



Lunar Reconnaissance Orbiter(LRO) Mission Overview



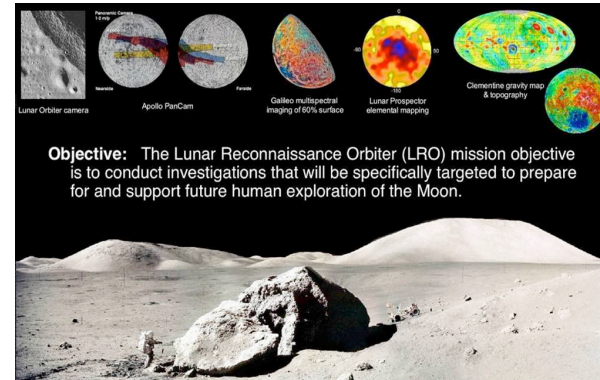
Richard Vondrak
LRO Project Scientist
NASA GSFC



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LRO Mission Objectives



Objective: The Lunar Reconnaissance Orbiter (LRO) mission objective is to conduct investigations that will be specifically targeted to prepare for and support future human exploration of the Moon.

LOCATE RESOURCES

- Hydrogen/water at the lunar poles
- Continuous solar energy
- Mineralogy

SAFE LANDING SITES

- High resolution imagery
- Global geodetic grid
- Topography
- Rock abundances

SPACE ENVIRONMENT

- Energetic particles
- Neutrons

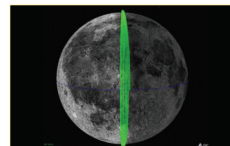
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LRO Mission Overview



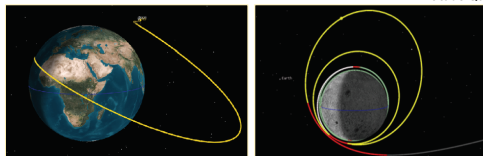
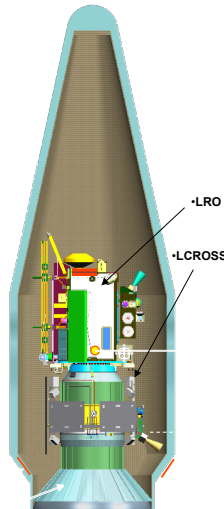
- Launch on an Atlas V into a direct insertion trajectory to the moon. Co-manifested with LCROSS lunar impactor mission.
- On-board propulsion system used to capture at the moon, insert into and maintain 50 km mean altitude circular polar orbit.
- 1 year exploration mission followed by handover to NASA Science Mission Directorate.
- Orbiter is 3-axis stabilized, nadir pointed, operates continuously during the primary mission.
- Data products delivered to Planetary Data Systems (PDS).
- Launched on June 18, 2009
- Began Exploration orbit on September 15



•Polar Mapping Phase, 50 km
Altitude Circular Orbit,
•At least 1 Year



•Commissioning Phase, 30 x 216 km
Altitude Quasi-Frozen Orbit, Up to 60
Days



LRO Instruments and Investigations

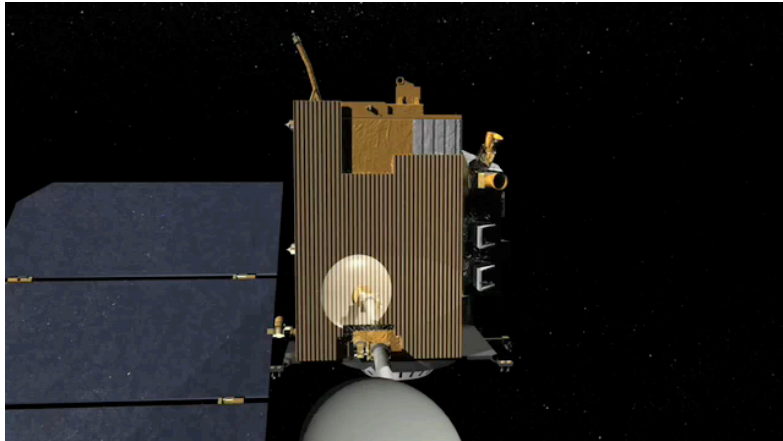


LOLA: Lunar Orbiter Laser Altimeter - Topography - Slopes - Roughness Full Orbit Autonomous	LROC/WAC: Wide-Angle Camera - Global Imagery - Lighting - Resources Day Side Autonomous	LROC/NACs: Narrow-Angle Cameras - Targeted Imagery - Hazards - Topography Day Side Timeline Driven
LR: Laser Ranging - Topography - Gravity GSFC LOS Autonomous	DLRE: Diviner Lunar Radiometer Exp. - Temperature - Lighting - Hazards - Resources Full Orbit Autonomous	Mini-RF: Synthetic Aperture Radar - Tech Demonstration - Resources - Topography Polar Regions Timeline Driven
CRaTER: Cosmic Ray Telescope... - Radiation Spectra - Tissue Effects Full Orbit Autonomous	LEND: Lunar Expr. Neutron Detector - Neutron Albedo - Hydrogen Maps Full Orbit Autonomous	LAMP: Lyman-Alpha Mapping Project - Water-Frost - PSR Maps Night Side Autonomous

