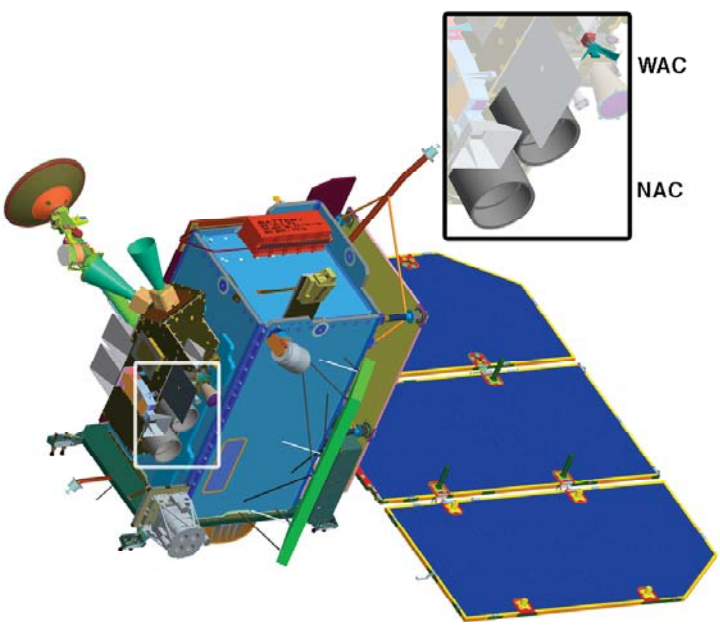
Lunar Reconnaissance Orbiter Camera

http://lroc.sese.asu.edu

Project Overview

The **Lunar Reconnaissance Orbiter Camera (LROC)** is designed to address two of the prime LRO measurement requirements: 1) Assess meter scale features to facilitate selection of future landing sites on the Moon. 2) Acquire images of the poles every orbit to characterize the polar illumination environment (100 meter scale), identifying regions of permanent shadow and permanent or near-permanent illumination over a full lunar year. In addition to these two main objectives, the LROC team plans to conduct meter-scale mapping of polar regions, 3-dimensional observations to enable derivation of meter-scale surface features, global multi-spectral imaging, and produce a global landform map. LROC images will also be used to map and determine current impact hazards by re-photographing Apollo images.

LROC consists of two narrow-angle cameras (NACs) to provide 0.5 meter-scale panchromatic images over a 5 km swath, a wide-angle camera (WAC) to provide images at a scale of 100 meter in seven color bands over a 60 km swath, and a Sequence and Compressor System (SCS) supporting data acquisition for both cameras. LROC is a modified version of the Mars Reconnaissance Orbiter's ConTeXt Camera (CTX) and MARs Color Imager (MARCI) provided by Malin Space Science Systems (MSSS) in San Diego, CA.



Internet Resources

LROC Website	**http://lroc.sese.asu.edu**
LRO Website	**http://lunar.gsfc.nasa.gov**
MSSS	**http://www.msss.com**

Measurement Objectives

1. Landing site identification and certification— The NACs will provide 0.5 meter per pixel angular resolution BW imaging to locate safe landing sites for future robotic and human missions and provide mission planners with the data needed to determine optimal sampling and logistical strategies for each proposed landing site.

2. Mapping of permanent shadow and sunlit regions— Permanently shadowed regions may harbor volatile deposits, and regions of permanent, or near-permanent, illumination are prime locations for future lunar bases. To delimit such regions the WAC will acquire 100 meter per pixel images of the polar regions during each orbit.

3. Meter-scale mapping of polar regions— During respective summers, the NACs will acquire contiguous meter-scale images of each polar region when the shadows are minimal. Then, in respective winters, areas that remain illuminated will be repeatedly imaged to sharpen mission planners' ability to select optimal landing sites.

4. Overlapping observations to enable derivation of meter-scale topography— The NACs will collect repeat images with appropriate illumination and viewing geometries to provide geometric and photometric stereo sets for production of 1 to 5 meter scale topographic maps.

5. Global multi-spectral imaging— Seven band WAC images will permit discrimination of mineralogic and compositional variations on the surface.

6. Global morphology base map— The WAC will provide BW imaging at 100 meters per pixel with illumination optimal for morphological mapping (incidence angles of 55°-75°, incidence angles will be higher at the poles).

7. Characterize regolith properties— NAC images will enable estimation of regolith thickness and other key parameters around potential lunar landing sites.

8. Determine current impact hazards— The NACs will reimage regions photographed by Apollo 15-17 to provide the means to estimate impact rates over the past 40 years.

