Delta-V

This blog focuses on the nuts-and-bolts of space technology. We're interested in the hardware that's actually going into orbit and beyond. We write about what's involved in building, launching, and operating spacecraft, exploration vehicles, and habitats (and what it takes on the ground to support them) today.

Delta-V is written by Stephen Cass, a senior editor at *TR* who has covered space technology and exploration for eight years, and Brittany Sauser, a space technology reporter at *TR*.

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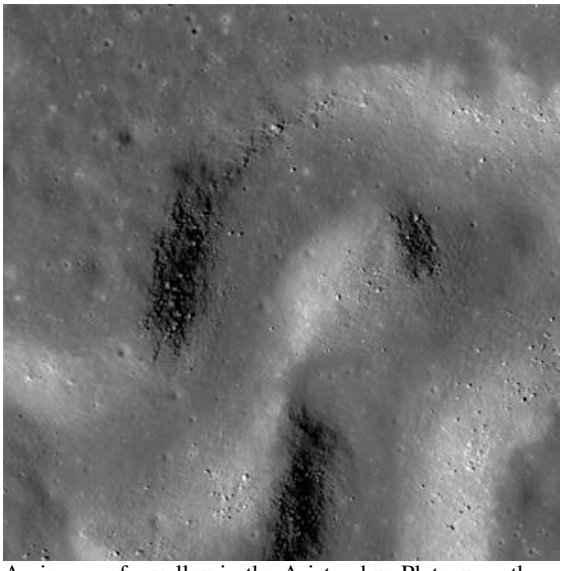
Wednesday, August 19, 2009

How Nasa's New Moon Probe Communicates

NASA's lunar orbiter uses a high-bandwidth connection to send back hundreds of gigabytes of data per day.
By Brittany Sauser



An image of a valley in the Aristarchus Plateau on the moon taken by LRO. Credit: NASA

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NASA's newest robot mission to the moon launched on June 18 and it has so far been a success, even sending back images of the Apollo lunar landing sites.

The Lunar Reconnaissance Orbiter (LRO) is using new sensing technology to scan the moon's surface, helping scientists search for resources such as ice, and assess the threat that radiation in the environment could pose for humans. The project is part of NASA's Vision for Space Exploration and is the first step towards returning humans to the moon.

The orbiter will spend the next year collecting data, gathering more information than any previous spacecraft. To accomplish this, NASA had to build a powerful communications system that can transmit nearly 461 gigabytes of data per day more than 238,800 miles back to Earth.

To communicate, LRO uses a 13-inch long tube called a Traveling Wave Tube Amplifier. It can send information at a rate of up to 100 megabytes per second and is the first high data transmitter of its kind to fly on a NASA spacecraft. According to NASA's press release,

> The device uses electrodes in a vacuum tube to amplify microwave signals to high power. It's ideal for sending large amounts of data over a long distance because it provides more power and more efficiency than its alternative, the transistor amplifier.
>
> As the orbiter collects information about the moon's geography, climate and environment, the communication system transmits this information to a receiver at a Ka band antenna network at White Sands Test Facility in New Mexico. Scientists are using the data to compile high-resolution, 3D maps of the lunar surface.
>
> "We're sending back more data than ever, faster and it's nearly real time," said Glenn project manager Todd Peterson.

While the new amplifier has been used for other planetary missions, previous designs were less powerful and efficient. For the moon the amplifier had to be custom designed and handmade. Without such a system, it would be nearly impossible to gather the necessary data to find a safe landing site or to properly understand the environmental characteristics relavent to future human missions.

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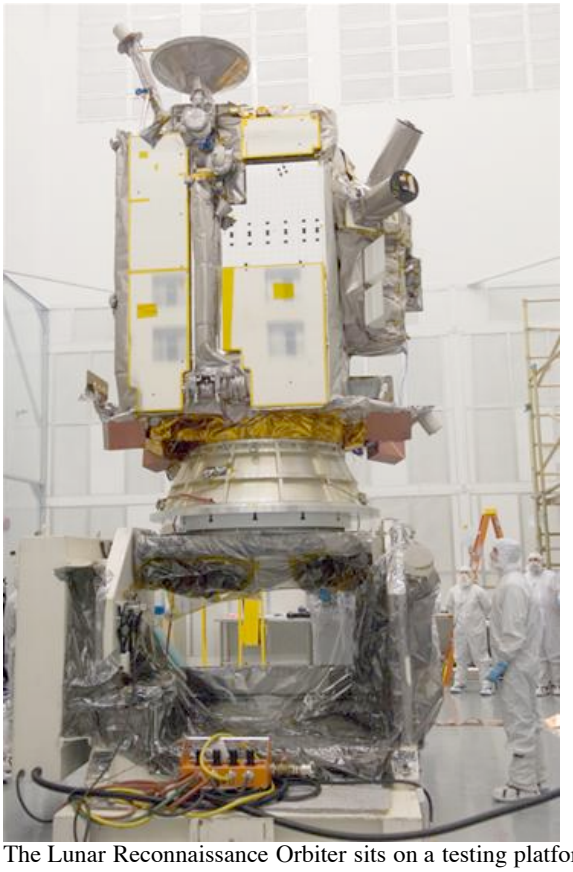

The Lunar Reconnaissance Orbiter sits on a testing platform in a clean room at NASA's Goddard Space Flight Center in Greenbelt, Md. This image gives an idea of the size of the spacecraft. Credit: NASA/Debbie McCallum

Tags: nasa, lunar orbiter, moon, LRO

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TWT history
Amazing that a device developed during WWII is still the standard in microwave broadband amplifiers.

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What???
"Without such a system, it would be nearly impossible to gather the necessary data to find a safe landing site or to properly understand the environmental characteristics relavent (sic) to future human missions"

Tell that to the Apollo guys.

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