NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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NASA NEWS

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PRESS KIT

PROJECT: HEOS-A2

contents

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NASA TO LAUNCH EUROPEAN SPACECRAFT

Another European satellite will be launched this month by the National Aeronautics and Space Administration on a reimbursable basis. The launch of the European Space Research Organization's (ESRO) Highly Eccentric Orbit Satellite (HEOS-A2) is scheduled no earlier than January 30, from the Western Test Range, Lompoc, Calif.

The HEOS-A2 will expand man's knowledge of the magnetosphere, the hugh teardrop-shaped envelope surrounding the Earth. It is formed by the solar wind "blowing" on the Earth's magnetic field. The HEOS spacecraft, with its highly elliptical polar orbit, will travel through a region of the magnetosphere described as the northern neutral point where it is believed that particles enter from interplanetary space.

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This possible entry point for particles suggests that the magnetosphere differs in configuration between the high latitudes and the lower latitudes. The HEOS-A2 is the first spacecraft to investigate the high latitude portion of the magnetosphere.

A three-stage Delta rocket will be used to place the spacecraft into a highly elliptical orbit of approximately 409 kilometers (253 statute miles) by 245,150 kilometers (151,995 statute miles) at an inclination of 90 degrees.

After entering orbit the spacecraft (HEOS-2 in orbit) will study interplanetary physics and the high latitude magnetosphere. The spacecraft carries seven experiments to investigate the strength and direction of the magnetic fields encountered, the energy distribution of protons and electrons, the nature of the solar winds, make very low frequency (VLF) solar observations and detect micrometeorites.

The nature of the experiments requires that the spacecraft be placed into the highly elliptical polar orbit with an apogee of approximately 38 Earth radii, outside the Earth's magnetosphere and shockwave, and have a one-year minimum operational lifetime.

ESRO will reimburse NASA approximately $6.6 million for the cost of the Delta launch vehicle and for required pre-launch and launch support services.

The HEOS is a 16-sided cylinder weighing 117 kilograms (257 pounds). Approximately 70 percent of its outer surface is covered by solar cells. A tripod-type boom is located on the upper part of the spacecraft. It supports a magnetic field sensor and the RF antenna.

During normal spacecraft operations, following insertion into the planned orbit, HEOS will be controlled from the European Space Operations Centre (ESOC), Darmstadt, West Germany. Spacecraft tracking, data acquisition and command operations will be performed by the European Space Tracking Stations (ESTRACK).

The Delta launch vehicle will first boost the HEOS spacecraft into a preliminary parking orbit. Subsequently, Delta's second stage rocket engine will be restarted and together with the third stage will place the spacecraft into its planned highly elliptical orbit.

The European Space Technology Centre (ESTEC), Noordwijk, Holland, has the project management responsibility for this mission.

The Goddard Space Flight Center, Greenbelt, Md., is responsible for NASA project management for the mission and for project management of the Delta launch vehicle.

NASA's Kennedy Space Center, Western Test Range, will provide prelaunch and launch support.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS)

MISSION

The orbit selected for HEOS is unique since no satellite has flown in this region of space. The primary scientific mission will be the investigation of interplanetary space and of the high latitude magnetosphere and its boundary in the region of the northern neutral point. It is for this reason that a polar orbit has been selected.

Scientific Objectives

The space environment near the Earth which is controlled by either the Sun or the geomagnetic field is shown in figure 1. It is predicted that at the boundary of the magnetosphere, where the magnetic field is nominally zero, neutral points exist. At these points the geomagnetic field lines change from being closed on the Sun-side to being swept back over the polar caps to the night side. These neutral points are believed to serve as entry ports through the magnetic boundary for particles originated in interplanetary space. Further, it is also believed that the configuration of the shock front and magnetopause are different at high latitudes compared with low latitudes. Although much is known about the lower latitudes, the high latitude area has not yet been explored. It is for this reason this unique orbit for HEOS has been selected and that the instrumentation of this satellite includes a magnetometer and a number of particle counting experiments. HEOS also carries a solar VLF observation experiment and a micrometeorite detector.

