usually 6.94 samples per second were used in ground data processing. Six weeks after launch, the frequency counter failed, thereby causing loss of the mainframe digitized data output of the rubidium magnetometer system. The rubidium magnetometer system was operating whenever data from the special purpose telemetry were being recorded. However, this telemetry system was operated only 30% of the time. A problem that developed with time and had an effect on the quality of the rubidium data was a lamp oscillation of one of the two rubidium magnetometers. This led to turning off the malfunctioning rubidium magnetometer in April 1968. With this magnetometer off, the operation was normal but caused the rubidium system to have larger null zones. As a result, some of the data are either of lower quality or absent. By the nature of fluxgate magnetometers without flippers on non-spinning spacecraft, a 1-nT drift could be expected in one orbit. Thus, the accuracy of the fluxgate data after correction was at best 1.5 to 3 nT. More details regarding experiment design may be found in Ledley, B. G., "Magnetometers for space measurements over a wide range of field intensities," Revue de Physique Appliquee, v. 5, pp. 164-168, February 1970. NSSDC has all the data that exist from this investigation.

------- OGO 5, KREPLIN----------

INVESTIGATION NAME- SOLAR X-RAY EMISSIONS

NSSDC ID- 68-014A-23

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SOLAR PHYSICS

PERSONNEL

PI - R.W.	KREPLIN	US NAVAL RESEARCH LAB
OI - T.A.	CHUBB	US NAVAL RESEARCH LAB
OI - H.D.	FRIEDMAN(RETIRED)	US NAVAL RESEARCH LAB
OI - C.S.	BOWYER	U OF CALIF, BERKELEY

BRIEF DESCRIPTION

This experiment consisted of a proportional counter connected to an eight-channel pulse-height analyzer. The detector operated only at altitudes greater than 60,000 km within the spacecraft's highly eccentric orbit. The resulting data cover about three-quarters of each 2.6-day orbit. The detector package was continuously oriented toward the sun. The proportional counter was filled with a mixture of xenon (97%) and carbon dioxide (3%) at a pressure of 204 cm Hg. The window, with a diameter of 0.250 in. (0.635 cm), consisted of 10 mil (0.0254 cm) of beryllium overlaid with 1 mil (0.00254 cm) of aluminum. The pulse-height analyzer separated pulses from the proportional counter into eight energy channels, ranging initially from 2 to 20 keV. The energy levels of the eight channels changed continuously after launch, stabilizing at approximately 4 to 40 keV by July 1968. Inflight calibration was carried out twice during each orbit, using an iron-55 source mounted on a movable arm. The detector was provided with no means for rejecting particle counts. The beryllium-window particle thresholds were 170 keV for electrons and 5.5 MeV for protons. Nominal quiet-time background count rates were about one count per second due to penetrating cosmic rays. Occasional particle interference due to the outer Van Allen belt was observed, and the data are not usable during energetic solar proton events. At the slowest spacecraft bit rate (1 kbs), a complete eight-channel readout was obtained every 4.6 s, data having been accumulated for 2.295 s. These values were decreased proportionately for spacecraft telemetry rates of 8 and 64 kbs. NSSDC has all the useful data that exist from this investigation.

------- OGO 5, MEYER----------

INVESTIGATION NAME- COSMIC-RAY ELECTRONS

NSSDC ID- 68-014A-C9 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - P. MEYER U OF CHICAGO
OI - C.Y. FAN U OF ARIZONA
OI - J.J. L'HEUREUX U OF CHICAGO

BRIEF DESCRIPTION
This experiment measured the flux and energy spectrum of electrons with energies between 15 and 45 MeV, and fluxes of protons with energies between 90 and 110 MeV and 110 and 169 MeV. The detector used was a particle telescope composed of a scintillation counter, a gas Cerenkov counter, a solid state detector, and a cesium iodide scintillation counter surrounded by two plastic scintillators. The experiment was turned on only when the satellite's McIlwain parameter, L, was greater than 12. The experiment was fully operational when the spacecraft was put in a standby status on October 6, 1971. NSSDC has all the data that exist from this investigation. The experiment was reactivated from June 1 to July 13, 1972. More details regarding experiment design may be found in L'Heureux, J., C. Y. Fan, and P. Meyer, "The quiet-time spectra of cosmic ray electrons of energies between 10 and 200 MeV observed on OGO-5," Ap. J., v. 171, n. 2, pt.1, pp. 363-376, January 15, 1972.

------- OGO 5, OGILVIE----------

INVESTIGATION NAME- TRIAXIAL ELECTRON ANALYZER

NSSDC ID- 68-014A-11 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - K.W. OGILVIE NASA-GSFC
OI - T.D. WILKERSON U OF MARYLAND

BRIEF DESCRIPTION
In this experiment electrons were analyzed by three 127-deg electrostatic analyzers with channeltron detectors. They were mounted in fixed position with respect to the spacecraft body. Look directions of the mutually orthogonal detectors formed equal angles to the earth-satellite line, and always pointed away from the earth. Each analyzer was stepped simultaneously through 14 energy windows with center energies of 10, 25, 45, 80, 130, 210, 340, 550, 890, 1400, 2300, 3800, and 9900 eV every 23 s. Each window was sampled for 1.15 s, and the actual 14-step simultaneous sequence was completed in 18.85 s. Each detector had a 10-deg acceptance cone. A radioactive source was used to calibrate each instrument in flight, and cross-calibration was also achieved. The instrument was operated only on the outward bound portion of each orbit because of a spacecraft heat problem. Degradation of the channeltrons limited useful operation to only about 30 days, with increasingly poor data quality received toward the end of the operation period. Detector sensitivity started at about 1.35 particles per (sq cm s sr keV), and extended over 5 orders of magnitude. More details regarding experiment design may be found in Ling, D. L., and N. McIlwraith, "Plasma electron detector using an open electron multiplier," IEEE Trans. on Nucl. Sci., v. NS-13, n.1, pp. 511-514, February 1966.

------- OGO 5, SAGALYN----------

INVESTIGATION NAME- PLASMA TEMPERATURE, DENSITY AND FLUX

NSSDC ID- 68-014A-C2 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - R.C. SAGALYN USAF GEOPHYS LAB
OI - W. SMIDDY USAF GEOPHYS LAB

BRIEF DESCRIPTION
This experiment consisted of two spherical retarding potential probes, one each for electron and ion observations. They were mounted on 1-m booms extending along the Y-axis of the spacecraft, generally opposite the spacecraft velocity vector. There were 7.5-cm spherical mesh grids for both sensors, a second internal grid for one of the sensors, and a spherical collector about 3 cm in diameter. Five modes of operation provided current and voltage curves for each sensor, from these curves one could calculate density (1.0E0 to 1.0E6 particles/cc), temperature (7E2 to 1.0E5 deg K), and energy (25 to 2,000 keV) for both ions and electrons. Spacecraft potential, electron flux (3E5 to 5E11 electrons/sq cm-s), and proton flux (1.0E5 to 1.0E11 protons/sq cm-s) could also be measured. A failure in the experiment power supply 2 weeks after launch caused severe degradation and prevented the acquisition of useful data.

------- OGO 5, SERBU----------

INVESTIGATION NAME- LOW-ENERGY INTEGRAL SPECTRAL MEASUREMENT

NSSDC ID- 68-014A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - G.P. SERBU NASA-GSFC
OI - E.J. MAIER NASA-GSFC

BRIEF DESCRIPTION
A planar multi-grid sensor programmed as a retarding potential analyzer was used to observe the directional intensity of the electron and ion components of the low-energy plasma in interplanetary space and near earth. Spectra were obtained for both ions and electrons in the energy range from 0 to 500 eV. A complete spectrum was obtained every 16 or 128 s. The experiment worked continuously from launch until the spacecraft was turned off. The nature of the data set is such that time aliasing could prove to be a limitation. However, hourly averages from this experiment published in J. Geophys. Res., v. 75, pp. 6102-6113, November 1970, do agree with other measurements from the spacecraft. Data from this investigation no longer exist.

