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NASA launches mission to explore the moon

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Justin Demier / European Pressphoto Agency

The orbiter and Atlas V rocket lift off from Cape Canaveral, Fla.

An orbiter will spend the next year cruising 31 miles above the lunar surface, looking for the best place to land and build Earth's first off-world colony.

By John Johnson Jr.
June 19, 2009

NASA took the first concrete step toward returning human beings to the moon Thursday, successfully launching the Lunar Reconnaissance Orbiter on a mission to find the best place to land and build Earth's first off-world colony.

The 19-story-high, two-stage rocket and spacecraft launched at 2:32 p.m. Pacific time. As the huge first-stage Atlas V rocket roared to life at Cape Canaveral in central Florida, NASA spokesman George Diller called it "America's first step in a lasting return to the moon."

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Centaur rocket
A key part of the mission



Spacecraft
Hunting for water on the moon

NASA delays moon-mapping mission by a day

The \$500-million orbiter will spend the next year cruising just 31 miles above the lunar surface, employing a suite of seven instruments to identify landing hazards such as rocks and craters.

It will be paying particular attention to the largely unknown lunar poles, where previous missions have picked up hints that water ice may exist in some permanently shadowed craters.

Locating water on the apparently desiccated moon would be a major discovery that would make permanent settlements much more feasible. Water would not only be

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useful for drinking, but it would also be invaluable as a source of oxygen for respiration and rocket fuel.

Finding water is so important, in fact, that riding along with the orbiter is a second spacecraft that has no other job than to punch a hole in one of the polar craters, in hopes of sending a plume of ice and debris six miles above the lunar surface.

Although the relatively inexpensive \$79-million [Lunar Crater Observation and Sensing Satellite](#) is a minor part of the mission, the idea has captured the attention of the public, from amateur to professional astronomers.

Thousands of sky watchers are expected to turn their telescopes to the moon on the morning of Oct. 9, when the water-seeking satellite steers the fuel-depleted second-stage Centaur rocket into a crater at 5,600 mph.

For those in the western United States, where the moon will still be up, the plume should be clearly visible with a moderately sized backyard telescope, NASA said.

"For astronomers all over the United States, this is going to be a very exciting day," said John Marmie, deputy project manager for the Lunar Crater Observation and Sensing Satellite mission, which is managed by the Ames Research Center in Mountain View, Calif. "It's going to be a smashing success."

Everything appeared to go smoothly during the launch. The only glitch was caused by a set of passing thunderstorms that prompted managers to call off the original 2:12 p.m. launch time. The weather broke in time to pick up the countdown 20 minutes before the day's launch window would have closed.

About 45 minutes after liftoff, the orbiter separated from the rest of the spacecraft and entered a trajectory that will carry it to the moon in about four days. At that point, it will use its on-board thrusters to settle into a polar orbit.

Among the instruments that will be used to make the most detailed map ever of the moon's topography is a set of lasers that will be bounced off the surface to create an image of lunar craters, hills and boulders. A set of cameras will also take pictures capable of resolving details less than one yard across.

An instrument called Diviner, built by the Jet Propulsion Laboratory in La Cañada Flintridge, will make the first temperature map of the moon, plumbing recesses of shadowed polar craters, which can be as cold as minus 370 degrees Fahrenheit, and the equator, which can climb to 240 degrees under the sun's radiation.

Meanwhile, the ice-seeking satellite began steering itself into a giant four-month-long Earth orbit that will carry it past the moon three times as it lines up for the Oct. 9 crash into a crater at the south pole.

Satellite managers have not picked a target yet. They are looking at a region known as the Cabeus system of craters, where previous spacecraft have detected the signature of large amounts of hydrogen, a key indicator of water.

Spacecraft controllers will not make a final crater selection until 30 days before impact, by which time the orbiter's instruments will have delivered enough data to help make the choice.

Most spacecraft separate from their rockets after the fuel is used up. In this case, however, the satellite will remain attached to the 42-foot-long Centaur shell as it lines up its target.

Nine hours before impact, the satellite will swing around so that the Centaur is being steered from behind as it heads for the crash point.

Once aimed at the proper crater, the satellite will sever its connection with the Centaur, sending it off alone for the last leg of its journey.

Then the satellite will use its own thrusters to slow itself down, creating a four-minute gap between the time the rocket shell and the satellite hit the moon.

That will allow enough time for the plume of debris to rise high enough so the satellite can fly through it, taking measurements and looking for evidence of water, before it also crashes, about one mile away from the Centaur impact.

"The launch was spectacular; we are on our way to the moon," said Jennifer Heldmann, a satellite research scientist at NASA who manages the outreach campaign that will allow professional astronomers and students around the world to share in the observation of the impact.

About two dozen observatories, and the Hubble Space Telescope in orbit, will be watching the crash.

On the ground, the impact should be observable from Mississippi in the east to Hawaii in the west.

The next landing of humans on the moon is not expected until 2020. But even that could be delayed or reversed depending on an ongoing review by the Obama administration.

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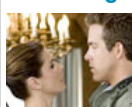
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