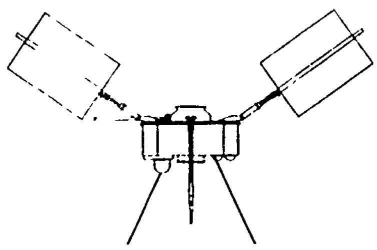
PIA-10107

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546
TELS. WO 2-4155
WO 3-6925

FOR RELEASE: SUNDAY
June 15, 1969

RELEASE NO: 69-89

P R E S S   K I T



PROJECT: IMP-G

(To be launched no earlier than June 18, 1969)

contents

6/7/69

NEWS

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

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: SUNDAY
June 15, 1969

RELEASE NO: 69-89

SEVENTH IMP SATELLITE

The seventh spacecraft in the Interplanetary Monitoring Platform (IMP) series will be launched by the National Aeronautics and Space Administration no earlier than June 18, 1969, from the Western Test Range, Lompoc, Calif.

Called IMP-G (to be designated Explorer 41 when successfully orbited) the 174-pound automated scientific laboratory will carry 12 individual experiments designed to study solar plasma, magnetic fields and cosmic rays. This is the greatest number of experiments ever carried by an IMP spacecraft.

A thrust-augmented Delta rocket will be used to launch the spin-stabilized IMP-G into a near-polar Earth orbit ranging from about 135,000 statute miles at apogee to a low point of about 215 miles. Inclination will be about 85 degrees to the Equator with a planned orbital period of about four days.

-more-

6/7/69

IMP-G is designed for a useful operating life-time of one year, although the mission will officially be considered successful if proper orbit and scientific data return are achieved.

As the seventh of ten programmed spacecraft in the interplanetary monitoring platform series, IMP-G is designed to continue the basic scientific study program during a period of intense solar activity. IMP-G primary objectives include:

* Continued study of the radiation environment of cis-lunar space (between Earth-Moon) begun with the launching of IMP I (Explorer 18) in 1963.

* Study of the characteristics of the interplanetary magnetic field and how it is affected by variations in the solar wind.

* Continue to help in development of a solar flare monitoring capability by NASA.

(IMP-F, Explorer 34, supported Apollo missions 8 and 9 by providing real time solar radiation data to Mission Control Center in Houston. IMP-G will provide similar support for Apollo 11.)

* Continue state-of-the-art development of comparatively inexpensive spin-stabilized satellites for interplanetary investigations.

Especially significant scientific information about the Earth's magnetosphere has come from scientific experiments flown on the six previous IMP spacecraft. Studies of the boundary of the transition region between the Earth's magnetosphere and interplanetary space have been particularly valuable.

The Earth's magnetosphere is a huge, comet-shaped envelope surrounding the Earth which contains the Van Allen radiation belts. It is formed by the Earth's magnetic field. Action of the solar wind tends to compress the Sun side of the magnetosphere, while the portion behind the Earth, away from the Sun, is distended and trails off behind the Earth for several million miles much like a comet tail.

The IMP series has provided the first accurate measurements of the interplanetary magnetic field, the magnetosphere boundary, and the so-called collisionless magnetohydrodynamic shock wave associated with the interaction of the solar wind and the Earth's magnetic field.

Measurements of the magnetosphere tail on the antisolar side have permitted detailed mapping of this region of the Earth's magnetic field for the first time. Also discovered in the magnetosphere tail region has been the neutral sheet--a magnetically neutral area caused by lines of force oppositely directed.

This unusual neutral region apparently is populated with energetic electrons which may be the source of radiation causing the aurora as well as replenishment of the Van Allen radiation belts.

IMP-E, Explorer 35, which was placed in lunar orbit in July of 1967 made significant contributions to scientific knowledge and understanding of the lunar and interplanetary environment. Major findings were that positive ions from the solar wind crash directly into the lunar surface and that a solar wind void exists directly behind the Moon.

The findings helped scientists to deduce information on the electrical conductivity and the internal temperature of the Moon.

The IMP-G mission represents a cooperative effort between scientists from U.S. universities, industry and Government research facilities. These include the Goddard Space Flight Center; the Universities of California, Chicago and Maryland; the State University of Iowa; the Graduate Research Center of the Southwest and the Applied Physics Laboratory of Johns Hopkins University. The Bell Telephone Laboratories, Inc., is the industrial firm represented on the mission.

The IMP series is part of the space exploration program directed by NASA's Office of Space Science and Applications. NASA's Goddard Space Flight Center, Greenbelt, Md., manages the project. The spacecraft is designed, built and tested at Goddard. Integration of IMP-G experiments was accomplished by Electro-Mechanical Research, Inc., College Park, Md.