------- OGO 5, SHARP----------

INVESTIGATION NAME- LIGHT ION MASS MAGNETIC SPECTROMETER

NSSDC ID- 68-014A-18 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
PARTICLES AND FIELDS

PERSONNEL
PI - G.W. SHARP NASA HEADQUARTERS
OI - T.J. CROWTHER(NLA) LOCKHEED PALO ALTO
OI - K.K. HARRIS LOCKHEED PALO ALTO

BRIEF DESCRIPTION
This experiment was designed to determine the concentration of light ion species in the topside ionosphere and exosphere and to measure these concentrations throughout the plasmasphere. The experiment was also designed to monitor the locations of the plasmapause, magnetopause, and bow shock. The instrument consisted of an automatic multiranged magnetic-focus ion mass spectrometer. The instrument was capable of measuring singly ionized atomic oxygen, hydrogen, and helium concentrations. A complete measurement of these concentrations plus a calibration was completed in 4.6 s. The accuracy of the measured data was estimated to be 10%. The instrument was mounted on the spacecraft so that the velocity vector was essentially normal to the instrument aperture. The instrument acquired useful data from launch until May 31, 1969. In early July 1967 the instrument was turned off due to degradation of the experiment sensing element. More details regarding experiment design may be found in Harris, K. K., and G. W. Sharp, "OGO-5 ion spectrometer," IEEE Trans. on Geosci. Electron., v. GE-7, n. 2, pp. 93-98, April 1969. NSSDC has the one data set generated from this investigation.

------- OGO 5, SIMPSON----------

INVESTIGATION NAME- LOW-ENERGY HEAVY COSMIC-RAY PARTICLES

NSSDC ID- 68-014A-27 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL
PI - J.A. SIMPSON U OF CHICAGO

BRIEF DESCRIPTION
This experiment was designed to detect particles in the energy range 2 to 50 MeV/nucleon and to accomplish the following: (1) examine the shape of the differential energy spectrum, (2) extend the measurement of relative abundance of the elements up through iron, (3) search for nuclei of very high charge (Z equals 5 to 50), and (4) extend observations of very heavy nuclei from solar flares to 2 MeV/nucleon. The telescope (three collinear sensors surrounded by an anticoincidence cup) was used in conjunction with a 512-channel and a 1024-channel analyzer. The experiment was considered operational and transmitting data when the spacecraft was turned off in October 1971. The experiment was reactivated between June 1 and July 13, 1972. For further details, see Mogro-Campero, A., and J. A. Simpson, Ap. J., v. 200, p. 776, 1975.

-------- OGO 5, SMITH----------

INVESTIGATION NAME- TRIAXIAL SEARCH-COIL MAGNETOMETER

NSSDC ID- 68-014A-16

INVESTIGATIVE PROGRAM
CODE EE-B, SCIENCE

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

PERSONNEL

PI - E.J.	SMITH	NASA-JPL
OI - R.E.	HOLZER	U OF CALIF, LA

BRIEF DESCRIPTION

The UCLA-JPL Search Coil Magnetometer sampled ambient field fluctuations from 0.01 to 1000 Hz in two modes. The triaxial search coils mounted at the end of a 6.1-m boom provided triaxial waveform data in three bands, from 0.03 to 0.1 Hz, 0.1 to 0.3 Hz, and 0.3 Hz to cutoff, which depended on sampling rate. For bit rates of 1, 8, or 64 kbs, the cutoff was 0.9, 7, or 55 Hz, respectively. Signals from the triaxial search coils were also sampled by seven comb filters with center frequencies of 10, 22, 47, 100, 216, 467, and 1000 Hz. The time required for a complete triaxial spectrum analysis (21 data values) was 8.06, 1.01, or 0.126 s, also depending on the satellite bit rate. Interference occurred between the seven-channel spectrum analyzer and the broadband channels, seriously degrading the broadband signals throughout the operational life of the experiment. The experiment operated adequately throughout the mission. More details regarding experiment design may be found in Frandsen, A. M. A., et al., "OGO search coil magnetometer experiments," IEEE Trans. on Geosci. Electron., v. GE-7, n. 2, pp. 61-74, April 1969.

-------- OGO 5, SNYDER----------

INVESTIGATION NAME- PLASMA SPECTROMETER

NSSDC ID- 68-014A-17

INVESTIGATIVE PROGRAM
CODE EE-B, SCIENCE

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL

PI - C.W.	SNYDER	NASA-JPL
OI - M.M.	NEUGEBAUER	NASA-JPL
OI - J.L.	LAWRENCE, JR.	NASA-JPL

BRIEF DESCRIPTION

Two pairs of detectors, one mounted on a solar panel always facing the sun and one mounted on the spacecraft body always facing radially away from the earth, were used to measure the ambient plasma in the vicinity of the spacecraft. Positive ions and electrons could be measured by the 120-deg curved-plate electrostatic analyzers, with a 5-deg conical field of view in 128 energy-per-charge channels logarithmically equispaced from 2.54 to 16,900 eV. Positive ions were also measured by Faraday cups with a 20-deg field of view in one energy-per-charge channel from 100 eV to 11,000 eV. Each of the two Faraday cup-electrostatic analyzer combinations was capable of making two plasma flux and angle of flow measurements, and one proton density, alpha particle density, bulk speed, and temperature measurement about every 10 s at 8 kbs. During almost all the time the spacecraft was in the solar wind, only the solar-panel-mounted sensor pair was able to make the usual solar wind plasma parameter measurements. This sensor pair was capable of being operated in three different measurement modes for positive ions and for electrons. However, the one used most often was for positive ions and was capable of the time resolution described above. Electrons were measured only occasionally. The electrostatic analyzers suffered data degradation from sensitivity scale switching which caused the loss of from 1 to 8 energy channels and from photoelectrons leaking into the detector through a slit in the electronics-detection assembly, which resulted in degradation of up to 20 channels, centered about 348 eV, corresponding to solar wind velocities from 320 to 400 km/s. Scale-switching transients affected the alpha data most often. Photoelectron contamination affected the location of the proton peak flux most often. Due to these effects, errors appeared in the calculated parameters of temperature, bulk speed, and density, but not angle flow and plasma flux. Plasma parameters were calculated by doing an iterative calculation involving correction of the Faraday cup density and angle by the proton bulk speed, and correction of the curved-plate-determined bulk speed by the Faraday-cup-determined angle of flow. Plasma parameters produced by production processing from this instrument were generated by doing a convected isotropic Boltzmann fit to the data points using Hermite polynomials. Results agreed favorably with least-square-fitted calculations. It should be added that the sources of error discussed here were observed in solar wind measurements. More details regarding experiment design may be found in Graham, R. A., and F. E. Vescelus, "OGO-E plasma spectrometer," Instrument Society of America, 13th National Aerospace Instrument Symposium Proceedings, San Diego, Calif., pp. 111-153, June 13-16, 1967 (TRF 003122). NSSDC has all the useful data that now exist from this investigation.

-------- OGO 5, VAN DE HULST----------

INVESTIGATION NAME- MEASUREMENT OF THE ABSOLUTE FLUX AND ENERGY SPECTRUM OF ELECTRONS

NSSDC ID- 68-014A-12

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

INVESTIGATION DISCIPLINE(S)
COSMIC RAYS

PERSONNEL

PI - H.C.	VAN DE HULST	HUYGENS LAB
OI - D.	TANKA	NETHERLANDS INSTITUTE
OI - M.N.	LIND	NETHERLANDS INSTITUTE

BRIEF DESCRIPTION

This experiment measured the absolute flux and energy spectrum of energetic galactic cosmic ray electrons (0.5 to 10 GeV) which are believed to be the source of synchrotron radiation which causes the nonthermal galactic radio noise. Protons (20 to 100 GeV) and gamma rays above 500 MeV were also measured. The instrument consisted of three collinear scintillators separated by lead and aluminum slabs, respectively, and placed on top of a high density lead-glass Cerenkov counter. A surrounding plastic scintillator anticoincidence sensor was also used. The experiment functioned normally throughout the mission. See Rogowski, L. K., et al., IEEE Trans. on Nucl. Sci., n. 1, p. 352, 1969, for further details.

