

NASA Artemis science, first intuitive machines flight head to moon

February 16 2024, by Abbey A. Donaldson



A SpaceX Falcon 9 rocket carrying Intuitive Machines' Nova-C lunar lander lifts off from Launch Pad 39A at NASA's Kennedy Space Center in Florida at 1:05 a.m. EST on Feb. 15, 2024. As part of NASA's CLPS (Commercial Lunar Payload Services) initiative and Artemis campaign, Intuitive Machines' first lunar mission will carry NASA science and commercial payloads to the moon to study plume-surface interactions, space weather/lunar surface interactions, radio astronomy, precision landing technologies, and a communication and navigation node for future autonomous navigation technologies. Credit: NASA

A suite of NASA science instruments and technology demonstrations is on the way to our nearest celestial neighbor for the benefit of humanity. Through this flight to the moon, they will provide insights into the lunar surface environment and test technologies for future landers and Artemis astronauts.

At 1:05 a.m. EST on Thursday, Intuitive Machines' Nova-C lander launched on a SpaceX Falcon 9 rocket from Launch Complex 39A at the agency's Kennedy Space Center in Florida. At approximately 1:53 a.m., the lander deployed from the Falcon 9 second stage. Teams confirmed it made communications contact with the company's mission operations center in Houston. The spacecraft is stable and receiving solar power.

These [deliveries](#) are part of NASA's CLPS (Commercial Lunar Payload Services) initiative and Artemis campaign, which includes new solar system science to better understand planetary processes and evolution, search for evidence of water and other resources, and support long-term [human exploration](#).

"NASA [scientific instruments](#) are on their way to the moon—a giant leap for humanity as we prepare to return to the lunar surface for the first time in more than half a century," said NASA Administrator Bill Nelson. "These daring moon deliveries will not only conduct new science at the moon, but they are supporting a growing commercial space economy while showing the strength of American technology and innovation. We have so much to learn through CLPS flights that will help us shape the future of human exploration for the Artemis Generation."

While enroute to the moon, NASA instruments will measure the quantity of cryogenic engine fuel as it is used, and during descent toward the

lunar surface, they will collect data on plume-surface interactions and test precision landing technologies.

Once on the moon, NASA instruments will focus on investigating space weather/[lunar surface](#) interactions and [radio astronomy](#). The Nova-C lander also will carry retroreflectors contributing to a network of location markers on the moon for communication and navigation for future autonomous navigation technologies.

NASA science aboard the lander includes:

- **Lunar Node 1 Navigation Demonstrator:** A small, CubeSat-sized experiment that will demonstrate autonomous navigation that could be used by future landers, surface infrastructure, and astronauts, digitally confirming their positions on the moon relative to other spacecraft, ground stations, or rovers on the move.
- **Laser Retroreflector Array:** A collection of eight retroreflectors that enable precision laser ranging, which is a measurement of the distance between the orbiting or landing spacecraft to the reflector on the lander. The array is a passive optical instrument and will function as a permanent location marker on the moon for decades to come.
- **Navigation Doppler Lidar for Precise Velocity and Range Sensing:** A Lidar-based (Light Detection and Ranging) guidance system for descent and landing. This instrument operates on the same principles of radar but uses pulses from a laser emitted through three optical telescopes. It will measure speed, direction, and altitude with high precision during descent and touchdown.
- **Radio Frequency Mass Gauge:** A technology demonstration that measures the amount of propellant in spacecraft tanks in a low-gravity space environment. Using sensor technology, the gauge will measure the amount of cryogenic propellant in Nova-C's fuel

and oxidizer tanks, providing data that could help predict fuel usage on future missions.

- **Radio-wave Observations at the Lunar Surface of the Photoelectron Sheath:** The instrument will observe the moon's surface environment in [radio frequencies](#), to determine how natural and human-generated activity near the surface interacts with and could interfere with science conducted there.
- **Stereo Cameras for Lunar Plume-Surface Studies:** A suite of four tiny cameras to capture imagery showing how the moon's surface changes from interactions with the spacecraft's engine plume during and after descent.

Intuitive Machines' Nova-C-class [lunar lander](#), named Odysseus, is scheduled to land on the moon's South Pole region near the lunar feature known as Malapert A on Thursday, Feb. 22. This relatively flat and safe region is within the otherwise heavily cratered southern highlands on the side of the moon visible from Earth. Landing near Malapert A will also help mission planners understand how to communicate and send data back to Earth from a location where Earth is low on the lunar horizon.

The NASA science aboard will spend approximately seven days gathering valuable scientific data about Earth's nearest neighbor, helping pave the way for the first woman and first person of color to explore the moon under Artemis.

Provided by NASA

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