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NEWS

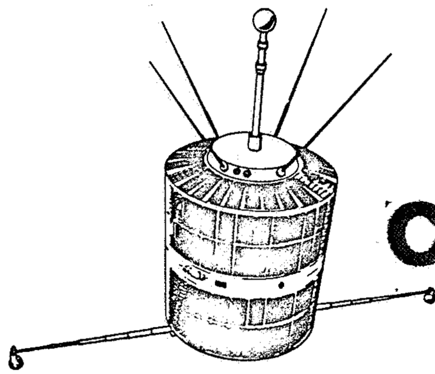
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: WEDNESDAY P.M.
September 25, 1968

RELEASE NO: 68-158

PRESS KIT



PROJECT: ESRO-I

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9/19/68

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ESRO-I LAUNCH SCHEDULED

A satellite designed and built in Europe will be launched Oct. 2, 1968, to study the aurora borealis (Northern Lights) and other related phenomena of the Polar Ionosphere.

Designated ESRO-I, the satellite will be launched in a cooperative program between the 10-nation European Space Research Organization (ESRO) and the U. S. National Aeronautics and Space Administration (NASA).

Under an agreement signed in 1964, the 185-pound satellite will be launched by NASA aboard a four-stage Scout launch vehicle from the Western Test Range in Lompoc, Calif.

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ESRO-I will be placed into a near-polar orbit with an apogee of 1,500 kilometers (about 932 statute miles) and a perigee of 275 kilometers (about 171 statute miles). Planned orbital period is 103 minutes and the orbit will be inclined 94 degrees retrograde to the Equator.

The eight experiments aboard the ESRO-I satellite are designed to make integrated measurements of the energies and pitch angles of particles impinging on the Polar Ionosphere in both magnetic storms and quiet periods. The effects of this activity to be measured include the production of visible light during auroral events and changes in the electron and ion density and temperature distributions.

The low perigee of the satellite will enable the vertical distribution of the measured particles to be determined. In addition, special high-speed transmissions from the satellite over the European auroral zone to a ground station at Tromso, Norway, will permit the fine structure of the aurora to be examined.

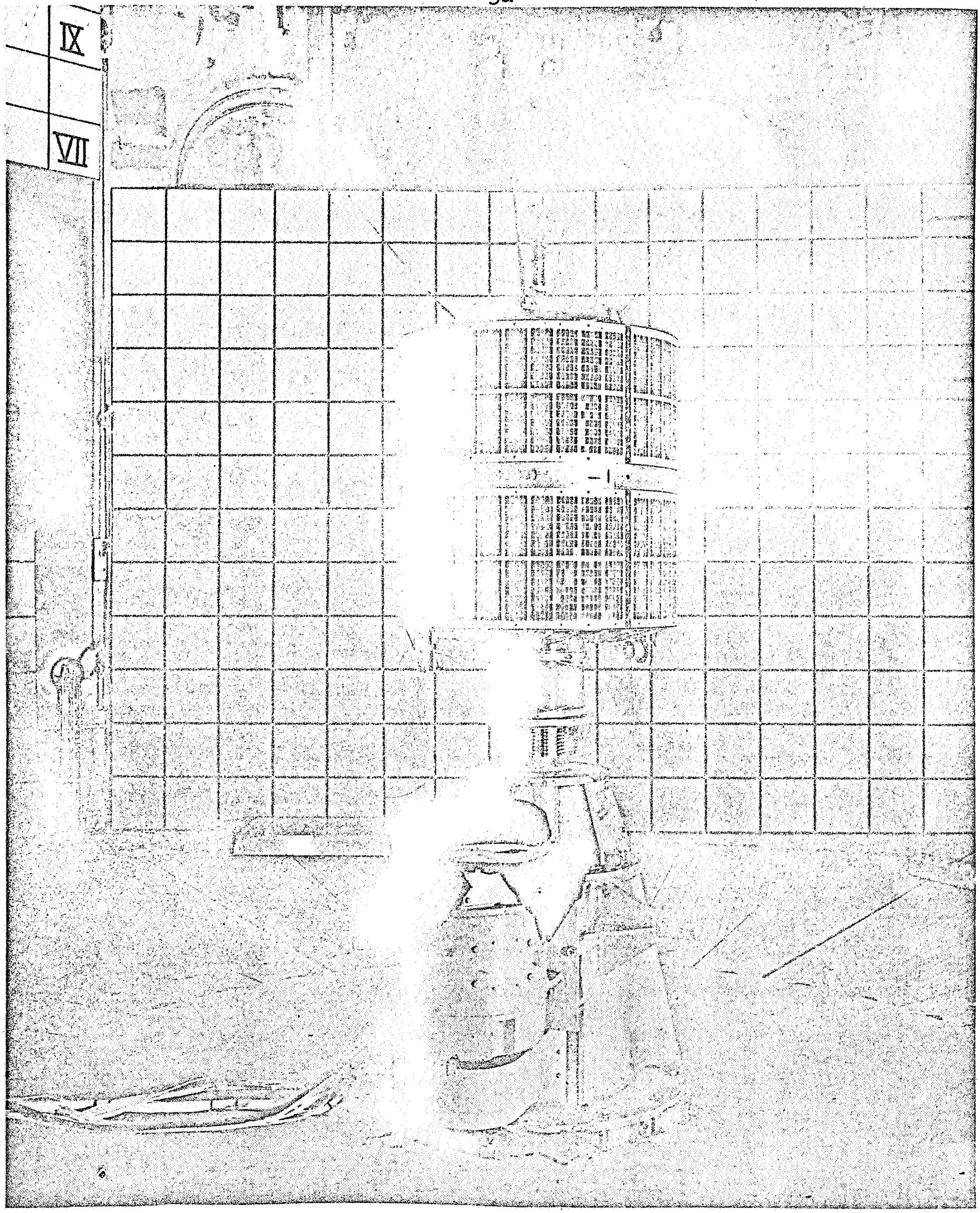
Measurements by the ESRO-I will be concentrated over northern Europe. This will enable good correlation between ground based observations and other measurements made simultaneously with sounding rockets launched from the ESRO range at Kiruna, Sweden.

