NEWS

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

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: MONDAY P.M.
February 26, 1968

RELEASE NO: 68-38K

PRESS KIT

PROJECT: OGO-E

(To be launched no earlier than Feb. 29)

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2/22/68

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OGO-E LAUNCH SCHEDULED

An Orbiting Geophysical Observatory (OGO-E), carrying a record number of experiments for a United States scientific satellite, will be launched from Cape Kennedy, Fla., no earlier than Feb. 29, 1968.

The 1,347-pound spacecraft, heaviest OGO ever launched, will carry instrumentation for 24 scientific experiments. These experiments will study the Earth's space environment and its relationship to the Sun during a period of maximum solar activity. The primary mission of OGO-E will be a comprehensive study of particles and fields in space.

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Like OGO I and III, the OGO-E (OGO V in orbit), will be launched by an Atlas-Agena rocket into a highly elliptical orbit with an apogee (high point) of 92,061 statute miles and a perigee (low) of 173 miles above the Earth. It will complete one large orbit every 63 hours and will have an inclination of 31 degrees to the Equator.

The elliptical orbit will pass OGO-E through the Earth's trapped radiation and make possible a series of geophysical measurements from the region near the Earth and through the magnetosphere into interplanetary space.

The instrumentation for OGO's experiments, weighing 339 pounds, has been designed to measure space particles with a wide range of energy characteristics.

The 24 OGO-E experiments have been contributed by six U.S. universities; four foreign universities, four Government laboratories, and two private companies.

The electric field experiment (Goddard) is flying on an OGO satellite for the first time. It has been designed to shed new light on the bow shock, or shock wave, which is caused by the solar wind which travels toward Earth at supersonic speeds.

OGO observatories and other scientific satellites, have seen and observed the shock wave but they have not discovered its cause. Electric field measurements on OGO-E will extend into the region of the outer magnetosphere and into the solar wind.

The scientific community has been interested in electrical field measurements because this phenomenon is fundamental to an understanding of magneto-hydrodynamics.

The University of Southampton, England, has provided a spark chamber for OGO-E. Well known as an experimental tool for laboratory studies of high energy physics, the chamber will make its maiden space flight on OGO. The experimenters hope to use it to study gamma radiation in cosmic rays and to search for unique sources.

This will be the first launch using the new Atlas-SLV-3A-Agena combination, the 26th Atlas-Agena used by NASA. It will be NASA's final Agena launch; the Atlas-Centaur will be used for unmanned interplanetary probes and high flights in its place.

This will also be NASA's last launch from Complex 13, which will revert to the Air Force.

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The new Atlas SLV-3A is 117 inches longer than the 71.5-foot Atlas SLV-3 booster. Carrying 48,000 pounds more usable propellants, it will boost 300 more pounds of payload than its predecessor into the OGO-E orbit.

The Atlas booster engines are uprated to 168,000 pounds of thrust over the 165,000 for the SLV-3. The sustainer engine thrust has increased from 57,000 to 58,000 pounds. The propellant utilization system has also been changed.

NASA has six OGO's programmed. Four have been launched between September 1964 and July 1967. OGO I, III and IV are still operating. OGO II was turned off last Nov. 1.

OGO II and IV are in polar orbit. OGO I and III are in a highly elliptical orbit like that intended for OGO-E. OGO-F will likewise be launched into polar orbit.

Because the detailed scientific picture of the Earth's environment continually changes, the data from several OGO satellites will help scientists to distinguish changes due to time, from changes due to position.

For example, with OGO I and -E in similar orbital position, they will be close enough together for studies of the detailed movements of plasmas and the magnetosphere and shock boundaries surrounding the Earth. With OGO III in a different position, its data can provide position, further distinctions between local and global effects.

During a two week period last October, all four satellites were operated simultaneously for this purpose, and scientific information was obtained from 55 experiments at once.

OGO experiments have been designed to help man understand better the complex interplanetary space relationship between the Earth and Sun. Under intensive study are the solar wind, solar flares, terrestrial magnetic field disturbances, sudden ionospheric disturbances, radiation belt particle population, aurora events, polar cap events, icnization and variations in atmospheric density.

OGO I and III operate part-time in a spin-stabilized mode and return useful scientific data from 12 of the 20 OGO I experiments and 15 of the 21 on OGO III.

OGO IV is stabilized in all three axes and has used less than half of its attitude and control gas supply after more than six months. Of its 20 experiments, 18 are returning useful scientific data.

To date, the four OGO observatories together have operated for more than 40,000 hours, and have collected more than 670,000 experiment hours of data. More than 100,000 experiment hours have resulted from OGO IV data alone. The program has resulted in more than 200 scientific and engineering papers and reports presented at symposia or published.

The most important feature of the OGO results is the high data rate -- providing scientists with a "moving picture" of the Earth's environment. Previous results from smaller scientific satellites, at lower data rates, were more like a snapshot view.

Data from OGO satellites have provided new knowledge concerning bow shock, the transition region, the magnetospheric boundary and tail, the radiation belts, the auroral regions, and the upper atmosphere.

These data are pointing the way to the resolution of important questions in energetic particle and wave propagation physics, ionic plasma physics and photo-chemistry.

Bow shock is formed by solar wind coming from the Sun at supersonic speeds. It is similar to the shock wave that forms around an airplane traveling at supersonic speeds, which causes the so-called sonic "boom."

OGO data show the shock and magnetospheric boundary as rapidly fluctuating regions of intense activity. As many as 10-20 crossings of the bow shock are observed on a single satellite pass.

Previously, it was thought that the solar wind emanating from the Sun did not penetrate into the magnetosphere. OGO has found evidence of boundary instability which could explain how particles get into the magnetosphere.

In the magnetospheric tail, rapid changes in the intensity and flux of energetic particles have been observed following magnetic storms. Sudden collapse of a portion of the magnetic field in the tail and distortions of the day-side magnetosphere boundary have been correlated with ground-observed polar cap magnetic changes which generally precede auroral activity. These have provided the first evidence of a common mechanism for major changes in the magnetosphere and in the polar region. A large increase in proton flux at a distance of several times the Earth's radius during two small magnetic storms appears to be the first definitive observation of the "ring current" belt.