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LRO Instruments



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LRO has robust and resilient capabilities

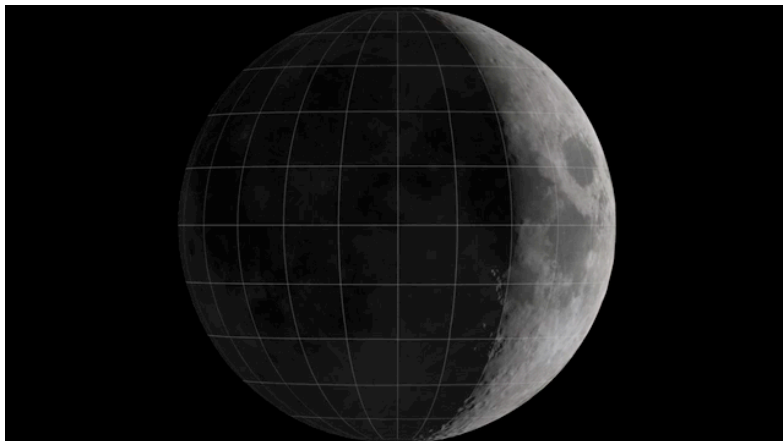


Objectives	LRO Requirements	Contributing Instruments
1 Find Safe Landing Sites	M30 M40 – Global geodetic grid 10 cm vertical, and at the poles, 50 m horizontal resolution	LOLA, LROC
	M80 – Identify surface features & hazards	LROC, LOLA, DLRE
2 Locate Potential Resources	M50 – Provide lunar temperature map from 40 - 300K, 5 K precision over full diurnal cycle.	DLRE
	M60 – Image the permanently shadowed regions.	LAMP, LOLA
	M70 – Identify putative deposits of water-ice	LAMP, LEND, LOLA
	M90 – Characterize the polar region illumination environment	LROC, LOLA, DLRE
	M100 - Characterize lunar mineralogy	LROC, DLRE
	M110 - Hydrogen mapping	LEND
3 Life in the Space Environment	M10 - Characterize the deep space radiation environment at energies in excess of 10 MeV	CRaTER, LEND
	M20 - measure the deposition of deep space radiation on human equivalent tissue.	CRaTER
4 New Technology	P160 - Technology demo	Mini-RF

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Lunar Mapping



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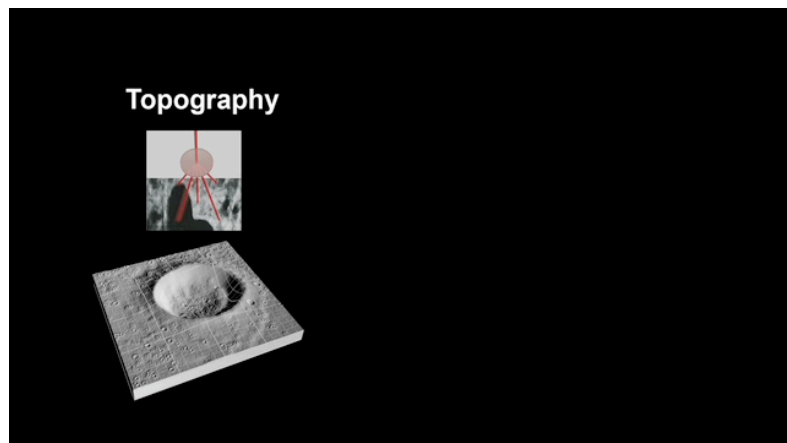
Lunar Resources