Orbit Information

In order to achieve the scientific objectives described above, an orbit with the following parameters has been selected:

Apogee:	245,150 km (151,995 miles)
Perigee:	409 km (253 miles)
Inclination:	90 degrees

The selected orbit will guarantee that the apogee will remain outside the shock front for the first 100 days and that the northern neutral point will be traversed during this period.

SPACECRAFT DESCRIPTION

The HEOS-A2 is a 16-sided cylinder having approximately 70 percent of its outer surface covered by solar cells. The spacecraft weighs 117 kilograms (257 pounds). Thermal protection for the interior and structural reinforcement are provided by top and bottom panels.

A central octagonal tube forms the primary structure and holds most of the spacecraft's experiment instrumentation, electronic controls, batteries, telemetry and command equipment. The sensors for experiments and the attitude sensor are located in the outer zone of the spacecraft. Experiment electronics are located on the outside of the central octagonal tube. A tripod-type boom approximately 2 meters (6 feet) long is located on the upper portion of the octagonal tube. The boom supports the sensor for the magnetic field vector experiment and the RF antenna.

Two nozzles for spin rate control are mounted in the spacecraft's equatorial plane, and the nozzle for the attitude control is mounted in a canted position near the bottom ring of the 16-sided outer cylinder.

SPACECRAFT EXPERIMENTS

Magnetic Field Measurement

The primary purpose of the magnetic field measurement experiment is to determine the magnetic field vector in interplanetary space and in the outer magnetosphere. The measurement range of this experiment is plus and minus 144 gamma. The secondary purpose of this experiment is to perform a low frequency noise measurement (1 to 5 Hz). Participating agency: Imperial College of Science and Technology, London, England.

Plasma Measurement

The purpose of the plasma measurement experiment is to determine the direction and to measure the energy level of electrons and protons inside and outside the magnetosphere in the range of 20 ev to 50 kev. Participating agency: Instituto di Fiscia, Officine Galileo, University of Rome, Florence, Italy.

VLF Solar Frequency Measurement

The primary purpose of the VLF solar frequency measurement experiment is to measure the very low frequency (20 to 250 Hz) emissions from the Sun. The secondary purpose of this experiment is to determine the amount of electrostatic and electromagnetic noise in the magnetosphere. Participating agency: Danish Space Research Institute, Lyngby, Denmark.

Particle Measurement

The purpose of the particle measurement experiment is to measure energy and direction of electrons, protons and alpha particles, in particular around the boundary of the polar magnetosphere and the neutral point, as well as outside the magnetosphere. The energy levels will be measured in the following ranges: electrons, 540 kev to 3.1 Mev; protons, 8 to 32 Mev; and alpha particles, 32 to 132 Mev. Participating agency: European Space and Technology Centre, Noordwijk, Holland.

High Energy Electron Experiment

The purpose of the high energy electron measurement experiment is to measure the flux and energy spectrum of primary electrons in the range of 10-600 Mev. Participating agencies: Instituto di Science Fisiche, University of Milan, Milan, Italy; and the Centre d'Etudes Nucleaires, Saclay, France.