Measurements obtained over the poles are providing new insight to the well-known auroral displays. Large changes in the intensity of magnetic field fluctuations -- bursting forth -- have been found near the auroral zones. Some classes of VLF emission correlate with specific forms of aurora. It has also been found that VLF hiss correlates with fluxes of precipitating electrons of low energies.

The global magnetic survey data obtained by OGO, as part of the United States' commitment to the International Quiet Sun Year World Magnetic Survey, has made major improvements in field maps prepared from earlier data. These data show that future mathematical models will have to include corrections for a non-spherical Earth.

Other results relate to the clear identification of the controlling influence of the geomagnetic field on ion population. These findings, correlating with electron data derived from very low frequency noise (whistlers) observed on the ground and data from other OGO experiments indicate the existence of a plasmapause region, location of a sudden decrease in electron and ion concentration.

The plasmapause is in the magnetosphere about 12,000-16,000 miles from Earth. Plasma in this region varies greatly between a factor of about 30 to 3,000. It is not understood why the variation is so great.

A complete time history of the X-ray spectra of several Class 2 solar flares, extending over periods of a half-hour with good time resolution, have been obtained. Solar X-ray data are now being provided -- as a service -- in the relatively short period of one day, to the Environmental Science Services Administration (ESSA) and solar flare warning networks.

OGO-E will resemble a giant insect in orbit, having arm and leg appearing booms, antennas and wing-like solar paddles which jut from the rectangular box-shaped main structure.

The complex OGO design includes an active three-axis stabilization system, a spin stabilization system and a sophisticated high rate data handling system.

The three-axis stabilization system provides a stable platform from which experiment sensors can point toward and away from Earth, at the Sun and into the orbital plane of the spacecraft.

A combination of horizon scanners, advanced electronics, Sun sensors and a gas jet system and electrically driven fly-wheels keep the satellite stable.

The spin stabilization system can be used, if required, to continue the mission. After the attitude control gas supply is nearly exhausted it provides a means of extending the operational life of the observatory.

With booms and solar panels fully extended, OGO is 49 feet long and about 20 feet wide. It contains several hundred thousand separate parts. In the launch phase these appendages are folded against the main body.

OGO-E will be launched on an azimuth of 103.8 degrees. The launch window opens about 8:06 a.m. EST Feb. 29 and closes at 8:21 a.m.

The Orbiting Geophysical Observatory program is part of NASA's scientific space exploration study under the Office of Space Science and Applications. OGO project management is the responsibility of the Goddard Space Flight Center, Greenbelt, Md.

NASA's Lewis Research Center, Cleveland, is responsible for the Atlas-Agena launch vehicle. Launch operations will be performed by NASA's Kennedy Space Center, Unmanned Launch Operations.

OGO prime contractor is TRW Systems, Inc., Redondo Beach, Calif. General Dynamics/Astronautics, San Diego, Calif., developed the Atlas booster and Lockheed Missiles and Space Co., Sunnyvale, Calif., developed the Agena stage. More than 1,000 sub-contractors and vendors across the nation have provided various subsystems and electronics for the satellites.

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OGO-E FACT SHEET

72,360

SPACECRAFT:

Shape	Main body is rectangular, 6 ft. long, 3 ft. wide, 3 ft. high; spacecraft looks like a giant insect with appendages deployed 49 ft. long, 22 ft. wide.
Weight	1,347 lbs.
Experiment Weight	339 lbs.
Appendages	Two 22-ft. booms and four (approx.) 4-ft. booms, two solar panels, 6 ft. wide, 7.5 ft. long, approx. 80 sq. ft. covered with 32,928 N/P solar cells; two orbital plane experiment packages, 18 in. long, 10 in. wide, 10 in. deep.
Power Supply	Solar supply to two 28-v. nickel cadmium batteries using unregulated direct current with maximum capability of about 550 watts.
Experiments	Twenty-four experiments supplied by six U.S. universities, four foreign universities, four government laboratories and two private companies.

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LAUNCH INFORMATION:

Vehicle	Atlas-Agena
Launch Pad	Complex 13, Cape Kennedy
Launch Azimuth	103.8 degrees
Date	Feb. 29, 1968
Time	8:06 a.m. EST
Window	About 15 minutes

NOMINAL ORBITAL ELEMENTS:

Apogee	92,061 miles (statute)
Perigee	173 miles
Period	63 hours, 6 minutes
Inclination	31 degrees

TRACKING AND DATA ACQUISITION STATIONS:

NASA's Space Tracking and Data Acquisition Network (STADAN) is responsible for tracking, telemetry and data processing support for the OGO mission. STADAN is operated by the Goddard Space Flight Center, Greenbelt, Md. Facilities in Australia are operated for NASA by the Australian Department of Supply. Facilities in the Republic of South Africa are operated for NASA by the South African Council for Scientific and Industrial Research.

OBSERVATORY MANAGEMENT:

NASA Office of Space Science and Applications and Goddard Space Flight Center.

LAUNCH VEHICLE MANAGEMENT:

NASA Lewis Research Center.

LAUNCH OPERATIONS:

NASA Kennedy Space Center Unmanned Launch Operations.

PRIME CONTRACTORS:

OGO-E Spacecraft	TRW Systems, Inc. Redondo Beach, Calif.
Atlas Booster	General Dynamics-Astronautics San Diego, Calif.
Agena Stage	Lockheed Missile and Space Co. Sunnyvale, Calif.

