The Lunar Reconnaissance Orbiter (LRO) Mission Overview

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Lunar Reconnaissance Orbiter (LRO)
First Step in the Robotic Lunar Exploration Program

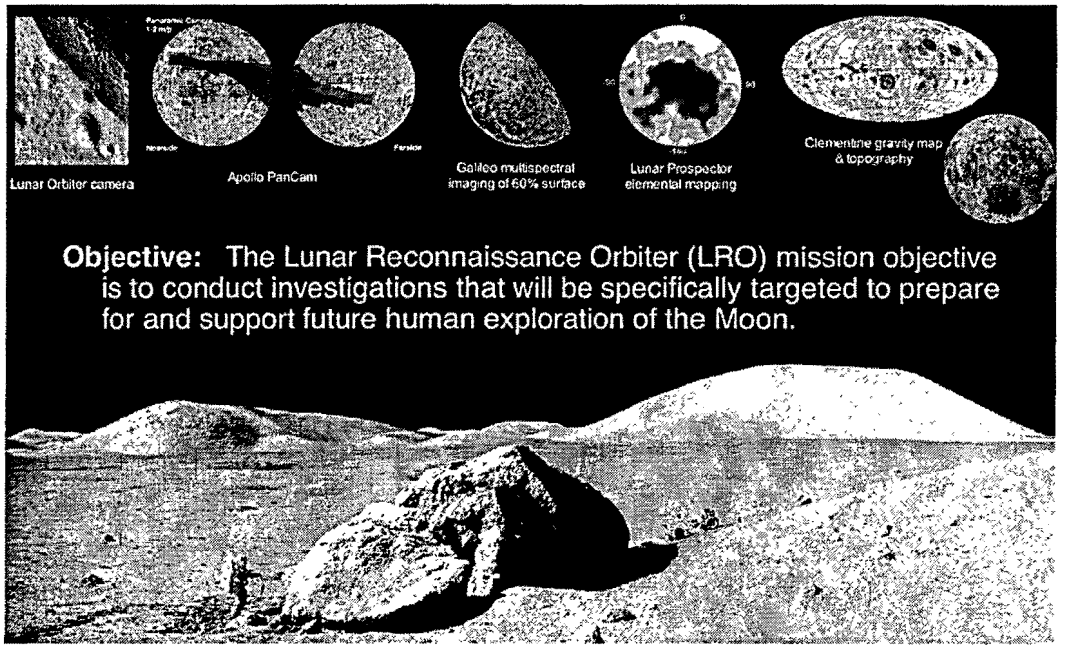
LRO Objectives

- **Characterization of the lunar radiation environment, biological impacts, and potential mitigation. Key aspects of this objective include determining the global radiation environment, investigating the capabilities of potential shielding materials, and validating deep space radiation prototype hardware and software.**

- **Develop a high resolution global, three dimensional geodetic grid of the Moon and provide the topography necessary for selecting future landing sites.**

- **Assess in detail the resources and environments of the Moon's polar regions.**

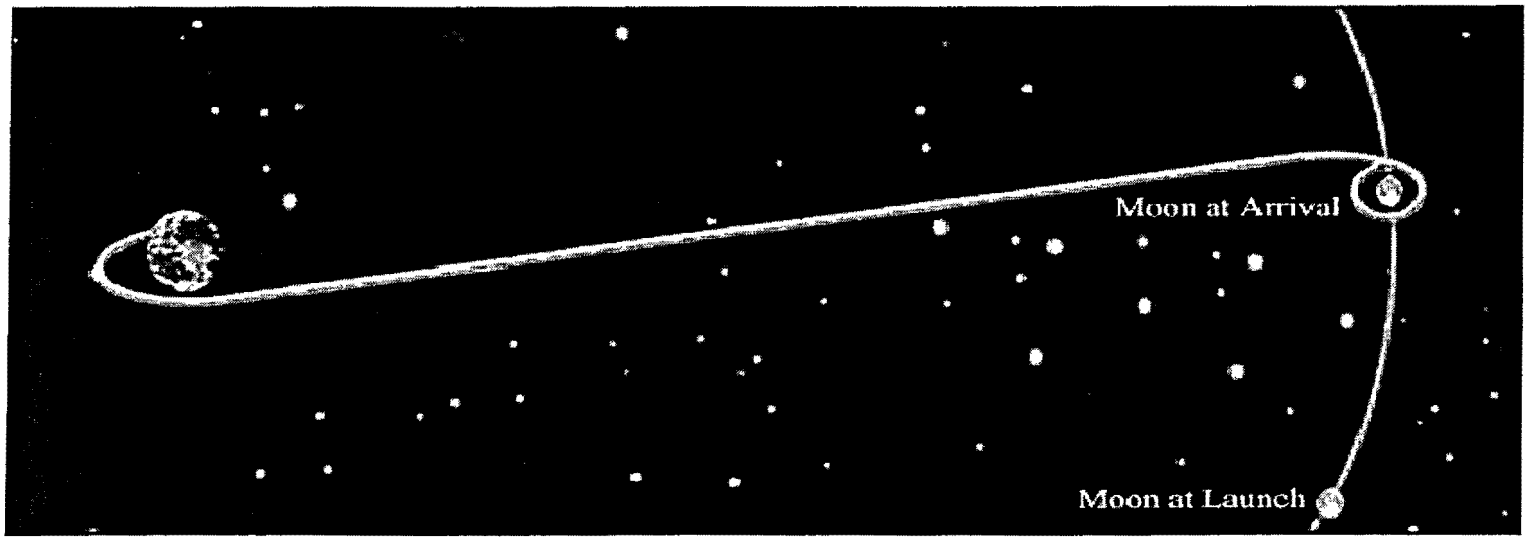
- **High spatial resolution assessment of the Moon's surface addressing elemental composition, mineralogy, and Regolith characteristics**



