72-229

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C. 20546
202-755-8370

FOR RELEASE:
Wednesday
December 6, 1972

PROJECT: AEROS

PRESS KIT

contents

(NASA-News-Release-72-229) GERMAN-US SATELLITE TO EXPLORE UPPER ATMOSPHERE (NASA) 22 p

N76-71763

Unclas
00/98 14017

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C. 20546

FOR RELEASE:
Wednesday
December 6, 1972

Howard Allaway
(Phone: 202/755-3680)

Jim Kukowski (GSFC)
(Phone: 301/982-4955)

RELEASE NO: 72-229

GERMAN-U.S. SATELLITE TO EXPLORE UPPER ATMOSPHERE

The German scientific satellite AEROS, designed to investigate the nature of the upper atmosphere, will be launched by NASA on a four-stage Scout rocket from the Western Test Range, near Lompoc, California, no earlier than December 8, 1972.

AEROS will carry five experiments, four German and one U.S., to investigate the varied physical processes that take place in the upper layers of Earth's envelope of air.

The AEROS project is a cooperative aeronomy project between the Bundesministerium für Bildung und Wissenschaft (BMBW) of the Federal Republic of Germany and the United States National Aeronautics and Space Administration that was initiated in June 1969.

The 127-kilogram (280-pound) spacecraft will be placed into a nearly polar orbit that will range from an apogee of up to 800 kilometers (500 miles) to a perigee as low as 230 kilometers (140 miles).

Small monopropellant vernier engines aboard the spacecraft will enable ground controllers to correct errors that might occur during orbit injection and change orbital parameters during the mission.

The four German scientific instruments are a mass spectrometer to study the chemical composition of the ambient atmosphere and ionosphere, a retarding potential analyzer to determine electron energy distribution and ion temperature, an impedance probe to measure electron density, and an extreme ultraviolet spectrometer to measure the intensity of the solar radiation.

The U.S. experiment, supplied by NASA's Goddard Space Flight Center, will measure the temperature as well as the overall density of the neutral ambient atmosphere.

The scientific payload will provide data describing the state of the ambient atmosphere; temperature, density, and composition of the neutral and charged components of the upper atmosphere and the F region of the ionosphere. Collected simultaneously, the data will be correlated with the incoming radiation of the Sun, which is responsible for producing these charged components by ionization of the neutral atmosphere.

The attitude control system of AEROS will insure that the spin-stabilized spacecraft will be in the required attitude so that the spectrometer is always pointing at the Sun and that the retarding potential analyzer and mass spectrometer do not deviate more than 60 degrees from the direction of flight during periods of instrument measuring.

As the AEROS dips into the upper atmosphere, residual air friction will lower the perigee and apogee. Approximately 130 days after the spacecraft is placed into orbit, perigee is expected to decrease to about 220 kilometers (135 miles) and apogee to about 580 kilometers (360 miles). At this time the hydrazine vernier engines may be fired to increase the apogee and provide additional life to the spacecraft.

Data acquisition will be the responsibility of the Central German Ground Station (Z-DBS) at Weilheim, Bavaria, under management of the German Space Operations Center (GSOC) in Oberpfaffenhofen, Germany.

Telemetry data acquisition will be performed by remote German receiving facilities in addition to the Z-DBS real-time data acquisition. These stations are located at Kevo, Finland, Fort Churchill, Canada, and Reykjavik, Iceland.

During the initial orbit and acquisition phases the NASA Spaceflight Tracking and Data Network will provide support to the mission. During normal mission operations the NASA Network will provide tracking support through its Minitrack system.

Prime contractor for AEROS is Dornier System of Friedrichshafen, Germany. The Scout launch vehicle is built by Ling-Temco-Vought Inc., Dallas, Texas.

Project management is the joint responsibility of the Gesellschaft fuer Weltraumforschung BH in Porz-Wahn, Germany, and the Goddard Space Flight Center, Greenbelt, Maryland, for the NASA Office of Space Science. The Scout launch vehicle program is managed by the Langley Research Center, Hampton, Virginia, and launch support will be provided by the Kennedy Space Center's Western Test Range Operations Division, Lompoc, California.

(END OF GENERAL RELEASE: BACKGROUND INFORMATION FOLLOWS)

SPACECRAFT DESCRIPTION

The AEROS satellite is a circular cylindrical structure 916 centimeters (36 inches) across and 710 centimeters (28 inches) high with a conical shaped shell at one end. A 1.80-meter (71-inch) long impedance probe antenna extends from the conical shaped cone. Four telemetry antennas are mounted to the outer shell of the spacecraft.

