

# LANDSAT 7

## PROJECT HIGHLIGHTS

Announcement of Opportunity	N/A
NASA Headquarters Office	Mission to Planet Earth
Enterprise	Earth Science
Project	Landsat 7
Protect Lead Center	GSFC
Management Approach	Hybrid
Mission Life (months)	60
Additional Data Analysis (months)	N/A
Launch Date	15 Apr 1999

## MISSION OBJECTIVES

The primary objectives of the Landsat 7 Mission are to:

- Maintain Landsat data continuity with data and data products consistent with the Program objectives.
- Provide a period of overlap with any available Landsat Missions and the present Mission to allow intercomparison of data from successive versions of Landsat instruments.
- Continue to make Landsat-type data available for U. S. civil, national security, private sector, and international users, and to seek to expand the use of such data for global change research and commercial purposes.

## FOREIGN PARTICIPATION

International Ground Stations (IGSs)

## PAYLOAD DESCRIPTION

The Landsat 7 payload consists of a single instrument, Enhanced Thematic Mapper Plus (ETM+), that provides high resolution imaging information of the Earth's surface. The ETM+ is an upgrade of the Landsat 6 Enhanced Thematic Mapper (ETM), which was itself an upgrade of the Landsat 4 and 5 Thematic mapper instruments. The ETM+ will provide continuity of data with the Landsat 4 and 5 missions.

## SPACECRAFT DESCRIPTION

The Landsat 7 spacecraft provides bus equipment housing and secondary structure, a uniform temperature environment as required and mounting interfaces for the instrument and launch vehicle. Thrusters are used for orbit adjustment and for supplementary attitude control capability. The Communications subsystem has three X-band antennas for wide band 150 Mbps data link transmissions to one or more ground sites simultaneously and two S-band antennas for narrowband telemetry transmission to the ground, as well as receiving command data from the Mission Operations Center. A spacecraft controls processor hosts the flight software and data necessary for navigating the spacecraft, controlling and pointing the X-band sharable antennas, monitoring the spacecraft subsystems, performing selective on-board hardware redundancy management, processing real-time commands from the ground and controlling payload operations. A solid state recorder is used for storing wideband data from ETM+ instrument and narrowband data from the satellite for later playback. Thermal control consists of thermal blankets and thermostat-controlled heaters. A single wing, silicon cell solar array and nickel hydrogen battery subsystem will provide 1,550 watts of load power. Electrical power control functions are implemented by automated on-board software processing capabilities.

## INSTRUMENT DESCRIPTIONS AND SCIENCE LEADERS

Data Point Number 941: The Enhanced Thematic Mapper Plus instrument (ETM+) [protoflight] (Landsat 7) is a nadir-viewing, 8-band multispectral scanning radiometer. The ETM+ collects, filters and detects radiation from the earth in a swath 185 km wide as it passes overhead. A scanning mirror provides cross track scanning motion while the spacecraft orbital motion provides along-track scan. The scanning mirror directs the earth scene irradiance into the main telescope assembly. The image data is collected in either a low-gain mode or a high-gain mode, which is twice as sensitive as the low-gain. Each mode is selectable by command for each spectral band. The eight spectral bands are comprised of four visible/near infrared (VNIR) bands, one panchromatic band (PAN), two short wave infrared (SWIR) bands and one long wave infrared (LWIR) band. Five bands are located in the Prime Focal Plane Assembly, mounted at the telescope prime focus. Three bands are located in the Cold Focal Plane Assembly, mounted on the cold stage of a passive radiative cooler. The detected signals are passed through an amplifier chain to an analog/digital multiplexer, and finally to an output formatter that provides output data on two 75 Mbps channels. D. Williams (GSFC) is the instrument PI.

## GROUND SYSTEM DESCRIPTION

The Landsat 7 ground system consists of Landsat 7 unique components as well as Mission to Planet Earth (MTPE) and institutional ground system components. The unique components include the Mission Operations Center (MOC), Landsat Ground Station (LGS), Landsat Processing System (LPS), Level 1 Product Generation System (LPGS), Image Assessment System (IAS), Earth Resources Observation System (EROS), Data Center Distributed Active Archive Center (EDAC-DAAC), Landsat 7 Simulator (LSIM) and International Ground Stations (IGSs). The MOC, located at GSFC, is the focal point for all space vehicle operations. It provides facilities, hardware, software and personnel to accomplish Landsat 7 monitoring, planning and scheduling functions. The LOS LPS, IAS and LPGS are all located at the EDC in Sioux Falls, SD. The LGS is a receive site for wideband X-Band downlinks of payload data from the space vehicle. The LPS records all wideband data, at real-time rates, into wideband data stores. The LPGS generates Level 1 data products in response to user requests received from the EDC-DAAC. The IAS is responsible for off-line assessment of image quality to ensure compliance with the radiometric and geometric requirements of the spacecraft and ETM+ sensor throughout the life of the Landsat 7 mission life. The EDC-DAAC, which is part of the Earth Observing System (EOS) Data and Information System (EOSDIS), provides information management, user interface, data archival and distribution functions for Landsat 7 users. The LSIM is used in support of flight software maintenance, tests and training, and procedures validation. The IGSs are satellite data receiving stations around the world which provide data receive, processing and distribution services for their user community.

The institutional support systems include the Landsat Ground Network (LGN), Space Network (SN), National Centers for Environmental Prediction (NCEP), Flight Dynamics Facility (FDF) and NASA Integrated Support Network (NISN). The LGN includes multiple communications sites which provide S - Band and X-Band communication support to the Landsat mission. The LGN institutional services include the Alaska Ground Station (AGS), Svalbard Ground Station (SGS) in Norway, and the Wallops Island, VA Ground Station (WPS) and Orbital Tracking Information System (WOTIS). The SN consists of the Tracking and Data Relay Satellite System (TDRSS), which includes ground terminals at the White Sands Complex and provides space-to-space and space-to-ground data relay services. The NCEP will generate weather relation products such as cloud cover predict data to support image scheduling in the MOC. The FDF, located at GSFC, provides MOC workstations used for orbit and attitude determination, generation of ephemeris data, maneuver planning support, and generation of planning and scheduling aids. The NISN, which includes a Network Control Center (NCC). is a global system of communications transmission switching and terminal facilities that provide NASA with communications services.

## CONTRACT AND SUBCONTRACT HISTORY

### Contractor/Subcontractor

Lockheed Martin

SBRS

US Geological Survey

### Project Element

Flight Vehicle

ETM+

Data Handling Facility

## LAUNCH AND MISSION ORBIT DATA

Launch Vehicle/Upper Stage	Delta 11 7920-10	Inclination (deg)	98.20
Launch Site	Western Test Range	Period (min)	98.9
Mission Orbit Type	Near Polar/ Sun Synchronous	Apogee (km)	705
		Perigee (km)	705