LRO Mission Overview

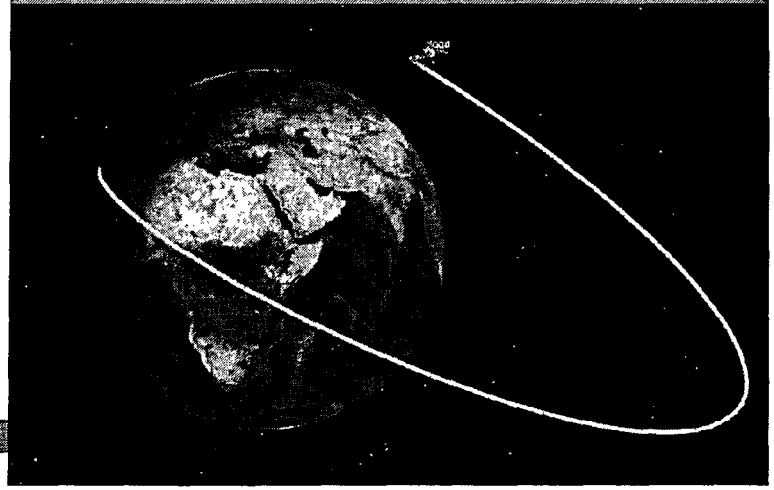
- Launched June 18, 2009 on a Atlas-V into a direct insertion trajectory to the moon.
- On-board propulsion system used to capture at the moon, insert into and maintain 50 km altitude circular polar reconnaissance orbit.
- 1 year prime mission, 2+ year extended mission

- **810 kilogram dry mass**
- **894 kilograms fuel**
- **823 watts orbit average power**
- **4kbps S-band uplink**
- **100Mbps Ka-Band downlink**
- **GSFC In-house spacecraft bus**
- **One RAD750 S/C processor**
- **1553 and Spacewire data bus**
- **7 science instruments**

