General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

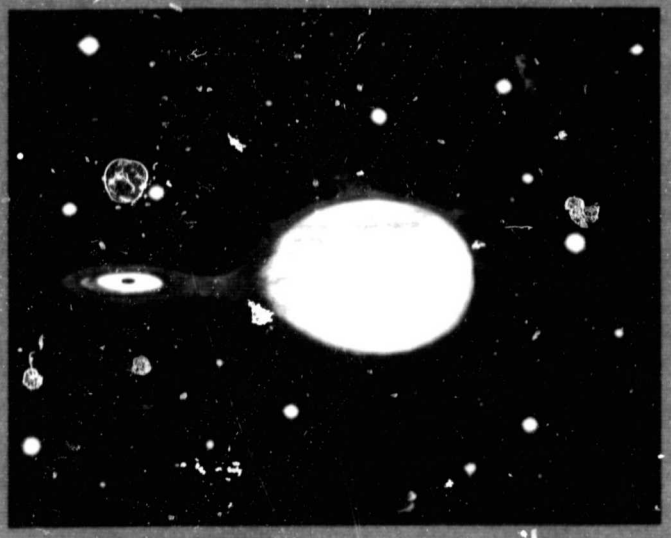
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

NSSDC
WDC-A-R&S
National Space Science Data Center/
World Data Center A For Rockets and Satellites
82-01

DIGEST OF CELESTIAL X-RAY MISSIONS AND EXPERIMENTS



January 1982

NSSDC/WDC-A-R&S
82-01

DIGEST OF CELESTIAL X-RAY MISSIONS AND EXPERIMENTS

Author/Coordinator

Maureen C. Locke

January 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

CONTENTS

1. INTRODUCTION

Since the discovery of celestial X-rays in 1962, more than 52 experiments have been flown in space to study these phenomena. The past two decades of exploration in X-ray astronomy represent continuing advances not only in scientific discovery, but also in experiment and spacecraft technology. This document presents in a ready reference form, information on these instruments, the platforms that carried them, and the data they gathered. Instrument selection has been confined to detectors operating in the 0.20 to 300 keV range. Included are brief descriptions of the spacecraft, experiment packages and missions. Cross-referenced indexes are provided for types of instruments, energy ranges, time spans covered, positional catalogs and observational catalogs. Data sets from these experiments that are available from the National Space Science Data Center (NSSDC) are described and references are given for those data sets that are still held by individual investigators or other institutions. All referenced information in this document is contained in the files of NSSDC. Although we do not claim our coverage to be complete, we have used all available information to make this document as accurate and up-to-date as possible. The information on NASA and NASA-cooperative programs is based to a large extent on project office reports. For non-US programs, information from ESA reports, reports of individual countries to COSPAR, press releases, and scientific journals have been used. All comments, corrections, and additions are appreciated.

2. DESCRIPTIONS OF SPACECRAFT AND EXPERIMENTS

This section contains descriptions of spacecraft and experiments pertinent to this report.

Each spacecraft or experiment entry in this section is composed of two parts, a heading and a brief description. The headings list characteristics of spacecraft and experiments.

The heading for each spacecraft description in this section includes a set of orbital parameters: orbit type, epoch date, orbit period, apoapsis, periapsis, and inclination for the spacecraft. In addition, the heading contains the spacecraft weight, launch date, site, vehicle, spacecraft common and alternate names, NSSDC ID code, sponsoring country and agency, and spacecraft personnel codes as follows:

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

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

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

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

If the common name, as used by NSSDC, is not known, the reader should refer to his own common name in Index 3.1 (Spacecraft Alphabetical Name Index) to obtain the cross reference.

****

SPACECRAFT COMMON NAME- OSO 3
ALTERNATE NAMES- OSO-E, 02703

NSSDC ID- 67-020A

LAUNCH DATE- 03/08/67

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 03/09/67
ORBIT PERIOD- 95.53 MIN — INCLINATION- 32.87 DEG
PERIAPSIS- 534. KM ALT — APOAPSIS- 564. KM ALT

PERSONNEL

SC - H.J.	SMITH	NASA HEADQUARTERS
PM - L.T.	HOGARTH	NASA-GSFC
PS - W.E.	BEHRING	NASA-GSFC

BRIEF DESCRIPTION
THE OBJECTIVES OF THE OSO SATELLITE SERIES WERE TO PERFORM SOLAR PHYSICS EXPERIMENTS ABOVE THE ATMOSPHERE DURING A COMPLETE SOLAR CYCLE AND TO MAP THE CELESTIAL SPHERE FOR DIRECTION AND INTENSITY OF UV LIGHT, X-RAY, AND GAMMA RADIATION. THE OSO 3 PLATFORM CONSISTED OF A SAIL SECTION, WHICH POINTED TWO EXPERIMENTS CONTINUALLY TOWARD THE SUN, AND A WHEEL SECTION, WHICH SPUN ABOUT AN AXIS PERPENDICULAR TO THE POINTING DIRECTION OF THE SAIL AND CARRIED SEVEN EXPERIMENTS. ATTITUDE ADJUSTMENT WAS PERFORMED BY GAS JETS AND A MAGNETIC TORQUING COIL. DATA WERE SIMULTANEOUSLY RECORDED ON TAPE AND TRANSMITTED BY PCM/PM TELEMETRY. A COMMAND SYSTEM PROVIDED FOR 94 GROUND-BASED COMMANDS. THE SPACECRAFT PERFORMED NORMALLY UNTIL THE SECOND ONBOARD TAPE RECORDER FAILED IN JULY 1968. THE SPACECRAFT WAS PUT IN STANDBY CONDITION ON NOVEMBER 10, 1969, AND BECAME INOPERABLE SHORTLY THEREAFTER.

****

INVESTIGATION NAME- SOLAR AND CELESTIAL GAMMA-RAY TELESCOPE

NSSDC ID- 67-020A-07

PERSONNEL

PI - L.E.	PETERSON	U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
THE EXPERIMENT WAS DESIGNED TO INVESTIGATE THE EMISSION OF X RAYS IN THE 7.7- TO 200-KEV RANGE FROM COSMIC AND SOLAR SOURCES WITH APPROXIMATELY 50 PERCENT FULL WIDTH HALF MAXIMUM SPECTRAL RESOLUTION AND 15-S TIME RESOLUTION. THE DETECTOR, MOUNTED ON THE WHEEL SECTION OF THE SPACECRAFT, CONSISTED OF A 0.5-CM THICK NAI CRYSTAL SURROUNDED BY A 4.8-KG CYLINDRICAL CUP-SHAPED CSI (TL) SHIELD CRYSTAL POINTED RADIALLY OUTWARD. THE ANTICOINCIDENCE SHIELD HAD A 5-CM WALL AND DEFINED A 13-DEG HALF-ANGLE FIELD OF VIEW FOR THE INNER NAI DETECTOR, WHICH HAD A 0.5-MM BERYLLIUM FOIL WINDOW 9.2 SQ CM IN AREA AND HAVING A GEOMETRIC FACTOR OF 1.5 SQ CM-STER. THE OUTPUT PULSE WAS PULSE-HEIGHT ANALYZED INTO SIX LOGARITHMICALLY SPACED CHANNELS AND TWO INTEGRAL CHANNELS. THE EXPERIMENT PERFORMED NORMALLY DURING THE LIFETIME OF THE SATELLITE.

****

SPACECRAFT COMMON NAME- OSO 4
ALTERNATE NAMES- OSO-D, 03000

NSSDC ID- 67-100A

LAUNCH DATE- 10/18/67

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 10/19/67
ORBIT PERIOD- 95.58 MIN — INCLINATION- 33.04 DEG
PERIAPSIS- 546. KM ALT — APOAPSIS- 560. KM ALT

PERSONNEL

SC - H.J.	SMITH	NASA HEADQUARTERS
PM - L.T.	HOGARTH	NASA-GSFC
PS - W.E.	BEHRING	NASA-GSFC

BRIEF DESCRIPTION
THE OBJECTIVES OF THE OSO SATELLITE SERIES WERE TO PERFORM SOLAR PHYSICS EXPERIMENTS ABOVE THE ATMOSPHERE DURING A COMPLETE SOLAR CYCLE AND TO MAP THE ENTIRE CELESTIAL SPHERE FOR DIRECTION AND INTENSITY OF UV LIGHT, X-RAY, AND GAMMA RADIATION. THE OSO 4 PLATFORM CONSISTED OF A SAIL SECTION, WHICH POINTED TWO EXPERIMENTS CONTINUOUSLY TOWARD THE SUN, AND A WHEEL SECTION, WHICH SPUN ABOUT AN AXIS PERPENDICULAR TO THE POINTING DIRECTION OF THE SAIL AND CARRIED SEVEN EXPERIMENTS. ATTITUDE ADJUSTMENT WAS PERFORMED BY GAS JETS AND A MAGNETIC TORQUING COIL. A POINTING CONTROL SYSTEM PERMITTED THE POINTED EXPERIMENTS TO SCAN THE REGION OF THE SUN IN A 40- BY 40-ARC-MIN RASTER PATTERN. DATA WERE SIMULTANEOUSLY RECORDED ON TAPE AND TRANSMITTED BY PCM/PM TELEMETRY. A COMMAND SYSTEM PROVIDED FOR 140 GROUND-BASED COMMANDS. THE SPACECRAFT PERFORMED NORMALLY UNTIL THE SECOND TAPE RECORDER FAILED IN MAY 1968. THE SPACECRAFT, WHICH WAS PUT IN STANDBY CONDITION IN NOVEMBER 1969, WILL BE TURNED ON NOW ONLY FOR RECORDING SPECIAL EVENTS IN REAL TIME. SUCH AN EVENT OCCURRED ON MARCH 7, 1970, WHEN OSO 4 RECORDED DATA DURING THE SOLAR ECLIPSE.

****

INVESTIGATION NAME- COSMIC X RAY MEASUREMENTS

NSSDC ID- 67-100A-02

PERSONNEL

PI - R.	GIACCONI	HARVARD COLLEGE OBS
OI - H.	GURSKY	HARVARD COLLEGE OBS

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED (1) TO MAKE A SURVEY OF THE DIRECTIONAL INTENSITY OF NONSOLAR COSMIC X RAYS, (2) TO MAKE A THOROUGH SURVEY OF THEIR SPECTRAL COMPOSITION BETWEEN 0.1 AND 10 A, (3) TO DISTINGUISH BETWEEN THE STELLAR AND THE SYNCHROTRON COMPONENTS, (4) TO CORRELATE REGIONS OF STRONG INTENSITY WITH OPTICAL AND RADIO OBJECTS OF SPECIAL INTEREST, AND (5) TO STUDY AURORAL X RAYS. FOR THE 0.1 - 1.8 A RANGE, A THIN .CSI CRYSTAL AND TWO PHOTOMULTIPLIERS, WERE USED; AND FOR THE 1.0 - 10 A RANGE, SRF2 ON TOP OF A PLASTIC SCINTILLATOR. THE EXPERIMENT FAILED SOON AFTER LAUNCH, AND NO DATA FROM IT EXIST.

****

SPACECRAFT COMMON NAME- VELA 5A
ALTERNATE NAMES - VELA 9 (TRW), 03954

NSSDC ID- 69-046D

LAUNCH DATE- 05/23/69

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

MG -	ARPA-STAFF	ARPA/WASH, DC
PM -	SAMSO	USAF-LAS
PS - R.W.	KLEBESADEL	LOS ALAMOS SCI 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 60 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, 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.

****

INVESTIGATION NAME- COSMIC X RAYS

NSSDC ID- 69-046D-06

PERSONNEL

PI - J.P.	CONNER	LOS ALAMOS SCI LAB
OI - W.D.	EVANS	LOS ALAMOS SCI LAB
OI - R.D.	DELIAN	LOS ALAMOS SCI LAB

BRIEF DESCRIPTION
THE COSMIC X-RAY DETECTOR WAS A LARGE-AREA (26 SQ CM) SODIUM IODIDE SCINTILLATOR WITH A 5-MIL BERYLLIUM WINDOW. THE EXPERIMENT WAS DESIGNED TO PROVIDE MEASUREMENTS OF THE LOCATION, INTENSITY, AND INTENSITY VARIATIONS OF NONSOLAR X-RAY SOURCES OVER A LONG PERIOD OF TIME. THE DETECTOR WAS SENSITIVE TO X-RAY PHOTONS IN TWO ENERGY INTERVALS (3 TO 6 KEV AND 3 TO 12 KEV), AND WAS SUFFICIENTLY SENSITIVE TO MONITOR FROM SIX TO TWELVE GALACTIC X-RAY SOURCES. ANY ONE SOURCE WAS VIEWED FOR APPROXIMATELY 1 H, AND EVERY 2 DAYS EACH SOURCE WAS BACK IN VIEW. THREE MODES OF READOUT WERE AVAILABLE: (1) THE REAL-TIME NORMAL MODE IN WHICH COUNTS FROM EACH ENERGY CHANNEL WERE TRANSMITTED EVERY 5, (2) THE HIGH-RESOLUTION MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS TRANSMITTED EIGHT TIMES PER 5, (3) THE STORE MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS STORED.

****

SPACECRAFT COMMON NAME- VELA 5B
ALTERNATE NAMES- VELA 10 (TRW), 03955
VELA 5B (USAF)

NSSDC ID- 69-046E

LAUNCH DATE- 05/23/69

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 6709. MIN
PERIAPSIS- 110920. KM ALT
EPOCH DATE- 05/25/69
INCLINATION- 32.8 DEG
APOAPSIS- 112283. KM ALT

PERSONNEL
MG - ARPA-STAFF — ARPA/WASH, DC
PM - SAMSO — USAF-LAS
PS - R.W. KLEBESADEL — LOS ALAMOS SCI 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 MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE (1) TO STUDY SOLAR AND COSMIC X RAYS, 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.

****

INVESTIGATION NAME- COSMIC X RAYS

NSSDC ID- 69-046E-06

PERSONNEL
PI - R.D. BELIAN — LOS ALAMOS SCI LAB
OI - W.D. EVANS — LOS ALAMOS SCI LAB
OI - J.P. CONNER — LOS ALAMOS SCI LAB

BRIEF DESCRIPTION
THE COSMIC X-RAY DETECTOR WAS A LARGE-AREA 26 SQ CM SODIUM IODIDE SCINTILLATOR WITH A 5-MIL BERYLLIUM WINDOW. THE EXPERIMENT WAS DESIGNED TO PROVIDE MEASUREMENTS OF THE LOCATION, INTENSITY, AND INTENSITY VARIATIONS OF NONSOLAR X-RAY SOURCES OVER A LONG PERIOD OF TIME. THE DETECTOR WAS SENSITIVE TO X-RAY PHOTONS IN TWO ENERGY INTERVALS (3 TO 6 KEV AND 3 TO 12 KEV), AND WAS SUFFICIENTLY SENSITIVE TO MONITOR FROM 6 TO 12 GALACTIC X-RAY SOURCES. ANY ONE SOURCE WAS VIEWED FOR APPROXIMATELY 1 H, AND EVERY 2 DAYS EACH SOURCE WAS BACK IN VIEW. THREE MODES OF READOUT WERE AVAILABLE: (1) THE REAL-TIME NORMAL MODE, IN WHICH COUNTS FROM EACH ENERGY CHANNEL WERE TRANSMITTED EVERY S, (2) THE HIGH-RESOLUTION MODE, IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS TRANSMITTED EIGHT TIMES PER S, AND (3) THE STORE MODE, IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS STORED.

****

SPACECRAFT COMMON NAME- VELA 6A
ALTERNATE NAMES- PL-7028, VELA 11 (TRW)
04366

NSSDC ID- 70-027A

LAUNCH DATE- 04/08/70

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 6729. MIN
PERIAPSIS- 111210. KM ALT
EPOCH DATE- 04/09/70
INCLINATION- 32.41 DEG
APOAPSIS- 112160. KM ALT

PERSONNEL
MG - ARPA-STAFF — ARPA/WASH, DC
PM - SAMSO — USAF-LAS
PS - R.W. KLEBESADEL — LOS ALAMOS SCI 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 MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE (1) TO STUDY SOLAR AND COSMIC X RAYS, 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. ROTATION RATES 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.

****

INVESTIGATION NAME- COSMIC X RAYS

NSSDC ID- 70-027A-06

PERSONNEL
PI - J.P. CONNER — LOS ALAMOS SCI LAB
OI - W.D. EVANS — LOS ALAMOS SCI LAB
OI - R.D. BELIAN — LOS ALAMOS SCI LAB

BRIEF DESCRIPTION
THE COSMIC X-RAY DETECTOR WAS A LARGE-AREA (26 SQ CM) SODIUM IODIDE SCINTILLATOR WITH A 5-MIL BERYLLIUM WINDOW. THE EXPERIMENT WAS DESIGNED TO PROVIDE MEASUREMENTS OF THE LOCATION, INTENSITY, AND INTENSITY VARIATIONS OF NONSOLAR X-RAY SOURCES OVER A LONG PERIOD OF TIME. THE DETECTOR WAS SENSITIVE TO X-RAY PHOTONS IN TWO ENERGY INTERVALS (3 TO 6 KEV AND 3 TO 12 KEV), AND WAS SUFFICIENTLY SENSITIVE TO MONITOR FROM SIX TO TWELVE GALACTIC X-RAY SOURCES. ANY ONE SOURCE WAS VIEWED FOR APPROXIMATELY 1 H, AND EVERY 2 DAYS EACH SOURCE WAS BACK IN VIEW. THREE MODES OF READOUT WERE AVAILABLE: (1) THE REAL-TIME NORMAL MODE IN WHICH COUNTS FROM EACH ENERGY CHANNEL WERE TRANSMITTED EVERY S, (2) THE HIGH-RESOLUTION MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS TRANSMITTED EIGHT TIMES PER S, AND (3) THE STORE MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS STORED.

****

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

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 6745. MIN
PERIAPSIS- 111500. KM ALT
EPOCH DATE- 04/11/70
INCLINATION- 32.52 DEG
APOAPSIS- 112210. KM ALT

PERSONNEL
MG - ARPA-STAFF — ARPA/WASH, DC
PM - SAMSO — USAF-LAS
PS - R.W. KLEBSADEL — LOS ALAMOS SCI 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 MONITORING CAPABILITY OF OPPOSITE SIDES OF THE EARTH. THE OBJECTIVES OF THE SATELLITES WERE (1) TO STUDY SOLAR AND COSMIC X RAYS, 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 B), COMPLETED THE OBJECTIVES OF THE VELA PROGRAM.

****

INVESTIGATION NAME- COSMIC X RAYS

NSSDC ID- 70-027B-06

PERSONNEL
PI - J.P. CONNER — LOS ALAMOS SCI LAB
OI - W.D. EVANS — LOS ALAMOS SCI LAB
OI - R.D. BELIAN — LOS ALAMOS SCI LAB

BRIEF DESCRIPTION
THE COSMIC X-RAY DETECTOR WAS A LARGE-AREA (26 SQ CM) SODIUM IODIDE SCINTILLATOR WITH A 5-MIL BERYLLIUM WINDOW. THE EXPERIMENT WAS DESIGNED TO PROVIDE MEASUREMENTS OF THE LOCATION, INTENSITY, AND INTENSITY VARIATIONS OF NONSOLAR X-RAY SOURCES OVER A LONG PERIOD OF TIME. THE DETECTOR WAS SENSITIVE TO X-RAY PHOTONS IN TWO ENERGY INTERVALS (3 TO 6 KEV AND 3 TO 12 KEV), AND WAS SUFFICIENTLY SENSITIVE TO MONITOR FROM SIX TO TWELVE GALACTIC X-RAY SOURCES. ANY ONE SOURCE WAS VIEWED FOR APPROXIMATELY 1 H, AND EVERY 2 DAYS EACH SOURCE WAS BACK IN VIEW. THREE MODES OF READOUT WERE AVAILABLE: (1) THE REAL-TIME NORMAL MODE IN WHICH COUNTS FROM EACH ENERGY CHANNEL WERE TRANSMITTED EVERY S, (2) THE HIGH-RESOLUTION MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS TRANSMITTED EIGHT TIMES PER S, AND (3) THE STORE MODE IN WHICH ONLY THE 3- TO 12-KEV CHANNEL WAS STORED.

****

SPACECRAFT COMMON NAME- SAS-A
ALTERNATE NAMES- SAS 1, EXPLORER 42
UHURU, PL-701C
04797

NSSDC ID- 70-107A

LAUNCH DATE- 12/12/70

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 12/13/70
ORBIT PERIOD- 95.7 MIN — INCLINATION- 3.0 DEG
PERIAPSIS- 531. KM ALT — APOAPSIS- 572. KM ALT

PERSONNEL
MG - J.R. HOLTZ — NASA HEADQUARTERS
SC - N.G. ROMAN — NASA HEADQUARTERS
PM - M.R. TOWNSEND — NASA-GSFC
PS - C.E. FICHTEL — NASA-GSFC

BRIEF DESCRIPTION
SAS-A WAS THE FIRST OF A SERIES OF SMALL SPACECRAFT WHOSE OBJECTIVES WERE TO SURVEY THE CELESTIAL SPHERE AND SEARCH FOR SOURCES RADIATING IN THE X-RAY, GAMMA-RAY, UV, AND OTHER SPECTRAL REGIONS. THE PRIMARY MISSION OF SAS-A WAS TO DEVELOP A CATALOG OF CELESTIAL X-RAY SOURCES BY SYSTEMATIC SCANNING OF THE CELESTIAL SPHERE IN THE ENERGY RANGE FROM 2 TO 20 KEV. THE SPACECRAFT WAS LAUNCHED DECEMBER 12, 1970, FROM THE SAN MARCO PLATFORM OFF THE COAST OF KENYA, AFRICA, INTO A NEAR-CIRCULAR EQUATORIAL ORBIT. THE ORBITING SPACECRAFT WAS IN THE SHAPE OF A CYLINDER APPROXIMATELY 56 CM IN DIAMETER AND 116 CM IN LENGTH. FOUR SOLAR PADDLES WERE USED TO RECHARGE A 6-AMP-HR, EIGHT-CELL, NICKEL-CADMIUM BATTERY AND TO PROVIDE POWER TO THE SPACECRAFT AND EXPERIMENT. THE SPACECRAFT WAS STABILIZED BY AN INTERNAL WHEEL, AND A MAGNETICALLY TORQUED COMMANDABLE CONTROL SYSTEM WAS USED TO POINT THE SPIN AXIS OF THE SPACECRAFT TO ANY POINT OF THE SKY. THE ASPECT SYSTEM CONSISTED OF BOTH A STAR AND SUN SENSOR THAT SHARED THE SAME PROCESSING ELECTRONICS. DATA WERE STORED ON A ONE-ORBIT STORAGE TAPE RECORDER AND TELEMETERED DURING A 3.4-MIN PLAYBACK CYCLE. A 1000-BPS PCM/PM SYSTEM WAS USED.

****

INVESTIGATION NAME- ALL-SKY X-RAY SURVEY

NSSDC ID- 70-107A-01

PERSONNEL
PI - R. GIACCONI — HARVARD COLLEGE OBS
OI - E.M. KELLOGG — HARVARD COLLEGE OBS
OI - H. GURSKY — HARVARD COLLEGE OBS
OI - H. TANANBAUM — SAO

BRIEF DESCRIPTION
THE X-RAY INSTRUMENT ABOARD SAS-A (EXPLORER 42) CONSISTED OF TWO NEARLY IDENTICAL SIDES, BOTH PHYSICALLY AND ELECTRONICALLY. EACH SIDE CONTAINED AN X-RAY DETECTION SYSTEM COMPOSED OF A COLLIMATOR, PROPORTIONAL COUNTERS, ASSOCIATED PROCESSING ELECTRONICS, AND AN ASPECT SENSING SYSTEM. THE HIGH-RESOLUTION (SPATIAL) SIDE HAD A VIEWING ANGLE OF 0.5 DEG BY 5 DEG FWHM AND A DETECTION RANGE FROM 1 TO 20 KEV. THE OTHER SIDE HAD A HIGH-SENSITIVITY (INTENSITY) COLLIMATOR WITH A VIEWING ANGLE OF 5 DEG BY 5 DEG FWHM. THIS SIDE HAD A DETECTION RANGE FROM 1 TO 10 KEV. THE CENTERS OF THE FIELDS OF VIEW OF THE TWO BANKS WERE DISPLACED FROM THE EQUATORIAL PLANE OF THE SATELLITE, SUCH THAT THE FULL BANDWIDTH COVERED BY THE TWO DETECTORS DURING EACH SPIN WAS APPROXIMATELY 127 DEG. SIX PROPORTIONAL COUNTERS, COMPOSED OF A BERYLLIUM SHELL WITH 2.5-MIL BERYLLIUM FOIL WINDOWS, WERE BEHIND EACH COLLIMATOR. THE INTERIOR CONTAINED A 2-MIL TUNGSTEN ANODE WIRE AND A GAS COMPOSITION OF 90 PERCENT ARGON, 9.5 PERCENT CARBON DIOXIDE FOR QUENCHING, AND 0.5 PERCENT HELIUM AT A PRESSURE OF 940 MM OF MERCURY. LOW-INTENSITY RADIOACTIVE SOURCES WERE USED FOR IN-FLIGHT CALIBRATION OF THE INSTRUMENT. THE SPIN AXIS OF THE SPACECRAFT WAS HELD FIXED IN THE SKY FOR ABOUT A DAY AT A TIME. DURING THIS PERIOD A BAND OF APPROXIMATELY 18 DEG ABOUT THE EQUATOR OF THE SPIN AXIS WAS SCANNED. THE PRIMARY DATA REDUCTION OBJECTIVE WAS TO SUPERIMPOSE THE X-RAY DATA RECORDED AS 'COUNT RATE VS TIME' TO 'COUNT RATE VS AZIMUTH' SO THAT THE SUPERIMPOSITION DATA WOULD BE EQUIVALENT TO A SINGLE SWEEP THROUGH THE OBSERVING 18-DEG BAND WITH A TOTAL OBSERVING TIME OF 1 DAY. AN ARRAY WAS CREATED OF X-RAY SUPERPOSITION (REPRESENTING THE 360-DEG CIRCLE SCANNED) BROKEN INTO 4320 ELEMENTS OF AZIMUTH OF 5 MIN EACH FOR THE 0.5-DEG DETECTOR AND 1080 ELEMENTS OF AZIMUTH OF 20 MIN EACH FOR THE 5-DEG DETECTOR.

****

SPACECRAFT COMMON NAME- SOLRAD 10
ALTERNATE NAMES- EXPLORER 44, SOLAR EXPLORER-C
SE-C, SOLRAD-C
PL-703A

NSSDC ID- 71-058A

LAUNCH DATE- 07/08/71

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 07/09/71
ORBIT PERIOD- 95.3 MIN — INCLINATION- 51.0 DEG
PERIAPSIS- 436. KM ALT — APOAPSIS- 630. KM ALT

PERSONNEL
MG - J.R. HOLTZ — NASA HEADQUARTERS
SC - J.D. BOHLIN — NASA HEADQUARTERS
PM - E.W. PETERKIN — US NAVAL RESEARCH LAB
PS - R.W. KREPLIN — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
SOLRAD 10, A SPIN-STABILIZED SATELLITE, WAS ONE IN A SERIES OF SPACECRAFT DESIGNED TO PROVIDE CONTINUOUS COVERAGE OF WAVELENGTH AND INTENSITY CHANGES IN SOLAR RADIATION IN THE UV, SOFT, AND HARD X-RAY REGIONS. (THE FIRST SPACECRAFT IN THIS SERIES WAS LAUNCHED IN 1960.) SOLRAD 10 ALSO MAPPED THE CELESTIAL SPHERE USING A HIGH-SENSITIVITY X-RAY DETECTOR. THE SPACECRAFT WAS A 12-SIDED CYLINDER THAT MEASURED 76 CM IN DIAMETER AND 58 CM IN HEIGHT. FOUR SYMMETRICALLY PLACED 17.8- BY 53.3-CM SOLAR CELL PANELS, HINGED AT THE CENTER SECTION OF THE STRUCTURE, SERVED AS THE ELEMENTS OF A TURNSTILE ANTENNA SYSTEM. EIGHTEEN SOLAR SENSORS WERE MOUNTED POINTING PARALLEL TO THE SPIN AXIS OF THE SATELLITE, WHICH POINTED DIRECTLY AT THE SOLAR DISK. THE PLANE OF ROTATION SHIFTED ABOUT 1 DEG/DAY SO THAT A STELLAR DETECTOR MOUNTED TO POINT RADIALLY OUTWARD FROM THE AXIS SCANNED THE CELESTIAL SPHERE. DATA FROM ALL DETECTORS WERE STORED IN A 54-KBS CORE MEMORY AND TELEMETERED ON COMMAND TO THE NRL TRACKING STATION AT BLOSSOM POINT, MD. DATA WERE ALSO TRANSMITTED IN REAL TIME AT 137.710 MHZ.

****

INVESTIGATION NAME- ALL-SKY X-RAY SURVEY

NSSDC ID- 71-058A-02

PERSONNEL
PI - R.W. KREPLIN — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO MAP THE SOURCES OF X-RAY EMISSION IN THE SKY IN THE 0.5 - 15-A REGION. THE DETECTOR, MOUNTED ON THE SIDE OF THE SPACECRAFT, WAS A LARGE-AREA PROPORTIONAL COUNTER MOUNTED TO POINT RADIALLY OUTWARD FROM THE SPIN AXIS, WHICH POINTED CONTINUALLY TOWARD THE SUN. THE DETECTOR WINDOW WAS MADE OF 1/8-MIL-THICK MYLAR WITH AN EFFECTIVE AREA OF 100 SQ CM. THE GAS FILLER WAS A MIXTURE OF 0.45 ARGON, 0.45 XENON, AND 0.10 CARBON DIOXIDE MAINTAINED AT 4 LB/SQ CM. A COLLIMATOR LIMITED THE FIELD OF VIEW TO 8 DEG, FULL WIDTH AT HALF MAXIMUM (FWHM) IN A PLANE CONTAINING THE SPIN AXIS AND 1 DEG IN THE PLANE PERPENDICULAR TO THE SPIN AXIS. CHARGED PARTICLE INFORMATION WAS PROVIDED BY PROPORTIONAL COUNTERS MOUNTED ON THREE SIDES OF THE X-RAY DETECTOR. ASPECT INFORMATION WAS PROVIDED BY A BLUE-SENSITIVE PHOTOMULTIPLIER CAPABLE OF DETECTING ALL FOURTH-MAGNITUDE AND NOT FIFTH-MAGNITUDE STARS. THE RESOLUTION OF THE ASPECT SYSTEM AND THE ACCURACY WITH WHICH THE EXPERIMENT COULD LOCATE X-RAY SOURCES WAS BETTER THAN PLUS OR MINUS 0.25 DEG. THE DETECTOR WAS CONNECTED TO A 400-CHANNEL PULSE TIME ANALYZER WHICH WAS SYNCHRONIZED WITH THE SPIN PERIOD TO GIVE A 2-DEG SPATIAL RESOLUTION IN THE SPIN DIRECTION. THE WHOLE CELESTIAL SPHERE WAS SURVEYED EVERY 6 MONTHS. DUE TO THE LOW ALTITUDE OF THE SATELLITE, THERE WAS A HIGH CHARGED-PARTICLE COUNT AT ALL TIMES. THIS BACKGROUND LIMITED THE USEFULNESS OF THE DATA, AND NO RESULTS FROM THIS EXPERIMENT WERE PUBLISHED.

