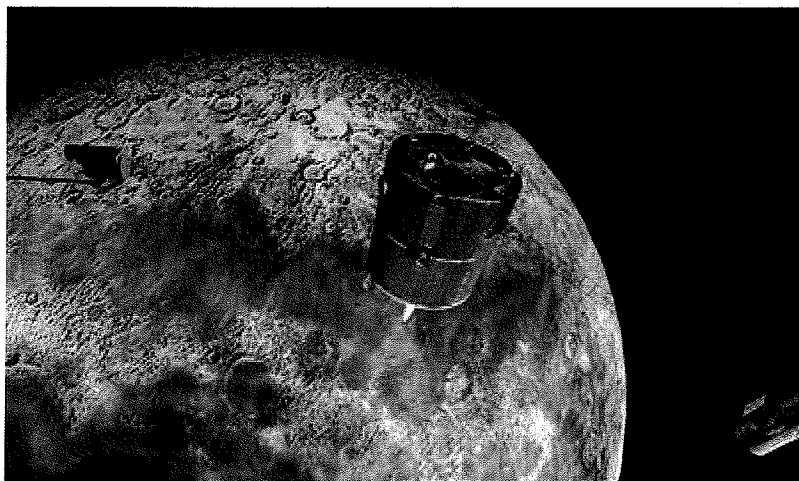


The Space Review

essays and commentary about the final frontier



The Lunar Reconnaissance Orbiter will be far more ambitious—and far larger—than recent missions to the Moon, like Lunar Prospector (above). (credit: NASA Ames)

Lunar Reconnaissance Orbiter: the cornerstone of the vision

by Taylor Dinerman
Monday, April 26, 2004

Scheduled to be launched sometime in 2008, the Lunar Reconnaissance Orbiter (LRO) project is quickly approaching the point where some basic decisions have to be made. Given the time it takes for missions such as the LRO to be designed, built, tested, and certified, the need to get the requirements right, and to do so fast, is an early test of Code T and Admiral Steidle's ability to change the way things get done at NASA.

The first requirement is to decide the goals of the LRO mission. Based on the vision paper, it can be assumed that the primary goal of this project is to map the Moon's usable resources so that Code T can begin to develop the technologies needed for in situ resource utilization (ISRU). Aside from the samples brought back from Apollo, there is still relatively little we know about the potential minerals—above all the water—that might exist on the Moon.

The meaning of the data from the 1994 Clementine and 1998 Lunar Prospector missions is still being debated. We know, for example, that there is plenty of hydrogen on the Moon, but we do not know what form it is in or what it is chemically bonded with. It would be nice if the LRO can confirm or deny the presence of water ice in the dark craters of the south polar region. Choosing the right instruments to do this should be at the top of any list of priorities.

It can be assumed that the primary goal of this project is to map the Moon's usable resources for planning ISRU technologies.

Subscribe

Enter your email address below to be notified when new articles are published:

[our privacy policy](#)

[Ads by Yahoo!](#)

moon roofs

See Remarks for Roofing Pros Review & Choose Who's Right For You.
ServiceMagic.com

trips to the moon

Find Best Deals on Over 200K Hotels and Flights. Fast Quick & Easy.
TravelSearch.com

Aquarium Moonlighting Systems

Advanced moon lights and lunar cycle controllers for all aquariums. fishbowl

bay half hotel moon

Know before you go. Read reviews from real travelers.
tripadvisor.com

Water is the second most valuable substance in the solar system (the most valuable, of course, being human brainpower.) In his April 1st testimony before the House Science Committee, Paul Spudis said that, "We estimate that over 10 billion tons of water exist at the lunar poles." If he's right, then the vision to build the Moonbase, to perfect ISRU technology and then go on the Mars, will be possible within roughly the time frame laid out by President Bush. If the water is not there, or if it is there in forms that make it difficult to extract, then the whole project will need to be rethought.

There are a number of other imperatives for the LRO instrument package. It must include instruments to produce a detailed topographic map of the whole lunar surface. This means that a state-of-the-art laser altimeter must be included. There must also be a pan-chromatic one-meter resolution or less imager, and a multi- or hyperspectral sensor. Magnetometers and some sort of ground penetrating radars are also desirable.

It is not likely that a suitable instrument suite can be made to fit inside the 40 or 50 kilo payload capability of a Delta 2. In order to put a probe into lunar orbit, enough propellant must be included so that the spacecraft can slow itself down. Unlike Mars, where the thin Martian atmosphere allows for aerobraking maneuvers, all of the energy needed to move into a capture orbit must be brought along from Earth in the form of hydrazine or another type of fuel.

If NASA plans to launch LRO on a Delta 2, as most observers assume, the payload limits will probably ensure that the limited data that will be transmitted back to Earth will not be enough to accomplish the mission's most important goals. If, on the other hand, they decide to upgrade to an Atlas V or

Since the people who handle space budgets inside the Pentagon are desperate to see more EELVs fly, it is likely that they will be willing to look for innovative ways to help the LRO onto a more powerful rocket.

Delta IV EELV class vehicle, the mission design team will be able to put together an instrument package that will weigh in at 120 kilos, or more. This, along with enough fuel to maintain a low altitude orbit around the moon, will produce a spacecraft that will accomplish all the main objectives.

Upgrading from a Delta 2 to an EELV will probably not cost more than 10 or 15 million dollars. Since the people who handle space budgets inside the Pentagon are desperate to see more EELVs fly, it is likely that they will be willing to look for innovative ways to help the LRO onto a more powerful rocket. In the case of the LRO, the more fuel it can carry the better.

ESA's SMART-1 mission is on its way to the Moon, and Japan has two missions planned: Lunar A, to be launched in September of this year and Selene, whose launch date is planned for August 2005. The data from these missions will be helpful, but they are not geared towards gathering resource inventory data for ISRU. Only the LRO is specifically designed for this mission.

This is critically important to the vision, since the Moon is only the

first place that such an inventory will be taken. If LRO is done right, we will have a model for the future. If it is done wrong, not only will this be a waste of time and money but it will put the whole vision plan into jeopardy. Getting this right the first time will require proper funding and superb mission management. This will be a test that NASA, Code T, as well as the Administration and Congress, dare not fail.



Taylor Dinerman is editor and publisher of SpaceEquity.com.

[Home](#)