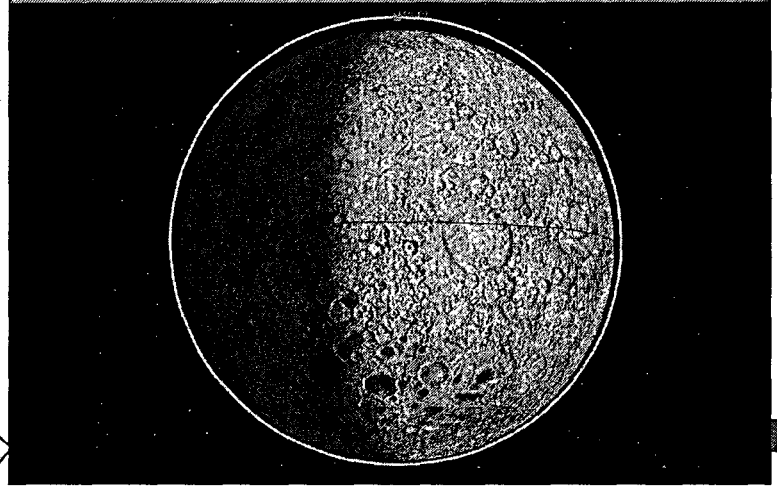


Trajectory/Orbit Overview

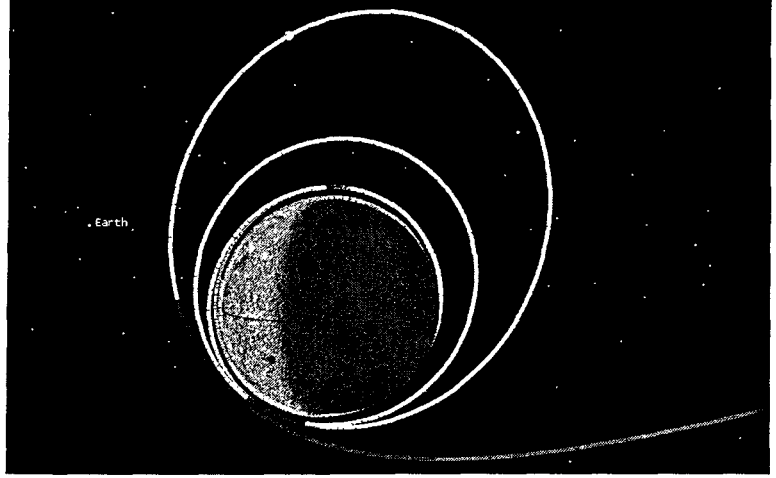
Minimum Energy Lunar Transfer: ~ 4 days



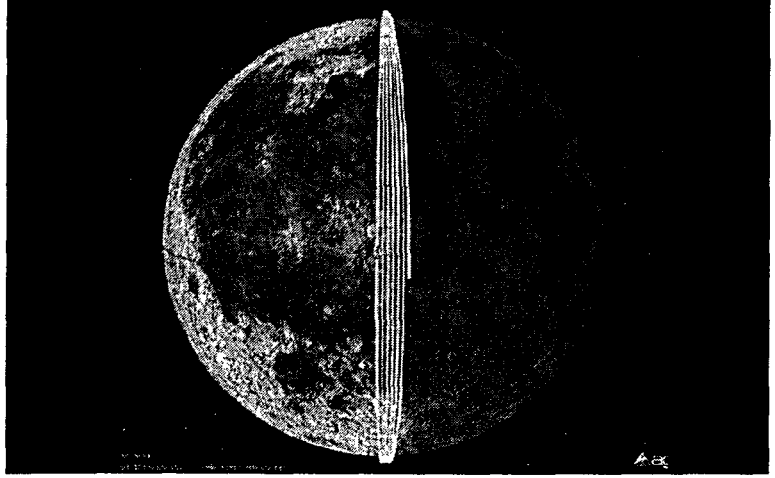
30 x 216 km Orbit: up to 60 days



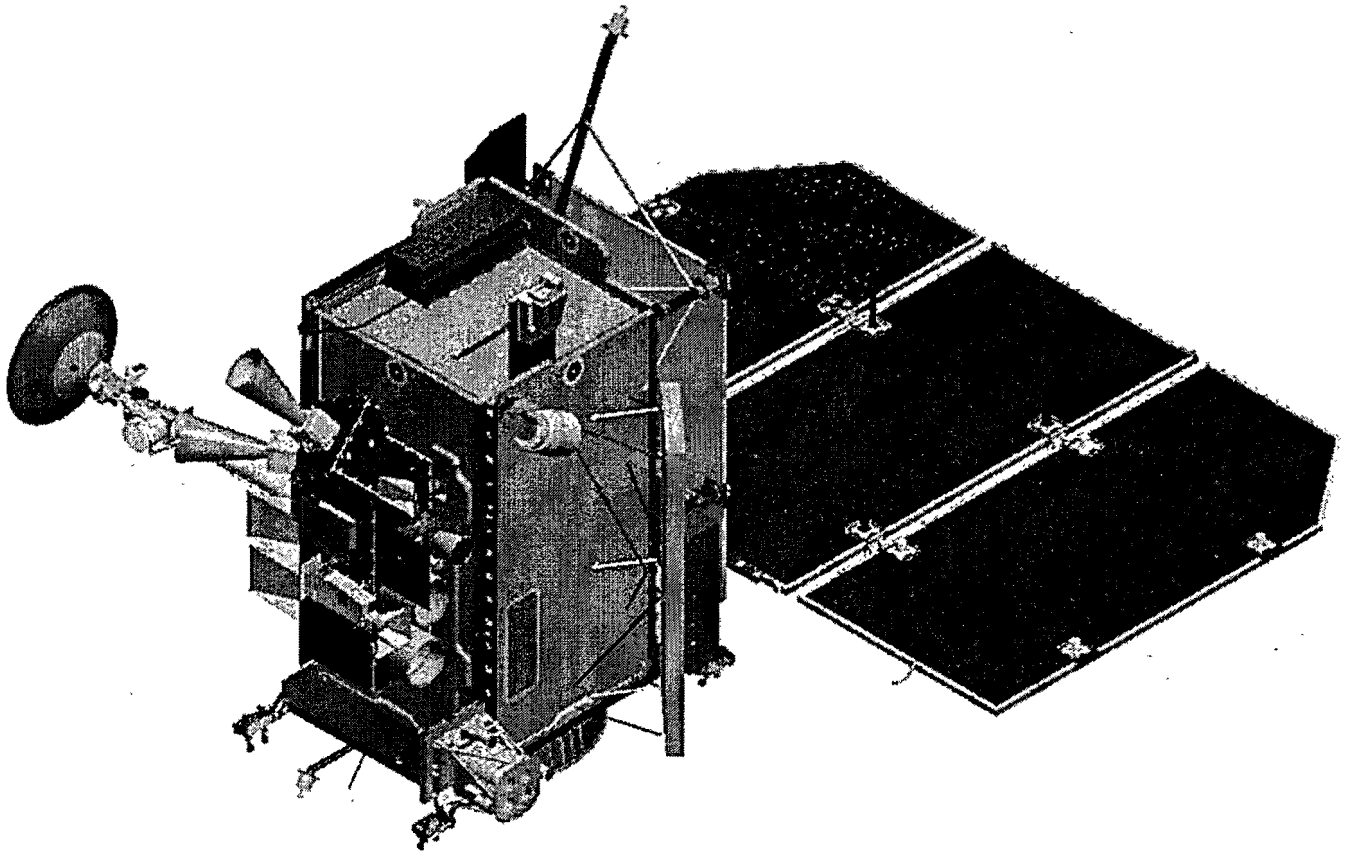
Lunar Orbit Insertion Sequence (4): 2-4 days