After injection into Earth orbit, ESRO-I will be spin-stabilized at about one revolution-per-minute for approximately 10 days. It will then be despun and allowed to lock onto the Earth's magnetic field for stabilization by means of a pair of strong magnets inside the satellite. Slender magnetic rods inside the craft will help minimize satellite oscillations.

This will be the third ESRO satellite to be launched. ESRO-IIA, which carried experiments to measure solar and cosmic radiation, was launched May 29, 1967, from the Western Test Range. The Scout launch vehicle failed during third-stage firing when the motor casing burned through and the spacecraft fell in the South Pacific.

ESRO-IIB, also equipped with solar and cosmic radiation experiments, was launched successfully from the Western Test Range May 17, 1968. A Scout placed the spacecraft into a retrograde orbit inclined 97 degrees to the Equator and ranging in altitude from 204 to 674 miles. ESRO-II circles the globe once every 99 minutes.

Prime contractor for construction of the ESRO-I is the Laboratoire Central de Telecommunications, Paris, under the technical direction of the European Space Technology Center (ESTEC), Noordwijk, The Netherlands.



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The eight experiments carried by the ESRO-I were provided by the Radio and Space Research Station, Slough, U. K.; Kiruna Observatory, Sweden; Bergen University, Norway; the Norwegian Defense Research Establishment, Kjeller, Norway; the Norwegian Institute of Cosmic Physics, Oslo; and the University College, London.

Some of the Scandinavian experiments were produced in conjunction with the Technical University of Denmark in Lyngby, Denmark.

ESRO and NASA will exchange all scientific information resulting from this cooperative project and will make the results available to the world scientific community.

The 10-nation members of ESRO are Belgium, Denmark, France, Federal Republic of Germany, Italy, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom, with headquarters in Paris. Professor Hermann Bondi is the Director General.

Primary control of the ESRO-I satellite will be maintained at the European Space Operation Centre's (ESOC) control center in Darmstadt, Germany.

ESRO-I will be tracked and interrogated by the European Satellite Tracking, Telemetry and Telecommand Network (ESTRACK). Tracking assistance will be provided by the French network under the direction of Centre National d'Etudes Spatiales (CNES). NASA's world-wide Space Tracking and DATA Acquisition Network (STADAN) will provide backup services.

