



*Credit: NASA/Chris Meaney*

## LUNAR RECONNAISSANCE ORBITER

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### Return To The Moon: The First Step



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### Mission Overview

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 is the Lunar Reconnaissance Orbiter (LRO), an unpiloted mission to create a comprehensive atlas of the Moon's features and resources to aid in the design of a lunar outpost. LRO focuses on the selection of safe landing sites, identification of lunar resources, and studies of how the lunar radiation environment will affect humans.

LRO is scheduled for launch on an Atlas V 401 rocket in early 2009. The trip to the Moon will take approximately four days.

LRO will spend at least one year in low polar orbit, approximately 50 km (31 miles) above the Moon's surface, where it will collect detailed information about the Moon and its environment. The LRO payload, composed of six instruments and one technology demonstration, will provide key data sets to enable a safe and productive human return to the Moon.

### Science Instruments:

The Cosmic Ray Telescope for the Effects of Radiation (CRaTER) will characterize the lunar radiation environment, allowing scientists to determine potential biological impacts.

The Diviner Lunar Radiometer (DLRE) will identify cold traps and potential ice deposits, as well as rough terrain, rock abundance, and other landing hazards.

The Lyman Alpha Mapping Project (LAMP) will map the entire lunar surface in the far ultraviolet spectrum.

The Lunar Exploration Neutron Detector (LEND) will collect data to be analyzed for evidence of water ice near the Moon's surface.

The Lunar Orbiter Laser Altimeter (LOLA) will measure landing site slopes and lunar surface roughness and generate a high resolution 3-D map of the Moon.

The Lunar Reconnaissance Orbiter Camera (LROC) will collect images that will show polar lighting conditions, identify potential resources and hazards, and aid selection of safe landing sites.

The Miniature Radio Frequency Technology Demonstration (Mini-RF) will be used to image the polar regions and search for water ice.

### Education Activity: Mission Moon

Mission Moon is an activity that has students think about the ideal location for an outpost on the Moon. Students are broken into groups to examine five examples of sites for a lunar outpost. These sites are Highlands Outpost, South Pole Crater, Aristarchus, Tranquility Outpost, and Far Eastern Outpost.

Each group reviews data on the lunar environment for each of the locations. The data include temperature, topography (elevation), radiation, water, and other resources. Students also are encouraged to look at the potential science and other considerations. Each team then debates the pros and cons of each site. They then determine if the data support a possible human lunar outpost ("go"), do not support future human activity ("no go"), or if more data are needed before a decision can be made. After all of the potential lunar outpost sites have been examined, each team determines which site it thinks will be the choice and why.

NASA scientists and engineers will make the same types of decisions when data from LRO are returned. Several of the instruments on LRO are designed to collect different information about the lunar environment, including trying to determine whether ice exists in the permanently shadowed polar regions. The data from LRO will provide more detailed information than what scientists currently have now.

You can find the Mission Moon activity at: [http://www.lpi.usra.edu/education/explore/LRO/activities/mission\\_Moon/](http://www.lpi.usra.edu/education/explore/LRO/activities/mission_Moon/)

For more information about LRO, visit: <http://lro.gsfc.nasa.gov>

*Mosaic of 1500 Clementine images of  
the south polar region of the Moon.  
Credit: Clementine, USGS*