-------- OGO 5, WEST, JR.----------

INVESTIGATION NAME- ELECTRON AND PROTON SPECTROMETER

NSSDC ID- 68-014A-06

INVESTIGATIVE PROGRAM
CODE EE-B, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI - H.I.	WEST, JR.	LAWRENCE LIVERMORE LAB
OI - R.G.	D'ARCY, JR.(NLA)	BARTOL RESEARCH FOUND
OI - L.	MANN	LAWRENCE LIVERMORE LAB

BRIEF DESCRIPTION

This experiment was designed to measure the spectra, fluxes, and directional properties of electrons, protons, and alpha particles. Electrons were sensed by solid-state detectors within each of two permanent-magnet spectrometers. These spectrometers measured electrons in narrow energy windows centered at 79, 158, 266, 479, 822, 1530, and 2820 keV. Protons in six contiguous energy intervals (at 0.23, 0.57, 1.35, 5.6, 14, and 43 MeV), alpha particles in three contiguous intervals (at 5.9, 22.7, and 56.4 MeV), and electrons above 4 MeV were separately measured by a four-sensor, solid-state telescope. This telescope was physically located inside the larger of the two electron spectrometer magnets and in line with the spectrometer entrance aperture. Protons between 100 and 150 keV were also measured by a single solid-state detector adjacent to the telescope. The instruments were mounted on OPEP 2 and had their apertures looking perpendicular to the radius vector from the earth. OPEP 2 was rotated back and forth about this radius vector through 230 deg at 3 deg/s, thus permitting the determination of particle directional distributions. For a given species-energy channel, detector accumulations were telemetered once each 4, 8, or 16 main frames (one main frame = 1.152, 0.144, or 0.018 s for telemetry rates of 1, 8, or 64 kbs) depending on the channel. The experiment worked normally as long as data were telemetered from OGO 5. Thus, nearly 100% coverage was obtained between March 1968 and August 1971. For further details, see West et al., J. Geophys. Res., v. 78, p. 1064, 1973.

********** PROGNOZ 3**********

SPACECRAFT COMMON NAME- PROGNOZ 3
ALTERNATE NAMES- 6369

NSSDC ID- 73-089A

LAUNCH DATE- 02/15/73 WEIGHT- KG
LAUNCH SITE- TYURATAM (BAIKONUR COSMODROME), U.S.S.R.
LAUNCH VEHICLE- A-2-E

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

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/16/73
ORBIT PERIOD- 5783. MIN	INCLINATION- 65. DEG
PERIAPSIS- 590. KM ALT	APOAPSIS- 200000. KM ALT

PERSONNEL

PM -	UNKNOWN	UNKNOWN
PS -	UNKNOWN	UNKNOWN

BRIEF DESCRIPTION
The spacecraft carried instruments to measure solar X rays and gamma rays, plasma, and energetic particles. The complete payload description was not provided.

-------- PROGNOZ 3, LOGACHEV----------

INVESTIGATION NAME- ENERGETIC PARTICLE DETECTORS

NSSDC ID- 73-009A-C1

INVESTIGATIVE PROGRAM
SCIENCE

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

PERSONNEL
PI - YU. I.LOGACHEV MOSCOW STATE U

BRIEF DESCRIPTION
This investigation utilized two semiconductor silicon detectors and two gas counters/plastic scintillators to measure energetic electron and proton fluxes perpendicular to the spin axis. The silicon detectors had sensitive layers 50 micrometers and 1.8 mm thick, and aluminum foil windows of 5 micrometers and 0.81 mm. The effective proton energy ranges were 1 to 5 and 14 to 30 MeV. Alpha particles and heavier nuclei which deposited sufficient energy in the crystals were also counted. Electron efficiency was very low (1E-4) and the cosmic-ray background rate for multiply charged nuclei was small (about 1E-2 counts/s). Therefore, minor increases in fluxes of solar origin could be observed. The fields of view were cones of approximately 60-deg full-angle, and the geometric factors were approximately 0.15 sq cm-sr. Protons of energy above 40 MeV and electrons above 2.5 MeV were detected by the plastic scintillators surrounding the gas counters. The flux of electrons with energies between 40 and 500 keV was determined from the difference of counting rates of two type SUI-9 gas counters, one of which had a magnetic filter in front of the window which deflected electrons of energy below 500 keV. Electrons of energy above 40 keV, and protons of energy above 0.8 MeV could penetrate the counter windows. The background counting rate was reduced by the use of the anti-coincidence scintillators surrounding the counters. The minimum electron flux detectable was 1 electron/(sq cm sr s).

********** S-CUBED A**********

SPACECRAFT COMMON NAME- S-CUBED A
ALTERNATE NAMES- SSS-A, EXPLORER 45
C5598

NSSDC ID- 71-096A

LAUNCH DATE- 11/15/71 WEIGHT- 114. KG
LAUNCH SITE- SAN MARCO PLATFORM, OFF COAST OF KENYA
LAUNCH VEHICLE- SCOUT

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSSA

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 11/16/71
ORBIT PERIOD- 469.3 MIN INCLINATION- 3.5 DEG
PERIAPSIS- 224. KM ALT APOAPSIS- 27031. KM ALT

PERSONNEL
PM - G.W. LONGANECKER NASA-GSFC
PS - R.A. HOFFMAN NASA-GSFC

BRIEF DESCRIPTION
Explorer 45 was designe to perform a wide variety of investigations within the magnetosphere with regards to particle fluxes, electric fields, and magnetic fields. Its primary scientific objectives were (1) to study the characteristics and origin of the earth's ring current and development of the main-phase magnetic storms, and (2) to study the relation between magnetic storms, substorms, and the acceleration of charged particles within the inner magnetosphere. To determine the major wave-particle interaction mechanisms, directional measurements of protons, electrons, and alpha particles were made over a wide energy range, and dc and ac electric and magnetic fields were measured. Explorer 45 had the capability for complete inflight control of the data format through the use of an onboard set of stored program instructions. These instructions governed the collection of data and were reprogrammable via ground command. The command system handled 80 commands for controlling the spacecraft and experiment functions, as well as for flight program loads for the data processing system. The antenna system consisted of four dipole antennas spaced 90 deg apart on the surface of the spacecraft cover. The satellite contained two transmitters, one for digital (PCM) data at 446 bps, and the other for either the digital data or wideband analog data from 30 Hz to 10 kHz from the ac electric field probes and from one search coil sensor. The satellite power system consisted of a rechargeable battery and an array of solar cells. The spin rate was about 7 rpm, and the spin axis lay in the spacecraft orbital plane which was approximately the same as the earth's equatorial plane. The initial local time of apogee was about 21.8 h and the line of apsides moved around toward the sun at an initial rate of 12 deg per month. The satellite was operationally turned off on September 30, 1974, after approximately 3 years of successful and productive operation. A coordinated series of papers describing the satellite and the experiments was contained in J. Geophys. Res., v. 78, n. 22, August 1973.

-------- S-CUBED A, CAHILL, JR.----------

INVESTIGATION NAME- FLUXGATE MAGNETOMETERS

NSSDC ID- 71-096A-04

INVESTIGATIVE PROGRAM
CODE EE-6, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.J. CAHILL, JR. U OF MINNESOTA

BRIEF DESCRIPTION
This experiment was designed to measure the vector magnetic field and fluctuations over the spacecraft's orbit. This set of magnetometers consisted of a triaxial fluxgate system. These, along with a commandable flipper mechanism to check zero levels, were housed in the sphere at the end of the single boom extending 76 cm along the spin axis. This system measured the vector magnetic field from dc to 10 Hz with a sensitivity of less than 5 nT. The magnetic field was sampled 30 times each second. The experiment functioned normally until the latter part of March 1973 when a switch in the spacecraft analog multiplexer began to fail. No useful data were obtained after that time.

-------- S-CUBED A, CAHILL, JR.----------

INVESTIGATION NAME- SEARCH COIL MAGNETOMETER

NSSDC ID- 71-096A-05

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - L.J. CAHILL, JR. U OF MINNESOTA

BRIEF DESCRIPTION
This experiment consisted of two perpendicular search coil magnetometers, each mounted on a 61-cm radial boom. The plane of one magnetometer was perpendicular to the spacecraft spin axis, and the plane of the other was parallel to the spacecraft spin axis. This system measured magnetic fluctuations between 1 and 3000 Hz. The search coil outputs were routed to sets of filters, each of which was nominally sampled once each second. The experiment functioned normally until the latter part of March 1973 when a switch in the spacecraft analog multiplexer (which affects analog to digital conversion) began to fail. After that time, the only reliable data were analog broad-band data.