****

SPACECRAFT COMMON NAME- APOLLO 15 CSM
ALTERNATE NAMES- 05351

NSSDC ID- 71-063A

LAUNCH DATE- 07/26/71

ORBIT PARAMETERS
ORBIT TYPE- SELENOCENTRIC — EPOCH DATE- 07/30/72
ORBIT PERIOD- 119.0 MIN — INCLINATION- 26. DEG
PERIAPSIS- 90.0 KM ALT — APOAPSIS- 115.0 KM ALT

PERSONNEL
PM - R. PETRONE — NASA HEADQUARTERS

BRIEF DESCRIPTION
APOLLO 15 WAS THE FIFTH SPACECRAFT (FOURTH ACCOMPLISHED) AND THE FIRST OF THE J-SERIES APOLLO MISSIONS DESIGNED TO LAND MEN ON THE MOON. THE LUNAR LANDING SITE FOR THE 12-DAY SCIENTIFIC MISSION WAS THE HADLEY RILLE-APENNINE MOUNTAIN REGION AT 26 DEG 06 MIN 54 SEC N, 3 DEG 39 MIN 30 SEC E ON THE LUNAR SURFACE. THE DATE OF LAUNCH WAS JULY 26, 1971. THE LUNAR MODULE (LM) CARRYING ASTRONAUTS DAVID SCOTT AND JAMES IRWIN AND THE LUNAR ROVING VEHICLE (LRV) LANDED ON THE MOON ON JULY 31, 1971. THE COMMAND MODULE (CM) PILOTED BY ALFRED WORDEN REMAINED IN A SLIGHTLY ELLIPTICAL ORBIT AT AN ALTITUDE OF 93 BY 120 KM WITH AN INCLINATION OF 23 DEG. THE PROJECTS CARRIED OUT ON THE SURFACE INCLUDED THE DEPLOYMENT OF THE APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE (ALSEP), GEOLOGICAL FIELD EXPLORATION IN THREE EVA EXCURSIONS, DOCUMENTING PHOTOGRAPHY, AND ACQUISITION OF SAMPLES OF THE LUNAR TERRAIN. PHOTOGRAPHS USING 16- AND 70-MM FILM WERE OBTAINED FROM BOTH THE SURFACE AND FROM ORBIT, AND 35-MM AND TWO KINDS OF 5-IN. FILM PHOTOGRAPHS WERE OBTAINED FROM ORBIT. SPECIAL UV AND DIMLIGHT PHOTOGRAPHIC EXPERIMENTS WERE PERFORMED DURING ORBIT. BEFORE LEAVING THE LUNAR ENVIRONMENT, A SUBSATELLITE WITH AN EXPERIMENTS PACKAGE WAS RELEASED FROM THE COMMAND SERVICE MODULE (CSM) ON AUGUST 4, 1971, INTO AN ORBIT 135 BY 97 KM. THE LRV WAS USED TO EXPLORE REGIONS WITHIN 5 KM OF THE LM LANDING SITE. THIS WAS THE FIRST TIME A VEHICLE OF THIS TYPE HAD BEEN USED, AND ITS PERFORMANCE ON THE LUNAR TERRAIN WAS VERY SUCCESSFUL. THE CM AND LM VEHICLES REJOINED ON AUGUST 2, 1971, PERFORMED FURTHER PHOTOGRAPHIC EXPERIMENTS IN ORBIT AROUND THE MOON FOR 2 DAYS. THE LM WAS SEPARATED FOR LUNAR IMPACT, AND THE CSM WAS PLACED IN EARTHBOUND TRAJECTORY. ENROUTE THE SERVICE MODULE WAS SEPARATED, AND THE CM RETURNED TO EARTH ON AUGUST 7, 1971. MORE INFORMATION ON THE LM MAY BE FOUND UNDER SPACECRAFT 71-063C.

****

INVESTIGATION NAME- X-RAY FLUORESCENCE

NSSDC ID- 71-063A-09

PERSONNEL
PI - I. ADLER — NASA-GSFC
OI - A.E. METZGER — NASA-JPL
OI - P. GORENSTEIN — HARVARD COLLEGE OBS
OI - H. GURSKY — HARVARD COLLEGE OBS
OI - J.I. TROMBKA — NASA-GSFC

BRIEF DESCRIPTION
THIS EXPERIMENT, CARRIED IN THE SCIENTIFIC INSTRUMENT MODULE (SIM) OF THE COMMAND AND SERVICE MODULE (CSM) ON THE APOLLO 15 MISSION, WAS USED FOR ORBITAL MAPPING OF THE LUNAR SURFACE COMPOSITION AND X-RAY GALACTIC OBSERVATIONS DURING THE TRANSEARTH COAST. THE INSTRUMENT CONSISTED OF THREE LARGE-AREA PROPORTIONAL COUNTERS WITH STATE-OF-THE-ART ENERGY RESOLUTION, A SET OF LARGE-AREA FILTERS FOR ENERGY DISCRIMINATION AMONG THE CHARACTERISTIC X RAYS OF ALUMINUM, SILICON, AND MAGNESIUM, AND A DATA HANDLING SYSTEM FOR COUNT ACCUMULATION, FOR EIGHT-CHANNEL PULSE-HEIGHT ANALYSIS, AND FOR RELAYING THE DATA TO THE SPACECRAFT (SC) TELEMETRY SYSTEM. ALSO INCLUDED WAS A SOLAR X-RAY MONITOR. THE LARGE-AREA PROPORTIONAL COUNTERS WERE COLLIMATED TO FIELDS OF VIEW OF ABOUT 60 DEG AND YIELDED A RESOLUTION ON THE LUNAR SURFACE OF 111 BY 148 KM.

****

SPACECRAFT COMMON NAME- OSO 7
ALTERNATE NAMES- OSO-H, 05491

NSSDC ID- 71-083A

LAUNCH DATE- 09/29/71

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 09/30/71
ORBIT PERIOD- 93.2 MIN — INCLINATION- 33.1 DEG
PERIAPSIS- 321. KM ALT — APOAPSIS- 572. KM ALT

PERSONNEL
MG - M.E. MCDONALD — NASA HEADQUARTERS
SC - G.K. OERTEL — NASA HEADQUARTERS
PM - R.H. PICKARD — NASA-GSFC
PS - S.P. MARAN — NASA-GSFC

BRIEF DESCRIPTION
THE OBJECTIVES OF THE OSO SATELLITE SERIES WERE TO PERFORM SOLAR PHYSICS EXPERIMENTS ABOVE THE ATMOSPHERE DURING A COMPLETE SOLAR CYCLE AND TO MAP THE ENTIRE CELESTIAL SPHERE FOR DIRECTION AND INTENSITY OF UV LIGHT AND X-RAY AND GAMMA RADIATION. THE OSO 7 PLATFORM CONSISTED OF A SAIL SECTION, WHICH POINTED TWO EXPERIMENTS CONTINUALLY TOWARD THE SUN, AND A WHEEL SECTION, WHICH SPUN ABOUT AN AXIS PERPENDICULAR TO THE POINTING DIRECTION OF THE SAIL AND CARRIED FOUR EXPERIMENTS. ATTITUDE ADJUSTMENT WAS PERFORMED BY GAS JETS AND A MAGNETIC TORQUING COIL. A POINTING CONTROL PERMITTED THE POINTED EXPERIMENTS TO SCAN THE REGION OF THE SOLAR DISK IN A 60- BY 60-ARC-MIN RASTER PATTERN. IN ADDITION, THE POINTED SECTION COULD BE COMMANDED TO SELECT AND SCAN ANY 7.5- BY 5-ARC-MIN REGION NEAR THE SOLAR DISK. DATA WERE SIMULTANEOUSLY RECORDED ON TAPE AND TRANSMITTED BY PCM/PM TELEMETRY. A COMMAND SYSTEM PROVIDED FOR AT LEAST 155 GROUND-BASED COMMANDS. ONLY REAL-TIME DATA HAVE BEEN RECEIVED SINCE MAY 1973, WHEN THE SECOND TAPE RECORDER FAILED. THE SPACECRAFT REENTERED THE EARTH'S ATMOSPHERE JULY 9, 1974.

****

INVESTIGATION NAME- COSMIC X-RAY EXPERIMENT

NSSDC ID- 71-083A-03

PERSONNEL
PI - L.E. PETERSON — U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
THE UCSD COSMIC X-RAY INSTRUMENT WAS A SENSITIVE DETECTOR MOUNTED IN THE ROTATING WHEEL SECTION OF THE SPACECRAFT SO THAT IT VIEWED THE CELESTIAL SPHERE IN SIX MONTHS. THE OBJECTIVES OF THE EXPERIMENT WERE (1) TO LOCATE ACCURATELY KNOWN AND NEWLY DETECTED X-RAY SOURCES, (2) TO MEASURE THE INTENSITY OF THE SOURCES, AND (3) TO ANALYZE SPECTRALLY THE SOURCES OVER THE RANGE OF 10 TO 550 KEV. THE EXPERIMENT CAPABILITIES WERE (1) A FULL CONICAL LOOK ANGLE OF 6.4 DEG, (2) A SPATIAL RESOLUTION OF PLUS-MINUS 0.2 DEG, (3) A SENSITIVITY OF 5.E-4 PHOTONS/(SQ CM-S), (4) AN ENERGY RESOLUTION PROVIDED BY THE USE OF 126 CHANNELS FOR THE 10-550 KEV RANGE, AND (5) A MAXIMUM DETECTION RATE OF 3.12 PHOTONS/S. THE X-RAY DETECTOR WAS A 4-IN-DIAMETER BY 3/8-IN-THICK NAI(TL) SCINTILLATION CRYSTAL VIEWED BY A 3-IN PHOTOMULTIPLIER TUBE (PMT). THE DETECTOR WAS SURROUNDED BY A THICK CSI(NA) SCINTILLATION CRYSTAL SHIELD WITH 10 HOLES BORED THROUGH IT ALONG THE OPTICAL AXIS TO DEFINE THE FIELD OF VIEW OF THE DETECTOR. THE SHIELD SCINTILLATOR WAS VIEWED BY SIX PM TUBES. LIGHT PULSES IN THE NAI CRYSTAL CAUSED BY X RAYS WHICH HAVE PASSED THROUGH THE HOLES IN THE SHIELD HAVE RELATIVELY SLOW RISE TIMES AND HAVE INTENSITIES PROPORTIONAL TO THE ENERGY OF THE PHOTONS. THE CORRESPONDING PROPORTIONAL CURRENT PULSES OUT OF THE PM WERE RECOGNIZED AS VALID PHOTON EVENTS AND PROCESSED BY THE DATA SYSTEM. X RAYS OR PARTICLES THAT PASSED THROUGH THE CSI SHIELD CAUSED LIGHT PULSES WITH FAST RISE TIMES AND CORRESPONDING PULSES IN THE SHIELD PM TUBES. PULSES FROM THE SHIELD PM TUBES WERE USED TO ELECTRONICALLY REJECT SIMULTANEOUS PULSES FROM THE DETECTOR PM. IN THIS WAY ONLY X RAYS PASSING THROUGH THE COLLIMATING HOLES WERE PROCESSED AS USEFUL DATA.

****

INVESTIGATION NAME- COSMIC X-RAY SOURCES IN THE RANGE 1.5 TO 9 A

NSSDC ID- 71-083A-04

PERSONNEL
PI - G.W. CLARK — MASS INST OF TECH
OI - H.V.D.BRADT — MASS INST OF TECH
OI - W.H.G.LEWIN — MASS INST OF TECH
OI - H.W. SCHNOPPER — MASS INST OF TECH

BRIEF DESCRIPTION
THE PURPOSE OF THIS EXPERIMENT WAS TO SURVEY THE ENTIRE SKY FOR COSMIC X-RAY SOURCES IN THE ENERGY RANGE 1 TO 60 KEV WITH AN ANGULAR RESOLUTION OF ABOUT 1 DEG, AND PERFORM SPECTRAL ANALYSIS IN 5 BROAD BANDS. EACH PORTION OF THE SKY WAS VIEWED SEVERAL TIMES DURING EACH YEAR OF OPERATION. TWO MULTICOMPARTMENTED PROPORTIONAL COUNTERS EQUIPPED WITH HONEYCOMB COLLIMATORS (3.5 SQ DEG SOLID ANGLE) WERE MOUNTED IN ONE SEGMENT OF THE OSO WHEEL SECTION, WITH THE CENTERS OF THEIR FIELDS OF VIEW ORIENTED 15 DEG ABOVE AND 15 DEG BELOW THE SPACECRAFT EQUATOR. X RAYS WERE DETECTED IN ONE OR ANOTHER OF FOUR COMPARTMENTS DEPENDING UPON THEIR ENERGY. LOW-ENERGY PHOTONS WERE STOPPED IN THE FIRST COMPARTMENT, HIGHER-ENERGY PHOTONS PENETRATED TO THE SECOND COMPARTMENT, AND PHOTONS OF EVEN HIGHER ENERGIES PENETRATED THROUGH THE FIRST AND SECOND COMPARTMENTS TO THE THIRD AND FOURTH COMPARTMENTS. THE ENERGY BANDS WERE LOGARITHMICALLY EQUISPACED. A SEPARATE SINGLE COMPARTMENT COUNTER WITH A THIN ALUMINUM WINDOW DETECTED PHOTONS BETWEEN 1.0 AND 1.5 KEV. COUNTS FROM EACH COMPARTMENT WERE STORED IN ONE OF 256 ACCUMULATORS CORRESPONDING TO A DIVISION OF THE SPACECRAFT SPIN INTO 256 SECTORS. IN-FLIGHT CALIBRATION WAS PROVIDED BY PERIODIC EXPOSURE TO A RADIOACTIVE

SOURCE. ACCURATE ASPECT INFORMATION WAS PROVIDED BY A STAR SENSOR.

****

SPACECRAFT COMMON NAME- TD 1A
ALTERNATE NAMES- PL-721E, TD 1
05879

NSSDC ID- 72-014A

LAUNCH DATE- 03/12/72

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 03/12/72
ORBIT PERIOD- 95.6 MIN — INCLINATION- 97.5 DEG
PERIAPSIS- 536. KM ALT — APOAPSIS- 867. KM ALT

PERSONNEL
SC - NONE ASSIGNED
PM - T.I. CURL — ESA-ESTEC
PM - R.J. GOSS — NASA-GSFC
PS - J. VON VOCHEL — ESA-ESTEC

BRIEF DESCRIPTION
THE TD-1 SATELLITE CARRIED SEVEN EXPERIMENTS DEVOTED TO ASTROPHYSICAL STUDIES. ITS SCIENTIFIC MISSION WAS TO MAKE A SYSTEMATIC SKY SURVEY IN THE ULTRAVIOLET AND HIGH-ENERGY REGIONS OF THE SPECTRUM. THE EXPERIMENTS WERE DIVIDED INTO TWO MAIN CATEGORIES: FIVE EXPERIMENTS--MEASURING ULTRAVIOLET, X AND GAMMA RAYS, AND HEAVY NUCLEI--SCANNED STRIPS OF THE SKY; THE OTHER TWO VIEWED ALONG THE SUN-POINTING X AXIS AND MEASURED SOLAR X AND GAMMA RAYS. THE SATELLITE WAS A TRIAXIALLY STABILIZED PLATFORM WITH THE X AXIS ALWAYS POINTED AT THE CENTER OF THE SUN WITH AN ACCURACY OF 1 ARC MIN. THE SATELLITE ROTATED AROUND THIS AXIS AT A CONSTANT RATE OF 1 REVOLUTION PER ORBIT DURING NORMAL OPERATIONS WHEN SUN SENSORS WERE USED FOR STABILIZATION BUT IT WAS SPUN UP DURING ECLIPSE PERIODS TO MAINTAIN ATTITUDE. THE SKY-SCANNING INSTRUMENTS WERE ABLE TO SCAN A NARROW BAND OF THE SKY DURING EACH ORBIT AND THE WHOLE CELESTIAL SPHERE IN 6 MONTHS. TWO AND ONE-HALF COMPLETE SCANS OF THE CELESTIAL SPHERE WERE COMPLETED BEFORE THE ATTITUDE CONTROL WAS LOST IN MAY 1974 FOLLOWING EXHAUSTION OF THE ON-BOARD GAS SUPPLY. DESPITE INTERMITTENT TAPE RECORDER FAILURE, DATA COVERAGE WAS ACHIEVED OVER 95 PERCENT OF THE CELESTIAL SPHERE AND MANY AREAS WERE OBSERVED DURING TWO OR THREE SEPARATE SCANS. THE SPACECRAFT WAS A RECTANGULAR STRUCTURE AND COMPRISED A BOTTOM COMPARTMENT CONTAINING THE SPACECRAFT SUBSYSTEMS AND A TOP COMPARTMENT CONTAINING THE OUTWARD-VIEWING SCIENCE INSTRUMENTS. IT HAD A CROSS SECTION OF 1 BY 0.9 M AND WAS 2.2 M HIGH; ITS MASS WAS 473 KG INCLUDING 120 KG OF INSTRUMENTS. FOR ADDITIONAL INFORMATION SEE "ESRO REPORT PRESENTED TO THE EIGHTEENTH COSPAR MEETING, VARNA, BULGARIA, JUNE 1975".

****

INVESTIGATION NAME- SPECTROMETRY OF CELESTIAL X RAYS 2-30 KEV (S77)

NSSDC ID- 72-014A-04

PERSONNEL
PI - J. LABEYRIE — CENS

BRIEF DESCRIPTION
A 100-SQ-CM PROPORTIONAL COUNTER WAS USED TO MEASURE THE SPECTRA OF CELESTIAL X-RAY SOURCES IN 10 CHANNELS BETWEEN 2 AND 30 KEV. THE PROPORTIONAL COUNTER WAS LOCATED BEHIND A CROSSED PAIR OF SLOT COLLIMATORS, WHICH TOGETHER YIELDED A 5- BY 1-DEG FIELD OF VIEW. THE PROPORTIONAL COUNTER HAD A 0.5-MM BERYLLIUM WINDOW AND A XENON FILLER GAS. IT WAS CONSTRUCTED IN TWO PARTS, WHICH WERE THEN ANTICOINCIDENCED TO REMOVE THE BACKGROUND DUE TO COSMIC-RAY PARTICLES. SEVERAL MONTHS AFTER LAUNCH THE EXPERIMENT WAS SWITCHED OFF WHEN PROBLEMS WERE ENCOUNTERED WITH THE SPACECRAFT'S ENCODER. DURING THE SECOND SCAN PERIOD, ON JULY 1, 1973, THE EXPERIMENT WAS SUCCESSFULLY SWITCHED ON. CALIBRATION SHOWED THAT THE INSTRUMENT HAD NOT SUFFERED ANY DEGRADATION IN SENSITIVITY NOR IN ENERGY RESOLUTION AND THE EXPERIMENT WAS ABLE TO FULFILL ITS SCIENTIFIC MISSION. DURING SPIN-UP MODE THE EXPERIMENT SCANNED THE EARTH AS WELL AS THE SKY AND WAS ABLE TO MONITOR X-RAY RADIATION FROM THE AURORAL ZONES.

****

SPACECRAFT COMMON NAME- APOLLO 16 CSM
ALTERNATE NAMES- 06000

NSSDC ID- 72-031A

LAUNCH DATE- 04/16/72

ORBIT PARAMETERS
ORBIT TYPE- SELENOCENTRIC — EPOCH DATE- 04/20/72
ORBIT PERIOD- 120.0 MIN — INCLINATION- 12.0 DEG
PERIAPSIS- 94.0 KM ALT — APOAPSIS- 120.0 KM ALT

PERSONNEL
PM - R. PETRONE — NASA HEADQUARTERS

BRIEF DESCRIPTION
APOLLO 16 WAS THE FIFTH MISSION IN THE APOLLO SERIES IN WHICH MEN LANDED ON THE MOON. THE 11-DAY SCIENTIFIC MISSION BEGAN ON APRIL 16, 1972, AT 1754 UT. (THE LAUNCH WAS POSTPONED FROM THE ORIGINALLY SCHEDULED DATE, MARCH 17, BECAUSE OF A DOCKING RING JETTISON MALFUNCTION.) NAVY CAPT. JOHN W. YOUNG AND AIR FORCE LT. CHARLES M. DUKE LANDED ON THE LUNAR SURFACE IN THE LUNAR MODULE (LM) ON APRIL 21. NAVY LT. THOMAS K. MATTINGLY REMAINED IN THE COMMAND MODULE (CM) PERFORMING SCIENTIFIC EXPERIMENTS WHILE THE CM WAS IN AN EQUATORIAL ORBIT ABOUT THE MOON. THE LM LANDED IN THE DESCARTES REGION OF THE MOON AT APPROXIMATELY 9 DEG S, 16 DEG E. AN APOLLO LUNAR SURFACE EXPERIMENTS PACKAGE (ALSEP) WAS DEPLOYED ON THE SURFACE, TERRAIN SAMPLES WERE ACQUIRED, AND PHOTOGRAPHS WERE OBTAINED BY THE SURFACE ASTRONAUTS AND FROM THE CM USING 16-, 35-, AND 70-MM FILM, 5- BY 46-IN. PANORAMIC FILM, AND 5- BY 5-IN. MAPPING FILM. THE SURFACE ASTRONAUTS ALSO TESTED THE SECOND LUNAR ROVING VEHICLE TO BE TAKEN TO THE MOON BY EXPLORING REGIONS WITHIN 4 KM OF THE LM LANDING SITE. A SUBSATELLITE CARRYING AN EXPERIMENT PACKAGE WAS LAUNCHED INTO LUNAR ORBIT ON APRIL 24, 1972, AND IMPACTED WITH THE MOON AFTER 425 REVOLUTIONS ON MAY 29, 1972. THE APOLLO 16 SPACECRAFT WAS LAUNCHED ON APRIL 16, 1972, AND WAS INJECTED INTO LUNAR ORBIT ON APRIL 19. THE LM LANDED ON THE MOON ON APRIL 21 AND RETURNED TO THE CM ON APRIL 24. THE CM LEFT LUNAR ORBIT ON APRIL 26 AND RETURNED TO EARTH ON APRIL 27, 1972.

****

INVESTIGATION NAME- X-RAY FLUORESCENCE

NSSDC ID- 72-031A-08

PERSONNEL
PI - I. ADLER — NASA-GSFC
OI - A.E. METZGER — NASA-JPL
OI - P. GORENSTEIN — HARVARD COLLEGE OBS
OI - H. GURSKY — HARVARD COLLEGE OBS
OI - J.I. TROMBKA — NASA-GSFC

BRIEF DESCRIPTION
THIS EXPERIMENT, CARRIED IN THE SCIENTIFIC INSTRUMENT MODULE OF THE COMMAND AND SERVICE MODULE ON THE APOLLO 16 MISSION, WAS USED FOR ORBITAL MAPPING OF THE LUNAR SURFACE COMPOSITION AND X-RAY GALACTIC OBSERVATIONS DURING TRANSEARTH COAST. THE INSTRUMENT CONSISTED OF THREE LARGE-AREA PROPORTIONAL COUNTERS WITH STATE-OF-THE-ART ENERGY RESOLUTION, A SET OF LARGE-AREA FILTERS FOR ENERGY DISCRIMINATION AMONG THE CHARACTERISTIC X RAYS OF ALUMINUM, SILICON, AND MAGNESIUM, AND A DATA HANDLING SYSTEM FOR COUNT ACCUMULATION, FOR EIGHT-CHANNEL PULSE-HEIGHT ANALYSIS, AND FOR RELAYING THE DATA TO THE SPACECRAFT TELEMETRY SYSTEM. ALSO INCLUDED WAS A SOLAR X-RAY MONITOR. THE LARGE-AREA PROPORTIONAL COUNTERS WERE COLLIMATED TO FIELDS OF VIEW OF ABOUT 60 DEG AND YIELDED A RESOLUTION ON THE LUNAR SURFACE OF 111 BY 148 KM.

****

SPACECRAFT COMMON NAME- OAO 3
ALTERNATE NAMES- PL-7010, OAO-C
COPERNICUS, 06153

NSSDC ID- 72-065A

LAUNCH DATE- 08/21/72

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 08/21/72
ORBIT PERIOD- 99.7 MIN — INCLINATION- 35.0 DEG
PERIAPSIS- 739. KM ALT — APOAPSIS- 751. KM ALT

PERSONNEL
MG - H.B. CHISHOLM — NASA HEADQUARTERS
SC - E.J. WEILER — NASA HEADQUARTERS
PM - J.P. CORRIGAN — NASA-GSFC
PS - J.E. KUPPERIAN, JR. — NASA-GSFC

BRIEF DESCRIPTION
THIS MISSION WAS THE THIRD IN THE OAO PROGRAM AND ITS SECOND SUCCESSFUL SPACECRAFT TO OBSERVE THE CELESTIAL SPHERE FROM ABOVE THE EARTH'S ATMOSPHERE. A UV TELESCOPE WITH A SPECTROMETER MEASURED HIGH-RESOLUTION SPECTRA OF STARS, GALAXIES, AND PLANETS WITH THE MAIN EMPHASIS ON THE DETERMINATION OF INTERSTELLAR ABSORPTION LINES. THREE X-RAY TELESCOPES AND A COLLIMATED, PROPORTIONAL COUNTER PROVIDED MEASUREMENTS OF CELESTIAL X-RAY SOURCES AND INTERSTELLAR ABSORPTION BETWEEN .1 AND 7 NM. THE OAO-3 SPACECRAFT WAS AN OCTAGONALLY SHAPED, ALUMINUM STRUCTURE WITH A 1.21-M HOLLOW, CENTRAL, TUBULAR AREA, WHICH HOUSED THE EXPERIMENT CONTAINER. SOLAR PANELS WERE MOUNTED ON EACH SIDE OF THE SPACECRAFT AT ANGLES OF 34 DEG AND HAD AN AREA OF 38.2 SQ M. A SUN BAFFLE PROTECTED THE EXPERIMENTS AND INCREASED THE LENGTH OF THE

SPACECRAFT TO 4.9 M. TWO INERTIAL BALANCE BOOMS, ONE FORWARD AND ONE AFT, EXTENDED APPROXIMATELY 6.8 M. THE SPACECRAFT WAS EQUIPPED WITH AN INERTIAL REFERENCE UNIT (A HIGH-PRECISION, THREE-AXIS GYRO INERTIAL SYSTEM), SUN SENSORS, A MAGNETOMETER, AND STAR TRACKERS, WHICH ENABLED SPACECRAFT POINTING TO BE DETERMINED IN MANY DIFFERENT WAYS. A BORESIGHT STAR TRACKER, SENSITIVE TO SIXTH MAGNITUDE, CONTROLLED PITCH AND YAW TO WITHIN 5 ARC S. IN ADDITION, THE HIGH-RESOLUTION TELESCOPE EXPERIMENT HAD A FINE POINTING CONTROL, WHICH COULD CONTROL THE PITCH AND YAW TO WITHIN ONE-TENTH ARC S ON BRIGHT STARS. SPACECRAFT ATTITUDE WAS CONTROLLED BY INERTIA WHEELS AND THRUSTERS. REDUNDANT TRACKING BEACONS FACILITATED GROUND TRACKING OF THE SPACECRAFT. TWO UHF (400.55 MHZ) TRANSMITTERS PROVIDED WIDEBAND TELEMETRY FOR TRANSMITTING DIGITAL DATA TO THE GROUND STATIONS. TWO REDUNDANT VHF (136.26 MHZ) TRANSMITTERS WERE USED IN A NARROW-BAND TELEMETRY LINK PRIMARILY FOR TRANSMITTING SPACECRAFT HOUSEKEEPING DATA, ALTHOUGH THEY SERVED AS BACKUPS FOR THE WIDEBAND TELEMETRY SYSTEM. TWO REDUNDANT PAIRS OF VHF COMMAND RECEIVERS WERE CARRIED AS PART OF A COMMAND SYSTEM CAPABLE OF STORING 1280 COMMANDS. DATA WERE STORED ON AN ON-BOARD TAPE RECORDER AND IN CORE STORAGE. AN ON-BOARD PROCESSOR MONITORED TELEMETRY DATA, ISSUED COMMANDS, AND WAS PROGRAMMED VIA THE COMMAND RECEIVER UPLINK. THE OBSERVATIONAL LIFE OF THE MISSION WAS AUG. 1972 - FEB. 1981 (9-1/2 YEARS).

****

INVESTIGATION NAME- STELLAR X RAYS

NSSDC ID- 72-065A-02

PERSONNEL
PI - R.L.F.BOYD U COLLEGE LONDON
OI - P.W. SANFORD U COLLEGE LONDON

BRIEF DESCRIPTION
THIS EXPERIMENT USED THREE REFLECTING MIRROR SYSTEMS AND A COLLIMATED PROPORTIONAL COUNTER TO OBSERVE CELESTIAL X-RAY SOURCES BETWEEN .1 AND 10 NM. BETWEEN .1 AND .3 NM, THE COLLIMATED PROPORTIONAL COUNTER WAS USED IN CONJUNCTION WITH PULSE-SHAPE DISCRIMINATION TO REJECT BACKGROUND COUNTS. FROM .3 TO .9 NM AND .6 TO 1.8 NM, PROPORTIONAL COUNTERS LOCATED AT THE FOCUS OF TWO GRAZING-INCIDENCE REFLECTING TELESCOPES (5.5 SQ CM AND 12.5 SQ CM, RESPECTIVELY) WERE USED, WITH AN ANTICOINCIDENCE SCINTILLATOR ALSO EMPLOYED TO REJECT BACKGROUND COSMIC-RAY COUNTS. AN OPEN-CHANNEL MULTIPLIER LOCATED AT THE FOCUS OF A GRAZING-INCIDENCE TELESCOPE (23 SQ CM) WAS USED TO OBSERVE BETWEEN 2 AND 10 NM. A SIX-CHANNEL PULSE HEIGHT ANALYZER COULD BE SWITCHED TO ANY OF THE THREE PROPORTIONAL COUNTERS TO IMPROVE THE ENERGY RESOLUTION. THE .3 TO 9 NM AND .6 - 1.8 NM SYSTEMS BECAME INOPERABLE IN JUNE 1973 WHEN THE BACKGROUND SHUTTER STUCK IN THE CLOSED POSITION. MOST OF THE OBSERVATIONS AFTER THIS WERE MADE WITH THE .1 - .3 NM SYSTEM.

****

SPACECRAFT COMMON NAME- ANS
ALTERNATE NAMES- ASTRO NETHERLAND SAT.

