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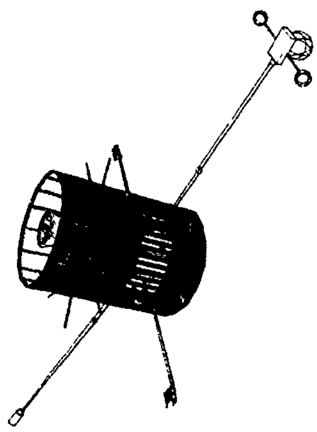
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C. 20546
202-755-8370

FOR RELEASE: Sunday,
September 17, 1972

PRESS KIT

PROJECT: IMP-H



contents

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FOR RELEASE: Sunday
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RELEASE NO: 72-185

ADVANCED IMP READIED FOR LAUNCH

NASA's ninth Interplanetary Monitoring Platform, IMP-H is scheduled to be launched from Kennedy Space Center, Fla., aboard a three-stage Delta rocket on Sept. 21, 1972.

The automated space physics laboratory will continue the study of interplanetary radiation, solar wind and energetic particle emissions, and magnetic fields in Earth's environment from an orbit approximately half way to the Moon.

The primary mission of IMP-H is to provide a more detailed understanding of the dynamics of the regions discovered and broadly surveyed by the previous seven Earth-orbiting IMPs and the lunar IMP (Explorer 35) by obtaining scientific data during the decreasing period of solar activity.

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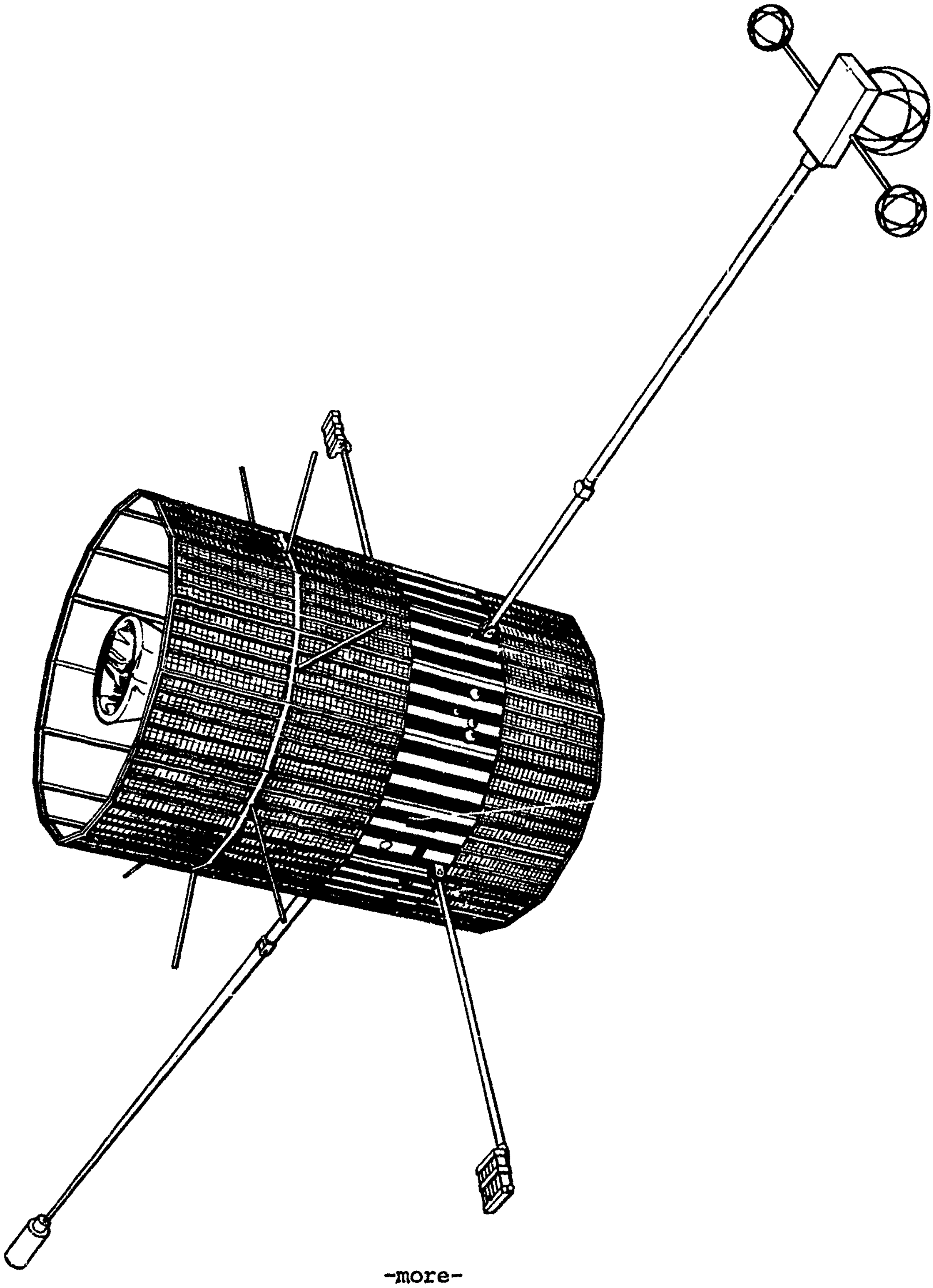


IMP-H will be able to measure the changes of Earth's magnetic tail as the changing solar wind "weather" disturbs Earth's environment.

Scientific results from the IMP program to date have greatly expanded man's knowledge of the turbulent space environment and defined the nature and extent of the magnetosphere. In support of the Apollo and Skylab manned exploration programs, IMP spacecraft have provided and will continue to provide warnings of possible solar flare radiation events to astronauts.

To be designated Explorer 47 after achieving orbit, IMP-H carries 13 scientific experiments to obtain measurements of energetic particles, plasmas, and magnetic and electric fields. Experiments are provided by universities throughout the nation, industry, the National Oceanic and Atmospheric Administration (NOAA), the Atomic Energy Commission (AEC) and Goddard Space Flight Center. Three engineering tests also will be conducted.