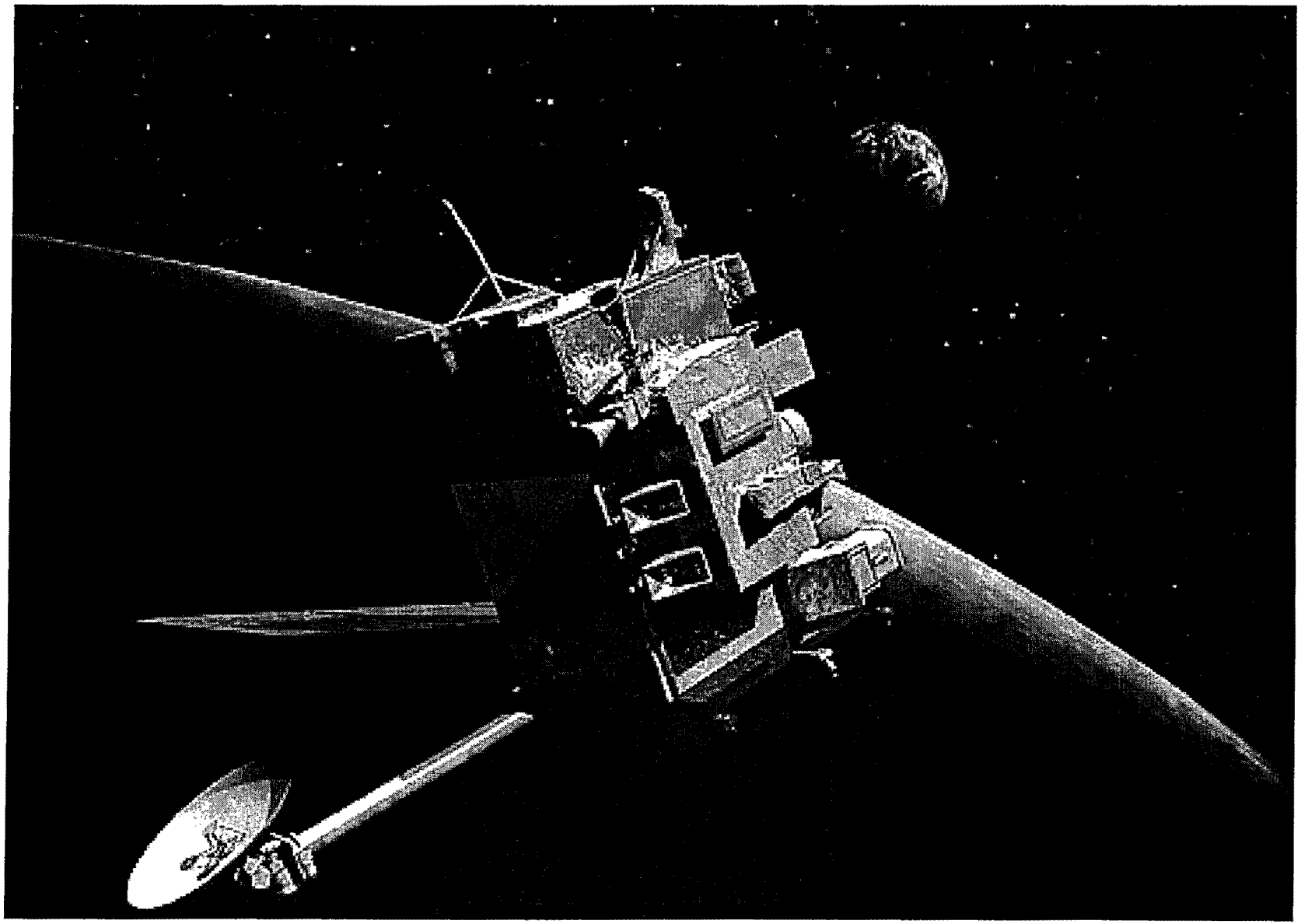
50 km Polar Mapping Orbit: at least 1 year