NSSDC ID- 74-070A

LAUNCH DATE- 08/30/74

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/14/74
ORBIT PERIOD- 99.2 MIN INCLINATION- 98. DEG
PERIAPSIS- 266. KM ALT APOAPSIS- 1176. KM ALT

PERSONNEL
MG - J.R. HOLTZ NASA HEADQUARTERS
SC - N.G. ROMAN NASA HEADQUARTERS
PM - W. BLOEMENDAL FOKKER AIRCRAFT CO
PM - E.W. HYMOWITZ NASA-GSFC
PS - T.P. STECHER NASA-GSFC

BRIEF DESCRIPTION
THE ASTRONOMICAL NETHERLANDS SATELLITE (ANS) WAS AN EARTH-ORBITING SUN-SYNCHRONOUS SATELLITE, DESIGNED AS AN ASTRONOMICAL OBSERVATORY. THE SPACECRAFT WAS ATTITUDE-CONTROLLED BY MAGNETIC COILS, REACTION WHEELS, AND A YO-YO. ATTITUDE SENSING WAS CARRIED OUT BY SOLAR SENSORS, HORIZON SENSORS, AND STAR SENSORS. TWO GUIDE STARS NEAR THE OBJECT BEING OBSERVED SERVED AS THE FINAL POINTING REFERENCES. EXPERIMENTS ON BOARD OBSERVED CELESTIAL OBJECTS IN UV AND X-RAY WAVELENGTHS. DURING ITS OBSERVING LIFETIME OF 20 MONTHS (SEPT. 74 - JUNE 76) ANS MEASURED THE POSITIONS, SPECTRA, AND TIME VARIATIONS OF GALACTIC AND EXTRAGALACTIC X-RAY SOURCES IN THE ENERGY RANGE 2 TO 15 KEV, OBTAINED UPPER LIMITS TO THE STRENGTH OF SILICON LINE EMISSION AROUND 2 KEV, AND OBTAINED OVER 18,000 OBSERVATIONS OF ABOUT 400 OBJECTS IN THE UV RANGE 1500 TO 3300A.

****

INVESTIGATION NAME- SOFT X-RAY EXPERIMENT (SXX)

NSSDC ID- 74-070A-02

PERSONNEL
PI - A.C. BRINKMAN U OF UTRECHT

BRIEF DESCRIPTION
THE INSTRUMENTATION CONSISTED OF A MYLAR-WINDOW PROPORTIONAL COUNTER (44- TO 55-A PASSBAND), LOCATED AT THE FOCUS OF A GRAZING INCIDENCE RING PARABOLOID TELESCOPE, AND A TITANIUM-WINDOW PROPURTIONAL COUNTER (PASSBANDS OF 27- TO 35-A, 4- TO 12-A, AND 2- TO 4-A) LOCATED BEHIND A HONEYCOMB COLLIMATOR. THE SENSORS, WHICH OBSERVED X RAYS FROM COSMIC SOURCES, REQUIRED AN INSTRUMENT-POINTING ACCURACY OF 0.1 DEG. PART OF THE EXPERIMENT BECAME INOPERABLE ON JUNE 21, 1975, WHEN THE MYLAR-WINDOW ON THE 44-55 A PROPORTIONAL COUNTER APPARENTLY RUPTURED.

****

INVESTIGATION NAME- HARD X-RAY EXPERIMENT (HXX)

NSSDC ID- 74-070A-03

PERSONNEL
PI - J.E. GRINDLAY HARVARD COLLEGE OBS
OI - H.W. SCHNOPPER MASS INST OF TECH

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO DETECT COSMIC X-RAY EMISSIONS IN THE ENERGY RANGE FROM 1 TO 30 KEV. THE PRINCIPAL SCIENTIFIC OBJECTIVES OF THE EXPERIMENT WERE (1) TO GATHER SPECTRAL DATA WITH AN ENERGY RESOLUTION OF 20 PERCENT, (2) TO DETECT SILICON EMISSION LINES IN THE 1- TO 4-KEV RANGE AT AN ENERGY RESOLUTION OF 0.15 PERCENT, (3) TO STUDY PERIODIC AND RANDOM INTENSITY VARIATIONS OF SOURCES OVER A TIME RANGE OF 4 MILLISECONDS TO SEVERAL MINUTES, (4) TO OBTAIN DATA ON X-RAY LIGHT CURVES, AND (5) TO DEFINE POSITIONS OF SOURCES WITH A PRECISION APPROACHING 1 ARC-MIN. THE EXPERIMENTAL PACKAGE CONTAINED THREE MAJOR COMPONENTS: (1) A COLLIMATOR ASSEMBLY, (2) A LARGE AREA DETECTOR (LAD) UNIT FOR MEASURING 1- TO 30-KEV X RAYS, AND (3) A BRAGG-CRYSTAL SPECTROMETER TUNED FOR DETECTION OF SILICON LINES IN THE 1- TO 4-KEV INTERVAL. THE LAD AND BRAGG SPECTROMETER DETECTORS WERE VERY SENSITIVE, BEING ABLE TO DETECT 3.E-3 PHOTONS/(SQ CM-S). X-RAYS INCIDENT ON THE FRONT FACE OF THE PACKAGE PASSED THROUGH THE COLLIMATOR ASSEMBLY ONTO EITHER THE LAD OR A SERIES OF FOUR BRAGG CRYSTALS THAT WERE ORIENTED AT ABOUT 45 DEG WITH RESPECT TO THE INCIDENT BEAM. THE COLLIMATOR IN FRONT OF THE LAD WAS A COMBINATION OF A FINE COLLIMATOR (10 ARC-MIN FWHM) AND A COARSE COLLIMATOR (3 DEG FWHM), WITH THE POINTING OF EACH COLLIMATOR BEING CENTERED ON SLIGHTLY DIFFERENT POINTS ON THE SKY. EACH COLLIMATOR HAD A SEPARATE ARGON FILLED PROPORTIONAL COUNTER WITH A 9.4-MG/SQ CM BERYLLIUM WINDOW. THE EFFECTIVE COLLECTION AREA OF EACH COUNTER WAS ABOUT 40 SQ CM, AFTER CORRECTION FOR THE COLLIMATOR TRANSMISSION, AND EACH HAD A DETECTION EFFICIENCY IN EXCESS OF 10 PERCENT. THE OUTPUT FROM A LAD COUNTER WAS PROCESSED BY A 15-CHANNEL LOGARITHMIC PULSE-HEIGHT ANALYZER, ALL CHANNELS OF WHICH WERE RECORDED IN MEMORY EITHER EVERY 4 S OR 64 S. HIGHER TIME RESOLUTIONS OF 1 TO 4 MILLISECONDS WERE POSSIBLE THROUGH THE USE OF A SCHEME, WHICH RECORDED THE TIME OF ARRIVAL OF THE FIRST SIX EVENTS OCCURING EACH SECOND IN THE LAD. IN ADDITION, A SINGLE CHANNEL ANALYZER WAS USED TO RECORD THE INTEGRATED COUNTS IN THE 1.3- TO 7-KEV RANGE IN 1-, 4-, OR 16-S INTERVALS. ONLY THE COARSE COLLIMATOR FED X RAYS ONTO THE FOUR BRAGG PET CRYSYALS. THE DIFFRACTED X RAYS WERE THEN DETECTED BY TWO ARGON-FILLED PROPORTIONAL COUNTERS WITH 4.7-MG/SQ CM BERYLLIUM WINDOWS. THE EFFECTIVE DETECTION AREA OF EACH COUNTER WAS 6 SQ CM WITHIN THE 2-EV RESOLUTION OF THE CRYSTAL TAKING ACCOUNT OF PROJECTION EFFECTS AND PEAK REFLECTIVITY OF THE CRYSTAL. THE OUTPUT FROM A BRAGG DETECTOR WAS FILTERED BY AN EIGHT-CHANNEL LOGARITHMIC PULSE-HEIGHT ANALYZER OPERATING IN THE ENERGY INTERVAL FROM 1.7 TO 4.2-KEV. FOR BOTH THE LAD AND BRAGG DETECTORS EFFECTIVE NON-X-RAY EVENT REJECTION WAS ACCOMPLISHED BY PULSE-SHAPE DISCRIMINATION OF THE PROPORTIONAL COUNTER SIGNALS. FOR ADDITIONAL DETAILS ON THIS INSTRUMENT SEE ASTROPHYS. J., LETTERS, 201, L127, 1975.

****

SPACECRAFT COMMON NAME- UK 5
ALTERNATE NAMES- UNITED KINGDOM-5, PL-7328
ARIEL 5

NSSDC ID- 74-077A

LAUNCH DATE- 10/15/74

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 10/16/74
ORBIT PERIOD- 95.3 MIN INCLINATION- 2.9 DEG
PERIAPSIS- 512.0 KM ALT APOAPSIS- 557.0 KM ALT

PERSONNEL
MG - J.R. HOLTZ — NASA HEADQUARTERS
SC - A.G. OPP — NASA HEADQUARTERS
PM - J.P. CORRIGAN — NASA-GSFC
PS - S.S. HOLT — NASA-GSFC

BRIEF DESCRIPTION
UK 5 WAS THE FIFTH SCIENTIFIC SATELLITE IN A UK/US COLLABORATIVE SPACE RESEARCH PROGRAM. IT CARRIED SIX EXPERIMENTS (5 UK AND 1 US) FOR COSMIC X-RAY STUDIES THAT MEASURED THE SPECTRA, POLARIZATION, AND PULSAR FEATURES OF X-RAY SOURCES. THE SPACECRAFT WAS SPIN STABILIZED, TWO EXPERIMENTS SCANNED THE SKY PERPENDICULAR TO THE SPIN AXIS, WHILE FOUR EXPERIMENTS POINTED PARALLEL TO THE SPIN AXIS. DATA WERE STORED ON BOARD THE SPACECRAFT IN A CORE STORAGE AND DUMPED TO GROUND STATIONS ONCE PER ORBIT. ALL SATELLITE OPERATIONS WERE DIRECTED FROM A CONTROL CENTER AT THE APPLETON LAB, UK.

****

INVESTIGATION NAME- ROTATION MODULATION COLLIMATOR (RMC)

NSSDC ID- 74-077A-01

PERSONNEL
PI - R.L.F.BOYD — U COLLEGE LONDON
OI - A.P. WILLMORE — U OF BIRMINGHAM
OI - P.W. SANFORD — U COLLEGE LONDON

BRIEF DESCRIPTION
THIS EXPERIMENT COMBINED THE FUNCTION OF OBSERVING X RAYS IN DIFFERENT ENERGY RANGES WITH THAT OF STAR TRACKING. THE EXPERIMENT CONTAINED A ROTATION COLLIMATOR, UTILIZING THE SATELLITE SPIN, BEHIND WHICH THERE WERE THREE DETECTORS. THE FIELD OF VIEW WAS A CONE WITH A HALF-ANGLE OF 10 DEG TO 20 DEG, DEPENDING ON THE TYPE OF RADIATION VIEWED BY THE DIFFERENT DETECTORS. THE THREE DETECTORS FUNCTIONED AS FOLLOWS: (1) A VISIBLE-LIGHT PHOTOMULTIPLIER ENABLED THE SPIN AXIS TO BE ACCURATELY DETERMINED BY VIEWING THE BACKGROUND OF OPTICAL STARS; (2) AN ARRAY OF CHANNEL ELECTRON MULTIPLIERS, WITH SELECTABLE FILTERS, COVERED THE WAVELENGTH RANGE 0.3 TO 6 KEV; (3) A GROUP OF PROPORTIONAL COUNTERS COVERED THE RANGE 2.5 TO 30 KEV. IT WAS ESTIMATED THAT SOURCE POSITIONS COULD BE DETERMINED TO WITHIN 2 ARC MIN FOR BRIGHT SOURCES.

****

INVESTIGATION NAME- 2- TO 10-KEV SKY SURVEY INSTRUMENT (SSI)

NSSDC ID- 74-077A-02

PERSONNEL
PI - K.A. POUNDS — U OF LEICESTER
OI - B.A. COOKE — U OF LEICESTER
OI - D.J. ADAMS — U OF LEICESTER
OI - R.E. GRIFFITHS — U OF LEICESTER

BRIEF DESCRIPTION
THIS EXPERIMENT CONSISTED OF A LARGE-AREA PROPORTIONAL COUNTER ARRANGED TO VIEW IN A DIRECTION PERPENDICULAR TO THE SATELLITE SPIN AXIS. THE SATELLITE ROTATION, THEREFORE, ALLOWED A SCAN OF A 360-DEG BAND OF THE SKY. WHEN THE SATELLITE SPIN AXIS WAS ARRANGED TO POINT AT A GALACTIC POLE, THE WHOLE OF THE MILKY WAY COULD BE SCANNED AT ONCE. THE EXPERIMENT COVERED THE PHOTON ENERGY RANGE 1.5 TO 20 KEV AND EFFECTED A HIGH-SENSITIVITY SURVEY, OBTAINING SOURCE LOCATIONS, INTENSITY, AND SPECTRA. A NUMBER OF DIFFERENT MODES OF OPERATION WERE USED IN WHICH THE AVAILABLE STORAGE SPACE IN THE CORE STORE OBTAINED SPATIAL INFORMATION AT THE EXPENSE OF SPECTRAL RESOLUTION OR CONVERSELY. THE SENSITIVITY OF THE EXPERIMENT ALLOWED THE DETECTION OF SOURCES OF THE ORDER OF 1.E-4 TIMES THE INTENSITY OF SCO X-1, WITHIN THE TIME OF ABOUT 1 DAY. THE ABILITY OF THE SURVEY INSTRUMENTS TO DETERMINE THE POSITIONS OF A SOURCE DEPENDED ON THE STRENGTH OF THE SOURCE AND THE NUMBER OF OTHER SOURCES IN A GIVEN PART OF THE SKY. A SOURCE OF 5.E-3 TIMES THE STRENGTH OF SCO X-1 COULD BE LOCATED WITH A PRECISION OF ABOUT 15 ARC MIN.

****

INVESTIGATION NAME- HIGH-RESOLUTION SOURCE SPECTRA

NSSDC ID- 74-077A-03

PERSONNEL
PI - R.L.F.BOYD — U COLLEGE LONDON
OI - A.P. WILLMORE — U OF BIRMINGHAM
OI - P.W. SANFORD — U COLLEGE LONDON

BRIEF DESCRIPTION
THIS EXPERIMENT CONSISTED OF A HIGH-RESOLUTION, PROPORTIONAL-COUNTER SPECTROMETER WITH A 128-CHANNEL PULSE-HEIGHT ANALYZER, AND RESPONDED TO PHOTONS IN THE 2- TO 30-KEV ENERGY RANGE. THE SPECTRA OF SOURCES WERE EXAMINED IN GREATER DETAIL THAN HAD BEEN PREVIOUSLY POSSIBLE. LINE EMISSION FOR CERTAIN ELEMENTS (E.G., IRON) COULD ALSO BE IDENTIFIED. THE DETECTOR VIEWED IN A DIRECTION PARALLEL TO THE SPIN AXIS AND, THEREFORE, CONTINUED TO OBSERVE THE SAME PIECE OF SKY FOR AS LONG AS THE POSITION OF THE SATELLITE SPIN AXIS REMAINED UNALTERED. THE EXPERIMENT AXIS POINTED APPROXIMATELY 2 DEG OFF THE SPIN AXIS, SO THAT WHEN OBSERVING A SOURCE ALSO 2 DEG OFF THE SPIN AXIS THE SOURCE PASSED IN AND OUT OF THE FIELD OF VIEW DURING EACH ROTATION. THIS PERMITTED THE BACKGROUND FLUX TO BE SAMPLED EVERY SPIN PERIOD BY RECORDING THE SPECTRAL INFORMATION IN FOUR SETS OF LOCATIONS, EACH CORRESPONDING TO A QUADRANT OF THE SPIN CYCLE. THIS SHOULD HAVE OVERCOME THE LACK OF INFORMATION ON POSSIBLE FLUCTUATIONS IN THE BACKGROUND FLUX DURING AN ORBIT'S INTEGRATION. THE EXPERIMENT COULD ALSO HAVE BEEN OPERATED IN A MODE IN WHICH PERIODICITIES IN THE RANGE TYPICAL OF PULSAR FREQUENCIES WERE DETECTED.

****

INVESTIGATION NAME- BRAGG CRYSTAL SPECTROMETER (BCS)

NSSDC ID- 74-077A-04

PERSONNEL
PI - K.A. POUNDS — U OF LEICESTER
OI - B.A. COOKE — U OF LEICESTER
OI - D.J. ADAMS — U OF LEICESTER
OI - R.E. GRIFFITHS — U OF LEICESTER

BRIEF DESCRIPTION
THIS EXPERIMENT WAS A POLARIMETER/SPECTROMETER OPERATING IN THE 2- TO 8-KEV RANGE. IT USED TWO LARGE PLANE CRYSTALS, LITHIUM HYDRIDE AND GRAPHITE, IN A BRAGG SPECTROMETER WITH A HONEYCOMB COLLIMATOR. IT WAS MOUNTED TO VIEW ALONG THE SATELLITE SPIN AXIS AND TO EXAMINE THE RADIATION OF INDIVIDUAL X-RAY SOURCES FOR POSSIBLE POLARIZATION AND/OR THE EXISTENCE OF LINE EMISSIONS. IN A SOURCE OF THE BRIGHTNESS OF THE CRAB NEBULA, A POLARIZATION OF 2.5 PERCENT COULD BE DETECTED. THE EXPERIMENT ALSO CONDUCTED SEARCHES FOR PULSAR ACTIVITY. THE NATURE OF THE EXPERIMENT MADE IT POSSIBLE TO EXAMINE THE POLARIZATION OF THE PULSAR ITSELF BY LOOKING FOR DIFFERENT PULSAR BEHAVIOR IN THE SEPARATE POLARIZATION COMPONENTS.

****

INVESTIGATION NAME- HIGH-ENERGY COSMIC X-RAY SPECTRA

NSSDC ID- 74-077A-05

PERSONNEL
PI - H. ELLIOT — IMPERIAL COLLEGE
OI - J.J. QUENBY — IMPERIAL COLLEGE
OI - A.R. ENGEL — IMPERIAL COLLEGE

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO EXTEND THE SPECTRAL INFORMATION ON SELECTED X-RAY SOURCES IN THE ENERGY REGION ABOVE 20 KEV. THE DETECTOR WAS AN 8 SQ CM X 4 CM CSI (NA) SCINTILLATOR ACTIVELY COLLIMATED TO PROVIDE 8 DEG FWHM. MEASUREMENTS WERE POSSIBLE UP TO 2 MEV, ALTHOUGH THE EFFICIENCY OF THE DETECTOR FELL STEEPLY AT THIS ENERGY. THE DETECTOR AXIS WAS INCLINED A FEW DEG WITH RESPECT TO THE SATELLITE SPIN AXIS SO THAT IT CONED AS THE SATELLITE SPUN. THE COUNTING RATE RESULTING FROM A POINT SOURCE A FEW DEG FROM THE SPIN AXIS WAS THUS MODULATED WITH THE SPIN PERIOD. THIS MODULATION WAS DETECTED BY DIVIDING THE SPIN CYCLE INTO FOUR SECTORS AND ANALYZING THE DIFFERENT COUNTING RATES IN EACH. IN THIS WAY, THE SOURCE INTENSITY COULD BE DETERMINED FROM THE AMPLITUDE OF THE MODULATION. FOR PULSAR OBSERVATIONS, A LARGE ENERGY WINDOW AT THE LOWER END OF THE DETECTOR RANGE WAS USED. THE OBSERVATIONS IN THIS ENERGY REGION WERE ANALYZED FOR A PULSAR PERIODICITY IN A SPECIAL SYSTEM THAT WAS PART OF THE SPACECRAFT HANDLING ELECTRONICS.

****

INVESTIGATION NAME- ALL-SKY MONITOR

NSSDC ID- 74-077A-06

PERSONNEL
PI - S.S. HOLT — NASA-GSFC
OI - E.A. BOLDT — NASA-GSFC
OI - P.J. SERLEMITSOS — NASA-GSFC

BRIEF DESCRIPTION
THE PURPOSE OF THIS EXPERIMENT WAS TO MONITOR THE ENTIRE SKY CONTINUOUSLY FOR TRANSIENT X-RAY PHENOMENA AND, AT THE SAME TIME, TO MONITOR ALL THE STRONG X-RAY SOURCES IN THE SKY FOR LONG-TERM TEMPORAL EFFECTS. THE EXPERIMENT UTILIZED TWO X-RAY PIN-HOLE CAMERAS TO IMAGE THE SKY. POSITION-SENSITIVE PROPORTIONAL COUNTERS RECORDED THE PHOTONS IMAGED THROUGH THE PINHOLES. THE FAN BEAM RESPONSE OF THE CAMERAS ALLOWED THE WHOLE SKY TO BE MONITORED AT LEAST ONCE PER SPACECRAFT ROTATION. THE ENERGY WINDOW WAS 3-6 KEV. IT WAS A VALUABLE AID IN PROGRAMMING SATELLITE MANEUVERS SO THAT TRANSIENT EVENTS IN THE X-RAY SKY, SUCH AS NEARBY NOVAE AND X-DAY FLARES, COULD BE RAPIDLY MADE AVAILABLE FOR STUDY WITH GREATER RESOLUTION BY THE OTHER EXPERIMENTS AND OTHER SPACECRAFT.

****

SPACECRAFT COMMON NAME- ARYABHATA
ALTERNATE NAMES- ARIABAT, INDIAN SCIENTIFIC SAT.
INDASAT

NSSDC ID- 75-033A

LAUNCH DATE- 04/19/75

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 04/20/75
ORBIT PERIOD- 96.5 MIN — INCLINATION- 50.7 DEG
PERIAPSIS- 568. KM ALT — APOAPSIS- 611. KM ALT

PERSONNEL
PD U.R. RAO — ISRO SATELLITE CENTER
MG - UNKNOWN — UNKNOWN
SC - UNKNOWN — UNKNOWN
PS - U.R. RAO — ISRO SATELLITE CENTER

BRIEF DESCRIPTION
THIS SPACECRAFT, NAMED AFTER THE FAMOUS INDIAN ASTRONOMER, WAS INDIA'S FIRST SATELLITE AND WAS COMPLETELY DESIGNED AND FABRICATED IN INDIA. IT WAS LAUNCHED BY A SOVIET ROCKET FROM A SOVIET COSMODROME. THE SPACECRAFT WAS QUASISPHERICAL IN SHAPE CONTAINING 26 SIDES AND CONTAINED THREE EXPERIMENTS FOR THE MEASUREMENT OF COSMIC X RAYS, SOLAR NEUTRONS, AND GAMMA RAYS, AND AN IONOSPHERIC ELECTRON TRAP ALONG WITH A UV SENSOR. THE SPACECRAFT WEIGHED 360 KG, USED SOLAR PANELS ON 24 SIDES TO PROVIDE 46 WATTS OF POWER, USED A PASSIVE THERMAL CONTROL SYSTEM, CONTAINED BATTERIES, AND A SPIN-UP GAS JET SYSTEM TO PROVIDE A SPIN RATE OF NOT MORE THAN 90 RPM. THERE WAS A SET OF ALTITUDE SENSORS COMPRISED OF A TRIAXIAL MAGNETOMETER, A DIGITAL ELEVATION SOLAR SENSOR, AND FOUR AZIMUTH SOLAR SENSORS. THE DATA SYSTEM INCLUDED A TAPE RECORDER AT 256 B/S WITH PLAYBACK AT 10 TIMES THAT RATE. THE PCM-FM-PM TELEMETRY SYSTEM OPERATED AT 137.44 MHZ. THE NECESSARY GROUND TELEMETRY AND TELECOMMAND STATIONS WERE ESTABLISHED AT SHAR CENTRE IN SRIHARIKOTA, ANDHRA PRADESH.

****

INVESTIGATION NAME- X-RAY ASTRONOMY

NSSDC ID- 75-033A-01

PERSONNEL
PI - U.R. RAO — ISRO SATELLITE CENTER
[illegible] - K. KASTURIRANGAN — ISSP, VSSC

BRIEF DESCRIPTION
THIS EXPERIMENT USED AN ARGON PLUS CARBON-DIOXIDE-FILLED PROPORTIONAL COUNTER WITH AN 8-DEG FWHM FIELD OF VIEW PARALLEL TO THE SPACECRAFT SPIN AXIS TO DETECT X RAYS IN THE 2.5-15 KEV RANGE AND TWO NAI SCINTILLATION TELESCOPES, ONE BLOCKED FOR INSTRUMENTAL BACKGROUND, MOUNTED PERPENDICULAR TO THE SPIN AXIS TO DETECT EMISSION IN THE 10-100 KEV RANGE.

****

SPACECRAFT COMMON NAME- SAS-C
ALTERNATE NAMES- PL-7430, SAS 3
EXPLORER 53

NSSDC ID- 75-037A

LAUNCH DATE- 05/07/75

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 05/08/75
ORBIT PERIOD- 94.9 MIN — INCLINATION- 3.0 DEG
PERIAPSIS- 509. KM ALT — APOAPSIS- 516. KM ALT

PERSONNEL
MG - J.R. HOLTZ — NASA HEADQUARTERS
SC - N.G. ROMAN — NASA HEADQUARTERS
PM - J.E. KUPPERIAN, JR. — NASA-GSFC
PS - C.E. FICHTEL — NASA-GSFC

BRIEF DESCRIPTION
SAS-C WAS THE THIRD OF A SERIES OF SMALL SPACECRAFT WHOSE OBJECTIVES WERE TO SURVEY THE CELESTIAL SPHERE FOR SOURCES RADIATING IN THE X-RAY, GAMMA-RAY, UV, AND OTHER SPECTRAL REGIONS. THE PRIMARY MISSIONS OF SAS 3 WERE TO MEASURE THE X-RAY EMISSION OF DISCRETE EXTRAGALACTIC SOURCES, TO MONITOR THE INTENSITY AND SPECTRA OF GALACTIC X-RAY SOURCES FROM 0.2 TO 60 KEV, AND TO MONITOR THE X-RAY INTENSITY OF SCORPIO X-1. THE SPACECRAFT WAS LAUNCHED FROM THE SAN MARCO PLATFORM OFF THE COAST OF KENYA, AFRICA, INTO A NEAR-CIRCULAR, EQUATORIAL ORBIT. FOUR SOLAR PADDLES WERE USED IN CONJUNCTION WITH A 12-CELL, NICKEL-CADMIUM BATTERY TO PROVIDE 65 W OF AVERAGE POWER OVER THE ENTIRE ORBIT. THE SPACECRAFT WAS STABILIZED ALONG THE Z-AXIS AND ROTATED AT ABOUT 0.1 DEG/S. CHANGES TO THE SPIN-AXIS ORIENTATION WERE BY GROUND COMMAND, EITHER DELAYED OR IN REAL TIME. THE SPACECRAFT COULD BE MADE TO DITHER BACK AND FORTH PLUS OR MINUS 2.5 DEG ACROSS A SELECTED SOURCE ALONG THE X AXIS AT 0.01 DEG/S. THE EXPERIMENTS LOOKED ALONG THE Z AXIS OF THE SPACECRAFT, PERPENDICULAR TO IT, AND AT AN ANGLE.

****

INVESTIGATION NAME- EXTRAGALACTIC EXPERIMENT (EGE)

NSSDC ID- 75-037A-01

PERSONNEL
PI - G.W. CLARK — MASS INST OF TECH
OI - H.V.D.BRADT — MASS INST OF TECH
OI - W.H.G.LEWIN — MASS INST OF TECH
OI - H.W. SCHNOPPER — MASS INST OF TECH

BRIEF DESCRIPTION
THIS EXPERIMENT DETERMINED THE POSITIONS OF VERY WEAK EXTRAGALACTIC X-RAY SOURCES. THE INSTRUMENT VIEWED A 100-DEG-SQ REGION OF THE SKY AROUND THE DIRECTION OF THE SPIN AXIS OF THE SATELLITE. THE NOMINAL TARGETS FOR A 1-YEAR STUDY WERE (1) THE VIRGO CLUSTER OF GALAXIES FOR 4 MONTHS, (2) THE GALACTIC EQUATOR FOR 2 MONTHS, (3) THE ANDROMEDA NEBULA FOR 2 MONTHS, AND (4) THE MAGELLANIC CLOUDS FOR 3 MONTHS. THE INSTRUMENTATION CONSISTED OF ONE 2.5-ARC-MIN AND ONE 4.5-ARC-MIN FWHM MODULATION COLLIMATOR, AS WELL AS PROPORTIONAL COUNTERS SENSITIVE OVER THE ENERGY RANGE FROM 1.5 TO 18 KEV. THE EFFECTIVE AREA OF EACH COLLIMATOR WAS ABOUT 225 SQ CM. THE ASPECT SYSTEM PROVIDED INFORMATION ON THE ORIENTATION OF THE COLLIMATORS TO AN ACCURACY OF 15 ARC S.

****

INVESTIGATION NAME- GALACTIC MONITOR EXPERIMENT (GME)

NSSDC ID- 75-037A-02

PERSONNEL
PI - G.W. CLARK — MASS INST OF TECH
OI - H.V.D.BRADT — MASS INST OF TECH
OI - W.H.G.LEWIN — MASS INST OF TECH
OI - H.W. SCHNOPPER — MASS INST OF TECH

BRIEF DESCRIPTION
THE OBJECTIVES OF THIS EXPERIMENT WERE TO LOCATE GALACTIC X-RAY SOURCES TO 15 ARC S AND TO MONITOR THESE SOURCES FOR INTENSITY VARIATIONS. THE SOURCE POSITIONS WERE DETERMINED WITH THE USE OF THE MODULATION COLLIMATORS OF THE EXTRAGALACTIC EXPERIMENT DURING THE NOMINAL 2-MONTH OBSERVATION OF THE GALACTIC EQUATOR. THE MONITORING OF THE X-RAY SKY WAS ACCOMPLISHED BY THE USE OF THREE SLAT COLLIMATORS. ONE COLLIMATOR, 1 BY 70 DEG FWHM, WAS ORIENTED PERPENDICULAR TO THE EQUATORIAL PLANE OF THE SATELLITE; WHILE THE OTHER TWO, EACH 0.5 BY 45 DEG FWHM, WERE ORIENTED 30 DEG ABOVE AND 30 DEG BELOW THE FIRST. THE DETECTOR BEHIND EACH COLLIMATOR WAS A PROPORTIONAL COUNTER, SENSITIVE FROM 1.5 TO 13 KEV, WITH AN EFFECTIVE AREA OF ABOUT 100 SQ CM. THE 1.8-DEG COLLIMATOR HAD AN ADDITIONAL COUNTER OF THE SAME AREA, SENSITIVE FROM 8 TO 50 KEV. THREE LINES OF POSITION WERE OBTAINED FOR ANY GIVEN SOURCE WHEN THE SATELLITE WAS BEING SPUN AT A STEADY ROTATION OF 4 ARC MIN/S ABOUT THE Z AXIS.