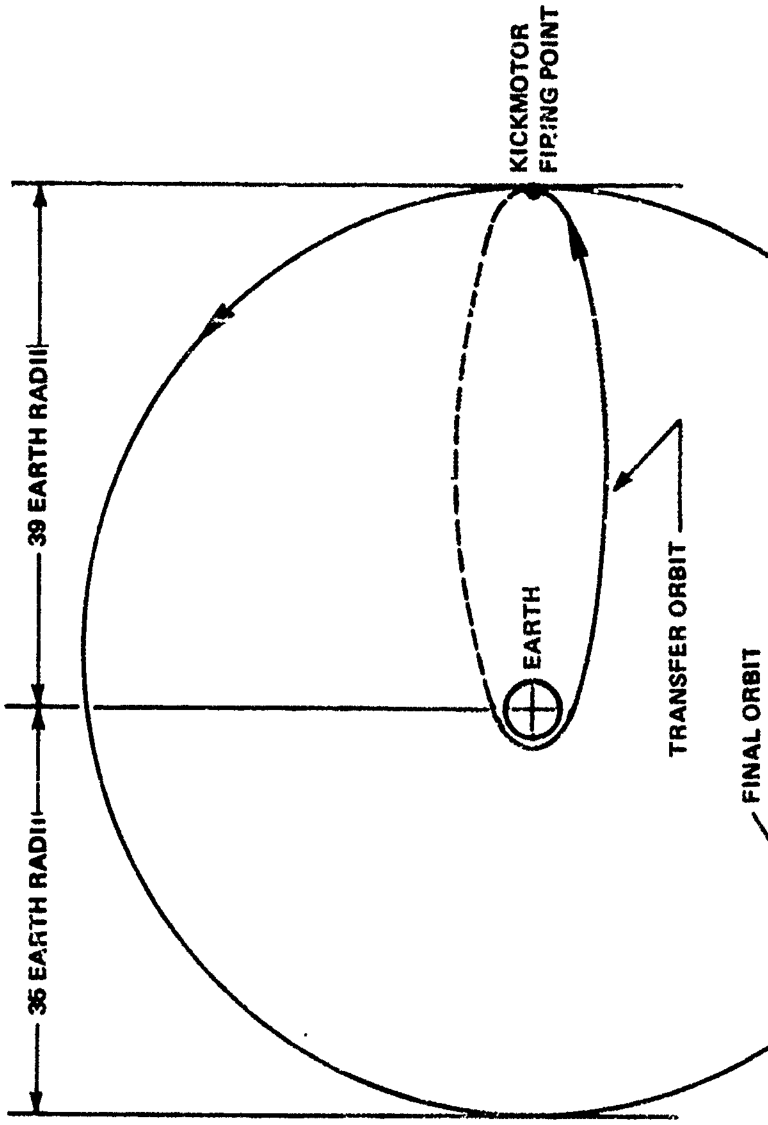
IMP-H is the largest and most complex spacecraft of the series built at the NASA Goddard Space Flight Center, Greenbelt, Md. It weighs 390 kilograms (860 pounds) and is drum-shaped in appearance.

The objective of the IMP-H mission is twofold:

* To perform detailed and near continuous studies of the interplanetary environment for orbital periods comparable to several rotations of active solar regions.
* To study particle and field interactions in the distant magnetotail including cross sectional mapping of the tail and neutral sheet.

In addition, the spacecraft will form the Earth reference point for interplanetary survey baselines with the Pioneer 10 and Pioneer G missions to Jupiter and Mariner missions to Venus and Mercury in 1973-74.

The planned orbit for IMP-H will be quite different from those of previous IMP spacecraft. Rather than being in a highly elliptical Earth orbit or a lunar orbit, IMP-H will be placed into a nearly circular Earth orbit approximately half the distance to the Moon, 30 to 40 Earth radii. With such an orbit, approximately 203,000 kilometers (127,000 miles) by 247,000 kilometers (155,000 miles), the spacecraft will be in a position to alternately monitor the interplanetary medium and the geomagnetic tail-plasma sheet for 6.5 days each throughout an entire year. The period of the orbit will be approximately 13 days.


KICKMOTOR
FIRING POINT
39 EARTH RADII
35 EARTH RADII
EARTH
TRANSFER ORBIT
FINAL ORBIT

Detailed mapping of Earth's magnetic field on the night-time side by previous IMPs revealed the development of a significant and permanent magnetic tail that does not corotate with Earth. This tail appears to play a dominant role in various terrestrial phenomena, storing energy from the solar wind and releasing it suddenly to cause auroral distrubances. With the 30 to 40 Earth radii orbit, IMP-H will be able for the first time to measure both the region of the geomagnetic tail-sheet and its relationship to the solar wind.

A series of IMPs has been launched since November 1963 to study and monitor the plasmas, magnetic fields and energetic particle populations of interplanetary space and have provided the first accurate measurements of the interplanetary magnetic field, the magnetosphere boundary, and the shockwave associated with the interaction of the geomagnetic field and solar wind. The detection of the extended geomagnetic tail-plasma sheet represents the most important result with respect to Earth's magnetic field.

Included in the IMP program are two Anchored Interplanetary Monitoring platform spacecraft, AIMP-D (Explorer 33) and AIMP-E (Explorer 35), launched in 1966 and 1967 respectively. Explorer 35 was placed into a lunar orbit. It still orbits the Moon, transmitting very useable data for correlation with Apollo Lunar Surface Experiment Packages (ALSEPS) on the lunar surface. Explorer 33 went into an orbit around both Earth and the Moon, and contributed a wealth of data on cislunar space. The two made significant contributions to scientific knowledge and understanding of the near lunar and interplanetary environment, including the finding that the Moon has a negligible large scale magnetic field and that a solar wind cavity void exists behind the Moon.

