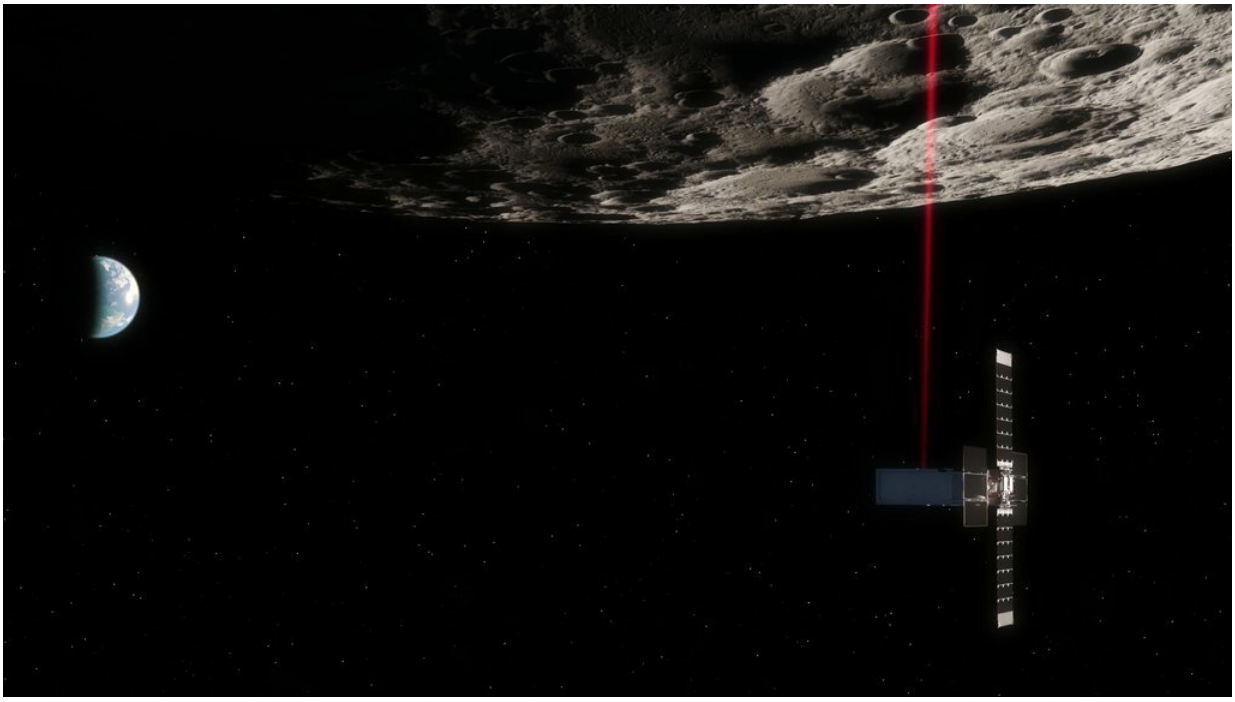
NASA's Lunar Flashlight SmallSat readies for launch

November 28 2022



This illustration shows NASA’s Lunar Flashlight using its four-laser reflectometer to search for surface water ice as it makes a close approach over the Moon’s South Pole. Credit: NASA/JPL-Caltech