The spacecraft structure contains welded science instrument modules that are sealed to prevent pressure differences and gas emission from interfering with the sensors and instrumentation. Gases can only escape from the conical end of the spacecraft through venting ports.

The upper side of the cylinder is covered with an array of solar cells except for an annular ring around the extreme ultraviolet sensor.

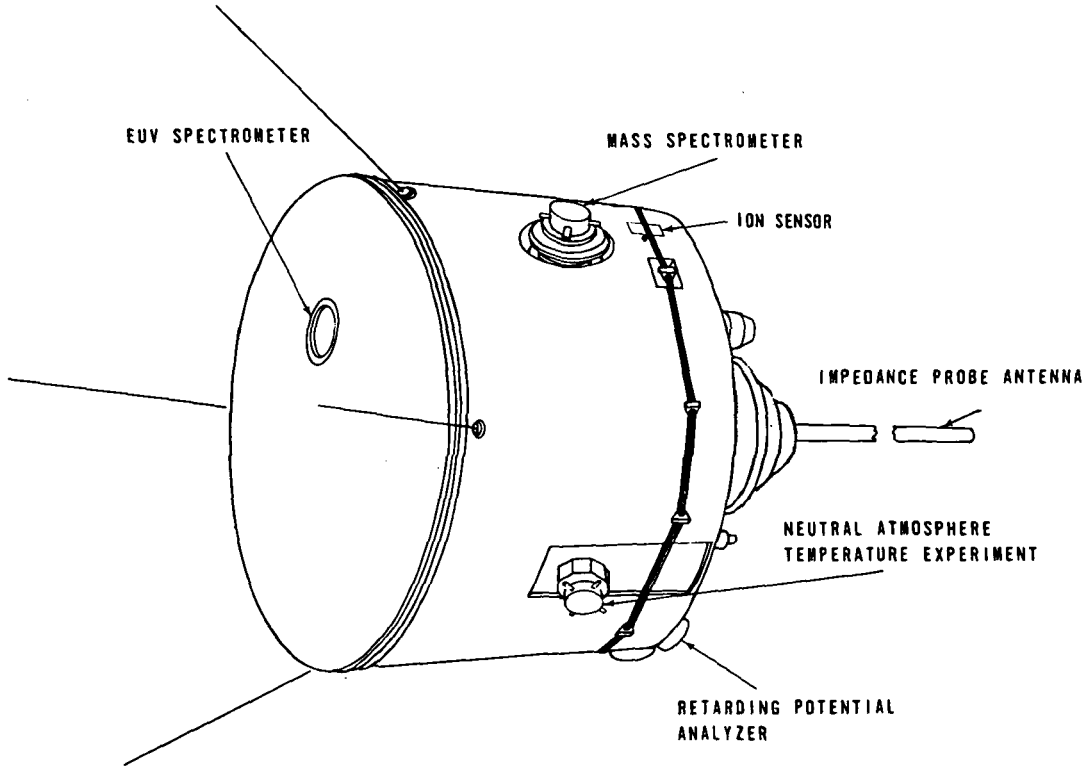
The spacecraft weighs 127 kilograms (280 pounds).

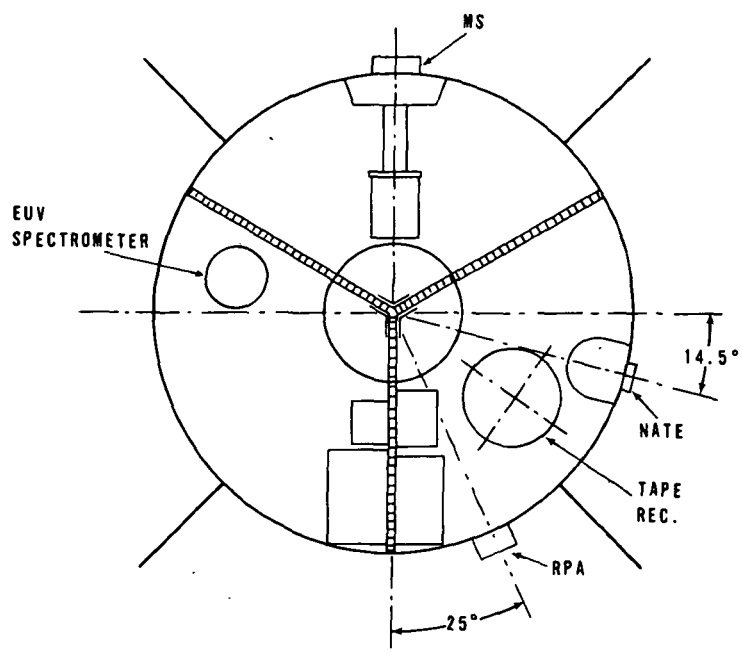
The attitude control system consists of a yo-yo despin unit, a passive mechanical damping device and an active magnetic control system to compensate for spin and attitude deviations. Attitude measurement and control are determined by two sun sensors, one for coarse alignment and the other a fine sensor for determining the solar aspect angle and solar azimuth angle; two pencil type infrared sensors for scanning the earth's horizon; an ion sensor to determine the maximum ion flux; and a three-axis magnetometer to determine the earth's magnetic field vector.