OGO-E EXPERIMENTS

PRINCIPAL INVESTIGATOR	BRIEF SUMMARY
Professor R. L. F. Boyd University College London, England	Electron Temperature and Density Experiment: To study the energy/particle transport processes involved in the interaction of the solar wind with the Earth's magnetospheric plasma.
Dr. Rita Sagalyn U.S. Air Force Cambridge Research Lab.	Plasma Temperature, Density and Flux-Experiment: Measurement should provide information on the physical relationships between thermal and epi-thermal plasma components for quiet and disturbed conditions.
Mr. G. P. Serbu NASA Goddard Space Flight Center (GSFC)	Electron and Ion Density and Temperature Experiment: Measurement to yield the temperature and density of the thermal plasma in the magnetosphere.
Dr. Kinsey A. Anderson University of California	Solar X-Ray and Charged Particles Experiment: Study of solar flare particle events during solar maximum.
Dr. Thomas L. Cline GSFC	Solar and Interplanetary Electrons and Positron Experiment: Monitor very intense hard X-ray flare events.
Dr. Raymond D'Arcy Lawrence Radiation Lab.	Electron and Proton Measurement Experiment: Study the process by which particles enter and are depleted from the trapping regions.

Dr. Louis A. Frank University of Iowa	Low Energy Particle Detector Experiment: Measure the differential energy spectra of protons and electrons to obtain definitive observations throughout the radiation zones, the Earth's magnetic tail and the magnetosheath.
Professor G. W. Hutchinson University of Southampton,UK	Gamma-Ray Astronomy Experiment: Detect high-energy, gamma-ray photons of extra-terrestrial origin, measurement of any anisotropy in their directions of incidence and location of any point sources.
Dr. Peter Meyer University of Chicago	Cosmic Ray Electrons Experiment: Determine the primary energy spectrum of electrons, short and long term variations of the flux and their correlation to solar phenomena and the solar emission of electrons in connection with solar flares.
Dr. Frank B. McDonald GSFC	Galactic and Solar Cosmic Rays Experiment: Study the properties of galactic and solar cosmic radiations.
Dr. Keith W. Ogilvie GSFC	Electron Distribution Experiment: Measure electron flux and energy distributions in the magnetosphere tail and solar wind; study electrons in the region of the bow shock; correlate between electron measurements in the far magnetosphere and auroral observations.

Professor H. C. van de Hulst Cosmic Ray Working Group Netherlands	Cosmic Ray Electronics Experiment: Measure electron flux and energy spectrum to provide basic data on one of the important components of the primary cosmic rays.
Dr. Paul J. Coleman, Jr. UCLA	Hydromagnetic Waves and Their Effects on Geomagnetically Trapped Particles Experiment: Investigate the relationship of hydromagnetic waves to the particles trapped in the magnetosphere.
Dr. J. P. Heppner GSFC	Magnetic Field Experiment: Study the interaction of geomagnetic field with solar interplanetary plasmas and fields.
Dr. Edward J. Smith NASA Jet Propulsion Lab.	Magnetic Field Experiment: Measure the magnetic fluctuations in the magnetosphere and nearby interplanetary medium.
Dr. Conway Snyder JPL	Plasma Experiment: Detailed understanding of solar plasma in space, its time variations and relations to solar and geophysical phenomena.
Dr. Gerald W. Sharp Lockheed Palo Alto Research Laboratory	Ion Mass Experiment: Highly elliptical orbit of OGO-E will make it possible to obtain height profiles for specific ions and thus observe which ion specifically dominates at a given altitude and the altitude at which the dominant ion is changed.

Professor Fred T. Haddock University of Michigan	Radio Astronomy Experiment: Measure the relative average level of cosmic noise and detect radio bursts from the Sun and Jupiter at eight frequencies from 50 KHz to 3,500 KHz.
Dr. Charles A. Barth University of Colorado	**Ultraviolet Airglow Experiment:** Measure the distribution of atomic hydrogen in the outer atmosphere of the Earth and measure the distribution of atomic oxygen in the upper atmosphere.
Professor J. E. Blamont University of Paris	Geocoronal Lyman-Alpha Experiment: Measure the number density of atomic hydrogen around the Earth and measure the temperature of atomic hydrogen.
Mr. Robert W. Kreplin U.S. Naval Research Lab.	Solar X-rays Experiment: Determine the spectral distribution of 2 to 20 Kev X-rays occuring with solar flares.
Mr. Gaines M. Crook TRW Systems	Plasma Waves Experiment: Detect and identify electric plasma oscillations and differentiate between these and electromagnetic waves.
Dr. Thomas L. Aggson GSFC	Electric Field Experiment: Study "dc" electric fields in the solar wind, the transition region, and in the outer regions of the magnetosphere. Particular emphasis will be placed on the electric fields at the magnetopause and bow shock boundaries.
Professor J. A. Simpson University of Chicago	Hi-Z Lo-E Particles Experiment: Measure the composition and differential energy spectrum of the heavy component of cosmic rays from atomic charge Z equal 5 to 50.

VEHICLE STATISTICS
(All figures approximate)

Atlas (SLV-3A), Agena-D and OGO-E

Height on pad:	120.5 feet
Liftoff Weight:	328,500 lbs.
Launch Complex:	13
Launch Azimuth:	103.8 degrees

	Atlas Booster	Agena-D Second Stage
Weight	311,250 lbs.	17,250 lbs. including shroud, propellants and 1,318 lbs. spacecraft.
Height	81.3 feet	39.2 ft. (includes shroud)
Thrust	Booster Engines - 336,000 lbs., sustainer engine - 58,000 lbs.	16,000 lbs. at altitude
Propellants	207,500 lbs. liquid Oxygen, 91,900 lbs. RP-1	570 gal. unsymmetrical dimethyl hydrazine (UDMH), 740 gal. inhibited red fuming nitric acid (IRFNA).
Propulsion	MA-5 (Rocketdyne)	One regeneratively cooled engine (Bell Aerosystems)
Velocity:	6,900 mph at BECO 13,170 mph at SECO	23,750 mph at spacecraft separation
Guidance	Atlas autopilot and G.E. guidance	Agena IRP (inertial reference package), horizon sensors and onboard flight programmer
Prime Contractor	General Dynamics Convair, San Diego, Calif.	Lockheed Missile and Space Co. Sunnyvale, Calif.