IMP scientific findings have been significant and have contributed greatly to the understanding of the solar-lunar-terrestrial relationships. Key findings include:

* First accurate measurements of the interplanetary magnetic field.
* First mapping of the shock front boundary of the magnetosphere and the turbulent transition region -- the magnetopause -- behind the boundary.
* First detailed information on the magnetosphere tail region.

* First evidence of a magnetically neutral area in the magnetosphere tail -- called the neutral sheet -- caused by magnetic lines of force moving in opposite directions.
* First evidence of energetic electrons in the neutral sheet which may be the source of radiation causing the aurora as well as replenishment of the Van Allen radiation belts.
* First on-line interplanetary cosmic ray monitor. IMPs have been used as an early-warning system for Apollo astronauts against exposure to dangerously-high radiation doses resulting from a solar flare.

In addition, the IMP series has made major contributions to the following important engineering developments:

* The onboard data handling system -- the digital data processor -- which enables the experimenter to encode his data in the most efficient way while simplifying his experiment construction and spacecraft integration task.
* Metal oxide silicon field effect transistors (MOSFET) used for the first time in onboard data handling systems in space providing increased power with considerable decrease in weight.

The series of IMP spacecraft is part of the space exploration program directed by NASA's Office of Space Science. NASA's Goddard Space Flight Center, where the IMP spacecraft are constructed, is responsible for IMP project management. EMR-Aerospace Sciences, College Park, Md., performed spacecraft systems integration and assisted in environmental testing. McDonnell Douglas Astronautics Company, Huntington Beach, Calif., is prime contractor for the Delta launch vehicle.

One more mission is planned of this series, IMP-J. Plans have also been announced for a cooperative mission with the European Space Research Organization (ESRO) involving the launch of two Earth-orbiting spacecraft (mother/daughter) and a heliocentric spacecraft in the late 1970s. The mother/daughter spacecraft will make repeated passes through the boundaries of Earth's magnetic field to measure fine-scale and time variations while the interplanetary heliocentric spacecraft records simultaneous variations of the incoming solar wind.

The IMP-H spacecraft, including experiments, cost approximately $8 million; the Delta rocket and launch services, approximately $6.5 million.

The launch window on Sept. 21 opens at 9:22 p.m. EDT and extends to 9:43 p.m.

(END OF GENERAL RELEASE: BACKGROUND INFORMATION FOLLOWS)

THE IMP-H SPACECRAFT

The IMP-H spacecraft structure has several improvements and modifications which are based on advances in the state-of-the-art and new spacecraft requirements. Geometrically, the structure is a 16-sided drum measuring 135 centimeters (53 inches) in diameter and 157.5 centimeters (62 inches) high. The upper portion of the spacecraft contains an aluminum honeycomb shelf which supports the experiments and associated spacecraft electronics. The lower portion of the IMP-H has a 46-centimeter (18-inch) thrust tube to accommodate the solid propellant kick motor required for circularization of the orbit at the preselected time.

To satisfy stringent radio interference and thermal requirements, the experiment section is fully enclosed in a metallic cover and side panels. Three rings of solar arrays are used to power the experiments and electronics while the spacecraft is in orbit. Two of the rings are mounted above the experiment section and one ring below.

Attached to the exterior of the structure are two diametrically opposed experiment booms, each approximately three meters (10 feet) long and two attitude control system booms, each 1.2 meters (4 feet) long, spaced 90 degrees from the experiment booms. During the launch phase, these booms are folded alongside the spacecraft. Deployment occurs at a predetermined time and sequence and places sensitive magnetic and electric field detectors far from the spacecraft.

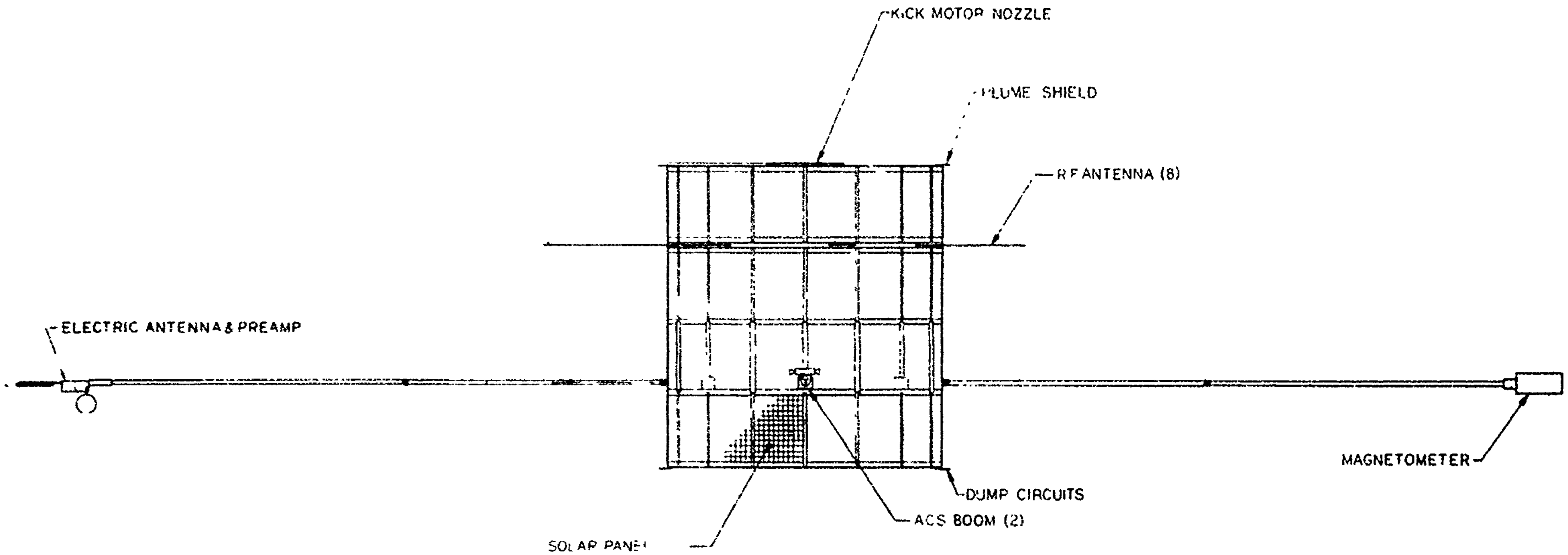
Eight small equally-spaced RF antennas (four active; four passive turnstyle type) extend radially from the IMP-H.

