



## Lunar CRater Observation and Sensing Satellite

### The "Impact" of LCROSS on the Moon

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When was the last time you looked at the Moon in the night sky? Even if you haven't looked in awhile you probably remember that the Moon is marked by many craters, impressions left on the Moon by many different objects in space, including asteroids. The craters in the Moon are being created all the time without any negative effect on the Moon. NASA is currently working on a mission called LCROSS, the Lunar Crater Observation and Sensing Satellite, which will come in direct contact with those craters by impacting into one of them. The Impact between the LCROSS Spacecraft and the Moon will not have any negative effect on the Moon.

The LCROSS spacecraft has two components; the Shepherding Spacecraft and the Centaur rocket. The Centaur rocket will be responsible for the main impact into the Moon striking at twice the speed of a bullet into a "permanently-shadowed" crater near one of the Moon's polar regions. The Shepherding Spacecraft will then collect data from the plume of debris that the impact will create. From this they will learn whether or not there is water ice in the Polar Regions. The impact will be so forceful that the plume that is emitted from the impact will be able to be viewed from Earth through an amateur telescope. After flying through the debris plume of the Centaur rocket, the Shepherding Spacecraft itself will then crash into the Moon. Both parts of the LCROSS mission are being launched from the Earth along with a third spacecraft, the Lunar Reconnaissance Orbiter (LRO). The LRO will be responsible for a different study of the Moon. It will detach from the two other pieces early on in the mission and instead of crashing into the Moon, it will go into orbit around the Moon, mapping it for future missions.

Twice the speed of a bullet is very fast, so how will this impact have no effect on the Moon (other than creating a new crater)? Well, this question is a simple matter of physics. While the impact carries a lot of energy, the fact that the Moon is so much bigger and more massive than the spacecraft makes even this powerful collision harmless to the Moon as a whole. The collision between the Moon and the Centaur rocket is what physicists call an inelastic collision. An inelastic collision is one in which some or all of the kinetic energy of the collision gets converted into another form of energy. This is the case when two objects collide and stick together. In the case of LCROSS, some of the kinetic energy is converted into thermal energy and studying the thermal flash will aide the scientists' work; a win-win situation for both the scientists of NASA and for the Moon.

With the possibility of hurting the Moon at zero, the LCROSS mission is destined to be a success with the help of brilliant scientists at NASA, and the curious students at the Lewis Center, and GAVRT students across the globe.



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