****

INVESTIGATION NAME- SCORPIO MONITOR EXPERIMENT (SME)

NSSDC ID- 75-037A-03

PERSONNEL
PI - G.W. CLARK — MASS INST OF TECH
OI - H.V.D.BRADT — MASS INST OF TECH
OI - W.H.G.LEWIN — MASS INST OF TECH
OI - H.W. SCHNOPPER — MASS INST OF TECH

BRIEF DESCRIPTION
A 12-BY-50-DEG FWHM SLAT COLLIMATOR WAS ORIENTED WITH ITS LONG AXIS PERPENDICULAR TO THE SATELLITE SPIN AXIS SUCH THAT A GIVEN POINT ON THE SKY COULD BE MONITORED FOR ABOUT 25 PERCENT OF A ROTATION. THIS COLLIMATOR WAS INCLINED BY 31 DEG WITH RESPECT TO THE EQUATORIAL PLANE OF THE SATELLITE, SO THAT SCORPIO X-1 WAS OBSERVED WHILE THE Z AXIS WAS ORIENTED TO THE VIRGO CLUSTER OF GALAXIES. THE DETECTORS USED IN THIS EXPERIMENT WERE PROPORTIONAL COUNTERS WITH 1-MIL BERYLLIUM WINDOWS. THE ENERGY RANGE WAS FROM 1.0 TO 60 KEV, AND THE TOTAL EFFECTIVE AREA WAS ABOUT 40 SQ CM.

****

INVESTIGATION NAME- GALACTIC ABSORPTION EXPERIMENT (GAE)

NSSDC ID- 75-037A-04

PERSONNEL
PI - G.W. CLARK — MASS INST OF TECH
OI - H.V.D.BRADT — MASS INST OF TECH
OI - W.H.G.LEWIN — MASS INST OF TECH
OI - H.W. SCHNOPPER — MASS INST OF TECH

BRIEF DESCRIPTION
THE DENSITY AND DISTRIBUTION OF INTERSTELLAR MATTER WAS DETERMINED BY MEASURING THE VARIATION IN THE INTENSITY OF THE LOW-ENERGY DIFFUSE X-RAY BACKGROUND AS A FUNCTION OF GALACTIC LATITUDE. A 1-MICROMETER POLYPROPYLENE WINDOW PROPORTIONAL COUNTER WAS USED FOR THE 0.1- TO 0.25-KEV AND 0.5- TO 1.0-KEV ENERGY RANGES, WHILE A 2-MICROMETER TITANIUM WINDOW COUNTER COVERED THE ENERGY RANGE FROM 0.3 TO 0.5 KEV. IN ADDITION, TWO 1-MIL BERYLLIUM WINDOW COUNTERS WERE USED FOR THE 1.0- TO 10-KEV ENERGY RANGE. THE COLLIMATORS IN THIS EXPERIMENT HAD FIELDS OF VIEW OF 3 DEG FOR THE 1-MICROMETER COUNTER, 2 DEG FOR THE 2-MICROMETER COUNTER, AND 2 DEG FOR THE 1-MIL COUNTERS.

****

SPACECRAFT COMMON NAME- OSO 8
ALTERNATE NAMES- OSO-I, OSO-EYE
7310

NSSDC ID- 75-057A

LAUNCH DATE- 06/21/75

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 06/22/75
ORBIT PERIOD- 95.7 MIN — INCLINATION- 32.9 DEG
PERIAPSIS- 544. KM ALT — APOAPSIS- 559. KM ALT

PERSONNEL
MG - M.E. MCDONALD — NASA HEADQUARTERS
SC - J.D. BOHLIN — NASA HEADQUARTERS
PM - J.P. CORRIGAN — NASA-GSFC
PS - R. THOMAS — NASA-GSFC

BRIEF DESCRIPTION
THE OBJECTIVES OF THE OSO SATELLITE SERIES WERE TO PERFORM SOLAR PHYSICS EXPERIMENTS ABOVE THE ATMOSPHERE DURING A COMPLETE SOLAR CYCLE AND TO MAP THE ENTIRE CELESTIAL SPHERE FOR DIRECTION AND INTENSITY OF UV LIGHT, X-RAY RADIATION, AND GAMMA-RAY RADIATION. THE OSO 8 PLATFORM CONSISTED OF A SAIL SECTION, WHICH POINTED TWO EXPERIMENTS CONTINUALLY TOWARD THE SUN, AND A WHEEL SECTION, WHICH SPUN ABOUT AN AXIS PERPENDICULAR TO THE POINTING DIRECTION OF THE SAIL AND CARRIED FIVE EXPERIMENTS. GAS JETS AND A MAGNETIC TORQUING COIL PERFORMED ATTITUDE ADJUSTMENT. POINTING CONTROL PERMITTED THE POINTED EXPERIMENTS TO SCAN THE REGION OF THE SOLAR DISK IN A 40- BY 40-ARC-MIN TO 60- BY 60-ARC-MIN RASTER PATTERN. IN ADDITION, THE POINTED SECTION WAS CAPABLE OF BEING COMMANDED TO SELECT AND SCAN A 1- BY 1-ARC-MIN OR 5- BY 5-ARC-MIN REGION ANYWHERE ON THE SOLAR DISK. DATA WERE SIMULTANEOUSLY RECORDED ON TAPE AND TRANSMITTED BY PCM/PM TELEMETRY. A COMMAND SYSTEM PROVIDED FOR AT LEAST 512 GROUND-BASED COMMANDS.

****

INVESTIGATION NAME- HIGH-SENSITIVITY CRYSTAL SPECTROSCOPY OF STELLAR AND SOLAR X RAYS

NSSDC ID- 75-057A-03

PERSONNEL
PI - R. NOVICK — COLUMBIA U
OI - J.R. ANGEL — U OF ARIZONA
OI - P.A. VANDENBOUT — COLUMBIA U
OI - M. WEISSKOPF — COLUMBIA U
OI - R.S. WOLFF — COLUMBIA U

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO MONITOR CONTINUOUSLY THE SUN'S EMISSION IN THE 2-8 KEV RANGE, TO OBTAIN COMPLETE SOLAR SPECTRA OF THE SUN EVERY 10 S DURING FLARES, TO OBTAIN HIGH-RESOLUTION SPECTRA OF MANY CELESTIAL X-RAY OBJECTS, AND TO MEASURE THE POLARIZATION OF X-RAY EMISSION FROM STELLAR SOURCES. THIS INSTRUMENT PACKAGE WAS MOUNTED IN THE WHEEL SECTION. THE SPECTROMETER WAS ORIENTED PERPENDICULAR TO THE SPIN AXIS AND USED LARGE AREA PANELS OF CRYSTALS (1100 SQ CM OF GRAPHITE, 194 SQ CM OF PET) TO REFLECT, VIA BRAGG REFLECTION, MONOCHROMATIC SOLAR X RAYS INTO PROPORTIONAL COUNTER DETECTORS. THE POLARIMETER WAS ORIENTED PARALLEL TO THE SPIN AXIS AND UTILIZED BRAGG ANGLE REFLECTION TO MEASURE POLARIZATION IN X RAYS FROM CELESTIAL SOURCES.

****

INVESTIGATION NAME- SOFT X-RAY BACKGROUND RADIATION INVESTIGATION

NSSDC ID- 75-057A-05

PERSONNEL
PI - W.L. KRAUSHAAR — U OF WISCONSIN
OI - A.N. BUNNER — U OF WISCONSIN

BRIEF DESCRIPTION
THE EXPERIMENT WAS DESIGNED TO MEASURE GALACTIC LATITUDE DEPENDENCE OF THE X-RAY BACKGROUND RADIATION IN THE 0.150- TO 45-KEV REGION, EMPHASIZING THE SOFT X-RAY PORTION. TWO SETS OF THREE PROPORTIONAL COUNTERS MOUNTED ON THE OSO WHEEL VIEWED PARALLEL AND ANTIPARALLEL TO THE WHEEL SPIN DIRECTION THROUGH A 3.5- BY 3.5-DEG FWHM COLLIMATOR. SENSITIVITY WAS EXPECTED TO BE ABOUT 1 PERCENT STATISTICAL ACCURACY NEAR THE GALACTIC POLES, AND ENERGY RESOLUTION WAS PROVIDED BY SELECTED FILTERS. SINCE TWO OF THE COUNTERS HAD THIN POLYCARBONATE WINDOWS THROUGH WHICH METHANE DIFFUSED, A HIGH-PRESSURE METHANE RESERVOIR CARRIED ON THE SPACECRAFT REPLENISHED THOSE COUNTERS THROUGH A GAS FLOW SYSTEM.

****

INVESTIGATION NAME- COSMIC X-RAY SPECTROSCOPY

NSSDC ID- 75-057A-06

PERSONNEL
PI - P.J. SERLEMITSOS — NASA-GSFC
OI - E.A. BOLDT — NASA-GSFC
OI - S.S. HOLT — NASA-GSFC
OI - P. SCHWARTZ — SAO

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO DETERMINE THE SPECTRA OF SOURCES AND THE DIFFUSE COSMIC X-RAY BACKGROUND IN THE ENERGY RANGE 2 TO 60 KEV, AND TO MEASURE INTENSITY VARIATIONS AND POSSIBLE EMISSION LINES OF DISCRETE X-RAY SOURCES. PROPORTIONAL CHAMBERS (MULTIANODE PROPORTIONAL COUNTERS) WERE USED AS DETECTORS. ONE DETECTOR COMPLEMENT, CONSISTING OF A PROPANE-NEON-FILLED CHAMBER AND A XENON-METHANE-FILLED CHAMBER (240 SQ CM), WAS LOCATED BEHIND A 5-DEG COLLIMATOR AND ORIENTED PARALLEL TO THE SPACECRAFT SPIN AXIS. A SINGLE-VOLUME, ARGON-METHANE-FILLED CHAMBER (75 SQ CM) WAS LOCATED BEHIND A 3-DEG COLLIMATOR AND WAS OFFSET SLIGHTLY FROM ANTI-PARALLEL TO THE SPIN AXIS. A XENON-METHANE-FILLED CHAMBER (270 SQ CM) WAS LOCATED BEHIND A 5-DEG COLLIMATOR AND WAS ORIENTED ANTI-PARALLEL TO THE SPIN AXIS. DATA WERE ACCUMULATED IN A BUFFER MEMORY FOR 1-MIN INTERVALS, THE DATA FROM THE OFFSET DETECTOR BEING SECTORED IN AZIMUTH.

****

INVESTIGATION NAME- HIGH-ENERGY CELESTIAL X RAYS

NSSDC ID- 75-057A-07

PERSONNEL
PI - K.J. FROST — NASA-GSFC
OI - B.R. DENNIS — NASA-GSFC

BRIEF DESCRIPTION
THE PURPOSE OF THIS EXPERIMENT WAS TO MEASURE THE ENERGY SPECTRA OF ALL KNOWN X-RAY SOURCES ABOVE THE INTENSITY THRESHOLD OF 1.E-6 PHOTONS/SQ CM-S-KEV IN THE ENERGY REGION .01 TO 1 MEV. THE INSTRUMENT CONSISTED OF 57-SQ-CM CSI (NA) SCINTILLATION CRYSTALS SURROUNDED BY A HONEYCOMB-TYPE CSI (NA) ANTICOINCIDENCE COLLIMATOR, THAT PROVIDED AN ACCEPTANCE ANGLE OF 6.30 DEG FROM THE VIEWING AXIS. THE INSTRUMENT WAS MOUNTED ON THE OSO WHEEL SECTION NEARLY PARALLEL TO THE SATELLITE SPIN AXIS.

****

SPACECRAFT COMMON NAME- ASTP-APOLLO
ALTERNATE NAMES- APOLLO SOYUZ TEST PROJ., SOYUZ APOLLO

NSSDC ID- 75-066A

LAUNCH DATE- 07/15/75

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 07/18/75
ORBIT PERIOD- 88.91 MIN — INCLINATION- 51.75 DEG
PERIAPSIS- 217. KM ALT — APOAPSIS- 231. KM ALT

PERSONNEL
SC - R.T. GIULI — NASA-JSC
PM - C.M. LEE — NASA HEADQUARTERS

BRIEF DESCRIPTION
THE UNITED STATES AND THE U.S.S.R. LAUNCHED AN APOLLO SPACECRAFT AND A SOYUZ SPACECRAFT, RESPECTIVELY, AS A JOINT EFFORT CALLED THE APOLLO-SOYUZ TEST PROJECT (ASTP). THE SOYUZ SPACECRAFT WAS LAUNCHED FIRST, WITH A TWO-MAN CREW WHO MANEUVERED THEIR SPACECRAFT INTO A DOCKING ORBIT. THE APOLLO SPACECRAFT WAS LAUNCHED 7-1/2 H LATER, WITH A THREE-MAN CREW WHO PLACED THEIR SPACECRAFT INTO A PROPER CONFIGURATION FOR DOCKING WITH THE SOYUZ SPACECRAFT. THE DOCKING OF THE TWO SPACECRAFT OCCURRED ON THE THIRD DAY. AFTER DOCKING, CREW TRANSFERS TOOK PLACE, WITH THE APOLLO CREW FIRST VISITING THE SOYUZ. THE COMBINED APOLLO-SOYUZ CREWS PERFORMED JOINT EXPERIMENTS AND PRESENTED RADIO AND TV REPORTS. AFTER JOINT EXPERIMENTS WERE COMPLETED, THE SPACECRAFT DISENGAGED AND EACH CONTINUED ITS SEPARATE MISSION.

****

INVESTIGATION NAME- SKY-EARTH X-RAY OBSERVATIONS

NSSDC ID- 75-066A-04

PERSONNEL
PI - H.D. FRIEDMAN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS ASTP EXPERIMENT WAS INTENDED TO PRODUCE A DETAILED MAP OF CELESTIAL SOFT X-RAY EMISSIONS IN THE 0.1- TO 1.0-KEV RANGE. ROCKET OBSERVATIONS HAVE DETECTED A DIFFUSE BACKGROUND OF SOFT X-RAY RADIATION, BUT A SYSTEMATIC SKY SURVEY HAS NEVER BEEN MADE IN THE 0.1- TO 1.0-KEV ENERGY RANGE. SATELLITE OBSERVATIONS PROVIDED FINER ANGULAR RESOLUTION AND STATISTICS NEEDED TO DETERMINE THE VARIOUS SOURCES THAT CONTRIBUTE. THE THIN-WINDOW, SOFT X-RAY DETECTOR WAS MOUNTED IN A BAY OF THE APOLLO SERVICE MODULE.

****

SPACECRAFT COMMON NAME- SOLRAD 11A
ALTERNATE NAMES- SRD-11A, SOLRAD HI-TRIP
SESP NO. NRL-111-0264, NRL-111
SESP P74-1C

NSSDC ID- 76-023C

LAUNCH DATE- 03/15/76

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/01/76
ORBIT PERIOD- 7344.3 MIN INCLINATION- 25.7 DEG
PERIAPSIS- 118383. KM ALT APOAPSIS- 119180. KM ALT

PERSONNEL
PM - E.W. PETERKIN US NAVAL RESEARCH LAB
PS - R.W. KREPLIN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
SOLRAD 11A WAS ONE OF A PAIR OF IDENTICAL SATELLITES THAT WERE PLACED IN A CIRCULAR EQUATORIAL ORBIT OF 20 EARTH RADII. THE SATELLITES, WHICH WERE ORIENTED TOWARDS THE SUN, PROVIDED 100 PERCENT REAL-TIME, CONTINUOUS MONITORING OF SOLAR X-RAY, UV, AND ENERGETIC PARTICLE EMISSIONS. EXPERIMENTS INCLUDED BROADBAND ION CHAMBERS OBSERVING SOLAR X RAYS BETWEEN 0.1 AND 60 A, PROPORTIONAL COUNTERS AND SCINTILLATORS OBSERVING SOLAR X RAYS BETWEEN 2 AND 150 KEV, AN EUV DETECTOR COVERING THREE BANDS BETWEEN 170 AND 1000 A, A VARIABLE RESOLUTION EBERT-FASTIE SPECTROMETER COVERING THE WAVELENGTH RANGE OF 1100 TO 1600 A (RESOLUTION: 1 TO 25 A), A SOLAR WIND MONITOR, SOLAR PROTON, ELECTRON, AND ALPHA PARTICLE MONITORS, TWO X-RAY POLARIMETERS (ONE UTILIZING BRAGG SCATTERING AND THE OTHER UTILIZING THOMPSON SCATTERING), A BRAGG SPECTROMETER OBSERVING MAGNESIUM-11 AND -12 LINES, A LARGE-AREA AURORAL X-RAY DETECTOR, AND A PASSIVELY COOLED SOLID-STATE X-RAY DETECTOR TO MEASURE BACKGROUND X-RAY EMISSIONS.

****

INVESTIGATION NAME- STELLAR/AURORAL X-RAYS

NSSDC ID- 76-023C-16

PERSONNEL
PI - E.T. BYRAM US NAVAL RESEARCH LAB
OI - D.M. HORAN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS EXPERIMENT CONSISTED OF THREE PROPORTIONAL COUNTERS SENSITIVE TO X RAYS BETWEEN 1 AND 8 A. THESE PROPORTIONAL COUNTERS WERE MOUNTED ON THE SIDE OF THE SATELLITE AND ORIENTED 45 DEG, 90 DEG, AND 135 DEG OFF THE SPIN AXIS. THE COUNTING CIRCUITS WERE CONTROLLED BY THE ROLL PERIOD AND SYNCHRONIZED TO THE STAR AND/OR EARTH PULSES SO THAT DATA SAMPLES COULD BE ASSOCIATED WITH PORTIONS OF THE SKY. THE STELLAR PORTION OF THIS EXPERIMENT WAS ABLE TO MAP COSMIC X-RAY SOURCES AND TO SWEEP THE ENTIRE CELESTIAL SPHERE IN ABOUT 6 MONTHS. THE AURORAL PORTION OF THE EXPERIMENT WAS DESIGNED TO MONITOR AURORAL X-RAY EMISSIONS FROM THE EARTH. THE STELLAR PORTION SAMPLING CYCLE TOOK 16 MIN, WHILE THE AURORAL PORTION REQUIRED 2 MIN FOR A SAMPLING CYCLE.

****

INVESTIGATION NAME- X-RAY BACKGROUND

NSSDC ID- 76-023C-24

PERSONNEL
PI - G.G. FRITZ US NAVAL RESEARCH LAB
OI - R. LUCKE US NAVAL RESEARCH LAB
OI - R.C. HENRY JOHNS HOPKINS U

BRIEF DESCRIPTION
A SOLID-STATE DETECTOR (LITHIUM-DRIFTED SILICON) WAS USED TO MEASURE THE GALACTIC X-RAY BACKGROUND IN THE 0.5- TO 20-KEV RANGE WITH AN ENERGY RESOLUTION OF BETTER THAN 0.3 KEV. TO REACH THE DESIRED 0.3-KEV ENERGY RESOLUTION, THE DETECTOR HAD TO BE PASSIVELY COOLED TO 70 TO 100 DEG K. THE INSTRUMENT WAS MOUNTED ON THE ANTISOLAR SIDE OF THE SPACECRAFT AND SWEPT OUT A BAND NEARLY 20-DEG WIDE, CENTERED NEAR THE ECLIPTIC PLANE AS THE SATELLITE MOVED AROUND THE SUN. THE DETECTOR OUTPUT UNDERWENT A 256-CHANNEL ANALYSIS TO PRODUCE THE ENERGY SPECTRUM. ALL 256 CHANNELS WERE READ OUT IN 16 MIN. A RADIOACTIVE SOURCE MOUNTED ON A SHUTTER WAS USED TO PROVIDE INFLIGHT CALIBRATION OF THE DETECTOR.

****

SPACECRAFT COMMON NAME- SOLRAD 11B
ALTERNATE NAMES- SOLRAD HI-TRIP, SESP P74-1D
SP74-1D, SESP NO. NRL-111-0264
SRD-11B

NSSDC ID- 76-023D

LAUNCH DATE- 03/15/76

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 07/01/76
ORBIT PERIOD- 7116.7 MIN INCLINATION- 25.6 DEG
PERIAPSIS- 115720. KM ALT APOAPSIS- 116645. KM ALT

PERSONNEL
PM - R.W. KREPLIN US NAVAL RESEARCH LAB
PS - R.W. KREPLIN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
SOLRAD 11B WAS ONE OF A PAIR OF IDENTICAL SATELLITES THAT WERE PLACED IN A CIRCULAR EQUATORIAL ORBIT OF 20 EARTH RADII. THE SATELLITES, WHICH WERE ORIENTED TOWARDS THE SUN, PROVIDED 100 PERCENT REAL-TIME, CONTINUOUS MONITORING OF SOLAR X-RAY, UV, AND ENERGETIC PARTICLE EMISSIONS. EXPERIMENTS INCLUDED BROADBAND ION CHAMBERS OBSERVING SOLAR X RAYS BETWEEN 0.1 AND 60 A, PROPORTIONAL COUNTERS AND SCINTILLATORS OBSERVING SOLAR X RAYS BETWEEN 2 AND 150 KEV, AN EUV DETECTOR COVERING THREE BANDS BETWEEN 170 AND 1000 A, A VARIABLE RESOLUTION EBERT-FASTIE SPECTROMETER COVERING THE WAVELENGTH RANGE OF 1100 TO 1600 A (RESOLUTION: 1 TO 25 A), A SOLAR WIND MONITOR, SOLAR PROTON, ELECTRON, AND ALPHA PARTICLE MONITORS, TWO X-RAY POLARIMETERS (ONE UTILIZING BRAGG SCATTERING AND THE OTHER UTILIZING THOMPSON SCATTERING), A BRAGG SPECTROMETER OBSERVING MAGNESIUM-11 AND -12 LINES, A LARGE-AREA AURORAL X-RAY DETECTOR, AND A PASSIVELY COOLED SOLID-STATE X-RAY DETECTOR TO MEASURE BACKGROUND X-RAY EMISSIONS.

****

INVESTIGATION NAME- STELLAR/AURORAL X RAYS

NSSDC ID- 76-023D-16

PERSONNEL
PI - E.T. BYRAM US NAVAL RESEARCH LAB
OI - D.M. HORAN US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS EXPERIMENT CONSISTED OF THREE PROPORTIONAL COUNTERS SENSITIVE TO X RAYS BETWEEN 1 AND 8 A. THESE PROPORTIONAL COUNTERS WERE MOUNTED ON THE SIDE OF THE SATELLITE AND ORIENTED 45 DEG, 90 DEG, AND 135 DEG OFF THE SPIN AXIS. THE COUNTING CIRCUITS WERE CONTROLLED BY THE ROLL PERIOD AND SYNCHRONIZED TO THE STAR AND/OR EARTH PULSES SO THAT DATA SAMPLES COULD BE ASSOCIATED WITH PORTIONS OF THE SKY. THE STELLAR PORTION OF THIS EXPERIMENT WAS ABLE TO MAP COSMIC X-RAY SOURCES AND TO SWEEP THE ENTIRE CELESTIAL SPHERE IN ABOUT 6 MONTHS. THE AURORAL PORTION OF THE EXPERIMENT WAS DESIGNED TO MONITOR AURORAL X-RAY EMISSIONS FROM THE EARTH. THE STELLAR PORTION SAMPLING CYCLE TOOK 16 MIN, WHILE THE AURORAL PORTION REQUIRED 2 MIN FOR A SAMPLING CYCLE.

****

INVESTIGATION NAME- X-RAY BACKGROUND

NSSDC ID- 76-023D-24

PERSONNEL
PI - G.G. FRITZ US NAVAL RESEARCH LAB
OI - R. LUCKE US NAVAL RESEARCH LAB
OI - R.C. HENRY JOHNS HOPKINS U

BRIEF DESCRIPTION
A SOLID-STATE DETECTOR (LITHIUM-DRIFTED SILICON) WAS USED TO MEASURE THE GALACTIC X-RAY BACKGROUND IN THE 0.5- TO 20-KEV RANGE WITH AN ENERGY RESOLUTION OF BETTER THAN 0.3 KEV. TO REACH THE DESIRED 0.3-KEV ENERGY RESOLUTION, THE DETECTOR HAD TO BE PASSIVELY COOLED TO 70 TO 100 DEG K. THE INSTRUMENT WAS MOUNTED ON THE ANTISOLAR SIDE OF THE SPACECRAFT AND SWEPT OUT A BAND NEARLY 20-DEG WIDE, CENTERED NEAR THE ECLIPTIC PLANE AS THE SATELLITE MOVED AROUND THE SUN. THE DETECTOR OUTPUT UNDERWENT A 256-CHANNEL ANALYSIS TO PRODUCE THE ENERGY

SPECTRUM. ALL 256 CHANNELS WERE READ OUT IN 16 MIN. A RADIOACTIVE SOURCE MOUNTED ON A SHUTTER WAS USED TO PROVIDE IN FLIGHT CALIBRATION OF THE DETECTOR.

****

SPACECRAFT COMMON NAME- HEAO 1
ALTERNATE NAMES- HIGH ENERGY ASTRON OBS-A, HEAO-A
10217

NSSDC ID- 77-075A

LAUNCH DATE- 08/12/77

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC — EPOCH DATE- 08/13/77
ORBIT PERIOD- 93.5 MIN — INCLINATION- 22.8 DEG
PERIAPSIS- 441. KM ALT — APOAPSIS- 452. KM ALT

PERSONNEL
NG - R.E. HALPERN — NASA HEADQUARTERS
SC - A.G. OPP — NASA HEADQUARTERS
PM - F.A. SPEER — NASA-MSFC
PS - F.B. MCDONALD — NASA-GSFC

BRIEF DESCRIPTION
HIGH-ENERGY ASTRONOMY OBSERVATORY 1 WAS THE FIRST IN A SERIES OF THREE SATELLITE OBSERVATORIES DESIGNED TO CONTINUE THE X-RAY AND GAMMA-RAY STUDIES INITIATED BY ANS, OAO 3, UK 5, THE OSO SERIES, THE SAS SERIES, AND THE GAMMA-RAY BURST DISCOVERIES OF THE VELA SATELLITES. THESE MISSIONS WERE DESIGNED TO SURVEY AND MAP THE CELESTIAL SPHERE FOR X-RAY SOURCES AT AN INTENSITY LEVEL OF 1.E-6 OF THE BRIGHTEST KNOWN SOURCE (SCO X-1), AND TO INVESTIGATE THE STRUCTURE AND SHAPE OF GALACTIC AND EXTRAGALACTIC COSMIC-RAY NUCLEI THROUGH THEIR INFLUENCE ON THE EARTH'S ATMOSPHERE. EACH SPACECRAFT OF THE SERIES HAD A COMMON SPACECRAFT EQUIPMENT MODULE (SEM) AND A UNIQUE EXPERIMENT MODULE (EM). THIS MISSION WAS SPECIFICALLY DESIGNED TO MAP X-RAY AND GAMMA-RAY SOURCES FROM 150 EV TO 10 MEV, TO ESTABLISH THE SIZE AND PRECISE LOCATION OF X-RAY SOURCES WITH AN ENERGY RANGE OF 1 KEV TO 15 KEV, TO DETERMINE THE CONTRIBUTION OF DISCRETE SOURCES TO THE X-RAY BACKGROUND, AND TO MEASURE TIME VARIATIONS OF X-RAY SOURCES. CONTINUOUS CELESTIAL SCANS WERE MADE PERPENDICULAR TO THE Z AXIS (POINTING TO THE SUN) DURING THE INITIAL PHASE OF THE MISSION. SCAN RATE WAS 0.03 REVOLUTIONS/MIN. THE ENTIRE CELESTIAL SPHERE WOULD BE SCANNED IN 6 MONTHS. SPECIAL MANEUVERS OF UP TO 5 TIMES/WEEK, TO OFFSET FROM THE SUN UP TO 7 DEG FOR SHORT OBSERVATION PERIODS, WERE PART OF THE MISSION'S OBJECTIVES. WHEN PASSING OVER THE SOUTH ATLANTIC ANOMALY (SAA), HIGH-VOLTAGE SUPPLIES WERE TURNED OFF OR REDUCED TO PREVENT DAMAGE DUE TO SATURATION EFFECTS. THE SIX-SIDED HEAO 1 WAS 5.68 M HIGH, 2.67 M IN DIAMETER, AND WEIGHED 2552 KG INCLUDING 1220 KG OF EXPERIMENTS. DOWNLINK TELEMETRY WAS AT A DATA RATE OF 6.5 KB/S FOR REAL-TIME DATA AND 128 KB/S FOR EITHER OF THE TWO TAPE RECORDER SYSTEMS. THE MISSION LIFETIME WAS AUG 12, 1977 TO JAN 9, 1979.

****

INVESTIGATION NAME- LARGE AREA COSMIC X-RAY SURVEY (A-1)

NSSDC ID- 77-075A-01

PERSONNEL
PI - H.D. FRIEDMAN — US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS INSTRUMENT WAS A MODULAR ASSEMBLY OF SEVEN LARGE-AREA, THIN-WINDOW, PROPORTIONAL COUNTER SENSOR MODULES TO RECORD INCIDENT X-RAY FLUXES. THE OBJECTIVES WERE TO MAP THE CELESTIAL SPHERE IN THE ENERGY RANGE FROM .15 TO 20 KEV WITH GREATER SENSITIVITY THAN ACHIEVED HERETOFORE AND TO MEASURE THE SPECTRA, LOCATION, AND TIME VARIATIONS OF X-RAY SOURCES WITH A 0.1 TO 1 DEG ANGULAR RESOLUTION. EACH OF THE SENSOR MODULES CONSISTED OF A PROPORTIONAL COUNTER BODY FRAME ON WHICH WAS MOUNTED A WINDOW SUPPORT STRUCTURE, COUNTER BACK STRUCTURE WITH INTEGRAL CONTROL COUNTER, COLLIMATOR ASSEMBLY, AND ELECTRONIC SUBASSEMBLIES. A HONEYCOMB CELL CONSTRUCTION FOR THE BASIC COUNTER PROVIDED X-RAY COLLIMATION OF 80 DEG BY 4 DEG FWHM. A BACK LAYER OF THE THREE-LAYERED COUNTER PROVIDED ANTICOINCIDENT PROTECTION AGAINST CHARGED PARTICLE EVENTS. THE FRONT LAYER WAS THE MAIN X-RAY SENSOR FOR MOST ENERGY RANGES. ALL THREE LAYERS PROVIDED DATA AT HIGHER ENERGIES. THE COLLIMATOR FOR EACH OF THE COUNTERS VIEWED THE SKY. THE COLLIMATOR ON SENSOR MODULES 1 THROUGH 4 PROVIDED 1 DEG BY 4 DEG COLLIMATION, ON SENSOR MODULES 5 AND 6 PROVIDED 1 DEG BY 0.5 DEG COLLIMATION, AND ON SENSOR MODULE 7 PROVIDED 8 DEG BY 2 DEG COLLIMATION. EACH OF THE SENSORS INCLUDED MOVABLE RADIOACTIVE CALIBRATION SOURCES TO PROVIDE A CHECK ON COUNTER OPERATION AND CHANNEL POSITION. THERE WAS ALSO A MAGNET ASSEMBLY TO DEFLECT LOW-ENERGY RADIATION BELT ELECTRONS. THE CONTROL COUNTER WAS A SMALL COUNTER AT THE BACK OF THE ASSEMBLY THAT SHARED THE COUNTING GAS WITH THE MAIN COUNTER. IT WAS EXCITED BY AN FE 55 SOURCE AND SERVED TO GENERATE THE PROPER OPERATING VOLTAGE ON THE MAIN COUNTER TO COMPENSATE FOR GAS DENSITY CHANGES AND HIGH-VOLTAGE DRIFTS.

