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## The Mission



**Rocket:** Atlas 5 (AV-020)  
**Payload:** LRO/LCROSS  
**Date:** June 18, 2009  
**Times:** 5:12, 5:22 and 5:32 p.m. EDT  
**Site:** Complex 41, Cape Canaveral, Florida

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## NASA prepares to take first steps back to the Moon

BY JUSTIN RAY  
SPACEFLIGHT NOW

Posted: June 17, 2009

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A robotic scout to reconnoiter the Moon like never before and a sleuth that will dig into a tantalizing mystery at the lunar south pole are awaiting blastoff Thursday aboard an Atlas 5 rocket from Cape Canaveral.

The 19-story booster will hurl toward the Moon its double payload comprised of NASA's Lunar Reconnaissance Orbiter and the Lunar Crater Observation and Sensing Satellite. Together, the two independent projects represent NASA's first steps in its eventual plans to return humans to the Moon.

Liftoff from Complex 41 will be possible at any of three available moments in time:

- 5:12 p.m. EDT (2112 GMT)
- 5:22 p.m. EDT (2122 GMT)
- 5:32 p.m. EDT (2132 GMT)

The United Launch Alliance control team will target the day's first opportunity, but weather or technical problems could prompt a delay to one of the subsequent times.

The precision required in putting the spacecraft on the proper Moon-bound trajectory restricts when the launch can occur. If the rocket is unable to go Thursday, alternate tries are possible Friday starting at 6:41 p.m. EDT and Saturday beginning at 8:08 p.m. EDT. The next lunar launch window



Credit: United Launch Alliance

## COLBERT Patch

The special patch celebrating the space station's new COLBERT treadmill named for the comedian is available for purchase.

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## Current Shuttle Mission Patch

The official embroidered patch for shuttle Endeavour's flight to finish building Japanese section of the space station.

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## Hubble Patch

The official embroidered patch for mission STS-125, the space shuttle's last planned service call to the Hubble Space Telescope, is available for purchase.

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## Ares Patch

The Ares Project will develop two new rockets to launch astronauts back to the Moon under NASA's Vision for Exploration. The Ares 1 will employ a single space shuttle solid rocket booster to loft the Orion crew capsule. The gigantic Ares 5 will haul the equipment and cargo needed for such lunar voyages. This is the Ares emblem.

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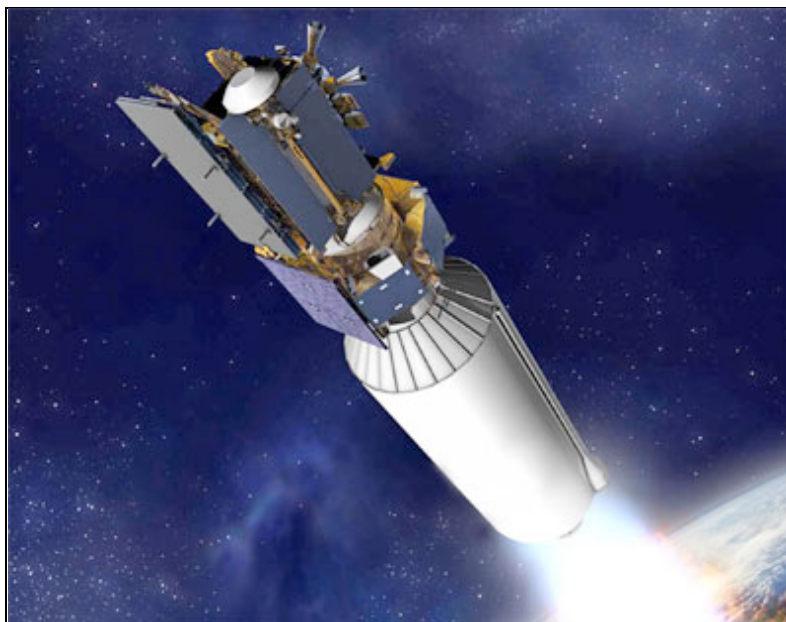
would open June 30.

Rumbling away from the planet on nearly a million pounds of thrust, the Atlas 5 rocket will be flying in its most basic, two-stage configuration without any added strap-on motors. A half-dozen previous missions have relied on this version of the launcher, each displaying a slow and majestic ascent trailing only a flickering golden flame from its Russian-designed RD-180 main engine.

Once above its launch pad, the rocket sets sail for the trek downrange over the Atlantic Ocean, constantly gaining speed as its double-nozzle engine gulps 25,000 gallons of kerosene fuel and 50,000 gallons of superchilled liquid oxygen in just four minutes.

The bronze first stage, its propellants depleted and job now completed, then jettisons with the help of tiny thrusters. Some 106.5 feet long and 12.5 feet around, the stage is discarded to fall back into the open sea.

The cryogenic Centaur upper stage ignites moments after shedding the lower booster, lighting its tried-and-true RL10 engine for 22,300 pounds of thrust to continue clawing toward orbit.



An artist's concept shows LRO and LCROSS riding into space atop the Centaur upper stage. Credit: NASA

Covered with insulating foam and adorned with mission logos, this stage stretching 41.5 feet in length and 10 feet in diameter must perform two burns during the launch. The LRO and LCROSS satellites stacked atop the Centaur are counting on a safe drive.



## Project Orion

The Orion crew exploration vehicle is NASA's first new human spacecraft developed since the space shuttle a quarter-century earlier. The capsule is one of the key elements of returning astronauts to the Moon.



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## Fallen Heroes Patch Collection

The official patches from Apollo 1, the shuttle Challenger and Columbia crews are available in the store.



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Shortly after the upper stage begins firing, the two-piece aluminum nose cone that shrouded the payloads during flight through the atmosphere becomes no-longer-necessary and separates to expose the lunar tandem to space for the first time.

Centaur will fire for almost 10 minutes to reach a temporary parking orbit around Earth. Once it has achieved the intended perch, the RL10 engine shuts down and the rocket begins a quiet coast over the equatorial Atlantic and southern Africa.

A spot high above the eastern shore of Africa is where Centaur will restart its powerplant about 38 minutes into the flight to establish a direct course to the Moon. The firing will last five minutes over the Southern Indian Ocean.

LRO is released from the launcher 46 minutes after liftoff, embarking on the multi-year mission to survey the Moon's terrain, map its natural resources and measure the radiation threats in preparation for the next human expeditions. The craft should reach the Moon in four days, then use its onboard engines to enter lunar orbit.

LCROSS will remain with the Centaur. Special procedures to deplete and expel residual fuel from the upper stage will be performed in the hours after launch, leading to the official transfer of control from the rocket to the LCROSS spacecraft about four hours into the mission.

The duo will stay coupled together for four months as they make incredibly long orbits around the Earth. The looping orbits will extend outward past the Moon's distance, then swing back to close proximity to the home planet, setting the stage for impact into the lunar south pole on October 9.

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