The monopropellant engine system consists of two engines using hydrazine fuel for correction of any injection errors and to lift the apogee toward the end of the mission.

Electrical power for the payload is supplied by two batteries, a silver zinc battery for use during initial phase activities and a nickel cadmium battery for use during normal operations. The batteries are charged by the solar cell array.

The data processing subsystem handles both the scientific and housekeeping information. The subsystem consists of an encoder, two magnetic core memory units to temporarily store data, two tape recorders, and a timer.





AEROS Spacecraft Experiment Sensor Positions

AEROS PAYLOAD

The five AEROS science instruments will contribute data on the aeronomic processes of the upper atmosphere and will operate simultaneously.

* The Mass Spectrometer (MS) measures the particle density and composition of the upper atmosphere. It consists of three major parts: an ion source with the electrostatic lens system, a mass analyzer, and a detection and amplifier system.

Experimenters: D. Krankowsky, Principal Investigator
P. Laemmerzahl, Co-Experimenter and Project Scientist
H. Wieder, Co-Experimenter

Institute: Max Planck Institut fur Kernphysik, Heidelberg, Germany

* The Retarding Potential Analyzer (RPA) measures the temperatures of the charged components (i.e., the energy distribution of ions and electrons). The total ion density is determined simultaneously.

Experimenters: K. Spenner, Principal Investigator
A. Dumbs

Institute: Arbeitsgruppe fuer physikalische Weltraumforschung, Freiburg, Germany

* The Impedance Probe (IP) determines the electron concentration in the atmosphere.

Experimenters: E. Neske, Principal Investigator
R. Kist

Institute: Arbeitsgruppe fuer physikalische Weltraumforschung, Freiburg, Germany

* The Extreme Ultraviolet Spectrometer (EUV) measures the flux and the spectral distribution of the EUV solar radiations and their spatial and temporal variations.

Experimenters: G. Schmidtke, Principal Investigator
W. Schweizer
A. Koch

Institute: Arbeitsgruppe fuer physikalische Weltraumforschung, Freiburg, Germany

* The Neutral Atmosphere Temperature Experiment (NATE) determines the neutral gas temperature in the thermosphere and the molecular nitrogen concentration and total atmospheric density over much of the AEROS orbit.

