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NASA Launches 2 Probes To Explore Moon

Twin Spacecraft Charged With Finding Future Landing Sites, Confirming Suspected Existence Of Ice

An Atlas V rocket blasts off the launch pad headed to the moon, carrying a pair of science probes that will scout out potential landing spots for astronauts, June 18, 2009 in Cape Canaveral, Fla. **(AP Photo/Florida Today)**

(CBS) *This story was filed by* ***CBS News space analyst Bill Harwood****.*

An Atlas 5 rocket thundered to life and streaked into space Thursday, boosting two NASA spacecraft toward the moon for an ambitious $583 million mission to scout out landing sites for future manned missions and to search for evidence of hidden ice near its frigid poles.

One spacecraft will map the cratered surface from a perilously low 31-mile-high orbit while the other will blast out 350 tons of pulverized rock and soil for chemical analysis, digging a shallow 66-foot-wide crater in a kamikaze crash visible from Earth.

"What we're about is taking us all back to the moon," said Cathy Peddie, a deputy project manager at NASA's Goddard Space Flight Center.

Delayed 20 minutes by nearby thunderstorms, the United Launch Alliance Atlas 5 rocket's RD-180 first stage engine ignited at 5:32 p.m., slowly pushing the towering rocket away from launch complex 41 at the Cape Canaveral Air Force Station. Shooting through low clouds and quickly disappearing from view, the rocket arced east over the Atlantic Ocean and accelerated toward space.

Two firings by the Atlas 5's hydrogen-fueled Centaur second stage successfully boosted the dual-spacecraft payload onto a four-day trajectory to the moon.

The $504 million Lunar Reconnaissance Orbiter (LRO), equipped with seven state-of-the-art cameras and other instruments, will look for suitable landing sites for future manned missions while creating the most detailed lunar atlas ever assembled.

The 4,200-pound solar-powered spacecraft also will measure the solar and cosmic radiation that future lunar explorers will face and map out the surface topology, mineralogy and chemical composition of Earth's nearest neighbor. One year will be spent scouting future landing sites followed by three years of purely scientific observations.

While its cameras will not be able to detect the footprints of the 12 Apollo astronauts who once walked on the moon, they will be able to see the landing stages, rovers and other equipment that were left behind.

LRO's companion, the $79 million Lunar Crater Observation and Sensing Satellite, or LCROSS, faces a much shorter lifetime. With LRO on its own, LCROSS will maneuver the spent Atlas 5's Centaur second stage into a looping four-month orbit back around the Earth.

If all goes well, LCROSS will aim itself and the Centaur back at the moon, targeting a permanently shadowed crater near the south pole for a dramatic crash landing on Oct. 9. With LRO looking on from lunar orbit, the 5,000-pound Centaur will hit the dark surface at some 5,600 mph, blasting out a 66-foot-wide crater some 13 feet deep.

The debris excavated by the impact will be blown high above the lunar surface, some of it above the crater's rim and into sunlight for the first time in two billion years or more.

LCROSS, following close behind the Centaur on a virtually identical course, will fly through the debris cloud, spending four precious minutes studying the composition of the material and looking for signs of water ice with a suite of nine instruments.

Then it, too, will crash to the moon less than two miles away after dutifully transmitting its data back to Earth. The Hubble Space Telescope will monitor the impact, as will amateur and professional astronomers in the western hemisphere, looking for the flash that will signal the Centaur's demise.

The LRO/LCROSS mission is NASA's first trip to the moon since the more modest Lunar Prospector was launched in 1998. The new missions are part of NASA's post-Columbia program to send astronauts back to the moon to establish permanent Antarctica-style research station starting around 2020.

The Bush administration approved the new plan and President Obama endorsed the resumption of moon flights during his campaign.

But earlier this year, the White House Office of Management and Budget cut $3.1 billion from NASA's projected budgets through 2013 - money needed to begin development of a heavy-life moon rocket - and the president ordered an independent re-assessment of NASA's long-range goals.

The review panel held its first public hearing Wednesday and its final report is expected by the end of the summer.

Regardless of the ultimate fate of NASA's manned moon program, the two spacecraft launched today promise to greatly advance understanding of the moon's history and evolution, along with making the first serious attempt to identify favorable landing sites for future long-duration visits.

Separating from the LCROSS/Centaur shortly after launch, LRO will fly to the moon on its own. After a long rocket firing Tuesday morning to brake into an elliptical orbit, engineers will spend up to two months checking out and calibrating the spacecraft's instruments and maneuvering it into a circular 31-mile-high orbit.

For comparison, the orbits used by Apollo command modules were about 70 miles high.

"As its name says, LRO is all about doing reconnaissance at the moon," said Craig Tooley, the mission's project manager at Goddard. "Reconnaissance, specifically, to bring us back the data and the information we need to plan and execute the human return to the moon.

"An inevitable question I get is 'why do we need LRO? Haven't we done this?' And, indeed, of course, we've been to the moon. But when we went to the moon for Apollo, we went to the equatorial regions and we intentionally planned to not stay for very long. And even at the onset of our renewed commitment to send human beings to the Moon back in 2004, we knew then if we were going to go to the moon with the more ambitious goals we have now of staying longer and perhaps establishing outposts, we were going to go to a different place."

Scientists and engineers thinking about future outposts on the moon are focused on the polar regions, where areas in permanent sunlight offer unlimited solar power. Conversely, permanently shadowy craters nearby offer the prospect of ice deposits, and along with them, a source of water, oxygen and hydrogen rocket fuel.

"We actually have much better maps of Mars than we have of our own moon's polar regions," Tooley said. "So the job of filling out that information set, making that atlas complete for planning safe and fruitful return to the moon, that job fell to LRO."

The LCROSS mission is much more tightly focused.

Earlier lunar probes detected signs of hydrogen in the dark polar regions, an indirect indication of water ice. Scientists believe ice could indeed be trapped in polar craters that never see sunlight, brought in by comet impacts over the billions of years since the moon's formation.

The Centaur impact is designed to blast out material in the top few feet of a shadowed crater's floor where ice deposits are suspected.

"The impact sounds spectacular, and it will be," said Tony Colaprete, the LCROSS project scientist. "But you have to consider impacts of this size hit the Moon three or four times a month, essentially once a week. What's unique about the LCROSS impact is we know exactly where and when, so we can actually coordinate all of these eyes to look at it.

"The actual event will be done in four minutes, meaning the ejecta, the physical material that comes up, will be all but settled out in four minutes. It's just like any other natural impact of the moon, it will not damage the moon in any way."

The amount of hydrogen detected in past missions implies the presence of enough water to possibly fill the Great Salt Lake basin in Utah. But no one knows if ice is really there.

"There's data out there which could show it's potentially ice rinks," said LCROSS project manager Dan Andrews. "There's data out there that shows it's blocky. There's data out there that could support the fact that there might not be water ice there… So that illustrates the importance of this mission. Let's go see what it is.

"The benefit of having water ice there is self-evident. The availability of water right there on the moon, availability of producing oxygen, oxidizer for rocket fuel for other missions, it's very, very interesting if water ice is indeed there."

By Bill Harwood