

Moon mission looking at possible colony sites

David Perlman, Chronicle Science Editor

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A California spacecraft, bound for deliberate doom inside a crater on the moon, is scheduled to soar into space today, along with a lunar orbiter searching for safe landing sites where humans might one day establish Earth's first colony.

In early October, the spacecraft will send a heavy rocket crashing into the moon's south polar region on a mission to find water that could support future crews bound for Mars. With its mission finished, the spacecraft itself then will die in its own final crash into the lunar surface.

The water-seeking mission was conceived, developed and now is controlled by space scientists and engineers at NASA's Ames Research Center in Mountain View.

Their spacecraft bears the unwieldy name of LCROSS - the Lunar Crater Observation and Sensing Satellite - and in a sense is merely hitching a ride on an Atlas rocket whose main job is to launch NASA's new Lunar Reconnaissance Orbiter. That spacecraft will spend at least a year creating the most minutely detailed map of the moon's surface ever seen.

Flying over the moon's southern hemisphere, LCROSS will use its high-precision instruments, as well as close-up images of the terrain gathered by the lunar orbiter, to seek out a crater just shallow enough and dark enough to be a prime bombing target.

There, acting as what the Ames team calls its "shepherding spacecraft," LCROSS will guide an empty Centaur rocket weighing two tons toward its target. The rocket will crash into the crater at 5,600 mph, creating a new crater - perhaps as large as 5 miles wide. The crash is scheduled to occur Oct. 9.

Scientists on Earth expect the impact to blast out a huge cloud of dust, gas and vaporized water ice at least 6 miles high. The cloud will be clearly visible to astronomers at Earth-bound observatories and the Hubble Space Telescope's new planetary camera, allowing each to observe and collect data on its composition.

Astronomers have long thought that a rain of comets brought water to the arid, lifeless moon over billions of years. In the past few years, at least two American spacecraft reported the presence of water by detecting hints of hydrogen and oxygen - the constituents of water - frozen deep in the darkest recesses of craters around both the north and south lunar poles.

Because an ample supply of water could help provide unlimited fuel for any future moon base, seeking it

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out has been a high-priority mission for NASA leaders still bent on implementing former President George W. Bush's "vision for space exploration" that Bush said would start with "a foothold on the moon."

Whether the Obama administration pursues that goal with as high a priority remains an open political question.

But to Anthony Colaprete, a planetary physicist and chief scientist for the LCROSS mission, the brilliant burst of matter his crashing Centaur will eject is the ultimate goal of the current mission.

"In only a few seconds, we'll see the brilliant flash from the crash," he said Wednesday from Cape Canaveral. "The ejecta should show first as a single bright, shimmering star; we're calling it sunrise. Seconds later, even modest telescopes on Earth should see two blurry stars as the ejecta spreads wider and higher."

Those blurry lights would show as stars of the fourth or fifth magnitude, Colaprete said - possibly as bright as the Andromeda nebula. That spectacle may last only 60 seconds or so, Colaprete said, but it will signal that the Centaur's crash has created a fresh crater up to 5 miles wide at a carefully selected spot inside the larger target crater.

Within 10 minutes, dense material ejected from that crater should rise some 6 miles high, with the water ice - perhaps billions of years old, if it exists at all - turning instantly to vapor. And within an hour, detectable hydrogen and oxygen should rise as high as 60 miles, according to calculations by Colaprete's team at Ames.

After the Centaur rocket crash, LCROSS, its fuel spent, will slam into the lunar surface as well, its job done.

The lunar orbiter, meanwhile, will continue its looping flights around the moon from pole to pole, and as the moon rotates beneath it, the orbiter will eventually have mapped the entire surface. On the way, it will send back images of flat regions inside or beyond the craters - the flat areas to be listed as potential sites for future lunar bases, if and when those bases are to be built.

The launch from Cape Canaveral is scheduled for 2:12 p.m. PDT today.

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