NASA participation in the ESRO program is directed by the Office of Space Science and Applications, in cooperation with the Office of International Affairs. NASA's Goddard Space Flight Center, Greenbelt, Md., supervises NASA's activities, provides technical assistance, trains ESRO technicians, and, for an interim period, tracks and acquires the data from the spacecraft.

NASA's Kennedy Space Center, Western Test Range, will provide prelaunch support and NASA's Langley Research Center, Hampton, Va., is responsible for the four-stage Scout launch rocket. The scout rocket is produced by Ling-Temco-Vought, Inc., Dallas.

(END OF GENERAL RELEASE: BACKGROUND INFORMATION FOLLOWS)

MEMORANDUM OF UNDERSTANDING BETWEEN THE
EUROPEAN SPACE RESEARCH ORGANIZATION
AND THE
UNITED STATES NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

The European Space Research Organization (ESRO) and the United States National Aeronautics and Space Administration (NASA) affirm a mutual desire to undertake a cooperative program of space research by means of satellites. The objectives are to (a) perform an integrated study of the polar ionosphere with particular emphasis on auroral events and (b) measure solar and cosmic radiation.

It is planned to accomplish this cooperative program through preparation, launching, and use of two satellites which are scheduled tentatively for launching in 1967.

a. The polar ionosphere satellite, to be known as ESRO I, will contain experiments to perform an integrated study of high latitude particles and their effects on the polar ionosphere, including optical, heating, ionization, and large scale dynamic effects involving currents and magnetic perturbations. It will also include a beacon experiment for measurements of the total electron content between the satellite and ground observers. A near-polar eccentric orbit within the capability of the present Scout launch vehicle is planned for ESRO I.

b. The solar astronomy and cosmic ray satellite, to be known as ESRO II, will contain experiments to measure solar and cosmic radiation including X-rays, He II line, Lyman Alpha, trapped radiation, solar and high energy electrons. A near-polar eccentric orbit within the capability of the present Scout launch vehicle is planned for ESRO II.

It is understood that this program is experimental in character and therefore subject to change in accordance with altered technical requirements and opportunities.

ESRO will be responsible for the following:

a. Providing the experiment instrumentation.
b. Designing, constructing, testing, and delivering to the launch site two flight qualified spacecraft for each mission.

c. Supplying spacecraft ground checkout and launch support equipment.
d. Providing such tracking and data acquisition support as may be within the capability of the projected ESRO network.
e. Reducing and analyzing the data.
f. Supporting such trainees as may be assigned pursuant to 5(a) below.

NASA will be responsible for the following:

a. Making available project-related training for periods providing mutual benefits within the limits of resources in facilities.
b. Reviewing the acceptance tests of satellite flight units and the results of these tests. Final determination of the suitability of flight units for launching will be by joint ESRO/NASA decision.
c. Providing the Scout launch vehicles, including heat shields and spacecraft tie-down and separation mechanisms, required for launching the two satellites.
d. Conducting the launch operations, including tracking to the point where an initial orbit is established.
e. Supplying necessary additional tracking and data acquisition support, with reimbursement by ESRO of any incremental costs such as those occasioned by special equipment and data tapes.

ESRO and NASA will each bear the cost of discharging its respective responsibilities including the costs of travel by personnel and transportation charges on all equipment for which it is responsible.

It is intended that this project proceed by mutual agreement between ESRO and NASA. The responsibility for accomplishing this will rest with project managers to be named by ESRO and NASA. Assisted by a Joint Working Group with appropriate membership, the ESRO and NASA project managers will coordinate the agreed functions and responsibilities of each agency with the other.

ESRO and NASA will use their best efforts to arrange for free customs clearance of equipment required in the program.

ESRO and NASA will exchange all scientific information resulting from this cooperative program and make the results freely available to the world scientific community.

(s) Pierre Auger
For the European Space Research Organization

(s) Hugh L. Dryden
For the National Aeronautics and Space Administration

July 8, 1964

ESRO-I EXPERIMENTS

Particle Measuring Experiments

Scintillator and Pulse Height Analyzer (S-71-A)

Robert Dalziel of the Radio and Space Research Station, Slough, U.K., Principal Investigator.

This experiment will measure electron flux and energy spectra in the range of 40-400 thousand electron volts. Precipitated electrons are observed by one detector which points approximately in the direction of the Earth's magnetic field while trapped electrons are examined by a second detector pointing perpendicularly to the magnetic field.