-------- S-CUBED A, FRITZ----------

INVESTIGATION NAME- SOLID-STATE PROTON-ALPHA PARTICLE TELESCOPE

NSSDC ID- 71-096A-02

INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - T.A. FRITZ NOAA-ERL

BRIEF DESCRIPTION
This experiment contained two telescopes, each consisting of two surface barrier solid-state silicon detector elements. The low-energy range telescope had detectors of thicknesses 100 and 300 micrometers, and was mounted behind a 2.2-kG broom magnet to sweep out electrons with energies less than 300 keV. This telescope measured the flux of protons in six channels covering the energy range 24.3 to 300 keV. The heavy ion telescope had detectors of thicknesses 3.4 and 100 micrometers. This telescope uniquely identified the presence of protons, alpha particles (Z=2), and two groups of heavier ions, (Li,Be,B) and (C,N,O), plus ions with Z>=9. The heavy ion telescope measured proton fluxes in six channels covering the energy range 365 to 872 keV, and the fluxes of alpha particles in the energy ranges 1.16 to 1.74 keV and 1.74 to 3.15 keV. It measured the fluxes of Li, Be, and B ions in the ranges 3.6 to 7.1 MeV, 6.1 to 9.7 MeV, and 8.7 to 12.2 MeV, respectively, and the fluxes of C, N, and O ions in the ranges 12.1 to 15.7 MeV, 15.6 to 19.2 MeV, and 19.1 to 22.7 MeV, respectively. And it measured the flux of Z>=9 ions with energies > 20 MeV. In addition, electrons of energy greater than 200 keV were detected via the coincidence mode of the low-energy range telescope. Both telescopes were mounted at 90 deg to the satellite spin axis, and had full conical viewing angles of about 11 deg. NSSDC has all the data from this investigation, except the uncondensed tapes for the period from launch to May 1973. Further details regarding experiment parameters may be

found in Longanecker, G. W. and R. A. Hoffman, "S-cubed-A spacecraft and experiment description," J. Geophys. Res., v. 78, n. 22, p.4711, August 1973, and in Fritz, T. A., "The SSS Solid State Proton Experiment, Part I: design, operation and calibrations" (TRF B33771), and in McKinnon, J. A., and T. A. Fritz, "SSS Solid State Proton Experiment, Part II: mean energy of a finite energy passband," NOAA Technical Memorandum ERL SEL-44, Space Environment Laboratory, Boulder, Colorado, April 1976 (TRF B33795).

------- S-CUBED A, GURNETT----------

INVESTIGATION NAME- AC ELECTRIC FIELD MEASUREMENT

NSSDC ID- 71-096A-07 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	D.A. GURNETT	U OF IOWA
OI -	N.C. MAYNARD	NASA-GSFC

BRIEF DESCRIPTION
The electric dipole antenna consisted of two boom-mounted graphite coated spheres, 14 cm in diameter, with a center-to-center separation of 5.08 m. Each sphere was connected to a high-input-impedance (capacitante approximately equal to 10 pF, resistance approximately equal to 50 megohms), urity-gain preamplifier mounted on the boom about halfway between the center of the sphere and the center of the spacecraft. The axis of the antenna was perpendicular to the spacecraft spin axis. The electronics for the electric field experiment consisted of a step-frequency analyzer and a wideband receiver. The spectrum analyzer had fifteen narrowband frequency channels with center frequencies logarithmically spaced from 35 Hz to 100 kHz and one wideband frequency channel with a bandpass of about 100 Hz to 10 kHz. The four highest frequency narrowband filters of the step frequency analyzer had bandwidths of plus or minus 7.5% of their center frequencies and the remaining narrowband filters had bandwidths of plus or minus 15.0% of their center frequencies. The filter outputs were sequentially switched into an 80 dB logarithmic detector with a measurement sensitivity of 10 microvolts/m. The wideband receiver was an automatic gain control receiver with a bandwidth from 100 Hz to 10 kHz. The output of the wideband receiver modulated a special purpose telemetry transmitter. The wideband data was recorded on the ground and then processed by a spectrum analyzer to produce high-resolution frequency-time spectrograms. The wideband system was normally operated one orbit out of three, but it could be operated continuously for special periods.

------- S-CUBED A, HOFFMAN----------

INVESTIGATION NAME- CHANNEL ELECTRON MULTIPLIERS WITH ELECTROSTATIC ANALYZERS

NSSDC ID- 71-096A-01 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	R.A. HOFFMAN	NASA-GSFC
OI -	D.J. WILLIAMS	APPLIED PHYSICS LAB
OI -	J.F. ARENS	NASA-GSFC
OI -	L.R. DAVIS(RETIRED)	NASA-GSFC
OI -	D.S. EVANS	NOAA-ERL
OI -	A. KONRADI	NASA-JSC
OI -	J.H. TRAINOR	NASA-GSFC
OI -	J.M. WILLIAMSON	NASA-GSFC

BRIEF DESCRIPTION
This experiment used cylindrical curved-plate electrostatic analyzers in conjunction with channel electron multipliers to study ion and electron directional intensities in 8 or 16 contiguous energy intervals in the energy range 800 eV to 25 keV. Under normal operation, the voltage steps were synchronized to either the half roll or full roll of the satellite. Dual detector systems were used to extend the dynamic range of the instrument. A complete set of measurements was obtained every 64 s. This period was reprogrammable. There were two electrostatic analyzers which looked along the spin axis. Both were capable of measuring ions or electrons as selected by ground command. One measured particles at 2 keV, the other at 5 keV. NSSDC has all the useful data that exist from this investigation.

------- S-CUBED A, MAYNARD----------

INVESTIGATION NAME- DC ELECTRIC FIELD MEASUREMENT

NSSDC ID- 71-096A-06 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	N.C. MAYNARD	NASA-GSFC
OI -	D.A. GURNETT	U OF IOWA

BRIEF DESCRIPTION
The electric field antenna consisted of two 13.97-cm-diameter metal spheres mounted on the ends of two booms with a 5.08-m separation. Determination of the potential difference between the spheres yielded electric fields with a sensitivity of 0.1 mV/m. The rotation of the spacecraft allowed a two-component dc measurement to be made. Over most of the orbit the dc measurements were contaminated by spacecraft photosheath-induced potentials and should not be used for determination of dc electric fields. A calibration plate on the spacecraft was used to change the spacecraft potential, thus checking on sheath overlap errors. In addition to the dc measurement, four rms spectrometer channels and a broad-band channel sampled low-frequency variations. The rms spectrometer channels sampled low-frequency variations from 0.3 to 1, 1 to 3, 3 to 10, and 10 to 30 Hz. About 1300 orbits of data were obtained, covering magnetic local times from 0800 to 2300 h through the noon sector. The instrument was used to locate the plasmapause because its amplifiers became saturated by the fields within the spacecraft photosheath when the electron density was below about 60 per cc. About 900 measurements were obtained of the plasmapause boundary throughout the useful lifetime of the instrument.

------- S-CUBED A, WILLIAMS----------

INVESTIGATION NAME- SOLID-STATE DETECTORS

NSSDC ID- 71-096A-03 INVESTIGATIVE PROGRAM
CODE EE-8, SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL

PI -	D.J. WILLIAMS	APPLIED PHYSICS LAB

BRIEF DESCRIPTION
The solid-state electron detector was a magnetic spectrometer with an 800-G magnet, and four 300-micrometer, 0.25-sq cm, rectangular, surface barrier, solid-state detectors. Electron intensities were measured in the energy ranges 35 to 70 keV, 75 to 125 keV, 120 to 240 keV, and 240 to 560 keV. After March 1973, due to a failure in the spacecraft analog multiplexer, analog data were not available and the actual energy levels could not be determined without special effort. NSSDC has all the reduced data from this investigation. Some further details regarding the experiment parameters may be found in Longanecker, G. W., and R. A. Hoffman, "S-cubed-A spacecraft and experiment description," J. Geophys. Res., v. 78, n. 22, pp. 4711-4717, August 1973, and in Barfield, J. N., J. L. Burch, and D. J. Williams, "Substorm associated reconfiguration of the dusk side equatorial magnetosphere - a possible mechanism for isolated plasma regions," J. Geophys. Res., v. 80, n. 1, pp. 47-55, January 1975.

********** 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
SPACE TEST PROGRAM/CO-OP

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, 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 diametically 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 distribution 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, 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 16 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 (SC6) 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, LEDLEY----------

INVESTIGATION NAME- MAGNETIC FIELD MONITOR

NSSDC ID- 79-007A-08

INVESTIGATIVE PROGRAM
SPACE TEST PROGRAM/CO-OP

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, 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----------

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 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.