****

INVESTIGATION NAME- COSMIC X-RAY EXPERIMENT (A-2)

NSSDC ID- 77-075A-02

PERSONNEL
PI - E.A. BOLDT — NASA-GSFC
PI - G.P. GARMIRE — CALIF INST OF TECH

BRIEF DESCRIPTION
THIS EXPERIMENT WAS DESIGNED TO MEASURE THE DIFFUSE X-RAY BACKGROUND IN THE ENERGY RANGE OF 0.15 TO 60 KEV. OBJECTIVES WERE TO MEASURE RELATIVE DIFFUSION AND ABSORPTION OF DIFFUSE HARD AND SOFT X RAYS AT HIGH GALACTIC LATITUDES, AND THEN CORRELATE THESE MEASUREMENTS WITH RADIO AND OPTICAL STUDIES; DETERMINE DISCRETE SOURCE BACKGROUND CONTRIBUTION; DETECT LARGE-SCALE GLOBAL ANISOTROPIES ASSOCIATED WITH SOLAR SYSTEM MOTION WITH RESPECT TO DISTANT EMISSION SOURCES; MAKE BROADBAND SPECTRAL CLASSIFICATIONS OF DIFFUSE AND DISCRETE X-RAY SOURCES; AND ESTABLISH TEMPORAL VARIATIONS OF MULTI-COMPONENT SPECTRAL SOURCES. THREE TYPES OF MULTIANODE, MULTILAYER COUNTERS WERE USED FOR THIS EXPERIMENT. THREE HIGH-ENERGY DETECTORS (HED) WITH XENON-FILLED COUNTERS COVERED THE ENERGY RANGE OF 3 TO 60 KEV WITH AN EFFECTIVE AREA OF 900 SQ CM. THE MINIMUM DETECTABLE FLUX IN A 1.0E3 S OBSERVATION WAS 1.0E-4/SQ CM-S-KEV FOR ENERGY DANDS 3 TO 20 KEV AND 20 TO 60 KEV. ONE MEDIUM ENERGY DETECTOR (MED) WITH AN ARGON-METHANE-FILLED COUNTER COVERED THE ENERGY RANGE 1.5-15 KEV. THE EFFECTIVE AREA OF THIS COUNTER WAS 900 SQ CM. THE MINIMUM DETECTABLE FLUX WAS THE SAME AS FOR THE HED'S. THE TWO LOW-ENERGY DETECTORS (LED) WERE THIN-WINDOW, PROPANE GAS, FLOW COUNTERS TO COVER THE ENERGY RANGE OF 0.15 TO 3 KEV. THE LED USED PERMANENT MAGNETS TO PREVENT INCIDENT ELECTRONS FROM REACHING THE DETECTOR WINDOW AND A SUNSHADE WHENEVER DIRECT SUNLIGHT WAS NEAR THE FIELD OF VIEW. IT HAD A 600 SQ CM EFFECTIVE AREA. THE MINIMUM DETECTABLE FLUX FOR A 1.0E3 S OBSERVATION WAS 1.0E-3/SQ CM-S-KEV FOR THE 0.15 TO 0.28 KEV BAND AND FOR THE 0.5 TO 3.0 KEV BAND. THE LED'S WERE SHUT DOWN IN MAY 1978 DUE TO DEPLETION OF GAS IN THE SYSTEM.

****

INVESTIGATION NAME- X-RAY SCANNING MODULATION COLLIMATOR
(A-3)

NSSDC ID- 77-075A-03

PERSONNEL
PI - D. SCHWARTZ — SAO
PI - H.V.D.BRADT — MASS INST OF TECH

BRIEF DESCRIPTION
THIS EXPERIMENT USED A SCANNING MODULATION COLLIMATOR (SMC) INSTRUMENT TO DETERMINE, FOR SELECTED X-RAY SOURCES, THEIR POSITION WITHIN 5 ARC S; THEIR ANGULAR SIZE TO A PRECISION OF 5-10 ARC S IN THREE ENERGY INTERVALS FROM 1-15 KEV; AND TO STUDY THE STRUCTURE OF THEIR X-RAY EMISSION TO A PRECISION OF 10 ARC S IN THREE ENERGY INTERVALS FROM 1-15 KEV. THE SMC WAS COMPRISED OF TWO PARTS, EACH CONTAINING FOUR WIRE GRID PLANES. EACH PROVIDED A LOCATION AND ANGULAR SIZE MEASUREMENT IN ONE DIMENSION. AN ADDITIONAL COLLIMATOR LOCATED FORWARD TO THE FRONT GRID RESTRICTED THE OVERALL INSTANTANEOUS FIELD OF VIEW TO 4 DEG X 4 DEG FWHM FOR EACH SMC. THE OUTWARD VIEW DIRECTION IS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS (Z-AXIS) AND HENCE THE INSTRUMENT SCANS A GREAT CIRCLE BAND ON THE SKY. THE TWO PARTS OF THE SMC DIFFER BY HAVING THEIR PLANE OF MAXIMUM TRANSMISSION INCLINED +10 DEG AND -10 DEG TO THE SCAN DIRECTION. PRECISE TWO-DIMENSIONAL LOCATIONS ARE DETERMINED BY THE INTERSECTIONS OF THE LOCATIONS OBTAINED FROM EACH OF THE COLLIMATORS. THE ANGULAR RESPONSE OF THE TWO SMC COMPONENTS WAS 30 AND 120 ARC S, WHICH EXTENDED THE DYNAMIC RANGE UP TO 16 ARC MIN OVER WHICH ANGULAR SIZE AND STRUCTURE MEASUREMENTS WERE MADE. THE SMC INSTRUMENT WAS CAPABLE OF DETECTING X-RAY SOURCES WITH AN INTENSITY OF 1.0E-3 THAT OF THE CRAB NEBULA. THIS EXPERIMENT WAS ALSO EQUIPPED WITH TWO ASPECT SENSORS TO PROVIDE DATA ON THE STELLAR ORIENTATION OF THE COLLIMATOR AXES TO ACHIEVE THE 5 ARC-S POSITION OF SOURCES.

****

INVESTIGATION NAME- LOW-ENERGY GAMMA-RAY AND HARD X-RAY SKY
SURVEY (A-4)

NSSDC ID- 77-075A-04

PERSONNEL
PI - L.E. PETERSON — U OF CALIF, SAN DIEGO
PI - W.H.G.LEWIN — MASS INST OF TECH

BRIEF DESCRIPTION
THIS EXPERIMENT MEASURED POINT AND DIFFUSE SOURCES OF X RAYS AND GAMMA RAYS IN THE 10-KEV TO 10-MEV RANGE. THE INSTRUMENT CONSISTED OF SEVEN NAI(TL)/CSI(NA) PHOSWICH SCINTILLATORS SURROUNDED BY EIGHT LARGE CSI(NA) SCINTILLATORS THAT PROVIDED SHIELDING AND DEFINED THE FIELDS OF VIEW. THERE WERE THREE DETECTOR TYPES. THE INTERMEDIATE-ENERGY DETECTORS HAD AN ENERGY RANGE OF 10-200 KEV, AN AREA OF 225 SQ CM, CSI SHIELDING OF 2 IN., AND A FIELD OF VIEW (FWHM) OF 1 DEG X 20 DEG. THE SLAT COLLIMATORS OF THE INTERMEDIATE-ENERGY DETECTORS WERE POSITIONED AT 60 DEG RELATIVE TO THE SCAN DIRECTION, ALLOWING POINT SOURCE DETERMINATION TO 1 DEG OVER THE

APPROXIMATELY 40-DEG-WIDE BAND SCANNED EACH SPACECRAFT ROTATION. THE POINT-MODE DETECTORS HAD AN ENERGY RANGE OF 0.1-5 MEV, AN AREA OF 180 SQ CM, CSI SHIELDING OF ABOUT 4 IN., AND A FIELD OF VIEW (FWHM) OF 20 DEG. SOURCES DETECTED WERE IDENTIFIED WITH LOW-ENERGY SOURCES BY SPECTRAL SIMILARITY WITH MEASUREMENTS MADE BY THE INTERMEDIATE-ENERGY DETECTOR AT ABOUT 100 KEV. THE DIFFUSE-MODE DETECTORS HAD AN ENERGY RANGE OF 0.2-10 MEV, AN AREA OF 125 SQ CM, CSI SHIELDING OF ABOUT 6 IN., AND A FIELD OF VIEW (FWHM) OF 10 DEG. POINT SOURCES MEASURED BY THE DIFFUSE-MODE DETECTORS WERE RELATED TO THOSE WITH SIMILAR SPECTRA IN THE POINT-MODE DETECTORS. EACH OF THE DETECTORS WAS EQUIPPED WITH A PULSE-SHAPE ANALYZER AND DISCRIMINATOR WHICH DETECTED AND VETOED CSI(NA) EVENTS. THE COMBINATION OF SHIELD UPPER- AND LOWER-LEVEL DISCRIMINATORS (NOMINAL SETTINGS OF 5 MEV AND 0.1 MEV) USED FOR DETECTOR ANTICOINCIDENCE WERE SELECTABLE BY COMMAND. EVENT TIME WAS NOMINALLY KNOWN TO 0.1 S ACCURACY. THIS COULD BE IMPROVED TO 5 MS OR 2.0E-5 S BY COMMAND. EVENTS SATISFYING THE ANTICOINCIDENCE CONDITION WERE PULSE-HEIGHT ANALYZED AND TELEMETERED ON AN EVENT-BY-EVENT BASIS BY A MAIN PULSE-HEIGHT ANALYZER (MPHA) SYSTEM. A ROVING PULSE-HEIGHT ANALYZER (RPHA) PERFORMED ENERGY AND PULSE-SHAPE ANALYZER CALIBRATIONS AND MONITORED SHIELD PERFORMANCE. IT WAS ALSO USED IN THE STUDY OF STRONG X-RAY SOURCES THAT WERE GREATER THAN THE MPHA SYSTEM'S READOUT RATE. THIS INSTRUMENT ALSO CONTAINED THREE PARTICLE MONITORS, WHICH MEASURED PROTON AND ELECTRON FLUXES IN THREE ENERGY RANGES. THERE WAS A HIGH-RESOLUTION TIMING SYSTEM THAT MEASURED COSMIC GAMMA-RAY BURSTS, BY SUMMING THE SIGNALS OF THE EIGHT LARGE CSI(NA) SHIELDS THAT HAVE A TOTAL OMNIDIRECTIONAL COLLECTION AREA OF ABOUT 2400 SQ CM, AND DISCRIMINATING THE SUMMED SIGNAL IN A SYSTEM WITH THRESHOLDS OF 0.1, 0.2, 0.4, 0.8, AND 1.6 MEV.

****

SPACECRAFT COMMON NAME- HEAO 2
ALTERNATE NAMES- HIGH ENERGY ASTRON OBS-B, 11101
HEAO-B, EINSTEIN

NSSDC ID- 78-103A

LAUNCH DATE- 11/13/78

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 11/14/78
ORBIT PERIOD- 94.0 MIN	INCLINATION- 23.5 DEG
PERIAPSIS- 465. KM ALT	APOAPSIS- 476. KM ALT

PERSONNEL

MG - R.E.	HALPERN	NASA HEADQUARTERS
SC - A.G.	OPP	NASA HEADQUARTERS
PM - J.F.	STONE	NASA-MSFC
PS - S.S.	HOLT	NASA-GSFC

BRIEF DESCRIPTION
THIS WAS THE SECOND OF THREE MISSIONS IN A PROGRAM OF RESEARCH IN HIGH-ENERGY ASTRONOMICAL PHENOMENA. THE SPECIFIC OBJECTIVES OF THIS MISSION WERE IMAGING AND SPECTROGRAPHIC STUDIES OF SPECIFIC X-RAY SOURCES AND STUDIES OF THE DIFFUSE X-RAY BACKGROUND. THE SPACECRAFT WAS IDENTICAL TO THE HEAO 1 VEHICLE WITH THE ADDITION OF REACTION WHEELS AND ASSOCIATED ELECTRONICS TO ENABLE THE TELESCOPE TO BE POINTED AT SOURCES TO WITHIN 1 MIN OF ARC. THE INSTRUMENT PAYLOAD WEIGHED 1450 KG. A LARGE GRAZING-INCIDENCE X-RAY TELESCOPE PROVIDED IMAGES OF SOURCES THAT WERE THEN ANALYZED BY FOUR INTERCHANGEABLE INSTRUMENTS (HRI, IPC, SSS, FPCS) THAT WERE MOUNTED ON A CAROUSEL ARRANGEMENT AND COULD BE ROTATED INTO THE FOCAL PLANE OF THE TELESCOPE. THE TELESCOPE COLLECTED X RAYS OVER AN ANGULAR RANGE OF APPROXIMATELY 1 DEG X 1 DEG, WITH THE FOCAL PLANE INSTRUMENTS DETERMINING THE LIMITING RESOLUTION FOR EACH MEASUREMENT. THESE INSTRUMENTS INCLUDED A SOLID-STATE SPECTROMETER (SSS), A FOCAL PLANE CRYSTAL SPECTROMETER (FPCS), AN IMAGING PROPORTIONAL COUNTER (IPC), AND A HIGH-RESOLUTION IMAGING DETECTOR (HRI). ALSO INCLUDED, WERE A MONITOR PROPORTIONAL COUNTER (MPC) WHICH VIEWED THE SKY ALONG THE TELESCOPE AXIS, BROADBAND FILTER AND OBJECTIVE GRATING SPECTROMETERS THAT COULD BE USED IN CONJUNCTION WITH FOCAL PLANE INSTRUMENTS AND AN ASPECT SYSTEM. THE SCIENTIFIC OBJECTIVES WERE (1) TO ACCURATELY LOCATE AND EXAMINE X-RAY SOURCES IN THE ENERGY RANGE 0.2 TO 4.0 KEV WITH HIGH RESOLUTION; (2) TO PERFORM HIGH-SPECTRAL-SENSITIVITY MEASUREMENTS WITH BOTH HIGH- AND LOW-DISPERSION SPECTROGRAPHS; (3) TO PERFORM HIGH-SENSITIVITY MEASUREMENTS OF TRANSIENT X-RAY BEHAVIOR. THE SPACECRAFT WAS A SIX-SIDED STRUCTURE 5.68 M HIGH AND 2.67 M IN DIAMETER. DOWNLINK TELEMETRY WAS AT A DATA RATE OF 6.5 KB/S FOR REAL-TIME DATA AND 128 KB/S FOR EITHER OF TWO TAPE-RECORDER SYSTEMS. AN ATTITUDE-CONTROL-AND-DETERMINATION SUBSYSTEM WAS USED TO POINT AND MANEUVER THE SPACECRAFT. GYROS, SUN SENSORS, AND STAR TRACKERS WERE EMPLOYED AS SENSING DEVICES.

****

INVESTIGATION NAME- MONITOR PROPORTIONAL COUNTER (MPC)

NSSDC ID- 78-103A-01

PERSONNEL

PI - R.	GIACCONI	SPACE TELESCOPE SCI IN
OI - H.D.	TANANBAUM	SAO
OI - G.W.	CLARK	MASS INST OF TECH
OI - S.S.	HOLT	NASA-GSFC
OI - R.	NOVICK	COLUMBIA U

BRIEF DESCRIPTION
THIS EXPERIMENT CONSISTED OF A PROPORTIONAL COUNTER THAT VIEWED SPACE THROUGH A COLLIMATOR CO-ALIGNED TO THE HIGH-RESOLUTION TELESCOPE. THE SYSTEM HAD AN X-RAY COLLIMATOR, A THERMAL IMPEDANCE COVERING THE SPACECRAFT VIEWING APERTURE, AND AN IN-FLIGHT CALIBRATION SYSTEM. THE ACTIVE AREA WAS 667 SQ CM, THE SPATIAL RESOLUTION 1.5 DEG X 1.5 DEG FWFM, AND THE TEMPORAL RESOLUTION 2.56 S.

****

INVESTIGATION NAME- HIGH-RESOLUTION IMAGER (HRI)

NSSDC ID- 78-103A-02

PERSONNEL

PI - R.	GIACCONI	SPACE TELESCOPE SCI IN
OI - H.D.	TANANBAUM	SAO
OI - G.W.	CLARK	MASS INST OF TECH
OI - S.S.	HOLT	NASA-GSFC
OI - R.	NOVICK	COLUMBIA U

BRIEF DESCRIPTION
THIS EXPERIMENT WAS EQUIPPED WITH THREE IDENTICAL HRI DETECTORS. THE HRI WAS A DIGITAL X-RAY CAMERA WHICH PROVIDED HIGH SPATIAL AND TEMPORAL RESOLUTION OVER THE CENTRAL 25 ARC MIN OF THE TELESCOPE FOCAL PLANE. IT WAS COMPOSED OF TWO MICROCHANNEL PLATES OPERATING IN CASCADE, A CROSS-GRID CHARGE DETECTOR AND A SET OF ELECTRONICS. IT HAD A SPATIAL RESOLUTION OF 1 ARC S, A TEMPORAL RESOLUTION OF 7.8125 MICROSECONDS, AND AN ENERGY RANGE OF .15 - 3.0 KEV. SPECTRAL STUDIES COULD BE PERFORMED USING THE INTERCHANGEABLE BROADBAND FILTER AND THE OBJECTIVE GRATING.

****

INVESTIGATION NAME- FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)

NSSDC ID- 78-103A-03

PERSONNEL

PI - R.	GIACCONI	SPACE TELESCOPE SCI IN
OI - H.D.	TANANBAUM	SAO
OI - G.W.	CLARK	MASS INST OF TECH
OI - S.S.	HOLT	NASA-GSFC
OI - R.	NOVICK	COLUMBIA U

BRIEF DESCRIPTION
THE FPCS WAS A CURVED CRYSTAL BRAGG SPECTROMETER WITH A THIN-WINDOW GAS-FILLED PROPORTIONAL COUNTER AS A POSITION-SENSITIVE DETECTOR. THERE WERE TWO IDENTICAL COUNTERS FOR REDUNDANCY, AND SUFFICIENT GAS WAS CARRIED TO COMPENSATE FOR DIFFERENTIAL LEAKAGE THROUGH THE WINDOWS. SIX DIFFERENT CRYSTAL DIFFRACTORS WERE AVAILABLE. THE SPECTROMETER AND DETECTOR HAD AN IMAGING CAPABILITY WITH AVAILABLE APERTURES OF 3 X 30, 2 X 20, 1 X 20 ARC MIN, AND 6-ARC-MIN DIAMETER. THE INSTRUMENT COULD BE OPERATED AS A CONVENTIONAL CURVED-CRYSTAL SPECTROMETER OR USED IN A MODIFIED DEFOCUSED MODE TO ACHIEVE HIGHER RESOLUTION.

****

INVESTIGATION NAME- IMAGING PROPORTIONAL COUNTER (IPC)

NSSDC ID- 78-103A-04

PERSONNEL

PI - R.	GIACCONI	SPACE TELESCOPE SCI IN
OI - H.D.	TANANBAUM	SAO
OI - G.W.	CLARK	MASS INST OF TECH
OI - S.S.	HOLT	NASA-GSFC
OI - R.	NOVICK	COLUMBIA U

BRIEF DESCRIPTION
THE IPC WAS A POSITION-SENSITIVE PROPORTIONAL COUNTER WHICH PROVIDED GOOD EFFICIENCY AND FULL FOCAL-PLANE COVERAGE WITH A 75-ARC-MIN X 75-ARC-MIN FOV AND AN EFFECTIVE AREA OF APPROXIMATELY 100 SQ CM. IT HAD A SPATIAL RESOLUTION OF 1 ARC MIN, A TEMPORAL RESOLUTION OF 63 MICROSECONDS, AND 32 ENERGY CHANNELS IN THE RANGE OF 0.15 - 4.0 KEV. TWO IDENTICAL COUNTERS WERE INCLUDED FOR REDUNDANCY PLUS A BACKGROUND COUNTER FOR ANTICOINCIDENCE AND AN IN-FLIGHT CALIBRATION SYSTEM.

****

INVESTIGATION NAME- SOLID-STATE SPECTROMETER (SSS)

NSSDC ID- 78-103A-05

PERSONNEL

PI - R.	GIACCONI	SPACE TELESCOPE SCI IN
OI - H.D.	TANANBAUM	SAO
OI - G.W.	CLARK	MASS INST OF TECH
OI - S.S.	HOLT	NASA-GSFC
OI - R.	NOVICK	COLUMBIA U

BRIEF DESCRIPTION
THIS INSTRUMENT WAS A COOLED SOLID-STATE SPECTROMETER AND WAS USED TO DETECT WEAK SOURCES AND WEAK SPECTRAL FEATURES OVER A BROAD BAND OF ENERGIES BY EMPLOYING A NONDISPERSIVE SPECTRAL TECHNIQUE. A LITHIUM-DRIFTED, SOLID-STATE DETECTOR WAS OPERATED AT A TEMPERATURE OF 120 DEG K. THE PRIMARY DETECTOR WAS 6 MM IN DIAMETER AND WAS SURROUNDED BY TWO VETO GUARD COUNTERS. A TWO-STAGE SOLID CRYOGEN REFRIGERATOR WAS USED TO COOL THE DETECTOR. SPECTRAL MEASUREMENTS WERE MADE BETWEEN 0.4 AND 4 KEV, WITH A RESOLUTION FROM 120 TO 150 EV, FWHM AND AN EFFICIENCY GREATER THAN 0.9. THE EFFECTIVE AREA WAS 200 SQ CM; THE FOV, 6 ARC MIN IN DIAMETER; AND THE TIME RESOLUTION, 2 - 5 MICROSECONDS. OBSERVATIONS WITH THE INSTRUMENT WERE TERMINATED WHEN THE SUPPLY OF THE SOLID AMMONIA-METHANE CRYOSTAT WAS EXPENDED AND OPERATING TEMPERATURES COULD NO LONGER BE MAINTAINED.

****

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

NSSDC ID- 79-014A

LAUNCH DATE- 02/21/79

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/22/79
ORBIT PERIOD- 96. MIN	INCLINATION- 29.9 DEG
PERIAPSIS- 545. KM ALT	APOAPSIS- 577. KM ALT

PERSONNEL

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

BRIEF DESCRIPTION
AFTER LAUNCH, THE SIXTH JAPANESE SATELLITE, CORSA-B WAS OFFICIALLY RENAMED HAKUCHO, THE JAPANESE WORD FOR SWAN. THE SPACECRAFT HAD THE SHAPE OF AN OCTAGONAL RIGHT PRISM WITH A MAXIMUM WIDTH OF 80 CM AND A HEIGHT OF 65 CM. IT WAS SPIN-STABILIZED WITH A RATE OF 5 - 8 RPM. THE SPIN AXIS WAS MANEUVERED BY MEANS OF MAGNETIC TORQUING TOWARDS THE CELESTIAL OBJECTS TO BE OBSERVED. ELEVEN X-RAY DETECTORS OF VARIOUS SPECIFICATIONS WERE DEVOTED TO THE OBSERVATION OF COSMIC X RAYS. FOUR DETECTORS HAD FIELDS OF VIEW (FOV) PERPENDICULAR TO THE SPIN AXIS AND PERFORMED A SCAN OVER A WIDE REGION OF THE SKY IN SEARCH OF X-RAY NOVAE AND TRANSIENTS. THE OTHER SEVEN DETECTORS HAD FOV ALONG THE SPIN AXIS AND WERE USED TO STUDY SELECTED CELESTIAL OBJECTS. OBSERVATIONAL DATA COULD EITHER BE TELEMETERED BACK REAL-TIME OR STORED ON AN ON-BOARD DATA RECORDER. TELEMETRY FREQUENCIES WERE 136.725 MHZ AT 500 MW AND 400.450 MHZ AT 100 MW. THE SCIENTIFIC OBJECTIVES OF HAKUCHO WERE, (1) A SYSTEMATIC SURVEY AND WATCH OF SHORT-LIVED X-RAY PHENOMENA, (2) OBSERVATIONS OF SELECTED X-RAY SOURCES WITH A WIDE SPECTRAL COVERAGE (0.1 TO 100 KEV), (3) STUDY OF SHORT-TERM VARIABILITIES AND PULSATIONS OF X-RAY SOURCES, AND (5) STUDY OF THE X-RAY SKY IN THE SUB-KEV RANGE.

****

INVESTIGATION NAME- MONITOR OF X-RAY SOURCES

NSSDC ID- 79-014A-01

PERSONNEL

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

BRIEF DESCRIPTION
THIS EXPERIMENT LOCATED AND MONITORED X-RAY BURST SOURCES AND OTHER VARIABLE X-RAY SOURCES OVER THE ENERGY RANGE 1 TO 100 KEV USING ROTATING MODULATION COLLINATORS AND OTHER COLLIMATORS.

****

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

NSSDC ID- 79-014A-02

PERSONNEL

PI - F.	MAKINO	NAGOYA U
PI - Y.	TANAKA	U OF TOKYO

BRIEF DESCRIPTION
THIS EXPERIMENT SURVEYED THE SKY AND MONITORED TRANSIENT SOFT X-RAY SOURCES IN THE ENERGY RANGE 0.1 TO 2 KEV BY MEANS OF GAS-FLOW-TYPE PROPORTIONAL COUNTERS WITH THIN POLYPROPYLENE WINDOWS.

****

SPACECRAFT COMMON NAME- STP P78-1
ALTERNATE NAMES- SPACE TEST PROGRAM P78-1, P78-1
11278, SOLWIND
SOLWIND

NSSDC ID- 79-017A

LAUNCH DATE- 02/24/79

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 02/24/79
ORBIT PERIOD- 96.3 MIN	INCLINATION- 97.9 DEG
PERIAPSIS- 560. KM ALT	APOAPSIS- 600. KM ALT

PERSONNEL

PM - R.D.	KEHL	USAF SPACE DIVISION
PS - J.R.	STEVENS	AEROSPACE CORP

BRIEF DESCRIPTION
THE SPACE TEST PROGRAM (STP) P78-1 MISSION WAS DESIGNED TO OBTAIN SCIENTIFIC DATA FROM EARTH AND SUN-ORIENTED EXPERIMENTS. THE SPACECRAFT WAS SUN-ORIENTED AND HAD ITS SPIN AXIS PERPENDICULAR TO THE ORBIT PLANE AND THE SATELLITE-SUN LINE. THE INSTRUMENTATION CONSISTED OF (1) A GAMMA-RAY SPECTROMETER AND PARTICLE DETECTORS, (2) A WHITE-LIGHT CORONAGRAPH AND AN EXTREME-ULTRAVIOLET (EUV) HELIOGRAPH, (3) SOLAR X-RAY SPECTROMETER AND SPECTROHELIOGRAPH, (4) AN EXTREME-ULTRAVIOLET (EUV) SPECTROMETER, (5) A HIGH-LATITUDE PARTICLE SPECTROMETER, (6) AN X-RAY MONITOR, AND (7) A PRELIMINARY AEROSOL MONITOR.

****

INVESTIGATION NAME- X-RAY MONITOR

NSSDC ID- 79-017A-06

PERSONNEL

PI - S.D.	SHULMAN	US NAVAL RESEARCH LAB

BRIEF DESCRIPTION
THIS INVESTIGATION USED AN X-RAY MONITOR TO DETERMINE THE FREQUENCY AND LOCATION OF SHORT-LIVED X-RAY BURSTS FROM SPACE. IT PROVIDED A LOW-RESOLUTION MAPPING CAPABILITY FOR AURORAL X-RAY EMISSION.

****

SPACECRAFT COMMON NAME- UK 6
ALTERNATE NAMES- UNITED KINGDOM-6, ARIEL 6
11382

NSSDC ID- 79-047A

LAUNCH DATE- 06/02/79

ORBIT PARAMETERS

ORBIT TYPE- GEOCENTRIC	EPOCH DATE- 06/02/79
ORBIT PERIOD- 97.3 MIN	INCLINATION- 55. DEG
PERIAPSIS- 605. KM ALT	APOAPSIS- 651. KM ALT

PERSONNEL

PM - J.E.	FOSTER	RUTHERFORD/APPLTON LAB
PS - J.L.	CULHANE	U COLLEGE LONDON

BRIEF DESCRIPTION
UK 6 WAS THE 6TH AND LAST SATELLITE IN THE ARIEL SERIES. THE OBJECTIVE OF THIS MISSION WAS TO UNDERTAKE STUDIES IN HIGH-ENERGY ASTROPHYSICS. TWO X-RAY EXPERIMENTS, ONE COSMIC-RAY EXPERIMENT, AND THREE TECHNOLOGY EXPERIMENTS WERE CARRIED. THE SPACECRAFT WAS SPIN STABILIZED, WITH THE SPIN AXIS COMMANDED INTO A SEQUENCE OF ORIENTATIONS TO ACCOMMODATE THE X-RAY EXPERIMENT REQUIREMENTS.

****

INVESTIGATION NAME- X-RAY PROPORTIONAL COUNTER SPECTROMETER

NSSDC ID- 79-047A-02

PERSONNEL
PI - K.A. POUNDS U OF LEICESTER

BRIEF DESCRIPTION
THE INSTRUMENT CONSISTED OF AN ARRAY OF XENON-FILLED PROPORTIONAL COUNTERS DESIGNED FOR DETAILED MEASUREMENT OF TIME VARIABILITY AND SPECTRA OF BOTH GALACTIC AND EXTRAGALACTIC SOURCES. THE DETECTOR ARRAY WAS SENSITIVE OVER THE ENERGY RANGE 1.2 - 50 KEV AND VIEWED ALONG THE SPACECRAFT SPIN AXIS THROUGH 3-DEG FWHM FIELD COLLIMATORS. BRIGHT X-RAY SOURCES COULD BE MEASURED TO SEVERAL MICROSECONDS TIME RESOLUTION, AND SPECTRAL DATA WERE OBTAINED IN 32 CHANNELS.

