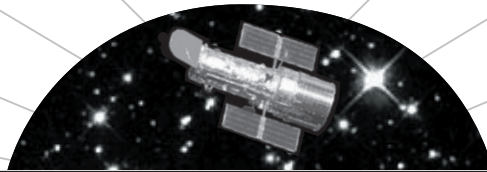




THE STAR ★ WITNESS



A PUBLICATION OF NASA'S "AMAZING SPACE" EDUCATION PROGRAM

Special Feature

Lunar Double Whammy: Two Spacecraft Crash into Moon in Hunt for Water

By NASA's Amazing Space reporters
October 2009

TWO LUNAR SPACECRAFT slammed into the Moon Friday. NASA scientists planned the lunar double whammy to see whether water, in the form of small ice crystals, is mixed in rock and dirt on the Moon's surface.

The Lunar Crater and Observation Sensing Satellite (LCROSS) and its attached Centaur rocket booster crashed into the Moon in two separate impacts. The satellites smashed into the shadowed lunar crater Cabeus near the Moon's South Pole.

NASA scientists orchestrated the planned smashup to perfection. The smaller LCROSS spacecraft first zeroed in on its 62-mile-wide (100-kilometer-wide) target. Then it unleashed its bus-sized Centaur rocket on the lunar crater, taking images of the impact. The satellite picked up heat radiating from the rocket's impact. Four minutes

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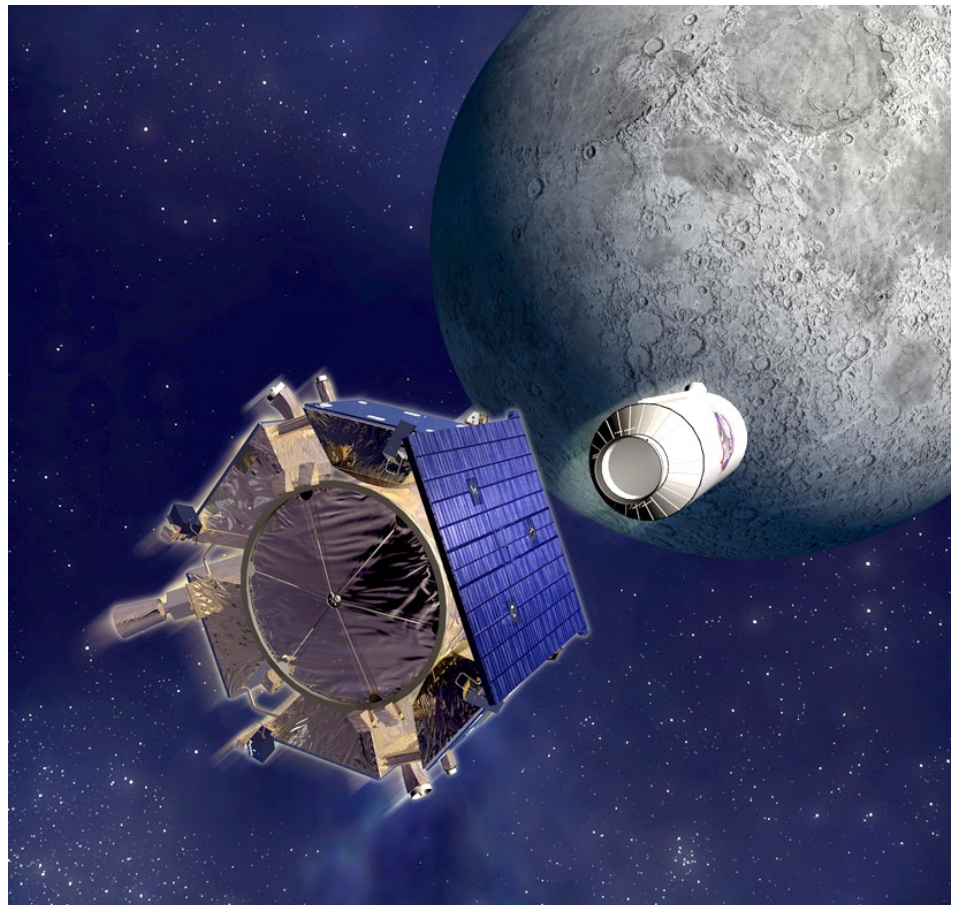


IMAGE: NASA

The LCROSS spacecraft and Centaur rocket: In this artist's illustration, the Centaur rocket stage (white object) has separated from the "shepherding" spacecraft as each object neared impact with the Moon's South Pole on October 9, 2009.