********** TELSTAR 1**********

SPACECRAFT COMMON NAME- TELSTAR 1
ALTERNATE NAMES- 1962 ALPHA EPSILON 1, A 40
00340

NSSDC ID- 62-02VA

LAUNCH DATE- 07/10/62 WEIGHT- 171. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES AT+T-BTL

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/10/62
ORBIT PERIOD- 157.7 MIN INCLINATION- 44.8 DEG
PERIAPSIS- 952. KM ALT APOAPSIS- 5632. KM ALT

PERSONNEL
PM - C.P. SMITH, JR.(RETIRED) NASA-GSFC

BRIEF DESCRIPTION
Telstar 1, primarily a communications satellite, carried an experiment designed to measure the energetic proton and electron distribution in the Van Allen belts. The spacecraft spin rate varied according to r=(178.2)exp(-t/333) rpm, where t was in days from launch. The spin axis original orientation was right ascension 81.96 deg and declination -65.87 deg. It varied slowly over the lifetime of the spacecraft. For example, on November 9, 1962, the right ascension was 94.09 deg, and the declination was -51.91 deg. Scientific information was transmitted by the spacecraft beacon, which was one of two onboard transmitters, via a PCM/FM/AM encoder. The telemetry sequence required about 1 min. The spacecraft operated normally from launch until November 1962, when the command channel began to behave erratically. The satellite was turned on continuously to circumvent this problem. On November 23, 1962, the command channel ceased to respond. On December 20, the satellite was successfully reactivated, and intermittent data were obtained until February 21, 1963, when the transmitter failed.

-------- TELSTAR 1, BROWN----------

INVESTIGATION NAME- PROTON AND ELECTRON RADIATION

NSSDC ID- 62-02VA-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN BELL TELEPHONE LAB

BRIEF DESCRIPTION
Three p-n junction, solid-state diodes separately measured protons (1) directionally in nine ranges from 4.4 to 25 MeV with an aperture of 25-deg half-angle, (2) omnidirectionally from 26 to 34 MeV, and (3) omnidirectionally greater than 50 MeV. A fourth p-n junction diode measured electrons in four energy ranges (180 to 280, 285 to 440, 390 to 615, and 635 to 990 keV) with an aperture of 20-deg half-angle. Each directional proton energy channel was sampled once every 3 min, each of the two omnidirectional proton detectors was sampled once per min, and each of the four electron energy channels was sampled once every 2 min. Accumulation times exceeded the spacecraft spin period. The instruments operated throughout the lifetime of the spacecraft. NSSDC has all the data that now exist from this investigation.

********** TELSTAR 2**********

SPACECRAFT COMMON NAME- TELSTAR 2
ALTERNATE NAMES- A 41, 00573

NSSDC ID- 63-013A

LAUNCH DATE- 05/07/63 WEIGHT- 176. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES AT+T-BTL

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 05/07/63
ORBIT PERIOD- 225.1 MIN INCLINATION- 42.7 DEG
PERIAPSIS- 974. KM ALT APOAPSIS- 10803. KM ALT

PERSONNEL
PM - C.P. SMITH, JR.(RETIRED) NASA-GSFC

BRIEF DESCRIPTION
Telstar 2, primarily a communications satellite, carried an experiment designed to measure the energetic proton and electron distribution in the Van Allen belts. The spacecraft spin axis shortly after launch was about 30 deg to the ecliptic plane. The initial spin rate was 180 rpm, and it varied slowly over the life of the spacecraft. Telstar 2 was essentially identical to the Telstar 1 satellite. It employed two transmitters, and data were telemetered via a PCM/FM/AM encoder. The telemetry sequence required about 1 min. Telstar 2 differed from Telstar 1 by employing provisions for scientific information to be transmitted in real time via the microwave telemetry system so that telemetry could be obtained after the 2-yr timer had turned off the VHF beacon. On May 16, 1965, at 1463 UT, during the satellite's 4736 orbit, the VHF transmitter was turned off. All systems operated normally until that time.

-------- TELSTAR 2, BROWN----------

INVESTIGATION NAME- PROTON AND ELECTRON RADIATION

NSSDC ID- 63-013A-01 INVESTIGATIVE PROGRAM
SCIENCE

INVESTIGATION DISCIPLINE(S)
PARTICLES AND FIELDS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - W.L. BROWN BELL TELEPHONE LAB

BRIEF DESCRIPTION
Three p-n junction, solid-state diodes separately measured protons (1) directionally in nine ranges from 2 to 30 MeV with an aperture of 25-deg half-angle, (2) omnidirectionally from 18 to 28 MeV, and (3) omnidirectionally greater than 50 MeV. A fourth p-n junction diode measured electrons with four threshold ranges (greater than 750, 900, 1200, and 1400 keV) with an aperture of 20-deg half-angle. Each directional proton energy channel was sampled once every 3 min, each of the two omnidirectional proton detectors was sampled once per min, and each of the electron energy channels was sampled once every 2 min. Accumulation times exceeded the spacecraft spin period. The experiment operated throughout the spacecraft life. NSSDC has all the useful data that now exist from this investigation.

********** VELA 3A**********

SPACECRAFT COMMON NAME- VELA 3A
ALTERNATE NAMES- VELA 3 (USAF), VELA 5 (TRW)
01458

NSSDC ID- 65-058A

LAUNCH DATE- 07/20/65 WEIGHT- 150. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/16/69
ORBIT PERIOD- 6709.8 MIN INCLINATION- 32.3 DEG
PERIAPSIS- 93297. KM ALT APOAPSIS- 129632. KM ALT

PERSONNEL
PP - SAMSO USAF-LAS
PS - J.H. COON(NLA) LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Vela 3A was one of two polyhedral satellites comprising the third in a series of six Vela launches. The orbits of the two satellites on each launch were basically circular at a radial distance of about 17 earth radii and spaced 180 deg apart. The satellites were spin stabilized at about 2 rps and had their spin axes inclined at about 60 deg to the ecliptic. Data acquisition was mainly real time and averaged 25% (1 out of every 4 h) coverage per day. Data coverage was increased for special events. The satellite operated well during the period of major data coverage, i.e., from launch until the April 1967 launch of the Vela 4 satellites. After this time, data acquisition from the Vela 3 satellites became increasingly sporadic.

-------- VELA 3A, BAME----------

INVESTIGATION NAME- ELECTROSTATIC ANALYZER AND GM TUBES

NSSDC ID- 65-058A-04 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS
INTERPLANETARY PHYSICS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment consisted of two Geiger counters and a hemispherical electrostatic analyzer. The instruments were designed to study the intensity, energy spectrum, and angular distributions of solar wind and magnetospheric particles. The Geiger counters measured electrons with energies greater than 45 keV. Particles were accepted from a cone of 35-deg half-angle. One counter was mounted so that the axis of the acceptance cone was perpendicular to the spin axis. The other counter had the field of view shifted 30 deg relative to the spin axis. The counters were operated only in real time (i.e., only 25% of the time), and a measurement was taken once each second. The electrostatic analyzer was mounted on the spacecraft equatorial plane and had a field of view of about 5 deg in spacecraft longitude and about 90 deg in spacecraft latitude. In the real-time mode, the electrostatic analyzer measured the ion or electron (polarity was selected by ground command) flux in 64 logarithmically spaced energy-per-charge channels covering the range 0.2 to 18 keV/q. A complete 64-point energy spectrum was taker centered on each of the following directions in the spacecraft equatorial plane and relative to the spacecraft-sun line: -11, -5, 1, 7, 14, 89, 190, and 291 deg (minus signs indicate angles to the left (east) of the sun). This set of angles could be rotated (by ground command) by +30 deg for Vela 5A and -30 deg for Vela 5B. In the real-time mode, a complete set of measurements (64-point spectra in each of eight directions) was taken every 256 s and repeated continuously. In the store mode, the analyzer took a 16-point energy spectrum at the angles 1 and 190 deg every 512 s. The instruments worked well over the period of major data coverage of the spacecraft.

********** VELA 5B **********

SPACECRAFT COMMON NAME- VELA 5B
ALTERNATE NAMES- VELA 3 (USAF), VELA 6 (TRW)
21459

NSSDC ID- 65-096B

LAUNCH DATE- 07/20/65 WEIGHT- 150. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- ATLAS

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/16/69
ORBIT PERIOD- 6718.3 MIN INCLINATION- 31.4 DEG
PERIAPSIS- 51949. KM ALT APOAPSIS- 141179. KM ALT

PERSONNEL
PM - SANSO USAF-LAS
PS - J.H. COON(NLA) LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Vela 5B was one of two polyhedral satellites comprising the third in a series of six Vela launches. The orbits of the two satellites on each launch were basically circular at a radial distance of about 17 earth radii and spaced 180 deg apart. The satellites were spin stabilized at about 2 rps and had their spin axes inclined at about 60 deg to the ecliptic. Data acquisition was mainly real time and averaged 25% (1 out of every 4 h) coverage per day. Data coverage was increased for special events. The satellite operated well during the period of major data coverage, i.e., from launch until the April 1967 launch of the Vela 4 satellites. After this time, data acquisition from the Vela 3 satellites became increasingly sporadic.