Prime contractor for the three-stage Delta launch vehicle is the McDonnell-Douglas Astronautics Co., Santa Monica, Calif.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS)

MAJOR SCIENTIFIC ACHIEVEMENTS OF IMP SERIES

A IMP A — DISCOVERED EARTH'S BOW SHOCK

B IMP-B — DETAIL STUDY OF TRANSITION REGION BETWEEN BOW FRONTS & MAGNETO-PAUSE

C IMP C — SOLAR CYCLE CHANGES IN PROPERTIES OF INTERPLANETARY MEDIUM

D IMP-D — EXPLORATION OF EARTH'S MAGNETIC TAIL

E IMP-E — DEFINITION OF LUNAR PLASMA ENVIRONMENT

F IMP-F — VERIFICATION OF SOLAR WIND HELIUM CONTENT

THE IMP-G SPACECRAFT

The IMP-G is essentially a compact, unmanned physics laboratory weighing about 174 pounds. It is a spin-stabilized satellite, similar in design to the six previous spacecraft launched in the series. Its electronic system makes extensive use of microelectronics.

The basic structure of the IMP-G is an octagon platform 10 inches in height and about 28 inches in diameter. All but one of the 12 on board experiments are carried inside this platform along with the spacecraft's electronics.

The remaining experiment, a fluxgate magnetometer, is carried on a six-foot-long fiberglass boom which extends out from the satellite's base.

Telemetry

Data collected by the satellite's experiments is transmitted continuously. It is recorded by the world-wide Space Tracking and Data Acquisition Network (STADAN) operated by the Goddard Space Flight Center. The telemetry transmitter onboard the IMP-G operates at a frequency of 136.080 MHz, with a normal power output of four watts. The command system capability is 29 commands from ground stations.

Four 16-inch telemetry antennas are affixed to the top of the spacecraft body about 90 degrees apart, each extending outward at an angle of 45 degrees.

Power Supply

The IMP-G power source is solar power. The o,144 solar cells carried on the spacecraft's four solar panels convert energy from the Sun to supply a nominal average of 70 watts and a minimum of 47 watts after one year. About 15 watts of power are required to operate the experiments.

A vital part of the power package on this spacecraft is a battery pack which supplies power during periods of peak power and when the spacecraft is not in the sunlight. This pack contains 13 silver-cadmium batteries, each of which has a five ampere-hour storage capability. This is sufficient to operate the spacecraft for two hours without recharge.

IMP-G EXPERIMENTS

The 12 scientific experiments carried by IMP-G weigh slightly more than 60 pounds--up about eight pounds from IMP-F (Explorer 34), which carried 11 experiments. The IMP-G experiment categories are magnetic fields (one experiment), solar and galactic cosmic radiation (eight experiments) and solar plasma (three experiments).

The Magnetic Field Experiment

The IMP-G carries a three-axis fluxgate magnetometer, the basic device for measuring magnetic fields. It was provided by the Goddard Space Flight Center, with Dr. Norman F. Ness as chief experimenter. The device is designed to measure the direction and magnitude as well as the fluctuations of these components of the interplanetary magnetic field, the Earth's magnetic tail field and the magnetic field of the Earth's magnetosphere.

This magnetometer is a dual-range device operated automatically in flight. A low range of this instrument measures the weaker magnetic fields farther out from the Earth and a higher range operates when the spacecraft is near the Earth where the fields are stronger. An integral part of this experiment is an auto-correlation computer housed in the spacecraft body. The experiment weighs slightly more than 12 pounds including the booms.

Galactic and Solar Cosmic Ray Experiments

This category includes the largest number of experiments--eight--carried by IMP-G. They are:

1. Range Versus Energy Loss - A solid state cosmic ray detector provided by the University of Chicago, with Dr. John A. Simpson as chief experimenter. It is designed to make definitive measurements of both galactic and solar cosmic ray particles when the Sun is most active.

This experiment continues the interplanetary and magnetospheric measurements conducted by similar cosmic ray experiments onboard four earlier IMP spacecraft. It weighs about 11 pounds.

2. Energy Versus Energy Loss - The Goddard Space Flight Center provided this experiment with Dr. Frank B. McDonald the experimenter. Dr. McDonald is also IMP Project Scientist. It is a solid state detector designed to make essentially the same measurements as the Range Versus Energy Loss experiment. This experiment weighs about 8 1/2 pounds.

