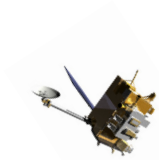
LUNAR RECONNAISSANCE ORBITER CAMERA



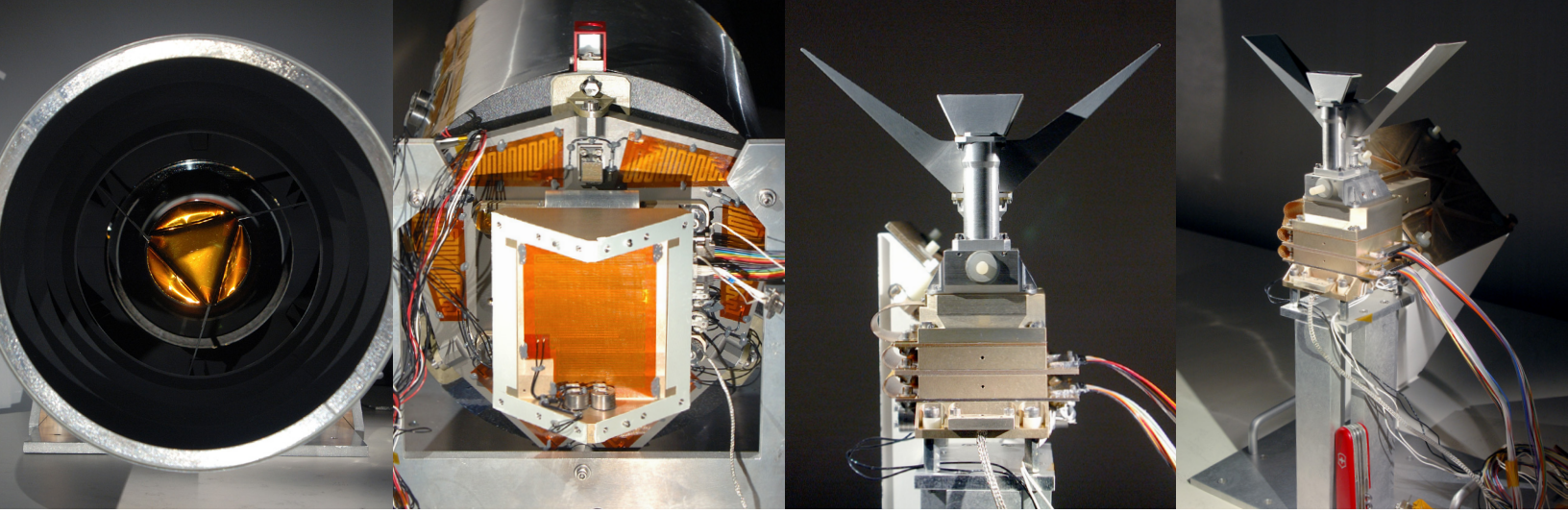
The Lunar Reconnaissance Orbiter Camera (LROC) is a system of three cameras onboard the Lunar Reconnaissance Orbiter (LRO): Two Narrow Angle Cameras (NACs) that capture 0.5 meter-scale panchromatic images over a 5 km swath at 50 km altitude, a Wide Angle Camera (WAC) that captures images in seven color bands at 100 meters/pixel over a 60 km swath at 50 km altitude, and a Sequence and Compressor System (SCS) that supports communications between the cameras and the spacecraft. The LROC cameras, built by Malin Space Science Systems, have been in orbit around the Moon since 2009, alongside seven other instruments, as part of the LRO mission.

LROC was originally designed to achieve eight measurement objectives during the LRO Exploration Mission phase: 1) Find potential landing sites; 2) map regions of permanent shadow or illumination; 3) create high-resolution maps of polar massifs; 4) observe regions from multiple angles to derive high-resolution topography; 5) improve maps of mineralogical components of the lunar crust; 6) create a global morphology base map; 7) characterize the regolith; 8) determine impact hazards. These objectives were created in preparation for future human and robotic lunar flights in contribution toward NASA's goals for the Moon, Mars, and beyond.