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later, it was LCROSS's turn to crash into the lunar surface.

Witnessing the event

More than a dozen ground-based and space-based observatories, including the Hubble Space Telescope, recorded the event. None of the telescopes captured visible images of any debris plumes produced by the impacts. Scientists now will spend several weeks studying all of the images and information taken of the crash to look for evidence of water.

Previous NASA missions, Lunar Prospector and Clementine, found indirect evidence for frozen water at the Moon's poles. NASA selected the South Pole as the crash site because it has unique craters, where sunlight does not reach the bottom. Scientists think that over billions of years, many icy comets have hit the Moon, depositing water on the surface. Much of that water has evaporated. But some water may still remain, in the form of small ice crystals, in the bottom of the sun-shielded craters.

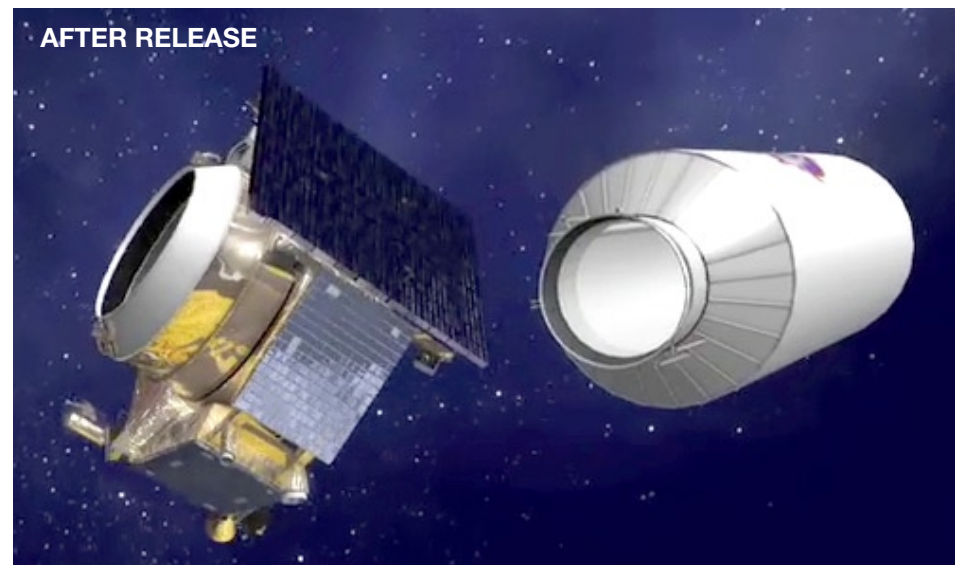
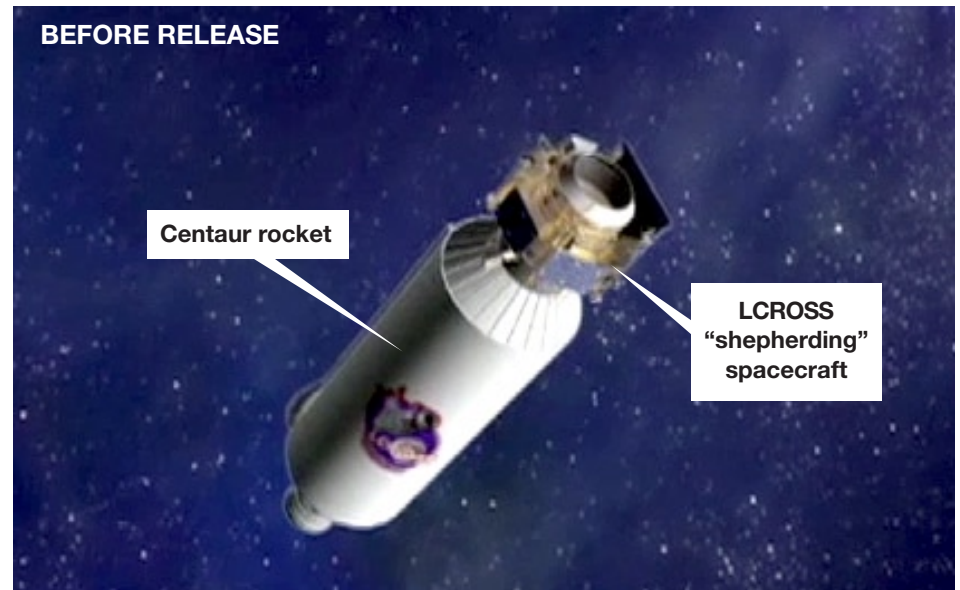
An inexpensive experiment

