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NASA lunar exploration strategies, part 1: Precursor missions

August 22, 1:33 PM | Denver Space Industry Examiner | Brian Enke

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Previous

As reported in the preceding "First lunar residents won't be human?" article, NASA has charged a new team called OSEWG (Optimizing Science and Exploration Working Group) with "gluing" together the Exploration Systems and Science Mission Directorates. OSEWG will initially focus on the current NASA plan to return astronauts to the lunar surface.



The Moon. Credit: NASA

OSEWG has split the lunar sortee timeline into six parts. The first, precursor missions, includes the interval from now (whenever you're reading this) until just prior to the next crewed mission sometime around the year 2020 - or 2030 if you believe the Augustine Committee.

Precursor missions will teach NASA about the operational environment on the Moon. Several have already been launched or completed. Using a broad definition, the Apollo missions from 1969 to 1972 served as valuable precursor missions for the lunar sortees in the coming decades.



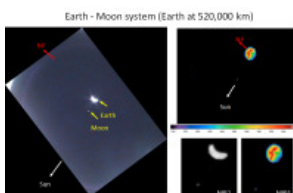
Current precursor missions

The recently launched Lunar Reconnaissance Orbiter (LRO) typifies the precursor missions NASA will consider over the coming years. LRO will remain in orbit around the Moon for many years (hopefully), returning science data and high resolution imagery of the whole surface - with special focus on the south polar regions where astronauts may someday land.

According to NASA's official LRO website:

"The primary objective of LRO is to conduct investigations that prepare for future lunar exploration. Specifically LRO will scout for safe and compelling landing sites, locate potential resources (with special attention to the possibility of water ice) and characterize the effects of prolonged exposure to the lunar radiation environment."

The Lunar CRater Observation and Sensing Satellite (LCROSS), another precursor mission already off the ground, will crash-land a Centaur rocket's upper stage into a shadowed crater in the Moon's south polar region on Friday, October 9, at 1:30am EDT. The five metric tonne projectile should blast ejecta nearly six miles above the lunar surface. Observers in several locations on Earth will attempt to spot the telltale signatures of water-ice by analyzing the ejecta plume directly.



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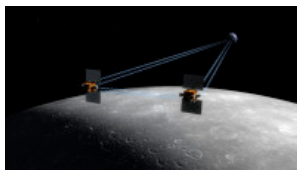


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Future precursor missions

NASA and other space agencies have several lunar precursor missions on the drawing boards. The first of these missions, the Gravity Recovery and Interior Laboratory (GRAIL), may launch in September of 2011. Two GRAIL orbiters, working in tandem, will create a detailed gravity map of the Moon, allowing scientists to infer interior composition and structures. GRAIL will also probe the south polar regions to determine, among other things, safe landing sites for future human missions.

Other future missions include NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE), scheduled to launch in May of 2012. China may launch a lunar orbiter in 2011, followed by two NASA lander missions after 2013 to set up an 8 or 10 node "Lunar Network". Details on these future missions are sketchy, and conjecture would be pointless at this stage.

However, some sort of future Lunar Network landers might fit into an overall lunar human/robotic architecture similar to the one discussed at the recent [OSEWG workshop](#). In summarizing the findings of the workshop's "precursor mission" sub-team, Sarah Noble stated that current technology is sufficiently advanced for precursor missions to meet the following objectives:

1. Characterize lunar landing sites (LRO, GRAIL?)
2. Identify and demonstrate In-Situ Resource Utilization (ISRU) opportunities (LRO, LADEE?)
3. Characterize the overall lunar environment (LRO, GRAIL, LADEE?)
4. Conduct paradigm-changing science prior to the next crewed mission (?)

The final objective, paradigm-changing science, may best be met by a sample return mission from the South Pole Aitken Basin region. However, a robotic sample return mission may be prohibitively expensive and hard to sell as a precursor mission since human geologists could visit similar sites and bring back orders of magnitude more (and better) samples.

This brings up an interesting point with robotic precursor missions. If the goal of a robotic mission is to support human exploration, each mission doesn't require super-futuristic Star Trek capabilities that ultimately replace the need for the human mission. NASA seems to have the right mindset, at least with regards to lunar missions: Let the machines and humans both do what they are best at.

Return to the Overview Article: [First lunar residents won't be human?](#)

Continue to phase 2: Pre-mission robotic activities (not yet available)

For more info:

- [LRO and LCROSS article](#)
- [LRO website](#)
- [LCROSS website](#)
- [GRAIL press release](#)
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Image credits:

- LRO concept image, Credit: NASA
- LCROSS image of Earth and Moon on Aug 17, Credit: NASA Ames
- GRAIL concept image, Credit: NASA/JPL

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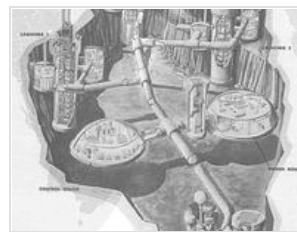
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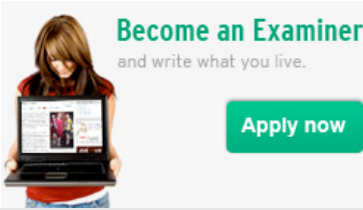
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