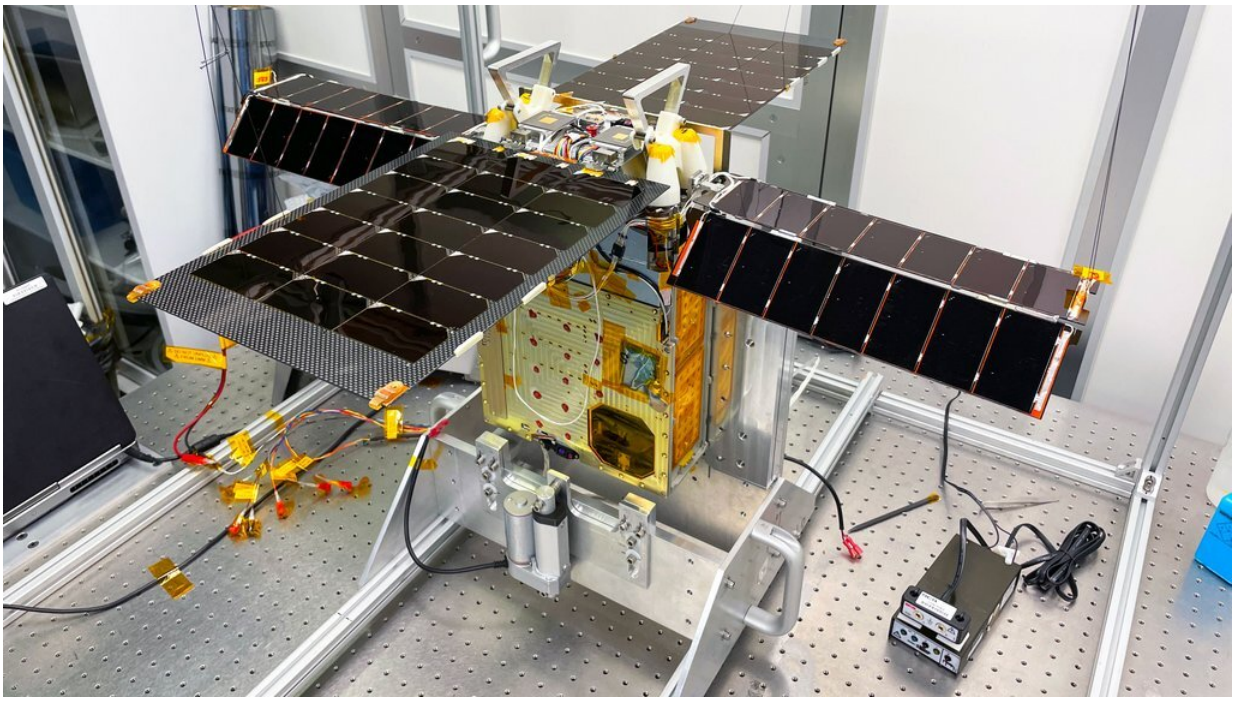
When NASA's Lunar Flashlight launches no earlier than Nov. 30, the tiny satellite will begin a three-month journey, with mission navigators guiding the spacecraft far past the moon. It will then be slowly pulled back by gravity from Earth and the sun before settling into a wide

science-gathering orbit to hunt for surface water ice inside dark regions on the moon that haven't seen sunlight in billions of years.

No larger than a briefcase, Lunar Flashlight will use a reflectometer equipped with four lasers that emit near-infrared light in wavelengths readily absorbed by surface water ice. This is the first time that multiple colored lasers will be used to seek out ice inside these dark craters. Should the lasers hit bare rock or regolith (broken rock and dust), the light will reflect back to the spacecraft. But if the target absorbs the light, that would indicate the presence of water ice. The greater the absorption, the more ice there may be.

"We are bringing a literal flashlight to the moon—shining lasers into these dark craters to look for definitive signs of water ice covering the upper layer of lunar regolith," said Barbara Cohen, Lunar Flashlight principal investigator at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "I'm excited to see our mission contribute to our scientific understanding of where water ice is on the moon and how it got to be there."

The spacecraft's orbit—called a near-rectilinear halo orbit—will take it 43,000 miles (70,000 kilometers) from the moon at its most distant point; at its closest approach, the satellite will graze the surface of the moon, coming within 9 miles (15 kilometers) above the lunar South Pole.



Earlier this year, NASA’s Lunar Flashlight mission underwent tests to prepare it for launch in November 2022. The solar-powered small satellite is shown here with its solar arrays extended in a Georgia Tech clean room. Credit: NASA/JPL-Caltech

Small satellites, or SmallSats, carry a limited amount of propellent, so fuel-intensive orbits aren't possible. A near-rectilinear halo orbit requires far less fuel than traditional orbits, and Lunar Flashlight will be only the second NASA mission to use this type of trajectory. The first is NASA's Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment (CAPSTONE) mission, which arrived at its orbit on Nov. 13, making its closest pass over the moon's North Pole.

Lunar Flashlight will use a new kind of "green" propellant that is safer to transport and store than the commonly used in-space propellants such as hydrazine. In fact, Lunar Flashlight will be the first interplanetary

spacecraft to use this propellant, and one of the mission's primary goals is to test this technology for future use. The propellant was successfully tested on a previous NASA technology demonstration mission in Earth orbit.

The science data collected by Lunar Flashlight will be compared with observations made by other lunar missions to help reveal the distribution of surface water ice on the moon for potential use by future astronauts.

Provided by JPL/NASA