COUNTDOWN MILESTONES
(Approximate)

Event	Time Before Launch
Start Count	-485 minutes
Start Agena UDMH Tanking	-235
Finish Agena UDMH Tanking	-205
Start Removal of Gantry	-200
Finish Removal of Gantry	-170
Start Agena IRFNA Tanking	-170
Finish Agena IRFNA Tanking	-135
Built-in Hold (60 minutes)	-130 to -70
Start Atlas LOX Tanking	-45
Built-in Hold (10 minutes)	-17 to -7
Secure LOX Tanking	-1.45
Automatic Sequencer	18 seconds
Atlas Engine to full Thrust	2 seconds

ATLAS-AGENA FLIGHT SEQUENCE

Event	Time Seconds	Altitude Statute Miles	Surface Range Statute Miles	Inertial Velocity MPH
Liftoff	0	0	0	0
Booster Engine Cutoff (BECO)	155	37.5	58.7	6,900
Sustainer Engine Cutoff (SECO)	324.5	102	465	13,170
Start Agena Time	328.2			
Vernier Engine Cutoff (VECO)	344.3	105.48	535	13,160
Atlas Separation	348.5			
Agena Engine First Ignition	402.4	115	710	13,100
Shroud Separation	411.2			
Agena Engine Cutoff	546.9	117	1,270	17,500
Agena Second Ignition	3167.4	173	13,200	17,200
Agena Cutoff	3262.5	182	13,620	23,900
Spacecraft Separation	3357.2	225	14,900	23,750
Start Agena Retro-maneuver	3360.2			
Complete Agena Retro maneuver	3390.2			

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THE OGO-E TEAM

Following are the key officials in the Orbiting Geophysical Observatory program:

NASA Headquarters

Dr. John E. Naugle, Associate Administrator for Space Science and Applications

Jesse Mitchell, Director, Physics and Astronomy Programs

Marcel J. Aucremanne, Program Manager, Geophysical Observatories

Thomas L. Fischetti, Associate Program Manager, OGO

Dr. A. W. Schardt, Program Scientist

W. L. Lovejoy, Agena Program Manager

NASA Goddard Space Flight Center, Greenbelt, Md.

Dr. John F. Clark, Director

Dr. John W. Townsend, Deputy Director

Wilfred E. Scull, Project Manager

Abraham Leventhal, Assistant Project Manager

Dr. James P. Heppner, Project Scientist

NASA Lewis Research Center, Cleveland

Seymour C. Himmel, Assistant Director for Launch Vehicles

Warren Plohr, Agena Project Manager

Roger S. Palmer, Agena Project Engineer for OGO

Edward Baehr, Manager, Atlas Project

NASA Kennedy Space Center, Fla.

Robert Gray, Assistant KSC Director for Unmanned Launch Operations

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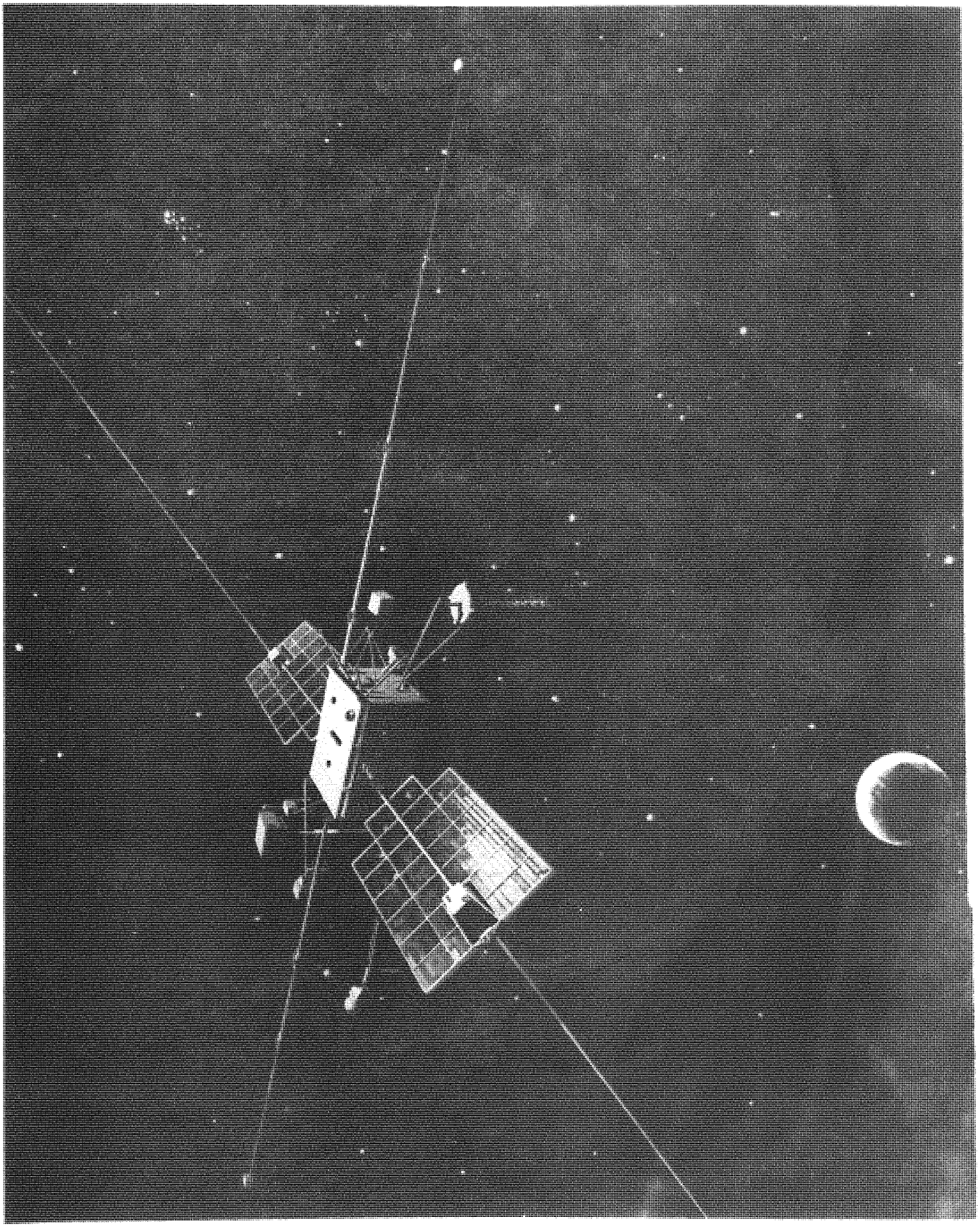