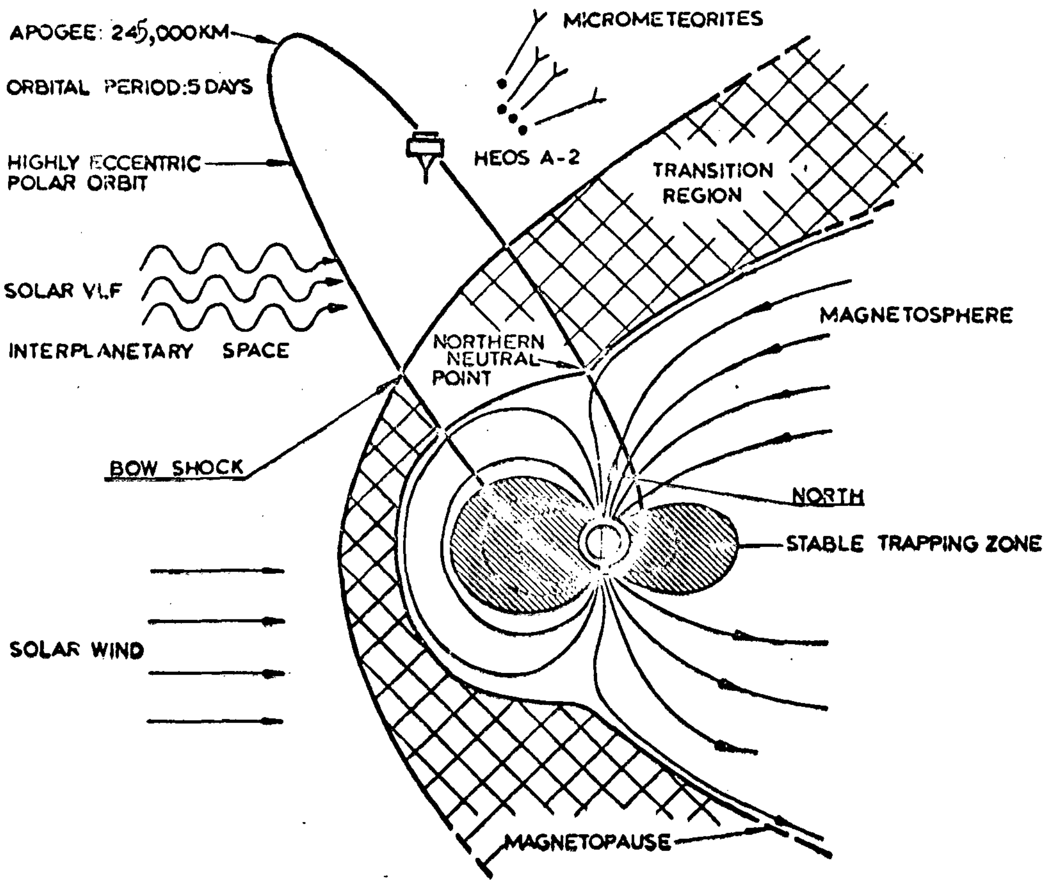
APOGEE: 245,000KM
ORBITAL PERIOD:5 DAYS
HIGHLY ECCENTRIC POLAR ORBIT
SOLAR VLF
INTERPLANETARY SPACE
BOW SHOCK
SOLAR WIND
MICROMETEORITES
HEOS A-2
TRANSITION REGION
MAGNETOSPHERE
NORTHERN NEUTRAL POINT
NORTH
STABLE TRAPPING ZONE
MAGNETOPAUSE

Figure 1.

Solar Wind Measurement

The solar wind measurement experiment consists of two instruments, either of which is selected by ground command. The one instrument will make measurements in interplanetary space to determine the direction and energy level of protons coming from the Sun, in the range of 231 ev to 16 kev. The second instrument will make measurements in the magnetosphere to determine the direction and energy level of protons and electrons in the range of 100 ev to 50 kev. Participating agency: Max Planck Institut fur Physik Und Astrophysik, Garching, Germany.

Micrometeoroid Measurement

The purpose of the micrometeoroid measurement experiment is to measure the flux, velocity and mass of micrometeorites as a function of distance from Earth. Participating agency: Max Planck Institut fur Kernphysik, Heidelberg, Germany.

