

NEW MILLENNIUM PROGRAM

NASA's New Millennium Program (NMP), managed by the Jet Propulsion Laboratory, takes an assertive step forward in the development of 21st Century space exploration and Earth observation technologies. Charged with testing and validating high payoff technologies under actual space flight conditions, NMP will demonstrate that scientific spacecraft can be developed at low cost with advanced technology and high science return, without sacrificing performance.

NMP

NEW MILLENNIUM PROGRAM

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Earth Observing-1

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Partnerships

*Air Force Research Laboratory
The Boeing Company
Jet Propulsion Laboratory
Litton Amecom
Lockheed Martin
MIT Lincoln Laboratory
NASA Goddard Space Flight Center
NASA Langley Research Center
NASA Glenn Research Center
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Santa Barbara Remote Sensing Corp.
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NEW MILLENNIUM PROGRAM

Earth Observing-1



EARTH OBSERVING-1



One of the key responsibilities of NASA's Earth Science Enterprise is to ensure the continuity of future Landsat data. The New Millennium Program's first Earth Observing (EO-1) flight, managed by NASA's Goddard Space Flight Center, will validate technologies that contribute to the reduction in cost of future land-imaging missions.

EO-1 was launched in November 2000 into a 705 km sun-synchronous orbit and flies in formation with Landsat 7. Three revolutionary land-imaging instruments on EO-1 have collected multispectral and hyperspectral scenes over the course of its mission in coordination with the Enhanced Thematic Mapper (ETM+) on Landsat 7.

LAND-IMAGING TECHNOLOGIES

EO-1 orbits approximately 1 minute behind Landsat 7, and covers the same ground track. The objective is to obtain images of the same ground areas at nearly the same time, so that direct comparison of results can be obtained for Landsat ETM+ and the three primary EO-1 instruments. The three primary instruments are the Advanced Land Imager (ALI), the Hyperion, and the Linear Etalon Imaging Spectrometer Array (LEISA) Atmospheric Corrector (AC).

ADVANCED LAND IMAGER (ALI)

The ALI was designed to produce images directly comparable to those of the Enhanced Thematic Mapper (ETM+) of Landsat 7. Ultimately, it is anticipated that ALI will establish data continuity with previous Landsats and demonstrate advanced capability and innovative approaches to future land imaging.

HYPERION

The focus of the Hyperion instrument is to provide high quality calibrated data that can support evaluation of hyperspectral technology for Earth observing missions. The Hyperion capabilities provide resolution of surface properties into hundreds of spectral bands versus the ten multispectral bands flown on traditional Landsat imaging missions. Through this large number of spectral bands, complex land eco-systems can be imaged and accurately classified.

ATMOSPHERIC CORRECTOR (AC)

Earth imagery is degraded by atmospheric absorption and scattering. EO-1 provides the first space test of an Atmospheric Corrector for increasing the accuracy of surface reflectance estimates.

COMBINED IMAGING CAPABILITIES

Parameters	MULTISPECTRAL		HYPERSPECTRAL	
	Landsat7	EO-1	EO-1	
	ETM+	ALI	HYPERION	AC
Spectral Range	0.4 - 2.4 μm	0.4 - 2.4 μm	0.4 - 2.5 μm	0.9 - 1.6 μm
Spatial Resolution	30 m	30 m	30 m	250 m
Swath Width	185 Km	37 Km	7.5 Km	185 Km
Spectral Resolution	Variable	Variable	10 nm	2-6 nm
Spectral Coverage	Discrete	Discrete	Continuous	Continuous
Pan Band Resolution	15 m	10 m	N/A	N/A
Number of Bands	7	10	220	256

*excluding them alband

NEXT GENERATION SPACECRAFT TECHNOLOGIES

Future NASA spacecraft will be an order of magnitude smaller and lighter than current versions, and the EO-1 Mission provides the on-orbit demonstration and validation of several subsystem technologies to enable this transition. Key subsystems addressed in this mission include communications, power, propulsion, thermal, and data storage.

X-BAND PHASED ARRAY ANTENNA

Enables data links of 100 Mbps from small spacecraft without the need for gimbaled antennas, and decouple image data collection and downlink events.

LIGHTWEIGHT FLEXIBLE SOLAR ARRAY

Demonstrates an increased power density from a typical 40 Watts per kg to greater than 100 Watts per kg.

PULSED PLASMA THRUSTER

Low mass, low cost, dependable electromagnetic propulsion. The Pulsed Plasma Thruster on EO-1 demonstrates pointing accuracy, response characteristics, and stability in an Attitude Control System (ACS) application, and confirms benign thruster plume.

ENHANCED FORMATION FLYING

Demonstrates autonomous capability to fly over the Landsat 7 ground track \pm 3 km and within a 1 minute separation for long periods of time.

CARBON-CARBON RADIATOR

Carbon-Carbon is a special composite material that uses pure carbon for both the fiber and matrix. Carbon-Carbon has the advantage of high thermal conductivity and good strength and weight characteristics.

WIDEBAND ADVANCED RECORDER/PROCESSOR

High rate (up to 900 Mbps capability), high density (48 Gbit storage), low weight (less than 22 kg) solid state recorder / processor with X-band modulation capability.