Attitude Control System

The IMP-H attitude control system (ACS) is a cold gas (Freon-14) monopropellant system that is used to orient the spacecraft spin-axis perpendicular to the eliptic plane. The ACS is also used to increase or decrease the spin rate of the spacecraft: prior to the kick-motor firing, if required 40 to 50 rpm; prior to boom deployment, 20 rpm; during normal mission lifetime, 46 rpm.

Optical Aspect System

The optical aspect system consists of a solar sensor, Earth telescope, and associated electronics that provide axis orientation data, spin rate data, and on-board Sun orientation pulses.



IMP-H General Layout

ENGINEERING TESTS

Thermal Coatings Engineering Test

The thermal coatings engineering test is designed to measure several thermal coatings for change in solar absorbency due to the space environment. The temperature of 12 samples, one of which is a black reference, will be monitored by thermistors and the results telemetered to the ground.

Data Systems Engineering Test

The objective of the data systems engineering test is to qualify a high data-rate capacity data multiplex unit (DMU) and a data processing unit (DPU) for use as the central data handling equipment on future IMP missions. The DMU and DPU and a power converter will be flown on IMP-H and will transmit PCM telemetry data via the analog transmitter.

Solar Cell Engineering Test

The purpose of the solar cell engineering test is to determine the operating efficiency of integral glass solar cells. The integral glass solar cells will be mounted on solar panels similar to those of the solar cells used to obtain operating power. The integral glass solar cells are the result of a new fabrication technique which reduces the time of fabrication and manufacturing costs significantly with no apparent loss of efficiency. The current from the integral glass solar cells and their temperature characteristics will be monitored and compared with those of the solar cells in use to determine the efficiency of the integral glass solar cells.

TELECOMMUNICATIONS

Telemetry Subsystem

The IMP-H telemetry system employs two transmitters and a convolutional encoder. Transmitter 1 is used exclusively to transmit convolutional coded or complement coded pulse coded modulation (PCM) data. Power output is 12 watts, and it operates on a frequency of 137.92 megahertz.

Transmitter 2 is used to transmit the range rate data and the special purpose split-phase PCM data from the Data Systems Engineering Test (DST) unit. It can also be used as a backup transmitter for PCM data if Transmitter 1 fails.

Command and Range Rate Subsystems

IMP-H has two command receivers, each operating at a frequency of 148.98 megahertz.

Receiver 1 is used to provide a ranging signal for Transmitter 2, a detected PCM signal for the ranging decoder and a detected AM signal for the PCM command decoder. Receiver 2 provides a detected AM signal for the sequential tone decoder.

Command Receiver 1 and Transmitter 2 provide for an exchange of range and range rate information between the spacecraft and the ground station.

SCIENTIFIC OBJECTIVES

Background

Earth is surrounded by an enormous teardrop-shaped envelope called the magnetosphere. The magnetosphere is formed by the solar wind -- a supersonic stream of particles -- "blowing," or impinging, on Earth's magnetic field. Within this region, complex electric and magnetic forces, invisible to the human eye, interact with one another and with all charged particles that enter the region. Charged particles move from one hemisphere to another in seconds. Electrons speed into the upper atmosphere of the Earth at thousands of miles per second to interact with atmosphere molecules and atoms to give off tremendous energies that form the auroras. Magnetic storms occur frequently, creating huge electric ring currents around the Earth, and often disrupt radio communications.

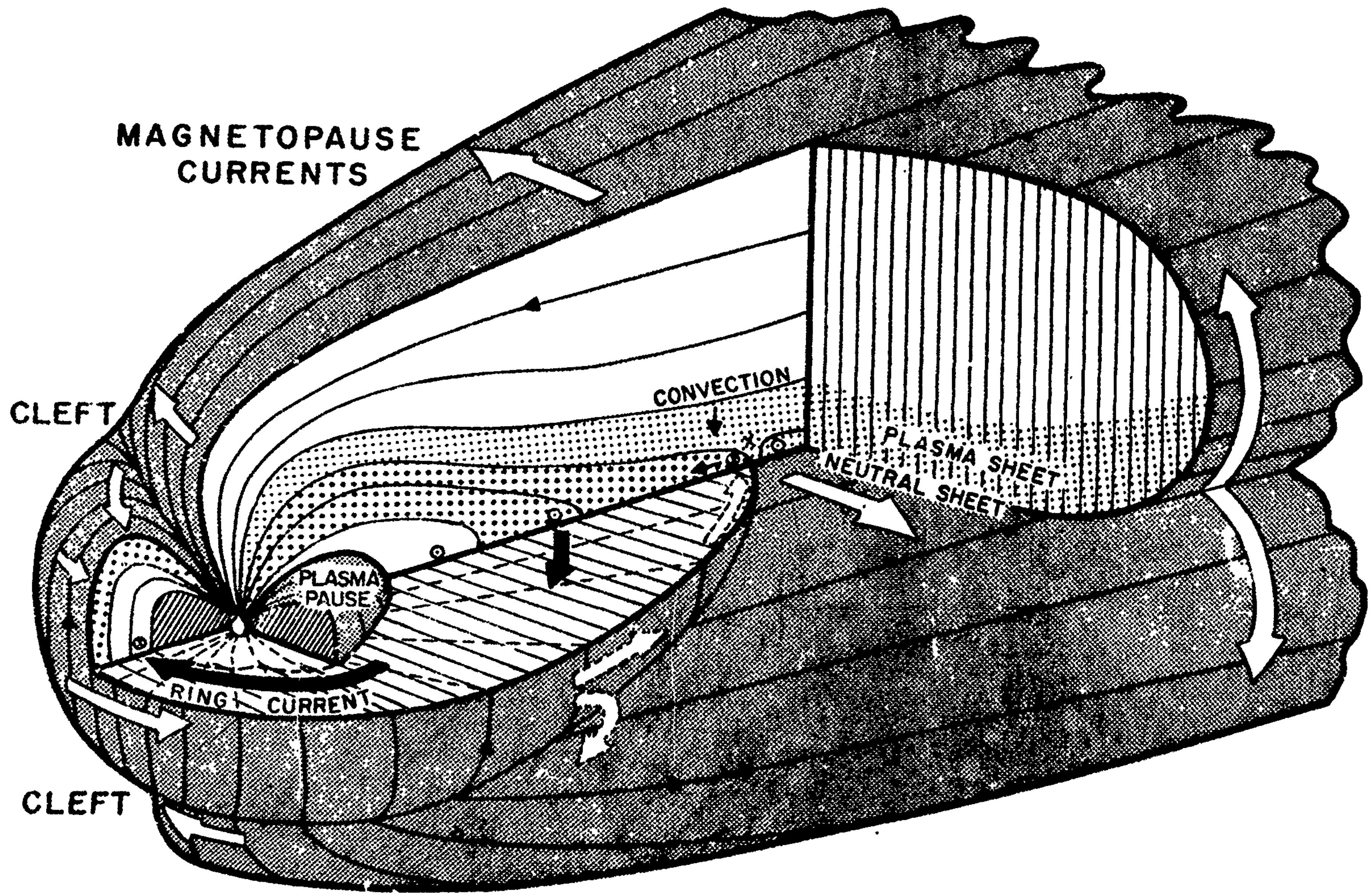
Such a complex, large scale phenomenon cannot be reproduced and studied in the laboratory. The only way of studying these actions and interactions taking place about Earth is to take direct measurements of the phenomenon.