3. Low Energy Proton and Alpha Detector - Provided by the Goddard Space Flight Center, also with Dr. McDonald as the experimenter. It is designed to measure galactic and solar cosmic ray flux levels, particularly at low energies. Weight of this device is four pounds.

4. Ion Chamber - Designed and built by the University of California (Berkeley) under Dr. Kinsey Anderson, this experiment serves as a basic monitor of solar cosmic rays. It is also sensitive to solar electron events. The experiment will provide further information on the description of energetic particle populations in and beyond the Earth's outer magnetosphere as well as the dynamic processes that influence these populations and their relation to the solar phenomena. It weighs about 2 1/2 pounds.

5. Low Energy Solar Flare Electron Detector - This new experiment for the IMP program was designed by the University of California (Berkeley) under the chief experimenter Dr. R. Lin. It will measure solar-flare electron fluxes in specific regions and thereby complement the University of California ion chamber experiment described above.

It consists of a parallel-plate electric field analyzer and two funnel-shaped multipliers for the electron detectors. The device is small and weighs just a little more than one pound.

6. Solar Proton Monitoring Experiment - The Applied Physics Laboratory and the Goddard Space Flight Center share in the contribution of this experiment. Co-experimenters are Dr. C. Bostrom of APL and Dr. Donald J. Williams of Goddard.

This experiment is also a basic monitoring device for solar protons. It is a simple device designed to operate outside the Earth's magnetosphere and does not have to screen out a background flux of high energy electrons. It weighs about 3 1/2 pounds.

7. Cosmic Ray Anisotropy - Provided by the Southwest Center for Advanced Studies, under chief experimenter Dr. K. G. McCracken. It is a combination solid state detector and a scintillation counter designed to measure the anisotropy or angular distribution of solar cosmic rays. Information from this experiment will contribute to a study of the large scale features of the interplanetary field. It weighs five pounds.

8. Low Energy Telescope - Provided by the Bell Telephone Laboratories, Inc., with Dr. W. L. Brown as the experimenter. It consists of an array of solid state detectors designed to measure electrons and protons in the energy range of 500 kilo-electron volts to 10 milli-electron volts. The low energy telescope weighs almost four pounds.

Solar Plasma Experiments

IMP-G carries three solar plasma experiments.

1. Plasma Experiment - The Goddard Space Flight Center and the University of Maryland jointly provided this experiment with co-experimenters Dr. T. D. Wilkerson of Maryland and Dr. K. W. Ogilvie of Goddard. It is designed to determine the composition and energy distribution of hydrogen and helium ions in the solar wind and in the transition zone between the wind and the Earth's magnetosphere. It weighs about six pounds.

2. Low Energy Proton and Electron Differential Energy Analyzer #1 - The State University of Iowa provided this experiment, with Dr. James A. Van Allen and Dr. L. A. Frank as experimenters. It is a particle detector designed to measure the energy and directivity of electrons and protons in the energy range of 100 electron volts to 50 kilo-electron volts. This range permits the instrument to measure low energy particles from the Sun and in the magnetosphere as well as the solar wind.

A further purpose is to make an extensive search for large-intensity, low-energy protons in the energy range of 10 to 100 kilo-electron volts at a distance from the Earth of 4,000 to 24,000 miles. It weighs about 2 1/2 pounds.

3. Low-Energy Proton and Electron Differential Energy Analyzer #2 - A modification to the University of Iowa experiment, this device weighs almost four pounds. It is provided by Dr. L. A. Frank, the experimenter. It is designed to measure energy and angular distribution of low-energy positive ions over an energy range of from 90 electron volts up to 12 kilo-electron volts. It uses curved plate electrostatic analyzers.

THE DELTA LAUNCH VEHICLE

NASA's improved Delta launch vehicle will be used to boost the IMP-G into orbit. This vehicle includes a thrust-augmented Thor first stage, the enlarged Delta second stage, and the FW-4 third stage. It is known as the Thrust-Augmented Improved Delta (TAID).

Project management of the Delta launch vehicle is vested in the Goddard Space Flight Center, Greenbelt, Md. Prime contractor is the McDonnell-Douglas Astronautics Co., Santa Monica, California.

Delta Statistics

The three-stage Delta for the IMP-G mission has the following characteristics:

Height: 92 feet (includes shroud)

Maximum Diameter: 8 feet (without attached solids)

Liftoff Weight: About 75 tons

Liftoff Thrust: 333,820 pounds (including strap-on solids)

First Stage (liquid only): Modified Air Force Thor, produced by McDonnell-Douglas Astronautics Co., engines produced by Rocketdyne Division of North American Aviation.