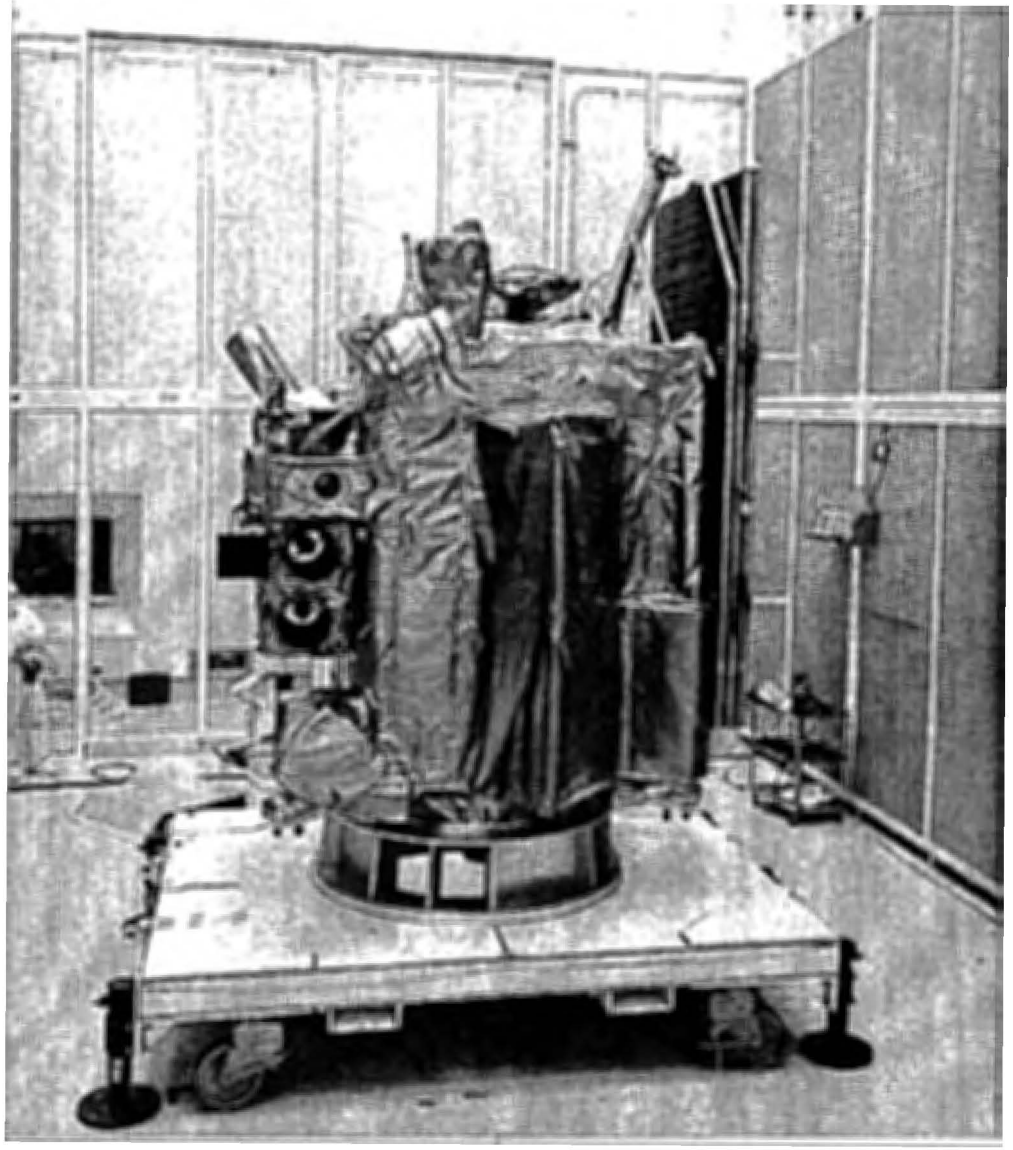
Spacecraft - Mechanical Drawing



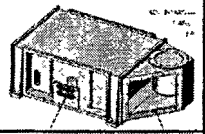
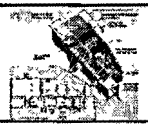
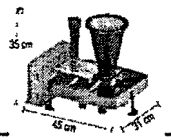
Spacecraft - Artist's Conception