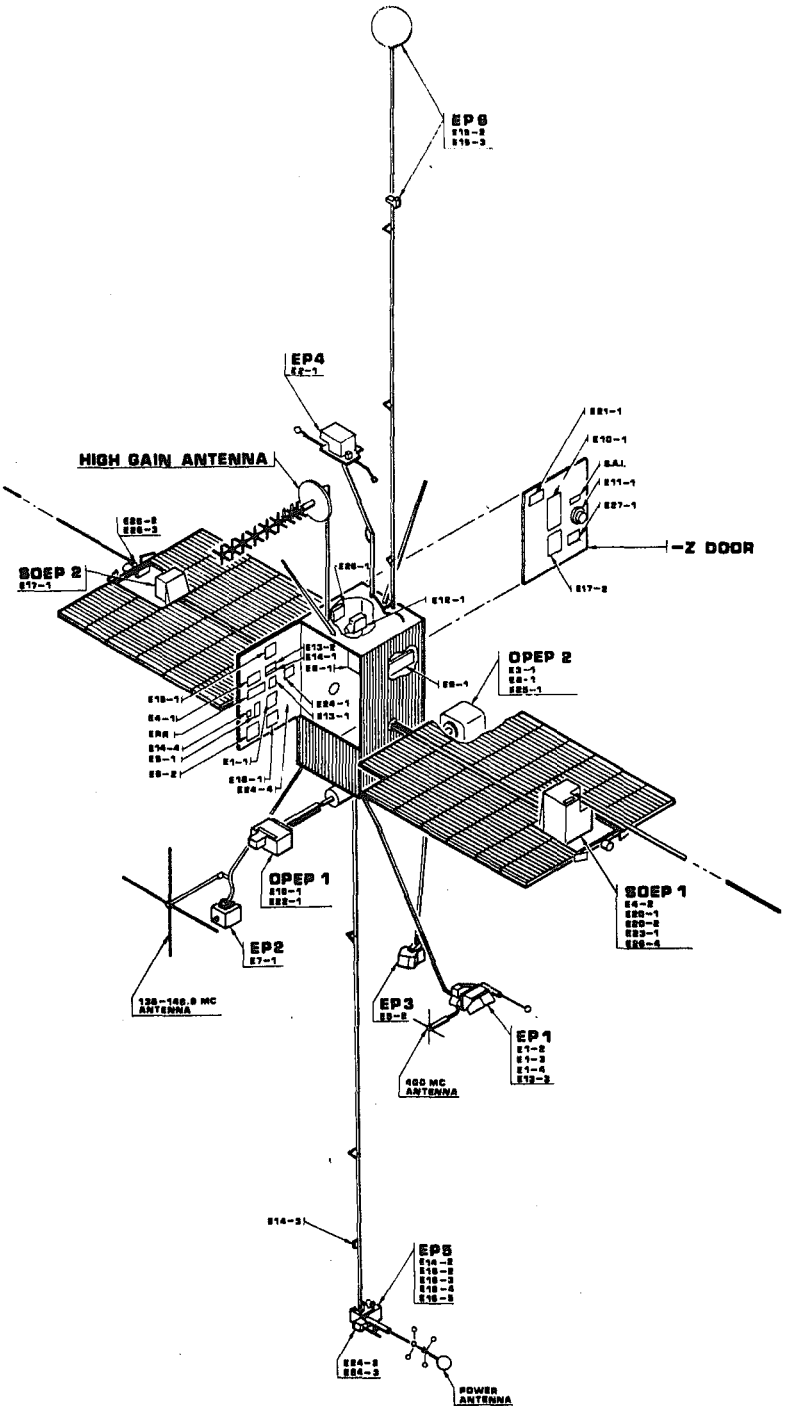

OGO-E Experiment Configuration