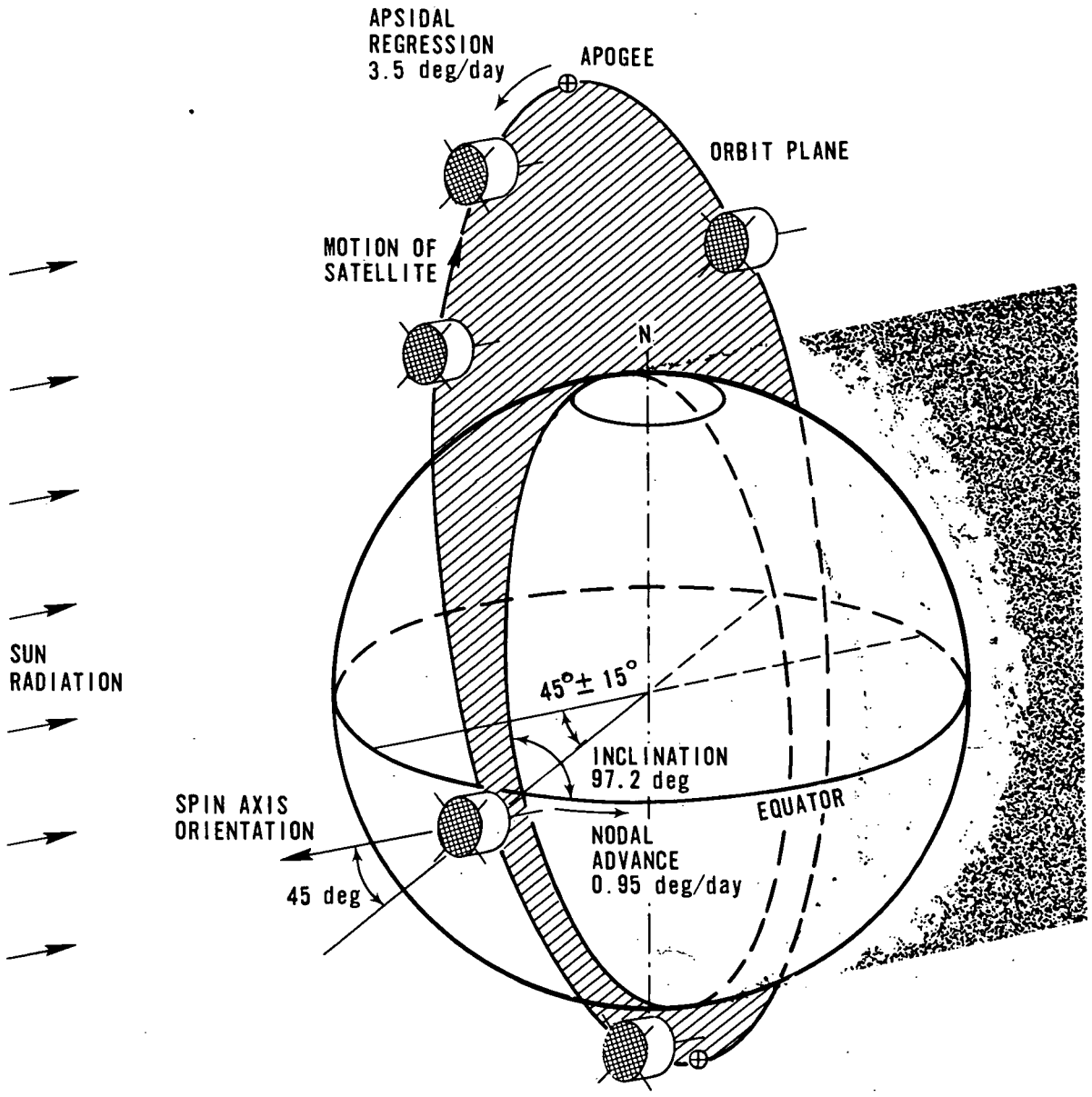
Experimenters: Nelson W. Spencer, Principal Investigator
D. Pelz
H. Niemann
G. Newton
C. Carignan (U. of Michigan)
J. Caldwell (U. of Michigan)

Institute: Goddard Space Flight Center, Greenbelt, Maryland

* The Atmospheric Drag Analysis investigation requires no on-board instrumentation, but makes use of ground tracking data. The atmospheric density at perigee will be determined from the orbital decay by observing the rate of change of the orbital period.

Experimenters: M. Roemer, Principal Investigator
C. Wulf-Mathies

Institute: Institut fuer Astrophysik und extraterrestrische Forschung der Universitaat Bonn



ORBIT PARAMETER

APOGEE	h_A =	800 km	NODAL ADVANCE	$\dot{\Omega}$ =	0.95 deg/day
PERIGEE	h_p =	230 km	APSIDAL REGRESSION	$\dot{\omega}$ =	-3.5 deg/day
INCLINATION	i =	97.2 deg	ORBITAL PERIOD	μ =	94.9 min.

