SUMMARY OF THE CONTRACTED DELIVERIES OF NASA PAYLOADS TO THE MOON VIA COMMERCIAL LUNAR PAYLOAD SERVICES (CLPS)

Commercial Lunar Payload Services (CLPS) Project Office[1] and Exploration Science Strategy and Integration Office (ESSIO)[1] [1]National Aeronautics and Space Administration

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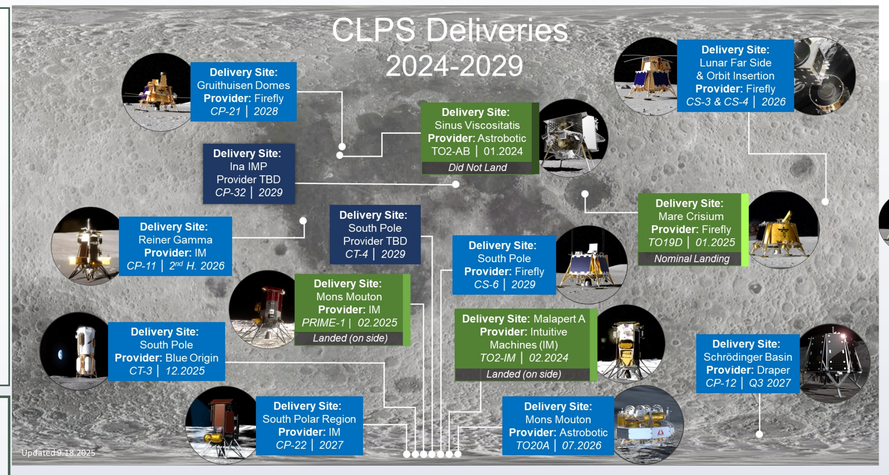
Introduction

- NASA's Commercial Lunar Payload Services (CLPS) initiative allows rapid acquisition of lunar delivery services from US companies for payloads that advance scientific, technological, or commercial development of the Moon [1]. In conjunction with instrument development efforts within NASA, academia, and international partners, a considerable variety of payloads have been delivered to CLPS vendors or are in the process of development.
- Total number of eligible vendors: 13.
- 9 task orders (TOs) are currently active (blue) under this contract, and 4 deliveries have been completed (green) for a total of 13. 1 mission has landed successfully, and 2 landed anomalously. The others are planned to land at widely distributed sites across the surface of the Moon, including the south polar region and the lunar farside (map, right).
- Individual task order awards cover end-to-end commercial payload delivery services, including payload integration, launch from Earth, landing on the surface of the Moon, and mission operations.

For more information: https://science.nasa.gov/lunar-discovery/deliveries



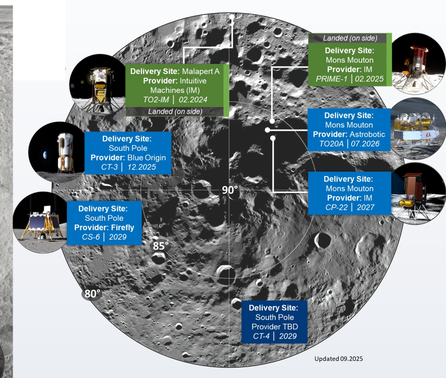
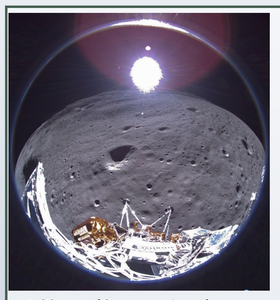
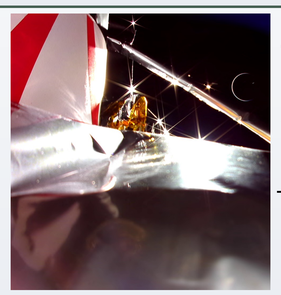


Image credit: NASA

Completed Task Orders:



Intuitive Machines Nova-C Lander (Odysseus) on the surface of the Moon on IM-1. Credit: Intuitive Machines