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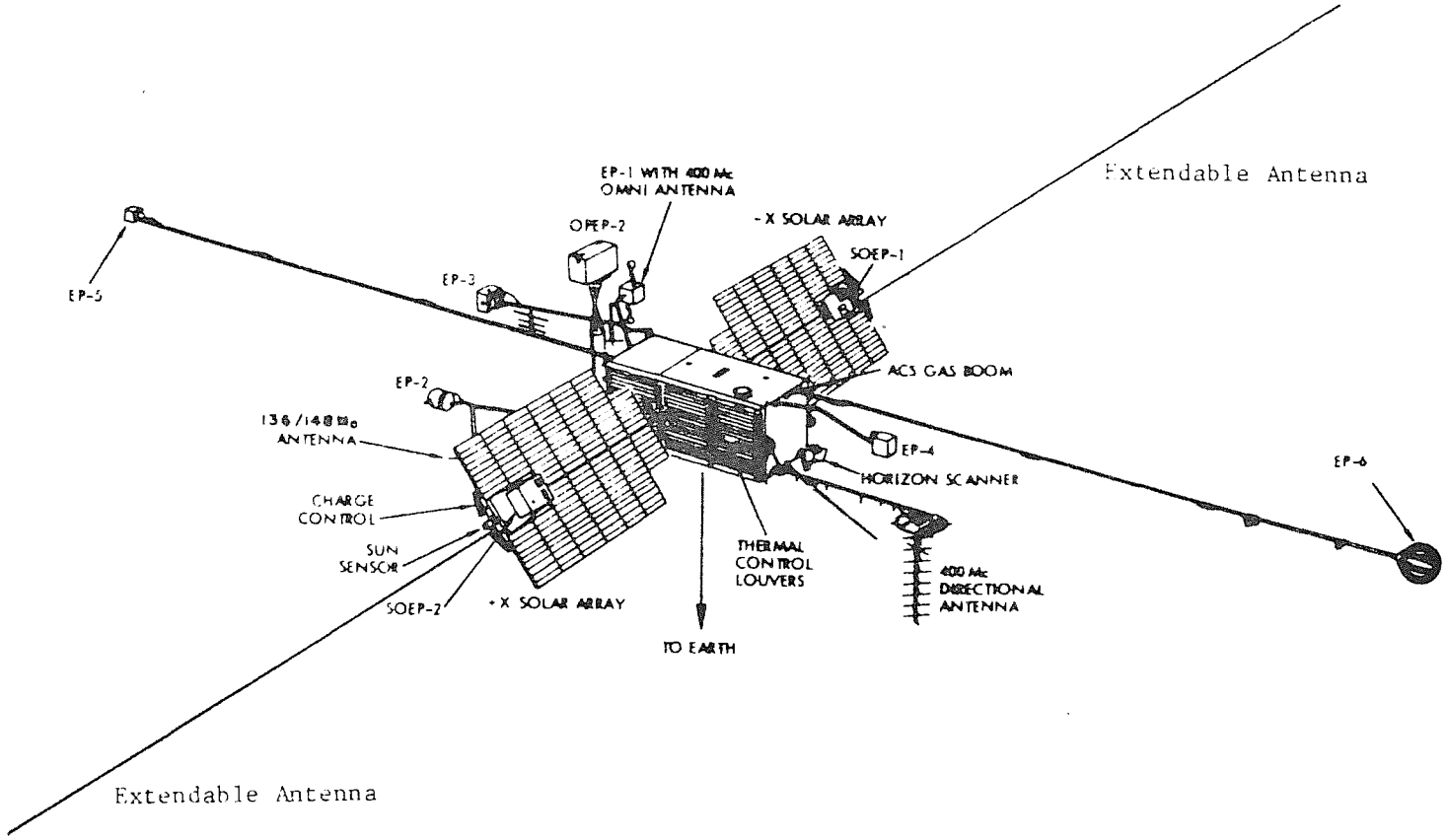