Spacecraft - Photo

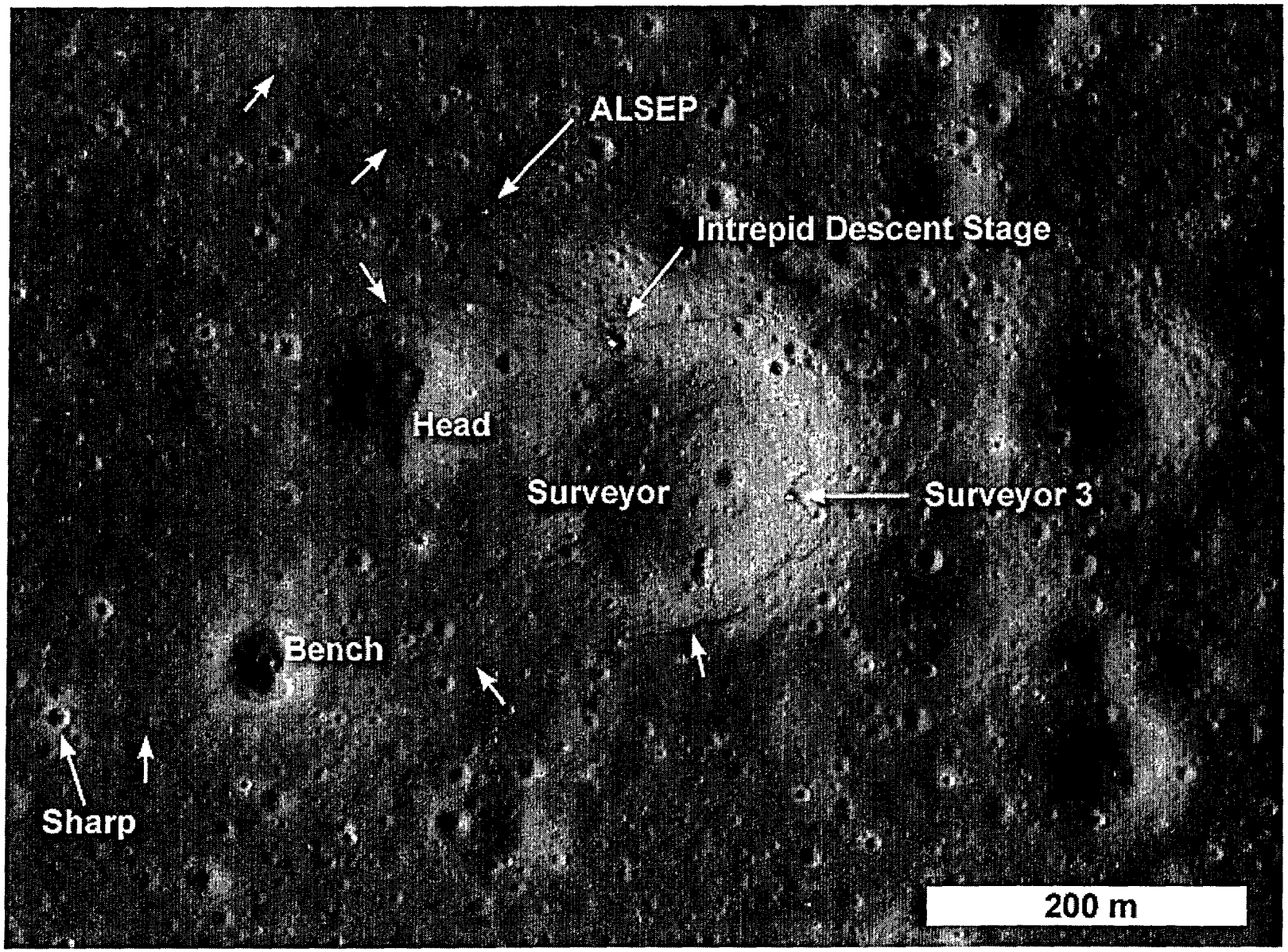


LRO Payload Overview

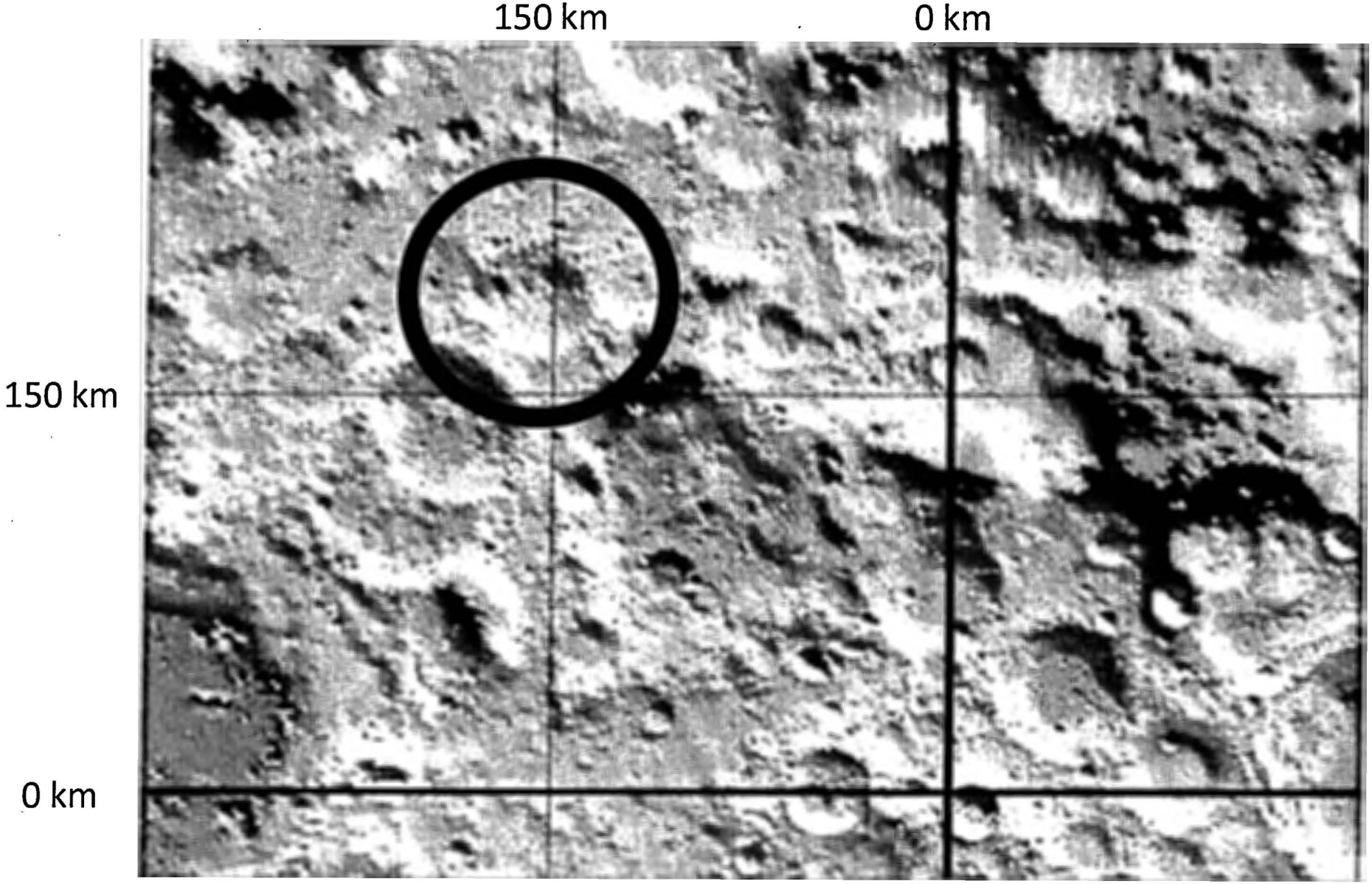
INSTRUMENT	Measurement	Exploration Benefit	Science Benefit
CRaTER Cosmic Ray Telescope for the Effects of Radiation 	Tissue equivalent response to radiation	Safe, high performance, lighter weight space vehicles	Radiation boundary conditions for biological response
DLRE Diviner Lunar Radiometer Experiment 	Better than 500m scale maps of Temperature, surface ice, mineralogy	Determines conditions for systems operability, resource including water-ice location	Source, history, migration and deposition of polar volatiles
LAMP Lyman Alpha Mapping Project 	Maps of frosts in permanently shadowed areas, etc.	Locate potential water-ice on the surface, image shadowed areas	
LEND Lunar Exploration Neutron Detector 	Maps of hydrogen in upper 1 m of Moon at 10km scales	Locate potential water-ice in lunar soil	
LOLA Lunar Orbiter Laser Altimeter 	~50 m scale polar topography at < 10 cm vertical, roughness	Safe landing sites and surface navigation	Geodetic topography for geological evolution
LROC Lunar Reconnaissance Orbiter Camera 	1000's of 50cm/pixel images (125km2), and entire Moon at 100m in UV, Visible	Surface Landing hazards and some resource identification	Tectonic, impact and volcanic processes, resource evaluation, and crustal evolution
Mini-RF *Technology Demonstration* 	X&S-band Radar imaging and radiometry	Demonstrate new lightweight SAR and communication technologies, locate potential water-ice	Source, history, deposition of polar volatiles