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Safe Landing Sites



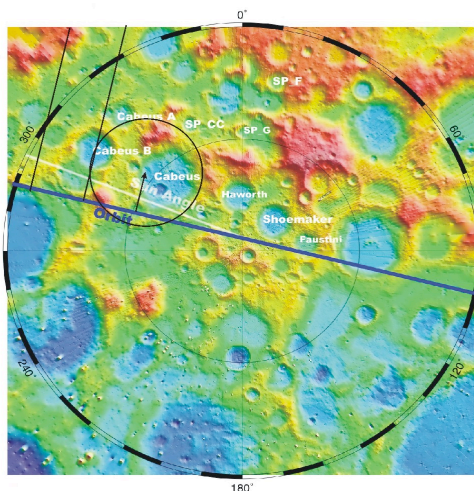
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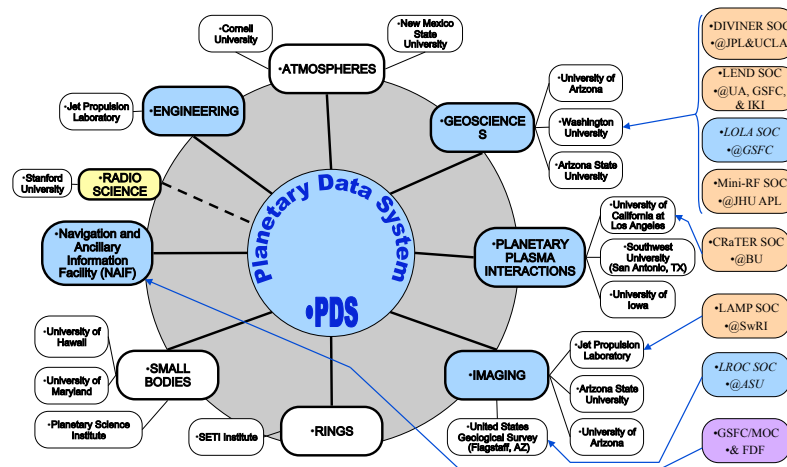
•LRO Recent Events



LRO & LCROSS Impact



LRO SOC's & PDS Nodes/Subnodes/ Data Nodes



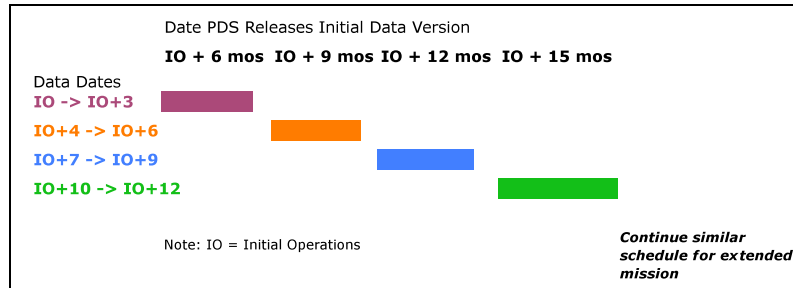
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LRO Data Delivery Schedule



SOCs deliver 3-6 month old, validated, initial version of LRO data to PDS every 3 months, starting 6 months after Initial Operations on 9/15/09.



Notes:

- 1) Subsequent versions and derived data products due to PDS in next 3-month delivery after creation and validation.
- 2) Creation of subsequent versions and derived data products is on a time scale commensurate with the level of data processing required.
- 3) Final data processing and release can not exceed 6 months from end of primary mission or extended mission, as applicable.

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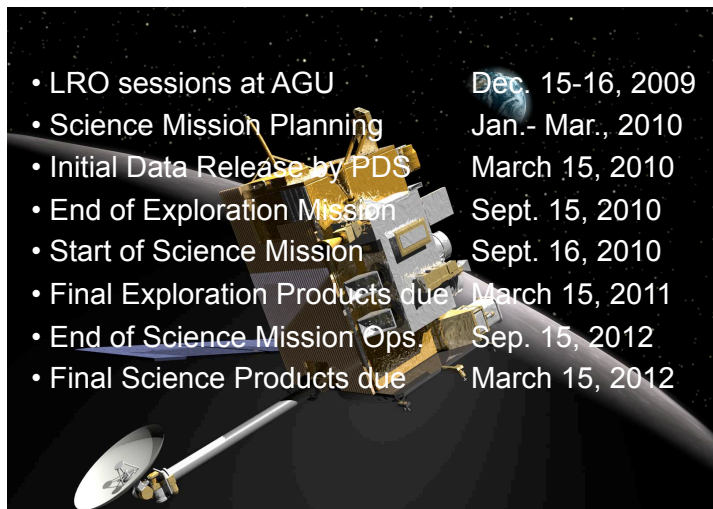
After 1 year of operation to accomplish Exploration objectives, LRO will be operated by NASA's Science Mission Directorate



- LRO instrument suite has strong planetary science heritage
- Measurement capabilities align with lunar science goals that were identified by the NRC Decadal Survey and SCEM reports
- SMD mission might stay in the 50-km orbit or move to a transition orbit (e.g. more complete coverage over the moon's lower latitudes).
- Eventually LRO will be placed in a more stable orbit (30 x 216 km) for prolonged operations.
- Spacecraft operations may differ from ESMD mission (e.g. limb views)
- SMD plans to provide funding for the LRO Principal Investigators and their teams, as well as other researchers
- All LRO data products will be delivered to the Planetary Data System within six months for use by the scientific community



•LRO Future Events



More information



- About LRO:
<http://www.nasa.gov/lro>
- To contact the LRO Project Scientist:
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