DELTA-L LAUNCH VEHICLE CHARACTERISTICS

Height:	32.3 meters (106 feet) (includes shroud)
Maximum Diameter:	2.4 meters (8 feet) (without attached solids)
Liftoff Weight:	89,050 kg (197,890 pounds)
Liftoff Thrust:	326,000 pounds
First Stage	Modified Air Force Thor, produced by McDonnell Douglas Astronautics Company, engines produced by Rocket-dyne Division of North American Rockwell.
Diameter:	2.4 meters (8 feet)
Height:	32.3 meters (75 feet)
Propellants:	RP-1 is the fuel and liquid oxygen (LOX) is the oxidizer for the Thor stage.
Thrust:	172,000 pounds at sea level
Burn time:	3 minutes 38 seconds
Gross weight:	69,750 kg (155,000 pounds)
Strap-on Solids	Three solid propellant Castor II rockets produced by the Thiokol Chemical Corp.
Diameter:	.94 meters (31 inches)
Height:	7.3 meters (24 feet)
Gross weight:	4,500 kg (10,000 pounds each)
Thrust:	52,000 pounds each
Burn time:	38 seconds

<u>Second Stage</u>	Produced by McDonnell Douglas Astronautics Company, utilizing the Aerojet General Corp. AJ 10-118E Propulsion System
Propellants:	IRFNA/UDMH
Diameter:	1.6 meters (5.3 feet)
Height:	3.9 meters (12 feet 10 inches)
Gross weight:	5,850 kg (13,000 pounds)
Thrust:	About 7,700 pounds
Burn time:	369 seconds, first burn; 10.3 seconds, second burn
<u>Third Stage</u>	Produced by McDonnell Douglas Astronautics Company, utilizing the United Technology Center FW-4D solid propellant rocket motor
Thrust:	5,910 pounds (vacuum)
Gross weight:	313 kg (697 pounds)
Burn time:	30.8 seconds

FLIGHT SEQUENCE OF EVENTS

Event	Time: Seconds	Time: Minutes/Seconds
Liftoff	T+0.000	
Solid Motors burnout	T+38.190	38 sec.
Jettison solid motors casing	T+100.000	1 min. 40 sec.
Main engine cutoff (MECO)	T+218.513	3 min. 38 sec.
Stage I-II separation	T+223.563	3 min. 43 sec.
Jettison fairing	T+244.513	4 min. 4 sec.
Second stage cutoff (SECO-I)	T+593.489	9 min. 53 sec.
Second stage restart	T+2715.563	45 min. 15 sec.
Second stage cutoff (SECO-II)	T+2725.852	45 min. 25 sec.
Third stage ignition	T+2770.513	46 min. 10 sec.
Third stage burnout	T+2801.313	46 min. 41 sec.
Spacecraft separation	T+2875.513	47 min. 55 sec.

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PROJECT MANAGEMENT

ESRO Management Personnel

Project Manager	Mr. Maurice Delahais, European Space Technology Center (ESTEC)
Project Scientist	Dr. Bryan Taylor, ESTEC
Operations Director	Mr. George Harris, Head, Spacecraft Data Acquisition Department, ESOC
Spacecraft Coordinator	Mr. Hubert A. Bath, ESOC

Goddard Management Personnel

Director	Dr. John F. Clark, Director, Goddard Space Flight Center (GSFC)
Launch Vehicle Mgr.	Mr. William R. Schindler, Delta Project Manager, GSFC
Project Manager	Mr. Robert Goss, Delta Project Office, GSFC
Mission Operations System Manager and Mission Support Mgr.	Mr. Robert G. Sanford, Project Operations Branch, GSFC
Network Support Mgr.	Mr. Gerald A. David, Operations Planning Branch, GSFC
Control Center Operations Mgr.	Mr. Richard A. Schumacher, Control Center Operations Branch, GSFC
Orbital Computations Engineer	Mrs. Ellen L. Herring, Orbital Operations Branch, GSFC

NASA HEADQUARTERS, Office of Space Science

Dr. John E. Naugle	Associate Administrator for OSS
Vincent L. Johnson	Deputy Associate Administrator, OSS
Joseph B. Mahon	Director, Launch Vehicles
Robert W. Manville	Manager, Small Launch Vehicles and International Programs
Isaac T. Gillam	Delta Program Manager

NASA Kennedy Space Center, Unmanned Launch Operations

Director, Unmanned Launch Operations	John Neilon
Manager, Western Test Range Operations Div.	Henry R. Van Goey
Spacecraft Coordinator	Eugene Langenfeld

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