****

INVESTIGATION NAME- X-RAY GRAZING INCIDENCE SYSTEM

NSSDC ID- 79-047A-03

PERSONNEL
PI - R.L.F.BOYD U COLLEGE LONDON
OI - A.P. WILLMORE U OF BIRMINGHAM
OI - A.M. CRUISE U COLLEGE LONDON
OI - C.V. GOODALL U OF BIRMINGHAM

BRIEF DESCRIPTION
THIS SYSTEM CONSISTED OF FOUR GRAZING-INCIDENCE HYPERBOLOID MIRRORS THAT REFLECTED X RAYS THROUGH AN APERTURE/FILTER TO FOUR CONTINUOUS-FLOW PROPANE GAS DETECTORS COVERED WITH A ONE-MICROMETER POLYPROPYLENE WINDOW. THE INSTRUMENT WAS SENSITIVE TO X RAYS FROM 0.1 TO 2 KEV AND HAD SEVEN SELECTABLE FIELDS OF VIEW FROM 0.2 TO 3.6 DEG. THE SYSTEM COULD BE OPERATED IN FOUR DIFFERENT MODES: SPECTRAL (32 CHANNELS OF PULSE HEIGHT), TIME (0.5 MS TO 16 S), PULSAR (PERIODS FROM 8 MS TO 4 H), AND AUTOCORRELATOR (PERIODIC VARIATIONS FROM 128 MS TO 2 S). THE DETECTORS POINTED ALONG THE SPACECRAFT SPIN AXIS.

****

SPACECRAFT COMMON NAME- BHASKARA
ALTERNATE NAMES- SEO, 11392

NSSDC ID- 79-051A

LAUNCH DATE- 06/07/79

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

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

BRIEF DESCRIPTION
BHASKARA, THE SECOND INDIAN SATELLITE, WAS LAUNCHED AS PART OF THE SATELLITE-FOR-EARTH-OBSERVATIONS (SEO) PROGRAM. IT WAS PLACED IN ORBIT BY A U.S.S.R. VEHICLE LAUNCHED FROM A COSMODROME IN THE U.S.S.R. THE MAIN OBJECTIVES WERE TO CONDUCT EARTH OBSERVATION EXPERIMENTS FOR APPLICATIONS RELATED TO HYDROLOGY, FORESTRY, AND GEOLOGY USING A TWO-BAND TV CAMERA SYSTEM, AND TO CONDUCT OCEAN-SURFACE STUDIES USING A TWO-FREQUENCY SATELLITE MICROWAVE RADIOMETER (SAMIR) SYSTEM. SECONDARY OBJECTIVES WERE TO TEST ENGINEERING AND DATA PROCESSING SYSTEMS, TO COLLECT LIMITED METEOROLOGICAL DATA FROM REMOTE PLATFORMS, AND TO CONDUCT SCIENTIFIC INVESTIGATIONS IN X-RAY ASTRONOMY. BHASKARA WAS A 26-FACED QUASI-SPHERICAL POLYHEDRON. IT HAD A HEIGHT OF 1.66 M, AND DIAMETER OF 1.55 M. THE SATELLITE WAS NAMED AFTER THE TWO "BHASKARACHARYAS" ASTRONOMER-MATHEMATICIANS OF ANCIENT INDIA.

****

INVESTIGATION NAME- PINHOLE X-RAY SKY SURVEY

NSSDC ID- 79-051A-03

PERSONNEL
PI - K. KASTURIRANGAN ISRO SATELLITE CENTER
OI - P.C. AGARWAL TATA INST OF FUND RES

BRIEF DESCRIPTION
THE OBJECTIVE OF THIS INVESTIGATION WAS TO CONDUCT INVESTIGATIONS ON TRANSIENT X-RAY SOURCES AND ON THE LONG TERM VARIABILITY OF STEADY X-RAY SOURCES IN THE 2 - 10 KEV RANGE. THE INSTRUMENT PERFORMED SATISFACTORILY DURING THE FIRST MONTH AFTER THE LAUNCH AND WAS THEN TURNED OFF. WHEN THE INSTRUMENT WAS TURNED ON AGAIN AFTER SOME TIME, IT WAS FOUND TO BE IN COUNT RATE SATURATION MODE. THE REASON FOR THE MALFUNCTION WAS NOT KNOWN.

****

SPACECRAFT COMMON NAME- HEAO 3
ALTERNATE NAMES- HIGH ENERGY ASTRON OBS-C, 11532
HEAO-C

NSSDC ID- 79-082A

LAUNCH DATE- 09/20/79

ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC EPOCH DATE- 09/21/79
ORBIT PERIOD- 94.5 MIN INCLINATION- 43.6 DEG
PERIAPSIS- 486.4 KM ALT APOAPSIS- 504.9 KM ALT

PERSONNEL
MG - R.E. HALPERN NASA HEADQUARTERS
SC - A.G. OPP NASA HEADQUARTERS
PM - J.F. STONE NASA-MSFC
PS - T.A. PARNELL NASA-MSFC

BRIEF DESCRIPTION
THIS THIRD MISSION PERFORMED A SKY SURVEY OF GAMMA RAYS AND COSMIC RAYS IN A MANNER SIMILAR TO HEAO 1. IT HAD A HIGHER ORBITAL INCLINATION THAN THE PREVIOUS MISSIONS IN THIS SERIES SINCE THE PAYLOAD CONSISTED PRIMARILY OF COSMIC-RAY INSTRUMENTATION; GREATER COSMIC-RAY FLUX OCCURS NEAR THE EARTH'S MAGNETIC POLES. THE SCIENTIFIC OBJECTIVES OF THE MISSION WERE (1) TO DETERMINE THE ISOTOPIC COMPOSITION OF THE MOST ABUNDANT COMPONENTS OF THE COSMIC-RAY FLUX WITH ATOMIC MASS BETWEEN 7 AND 56, AND THE FLUX OF EACH ELEMENT WITH ATOMIC NUMBER (Z) BETWEEN Z = 4 AND Z = 50; (2) TO SEARCH FOR SUPER-HEAVY NUCLEI UP TO Z = 120, AND MEASURE THE COMPOSITION OF THE NUCLEI WITH Z .GT. 20; (3) TO STUDY INTENSITY, SPECTRUM, AND TIME BEHAVIOR OF X-RAY AND GAMMA-RAY SOURCES BETWEEN 0.06 AND 10 MEV, AND MEASURE ISOTROPY OF THE DIFFUSE X-RAY AND GAMMA-RAY BACKGROUND; AND (4) TO PERFORM AN EXPLORATORY SEARCH FOR X- AND GAMMA-RAY LINE EMISSIONS. THE NORMAL OPERATING MODE WAS A CONTINUOUS CELESTIAL SCAN ABOUT THE Z AXIS (WHICH NOMINALLY POINTED TO THE SUN).

****

INVESTIGATION NAME- GAMMA-RAY LINE SPECTROMETER

NSSDC ID- 79-082A-01

PERSONNEL
PI - A.S. JACOBSON NASA-JPL
OI - J.R. ARNOLD U OF CALIF, SAN DIEGO
OI - A.E. METZGER NASA-JPL
OI - L.E. PETERSON U OF CALIF, SAN DIEGO

BRIEF DESCRIPTION
THE BASIC GOALS OF THIS EXPERIMENT WERE TO SEARCH FOR GAMMA-RAY LINE EMISSIONS ARISING FROM A VARIETY OF SOURCE PHENOMENA. PARTICULAR EMPHASIS WAS PLACED ON FINDING LINE EMISSIONS FROM PROCESSES OF NUCLEOSYNTHESIS IN SUPERNOVAE, AND FROM POSITRON-ELECTRON ANNIHILATION AND NUCLEAR REACTIONS IN LOW-ENERGY COSMIC RAYS. IN ADDITION, CAREFUL STUDY WAS MADE OF THE SPECTRAL AND TIME VARIATIONS OF KNOWN HARD X-RAY SOURCES. THE EXPERIMENT WAS CAPABLE OF MEASURING GAMMA-RAY LINES FALLING WITHIN THE ENERGY INTERVAL FROM 0.06 TO 10 MEV, AND WITH AN ENERGY RESOLUTION BETTER THAN 2.5 KEV AT 1.33 MEV AT A LINE SENSITIVITY FROM 1.E-4 TO 1.E-5 PHOTONS/SQ CM-S, DEPENDING ON THE ENERGY. THE EXPERIMENTAL PACKAGE CONTAINED FOUR COOLED DRIFTED-GERMANIUM DETECTORS SHIELDED BY CESIUM IODIDE. THE KEY EXPERIMENTAL PARAMETERS WERE (1) GEOMETRY FACTOR OF 11.1 SQ CM-SR, (2) A FIELD OF VIEW OF 27 DEG FWHM AND, (3) A TIME RESOLUTION OF LESS THAN 0.1 MS FOR THE GERMANIUM DETECTOR AND 10 S FOR THE CESIUM IODIDE DETECTOR.

3. INDEXES

This section comprises eight different indexes that contain additional information and cross-referencing items to assist the user in finding specific information.

3.1 SPACECRAFT ALPHABETICAL NAME INDEX

This index is ordered alphabetically by spacecraft common name and is cross-referenced to the brief descriptions in section 1. Spacecraft alternate names and NSSDC IDs are included.

3.2 OBSERVING CATALOGS

Experimenters usually maintain a log of observations made during the operational lifetime of their instrument. These catalogs provide a reference as to what objects or areas were observed by the experiment. The additional information varies from experiment to experiment and the format can range from a full catalog to a single page list. The following index lists the observing catalogs that are available through NSSDC and their form (see Appendix A).

SPACECRAFT NAME / INVESTIGATOR NAME	LAUNCH DATE / EXPERIMENT NAME / DATA SET NAME	NSSDC ID	DATA SET INFORMATION: FORM	QUANTITY	TIME SPAN OF DATA		PAGE
ANS	08/30/74	74-070A					10
GRINDLAY	ANS, HARD(2-40 KEV) X-RAY EXP. HXX OBSERVING CATALOG	74-070A-03 74-070A-03B	FR	1			10
HEAO 2	11/13/78	78-103A					16
GIACCONI	HEAO 2, MONITOR PROPORTIONAL CNTR	78-103A-01					16
	CATALOG OF OBSERVED TARGETS-TAPE	78-103A-01A	DD	1	11/16/78	04/25/81	
	CATALOG OF OBSERVED TARGETS-FICHE	78-103A-01B	FR	4	11/16/78	04/25/81	
GIACCONI	HEAO 2, HIGH-RESOLUTION IMAGER	78-103A-02					16
	CATALOG OF OBSERVED TARGETS-TAPE	78-103A-02A	DD	1	11/16/78	04/25/81	
	CATALOG OF OBSERVED TARGETS-FICHE	78-103A-02B	FR	4	11/16/78	04/25/81	
GIACCONI	HEAO 2, CRYSTAL X-RAY SPECTROMETER	78-103A-03					16
	CATALOG OF OBSERVED TARGETS-TAPE	78-103A-03A	DD	1	11/16/78	04/25/81	
	CATALOG OF OBSERVED TARGETS-FICHE	78-103A-03B	FR	4	11/16/78	04/25/81	
GIACCONI	HEAO 2, IMAGING PROPORTIONAL CNTR	78-103A-04					16
	CATALOG OF OBSERVED TARGETS-TAPE	78-103A-04A	DD	1	11/16/78	04/25/81	
	CATALOG OF OBSERVED TARGETS-FICHE	78-103A-04B	FR	4	11/16/78	04/25/81	
GIACCONI	HEAO 2, SOLID-STATE SPECTRM (SSS)	78-103A-05					17
	CATALOG OF OBSERVED TARGETS-TAPE	78-103A-05A	DD	1	11/16/78	04/25/81	
	CATALOG OF OBSERVED TARGETS-FICHE	78-103A-05B	FR	4	11/16/78	04/25/81	
OAO 3	08/21/72	72-065A					9
BOYD	OAO 3,STELLAR X RAY EMISS, 1-100A	72-065A-02					10
	UCL OBSERVING CATALOG	72-065A-02C	MP	1	08/26/72	12/14/80	
OSO 8	06/21/75	75-057A					13
FROST	OSO 8,HIGH ENERGY CELESTIAL X RAY	75-057A-07					13
	CELESTIAL X-RAY SOURCES OBS	75-057A-07A	HI	1	06/21/75	09/30/78	
SERLEMITSOS	OSO 8, COSMIC X-RAY SPECTROSCOPY	75-057A-06					13
	SPIN AXIS POINTING MAPS	75-057A-06A	FR	5	07/02/75	10/01/78	
SAS-C	05/07/75	75-037A					12
CLARK	SAS-C, SCORPIO MONITOR 0.4-80KEV	75-037A-02					12
	Y-AXIS POINTED OBSERVATION LOG	75-037A-02B	HI	8	05/30/75	03/23/79	
CLARK	SAS-C, GALACTIC ABS. 0.2-10KEV	75-037A-03					12
	Y-AXIS POINTED OBSERVATION LOG	75-037A-03B	HI	8	05/30/75	03/23/79	
CLARK	SAS-C, GALACTIC MONITOR 1.8-8KEV	75-037A-04					12
	Y-AXIS POINTED OBSERVATION LOG	75-037A-04B	HI	8	05/30/75	03/23/79	
UK 6	06/02/79	79-047A					17
POUNDS	UK 6,,X-RAY PROPORTIONAL COUNTERS	79-047A-02					18
	X-RAY PROP COUNTER SOURCE LIST	79-047A-02A	HI	1			

INDEXES
(continued)

3.3 X-RAY SOURCE CATALOGS

The following is a list of X-ray source catalogs that are currently available from NSSDC. Included are the data form (see Appendix A) and quantity.

DISCIPLINE / SOURCE / DATA TYPE NAME / DATA CONTENTS NAME / DATA SET NAME	DATA SET INFORMATION: FORM	QUANTITY	TIME SPAN OF DATA		NSSDC ID
ASTROPHYSICS					
SPACECRAFT RELATED DATA					
ASTRONOMICAL CATALOGS					SX-D
X-RAY CATALOGS					SX-D1
2ND ARIEL SELECTED X-RAY DATA	DD	1			SX-D1A
3RD UHURU SELECTED X-RAY DATA	DD	1			SX-D1B
4TH UHURU SELECTED X-RAY DATA	DD	1			SX-D1C
4U CATALOG OF X-RAY SOURCES	FR	2	12/12/70	03/18/73	SX-D1J
ARIEL V 3A X-RAY CATALOGUE,MFICH	FR	1	10/18/74	03/14/80	SX-D1F
ARIEL V 3A X-RAY CATALOGUE,TAPE	DD	1	10/18/74	03/14/80	SX-D1E
COMPACT GALACTIC X-RAY SOURCES	FR	2			SX-D1I
EXTRAGALACTIC X-RAY SOURCES	DD	1			SX-D1K
HAKUCHO LIST OF X-RAY BURSTERS	HI	1	04/00/79	07/15/81	SX-D1L
HEAO A-1 X-RAY SOURCE CATALOG	MP	1			SX-D1G
HEAO A-2 NEW HARD X-RAY SOURCES	DD	1	09/01/77	03/09/78	SX-D1H
X-RAY SOURCES ACCURATE POSITIONS	DD	1			SX-D1D

INDEXES
(continued)

3.4 X-RAY INSTRUMENTS

The following index can be used as a quick reference to types of X-ray instruments. A categorization is made by the principal types of detection devices employed in the referenced experiments. Since each category is in chronological order, the index is a form of brief historical overview.

SPACECRAFT COMMON NAME	EXPERIMENT NAME	NSSDC ID	PAGE
	PROPORTIONAL CHAMBER		
OSO 8	COSMIC X-RAY SPECTROSCOPY	75-057A-06	13
	CHANNEL MULTIPLIER		
UK 5	ROTATION MODULATION COLLIMATOR (RMC)	74-077A-01	11
	SOLID STATE DETECTORS		
SOLRAD 11 A	X-RAY BACKGROUND	76-023C-24	14
SOLRAD 11 B	X-RAY BACKGROUND	76-023D-24	14
HEAO 2	SOLID-STATE SPECTROMETER (SSS)	78-103A-05	17
HEAO 3	GAMMA-RAY LINE SPECTROMETER	79-082A-01	18
	CRYSTAL SPECTROMETERS/POLARIMETERS		
ANS	HARD X-RAY EXPERIMENT (HXX)	74-070A-03	10
UK 5	BRAGG CRYSTAL SPECTROMETER (BCS)	74-077A-04	11
OSO 8	HIGH-SENSITIVITY CRYSTAL SPECTROSCOPY OF STELLAR AND SOLAR X-RAYS	75-057A-03	13
HEAO 2	FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)	78-103A-03	16
	IMAGING DETECTORS		
UK 5	ALL-SKY MONITOR	74-077A-06	11
HEAO 2	HIGH-RESOLUTION IMAGER (HRI)	78-103A-02	16
HEAO 2	FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)	78-103A-03	16
HEAO 2	IMAGING PROPORTIONAL COUNTER (IPC)	78-103A-04	16
BHASKARA	PINHOLE X-RAY SKY SURVEY	79-051A-03	18

INDEXES
(continued)

3.5 EXPERIMENT ENERGY RANGES

This index separates the different experiments into three basic energy ranges that span the X-ray spectrum. Instruments that were designed to operate over a wide range are included in all applicable categories. The spacecraft and experiments are listed in chronological sequence within each range. Cross-references are provided to the descriptions in Section 1.

0.2 – 2.0 keV

2.0 – 20.0 keV

SPACECRAFT COMMON NAME	EXPERIMENT NAME	NSSDC ID	PAGE
OSO 3	SOLAR AND CELESTIAL GAMMA-RAY TELESCOPE	67-020A-07	5
OSO 4	COSMIC X-RAY MEASUREMENTS	67-100A-02	5
VELA 5A	COSMIC X RAYS	69-046D-06	5
VELA 5B	COSMIC X RAYS	69-046E-06	6
VELA 6A	COSMIC X RAYS	70-027A-06	6
VELA 6B	COSMIC X RAYS	70-027B-06	7
SAS-A	ALL-SKY X-RAY SURVEY	70-107A-01	7
SOLRAD 10	ALL-SKY X-RAY SURVEY	71-058A-02	7
OSO 7	COSMIC X-RAY EXPERIMENT	71-083A-03	8
OSO 7	COSMIC X-RAY SOURCES IN THE RANGE 1.5 TO 9 A	71-083A-04	8
TD 1A	SPECTROMETRY OF CELESTIAL X-RAYS 2-30 KEV (S77)	72-014A-04	9
OAO 3	STELLAR X RAYS	72-065A-02	10
ANS	SOFT X-RAY EXPERIMENT (SXX)	74-070A-02	10
ANS	HARD X-RAY EXPERIMENT (HXX)	74-070A-03	10
UK 5	ROTATION MODULATION COLLIMATOR (RMC)	74-077A-01	11
UK 5	2- TO 10-KEV SKY SURVEY INSTRUMENT (SSI)	74-077A-02	11
UK 5	HIGH-RESOLTUION SOURCE SPECTRA	74-077A-03	11
UK 5	BRAGG CRYSTAL SPECTROMETER (BCS)	74-077A-04	11
UK 5	ALL-SKY MONITOR	74-077A-06	11
ARYABHATA	X-RAY ASTRONOMY	75-033A-01	12
SAS-C	EXTRAGALACTIC EXPERIMENT (EGE)	75-037A-01	12
SAS-C	GALACTIC MONITOR EXPERIMENT (GME)	75-037A-02	12
SAS-C	SCORPIO MONITOR EXPERIMENT (SME)	75-037A-03	12
SAS-C	GALACTIC ABSORPTION EXPERIMENT (GAE)	75-037A-04	12
OSO 8	HIGH-SENSITIVITY CRYSTAL SPECTROSCOPY OF STELLAR AND SOLAR X RAYS	75-057A-03	13
OSO 8	SOFT X-RAYS BACKGROUND RADIATION INVESTIGATION	75-057A-05	13
OSO 8	COSMIC X-RAY SPECTROSCOPY	75-057A-06	13
OSO 8	HIGH ENERGY CELESTIAL X RAYS	75-057A-07	13
SOLRAD 11A	STELLAR/AURORAL X RAYS	76-023C-16	14
SOLRAD 11A	X-RAY BACKGROUND	76-023C-24	14
SOLRAD 11B	X-RAY BACKGROUND	76-023D-24	14
SOLRAD 11B	STELLAR/AURORAL X RAYS	76-023D-16	14
HEAO 1	LARGE AREA COSMIC X-RAY SURVEY (A-1)	77-075A-01	15
HEAO 1	COSMIC X-RAY EXPERIMENT (A-2)	77-075A-02	15
HEAO 1	X-RAY SCANNING MODULATION COLLIMATOR (A-3)	77-075A-03	15
HEAO 1	LOW-ENERGY GAMMA-RAY AND HARD X-RAY SKY SURVEY (A-4)	77-075A-04	15
HEAO 2	MONITOR PROPORTIONAL COUNTER (MPC)	78-103A-01	16
HEAO 2	HIGH-RESOLUTION IMAGER (HRI)	78-103A-02	16
HEAO 2	FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)	78-103A-03	16
HEAO 2	IMAGING PROPORTIONAL COUNTER (IPC)	78-103A-04	16
HEAO 2	SOLID-STATE SPECTROMETER (SSS)	78-103A-05	17
HAKUCHO	MONITOR OF X-RAY SOURCES	79-014A-01	17
UK 6	X-RAY PROPORTIONAL COUNTER SPECTROMETER	79-047A-02	18
BHASKARA	PINHOLE X-RAY SKY SURVEY	79-051A-03	18

> 20.0 keV

SPACECRAFT COMMON NAME	EXPERIMENT NAME	NSSDC ID	PAGE
OSO 3	SOLAR AND CELESTIAL GAMMA-RAY TELESCOPE	67-020A-07	5
OSO 4	COSMIC X-RAY MEASUREMENTS	67-100A-02	5
OSO 7	COSMIC X-RAY EXPERIMENT	71-083A-03	8
OSO 7	COSMIC X-RAY SOURCES IN THE RANGE 1.5 TO 9 A	71-083A-04	8
TD 1A	SPECTROMETRY OF CELESTIAL X RAYS 2-30 KEV (S77)	72-014A-04	9
OAO 3	STELLAR X RAYS	72-065A-02	10
ANS	HARD X-RAY EXPERIMENT (HXX)	74-070A-03	10
UK 5	ROTATION MODULATION COLLIMATOR (RMC)	74-077A-01	11
UK 5	HIGH-RESOLUTION SOURCE SPECTRA	74-077A-03	11
UK 5	HIGH-ENERGY COSMIC X-RAY SPECTRA	74-077A-05	11
ARYABHATA	X-RAY ASTRONOMY	75-033A-01	12
SAS-C	GALACTIC MONITOR EXPERIMENT (GME)	75-037A-02	12
SAS-C	SCORPIO MONITOR EXPERIMENT (SME)	75-037A-03	12
OSO 8	SOFT X-RAY BACKGROUND RADIATION INVESTIGATION	75-057A-05	13
OSO 8	COSMIC X-RAY SPECTROSCOPY	75-057A-06	13
OSO 8	HIGH-ENERGY CELESTIAL X RAYS	75-057A-07	13
HEAO 1	COSMIC X-RAY EXPERIMENT (A-2)	77-075A-02	15
HEAO 1	LOW-ENERGY GAMMA-RAY AND HARD X-RAY SKY SURVEY (A-4)	77-075A-04	15
HAKUCHO	MONITOR OF X-RAY SOURCES	79-014A-01	17
UK 6	X-RAY PROPORTIONAL COUNTER SPECTROMETER	79-047A-02	18
HEAO 3	GAMMA-RAY LINE SPECTROMETER	79-082A-01	18

INDEXES

(continued)

3.6 OPERATIONAL LIFETIMES

This index provides a quick-reference to the operational lifetime of both the spacecraft and the X-ray experiments. It can be of use in determining what experiments may have been taking data at any specific time. The information printed includes spacecraft common name, experiment names, NSSDC ID, the funding country for the spacecraft, the institution responsible for the experiment, and operational lifetimes.

SPACECRAFT AND EXPERIMENT OPERATIONAL LIFETIME

SPACECRAFT NAME	NSSDC ID	FUNDING COUNTRY / ORIGINAL EXP INST	EXPERIMENT NAME	DATE EXP TURNED ON	DATE PLACED INOP	PAGE
ANS	74-070A	NETHR UNTST		08/30/74	07/30/76	10
	74-070A-02	U OF UTRECHT	SOFT X-RAY EXPERIMENT (SXX)	09/05/74	07/30/76	10
	74-070A-03	HARVARD COLLEGE OBS	HARD X-RAY EXPERIMENT (HXX)	09/08/74	07/30/76	10
APOLLO 15 CSM	71-063A	UNTST		07/26/71	08/07/71	8
	71-063A-09	NASA-GSFC	X-RAY FLUORESCENCE	07/30/71		8
APOLLO 16 CSM	72-031A	UNTST		04/16/72	04/27/72	9
	72-031A-08	NASA-GSFC	X-RAY FLUORESCENCE			9
ARYABHATA	75-033A	INDIA USSRN		04/19/75	09/23/76	12
	75-033A-01	ISRO SAT SYS PROJ	X-RAY ASTRONOMY	04/19/75	09/23/76	12
ASTP-APOLLO	75-066A	UNTST		07/15/75	07/24/75	13
	75-066A-04	US NAVAL RESEARCH LAB	SKY-EARTH X-RAY OBSERVATIONS	07/15/75	07/24/75	14
BHASKARA	79-051A	INDIA USSRN		06/07/79	Unknown	18
	79-051A-03	ISRO SATELLITE CENTER	PINHOLE X-RAY SKY SURVEY	06/07/79	06/30/79	18
HAKUCHO	79-014A	JAPAN		02/21/79†		17
	79-014A-01	OSAKA CITY U	MONITOR OF X-RAY SOURCES	03/00/79†		17
	79-014A-02	NAGOYA U	DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES	03/00/79†		17
HEAO 1	77-075A	UNTST		08/12/77	01/09/79	15
	77-075A-01	US NAVAL RESEARCH LAB	LARGE AREA COSMIC X-RAY SURVEY (A-1)	08/12/77	01/09/79	15
	77-075A-02	NASA-GSFC	COSMIC X-RAY EXPERIMENT (A-2)	08/12/77	01/09/79	15
	77-075A-03	HARVARD COLLEGE OBS	X-RAY SCANNING MODULATION COLLIMATOR (A-3)	08/12/77	01/09/79	15
	77-075A-04	U OF CALIF, SAN DIEGO	LOW-ENERGY GAMMA-RAY AND HARD X-RAY SKY SURVEY (A-4)	08/12/77	01/09/79	15
HEAO 2	78-103A	UNTST		11/13/78	04/25/81	16
	78-103A-01	HARVARD COLLEGE OBS	MONITOR PROPORTIONAL COUNTER (MPC)	11/15/78	04/25/81	16
	78-103A-02	HARVARD COLLEGE OBS	HIGH-RESOLUTION IMAGER (HRI)	11/16/78	04/25/81	16
	78-103A-03	MASS INST OF TECH	FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)	11/16/78	04/25/81	16
	78-103A-04	HARVARD COLLEGE OBS	IMAGING PROPORTIONAL COUNTER (IPC)	11/16/78	04/25/81	16
	78-103A-05	NASA-GSFC	SOLID-STATE SPECTROMETER (SSS)	11/16/78	10/20/79	17
HEAO 3	79-082A	UNTST		09/20/79	05/30/81	18
	79-082A-01	NASA-JPL	GAMMA-RAY LINE SPECTROMETER	09/23/79	05/30/81	18
OAO 3	72-065A	UNTST		08/21/72	02/15/81	9
	72-065A-02	U COLLEGE LONDON	STELLAR X RAYS	08/21/72	02/15/81	10
OSO 3	67-020A	UNTST		03/08/67	11/10/69	5
	67-020A-07	U OF CALIF, SAN DIEGO	SOLAR AND CELESTIAL GAMMA-RAY TELESCOPE	03/08/67	11/10/69	5
OSO 4	67-100A	UNTST		10/18/67	12/07/71	5
	67-100A-02	HARVARD COLLEGE OBS	COSMIC X-RAY MEASUREMENTS	10/18/67		5
OSO 7	71-083A	UNTST		09/29/71	07/09/74	8
	71-083A-03	U OF CALIF, SAN DIEGO	COSMIC X-RAY EXPERIMENT	09/29/71	07/09/74	8
	71-083A-04	MASS INST OF TECH	COSMIC X-RAY SOURCES IN THE RANGE 1.5 TO 9 A	09/29/71	07/09/74	8
OSO 8	75-057A	UNTST		06/21/75	10/30/78	13
	75-057A-03	COLUMBIA U	HIGH-SENSITIVITY CRYSTAL SPECTROSCOPY OF STELLAR AND SOLAR X RAYS	06/22/75	10/15/78	13
	75-057A-05	U OF WISCONSIN	SOFT X-RAY BACKGROUND RADIATION INVESTIGATION	06/22/75	10/15/78	13
	75-057A-06	NASA-GSFC	COSMIC X-RAY SPECTROSCOPY	06/22/75	10/15/78	13
	75-057A-07	NASA-GSFC	HIGH-ENERGY CELESTIAL X RAYS	06/22/75	10/15/78	13
SAS-A	70-107A	UNTST		12/12/70	01/04/75	7
	70-107A-01	HARVARD COLLEGE OBS	ALL-SKY X-RAY SURVEY	12/18/70	01/04/75	7
SAS-C	75-037A	UNTST		05/07/75	04/09/79	12
	75-037A-01	MASS INST OF TECH	EXTRAGALACTIC EXPERIMENT (EGE)	05/10/75	04/09/79	12
	75-037A-02	MASS INST OF TECH	GALACTIC MONITOR EXPERIMENT (GME)	05/10/75	04/09/79	12
	75-037A-03	MASS INST OF TECH	SCORPIO MONITOR EXPERIMENT (SME)	05/10/75	04/09/79	12
	75-037A-04	MASS INST OF TECH	GALACTIC ABSORPTION EXPERIMENT (GAE)	05/10/75	04/09/79	12
SOLRAD 10	71-058A	UNTST UNTST		07/08/71	07/00/78*	7
	71-058A-02	US NAVAL RESEARCH LAB	ALL-SKY X-RAY SURVEY	07/08/71	11/00/73*	7
SOLRAD 11A	76-023C	UNTST		03/15/76	06/12/77	14
	76-023C-16	US NAVAL RESEARCH LAB	STELLAR/AURORAL X-RAYS	03/16/76	06/12/77	14
	76-023C-24	US NAVAL RESEARCH LAB	X-RAY BACKGROUND	03/16/76	03/16/78	14
SOLRAD 11B	76-023D	UNTST		03/15/76	10/31/79	14
	76-023D-16	US NAVAL RESEARCH LAB	STELLAR/AURORAL X RAYS	03/16/76	12/00/76*	14
	76-023D-24	US NAVAL RESEARCH LAB	X-RAY BACKGROUND	03/16/76	06/00/78*	14
STP P78-1	79-017A	UNTST		02/24/79†		17
	79-017A-06	US NAVAL RESEARCH LAB	X-RAY MONITOR	02/24/79†		17

* The exact day is not known.
† This spacecraft was still operational at the time of publication.