AEROS Spacecraft Orbit

LAUNCH VEHICLE

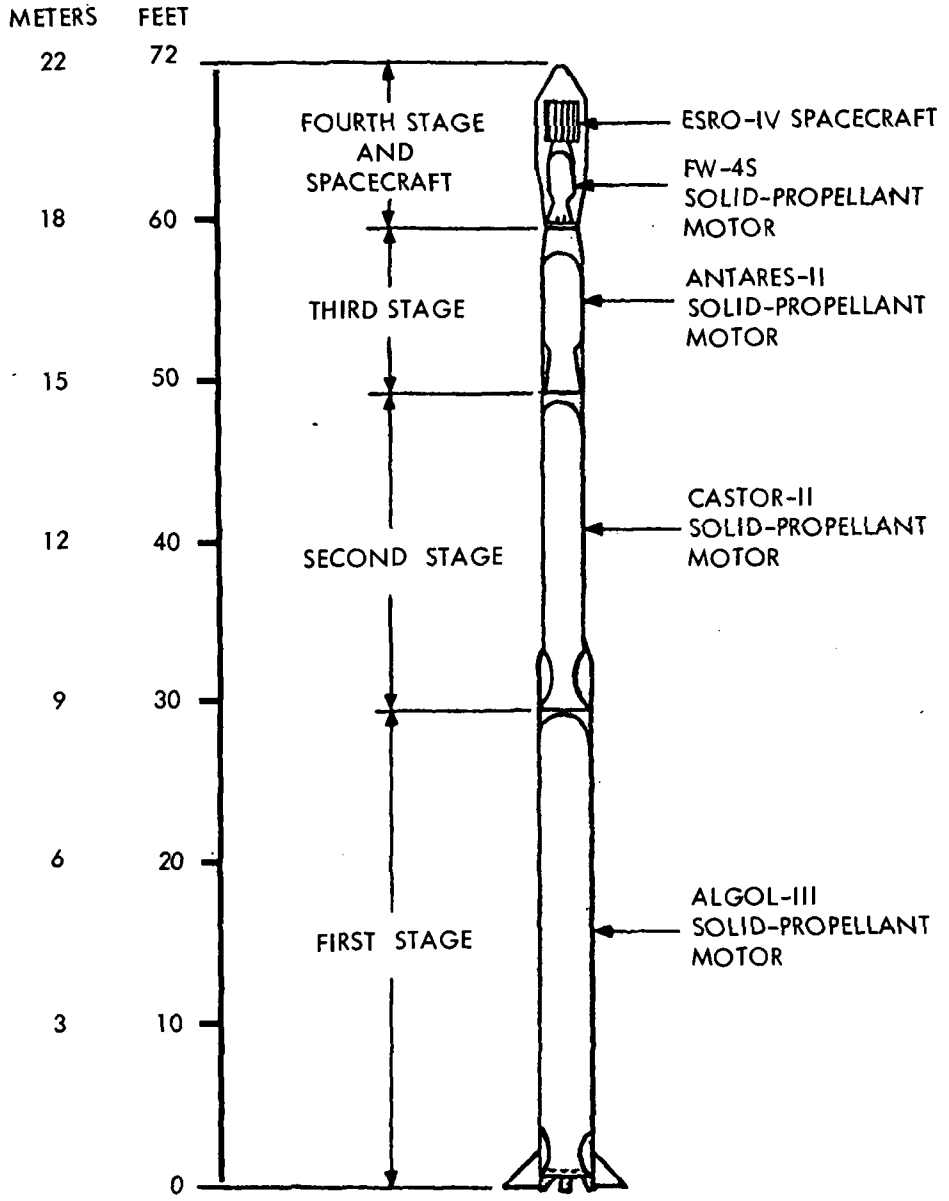
The Scout-D launch vehicle is a four-stage, solid-fuel rocket system. Scout S-181 and the AEROS-A spacecraft will be set on an initial launch azimuth of 190.821 degrees to obtain a retrograde orbit.

The four Scout-D motors -- Algol III, Castor IIA, Antares II, and Altair III -- are interlocked with transition sections that contain guidance, control, ignition instrumentation system, separation mechanics, and the spin motors needed to stabilize the fourth stage.

Guidance for Scout-D is provided by an autopilot and control is achieved by a combination of aerodynamic surfaces, jet vanes, and hydrogen peroxide jets. The vehicle is approximately 22.25 meters (73 feet) long and weighs about 21.485 kilograms (47,267 pounds) at liftoff.