Plastic Scintillator Low-Energy Proton Experiment (S-71-E)

Mr. Robert Dalziel, Radio and Space Research Station, Slough, U.K., Principal Investigator.

Major objective of this experiment is to measure energy spectra of protons during polar-cap absorption events. The energy range to be covered is 5 to 30 million electron volts.

Electrostatic Analyzer (S-71-B)

Dr. W. Riedler of the Kiruna Geophysical Observatory, Sweden, Principal Investigator.

The purpose of this experiment is to measure the number of electrons and protons at four different energies, as well as their pitchangle distribution in three directions. The energies to be measured are 1.25, 2.5 and 16 thousand electron volts for electrons, and 1.25 and 8 thousand electron volts for protons.

The dynamic range of this instrument makes it possible to obtain results both for strong auroras and for low ionospheric activity.

Measurements by this experiment will be made principally over a readout station at Tromso, Norway.

Solid-State Detectors (S-71-C)

F. Sorass, University of Bergen, Norway, Principal Investigator.

This experiment consists of three solid-state detectors for measuring energy spectra of auroral protons in the range of 100,000 electron volts to six million electron volts.

Geiger-Muller Counters (S-71-D)

G. H. Skovli of the Norwegian Defense Research Establishment, Kjeller, Norway, Principal Investigator.

This experiment consists of four counters, placed on the satellite looking outwards at various angles to obtain information about the angular distribution of protons and electrons.

The detectors will measure integral particle fluxes of protons with energies less than 0.5 million electron volts and of electrons less than 40,000 electron volts.

Auroral Photometry

Auroral Photometer (S-32)

Dr. A. Egeland, Norwegian Institute of Cosmic Physics, Oslo, Principal Investigator.

This experiment will consist of two photometers which will look downwards from the satellite along the magnetic line of force over the northern hemisphere. They will measure the absolute luminosity of the aurora (total input energy) at two different auroral lines (4278 and 4861 angstroms).

The two lines will be measured to compare changes in flux and energy of auroral particles directly with variations in auroral luminosity.