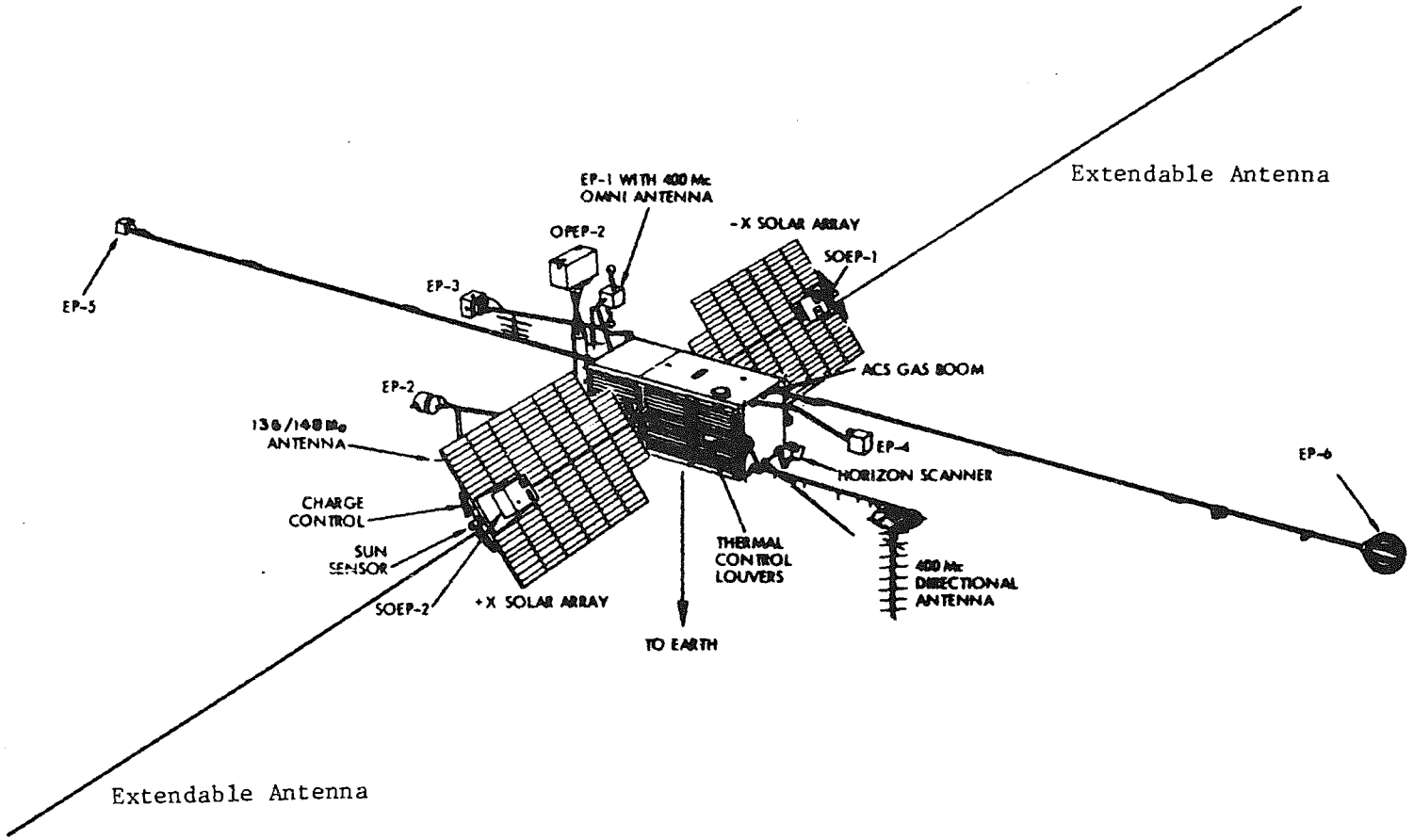
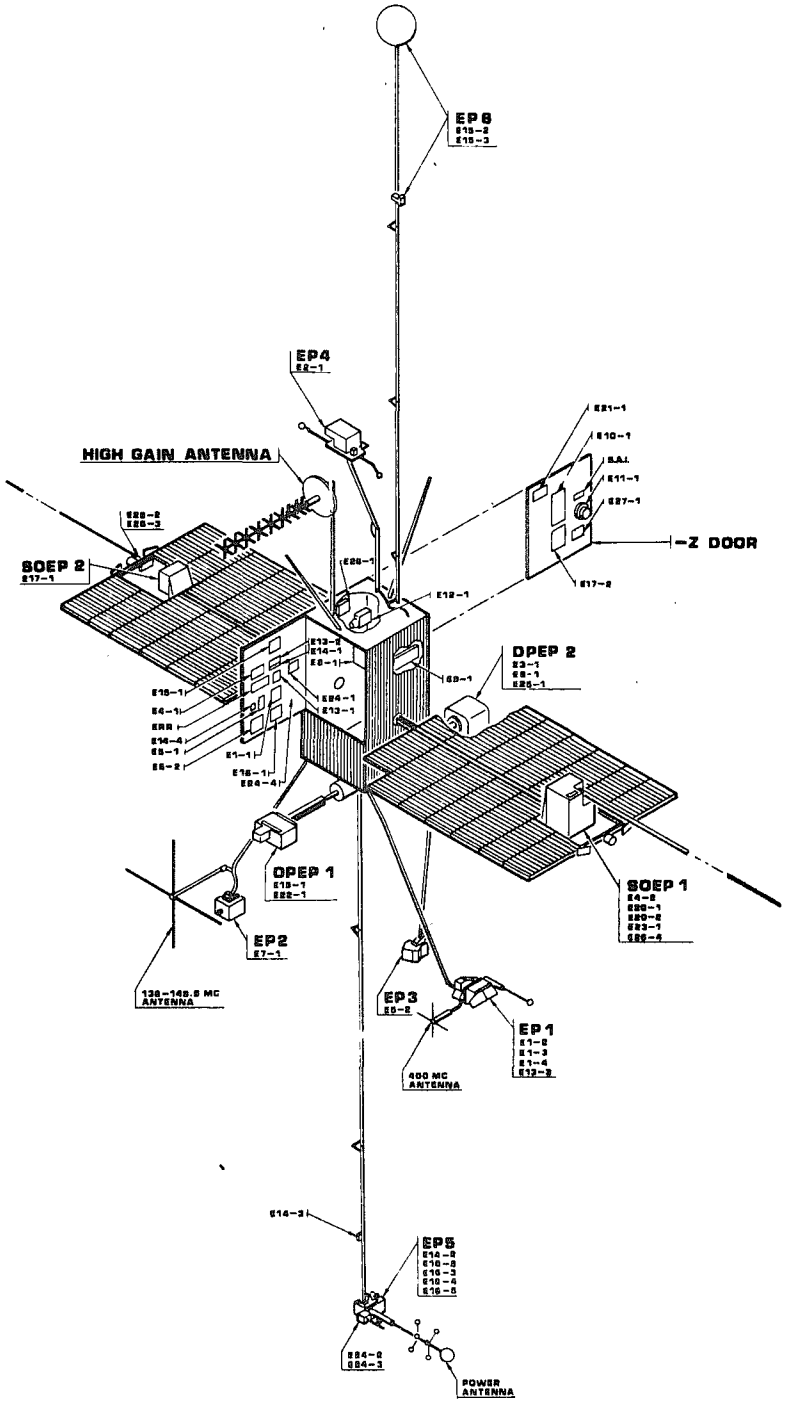