Energetic Particles

The eight energetic particle experiments will provide additional information on the effects of cosmic rays that constantly bombard Earth and its protective shield. Cosmic rays come from deep space (galactic cosmic rays) and from the Sun (solar cosmic rays). They are high energy particles consisting primarily of protons (high energy hydrogen nuclei), alpha particles (helium nuclei), and heavier nuclei.

Cosmic rays are very powerful, some carrying energies ranging from a million to a billion-billion electron volts. Some cosmic rays are so powerful they can penetrate a one-meter (three-foot) lead wall.

It isnnot clearly understood what produces galactic cosmic rays. The energy, present at all times in the solar system, easily penetrates Earth's magnetic field. Only during periods of intense solar activity does the rate of penetration decrease. Called the Forbush decrease, this is observed when a large solar flare occurs on the Sun. Scientists believe that the magnetic field lines in the tongue of plasma from the solar disturbance are so strong that the galactic cosmic rays are deflected away. Data from earlier IMP spacecraft have shown that during periods of minimum solar activity in the Sun's 11-year cycle the flow of galactic cosmic radiation tends to increase.


MAGNETOPAUSE CURRENTS
CLEFT
CONVECTION
PLASMA SHEET
NEUTRAL SHEET
PLASMA PAUSE
RING CURRENT
CLEFT

-more-

It is also known that the intensity of cosmic radiation varies with the latitude on Earth, being more intense at the poles.

Solar cosmic rays have less energy than galactic cosmic rays composition. They stream from the Sun during periods of high solar activity and produce clouds of highly charged particles that are ejected into the solar system. Those rays that reach Earth, in particular the protons, interact with the atmosphere and are responsible for auroral displays, radio blackouts, magnetic storms, and other phenomena.

The Solar Plasma

The solar plasma or solar wind is the constant stream of charged particles, traveling at supersonic speeds, that are emitted from the Sun. It is made up primarily of electrons and protons which impinge upon Earth's magnetosphere in about equal numbers.

The stream of the solar plasma striking the magnetosphere tends to compress the magnetic field on the side toward the Sun and distends the tail, or the side away from the Sun, to a distance of millions of miles. The shape of the field appears comet-like, giving the entire magnetosphere an aerodynamic form.

During periods of maximum solar activity, in the 11-year cyclic period of the Sun, the stream of solar plasma increases greatly. This brings about disruptive effects on short wave communications and undersea communication cables.

There is also a cycle of about 27 days corresponding to the rotation of the middle portion of the Sun's surface. Charged particles and a lesser number of heavy atomic nuclei are expelled at tremendous speeds.

Fields

Magnetic fields permeate the universe. In our solar system the Sun's magnetic field affects the movement of particles in space. Solar disturbances occuring periodically in the Sun can dramatically alter these magnetic and electric fields. It is believed that galactic magnetic fields also exist.

Earth also has its own magnetic field that is responsible for the magnetic shield around Earth. Many variations occur in this field system. Its configuration is in the form of a positive-negative field that can be detected for thousands of miles into space. The fact that variations move slowly westward indicates that Earth's crust and its molten, metallic core rotate at slightly different rates.

The IMP-H will provide additional information on Earth's main electric field of which there is limited knowledge presently.

IMP-H SCIENTIFIC EXPERIMENTS, ORGANIZATIONS, AND PRINCIPAL INVESTIGATORS

EXPERIMENT	CONTRIBUTING ORGANIZATION	PRINCIPAL INVESTIGATOR
	Energetic Particles	
Cosmic Ray	Goddard Space Flight Center	Dr. F.B. McDonald
Cosmic Ray	University of Chicago	Dr. J.A. Simpson
Energetic Particles	National Oceanic and Atmospheric Administration	Dr. D.J. Williams
Charged Particles	Applied Physics Laboratory/Johns Hopkins University	Dr. S.M. Krimigis
Electrons and Isotopes	California Institute of Technology	Dr. E.C. Stone
Ion and Electron	University of Maryland	Dr. G. Gloeckler
Solar Electrons	Goddard Space Flight Center	Dr. T.L.Cline
Low Energy Particles	University of Iowa	Dr. L.A. Frank
	Fields	
Magnetic Fields	Goddard Space Flight Center	Dr. N.F. Ness
Plasma Wave	TRW Systems Group, Inc.	Dr. F.L. Scarf
	Plasma	
Solar Wind	Los Alamos Scientific Laboratory	Dr. S.J. Bame
Solar Wind	Massachusetts Institute of Technology	Dr. H.S. Bridge
Ion Composition	Goddard Space Flight Center	Dr. K.W. Ogilvie

THE SCIENTIFIC EXPERIMENTS

Energetic Particles

Cosmic Ray. Provided by the Goddard Space Flight Center, this experiment is part of a systematic program to study solar and galactic electrons and nuclei throughout the solar cycle. Solar modulation, quiet-time and flare-associated anisotropies, solar and magnetospheric acceleration processes, and solar composition are among the subjects to be studied.