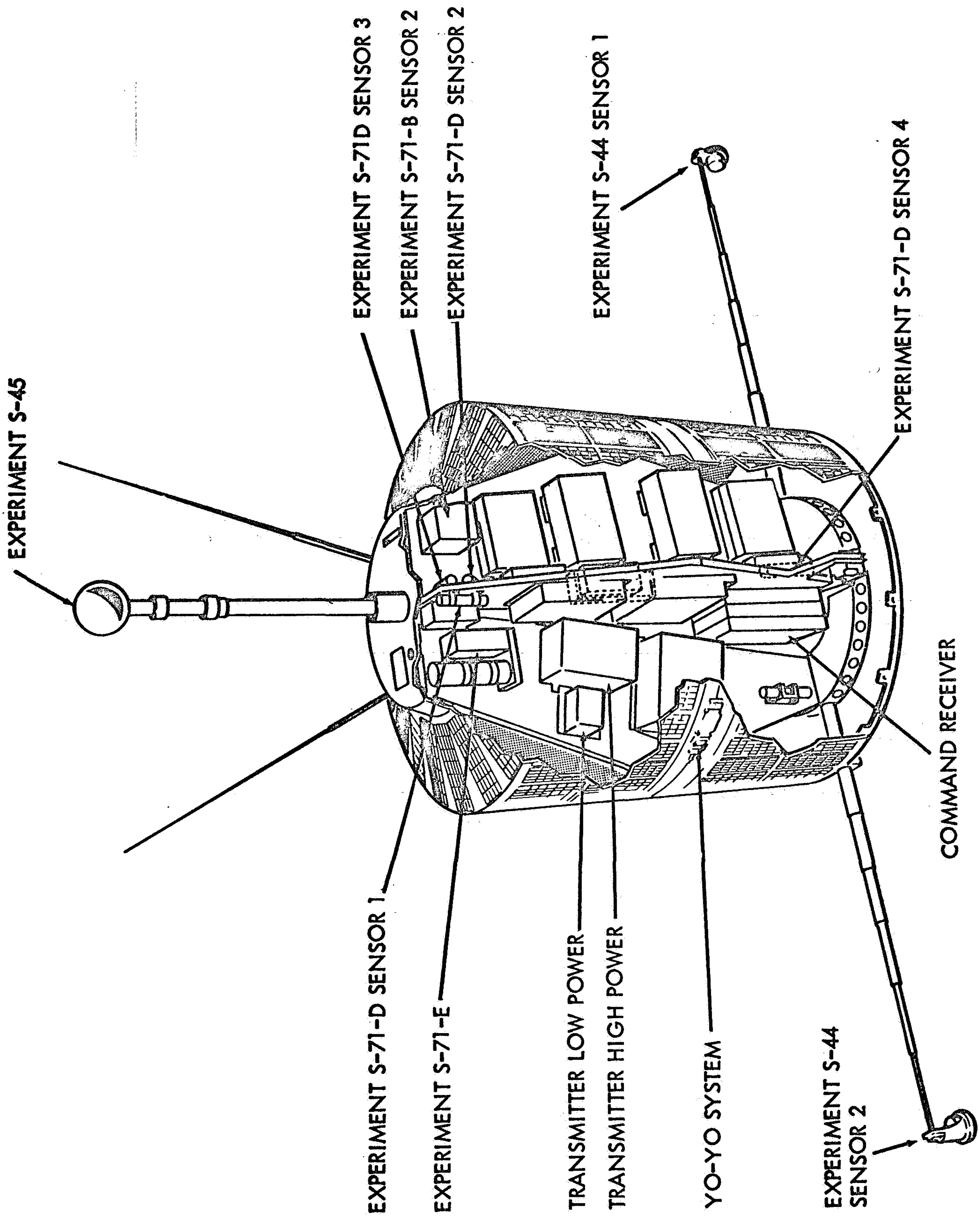
Electron and Ion Probes

Positive Ion Composition and Temperature (S-45)

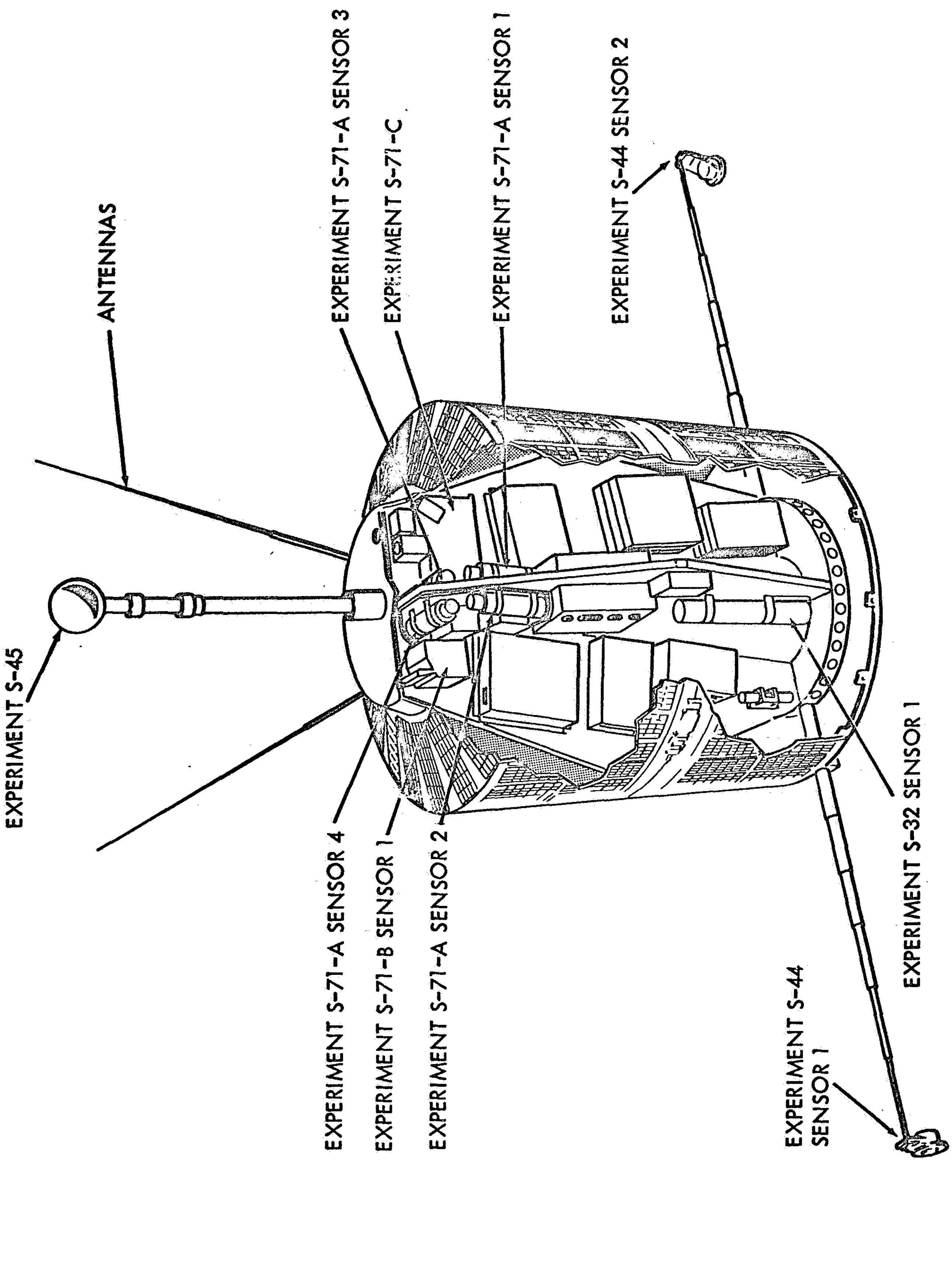
Dr. A. P. Willmore, University College, London, Principal Investigator.