SPACECRAFT AND EXPERIMENT OPERATIONAL LIFETIME

SPACECRAFT NAME	NSSDC ID	FUNDING COUNTRY *ORIGINAL EXP INST	EXPERIMENT NAME	DATE EXP TURNED ON	DATE PLACED INOP	PAGE
TD 1A	72-014A	INTNL		03/12/72	05/04/74	9
	72-014A-04	CENS	SPECTROMETRY OF CELESTIAL X RAYS 2-30 KEV (S77)	07/02/73	05/04/74	9
UK 5	74-077A	UKING UNTST		10/15/74	03/14/80	10
	74-077A-01	U COLLEGE LONDON	ROTATION MODULATION COLLIMATOR (RMC)	10/18/74	03/14/80	11
	74-077A-02	U OF LEICESTER	2- TO 10-KEV SKY SURVEY INSTRUMENT (SSI)	10/18/74	03/14/80	11
	74-077A-03	U COLLEGE LONDON	HIGH-RESOLUTION SOURCE SPECTRA	10/31/74	03/14/80	11
	74-077A-04	U OF LEICESTER	BRAGG CRYSTAL SPECTROMETER (DCS)	10/18/74	03/14/80	11
	74-077A-05	IMPERIAL COLLEGE	HIGH-ENERGY COSMIC X-RAY SPECTRA	10/18/74	03/14/80	11
	74-077A-06	NASA-GSFC	ALL-SKY MONITOR	10/18/74	03/14/80	11
UK 6	79-047A	UKING UNTST		06/02/79†		17
	79-047A-02	U OF LEICESTER	X-RAY PROPORTIONAL COUNTER SPECTROMETER	06/02/79†		18
	79-047A-03	U COLLEGE LONDON	X-RAY GRAZING INCIDENCE SYSTEM	06/02/79†		18
VELA 5A	69-046D	UNTST		05/23/69		5
	69-046D-06	LOS ALAMOS SCI LAB	COSMIC X RAYS	05/23/69	06/00/70*	5
VELA 5B	69-046E	UNTST		05/23/69		6
	69-046E-06	LOS ALAMOS SCI LAB	COSMIC X RAYS	05/23/69	06/15/79	6
VELA 6A	70-027A	UNTST		04/08/70		6
	70-027A-06	LOS ALAMOS SCI LAB	COSMIC X RAYS	04/08/70	03/13/72	6
VELA 6B	70-027B	UNTST		04/08/70		6
	70-027B-06	LOS ALAMOS SCI LAB	COSMIC X RAYS	04/08/70	02/00/72*	7

* The exact day is not known.
† This spacecraft was still operational at the time of publication.

3.7 DATA LISTING

This listing provides a convenient reference to space science and supportive data available through the NSSDC. It is ordered by spacecraft common name, followed by the X-ray experiment names. The data set name, NSSDC ID, time span of the data, data form (see Appendix A), and quantity of data are printed for each available data set. For data not at NSSDC but still held by individual investigators or institutions, refer to index 3.8.

SPACECRAFT, EXPERIMENT, DATA SET NAME	NSSDC ID	TIME COVERAGE	FORM	QUANTITY	PAGE
ANS	74-070A				10
SOFT X-RAY EXPERIMENT (SXX)	74-070A-02				10
HARD X-RAY EXPERIMENT (HXX)	74-070A-03				10
REDUCED DATA IN 4,16,64 S INTEGRATIONS, ATTITUDE, ABSOLUTE TIME AND BACKGROUND	74-070A-03A	-	DD	0*	
CATALOG OF THE 161 UHURU SOURCES OBSERVED BY THE HARD X-RAY EXPERIMENT	74-070A-03B	-	FR	5	
APOLLO 15 CSM	71-063A				8
X-RAY FLUORESCENCE	71-063A-09				8
LUNAR ORBIT X-RAY DATA	71-063A-09A	07/30/71 - 08/04/71	DD	1	
TRANSEARTH COAST X-RAY DATA	71-063A-09B	08/04/71 - 08/07/71	DD	1	
APOLLO 16 CSM	72-031A				9
X-RAY FLUORESCENCE	72-031A-08				9
LUNAR ORBIT X-RAY FLUORESCENCE DATA ON MAGNETIC TAPE	72-031A-08A	04/20/72 - 04/24/72	DD	1	
X-RAY FLUORESCENCE GALACTIC SURVEY DATA ON MAGNETIC TAPE	72-031A-08B	-	DD	0*	
ARYABHATA	75-033A				12
X-RAY ASTRONOMY	75-033A-01				12
ASTP-APOLLO	75-066A				13
SKY-EARTH X-RAY OBSERVATIONS	75-066A-04				14
BHASKARA	79-051A				18
PINHOLE X-RAY SKY SURVEY	79-051A-03				18
HAKUCHO	79-014A				17
MONITOR OF X-RAY SOURCES	79-014A-01				17
EXPERIMENTER HELD DATA BASE AVAILABLE THROUGH ISAS UNIVERSITY OF TOKYO	79-014A-01A	-	DD	0*	
DIFFUSE SOFT X-RAYS AND SOFT X-RAY SOURCES	79-014A-02				17
EXPERIMENTER HELD DATA BASE AVAILABLE THROUGH ISAS UNIVERSITY OF TOKYO	79-014A-02A	-	DD	0*	
HEAO 1	77-075A				15
LARGE AREA COSMIC X-RAY SURVEY (A-1)	77-075A-01				15
X-RAY SOURCE CATALOG ON MICROFILM	77-075A-01A	-	MP	1	
COSMIC X-RAY EXPERIMENT (A-2)	77-075A-02				15
COSMIC X-RAY PULSE HEIGHT DATA ON MAGNETIC TAPE	77-075A-02A	09/14/77 - 10/21/78	DD	11	
DISCOVERY SCALER ON MAGNETIC TAPE	77-075A-02B	08/17/77 - 01/04/79	DD	6	
STATUS INFORMATION DATA ON TAPE	77-075A-02C	08/17/77 - 02/17/78	DD	1	
NEW HARD X-RAY SOURCES OBSERVED WITH HEAO A2 ON MAGNETIC TAPE	77-075A-02D	09/01/77 - 03/09/78	DD	1	
CATALOG OF HIGH LATITUDE EXTRAGALACTIC X-RAY SOURCES ON MAGNETIC TAPE	77-075A-02E	-	DD	1	
X-RAY SCANNING MODULATION COLLIMATOR (A-3)	77-075A-03				15
REDUCED X-RAY COUNT DATA ON MAGNETIC TAPE	77-075A-03A	-	DD	3	
LOW-ENERGY GAMMA-RAY AND HARD X-RAY SKY SURVEY (A-4)	77-075A-04				15
PRELIMINARY DATA SUBMISSION - PLOTS, LISTS, SCAN-TRACK MAP, DAY-DATE TABLES	77-075A-04A	-	FR	9	
HEAO 2	78-103A				16
MONITOR PROPORTIONAL COUNTER (MPC)	78-103A-01				16
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY ON MAGNETIC TAPE	78-103A-01A	11/16/78 - 04/25/81	DD	1	
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY - MICROFICHE	78-103A-01B	11/16/78 - 04/25/81	FR	4	
HIGH-RESOLUTION IMAGER (HRI)	78-103A-02				16
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY ON MAGNETIC TAPE	78-103A-02A	11/16/78 - 04/25/81	DD	1	
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY - MICROFICHE	78-103A-02B	11/16/78 - 04/25/81	FR	4	
FOCAL PLANE CRYSTAL SPECTROMETER (FPCS)	78-103A-03				16
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY ON MAGNETIC TAPE	78-103A-03A	11/16/78 - 04/25/81	DD	1	
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY - MICROFICHE	78-103A-03B	11/16/78 - 04/25/81	FR	4	
IMAGING PROPORTIONAL COUNTER (IPC)	78-103A-04				16
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY ON MAGNETIC TAPE	78-103A-04A	11/16/78 - 04/25/81	DD	1	
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY - MICROFICHE	78-103A-04B	11/16/78 - 04/25/81	FR	4	
SOLID-STATE SPECTROMETER (SSS)	78-103A-05				17
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY ON MAGNETIC TAPE	78-103A-05A	11/16/78 - 04/25/81	DD	1	
CATALOG OF ALL TARGETS OBSERVED BY THE EINSTEIN OBSERVATORY - MICROFICHE	78-103A-05B	11/16/78 - 04/25/81	FR	4	
HEAO 3	79-082A				18
GAMMA-RAY LINE SPECTROMETER	79-082A-01				18
OAO 3	72-065A				9
STELLAR X RAYS	72-065A-02				10
REDUCED DATA ON MAGNETIC TAPE	72-065A-02A	09/01/72 - 12/31/80	DD	28	
QUICK LOOK PLOTS OF REDUCED X-RAY FLUX VS TIME IN 30 MIN BINS WITH SOURCE ID	72-065A-02B	-	MP	2	
UCL CATALOG OF OBSERVED SOURCES 1972 - 1980	72-065A-02C	08/26/72 - 12/14/80	MP	1	
OSO 3	67-020A				5
SOLAR AND CELESTIAL GAMMA-RAY TELESCOPE	67-020A-07				5
REDUCED SOLAR AND COSMIC SOURCE DATA PER ENERGY CHANNEL VS TIME ON TAPE	67-020A-07A	03/09/67 - 04/08/68	DD	100	
OSO 4	67-100A				5
COSMIC X-RAY MEASUREMENTS	67-100A-02				5
OSO 7	71-083A				8
COSMIC X-RAY EXPERIMENT	71-083A-03				8
UCSD COSMIC RAY SKYMAP	71-083A-03A	09/29/71 - 05/18/73	FR	57	
COSMIC X-RAY SOURCES IN THE RANGE 1.5 TO 9 A	71-083A-04				8

*Data not at NSSDC but still held by individual investigators or institutions.

SPACECRAFT, EXPERIMENT, DATA SET NAME	NSSDC ID	TIME COVERAGE	FORM	QUANTITY	PAGE
MASTER DATA TAPES FOR CELESTIAL SOURCES OF X-RAYS, 1-60 KEV	71-083A-04A	10/02/71 - 05/24/73	DD	66	
ANNOTATED PLOTS OF THE 1-60 KEV X-RAY RESULTS ON MICROFILM	71-083A-04B	03/27/72 - 01/11/74	MI	115	
OSO 8	75-057A				13
HIGH-SENSITIVITY CRYSTAL SPECTROSCOPY OF STELLAR AND SOLAR X RAYS	75-057A-03				13
STELLAR AND SOLAR X-RAY SPECTROSCOPE MERGED DATA TAPES	75-057A-03A	07/24/75 - 09/15/78	DD	370	
SOFT X-RAY BACKGROUND RADIATION INVESTIGATION	75-057A-05				13
REDUCED COSMIC X-RAY COUNTS BY DETECTOR, ENERGY CHANNEL, AND SECTOR ON TAPE	75-057A-05A	06/25/75 - 09/01/77	DD	150	
COMPRESSED NIGHTIME DATA ON MAGNETIC TAPE	75-057A-05B	-	DD	23	
COSMIC X-RAY SPECTROSCOPY	75-057A-06				13
SPIN AXIS POINTING MAPS	75-057A-06A	07/02/75 - 10/01/78	FR	5	
SAMPLE DATA BASE AND ANALYSIS PROGRAMS	75-057A-06B	-	DD	12	
HIGH-ENERGY CELESTIAL X RAYS	75-057A-07				13
TABLE OF ALL CELESTIAL X-RAY SOURCES OBSERVED BY THE HIGH-ENERGY DETECTOR	75-057A-07A	06/21/75 - 09/30/78	HI	1	
SAS-A	70-107A				7
ALL-SKY X-RAY SURVEY	70-107A-01				7
SOURCE LIBRARY TAPE	70-107A-01B	-	DD	1	
DAILY SUMMARY DATA ON TAPE	70-107A-01C	12/16/70 - 05/17/71	DD	350	
THE FOURTH UHURU CATALOG OF X-RAY SOURCES	70-107A-01D	12/12/70 - 03/18/73	FR	2	
ANALYZED SUPERIMPOSED DATA, DETECTED SOURCES, PULSE HEIGHT INFORMATION	70-107A-01E	12/18/70 - 01/04/75	MP	0*	
PLOTS OF SUPERIMPOSED OBSERVATIONS	70-107A-01F	12/18/70 - 01/04/75	FR	0*	
SAS-C	75-037A				12
EXTRAGALACTIC EXPERIMENT (EGE)	75-037A-01				12
PLOTS OF DETECTOR COUNTING RATES AT 5 S RESOLUTION PLUS HOUSEKEEPING DATA	75-037A-01A	01/25/76 - 09/07/77	FR	40	
GALACTIC MONITOR EXPERIMENT (GME)	75-037A-02				12
PLOTS OF DETECTOR COUNTING RATES AT 5 S RESOLUTION PLUS HOUSEKEEPING DATA	75-037A-02A	01/25/76 - 09/07/77	FR	40	
Y-AXIS POINTED OBSERVATION LOG	75-037A-02B	05/30/75 - 03/23/79	HI	8	
SCORPIO MONITOR EXPERIMENT (SME)	75-037A-03				12
PLOTS OF DETECTOR COUNTING RATES AT 5 S RESOLUTION PLUS HOUSEKEEPING DATA	75-037A-03A	01/25/76 - 09/07/77	FR	40	
Y-AXIS POINTED OBSERVATION LOG	75-037A-03B	05/30/75 - 03/23/79	HI	8	
GALACTIC ABSORPTION EXPERIMENT (GAE)	75-037A-04				12
PLOTS OF DETECTOR COUNTING RATES AT 5 S RESOLUTION PLUS HOUSEKEEPING DATA	75-037A-04A	01/25/76 - 09/07/77	FR	40	
Y-AXIS POINTED OBSERVATION LOG	75-037A-04B	05/30/75 - 03/23/79	HI	8	
SOLRAD 10	71-058A				7
ALL-SKY X-RAY SURVEY	71-058A-02				7
SOLRAD 11A	76-023C				14
STELLAR/AURORAL X-RAYS	76-023C-16				14
X-RAY BACKGROUND	76-023C-24				14
SOLRAD 11B	76-023D				14
STELLAR/AURORAL X RAYS	76-023D-16				14
X-RAY BACKGROUND	76-023D-24				14
STP P78-1	79-017A				17
X-RAY MONITOR	79-017A-06				17
TD 1A	72-014A				9
SPECTROMETRY OF CELESTIAL X RAYS 2-30 KEV (S77)	72-014A-04				9
UK 5	74-077A				10
ROTATION MODULATION COLLIMATOR (RMC)	74-077A-01				11
2- TO 10-KEV SKY SURVEY INSTRUMENT (SSI)	74-077A-02				11
ARIEL V SSI 3A X-RAY CATALOG ON MAGNETIC TAPE	74-077A-02A	10/18/74 - 03/14/80	DD	1	
ARIEL V SSI 3A X-RAY CATALOGUE ON MICROFICHE	74-077A-02B	10/18/74 - 03/14/80	FR	1	
HIGH-RESOLUTION SOURCE SPECTRA	74-077A-03				11
BRAGG CRYSTAL SPECTROMETER (BCS)	74-077A-04				11
HIGH-ENERGY COSMIC X-RAY SPECTRA	74-077A-05				11
ALL-SKY MONITOR	74-077A-06				11
UK 6	79-047A				17
X-RAY PROPORTIONAL COUNTER SPECTROMETER	79-047A-02				18
LIST OF SOURCES OBSERVED BY THE X-RAY PROPORTIONAL COUNTER EXPERIMENT	79-047A-02A	-	HI	1	
X-RAY GRAZING INCIDENCE SYSTEM	79-047A-03				18
VELA 5A	69-046D				5
COSMIC X RAYS	69-046D-06				5
VELA 5B	69-046E				6
COSMIC X RAYS	69-046E-06				6
VELA 6A	70-027A				6
COSMIC X RAYS	70-027A-06				6
VELA 6B	70-027B				6
COSMIC X RAYS	70-027B-06				7

*Data not at NSSDC but still held by individual investigators or institutions.

3.8 GUEST OBSERVER PROGRAMS

The acquired data from space science experiments is not always suitable or available for archiving in NSSDC. Some data bases require specialized software, some are held by other than U.S. facilities, and some are still being actively processed by science working groups. Many of these experimenters desire to participate in data exchange and collaborations. The following index lists the name and address of a representative for each experiment that has such a data base. Interested parties can contact representatives directly or through NSSDC.

SPACECRAFT	EXPERIMENT	NSSDC ID	PAGE
ANS	Hard X-ray Experiment (HXX)	74-070A-03	11
	Prof. Johnathan E. Grindlay Harvard College Observatory 60 Garden Street Cambridge, MA 02138 USA		
HAKUCHO	X-ray Monitor 1 to 100 keV Soft X-ray Sources 0.1 - 2 keV	79-014A-01 79-014A-02	17
	Prof. M. Matsuoka Inst. for Space and Aeronautical Science 4-6-1 Komaba Meguro-Ku, Tokyo Japan		
HEAO-1	Large Area Cosmic X-ray Survey (A-1)	77-075A-01	15
	Dr. Kent S. Wood Code 4121 Naval Research Laboratory Washington, DC 20375 USA		
HEAO-1	Scanning Modulation Collimator (A-3)	77-075A-02	15
	Dr. Daniel A. Schwartz Center for Astrophysics 60 Garden Street Cambridge, MA 02138 USA		
HEAO-2 (Einstein)	All Experiments	78-103A	16
	Dr. Harvey D. Tananbaum Center for Astrophysics 60 Garden Street Cambridge, MA 02138 USA		

SPACECRAFT	EXPERIMENT	NSSDC ID	PAGE
SAS-3	All Experiments Dr. Larry D. Petro 37-541 Mass. Inst. of Tech. Cambridge, MA 02139 USA	75-037A	12
UK 5 (Ariel 5)	Sky Survey (SSI) Dr. Ian M. McHardy Dept. of Physics University of Leicester University Road Leicester LE1 7RH England Or Dr. John P. Pye Dr. Robert S. Warwick	74-077A-02	11
UK 5 (Ariel 5)	All-Sky Monitor Dr. Stephen S. Holt Code 661 Goddard Space Flight Center Greenbelt, Maryland 20771 USA	74-077A-06	11
UK 6 (Ariel 6)	X-ray Proportional Counters Dr. Martin Ricketts Dept. of Physics University of Leicester University Road Leicester LE1 7RH England Or Dr. Robert Hall	79-047A-02	18

APPENDIX A:

List of Data Set Form Codes

APPENDIX A - LIST OF DATA SET FORM CODES

Hardcopy

BI 8- x 10-in. books or bound volumes
BT various sizes of books or bound volumes
HI 8- x 10-in. pages
HK 16- x 20-in. pages
HL 20- x 24-in. pages
HT Various sizes pages

Digital Magnetic Tape (Reels)

DA analog data tape
DB reformatted data tape
DD data tape

Computer Printout

PJ 11- x 15-in. pages

Punched cards

CQ 3 1/4- x 7 5/8-in.

Microfilm (Reels)

MO 35-mm
MP 16-mm
MT various sizes

Microfiche (Cards)

FR 4- x 6-in. (b/w)
GR 4- x 6-in. (color)

Photographic Film (Frames)

QO 35-mm b/w slides
RO 35-mm color slides
UG 4- x 5-in. b/w positives
UI 8- x 10-in. b/w positives
UM 70-mm b/w positives
UO 35-mm b/w positives
UP 16-mm b/w positives
US 5- x 8-in. b/w positives
UT various sizes of b/w positives
UV 5- x 5-in. b/w positives
UW 5- x 47.5-in. b/w positives
UX 9- x 80-in. b/w positives
UY 5- x 12-in. b/w positives
VG 4- x 5-in. color positives
VH 5- x 7-in. color positives
VI 8- x 10-in. color positives
VM 70-mm color positives
VO 35-mm color positives
VP 16-mm color positives
VT Various sizes color positives
WI 8- x 10-in. b/w prints
YG 4- x 5-in. b/w negatives
YH 5- x 7-in. b/w negatives
YI 8- x 10-in. b/w negatives
YK 16- x 20-in. b/w negatives
YL 20- x 24-in. b/w negatives
YM 70-mm b/w negatives
YN 9.5-in. b/w negatives
YO 35-mm b/w negatives
YP 16-mm b/w negatives
YT Various sizes b/w negatives
YV 5- x 5-in. b/w negatives
YW 5- x 47.5-in. b/w negatives
YX 9- x 80-in. b/w negatives
YY 5- x 12-in. b/w negatives
ZG 4- x 5-in. color negatives
ZI 8- x 10-in. color negatives
ZM 70-mm color negatives
ZY 5- x 12-in. color negatives

Photographic Film (Feet)

EM	70-mm color negative	LM	70-mm color positive
EP	16-mm color negative	LO	35-mm color positive
IM	70-mm b/w negative	LP	16-mm color positive
IN	9.5-in. b/w negative	TM	70-mm b/w positive
IO	35-mm b/w negative	TO	35-mm b/w positive
IP	16-mm b/w negative	TP	16-mm b/w positive
IV	5- x 5-in. b/w negative	TV	5- x 5-in. b/w positive
IW	5- x 47.5-in b/w negative	TW	5- x 47.5-in. b/w/ positive
IX	9- x 80-in. b/w negative	TX	9- x 80-in. b/w positive
IY	5- x 12-in. b/w negative	TY	5- x 12-in. b/w positive

Strip or Brush Charts (Rolls)

SO	35-mm
ST	various sizes

Abbreviations and Acronyms

APPENDIX B:

This list of abbreviations and acronyms, which was designed for the use of the National Space Science Data Center, contains many terms which are not included in this publication.

APPENDIX B - ABBREVIATIONS AND ACRONYMS

A	angstrom
ABMA	Army Ballistic Missile Agency
AC	alternating current
ACAD	academy
ACIC	Aeronautical Chart and Information Center (now Defense Mapping Agency Aerospace Center)
ACS	attitude control system
AD	Dual Air Density Explorer (satellite, NASA)
A/D	analog to digital
AE	Atmosphere Explorer (satellite, NASA)
AEC	Atomic Energy Commission
AEM	Atmospheric Explorer Mission
AEROPROPUL	aeropropulsion
AEROSAT	Aeronautical Satellite (NASA-ESA)
AEROSP	aerospace
AFB	Air Force Base
AFCRL	Air Force Cambridge Research Laboratories (now US Air Force Geophysics Laboratory)
AFGL	Air Force Geophysics Laboratory
AFO	Announcements of Flight Opportunities
AFSC	Air Force Systems Command
AGC	automatic gain control
AGCY	agency
AH	amp hours
AIMP	Anchored Interplanetary Monitoring Platform (satellite, NASA)
AK	Alaska
AL	Alabama
ALOSYN	Alouette topside sounder synoptic (data)
ALPO	Apollo Lunar Polar Orbiter (satellite, NASA); Association of Lunar and Planetary Observers
ALS	advanced limb scanner
ALSEP	Apollo Lunar Surface Experiments Package (NASA)
ALT	altitude
AM	amplitude modulation
A.M.	ante meridien
AMP	ampere
AMPS	Atmosphere, Magnetosphere, and Plasmas in Space (satellite, NASA)
AMS	Army Map Service (now Defense Mapping Agency Topographic Center)
AMSAT	Radio Amateur Satellite Corporation
AMU	atomic mass unit; astronaut maneuvering unit
ANIK	Canadian Telecommunications Satellite; also referred to as TELESAT
ANNA	Army, Navy, NASA, Air Force (geodetic satellite)
ANS	Astronomical Netherlands Satellite (The Netherlands-NASA)
AOSO	Advanced Orbiting Solar Observatory
AP	magnetic activity index Ap
APL	Applied Physics Laboratory of Johns Hopkins University
APPL	application
APT	automatic picture transmission
A/R	acquisition/reference

AR	Arkansas
ARC	Ames Research Center (NASA)
ARC MIN	arc minute
ARC S	arc second
ARDC	Air Research and Development Command (now AFSC)
ARPA	Advanced Research Projects Agency
ARSP	Aerospace Research Support Program (USAF)
AS+E	American Science & Engineering, Inc.
ASOS	antimony-sulfide oxy-sulfide
ASTP	Apollo-Soyuz Test Project (USSR-NASA)
ASTROPHYS	astrophysics
AT	atomic
ATCOS	Atmospheric Composition Satellite (NASA)
ATDA	Alternate Target Docking Adapter
ATFE	advanced thermal control flight experiment
ATM	Apollo Telescope Mount; atmosphere
ATMOS	Atmospheric Trace Molecules Observed by Spectroscopy
ATS	Applications Technology Satellite (NASA)
AT+T	American Telephone & Telegraph Corporation
ATU	Adaptive Tracker Unit
AU	astronomical unit
AUST	Australia
AVCS	advanced vidicon camera system
AVG	average
AVHRR	advanced very high resolution radiometer
AWRE	Atomic Weapons Research Establishment (Australia)
AXIS	atmospheric X-ray imaging spectrometer
AZ	Arizona

BAF	barium fluoride
BCD	binary coded decimal
BCG	ballistocardiogram
BE	Beacon Explorer (satellite, NASA); beryllium
BEV	billion electron volts
BIC	barium iodide cloud
BIMS	Bennett ion mass spectrometer
BIOS	Biological Satellite (NASA)
BPI	bits per inch
BPS	bits per second
BSU	basic sounding unit
BTL	Bell Telephone Laboratories
BUV	backscatter ultraviolet
B/W	black and white
BWF	Bundesminister fur Wissenschaftliche Forschung (Fed Rep of Germany)

CA	California
CAF	calcium fluoride
CAL	calorie

CAL TECH	California Institute of Technology
CALSPHERE	calibration sphere
CAMEO	Chemically Active Materials Ejected In Orbit (satellite, NASA)
CAN	Canada
CAS	Cooperative Applications Satellite (France-NASA)
CAV	composite analog video
CBE	controlled beam emissions
CCD	charged-coupled device
CCE	Charge Composition Explorer (satellite, NASA)
CCP	charged and current probes
CD	cadmium; crystal detector
CDA	command and data acquisition (station)
CDC	Control Data Corporation
C+DH	control and data handling
CDHP	Command and Data Handling Package
CDS	cadmium sulfide
CEM	channel electron multipliers
CENS	Centre d'Etudes Nucleaires de Saclay (France)
CEP	Cylindrical Electrostatic Probe
CFA	crossed electric and magnetic field analyzer
CHASE	coronal helium abundance Spacelab experiment
CHEM	charge and energy mass spectrometer; chemical
CI	co-investigator
CID	cathode imaging detector
CM	command module; centimeter
CMD	command
CMS	composition measurement system
CN	cellulose nitrate
CNES	Centre National d'Etudes Spatiales (France)
CNET	Centre National d'Etudes des Telecommunications (France)
CNRS	Centre National de la Recherche Scientifique (France)
CO	Colorado; general contact
COBE	Cosmic Background Explorer (satellite, NASA)
COMM	commission
COMSAT	Communications Satellite Corporation
CONIE	Comision Nacional de Investigacion del Espacio (Spain)
CORSA	Cosmic-Ray Satellite (Japan)
COS	Cosmic-Ray Satellite (ESA); cosmic
COSPAR	Committee on Space Research
COUNC	council
CO2	carbon dioxide
CPA	comprehensive particle analysis
CPS	cycles per second
CPT	charged-particle telescope
CPU	central processing unit
CRC	Communications Research Centre (Canada)
CRIS	Centre de Rectification des Images Spatiales
CRIE	cosmic-ray isotope experiment
CRPL	Central Radio Propagation Laboratories (later ITSA; formerly part of ESSA; now NOAA/ERL)
CRREL	Cold Region Research & Engineering Laboratories
CRS	Commission for Space Research (Italy)
CRT	cathode ray tube

CSI	cesium iodide
CSM	command service module
CSTE	cesium telluride
CT	Connecticut
CTR	center
CTS	Canadian Telecommunications Satellite
CULER	cryogenic upper-atmosphere limb emission radiometer
CVF	circular variable filter
CXX	white light coronograph/X-ray XUV telescope
CZCS	coastal zone ocean color scanner
D	day
DAC	data acquisition camera
DADE	Dual Air Density Explorer (satellite, NASA)
DAN	Danish
DAPP	Defense Acquisition and Processing Program (DOD)
DASA	Defense Atomic Support Agency
DATS	Despun Antenna Test Satellite (DOD)
DB	decibel
DC	direct current; District of Columbia
DCLS	data collection and location system
DCP	data collection platform
DCS	direct couple system; data collection system
DDM	drop dynamics module
DE	Dynamics Explorer (satellite, NASA); Delaware
DEF	defense
DEG	degree
DENPA	Density Phenomena (satellite, Japan)
DEV	development
DFI	development flight instrumentation
DFVLR	Deutsche Forschungs-und Versuchanstalt fur Luft-und Raumfahrt; (Research Laboratory for Aeronautics and Astronautics, Fed Rep of Germany)
DIAL/MIKA	Diament Allemande/Mini Kapsel (satellite, Fed Rep of Germany-France)
DIAL/WIKA	Diament Allemande/Wissenschaftliche Kapsel (satellite, Fed Rep of Germany)
DIAM	diameter
DIAPO	Diapason (satellite, France)
DIRBE	diffuse infrared background experiment
DIT	Drexel Institute of Technology (now Drexel University)
DMA	Defense Mapping Agency
DMAAC	Defense Mapping Agency Aerospace Center
DMATC	Defense Mapping Agency Topographic Center
DME	Direct Measurements Explorer (satellite, NASA)
DMR	differential microwave radiometer
DMSP	Defense Military Satellite Program (DOD)
DMU	IUE data multiplex unit
DOD	Department of Defense
DODGE	Department of Defense Gravity Experiment (satellite, DOD)
DPL	VLF Doppler Propagation

DPU	data processing unit
DRID	direct readout image dissector (camera system)
DRIR	direct readout infrared radiometer
DRTE	Defense Research Telecommunications Establishment (now CRC)
DSAP	Defense System Applications Program (DOD)
DSCS	Defense Satellite Communications System (DOD)
DSIR	Department of Science and Industrial Research (England)
DSN	Deep Space Network
DTM	digital terrain model
DT	deputy team leader
DUS	data utilization stations
DV	digital video
DYN	dynamic
E	energy; east
EASEP	Early Apollo Scientific Experiment Package
EBS	electron beam system
ECG	electrocardiograph
ECS	Experimental Communications Satellite (NASA)
EDS	Environmental Data Service (NOAA)
EEG	electroencephalogram
EFI	electric field instrument
EGO	Eccentric (Orbiting) Geophysical Observatory (satellite, NASA)
EGRS	Engineers Satellite (DOD)
EICS	energetic ion composition spectrometer
EIRP	effective isotropic radiative power
EL	electric (data camera carried on Apollo)
ELDO	European Launch Development Organization (ESA)
ELEC	electric
ELECTR	electronics
ELF	extremely low frequency
ELMS	Earth Limb Measurement Satellite (NASA-USAF)
EM	experiment manager
EME	environmental measurement experiment
EMG	electromyogram
EMR	Electromechanical Research (Company, England)
ENVIRON	environment; environmental
EOF	end of file
EOG	electro-oculogram
EOGO	Eccentric Orbiting Geophysical Observatory (satellite, NASA)
EOS	Earth Observation Satellite (NASA)
EPE	Energetic Particle Explorer (satellite, NASA)
E/Q	energy per unit charge
ERB	Earth radiation budget (experiment)
ERBI	Earth radiation budget instrument
ERBS	Earth Radiation Budget Satellite (NASA)
ERBSS	Earth Radiation Budget Satellite system
ERDC	Earth Resources Data Center
ERGS	Earth Geodetic Satellite (USAF)
ERL	Environmental Research Laboratory (NOAA)
EROS	Earth Resources Observation Service
ERS	Environmental Research Satellite (USAF)