FLIGHT SEQUENCE

Event	Time (Min.-Sec.)
Liftoff	00.00
First Stage Burnout	01:20.6
Second Stage Ignition	01:27
Second Stage Burnout	02:06
Heat Shield Ejection	03:04.3
Third Stage Ignition	03:06
Third Stage Burnout	03:42.3
Spin-up	06:00.1
Third Stage Separation	06:01.6
Fourth Stage Ignition	06:06.4
Fourth Stage Burnout & Orbital Injection	06:37.6
Payload Separation	11:01.6



SCOUT LAUNCH VEHICLE

AEROS FACT SHEET

Spacecraft:

Weight:	127 kilograms (280 pounds) with five experiments weighing a total of 28 kilogram (62 pounds).
Structure:	Cylinder 916 centimeters (36 inches) in diameter, 710 centimeter (28 inches) high with a conical shaped shell at one end from which a 1.8-meter (71-inch) probe extends. The flat end of the spacecraft is covered with solar cells.
Power:	Solar cells located on spacecraft supply electrical power to a nickel-cadmium battery. A silver-zinc battery provides power during initial phase of mission. Power requirements vary from 4.7 watts during idle orbit configuration to 34.3 watts during a measuring orbit.
Telemetry:	PCM/PM transmitter operating at 137.29 magahertz, with real-time and tape-recorded data transmission modes.

Tracking and Data Acquisition: Central German Ground Station (Z-DBS) responsible for all data acquisition operations. Initial orbit and acquisition support to be provided by NASA Spaceflight Tracking and Data Network. Data acquisition of Z-DBS to be augmented by ground receiving stations at Kevo, Finland; Fort Churchill, Canada; and Reykjavik, Iceland, under contract to Gesellschaft fuer Weltraumforschung (GfW).

Tracking support by STDN minitrack system to provide data for Atmosphere Drag Analysis experiment.

Orbit Data: Elliptical sun-synchronous. Initial orbital elements:

Apogee: 800 kilometers (500 miles)
Perigee: 230 kilometers (140 miles)
Inclination: 97.2 degrees
Period: 95 minutes

AEROS PROGRAM/PROJECT MANAGEMENT

Federal Republic of Germany

Dr. F. R. Guentsch	Director, Dept. of Space and Aeronautics Federal Ministry for Education and Science (BMBW)
Dr. K. Spindler	Chief, Space Science Division Dept. of Science and Aeronautics Federal Ministry for Education and Science
M. Otterhein	AEROS Program Manager Dept. of Science and Aeronautics Federal Ministry for Education and Science
Dr. E. Lubbert	AEROS Program Scientist Dept. of Science and Aeronautics Federal Ministry for Education and Science
W. Luksch	Technical Director Space Research Corp. (GFW) German Aerospace Research and Test Establishment
A. Kutzer	Chief, Spacecraft Projects Space Research Corp. German Aerospace Research and Test Establishment
H. Schreiber	AEROS Project Manager Space Research Corp. German Aerospace Research and Test Establishment
Dr. P. Laemmerzahl	AEROS Project Scientist Max Planck Institute for Nuclear Physics
H. J. Gluitz	AEROS Program Manager Dornier System, Inc.

- more -

NASA Headquarters

Dr. John E. Naugle	Associate Administrator for Space Science
Vincent L. Johnson	Deputy Associate Administrator for Space Science
Jesse L. Mitchell	Director of Physics and Astronomy Programs
John R. Holtz	Program Manager, Explorers and Sounding Rockets
Raymond Miller	Deputy Program Manager, Explorers and Sounding Rockets
Dr. E. R. Schmerling	Chief of Magnetospheric Physics
Joseph B. Mahon	Director of Launch Vehicles and Propulsion Program
R. W. Manville	Manager, Small Launch Vehicles and International Projects
Paul E. Goozh	Manager, Scout Program

Goddard Space Flight Center

Dr. John F. Clark	Director
Robert Bourdeau	Director of Space Applications
Gilbert W. Ousley	International Projects Office
Carl L. Wagner, Jr.	Project Manager
Dr. Siegfried J. Bauer	Project Scientist
Arthur E. Wilder	Project Coordinator
Nelson W. Spencer	U.S. Experiment Principal Investigator
William F. Mack	Mission Operations Systems Manager
Alan M. Bell	Business Support Representative
Tecwyn Roberts	Director of Networks
Albert G. Ferris	Director of Mission and Data Operations

Langley Research Center

Edgar M. Cortright	Director
R. D. English	Head, Scout Project Office
Abraham Leiss	Asst. Head, Scout Project Office
Larry Tant	Scout Payload Coordinator
Clyde Winters	Launch Operations Engineer
William D. Hinshaw	Head, Langley Mission Support Office, KSC Unmanned Launch Operations Western Test Range

Kennedy Space Center

Henry R. Van Goey	Manager, KSC Unmanned Launch Operations Western Test Range Operations Division
C. R. Fuentes	AEROS-181 Coordinator KSC Unmanned Launch Operations Western Test Range Operations Division

- end -

GPO 940-498