Diameter: 8 feet

Height: 51 feet

Propellants: RP-1 kerosene is used as the fuel and liquid oxygen (LOX) is utilized as the oxidizer.

Thrust: 172,000 pounds

Weight: Approximately 53 tons

Strap-on Solids: Three solid propellant Sergeant rockets produced by the Thiokol Chemical Corp.

Diameter: 31 inches

Height: 19.8 feet

Weight: 27,510 pounds (9,170 each)

Thrust: 161,820 pounds (53,940 each)

Second Stage: Produced by the McDonnell-Douglas Astronautics Co., utilizing the Aerojet-General Corp. AJ10-118 propulsion system. Major contractors for the auto-pilot include Minneapolis-Honeywell, Inc.; Texas Instruments, Inc.; and Electrosolids Corp.

Propellants: Liquid -- Unsymmetrical Dimethyl Hydrazine (UDMH) for the fuel and Inhibited Red Fuming Nitric Acid (IRFNA) for the oxidizer.

Diameter: 4.7 feet (compared to 2.7 feet for the earlier Deltas)

Height: 16 feet

Weight: 6 1/2 tons (compared to 2 1/2 tons for the earlier Deltas)

Thrust: about 7,800 pounds

Guidance: Western Electric Co.

Third Stage: United Technology Corp., FW-4

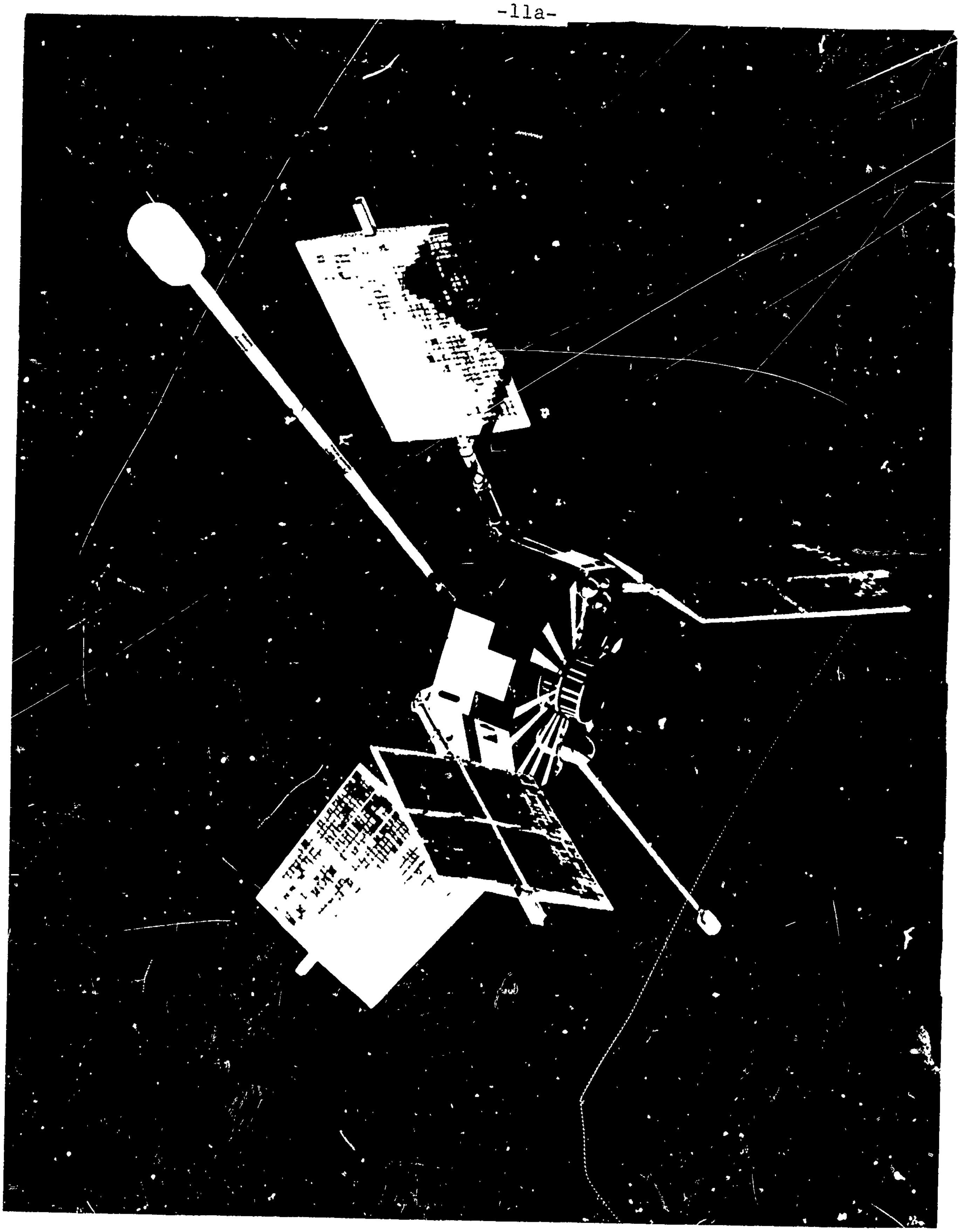
Thrust: 5,450 pounds

Fuel: solid propellant

Weight: about 660 pounds

Length: about 62 inches

Diameter: 19.6 inches



IMP-G PROJECT OFFICIALS, EXPERIMENTERS, AND MAJOR CONTRACTORS

NASA Headquarters

Dr. John E. Naugle, Associate Administrator for Space Science and Applications
Jesse E. Mitchell, Director, Physics and Astronomy Programs
Tom Fischetti, Program Manager, Geophysical Observatories
Frank W. Gaetano, IMP Program Manager
Dr. A. Schardt, Program Scientist
I.T. Gillam IV, Delta Program Manager

Goddard Space Flight Center

Paul Butler, Project Manager
Dr. Frank B. McDonald, Project Scientist
Benjamin H. Ferer, Assistant Project Manager
Curtis M. Stout, Tracking and Data Scientist
William B. Schindler, Delta Project Manager

Kennedy Space Center

Robert H. Gray, Assistant Director, Unmanned Launch Operations, Kennedy Space Center
Henry R. Van Goey, Manager, Unmanned Launch Operations, Kennedy Space Center, Western Test Range Operations Division

Principal Investigators

Dr. W. L. Brown, Bell Telephone Laboratories, Inc., Low Energy Telescope
Dr. K. A. Anderson, University of California (Berkeley), Ion Chamber
Dr. J. A. Simpson, University of Chicago, Range Versus Energy Loss