The collection of information for a study of the composition and temperature of positive ions in the ionosphere is the scientific objective of this experiment. Observations with this instrument, taken together with those of the Electron Temperature and Density Probe, can provide a comprehensive description of the temperature distribution and composition of the high atmosphere.

This experiment consists of an ion probe carried on a boom extending about 22 inches from the top of the satellite.



ESRO-1 SPACECRAFT CONFIGURATION



ESRO-1 SPACECRAFT CONFIGURATION

Electron Temperature and Density Probe (S-44)

Dr. A. P. Willmore, University College, London, Principal Investigator.

The objective of this experiment is to make a global survey of electron density and temperature. These measurements can be related to the distribution of atmospheric temperature and will lead to an improved understanding of changes in height of the ionosphere layers at times of magnetic disturbance.

The measuring instruments are two plasma probes, each mounted on a separate 39-inch boom projecting from the spacecraft bottom perpendicular to the satellite spin axis. One probe is parallel to the spin axis, the other is perpendicular to the spin axis.

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ESRO-I FACT SHEET

Launch Window:	15-minute window opens at 4:48 p.m. EDT, Oct. 2, changes slightly from day to day.
Launch Site:	Western Test Range, California, Pad SLC-5.
Launch Vehicle:	Four-stage solid fuel Scout S-167.
Orbit:	Apogee: 1500 km (about 932 stat. miles). Perigee: 275 km (about 171 stat. miles). Period: 103 minutes. Inclination: 94 degrees retrograde (near polar). Orbit life: Six months.
Stabilization:	Spacecraft is spin stabilized about 148 rpm initially. Despun to one rpm by yo-yo mechanism and further despun by magnetic system which interacts with Earth's magnetic field. Stabilization thereafter will be provided by a passive system consisting of two permanent magnets.
Spacecraft:	Weight: 84 kg. (about 185 pounds) Structure: Cylindrical body with truncated cones at each end. Overall height is 153 cm. (about 60 inches) and diameter is 76 cm. (about 30 inches). Appendages: One experiment boom one-half meter (about 20 inches) long extending along the spin axis from top of spacecraft. Two experiment booms each one meter (about 39 inches) long extending from bottom of spacecraft perpendicular to spin axis. Four telemetry antennas extending from top rim of spacecraft. Power: 7,120 solar cells mounted on spacecraft surface supply an average of 23 watts to operate the spacecraft systems and to keep the 16-cell, three ampere-hour unit battery charged.

Telemetry: Low-Speed Data System - Low-power transmitter with an output of two-tenths of a watt in the 136-137 mhz frequency range for continuous data transmission.

High-speed Data System - High-power transmitter with an output of 1.2 watts in the 136-137 mhz frequency range for high-speed, real-time transmission. The system also will transmit data stored by the spacecraft's single tape recorder during one orbit (about 100 minutes). Playback time is three minutes.