Following the highly successful completion of initial objectives, LROC adjusted its focus, addressing further lunar science in chronology and bombardment history, crustal evolution, regolith evolution, and polar volatile content. Now, more than a decade after launch, the LROC team continues to explore our beautifully enigmatic Moon, expanding on an already enormous amount of collected lunar data and helping humankind prepare for future crewed and robotic missions.

lroc.sese.asu.edu – lunar.gsfc.nasa.gov – sese.asu.edu – www.msss.com

ser.sese.asu.edu – quickmap.lroc.asu.edu – apollo.sese.asu.edu – tothemoon.ser.asu.edu



From left to right: LROC NAC front looking down the barrel, back of NAC viewing the electronics, side view (and 45 deg. view) of WAC, electronics, and radiator (behind).

LROC Science Team

Mark Robinson[1]
Principal Investigator

Brett Denevi[4]
Deputy PI

Carolyn van der Bogert[14]
Co-Investigator

Bruce Hapke[12]
Co-Investigator

Harald Hiesinger[14]
Co-Investigator

Dave Humm[9]
Co-Investigator

Brad Jolliff[13]
Co-Investigator

Samuel Lawrence[7]
Co-Investigator

Prasun Mahanti[1]
Co-Investigator

Michael Malin[6]
Co-Investigator

Alfred S. McEwen[10]
Co-Investigator

Jeff Plescia[4]
Co-Investigator

Hiroyuki Sato[3]
Co-Investigator

Emerson Speyerer[1]
Co-Investigator

Julie Stopar[4]
Co-Investigator

Peter Thomas[2]
Co-Investigator

Elizabeth Turtle[4]
Co-Investigator

Tom Watters[8]
Co-Investigator

Heather Meyer[4]
Research Scientist

[1]Arizona State University,
[2]Cornell University,
[3]Japan Aerospace Exploration Agency,
[4]Johns Hopkins University Applied Physics Lab,
[5]Lunar and Planetary Institute,
[6]Malin Space Science Systems,
[7]NASA Johnson Space Center,
[8]National Air and Space Museum,
[9]SPICACON,
[10]University of Arizona,
[11]University of Hawaii at Manoa,
[12]University of Pittsburgh,
[13]Washington University,
[14]Westfälische Wilhelms-Universität Münster

Narrow Angle Cameras Specifications

Pixel Scale	0.5 meter* (10 micro-radian IFOV)
Maximum Image size	2.5 x 26 km*
Optics	f/3.59 Cassegrain (Ritchey-Chretien)
Effective FL	700 mm
Primary Mirror Diameter	195 mm
FOV	2.85° per NAC
MTF (@Nyquist)	> 0.23
Structure + baffle	graphite-cyanate composite
Detector	Kodak KLI-5001G
Pixel format	1 x 5,064
Noise	76 e-
A/D Converter	Honeywell ADC9225
FPGA	Actel RT54SX32-S
Mass	8.2 kg per NAC
Volume	70 cm x 27 cm diameter
Peak Power	9.3 W
Average Power	6.4 W
Sensitivity	400-750 nm
Voltage	28 V DC
Radiometric Accuracy	1% relative, 10% absolute
Detector Digitization	12-bit, encoded to 8-bit

* At an altitude of 50 km

Wide Angle Camera Specifications

Image Format	1024 x 14 pixels monochrome (push frame) 704 x 14 pixels 5-filter (visible, push frame) 128 x 4 2-filter UV color
Pixel Scale (nadir)	1.50 milli-radian, 75 m/pix* (visible) 7.67 milli-radian, 385 m/pix* (UV, 4 x 4 binned)
Image Frame Width (km)	105 km* (visible monochrome) 60 km* (visible color) 57 km* (UV)
Optics	f/5.05 (visible) f/5.65 (UV)
Effective FL	6.0 mm (visible) 4.7 mm (UV)
Entrance Pupil Diameter	1.19 mm (visible) 0.85 mm (UV)
FOV	92° (monochrome) 61° (visible) 59° (UV)
MTF (@Nyquist)	0.37
Electronics	4 circuit boards
Detector	Kodak KAI-1001
Pixel format	1024 x 1024
Noise	66±4 e–
Mass	0.9 kg
Volume (W×L×H)	15.8 cm x 23.2 cm x 32.3 cm (incl. radiator)
Peak Power	2.7 W
Average Power	2.6 W
Filters (nm)	321, 360, 415, 566, 604, 643, 689
Detector Digitization	11-bit, encoded to 8-bit

* At an altitude of 50 km