ERT	extended range telescope
ERTS	Earth Resources Technology Satellite (NASA)
ES	experiment scientist
ESA	European Space Agency; electrostatic analyzer
ESA-GEOS	Geostationary Earth-Orbiting Satellite (ESA)
ESM	equipment support module
ESMR	electrically scanning microwave radiometer
ESOC	European Space Operations Centre (ESA)
ESP	energy spectrum of particles
ESRO	European Space Research Organization (now ESA)
ESSA	Environmental Science Services Administration (now NOAA)
ESTABL	establishment
ESTEC	European Space Technology Center (ESA)
ETR	Eastern Test Range (also referred to as Cape Canaveral)
ETS	Engineering Test Satellite
EU	europium
EUV	extreme ultraviolet
EUVE	Extreme Ultraviolet Explorer (satellite, NASA)
EUVS	extreme ultraviolet spectrophotometer
EV	electron volt
EVA	extravehicular activity
EVM	Earth-viewing (equipment) module
EXOS	Exospheric Satellite (Japan)
EXOSAT	European X-ray Observation Satellite (ESA)
EXTRATERR	extraterrestrial
FARO	Flare-Activated Radiobiological Observatory (satellite, DOD)
FAUST	far ultraviolet space telescope
FE	iron
FES	fluid experiment systems
FGS	fine guide system
FIRAS	far infrared absolute spectrophotometer
FL	Florida
FLT-SAT	Fleet Satellite (USN)
FM	frequency modulation
FMDM	flex multiplexer/demultiplexer
FMRT	final meteorological radiation tape
FOC	faint object camera
FOF2	frequency of F2
FOS	faint object spectrograph
FOUND	foundation
FOV	field of view
FPCS	focal plane crystal spectrometer
FPEG	fast pulse electron gun
FPI	Fabry-Perot interferometer
FPR	flat plate radiometer
FR	French Research (satellite, France)
FRC	Flight Research Center (NASA)
FRG	Federal Republic of Germany
FS	frequency scatterometer
FSC	FLTSATCOM (satellite, USN-USAF)

FSK	frequency shift key
FWHM	full width at half maximum
FWS	filter wedge spectrometer
G	Earth gravity; geometry factor; gram
GA	Georgia
GAC	global area coverage
GARP	Global Atmospheric Research Program
GASTE	Gravity and Atmospheric and Solid Tides Experiment
GCA	Geophysics Corporation of America
GE	General Electric (Company)
.GE.	greater than or equal to
GEMS	Geostationary European Meteorological Satellite (ESA)
GEOPHYS	geophysical
GEOS	Geodetic Earth-Orbiting Satellite (NASA); Geostationary Earth-Orbiting Satellite (ESA)
GES FUR WELTRAUM-FORSCH	Gesellschaft fur Weltraumforschung (Center for Space Research, Fed Rep of Germany)
G.E.T.	ground elapsed time
GEV	giga electron volts (10^9 ev)
GEX	gas exchange
GFFC	geophysical fluid flow cell
GGSE	gravity gradient stabilization experiment
GHZ	gigahertz
GI	guest investigator
GISS	Goddard Institute for Space Studies (NASA)
GLIMPSE	global limb photometric scanning experiment
GM	Geiger-Mueller
GMS	Geostationary Meterological Satellite (Japan)
GMT	Greenwich mean time
GOES	Geosynchronous Operational Environmental Satellite (NASA-NOAA; also called SMS)
GP	Gravitational Redshift Space Probe (NASA)
GPS	global positioning system
GRARR	Goddard Range and Range Rate
GRAVR	Gravitational Redshift Space Probe (NASA)
GRE	ground reconstruction equipment; ground reconstruction electronics
GREB	Galactic Radiation Experiment Background (satellite, USN)
GRI	Groupe de Recherche Ionospherique (France)
GRO	Gamma-Ray Observatory
GROC	Netherlands Committee for Geophysics and Space Research
GRS	German Research Satellite (NASA-Fed Rep of Germany)
GSD	Grid Sphere Drag (satellite, DOD)
GSE	geocentric solar ecliptic (coordinate system); ground support equipment
GSFC	Goddard Space Flight Center (NASA)
GSM	geocentric solar magnetospheric (coordinate system)
GSPC	gas scintillation proportional counter
.GT.	greater than

GUGMS	Glavnoye Upravleniye Gidrometeorologicheskoi Sluzhby (Main Administration of the Hydrometeorological Service, USSR)
GV	gigavolt
GVHRR	geosynchronous very high resolution radiometer
H	hour; hydrogen
HAC	half-angle collimator
HALOE	halogen occultation experiment
HAO	High Altitude Observatory
HAPI	high-altitude plasma instrument
HCMM	Heat Capacity Mapping Mission (satellite, NASA)
HCMR	heat capacity mapping radiometer
HCO	Harvard College Observatory
HDRSS	high data rate storage system
HE	helium
HEAO	High-Energy Astrophysical Observatory (satellite, NASA)
HEOS	High-Eccentricity Earth-Orbiting Satellite (ESA)
HEP	high-energy protons
HEPS	high-energy particle spectrometer
HEPAT	high-energy proton alpha telescope
HET	health, education, telecommunications; high-energy telescope
HETS	high-energy telescope system
HEW	US Dept. of Health, Education and Welfare (now US Dept. of Education)
HF	high frequency
HFE	heat-flow experiment; heat-flow electronics
HG	mercury
HGI2	mercuric iodide
HI	Hawaii
HRDI	high-resolution Doppler imager
H2O	water
HOLE	high ionospheric depletion region
HR	high resolution
HRDI	high-resolution Doppler image
HRI	high-resolution imager
HRIR	high-resolution infrared radiometer
HRIRS	high-resolution infrared radiometer sounder
HRPT	high-resolution picture transmission
HRS	high-resolution spectrograph
HRTS	high-resolution telescope and spectrograph
H.S.	high school
HSP	high-speed photometer
HXIS	hard X-ray imaging spectrometer
HXRBS	hard X-ray burst spectrometer
HYDROMET	hydrometeorological
HZ	hertz (cycles per second)
IA	instrument assembly; Iowa
IAP	Institute of Atmospheric Physics (USSR)
IBM	International Business Machines (Corporation)
ICBM	intercontinental ballistic missile

ICE	ion convection electrodynamics
ICEX	ice and climate experiment
ICSU	International Council of Scientific Unions
ID	identification; Idaho
IDC	image dissector camera
IDCS	image dissector camera system
IDCSP	Initial (or Interim) Defense Communication Satellite Program (or Project) (DOD)
IDM	ion drift meter
IDSCS	Initial Defense Satellite Communication system (DOD)
IDT	instrument definition team
IE	Ionospheric Explorer (satellite, NASA-NBS)
IEAS	ice evaluation altimeter system
IECM	induced environment contamination monitor
IEF	impedance & electric field
IFOV	instrument field of view
IGN	Institut Geographique National
IGRF	International Geomagnetic Reference Field
IGY	International Geophysical Year
IKI	Institute for Space Research (USSR)
IL	Illinois
IME	International Magnetospheric Explorer (satellite, NASA-ESA)
IMP	Interplanetary Monitoring Platform (satellite, NASA)
IMS	International Magnetospheric Study
IN	Indiana
IN.	inch
INDASAT	Indian Scientific Satellite (ISRO-USSR)
INOP	inoperable
INSAT	Indian National Satellite (ISRO-USSR)
INSB	indium/antimony
INST	institute
INTA	Instituto Nacional de Tecnica Aerospacial (Spain); the National Institute of Aerospace Science
INTASAT	satellite (INTA, Spain)
INTELSAT	International Telecommunications Satellite (NASA-COMSAT)
ION COMP	ionospheric composition
IPA	Institute for Physics of the Atmosphere (SAS)
IPC	imaging proportional counter
IPP	imaging photopolarimeter
IPS	instrument pointing system
IQSY	International Quiet Sun Year
IR	infrared
IRAS	Infrared Astronomy Satellite (The Netherlands-NASA-UK)
IRBM	intermediate range ballistic missile
IRIG	Inter-Range Instrumentation Group
IRIS	infrared-interferometer spectrometer; International Investigation Radiation Satellite (NASA-ESA)
IRLS	interrogation, recording, and location system
IRM	Ion Release Module (satellite, NASA)
IRR	infrared radiometry
IRTM	infrared thermal mapping
IRTRN	infrared transmission
ISAMS	improved stratospheric & mesospheric sounder

ISAS	Institute of Space & Aeronautical Science (Japan)
ISEE	International Sun-Earth Explorer (satellite, NASA-ESA)
ISIS	International Satellite for Ionospheric Studies (NASA-Canada)
ISPM	International Solar Polar Mission (ESA)
ISRO	Indian Space Research Organization
ISS	Ionospheric Sounding Satellite (Japan)
ITCZ	intertropical convergence zone
ITE	intersite transportation equipment
ITOS	Improved TIROS Operational Satellite (NOAA)
ITPR	infrared temperature profile radiometer
ITR	incremental tape recorder
ITSA	Institute for Telecommunication of Sciences and Aeronomy (formerly a subdivision of ESSA; now NOAA-ERL)
IU	instrument unit
IUE	International Ultraviolet Explorer (satellite, NASA-UK-ESA)
IUS	intermediate upper stage
IUWDS	International URSIGRAM and World Days Service
IVI	ion velocity instrument
IZMIRAN	Institute of Terrestrial Magnetism and Aeronomy of the Academy of Sciences (USSR)
JHU	Johns Hopkins University
JOP	Jupiter Orbiter Probe (Galileo Probe)
JPL	Jet Propulsion Laboratory (NASA)
JSC	Johnson Space Center (NASA)
K	Kelvin
KBS	kilobits per second
KEV	kiloelectron volt
KG	kilogram
KHZ	kilohertz
KM	kilometer
KP	magnetic activity index Kp
KPNO	Kitt Peak National Observatory
KS	Kansas
KSC	Kennedy Space Center (NASA)
KY	Kentucky
LA	Los Angeles; Louisiana
LAB	laboratory
LAC	local area coverage
LACATE	lower atmosphere composition and temperature
LAGEOS	Laser Geodetic Earth-Orbiting Satellite (NASA)
LAMMR	large antenna multifrequency microwave radiometer
LANG	Langmuir probe instrument
LAPI	low-altitude plasma instrument
LARC	Langley Research Center (NASA)
LAS	Large Astronomical Satellite (ESA)
LASL	Los Alamos Scientific Laboratory

LCS	Lincoln Calibration Sphere
LDEF	long-duration exposure facility
.LE.	less than or equal to
LED	light-emitting diode
LEE	low-energy electron
LEM	lunar excursion module
LEMMS	low-energy magnetospheric measurement system
LEPAT	low-energy proton alpha telescope
LEPEDEA	low-energy proton and electron differential energy analyzer
LERC	Lewis Research Center (NASA)
LES	Lincoln Experimental Satellite (DOD)
LET	low-energy telescope
LETS	low-energy telescope system
LF	light fine; low frequency
LI	lithium
LIF	lithium fluoride
LL	Lincoln Laboratory (MIT)
LM	lunar module
LMD	Laboratory of Meteorological Dynamics
LOFTI	Low-Frequency Trans-Ionospheric (satellite, USN-SRL)
LOGACS	Low-G Accelerometer Calibration System (USAF)
LP	Langmuir probe
LPSP	Laboratoire de Physique Stellaire et Planetaire (CNRS)
LR	labeled release; low resolution
LRIR	limb radiance inversion radiometer; low-resolution infrared radiometer
LRL	Lunar Receiving Laboratory (JSC)
LRV	lunar roving vehicle
LS	light smoothed
LST	Large Space Telescope (satellite, NASA; now called Space Telescope)
.LT.	less than
LTV	Ling-Temco-Vought (Company)

M	meter; milli- (prefix)
MA	Mercury Atlas; Massachusetts
MAG	magnetic field
MAG-A	magnetometer A
MAG-B	magnetometer B
MAPS	measurement of air pollution from satellite
MARENTS	Modified Advanced Research Environmental Test Satellite (USAF)
MAS	Ministry of Aviation Supply (UK)
MASC	magnetic attitude spin coil
MATER	material
MAWD	Mars atmosphere water detection
MB	millibar
MC	megacycle
MCC	Mission Control Center
MD	Maryland
ME	Maine
M/E	mass to charge ratio

MED	medicine; medical
MEPA	medium-energy particle analyzer
MEPS	medium-energy particle spectrometer
MESA	miniature electrostatic accelerometer
METEC	Meteoroid Technology (satellite, NASA)
METEOSAT	Meteorological Satellite (ESA)
MEV	million electron volts
MG	magnesium; milligram
MGF	fluxgate magnetometer
MHZ	megahertz
MI	Michigan
MIDAS	Missile Defense Alarm System (USAF)
MIN	minute
MIT	Massachusetts Institute of Technology
MJS	Mariner Jupiter/Saturn (spacecraft, NASA)
MLS	microwave limb sounder
MM	millimeter
MMS	multimission modular spacecraft
MMW	millimeter wave
MN	Minnesota
MO	month; Missouri
MOL	Manned Orbiting Laboratory (satellite, DOD)
M-P	minus-plus
MPC	monitor proportional counter
MPD	magneto-plasma dynamic
MPI	Max-Planck-Institute (Fed Rep of Germany)
MR	medium resolution
MRIR	medium-resolution infrared radiometer
MRSE	microwave remote sensing experiment
MS	microsecond; millisecond; Mississippi
MSC	Manned Spacecraft Center (now Johnson Space Center)
MSFC	Marshall Space Flight Center (NASA)
MSIS	mass spectrometer - incoherent scatter (model)
MSN	mission
MSS	Magnetic Storm Satellite (NASA-AFCRL); multispectral scanner
MSSCC	multicolor spin-scan cloudcover camera
MT	Montana
MTS	Meteoroid Technology Satellite (NASA)
MUSE	monitor of ultraviolet solar energy
MV	millivolts (10^{-3} volts)
MW	milliwatt
N	nucleon; north
NA	not applicable; Nora Alice (satellite, DOD)
NACE	neutral atmosphere composition experiment
NACS	neutral atmosphere composition spectrometer
NADUC	Nimbus/ATS Data Utilization Center
NASA	National Aeronautics and Space Administration (Washington, DC, Headquarters)
NASC	National Aeronautics and Space Council
NASDA	National Space Development Agency (Japan)

NATE	neutral atmosphere temperature experiment
NATL	national
NATO	North Atlantic Treaty Organization
NBS	National Bureau of Standards
NC	North Carolina
NCAR	National Center for Atmospheric Research
NCC	National Climatic Center (NOAA)
ND	North Dakota
NDRE	Norwegian Defense Research Establishment
NE	electron density (concentration); Nebraska
NEMS	Nimbus-E microwave spectrometer; Near-Earth Magnetospheric Satellite (ESA)
NESC	National Environmental Satellite Center (now NESS)
NESS	National Environmental Satellite Service (NOAA)
NGM	direct measurement of interstellar gas using HE as tracer
NGSP	National Geodetic Satellite Program
NH	New Hampshire
NHC	National Hurricane Center
NI	ion density (concentration)
NIH	National Institutes of Health
NIMS	near infrared mapping spectrometer
NJ	New Jersey
NM	nanometer; New Mexico
NMC	National Meteorological Center
NMRT	Nimbus meteorological radiation tape
NNN	no national name
NNSS	Navy Navigational Satellite System
NO.	number
NOAA	National Oceanic and Atmospheric Administration (formerly ESSA)
NOESS	National Operational Environmental Satellite Subsystem
NOMSS	National Operational Meteorological Satellite System
NORAD	North American Air Defense Command
NORW	Norwegian
NOS	National Ocean Survey (NOAA)
NOSS	National Oceanic Satellite System
NOTS	Naval Ordnance Test Station
NPW	natural plasma wave
NRC	National Research Council
NRL	Naval Research Laboratory
NSA	National Security Agency
NSF	National Science Foundation
NSSDC	National Space Science Data Center
NT	nanotesla
NUCL	nuclear
NWL	Naval Weapons Laboratory
NWRC	National Weather Records Center (presently NCC)
NV	Nevada
NY	New York
OA	Office of Applications (NASA)
OAO	Orbiting Astronomical Observatory (satellite, NASA)

OAPS	orbit adjust propulsion system
OAR	Office of Aerospace Research (USAF-AFSC)
OART	Office of Advanced Research and Technology (NASA)
OAST	Office of Aeronautics and Space Technology (NASA)
OBS	observatory
O+C	operations and checkout
OCC	OPLE Command Center
OFO	Orbiting Frog Otolith (NASA experimental spacecraft)
OFT	orbital flight test
OGO	Orbiting Geophysical Observatory (satellite, NASA)
OGPC	orbiter general purpose computer
OH	Ohio
OI	other investigator
OIB	orbiter interface box
OK	Oklahoma
OLS	operational linescan system
OMNI	low-resolution omnidirectional radiometer (on Explorer 7)
OMSF	Office of Manned Space Flight (NASA)
ONERA	Office National d'Etudes et de Recherches Aerospatiales
ONR	Office of Naval Research
OOI	orbiter operational instrumentation
OPEP	orbital-plane experiment package
OPF	Orbiter Processing Facility
OPLE	Omega position and location experiment
OP OFF	operational off
OR	Oregon
ORBIS	Orbiting Radio Beacon Ionospheric Satellite (NASA)
ORS	Octahedral Research Satellite (NASA); Orbiting Research Satellite (DOD)
OSCAR	Orbiting Satellite Carrying Amateur Radio
OSO	Orbiting Solar Observatory (satellite, NASA)
OSS	Office of Space Science (NASA); open source spectrometer
OSSA	Office of Space Science and Applications (NASA; now two separate offices)
OSTA	Office of Space and Terrestrial Applications
OT	Operational TIROS (satellite, NASA)
OTDA	Office of Tracking and Data Acquisition (NASA)
OV	Orbiting Vehicle (satellite, USAF)
OVT	organic vapor trap
PA	Pennsylvania
PAC	Packaged Attitude Control (satellite, NASA)
PAET	Planetary Atmosphere Experiment Test
PAGEOS	Passive Geodetic Earth-Orbiting Satellite (NASA)
PAM	pulse amplitude modulation
PC	proportional counter
PCB	power control box
PCM	pulse coded modulation
PD	project director
PDP	plasma diagnostic package; passive dosimeter packet
PE	Planetary Explorer

PEA	planar electrostatic analyzer
PEM	particle environment monitor
PEP	platform electronic package
PES	photoelectron spectrometer
PFM	pulse frequency modulation
PHA	pulse height analyzer
PHASR	Personnel Hazards Associated with Space Radiation (satellite, USAF)
PHYS	physics
PI	principal investigator
PIPS	positive ion beam system
PICNO	picture number
PIMR	polar ice mapping radiometer
PIP	Payload Integration Plan
PIXEL	picture element
PL	prelaunch
PLACE	position location and aircraft communication experiment
PM	pulse modulation; photomultiplier
P.M.	post meridien
PMEL	Pacific Marine Environmental Laboratory (NOAA)
PMP	precision mounting platform
PMR	pressure modulation radiometer; Pacific Missile Range
PMT	photomultiplier tube
P-N	positive-negative (junction)
POCC	OFT Payloads Operations Control Center
POD	proton omnidirectional detector
POGO	Polar Orbiting Geophysical Observatory (satellite, NASA)
PPR	photopolarimeter radiometer
PPS	pulses per second
PR	pyrolytic release
PROT	protection
PS	picoseconds; pressure sensor
PSA	pressure sensor A
PSB	pressure sensor B
PSE	passive seismic experiment
PTL	Photographic Technology Laboratory (JSC)
PWI	plasma wave instrument
Q	charge
QOMAC	quarter-orbit magnetic attitude control (system)
RA	Ranger (spacecraft, NASA)
RAD	radium; radiation
RADCAT	Radar Calibration Target (satellite, ARPA)
RADOSE	Radiation Dosimeter (satellite, DOD)
RAE	Radio Astronomy Explorer (satellite, NASA); electromagnetic survey & unified radio and plasma wave
RAGE	Radiometry Altimetry Gravity Experiment
RAHF	Research Animal Holding Facility
RAM	random access memory (system)
RANICON	resistor anode image converter

RBV	return beam vidicon (camera)
RC	resistance capacitor
RCA	Radio Corporation of America
RCE	reaction control equipment
R+D	research and development
REP	republic
RES	research
REXS	Radio Exploration Satellite (Japan)
RF	radio frequency
RFI	radio frequency interference
RHU	radioscope heater units
RI	Rhode Island
RIMS	retarding ion mass spectrometer
RM	Radiation Meteoroid (satellite, NASA); Radiometric Measurement (satellite, DOD)
RMS	root mean square; Radiation Meteoroid Satellite (NASA); Radiometric Measurement Satellite (DOD); remote manipulator system
RPA	retarding potential analyzer
RPM	revolutions per minute
RPQ	retarding potential quadrupole
RPS	revolutions per second
RRL	Radio Research Laboratories (Japan)
RSRS	Radio and Space Research Station (England)
RTD	Research Technology Division (USAF)
RTG	radioisotope thermoelectric generator
RTTS	real-time transmission system
S	second; south
SAA	South Atlantic Anomaly
SACU	synchronization and control unit
SAGE	stratospheric aerosol and gas experiment
SAI	spin-scan auroral imager
SAM	stratospheric aerosol measurement
SAMIR	satellite microwave radiometer
SAMOS	Satellite Mission Observation (satellite, USAF)
SAMS	stratospheric and mesospheric sounder
SAMSO	Space and Missile Systems Organization (USAF)
SAO	Smithsonian Astrophysical Observatory
SAPPSAC	spacecraft attitude precision pointing and slewing adaptive control
SAR	synthetic aperture radar
SAS	Small Astronomy Satellite (NASA); Soviet Academy of Sciences
SATAR	Satellite for Aerospace Research (NASA)
SATELL	satellite
SATS	Satellite Antenna Test System (NASA)
SBRC	Santa Barbara Research Center
SBUV/TOMS	Solar Backscatter Ultraviolet/Total Ozone Mapping System
SC	project scientist; spark chamber; South Carolina
S/C	spacecraft
SCAMS	scanning microwave spectrometer
SCAT	scattometer

SCATHA	spacecraft charging at high altitudes
SCEL	Signal Corps Engineering Laboratories
SCH	school
SCI	science
SCMR	surface composition mapping radiometer
SCORE	Signal Communication by Orbiting Relay Equipment (satellite, DOD)
SCR	selective chopper radiometer
SCS	selective combined plasma spectrometer
SD	San Diego; South Dakota
SDPF	Sensor Data Processing Facility
SE	Solar Explorer (satellite, NASA)
SEA	spherical electrostatic analyzer
SEASAT	Ocean Dynamic Satellite (NASA)
SEC	secondary electron conduction (vidicon tube)
SECOR	Sequential Collation of Range (satellite, USAF)
SEM	space environment monitor
SEO	Satellite for Earth Observations (Program, India)
SEPAC	space experiments with particle accelerators
SERT	Spinning Satellite for Electric Rocket Test (NASA)
SESP	Space Experiment Support Program
SESPO	Space Environmental Support Project Office
SFA	sweep frequency analyzer
SHS	Soviet Hydrometeorological Service
SIBS	Salk Institute for Biological Studies
SIDS	Space Investigations Documentation System (NASA)
SIG	selenide isotope generator
SIM	scientific instrument module
SIRE	satellite infrared experiment
SIRS	satellite infrared spectrometer; System for Information Retrieval and Storage (NSSDC)
SM	San Marco (satellite, NASA-Italy)
SMC	scanning modulation collimator
SME	Solar Mesosphere Explorer (satellite, NASA)
SMM	Solar Maximum Mission (satellite, NASA)
SMMR	scanning multispectral microwave radiometer
SMS	Synchronous Meteorological Satellite (NASA)
S/N	signal to noise
SNAP	systems for nuclear auxiliary power
SOEP	solar-oriented experiment package
SOLRAD	Solar Radiation (satellite, NASA-DOD)
SPADES	Solar Pertubation and Atmospheric Density Measurement Satellite (DOD)
SPHINX	Space Plasma High Voltage Interactive Experiment (satellite, NASA)
SPIDPO	Shuttle Payload Integration and Development Program Office
SPM	solar proton monitor
SPOT	Systeme Probatoire d'Observation de la Terre
SPW	stimulated plasma waves
SQ	square
SR	Solar Radiation (satellite, NASA); scanning radiometer; sounding rocket; steradian
SRATS	Solar Radiation and Thermospheric Structure (satellite, Japan)
SRC	Space Research Council; Science Research Council

SRI	Stanford Research Institute
SRPA	spherical retarding potential analyzer
SRT	supporting research and technology
SS	Space Shuttle
SSC	Satellite Situation Center
SSCC	spin-scan cloudcover camera
SSD	Space Science Division (JPL)
SSH	spherical sensor H
SSLDEF	Space Shuttle Long-Duration Exposure Facility
SSM/T	special sensor microwave/temperature sounder
SSPP	Shuttle Spacelab Payloads Project
SSS	Small Scientific Satellite (NASA)
SST	satellite-to-satellite tracking
SSUS	solid spinning upper stage
ST	Space Telescope (satellite, NASA)
STADAN	Spacecraft Tracking and Data Acquisition Network (now STDN)
STARAD	Starfish Radiation (satellite, NASA)
STD	standard
STDN	Spaceflight Tracking and Data Network (NASA)
STL	Space Technology Laboratories (now TRW Systems Group)
STN	station
STP	Solar Terrestrial Probe (satellite, NASA); Solar Terrestrial Physics; Space Test Program
STRATOS	stratosphere
STS	Space Transportation Systems
STUD	studies
SUI	State University of Iowa (now University of Iowa)
SURCAL	Surveillance Calibration (satellite, DOD)
SUSIM	solar ultraviolet spectral irradiance monitor
SVC	service
SW	southwest
SWE	mass separating solar wind; solar wind experiment
SWRF	Sine Wave Response Filter (program)
SXR	solar X-ray flare and cosmic-ray burst investigation
SYNCOM	Synchronous Communication (satellite, NASA)
SYST	system
TAC	Technology Application Center
TACOMSAT	Tactical Communications Satellite (DOD)
TATS	Test and Training Satellite (NASA)
TATSACOM	Tactical Satellite Communications (program, DOD)
TBD	to be determined
TD	technical director; Thor-Delta (satellite, ESA); launch vehicle (NASA-USAF)
TDP	Tracking Data Processor (program)
T+DR	tracking and data relay
TDRSS	tracking and data relay satellite system
TE	electron temperature; tellurium
TEC	telemetry and command; transearth coast
TECH	technical; technology
TED	total energy detector

TEI	transearth injection
TELESAT	Canadian Telecommunications Satellite (also referred to as ANIK)
TEMP	temporal; temperature
TET	telescope·and electron telescope
TETR	Test and Training (satellite, NASA)
TEV	tetra electron volts
THIR	temperature/humidity infrared radiometer
THORAD-AGE	Thor Augmented Delta Agena (launch vehicle)
TIMATION	Time Location System (USN)
TIP	Tracking Impact Prediction (satellite, DOD)
TIROS	Television and Infrared Observations Satellite (NASA)
TL	team leader
TLD	thermoluminescence detector
TLI	translunar injection
TM	team member; thematic mapper
TN	Tennessee
TOMS	total ozone mapping system
TOPO	topographic
TOPS	Thermal Noise Optical Optimization Communication System (NASA)
TOS	TIROS Operational Satellite (or System) (NASA)
TOVS	TIROS operational vertical sounder
TPS	thick plastic stack
TRAAC	Transit Research and Attitude Control (satellite, USN)
TRANET	Doppler Tracking Network (USN)
TRANSP	transportation
TRS	Tetrahedral Research Satellite (USAF)
TRUST	television relay using small terminals
TRW	Thompson, Ramo, Wooldridge (Inc.)
TS	thermal smoothed
TT	triggering telescope
TTS	Test and Training Satellite (NASA) (also called TATS, TETR)
TWERLE	tropical wind energy conversion and reference level experiment
TX	Texas

U	university; atomic mass unit
UA	unified abstract
UARS	Upper Atmosphere Research Satellite(s)
UCLA	University of California at Los Angeles
UHF	ultrahigh frequency
UK	United Kingdom
UKSRC	United Kingdom Space Research Council
ULEWAT	ultralow-energy wide-angle telescope
ULEZEQ	ultralow-energy Z, E, Q
US	United States
USA	United States Army; United States of America
USAF	United States Air Force
USB	unified s-band; upper side band
USGS	United States Geological Survey
USN	United States Navy
USSR	Union of Soviet Socialist Republics

UT	universal time; Utah
UV	ultraviolet
UVNO	ultraviolet nitric-oxide experiment
UVS	ultraviolet spectrometer
V	volt
VA	Virginia
VAE	visible airglow experiment
VAR	variation
VAS	VISSR atmospheric sounder
VCGS	vapor crystal growth system
VCO	voltage controlled oscillator
VDC	volts DC
VEFI	vector electric field instrument
VHF	very high frequency
VHRR	very high resolution radiometer
VIS	visual imaging spectrometer
VISSR	visible infrared spin-scan radiometer
VLF	very low frequency
VOIR	Venus Orbiting Imaging Radar
VT	Vermont
VTPR	vertical temperature profile radiometer
W	watt; west
WA	Washington
WATS	wind and temperature spectrometer
WBM	wide-band module
WBVTR	wide-band video tape recorder
WDC	World Data Center
WDC-A-R&S	World Data Center A for Rockets and Satellites
WEFAX	weather facsimile
WFC	Wallops Flight Center (NASA); wave form channel
WGSPR	Working Group for Space Physics Research
WI	Wisconsin
WMO	World Meteorological Organization
WPM	words per minute
WRESAT	Weapons Research Establishment Satellite (Australia)
WS	Wallops Station (NASA; now Wallops Flight Center)
WSIR	wide swath imaging radar
WSMR	White Sands Missile Range
WTR	Western Test Range (also referred to as Vandenberg AFB)
WV	West Virginia
WWW	World Weather Watch
WY	Wyoming
XRFS	X-ray fluorescence spectrometer
XRP	X-ray polychromator
XUV	extreme ultraviolet

YR	year
Z	atomic number
ZLE	zodiacal light/background starlight investigation