The experiment consists of four separate telescopes including scintillators, surface barrier, and lithium drifted silicon detectors. A unique priority system is employed to overcome the limitations of relatively low bit-rate during intense solar flares. Principal investigator is Dr. F. B. McDonald.

Cosmic Ray. Provided by the University of Chicago, this experiment is designed to study the solar flare particle acceleration and particle containment in the vicinity of the Sun. The instrument will measure energy spectra, nuclear composition and electrons over a wide range of energies and a wide dynamic range of fluxes. Principal investigator is Dr. J. A. Simpson.

Ion and Electron. Provided by the University of Maryland, the objective is to determine the composition and energy spectra of low energy particles observed during solar flares and "27 day" events. Special emphasis is placed on charge measurements and in particular those of positively charged particles in an energy band which has not been previously measured. The instrumentation can determine sign and magnitude of change, measure the energy of cosmic ray particles and uniquely identify positrons, electrons, protons, helium nuclei, and CNO nuclei. Principal investigator is Dr. G. Gloeckler.

Solar Electrons. Provided by the Goddard Space Flight Center, this experiment is to study solar flare X-rays and interplanetary electrons and positrons from the nonrelativistic to the relativistic region and to determine by means of their energy spectra, intensity, and variations with solar and magnetic activity whether they have cosmic ray characteristics. Another objective is to study shock, transition region, magnetospheric tail, and boundary electrons.

Two collimated electron detectors (scintillator and anti-correlation scintillator) mounted at right angles, with a single background detector mounted nearby, comprise the basic instrumentation. Principal investigator is Dr. T.L. Cline.

Electrons and Isotopes. Provided by the California Institute of Technology, this experiment is to study local acceleration of particles, solar particle acceleration processes, and storage in the interplanetary medium and to study the interstellar propagation and solar modulation of particles in the interplanetary medium. This will be accomplished by measuring the differential energy spectra of electrons and hydrogen and helium isotopes.

The instrumentation consists of a multi-element, totally depleted solid state telescope with anticoincidence shielding. The detector is specially designed to eliminate scattered electron efforts. Principal investigator is Dr. E.C. Stone.

Energetic Particles. Provided by the National Oceanic and Atmospheric Administration, this experiment is to study the propagation characteristics of solar cosmic rays through the interplanetary medium over the energy ranges indicated, to study electron and proton patches throughout the geomagnetic tail and near and through the flanks of the magnetopause, and to study the entry of solar cosmic rays into the geomagnetic field by utilizing comparisons with similar data from the TIROS series of satellites. The instrumentation consists of a three-element telescope configuration employing solid state detectors and a magnetic field to deflect electrons. Two side-mounted detectors are used to detect the electrons deflected by the magnet. Principal investigator is Dr. D.J. Williams.

Charged Particles. Provided by the Johns Hopkins University (Applied Physics Laboratory), the main objective of the charged particle measurements experiment (CPME) is to measure protons, alpha particles, heavier nuclei, and X-rays in a wide energy interval, primarily designed to study radiations of solar origin, but with sufficient dynamic range and resolution to measure cosmic ray and magnetospheric tail particles. The experimental data will be used to study angular distributions, energy spectra, propagation characteristics, and absolute intensities of particles emitted from the Sun, as well as those streaming along the magnetospheric tail away from Earth. Solar X-ray emissions will be studied at two wavelengths and a large Geiger-Muller tube will be used to obtain information on galactic X-ray sources. Principal investigator is Dr. S.M. Krimigis.

Plasma

Plasma. Provided by the Massachusetts Institute of Technology, this experiment is developed to measure the properties of the plasma in the interplanetary region in the transition region, and in the tail of the magnetosphere. The parameters measured are the energy distribution and the angular distribution of the charged particle flux for electrons in the equatorial plane of the spacecraft. The flow direction relative to the spacecraft equatorial plane is also determined.

A split collector "Faraday cup" (split about the equatorial plane of the spacecraft) with a modulation potential applied to one of the grids is the basic instrumentation. Principal investigator is Dr. H.S. Bridge.

Low Energy Particles. Provided by the University of Iowa, this experiment is designed to study the differential energy spectra of low energy electrons and protons measured over the geocentric radial distance of 40 Earth radii to increase our understanding of geomagnetic storms, aurora, tail and neutral shield, and other magnetospheric phenomena. Principal investigator is Dr. L. A. Frank.

Ion Composition. Provided by the Goddard Space Flight Center, the object of this experiment is to measure the ion composition of the solar wind and relate the information to the temperature and composition of the solar corona and photosphere. The experiment will also investigate plasma energization processes. The instrument measures mass-to-charge ratio and energies of solar wind ions with velocities between 200 and 600 kilometers (120 and 360 miles) per second. The heavy ions of helium and oxygen are identified. Principal investigator is Dr. K. W. Ogilvie.

Plasma. Provided by the Los Alamos Scientific Laboratory, AEC, the experiment is to make a comprehensive study of electrons and positive ions in the regions of space traversed by IMP-H and to coordinate them with the magnetometer and other scientific data. The instrument is capable of resolving ions at least as heavy as oxygen and identifying their separation in the energy per charge spectrum when solar wind ion temperatures are low. A plasma analyzer consisting of a set of hemispherical analyzer plates and an electron multiplier together with associated detector electronics, voltage supplies, and logics is employed for measurement. Principal investigator is Dr. S. J. Bame.

