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Lcross Will Crash To Search for Water on the Moon

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Now that its flight has begun, a full array of observatories is standing by to take pictures of the Lunar Crater Observation and Sensing Satellite (Lcross) when it slams into the bottom of a crater on the Moon's south pole on Oct. 9.

Lcross was lofted piggyback with NASA's Lunar Reconnaissance Orbiter (LRO) on an Atlas V 401 from Kennedy Space Center on June 18. LRO is preparing detailed maps for an eventual manned landing site; Lcross will look for evidence of water ice and hydrogen on the lunar surface.

LRO separated from the launcher's Centaur upper stage shortly after launch, but the Lcross payload will remain connected to the Centaur until about 9 min. before impact three months from now. Rather than being discarded, the 5,216-lb. Centaur is being deployed as a big, dumb battering ram to help with the Lcross experiment. The 1,290-lb. Lcross Shepherding Spacecraft is the brains of the operation. Both will impact the floor of a crater - the Centaur first - to be selected 30 days before the end of the mission.

The intent is to kick up a cloud of regolith and dust like a bomb blast. Observatories will take pictures using optical and infrared telescopes from the ground and space. Amateurs should be able to see it with 10-12-in. telescopes.

Exactly how long the shower will remain suspended in the thin lunar atmosphere is a subject of debate. But it's expected to last at least a few minutes.

Many spacecraft have nose-dived into the Moon, but not as their primary mission. They hit at shallow angles not conducive to a good debris plume. Lcross was tailor-made for the task and will descend at an optimum, nearly perpendicular angle.

The spacecraft completed its first two post-launch milestones June 23 with a lunar swingby and instrument calibration. The science team observed it all from a new control room at NASA Ames Research Center. They report a healthy spacecraft that produced initial images in visible, near-infrared and mid-range IR.

The unusual mission came about because NASA had surplus lift available when it switched the LRO launch to an Atlas V. Ames jumped at the chance to custom-design a mission to take up the space. With Northrop Grumman Aerospace Systems as the manufacturing partner, the Lcross team met a \$79-million funding cap and produced a science payload that includes five cameras, three spectrometers, a photometer and a data-handling unit (AW&ST Mar. 9, p. 46). Using Centaur as its battering ram, the Shepherding Spacecraft will have just 4 min. to image, chemically analyze and transmit its data of the regolith ejecta before it follows the Centaur into the lunar surface.

Now that it has completed its swingby, Lcross is headed back to Earth for a gravity-assist trajectory for the final impact.

The LRO/Lcross liftoff was pushed back 20 months, largely because of other mission schedules, most recently that of the space shuttle Endeavour. When a liftoff date was set, LRO called the shots as the primary mission. Its window had to be precise to assure an orbital insertion giving it full sunlight to take surface temperature measurements of the lunar surface. In some cases, what was looking good for LRO was bad for Lcross because its impact would be timed to a bad phase of the Moon for optimum viewing. As luck would have it, the mid-June liftoff was excellent.

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