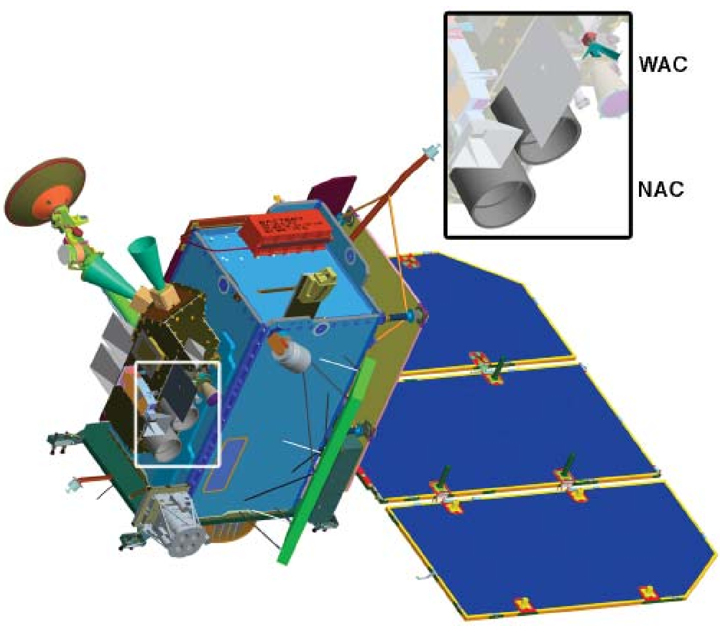
Lunar Reconnaissance Orbiter Camera

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 multispectral imaging, and produce a global landform map. LROC images will also be used to map and determine current impact hazards by rephotographing areas seen in 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 100-meter scale images 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://lro.gsfc.nasa.gov**
MSSS **http://www.msss.com**

Measurement Objectives

1. Landing site identification and certification— The NACs provide 0.5-meter per pixel angular resolution monochrome 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 that are prime locations for future lunar bases. To delimit such regions the WAC acquires 100-meter per pixel images of the polar regions during nearly every orbit.

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

4. Overlapping observations to enable derivation of meter scale topography— The NACs 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 permit discrimination of mineralogic and compositional variations on the surface.

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

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

8. Determine current impact hazards— The NACs 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 take place at the Science Operations Center (SOC) located at Arizona State University. The SOC receives between 300 and 450 Gbits of raw image data per day (about 350 NAC images and pole-to-pole WAC images). 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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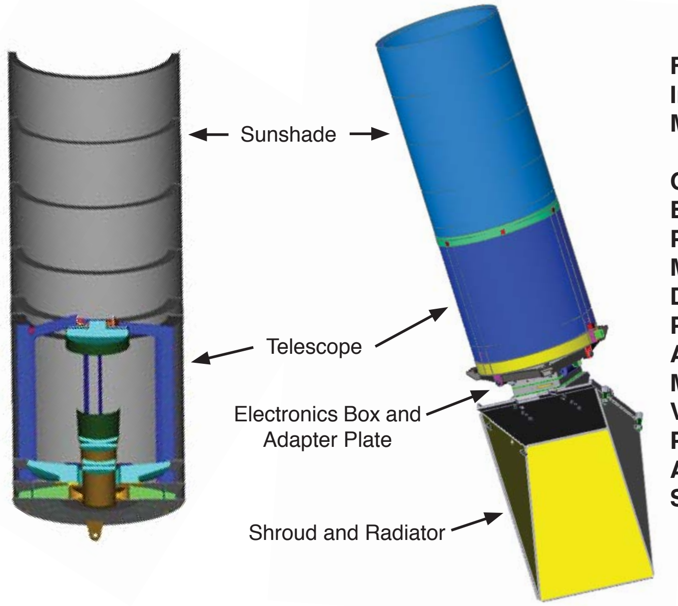
Narrow Angle Camera (NAC)



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)

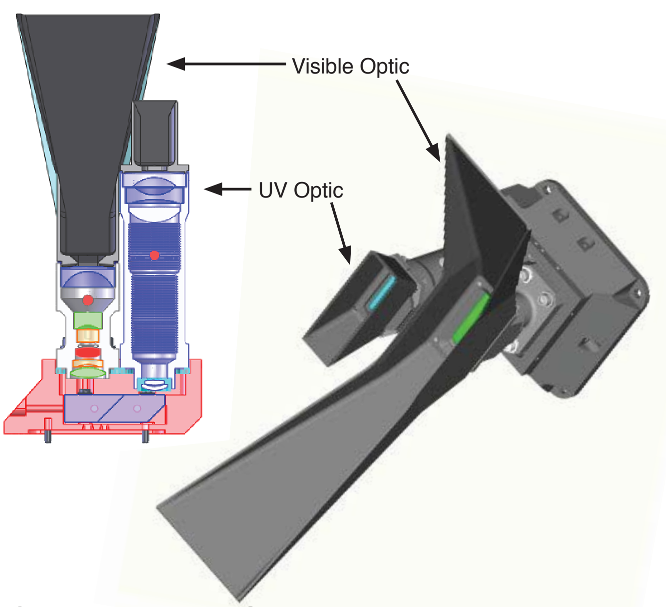


Image Format	1024 x 16 pixels monochrome (push frame) 704 x 16 pixels 7-filter VIS color (push frame) 512 x 4 pixels 2-filter UV color (push frame)
FOV	90° (vis) and 60° (UV)
Image Scale	1.5 milli-radian, 75 meters/pixel nadir (vis) 2.0 milli-radian, 400 meters/pixel nadir (UV)
Image Width	100 km (vis 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
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