LROC - LUNAR RECONNAISSANCE ORBITER CAMERA. M.S. Robinson[1], E.M. Eliason[2], H. Hiesinger[3], B.L. Jolliff[4], A.S. McEwen[2], M.C. Malin[5], M.A. Ravine[5], D. Roberts[1,6], P.C. Thomas[7], and E.P. Turtle[8], [1]Arizona State University, SESE, Tempe AZ, mrobinson@asu.edu, [2]LPL, Univ. of Arizona, [3]Brown Univ., [4]Washington Univ., [5]Malin Space Science Systems, [6]Adler Planetarium, [7]Cornell Univ., [8]Johns Hopkins University Applied Physics Lab

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 re-imaging 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.

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

Image scale	0.5 meters per pixel (10 micro-radian IFOV)
Maximum image size	5 x 25 km
Optics	f/3.59 Casssegrain (Ritchey-Chretien)
Effective FL	700 mm
Primary Mirror Diameter	195 mm
FOV	2.86° (0.05 radian) per NAC
MTF (Nyquist)	>0.20
Structure + baffle	graphite-cyanite composite
Detector	Kodak KLI-5001G
Pixel Format	1 x 5,000
Noise	100 e-
A/D converter	Honeywell ADC9225
FPGA	Actel RT54SX32-S
Volume	70 cm x 26 cm diameter
Power (peak, average)	10W, 6W
Filter	400-750 nm

Table 1. Key parameters for the LROC NACs.

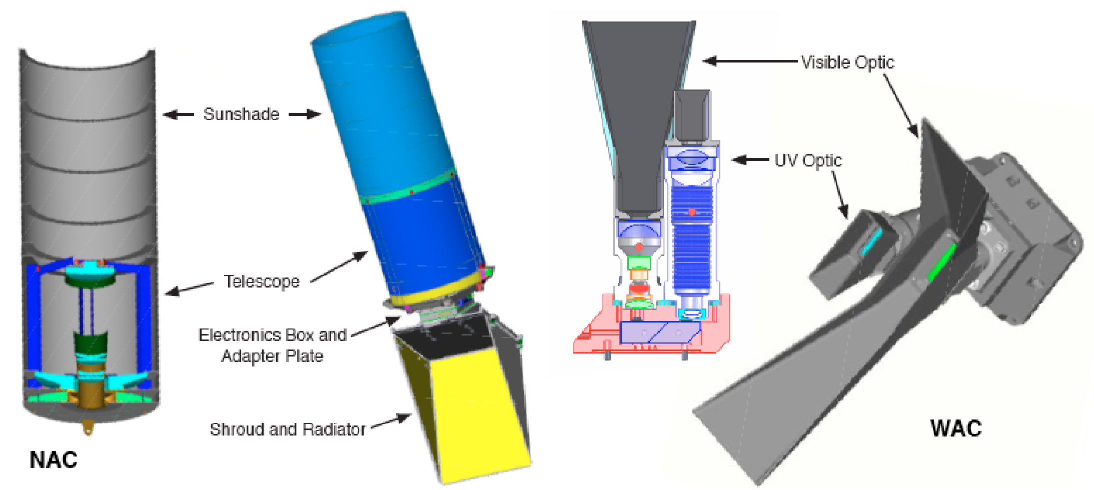

Image Scale	75 meters per pixel (1.5 milli-radian) VIS 400 meters per pixel (8.0 milli-radian) UV
Image format	1024 x 16 pixels monochrome (push frame) 704 x 16 pixels 7-filter color (push frame)
Image frame width	110 km (vis monochrome) 88 km (vis color), 88 km (UV)
Optics	f/5.1 (vis) f/5.3 (UV)
Effective FL	6.0 mm (vis), 4.6 mm (UV)
FOV	90° (vis), 60° (UV)
System MTF (Nyquist)	>0.2
Detector	Kodak KLI-1001
Noise	50 e-
Volume	14.5 cm x 9.2 cm x 7.6 cm
Power (peak, average)	4W, 4W
Filters (nm)	315, 360, 415, 560, 600, 640, 680

Table 2. Key parameters for the LROC WAC.