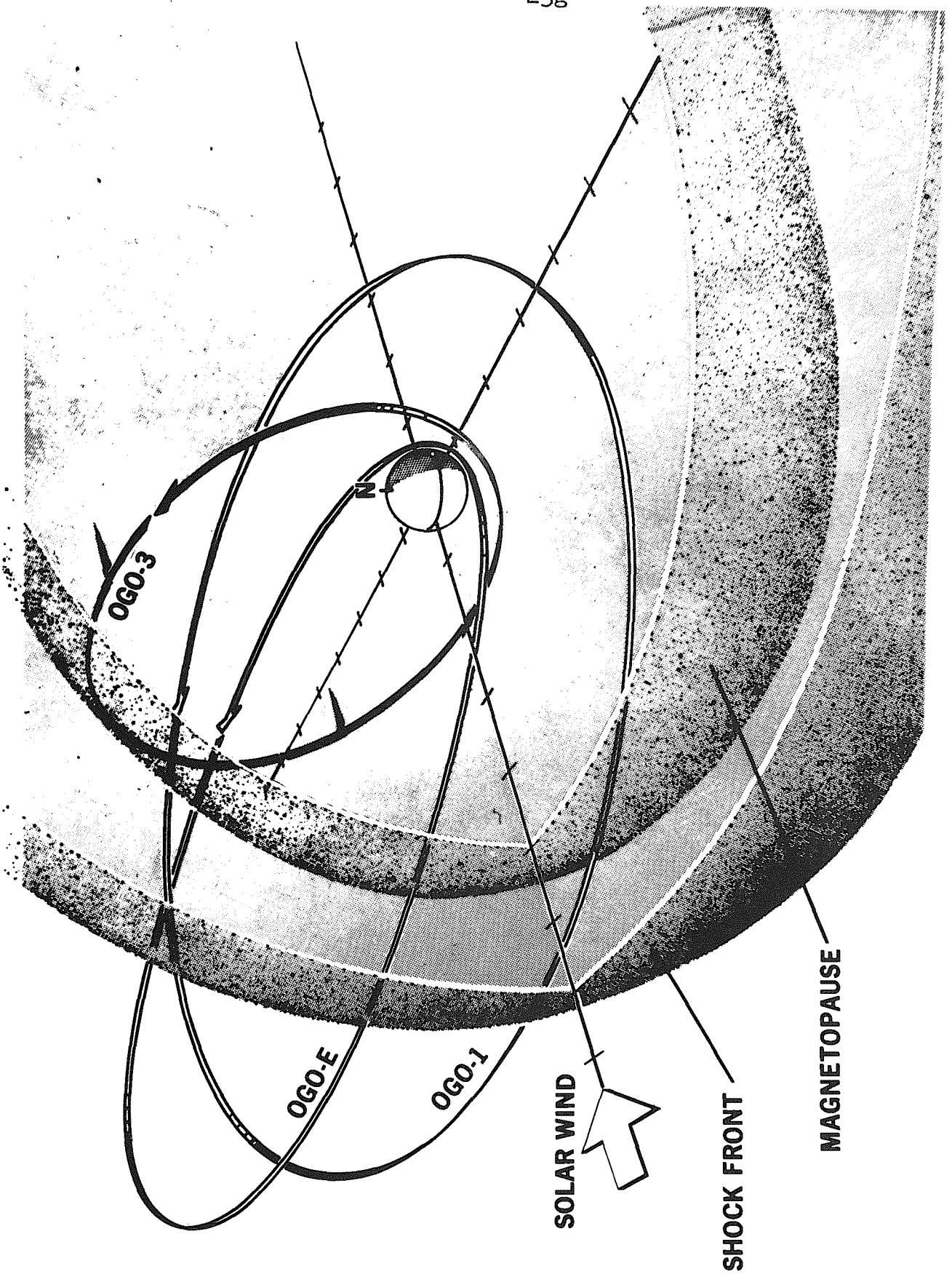
OGO-E Observatory

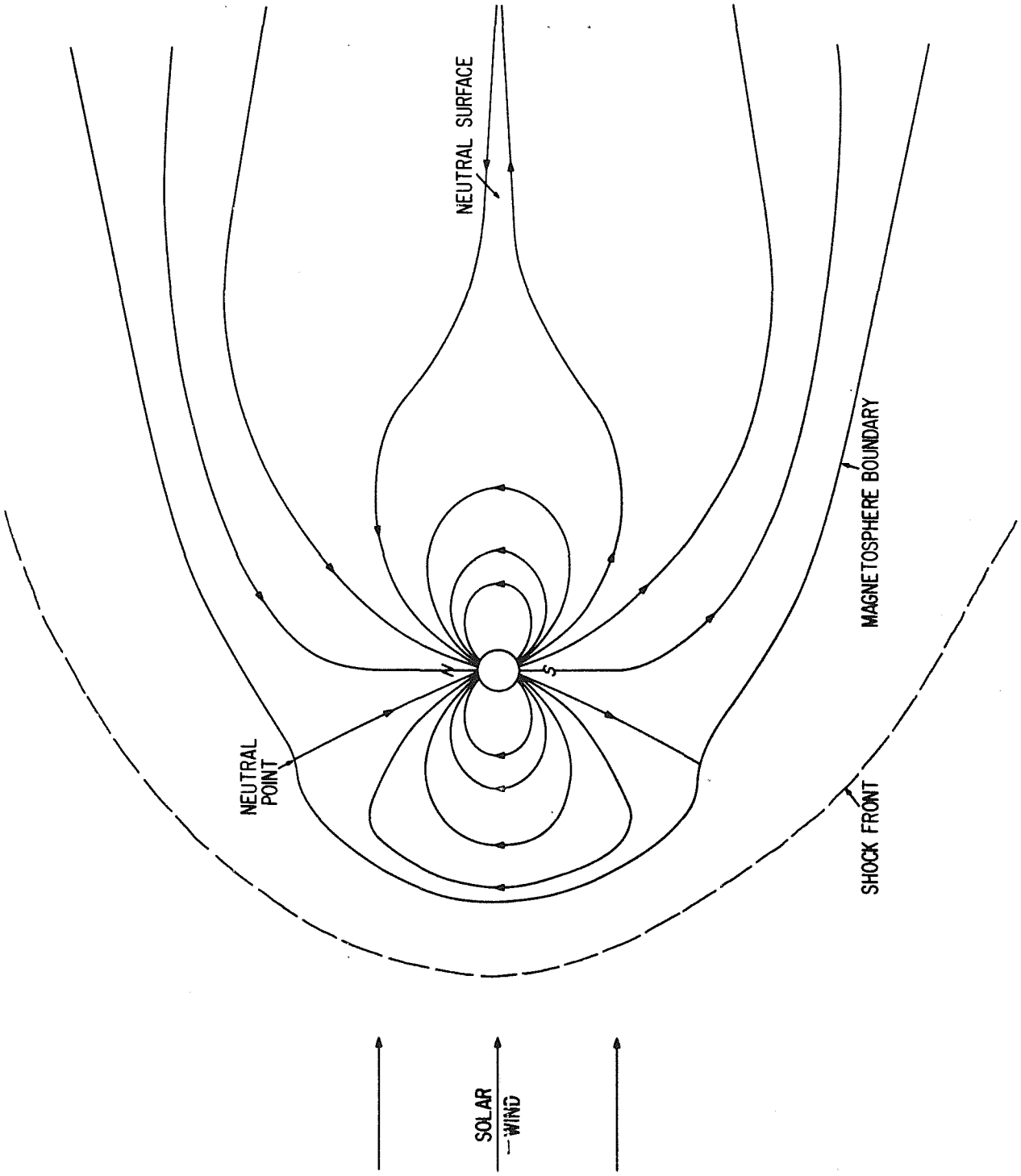


OGO-E Observatory



OGO-E Experiment Configuration


OGO-3
N
OGO-E
OGO-1
SOLAR WIND
SHOCK FRONT
MAGNETOPAUSE


NEUTRAL SURFACE
NEUTRAL POINT
N
S
MAGNETOSPHERE BOUNDARY
SHOCK FRONT
SOLAR WIND

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