Fields

Magnetic Fields. Provided by the Goddard Space Flight Center, this package will measure the vector magnetic field in three dynamic ranges. The sensors will be located at the end of a 305-centimeter (10-foot) boom. The three sensors will allow study of the interplanetary magnetic field, Earth's magnetic tail, and the interaction of the solar wind with the geomagnetic field. Principal investigator is Dr. Norman F. Ness.

Plasma Wave. Provided by the TRW Systems Group, this experiment will measure two components of the vector electric field and one component of the vector magnetic field in eight discrete frequency intervals. A 61-centimeter (24-inch) electric dipole antenna and an 18-centimeter (7-inch) magnetic loop antenna mounted on a 305-centimeter (10-foot) boom. The electric and magnetic field components of plasma waves in the solar wind, in the bow stock and transition regions, and in the geomagnetic tail will be measured and the results correlated with particle data taken from other spacecraft instruments. Principal investigator is Dr. F. L. Scarf.

IMP SERIES STATUS

SPACECRAFT	APOGEE IN EARTH RADII/ KILOMETERS/STATUE MILES	INCLINATION (degrees)	PRINCIPAL DATA COVERAGE
IMP-A EXPLORER 18	31.7 Re 202,000 km 125,000 mi.	33.3	11/27/63-5/6/64
IMP-B EXPLORER 21	15.9 Re 101,300 km. 63,000 mi	33.5	10/4/64 - 4/9/65
IMP-C EXPLORER 28	41.5 Re 264,400 km. 164,300 mi.	33.9	5/29/65 - 5/12/67
AIMP-D EXPLORER 33	71.6 Re 456,200 km 283,500 mi.	28.5	8/1/66 - 10/15/71
AIMP-E EXPLORER 35	Lunar Orbit	169.0	7/19/67 - Present
IMP-F EXPLORER 34	35.4 Re 225,500 km. 140,100 mi.	66.5	5/24/67 - 5/3/69
IMP-G EXPLORER 41	35.4 Re 182,800 km. 113,600 mi.	86.8	6/21/69 - Present
IMP-I EXPLORER 43	32.3 Re 205,800 km. 127,200 mi.	28.6	3/13/71 - Present

IMP-H MISSION FACTS AT A GLANCE

Launch:	From Complex 17, Eastern Test Range, Cape Kennedy, Fla.
Launch Vehicle:	Three-stage Delta rocket with six solid-motor thrust augmenters.
Orbit:	Apogee: 248,500 kilometers (154,500 miles) Perigee: 203,900 Kilometers (126,700 miles) Period: About 13 days Inclination: 28.8 degrees
Operating lifetime:	At least one year.
Spacecraft weight:	390 kilograms (860 pounds)
Structure:	Drum-shaped, 16-sided, measuring 158 centimeters (62 inches) high and 136 centimeters (53.4 inches) in diameter. Consists of an aluminum honeycomb shelf supported by struts and a 46-centimeter (18-inch) diameter thrust tube, 38 centimeters (15 inches) deep. The experiment section is enclosed by metallic cover and side panels.
Appendages:	Two diametrically opposed experiment booms, 305 centimeters (10 feet) long and two attitude control system booms spaced 90 degrees from the experiment booms, 122 centimeters (48 inches) long. Eight radio frequency antennas.
Power System:	Three rings of solar panels on the outer surface of the spacecraft. Provides 130 watts of power at 28 volts during normal spacecraft operation.
Communications and Data Handling	
Telemetry:	Pulse-Coded Modulation (PCM) operating at 137.920 megahertz, 12 watts.

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Encoder and Digital Data Processor:	PCM with digital data storage capability.
Tracking and Data Acquisition:	Stations of the Spaceflight Tracking and Data Network (STDN) operated by the Goddard Space Flight Center.

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TRACKING AND DATA OPERATIONS

The Spaceflight Tracking and Data Acquisition Network (STDN) will provide necessary support for the IMP-H mission. Range and Range Rate systems located at Carnarvon, Australia; Tananarive, Malagasay Republic; Rosman, N.C.; Santiago, Chile; and Fairbanks, Alaska will interrogate the spacecraft. STDN minitrack stations will track only during the early orbit phase while the spacecraft signal is of sufficient strength.

STDN stations at Canberra, Australia; Quito, Ecuador; Rosman, N.C.; and Johannesburg, South Africa will be used to transmit PCM commands to IMP-H in addition to providing telemetry recording coverage.

The STDN stations are scheduled to provide 100-percent telemetry recording coverage, whenever possible, throughout the active lifetime of the spacecraft.

Real time support of spacecraft operations and processing of the scientific data is handled by Mission and Data Operations.

The STDN and Mission and Data Operations are managed by the Goddard Space Flight Center for NASA's Office of Tracking and Data Acquisition.

