GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE (GOES I-M) METSAT PROJECT

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LV/Range: Atlas Centaur/ETR

Launch Date: October 1992 - (I); May 1993 - (J); July 1995 - (K); February 1997 - (L); 2000 - (M)

Projected SC Life/DSN Support: 5 years/Launch + 30 to 45 days

Project Responsibility: Goddard Space Flight Center (GSFC)

Source: SIRD December 1983
Sponsor: OSO

A. MISSION DESCRIPTION

The primary objective of the METSAT project is to provide a satellite system that meets the National Environmental Satellite Data and Information Service (NESDIS) requirements as specified by the National Oceanic and Atmospheric Administration (NOAA). For the GOES I-M spacecraft, these requirements include an Imager and Sounder system, a Space Environment Monitoring (SEM) System, a Data Collection System, and a Search and Rescue (SAR) System. The SEM subsystems include a Solar X-Ray Sensor (XRS), an Energetic Particle Sensor (EPS), a High-Energy Proton and Alpha Detector (HEPAD), a Magnetometer, and an X-Ray Imager (XRI). The GOES I-M spacecraft will be designed to meet specified performance requirements for a period of 5 years.

The GOES I-M mission profiles are identical. The NASA phase extends from liftoff through completion of spacecraft checkout (approximately 30-45 days after launch). The GOES I-M spacecraft are launched using an Expendable Launch Vehicle (ELV) from Kennedy Space Center (KSC). At completion of spacecraft checkout, operations are transferred to NOAA, which will operate the spacecraft for the remainder of the mission.

B. FLIGHT PROFILE

The GOES I-M spacecraft has been designed to be launched using an ELV. Additionally, the spacecraft has been designed to be retrieved by the Shuttle in the event of a Perigee Kick Motor (PKM) or similar failure that would prevent the spacecraft from leaving low Earth orbit.

1. STS Launch and GOES I-M Development Philosophy

The GOES-I/M spacecraft will be launched, maneuvered into geostationary orbit, and checked out in orbit by the NASA/GSFC flight operations team using NASA, Air Force, and NOAA ground systems. The NASA phase of the GOES-I/M mission will be designed to satisfy the following mission objectives:

(a) Ensure the health and safety of the spacecraft from launch through handover to NESDIS.

(b) Conduct on orbit testing of the satellite and instruments to characterize system performance.

(c) Hand over the spacecraft to NOAA for operations with sufficient on-board propellant for a minimum of five years of stationkeeping.

2. Satellite Transfer Orbit Philosophy

The GOES-I/M spacecraft will be launched from KSC using Atlas G/Centaur D-1A expendable launch vehicles.

Approximately four minutes before liftoff, the satellite is switched to internal battery power. During the launch vehicle ascent phase, spacecraft telemetry is relayed to MSOCC using the STDN stations at MILA and Bermuda. After Atlas/Centaur separation, the Centaur upper stage performs two main engine burns to place the satellite into an elliptical orbit with the apogee close to geosynchronous altitude. Prior to satelite separation, the Centaur upper stage performs a reorb maneuver to ensure that the GOES omni antenna rotation is normal to the plane of the earth to eliminate look-angle nulls.

The DSN stations (Canberra, Goldstone, and Madrid) are used for Telemetry, Tracking, and Command (TT&C) operations. The DSN is supplemented by telemetry and commanding capability from the NOAA Wallops CDA station. Each DSN station complex is fully redundant within itself.

C. COVERAGE

1. Coverage Goals

The coverage required for launch and the support of transfer and drift orbits will consist of the 26-m antenna as prime and the TBD antenna as backup for 11 days at all complexes. There will also be contingency support for 15 days, for on-station spacecraft checkout. After the initial 30-45 days, the DSN is committed for emergency support. Contingency and emergency support will be provided by Goldstone only.

2. Network Support

The support provided by the DSN is indicated in the following table:

System	Goldstone					Canberra				Madrid		
	12	14	15	16	17	42	43	45	46	61	63	66
S-band TLM			P		B	B			P	B		P
S-band CMD			P		B	B			P	B		P
S-band TRK			P		B	B			P	B		P

NOTE: B = Backup; P = Prime

NOTE

After checkout, all normal CMD and TLM support is to be provided by NOAA (Command and Data Acquisition) facilities at Wallops Island, Va. NASA contingency support following handover will be committed on a noninterference basis with ongoing NASA missions.

D. FREQUENCY ASSIGNMENTS

Frequencies are allocated according to the following table:

System	Uplink (MHz)	Downlink (MHz)	Polarization
S-band TLM	--	2209.086/2208.586	RCP
S-band CMD	2034.2	--	RCP
S-band TRK	2034.2	2209.086	RCP

E. SUPPORT PARAMETERS

The support parameters for the Telemetry, Command, and Support Systems are listed below:

(1) Telemetry

Data Streams	1
Format	PM 1024 MHz subcarrier Manchester II
Bit Rate	2 kb/s
Record	Required

(2) Command

Format	PCM/PSK/PM
Bit Rate	1 kb/s
Subcarrier Frequency	16 KHz

(3) Support

Uplink Power	10 kW
Antenna Rate	Nil, except for launch and transfer orbit
Antenna Angle Data	Not required
Antenna Autotrack	Launch and transfer orbit
Doppler Rates	Nil, except for launch and transfer orbit
Range Format	Tone (Prime) DSN standard (Backup)
Recording	
. Digital	Required

F. TRACKING SUPPORT RESPONSIBILITY

The allocation of responsibilities for tracking support is listed in the following table:

Mission Phase	Support Responsibility
STS Shuttle Launch	JSC
ELV Launch	STDN/KSC
Transfer/Drift Orbits	DSN
Geostationary Orbit	NOAA/CDA
Emergency Support	DSN