Mission Operations Center

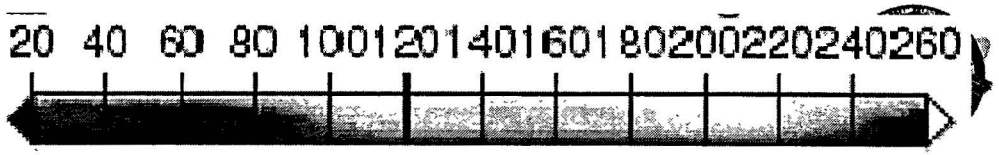
Apollo 12 Landing Site - LROC



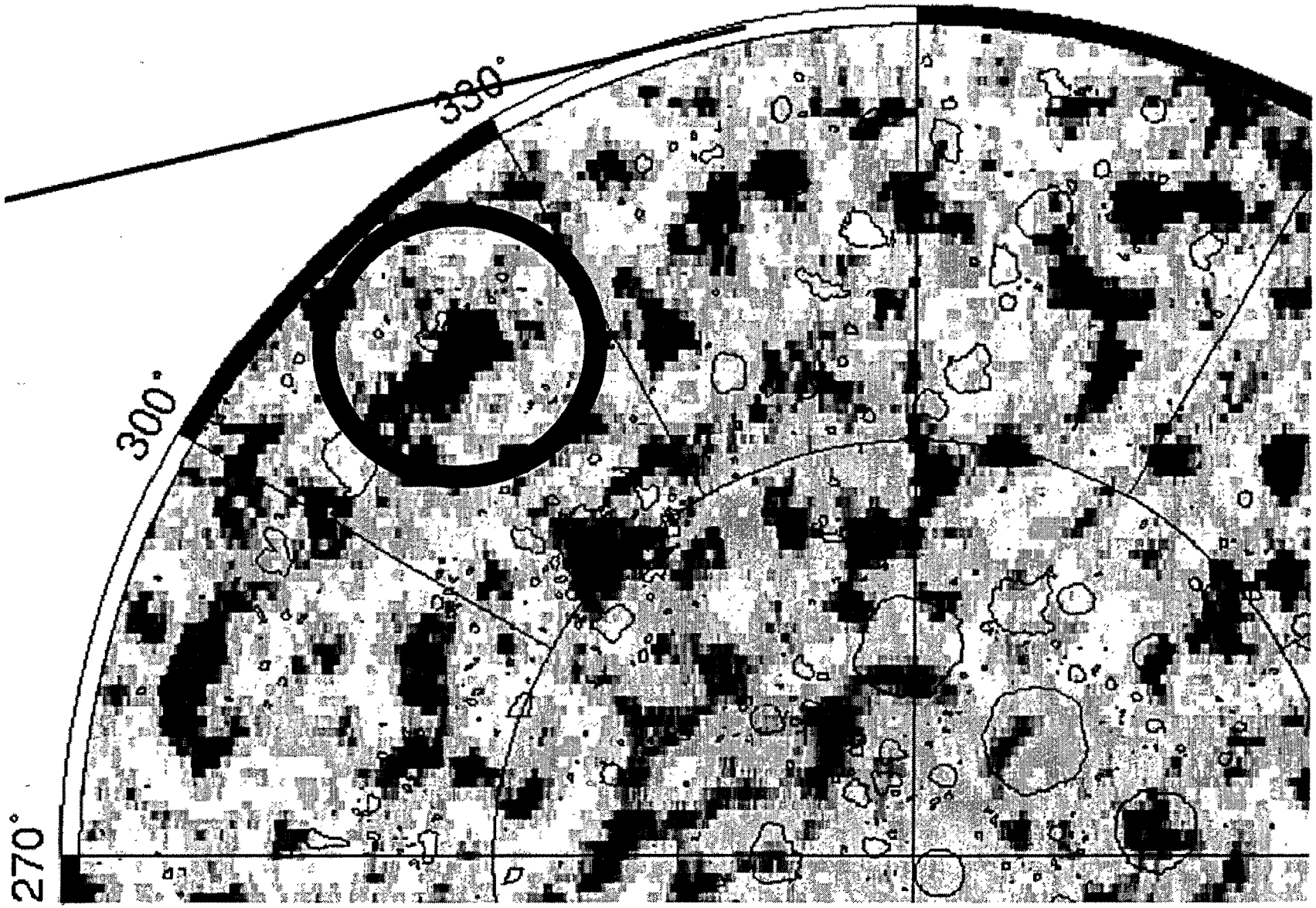
LOLA Data



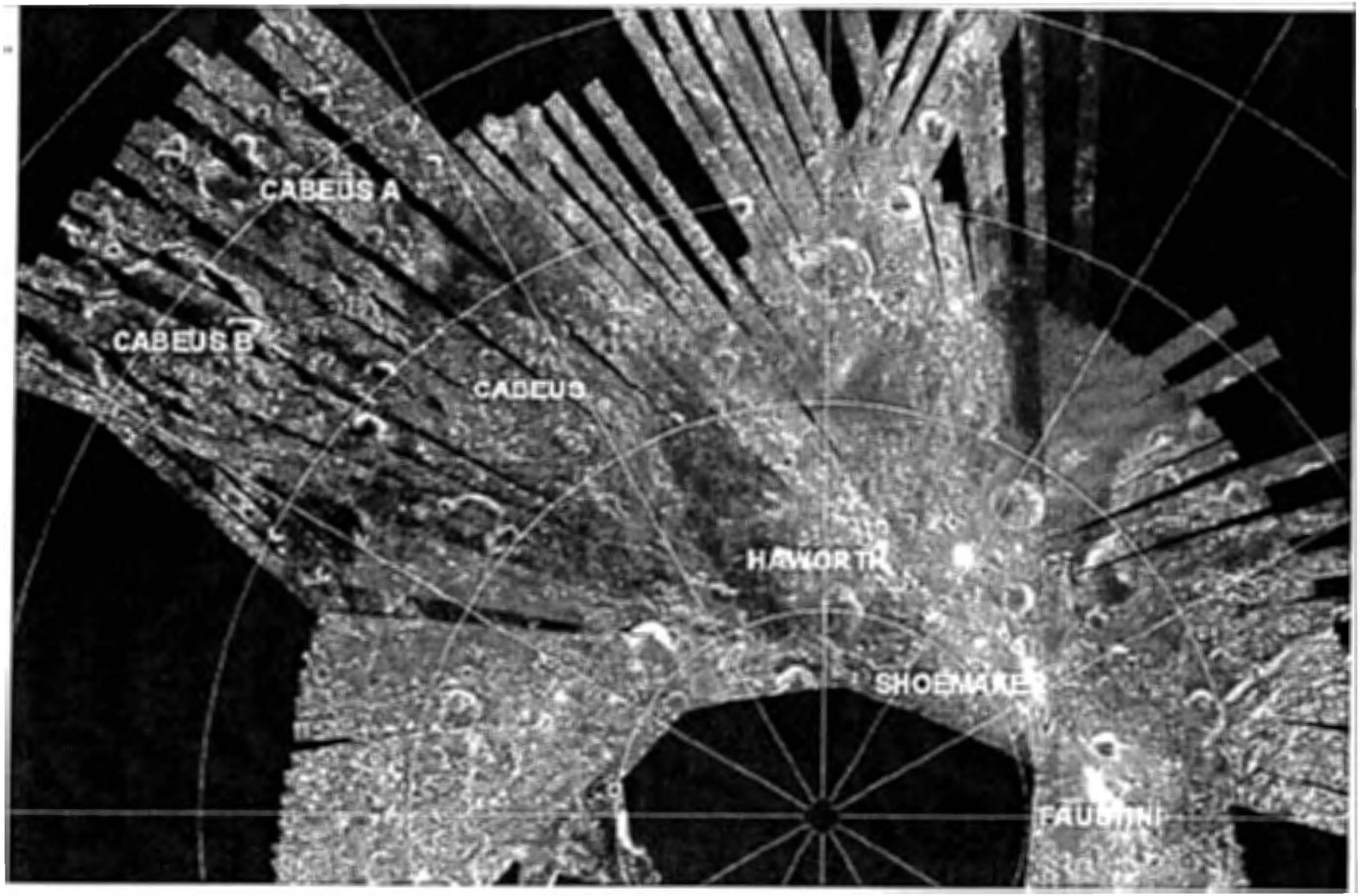
Diviner Data



LEND Data



Mini-RF



Additional Resources

- ***NASA LRO Mission Website:***

  www.nasa.gov/mission_pages/LRO/main/index.html

- ***LRO Project Website:*** lro.gsfc.nasa.gov

- ***LRO on Twitter:*** twitter.com/LRO_NASA

- ***LRO Blog:*** lroupdate.blogspot.com