Science Operations Center

LROC planning, targeting, and data processing activities will take place at the Science Operations Center (SOC) located at Arizona State University. The SOC will receive between 300 and 450 Gbits of raw image data per day during the year-long mapping phase of the mission. Production of calibrated images and mosaics will result in over 65 TBytes for archive with NASA's Planetary Data System (PDS). LROC image data will be disseminated to the public via a web interface: http://lroc.sese.asu.edu

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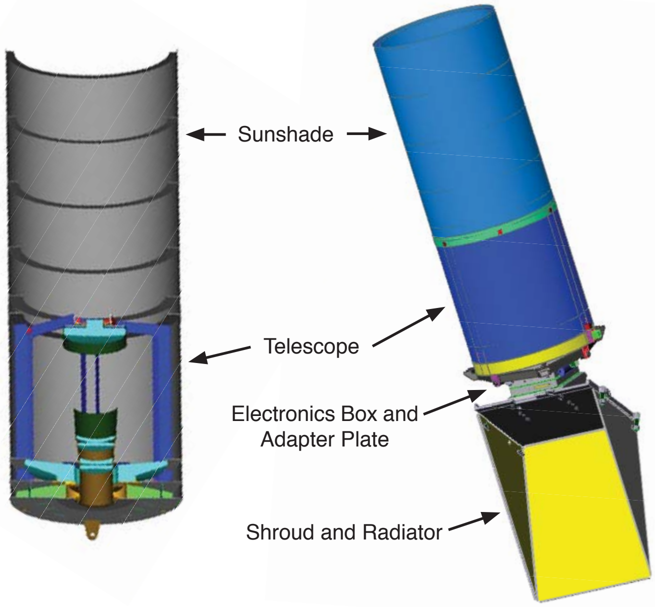
Narrow Angle Camera (NAC)



FOV	2.86°(0.05 radian) per NAC
Image Scale	0.5 meter per pixel (10 micro-radian IFOV)
Max Images Size	5,000 x 50,000 pixels 2.5 km x 25 km
Optics	f/3.59 Cassegrain (Richey-Chretien)
Effective FL	700 mm
Primary Mirror Diameter	195 mm
MTF (Nyquist)	> 0.20
Detector	Kodak KLI-5001G
Pixel Format	1 x 5,000
A/D Converter	Honeywell ADC9225
Mass	15.2 kg for both NACs and Adapter Plate
Volume	70 cm x 26 cm diameter
Peak Power	10 W
Average Power	6 W
Sensitivity	400-750 nm

Wide Angle Camera (WAC)

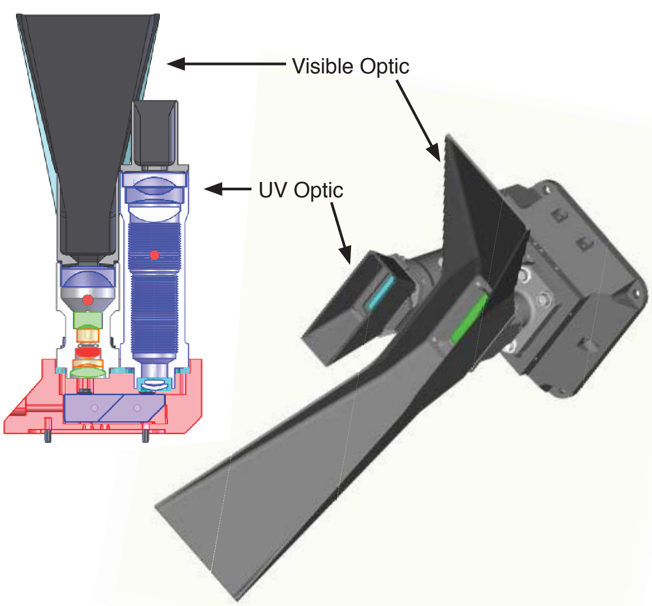


Image Format	1024 x 16 pixels monochrome (push frame) 704 x 16 pixels 7-filter VIS color (push frame) 512 x 4 pixels 2-filter UV color (push frame)
FOV	90° (vis) and 60° (UV)
Image Scale	1.5 milli-radian, 75 meters/pixel nadir (vis) 2.0 milli-radian, 400 meters/pixel nadir (UV)
Image Width	100 km (vis monochrome) 88 km (vis color and UV)
Optics	f/5.1 (vis), f/5.3 (UV)
Effective FL	6.0 mm (vis), 4.6 mm (UV)
Pupil Diameter	1.19 mm (vis), 0.85 mm (UV)
MTF (Nyquist)	> 0.3
Detector	Kodak KAI-1001
Mass	0.86 kg
Volume	14.5 cm x 9.2 cm x 7.6 cm
Peak Power	4 W
Average Power	4 W
Filters	315, 360, 415, 560, 600, 640, 680 nm

Science and Operations Team

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MSSS Instrument Development Team

Michael A. Ravine	Advanced Projects Manager
Michael Caplinger	Senior Systems Engineer
Scott Brylow	Instrument Manager
Tony Ghaemi	Senior Optical Engineer
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