------- VELA 5B, BAME -------

INVESTIGATION NAME- ELECTROSTATIC ANALYZER AND GM TUBES

NSSDC ID- 65-096B-04 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS
INTERPLANETARY PHYSICS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment consisted of two Geiger counters and a hemispherical electrostatic analyzer. The instruments were designed to study the intensity, energy spectrum, and angular distributions of solar wind and magnetospheric particles. The Geiger counters measured electrons with energies greater than 45 keV. Particles were accepted from a cone of 35-deg half-angle. One counter was mounted so that the axis of the acceptance cone was perpendicular to the spin axis. The other counter had the field of view shifted 30 deg relative to the spin axis. The counters were operated only in real time (i.e., only 25% of the time), and a measurement was taken once each second. The electrostatic analyzer was mounted on the spacecraft equatorial plane and had a field of view of about 5 deg in spacecraft longitude and about 90 deg in spacecraft latitude. In the real-time mode, the electrostatic analyzer measured the ion or electron (polarity was selected by ground command) flux in 64 logarithmically spaced energy-per-charge channels covering the range 0.2 to 18 keV/q. A complete 64-point energy spectrum was taken centered on each of the following directions in the spacecraft equatorial plane and relative to the spacecraft-sun line: -11, -5, 1, 7, 14, 89, 190, and 291 deg (minus signs indicate angles to the left (east) of the sun). This set of angles could be rotated (by ground command) by +30 deg for Vela 5A and -30 deg for Vela 5B. In the real-time mode, a complete set of measurements (64-point spectra in each of eight directions) was taken every 256 s and repeated continuously. In the store mode, the analyzer took a 16-point energy spectrum at the angles 1 and 190 deg every 512 s. The instruments worked well over the period of major data coverage of the spacecraft.

********** VELA 5A **********

SPACECRAFT COMMON NAME- VELA 5A
ALTERNATE NAMES- VELA 9 (TRW), 03954

NSSDC ID- 69-046D

LAUNCH DATE- 05/23/69 WEIGHT- 259. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 05/24/69
ORBIT PERIOD- 6703. MIN INCLINATION- 32.8 DEG
PERIAPSIS- 110900. KM ALT APOAPSIS- 112210. KM ALT

PERSONNEL
PM - SANSO USAF-LAS
PS - R.W. KLEBESADEL LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Vela 5A was one of two spin-stabilized, polyhedral satellites that comprised the fifth launch in the Vela program. The orbits of the two satellites on each launch were basically circular at about 17 earth radii, inclined at 90 deg to the ecliptic, and spaced 180 deg apart, thus providing a monitoring capability of opposite sides of the earth. The objectives of the satellites were (1) to study solar and cosmic X rays, extreme ultraviolet radiation (EUV), solar protons, solar wind, and neutrons, (2) to carry out research and development on methods of detecting nuclear explosions by means of satellite-borne instrumentation, and (3) to provide solar flare data in support of manned space missions. Vela 5A, an improved version of the earlier Vela series satellites, had better command capabilities, increased data storage, improved power requirements, better thermal control of optical sensors, and greater experimentation weight. Power supplies of 120 w were provided by 22,500 solar cells mounted on 24 of the spacecraft's 26 faces. A rotation rate of 78 rpm during transfer orbits and 1 rpm after final orbit insertion maintained nominal attitude control. Eight whip antennas and four stub antenna arrays at opposite ends of the spacecraft structure were used for ground commands and telemetry.

------- VELA 5A, BAME -------

INVESTIGATION NAME- SOLAR WIND

NSSDC ID- 69-046D-05 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
INTERPLANETARY PHYSICS
MAGNETOSPHERIC PHYSICS
SPACE PLASMAS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB
CI - J.R. ASBRIDGE LOS ALAMOS NAT LAB
CI - H.E. FELTHAUSER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Two electrostatic analyzer-electron multiplier units were used to study the interplanetary solar wind (including heavy ions) and protons and electrons in the magnetotail. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. Particles in a 5-deg by 160-deg, fan-shaped angular range were accepted for analysis during a decaying voltage cycle. The 160-deg dimension was parallel to the spacecraft spin axis for both detectors. One analyzer-multiplier unit studied solar wind electrons in the energy range from 7.5 ev to 18.5 kev and solar wind positive ions (mainly protons and alpha particles) in an energy-per-charge range from 120 ev/q to 5 kev/q. The other unit studied magnetotail protons or electrons between 20 ev and 33 kev and solar wind heavy ions in the energy-per-charge range from 1 kev/q to 8.3 kev/q.

------- VELA 5A, CHAMBERS----------

INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A, 1 TO 8 A, 1 TO 16 A, 44 TO 60 A

NSSDC ID- 69-046D-02

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL

PI - W.H.	CHAMBERS	LOS ALAMOS NAT LAB
OI - J.C.	FULLER	LOS ALAMOS NAT LAB
OI - W.E.	KUNZ	LOS ALAMOS NAT LAB
OI - P.E.	FEHLAU	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to monitor the solar ambient and flare-produced flux of X rays in the 0.3- to 60-A wavelength region. Two identical X-ray sensor units were mounted at diametrically opposed apex positions on the satellite. Each unit contained four detectors: three ion chambers and a thallium-activated sodium iodide (NaI(Tl)) scintillation detector. Since each ion chamber had a hemispherical window, the combined output signals from identical chambers in each sensor unit approximated the response of an ideal detector with a 4-pi-sr field of view. The ion chambers had the following window materials, gas fills, and wavelength responses. Chamber 1: 0.127 mm of beryllium, 0.9 atm of argon plus 0.1 atm of helium, 1 to 8 A. Chamber 2: 6.35 micrometers of mylar overcoated with about an 8500-A layer of aluminum, 0.5 atm of nitrogen, 1 to 16 A. Chamber 3: 6.35 micrometers of mylar, 0.5 atm of nitrogen, 1 to 16 A and 44 to 60 A. This combination of ion chambers allowed solar X-ray flux measurements in the bands 1 to 8 A, 1 to 16 A, 8 to 16 A, and 44 to 60 A to be obtained upon suitable analysis of the data. The scintillation detector used for the 0.3- to 3-A wavelength region consisted of a NaI(Tl) crystal optically coupled to a PMT, the output of which fed a five-level, integral, pulse-height analyzer. Unlike the ion chambers, the two scintillation detectors in the two sensor units were not identical. The more sensitive detector had a 1.27-cm-diameter, 1-mm-thick crystal covered by a flat 0.25-mm-thick beryllium window. The less sensitive detector (1E-2 ergs/sq cm-s) had a 6.35-mm-diameter, 1-mm-thick crystal and a 2.03-mm-thick beryllium dome window in addition to the flat 0.25-mm window mounted on the face of the crystal. Both ion chambers and scintillation detectors were capable of observations with time resolutions of 2 s. The average detection efficiencies for the ion and scintillation detectors were of the order of 20% and 60%, respectively.

********** VELA 5B**********

SPACECRAFT COMMON NAME- VELA 5B
ALTERNATE NAMES- VELA 10 (TRW), 03955
VELA 5B (USAF)

NSSDC ID- 69-046E

LAUNCH DATE- 05/23/69 WEIGHT- 259. KG
LAUNCH SITE- VANDENBERG AFB, UNITED STATES
LAUNCH VEHICLE- TITAN 3C

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS

ORBIT TYPE- GEOCENIRIC	EPOCH DATE- 05/25/69
ORBIT PERIOD- 6709. MIN	INCLINATION- 32.8 DEG
PERIAPSIS- 110920. KM ALT	APOAPSIS- 112283. KM ALT

PERSONNEL

PM -	SAMSO	USAF-LAS
PS - R.W.	KLEBESADEL	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

Vela 5B was one of two spin-stabilized, polyhedral satellites that comprised the fifth launch in the Vela program. The orbits of the two satellites on each launch were basically circular at about 17 earth radii, inclined at 60 deg to the ecliptic, and spaced 180 deg apart, thus providing a capability of monitoring opposite sides of the earth. The objectives of the satellites were (1) to study solar and cosmic X rays, extreme ultraviolet radiation (EUV), solar protons, solar wind, and neutrons, (2) to carry out research and development on methods of detecting nuclear explosions by means of satellite-borne instrumentation, and (3) to provide solar flare data in support of manned space missions. Vela 5B, an improved version of the earlier Vela series satellites, had better command capabilities, increased data storage, improved power requirements, better thermal control of optical sensors, and greater experimentation weight. Power supplies of 120 W were provided by 22,500 solar cells mounted on 24 of the spacecraft's 26 faces. A rotation rate of 78 rpm during transfer orbits and 1 rpm after final orbit insertion maintained nominal attitude control. Eight whip antennas and four stub antenna arrays at opposite ends of the spacecraft structure were used for ground command and telemetry.

