National Aeronautics and Space Administration

NASAfacts

Lunar Reconnaissance Orbiter

Return to the Moon: The First Step

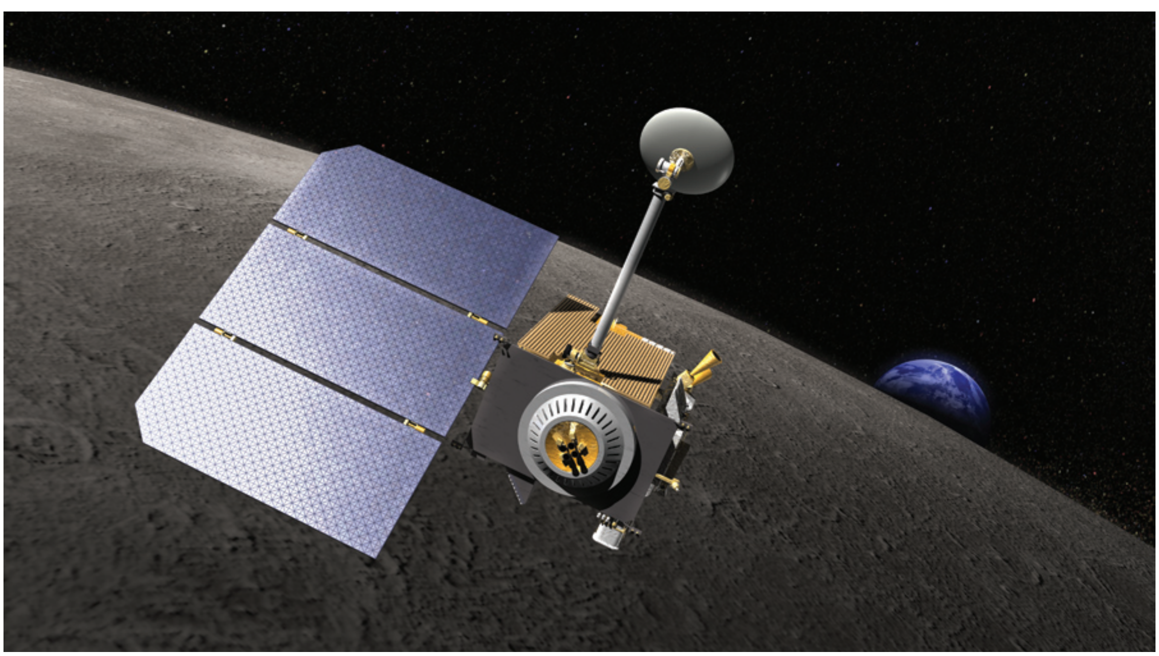
The United States has begun a program to extend human presence in the solar system, beginning with a return to the moon. Returning to the moon will enable the pursuit of scientific activities that address our fundamental questions about the history of Earth, the solar system and the universe – and about our place in them. Returning to the moon will allow us to test technologies, systems, flight operations and exploration techniques to reduce the risk and enable future missions to Mars and beyond.

The first step in this endeavor is the Lunar Reconnaissance Orbiter (LRO), an unmanned mission to create a comprehensive atlas of the moon's features and resources to aid in the design of a lunar outpost. LRO follows in the footsteps of Ranger, Lunar Orbiter and Surveyor. These predecessors to the Apollo missions searched for the best possible landing sites. The goals of LRO go beyond the requirements of these previous missions because building a lunar outpost means spending extended periods on the lunar surface. LRO focuses on the selection of safe landing sites, identification of lunar resources, and studies of how the lunar radiation environment will affect humans.

Mission Profile

LRO is scheduled for launch on an Atlas V 401 rocket in late 2008. The trip to the moon will take approximately four days. LRO will then enter an elliptical orbit, also called the commissioning orbit. From there, it will be moved into its final orbit: a circular polar orbit approximately 50 km (31 miles) above the moon's surface.

LRO will spend at least one year in low polar orbit collecting detailed information about the moon and its environment. The LRO payload, comprised of six instruments and one technology demonstration, will provide key data sets to enable a safe and productive human return to the moon.



Instrument Payload

Cosmic Ray Telescope for the Effects of Radiation

The Cosmic Ray Telescope for the Effects of Radiation (CRaTER) will characterize the lunar radiation environment allowing scientists to determine potential biological impacts. CRaTER will also test models of radiation effects and shielding and measure radiation absorption by human tissue-like plastic, aiding in the development of protective technologies to help keep crews safe.

Diviner Lunar Radiometer Experiment

The Diviner Lunar Radiometer (DLRE) will measure surface and subsurface temperatures from orbit. It will identify cold traps and potential ice deposits as well as rough terrain, rock abundance and other landing hazards.

Lyman Alpha Mapping Project

The Lyman Alpha Mapping Project (LAMP) will map the entire lunar surface in the far ultraviolet spectrum. LAMP will search for surface ice and frost in the polar regions and provide images of permanently shadowed regions illuminated only by starlight and the glow of interplanetary hydrogen emission, the Lyman Alpha line.

Lunar Exploration Neutron Detector

The Lunar Exploration Neutron Detector (LEND) will create high-resolution maps of hydrogen distribution and gather information about the neutron component of lunar radiation environment. LEND data will be analyzed to search for evidence of water ice near the moon's surface.

Lunar Orbiter Laser Altimeter

The Lunar Orbiter Laser Altimeter (LOLA) will measure landing site slopes, lunar surface roughness, and generate a high resolution 3-dimensional map of the moon. LOLA also will measure and analyze the lunar topography to identify the permanently illuminated and permanently shadowed areas.

Lunar Reconnaissance Orbiter Camera

Two narrow angle cameras (NACs) on the Lunar Reconnaissance Orbiter Camera (LROC) will make high resolution black-and-white images of the surface, capturing images of the poles with resolutions down to 1 m (3.3 feet). Up to 10% of the lunar surface will be imaged with the NACs. A third, wide angle camera (WAC), will take color and ultraviolet images over the complete lunar surface at 100 m resolution. These images will show polar lighting conditions, identify potential resources and hazards, and aid selection of safe landing sites.

Mini-RF Technology Demonstration

The Miniature Radio Frequency Technology Demonstration (Mini-RF) is an advanced synthetic aperture radar that operates in both the X and S bands of the radio spectrum. It will be used to image the polar regions and search for water ice. In addition, it will used to demonstrate the ability to communicate with an Earth-based ground station.

Data Return

With a comprehensive data set focused on supporting the extension of human presence in the solar system, the Lunar Reconnaissance Orbiter will help identify sites that are close to potential resources and have high scientific value, favorable terrain, and the environment necessary for safe future robotic and human lunar missions. All initial data sets will be deposited in the Planetary Data System, a publicly accessible repository of planetary science information, within six months of primary mission completion. The processed data sets will provide a deeper understanding of the moon and its environment. This will clear the way for a safe human return to the moon and for future human exploration of our solar system.

For additional information on LRO, visit:
http://lro.gsfc.nasa.gov

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