Crashing spacecraft into the Moon may seem surprising, but scientists say it is an inexpensive way to look for frozen water. A satellite slamming into the surface would turn ice crystals into gas. As the gas floats into space, sunlight would warm it, creating further chemical changes. The gas would then begin to glow faintly. Astronomers used telescopes such as Hubble to look for this faint glow.

Studying the Moon will greatly improve scientists' understanding of our closest celestial neighbor. Finding a water source on the Moon

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LCROSS before and after release of Centaur rocket



IMAGES: NASA

Artist's conceptions: These are an artist's renderings of the LCROSS spacecraft before and after separating from the Centaur rocket. The large Centaur rocket was attached to the small LCROSS "shepherding spacecraft" for most of the journey to the Moon. When the smaller spacecraft had zeroed in on the mission's target crater, it released the rocket.

LCROSS and rocket approach the Moon

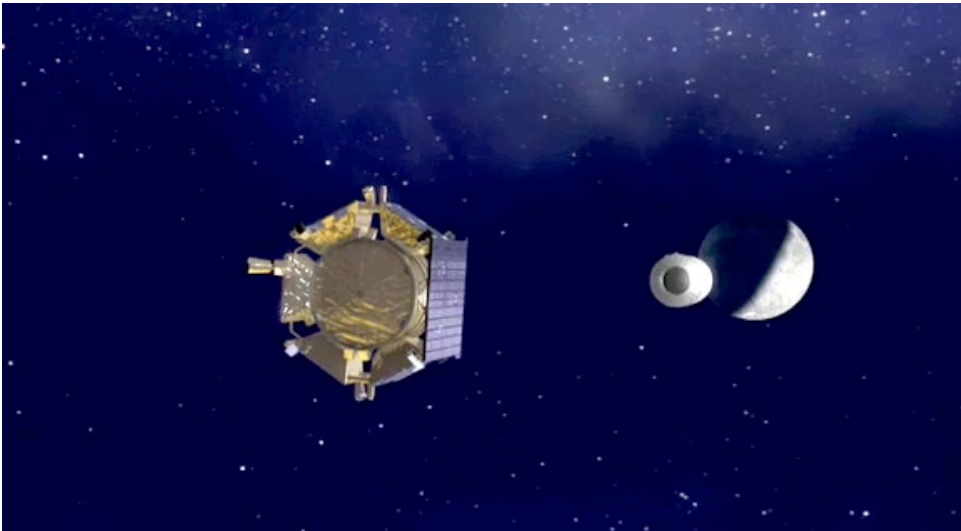


IMAGE: NASA

Artist's conception: LCROSS and its Centaur rocket speed toward their crash landings on the Moon. The Centaur rocket crashed into the lunar surface first. The shepherding spacecraft descended through the material dislodged by the rocket's impact, and quickly gathered and transmitted data on it. The shepherding spacecraft then crashed into the Moon, as well.

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is important because NASA plans to return astronauts to the lunar surface some day. Sending frequent shipments of water to a lunar outpost would be too expensive.

NASA's history of planned satellite crashes has yielded useful scientific information. The European Space Agency's Smart-1 satellite dove into the lunar surface in 2006. Another mission, called Deep Impact, made history in 2005 by sending a probe crashing into comet Tempel 1.

To the Moon, again

NASA launched LCROSS and the Lunar Reconnaissance Orbiter (LRO) together on June 18, 2009. LCROSS orbited the Moon for three months so that it could reach its proper moon smashing position. Together, LCROSS and LRO make up a mission to scout the moon for future

landing sites and resources that may be used by future astronauts.

The LRO and LCROSS mission launched just over a month ahead of the 40th anniversary of the first-ever manned moon landing by Apollo 11 astronauts on July 20, 1969. ★

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