Dr. J. A. Van Allen, State University of Iowa, Low Energy Proton and Electron Differential Energy Analyzer #1
Dr. L. A. Frank, State University of Iowa, Low Energy Proton and Electron Differential Energy Analyzer #2

Dr. K.G. McCracken, Graduate Research Center of the Southwest, Cosmic Ray Anisotropy

Dr. Carl Bostrom, Applied Physics Laboratory Solar Proton Monitoring Experiment

Dr. K.W. Oglivie, Goddard Space Flight Center, and Dr. T. D. Wilkerson, University of Maryland, Plasma Experiment

Dr. F.B. McDonald, Goddard Space Flight Center, Low Energy Proton and Alpha Detector

Dr. Frank B. McDonald, Goddard Space Flight Center, Energy Versus Energy Loss and Low Energy Proton and Alpha Detector

Dr. Norman F. Ness, Goddard Space Flight Center, Magnetic Field Experiment

Dr. R. Lin, University of California (Berkeley) Low Energy Solar Flare Electron Detector.

Major Contractors

Electro-Mechanical Research, Inc., College Park, Md. Spacecraft Integration

McDonnell-Douglas Astronautics Co., Santa Monica, Calif. Delta Rocket

IMP-G FACT SHEET

Launch: From Space Launch Complex 2, North Vandenberg AF Base, Calif. Western Test Range

Launch Rocket: Thrust Augmented Improved Delta (TAID)

Orbit:

Apogee:	135,000 statute miles
Perigee:	215 statute miles
Period:	Four days
Inclination:	85 degrees

Design Lifetime: One year

Spacecraft Weight: 174 pounds, including about 60 pounds of experiments

Main Structure: Octagon shape, 28 inches in diameter

Appendages: Four rectangular-shaped solar panels
Four transmitting antennas, 16 inches long
Two hinged magnetometer booms about six feet long

Power System: Power Supply: 6,144 Solar cells mounted on four panels to supply minimum average power of 70 watts with one silver cadmium battery pack capable of supplying 45 watts of power for two hours

Power Requirements: 35 watts average

Communications and Data-Handling System:

Telemetry: Pulsed-frequency modulation (PFM)

Transmitter: Four-watt output at a frequency of 136,080 MHz mc

Encode: PFM with digital data processor (DDP) for accumulation and storage of data

Tracking and Data Acquisition Stations: Stations of the world-wide Space Tracking and Data Acquisition Network (STADAN) operated by Goddard Space Flight Center

-end-