------- VELA 5B, BAME----------

INVESTIGATION NAME- SOLAR WIND

NSSDC ID- 69-046E-05

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL

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

BRIEF DESCRIPTION

Two electrostatic analyzer-electron multiplier units were used to study the interplanetary solar wind (including heavy ions) and protons and electrons in the magnetotail. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. Particles in a 6-deg by 100-deg, fan-shaped angular range were accepted for analysis during a decaying voltage cycle. The 100-deg dimension was parallel to the spacecraft spin axis for both detectors. One detector unit was used to study magnetotail protons or electrons between 20 eV and 33 keV and solar wind heavy ions in the energy-per-charge range between 1 keV/Q and 8.3 keV/Q. The other detector unit, which failed, was designed to study solar wind electrons in the energy range from 7.5 eV to 18.5 keV and solar wind positive ions (mainly protons and alpha particles) in an energy-per-charge range from 120 eV/Q to 5 keV/Q.

------- VELA 5B, CHAMBERS----------

INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A, 1 TO 8 A, 1 TO 16 A, 44 TO 60 A

NSSDC ID- 69-046E-02

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL

PI - W.H.	CHAMBERS	LOS ALAMOS NAT LAB
OI - J.C.	FULLER	LOS ALAMOS NAT LAB
OI - W.E.	KUNZ	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to monitor the solar ambient and flare-produced flux of X rays in the 0.3- to 60-A wavelength region. Two identical X-ray sensor units were mounted at diametrically opposed apex positions on the satellite. Each unit contained four detectors: three ion chambers and a thallium-activated sodium iodide (NaI(Tl)) scintillation detector. As each ion chamber had a hemispherical window, the combined output signals from identical chambers in each sensor unit approximated the response of an ideal detector with a 4-pi-sr field of view. The ion chambers had the following window materials, gas fills, and wavelength responses. Chamber 1: 0.127 mm of beryllium, 0.9 atm of argon plus 0.1 atm of helium, 1 to 8 A. Chamber 2: 6.35 micrometers of mylar overcoated with about an 8500-A layer of aluminum, 0.5 atm of nitrogen, 1 to 16 A. Chamber 3: 6.35 micrometers of mylar, 0.5 atm of nitrogen, 1 to 16 A and 44 to 60 A. This combination of ion chambers allowed solar X-ray flux measurements in the bands 1 to 8 A, 1 to 16 A, 8 to 16 A, and 44 to 60 A to be obtained upon suitable analysis of the data. The scintillation detector used for the 0.3- to 3-A wavelength region consisted of a NaI(Tl) crystal optically coupled to a PMT, the output of which fed a five-level, integral, pulse-height analyzer. Unlike the ion chambers, the two scintillation detectors in the two sensor units were not identical. The more sensitive detector had a one-half-inch(1.27 cm)-diameter, 1-mm-thick crystal covered by a flat 10-mil(0.254 mm)-thick beryllium window. The less sensitive detector (1E-2 ergs/sq cm-s) had a one-quarter-inch(6.35 mm)-diameter, 1-mm-thick crystal and a 0.08-inch(2.032 mm)-thick beryllium dome window in addition to the flat 10-mil(0.254 mm) window mounted on the face of the crystal. Both ion chambers and scintillation detectors were capable of observations with time resolutions of 2 s. The average detective efficiencies for the ion and scintillation detectors were of the order of 20% and 60%, respectively.

********** VELA 6A**********

SPACECRAFT COMMON NAME- VELA 6A
ALTERNATE NAMES- PL-702B, VELA 11 (TRW)
04366

NSSDC ID- 70-027A

LAUNCH DATE- 04/08/70 WEIGHT- 261. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/09/70
ORBIT PERIOD- 6729. MIN INCLINATION- 32.41 DEG
PERIAPSIS- 111210. KM ALT APOAPSIS- 112160. KM ALT

PERSONNEL
PM - SAMSO USAF-LAS
PS - R.W. KLEBESADEL LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Vela 6A was one of two spin-stabilized, polyhedral satellites that comprised the sixth launch in the Vela program. The orbits of the two satellites on each launch were basically circular at about 17 earth radii, inclined at 60 deg to the ecliptic, and spaced 180 deg apart, thus providing a capability of monitoring opposite sides of the earth. The objectives of the satellites were (1) to study solar and cosmic X rays, extreme ultraviolet radiation (EUV), solar protons, solar wind, and neutrons, (2) to carry out research and development on methods of detecting nuclear explosions by means of satellite-borne instrumentation, and (3) to provide solar flare data in support of manned space missions. Vela 6A was an improved version of the earlier Vela series satellites having better command capabilities, increased data storage, improved power requirements, better thermal control of optical sensors, and greater experimentation weight. Power supplies of 120 W were provided by 22,500 solar cells mounted on 24 of the spacecraft's 26 faces. A rotation rate of 78 rpm during transfer orbits and 1 rpm after final orbit insertion maintained nominal attitude control. Eight whip antennas and four stub antenna arrays at opposite ends of the spacecraft structure were used for ground commands and telemetry. The launch of Vela 6A and 6B, plus the two active Velas still in orbit (Vela 5A and 5B), completed the objectives of the Vela program.

------- VELA 6A, BAME----------

INVESTIGATION NAME- SOLAR WIND EXPERIMENT

NSSDC ID- 70-027A-05 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB
OI - J.R. ASBRIDGE LOS ALAMOS NAT LAB
OI - H.E. FELTHAUSER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Two electrostatic analyzer-electron multiplier units were used to study the interplanetary solar wind (including heavy ions) and protons and electrons in the magnetotail. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. Particles in a 6-deg by 100-deg, fan-shaped angular range were accepted for analysis during a decaying voltage cycle. The 100-deg dimension was parallel to the spacecraft spin axis for both detectors. One analyzer-multiplier unit studied solar wind electrons in the energy range from 7.5 eV to 18.5 keV and solar wind positive ions (mainly protons and alpha particles) in an energy-per-charge range from 120 eV/Q to 5 keV/Q. The other unit studied magnetotail protons or electrons between 20 eV and 33 keV and solar wind heavy ions in the energy-per-charge range from 1 keV/Q to 8.3 keV/Q.

------- VELA 6A, CHAMBERS----------

INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A, 1 TO 8 A, 1 TO 16 A, 44 TO 60 A

NSSDC ID- 70-027A-02 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL
PI - W.H. CHAMBERS LOS ALAMOS NAT LAB
OI - J.C. FULLER LOS ALAMOS NAT LAB
OI - W.E. KUNZ LOS ALAMOS NAT LAB
OI - P.E. FEHLAU LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
This experiment was designed to monitor the solar ambient and flare-produced flux of X rays in the 0.3- to 60-A wavelength region. Two identical X-ray sensor units were mounted at diametrically opposed apex positions on the satellite. Each unit contained four detectors: three ion chambers and a thallium-activated sodium iodide (NaI(Tl)) scintillation detector. As each ion chamber had a hemispherical window, the combined output signals from identical chambers in each sensor unit approximated the response of an ideal detector with a 4-pi-sr field of view. The ion chambers had the following window materials, gas fills, and wavelength responses. Chamber 1: 0.127 mm of beryllium, 0.9 atm of argon plus 0.1 atm of helium, 1 to 8 A. Chamber 2: 6.35 micrometer of mylar overcoated with about an 8,500-A layer of aluminum, 0.5 atm of nitrogen, 1 to 16 A. Chamber 3: 6.35 micrometer of mylar, 0.5 atm of nitrogen, 1 to 16 A and 44 to 60 A. This combination of ion chambers allowed solar X-ray flux measurements in the bands 1 to 8 A, 1 to 16 A, 8 to 16 A, and 44 to 60 A to be obtained upon suitable analysis of the data. The scintillation detector used for the 0.3- to 3-A wavelength region consisted of a NaI(Tl) crystal optically coupled to a PMT, the output of which fed a five-level, integral, pulse-height analyzer. Unlike the ion chambers, the two scintillation detectors in the two sensor units were not identical. The more sensitive detector had a 1.27-cm-diameter, 1-mm-thick crystal covered by a flat 0.25-mm-thick beryllium window. The less sensitive detector (1E-2 ergs/sq cm-s) had a 6.35-mm-diameter, 1-mm-thick crystal and a 2.03-mm-thick beryllium dome window in addition to the flat 0.25-mm window mounted on the face of the crystal. Both ion chambers and scintillation detectors were capable of observations with time resolutions of 2 s. The average detection efficiencies for the ion and scintillation detectors were of the order of 20% and 60%, respectively.