DELTA LAUNCH VEHICLE

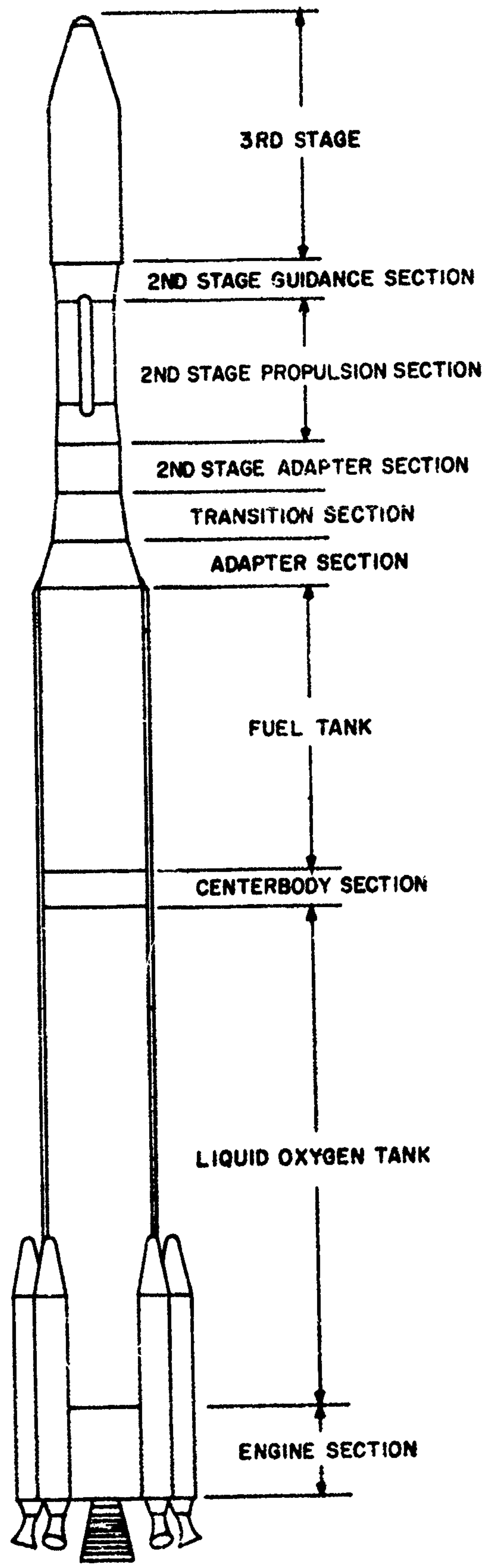
The IMP-H will be launched from the Eastern Test Range, Cape Kennedy, Fla., aboard a three-stage Delta rocket. The launch vehicle, Delta #90; is 35.4 meters (116 feet) tall, has a diameter of 2.4 meters (8 feet), and weighs approximately 132,000 kilograms (262,000 pounds) at liftoff.

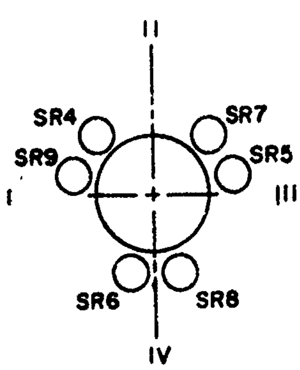
The first stage of the launch vehicle is a modified Thor booster incorporating six Castor strap-on solid fuel rocket motors. The main engine is gimbal mounted to provide pitch and yaw control from liftoff to main engine cutoff. Two vernier engines provide roll control.

The second stage is powered by a liquid-fuel, pressure-fed engine, also gimbal-mounted, to provide pitch and yaw control through second stage burn. A nitrogen gas system provides roll control during powered and coast flight, as well as pitch and yaw control after the second stage cutoff.

The third stage is a spin-stabilized, solid-propellant motor to which the IMP-H is attached.

The Delta vehicle will inject the spacecraft into a transfer orbit approximately 248 kilometers (154 miles) by 40 Earth radii, or 254,800 kilometers (150,000 miles). Then 2.5 days or 7.5 days later at the apogee of the first or second transfer orbit the kick motor aboard the IMP-H will be fired to place the IMP-H into its final, near circular orbit approximately 39 Earth radii, or 248,500 kilometers (154,000 miles), by 32 Earth radii, or 203,900 kilometers (127,000 miles).





LOOKING FORWARD

Launch Vehicle

SEQUENCE OF FLIGHT EVENTS

Events	Time after liftoff (Minutes:seconds)
Liftoff	0:00
Castor motor ignition	0:00
Castor motor burnout	0:38
Solid motor separation	1:15
Main engine (first stage) cutoff (MECO)	4:25
First/second stage separation	4:33
Second stage ignition	4:37
Jettison protective fairing	4:55
Second stage engine cutoff (SECO)	10:02
Start coast pitch program	10:10
End coast pitch program	11:50
Start spin rockets	15:25
Second/third stage separation	15:27
Third stage ignition	15:40
Third stage burnout	16:20
Spacecraft separation	18:05

Spacecraft kick motor ignition	2.5 or 7.5 days

IMP-H PROGRAM OFFICIALS AND CONTRACTORS

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
Dr. L.D. Kavanagh, Jr.	IMP-H Program Scientist
Joseph B. Mahon	Director of Launch Vehicle and Propulsion Program
R.W. Manville	Manager, Small Launch Vehicles and International Projects
I.T. Gillam IV	Delta Program Manager

GODDARD SPACE FLIGHT CENTER

Dr. John F. Clark	Director
Robert E. Bourdeau	Director of Space Applications and Technology
Robert C. Baumann	Assistant Director for Support (Acting)
Mr. Paul Butler	Project Manager
Mr. Jeremiah Madden	Assistant Project Manager
Dr. Norman Ness	Project Scientist

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Dr. James Trainor	Assistant Project Scientist
Mr. William Limberis	Spacecraft Manager
Mr. Martin Davis	Experiment Manager
Mr. Stephen Paddack	Project Operations Director
Mr. Leonard Ripley	T&E Test Manager
Mr. Ernest Doutrich	Quality Assurance
Mr. Ton Eng	Mechanical Systems
Mr. Theodore Goldsmith	Electrical Systems
Mr. William Schindler	Launch Vehicle Manager
Mr. Thomas Moore	Mission Operations System Manager
Mr. John Quill	Network Support Manager
Mr. Robert Coady	Flight Director
Mr. Daniel Muhonen	Mission Analyst

KENNEDY SPACE CENTER

Dr. Kurt H. Debus	Director
John J. Nelson	Director, Unmanned Launch Operations
Hugh A. Weston, Jr.	Manager, Delta Launch Operations

CONTRACTORS

IMP-H -- EMR-Aerospace Sciences, College Park, Md., performed spacecraft systems integration and assisted in environmental testing.

Delta Launch Vehicle -- McDonnell Douglas Astronautics Co., Huntington Beach, California

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