Spacecraft Control: Primary control of the ESRO-I spacecraft is maintained at the European Space Operation Centre's (ESCO) control center in Darmstadt, Germany.

Tracking: The satellite will be tracked by the Redu, Belgium, station of ESRO's European Satellite Tracking and Telecommand Network (ESTRACK) as well as the Pretoria, South Africa, and the Kourou, French Guiana, stations of the French Centre National d'Etudes Spatiales (CNES). NASA's worldwide Space Tracking and Data Acquisition Network (STADAN) will provide additional tracking support.

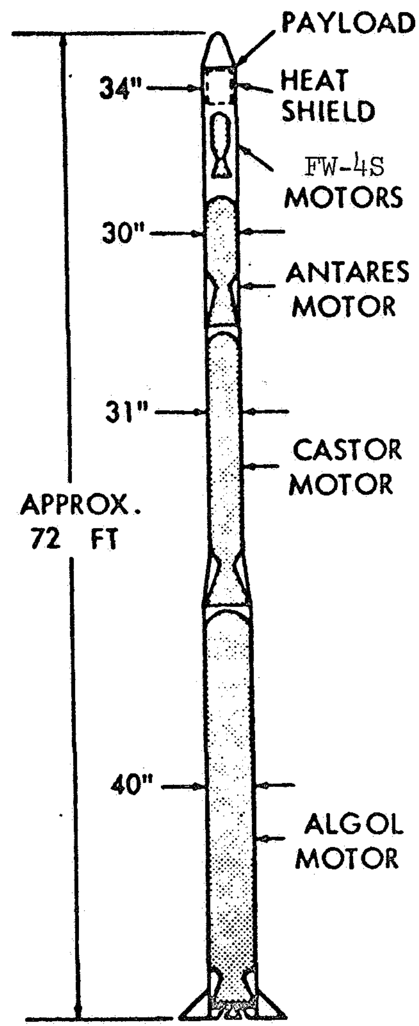
Data Acquisition: Scientific and spacecraft performance data will be acquired from ESRO-I by the following stations:

ESTRACK - Fairbanks, Alaska; Port Stanley, Falkland Islands; Redu, Belgium; and Ny-Alesund, Spitsbergen.

CNES - Pretoria, South Africa; Brazzaville, Congo; and Ouagadougou, Upper Volta.

Norway - Station at Tromso, Norway.

STADAN - Available stations will support ESRO-I. STADAN stations at Fort Myers, Florida; and Rosman, N.C. will relay spacecraft data in real time to the Goddard Space Flight Center, Greenbelt, Md., during satellite's initial week in orbit for ESRO representative.



	1ST STAGE ALGOL II B	2ND STAGE CASTOR II	3RD STAGE ANTARES-II X-259	4TH STAGE FW-4S
Burning Time (sec)	80.0	39.3	34.9	31.5
Thrust (average) (lb.)	100,944	60,764	20,942	5,884
WEIGHT, TOTAL (lb.)	23,750	9,766	2,778	665.1

LAUNCH VEHICLE

Scout is a four-stage solid fuel rocket system. Scout S-167 and the ESRO I spacecraft will be set on an initial launch azimuth of 186 degrees to obtain a retrograde orbit.

The four motors, Algol, Castor, Antares, and FW-4S 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 is provided by an autopilot and control achieved by a combination of aerodynamic surfaces, jet vanes and hydrogen peroxide jets. The launch vehicle is approximately 72 feet long and weighs about 37,000 pounds at liftoff.

The Scout rocket program is managed by NASA's Langley Research Center, Hampton, Va.

Flight Sequence

Event	Time (seconds)
Liftoff	
1st Stage Burnout	75.42
2nd Stage Ignition	79.32
2nd Stage Burnout	116.98
3rd Stage Ignition & Heatshield Separation	176.98
3rd Stage Burnout	212.88
Spin-up	354.65
3rd & 4th Stage Separation	356.15
4th Stage Ignition (FW-4)	360.65
4th Stage Burnout and Orbital Injection	394.15
S/C Separation	686.15
S-44 Boom Deployed	688.15
Yo-Yo Release	692.15
S-45 Boom Deployed	694.15

ESRO PROGRAM PARTICIPANTS

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Marcel dePasse	Director, Administration
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