********** VELA 6B**********

SPACECRAFT COMMON NAME- VELA 6B
ALTERNATE NAMES- PL-702C, VELA 12 (TRW)
04368, VELA 6B (USAF)

NSSDC ID- 70-027B

LAUNCH DATE- 04/08/70 WEIGHT- 261. KG
LAUNCH SITE- CAPE CANAVERAL, UNITED STATES
LAUNCH VEHICLE- TITAN

SPONSORING COUNTRY/AGENCY
UNITED STATES DOD-USAF

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 04/11/70
ORBIT PERIOD- 6745. MIN INCLINATION- 32.52 DEG
PERIAPSIS- 111500. KM ALT APOAPSIS- 112210. KM ALT

PERSONNEL
PM - SAMSO USAF-LAS
PS - R.W. KLEBSADEL LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Vela 6B was one of two spin-stabilized, polyhedral satellites that comprised the sixth launch in the Vela program. The orbits of the two satellites on each launch were basically circular at about 17 earth radii, inclined at 60 deg to the ecliptic, and spaced 180 deg apart, thus providing a capability of monitoring opposite sides of the earth. The objectives of the satellites were (1) to study solar and cosmic X rays, extreme ultraviolet radiation (EUV), solar protons, solar wind, and neutrons, (2) to carry out research and development on methods of detecting nuclear explosions by means of satellite-borne instrumentation, and (3) to provide solar flare data in support of manned space missions. Vela 6B was an improved version of the earlier Vela series satellites having better command capabilities, increased data storage, improved power requirements, better thermal control of optical sensors, and greater experimentation weight. Power supplies of 120 W were provided by 22,500 solar cells mounted on 24 of the spacecraft's 26 faces. A rotation rate of 78 rpm during transfer orbits and 1 rpm after final orbit insertion maintained nominal attitude control. Eight whip antennas and four stub antenna arrays at opposite ends of the spacecraft structure were used for ground commands and telemetry. The launch of Vela 6A and 6B, plus the two active Velas still in orbit (Vela 5A and 5B), completed the objectives of the Vela program.

------- VELA 6B, BAME----------

INVESTIGATION NAME- SOLAR WIND EXPERIMENT

NSSDC ID- 70-027B-05 INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
SPACE PLASMAS
MAGNETOSPHERIC PHYSICS

PERSONNEL
PI - S.J. BAME LOS ALAMOS NAT LAB
OI - J.R. ASBRIDGE LOS ALAMOS NAT LAB
OI - H.E. FELTHAUSER LOS ALAMOS NAT LAB

BRIEF DESCRIPTION
Two electrostatic analyzer-electron multiplier units were used to study the interplanetary solar wind (including heavy ions) and protons and electrons in the magnetotail. Energy analysis was accomplished by charging the plates to known voltage levels and allowing them to discharge with known RC time constants. Particles in a 6-deg by 100-deg, fan-shaped angular range were accepted for analysis during a decaying voltage cycle. The 100-deg dimension was parallel to the spacecraft spin axis for both detectors. One analyzer-multiplier unit studied solar wind electrons in the energy range from 7.5 eV to 18.5 keV and solar wind positive ions (mainly protons and alpha particles) in an

energy-per-charge range from 128 eV/Q to 5 keV/Q. This unit operated well until its failure on February 20, 1973. The other unit studied magnetotail protons or electrons between 20 eV and 33 keV and solar wind heavy ions in the energy-per-charge range from 1 keV/Q to 6.3 keV/Q. This unit operated well until its failure on August 10, 1972.

------- VELA 6B, CHAMBERS----------

INVESTIGATION NAME- SOLAR X-RAY DETECTORS, 0.5 TO 3.0 A, 1 TO 8 A, 1 TO 16 A, 44 TO 60 A

NSSDC ID- 70-027B-02

INVESTIGATIVE PROGRAM
NUCLEAR DETECTION

INVESTIGATION DISCIPLINE(S)
X-RAY ASTRONOMY
SOLAR PHYSICS

PERSONNEL

PI - W.H.	CHAMBERS	LOS ALAMOS NAT LAB
OI - J.C.	FULLER	LOS ALAMOS NAT LAB
OI - W.E.	KUNZ	LOS ALAMOS NAT LAB

BRIEF DESCRIPTION

This experiment was designed to monitor the solar ambient and flare-produced flux of X rays in the 0.3- to 60-A wavelength region. Two identical X-ray sensor units were mounted at diametrically opposed apex positions on the satellite. Each unit contained four detectors: three ion chambers and a thallium-activated sodium iodide (NaI(Tl)) scintillation detector. As each ion chamber had a hemispherical window, the combined output signals from identical chambers in each sensor unit approximated the response of an ideal detector with a 4-pi-sr field of view. The ion chambers had the following window materials, gas fills, and wavelength responses. Chamber 1: 0.127 mm of beryllium, 0.9 atm of argon plus 0.1 atm of helium, 1 to 8 A. Chamber 2: 6.35 micrometers of mylar overcoated with about an 8500-A layer of aluminum, 0.5 atm of nitrogen, 1 to 16 A. Chamber 3: 6.35 micrometers of mylar, 0.5 atm of nitrogen, 1 to 16 A and 44 to 60 A. This combination of ion chambers allowed solar X-ray flux measurements in the bands 1 to 8 A, 1 to 16 A, 8 to 16 A, and 44 to 60 A to be obtained upon suitable analysis of the data. The scintillation detector used for the 0.3- to 3-A wavelength region consisted of a NaI(Tl) crystal optically coupled to a PMT, the output of which fed a five-level, integral, pulse-height analyzer. Unlike the ion chambers, the two scintillation detectors in the two sensor units were not identical. The more sensitive detector had a one-half-inch(1.27 cm)-diameter, 1-mm-thick crystal covered by a flat 10-mil(0.254 mm)-thick beryllium window. The less sensitive detector (1E-2 ergs/sq cm-s) had a one-quarter-inch(6.35 mm)-diameter, 1-mm-thick crystal and a 0.08-inch(2.032 mm)-thick beryllium dome window in addition to the flat 10-mil(0.254 mm) window mounted on the face of the crystal. Both ion chambers and scintillation detectors were capable of observations with time resolutions of 2 s. The average detective efficiencies for the ion and scintillation detectors were of the order of 20% and 60%, respectively.

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Appendix

APPENDIX A - DEFINITIONS

Investigation Discipline - The subject to which an investigation pertains. The possible entries are limited, and the NSSDC information files can be searched using this field.

Investigative Program - Code of the cognizant NASA Headquarters office, or name of other sponsoring agency program. "CO-OP" added to a code indicates a cooperative effort with another agency or a foreign country.

NLA - No Longer Affiliated. Used in the spacecraft personnel section and occasionally with investigations to indicate that the person had the specified affiliation at the time of his participation in the project, but is no longer there.

NSSDC ID - An identification code used in the NSSDC information system. In this system, each successfully launched spacecraft and 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. Prior to launch, for example, the approved NASA launch, Solar Mesosphere Explorer, was coded SME. The experiments to be carried aboard this spacecraft were coded SME -01, SME -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, and the NSSDC spacecraft common name of Pioneer 11.

OI - Other Investigator.

PI - Principal Investigator.

PM - Project Manager.

PS - Project Scientist.

TL - Team Leader.

TM - Team Member.

TRF - Technical Reference File. A computerized space-investigation-oriented bibliographic reference list maintained by NSSDC. Journal publications and other documents are cited, and can be retrieved by author name, title, or NSSDC ID of relevant investigation. Used to keep track of descriptive and documentation material, as well as to produce bibliographies of certain spacecraft. The TRF accession number begins with the letter B and contains five digits; for example, B10851.