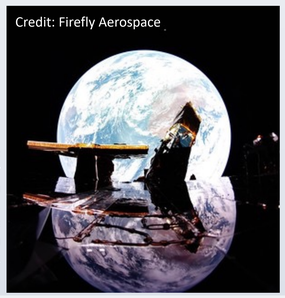
Astrobotic Peregrine-1 Lander with Earth in the distance. Credit: Astrobotic

1. TO2 – AB Astrobotic's Peregrine Mission-1 (PM-1) launched on January 8, 2024, but was prevented from landing on the Moon due to a propulsion issue with the spacecraft. The NASA payloads successfully powered on and collected data during PM-1's 10 days in space.

2. TO2 – IM Intuitive Machines (IM-1), their Nova-C lunar lander *Odysseus* launched on Feb. 15, and landed on Feb. 22, 2024, at 80.13°S, 1.44°E, 2579 m elevation. The IM-1 mission carried 6 CLPS payloads. *Odysseus* operated all active payloads, ceasing operations on Feb 29, 2024, nearly a full a week after landing.

3. TO-19D

Firefly's Blue Ghost lunar lander in Earth orbit. Earth is reflected in the top deck solar panels.



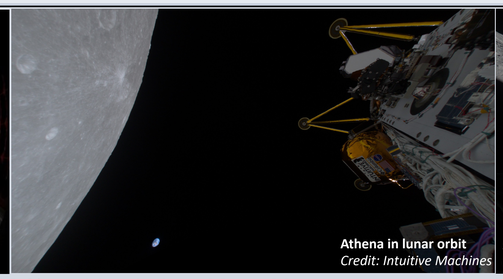
Firefly's Blue Ghost lunar lander in Lunar Orbit
Credit: Firefly Aerospace

Firefly Blue Ghost Lander on the lunar surface at Mare Crisium.
Credit: Firefly Aerospace

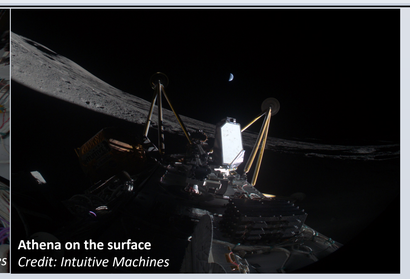
Awarded to Firefly Aerospace and successfully landed in Mare Crisium on March 2nd, 2025 and operated through March 16th. Blue Ghost mission 1 (BGM1) operated payloads that investigated the heat flow of the lunar interior (Lunar Instrumentation for Subsurface Thermal Exploration with Rapidity**, LISTER)**, plume-surface interactions (Stereo Cameras for Lunar Plume-Surface Studies**, SCALPSS)**, and tested regolith sampling technologies (**Lunar PlanetVac)**. Payloads also acquired X-ray images to study the interaction of the solar wind and Earth's magnetic field (Lunar Environment heliospheric X-Ray Imager**, LEXI)** and deployed sensors to study the Moon's interior by measuring electric and magnetic fields (Lunar Magnetotelluric Sounder**, LMS**). Payloads also investigated regolith adherence on different materials (Regolith Adherence Characterization**, RAC)**, demonstrated the first use of GNSS (Global Navigation Satellite System) in transit to and on the surface of the Moon (Lunar GNSS Receiver Experiment**, LuGRE)**, tested a radiation tolerant computing system (Radiation Tolerant Computer System**, RadPC)**, performed dust mitigation experiments using electrodynamic fields (Electrodynamic Dust Shield**, EDS)**, and reflected laser pulses from Earth-based Lunar Laser Ranging Observatories (Next Generation Lunar Retroreflector**, NGLR-1)** and from the orbiting Lunar Orbiter Laser Altimeter (LOLA).

4. TO-PRIME1

Intuitive Machines IM-2 Athena lander Post Lunar Vehicle Separation
Credit: Intuitive Machines



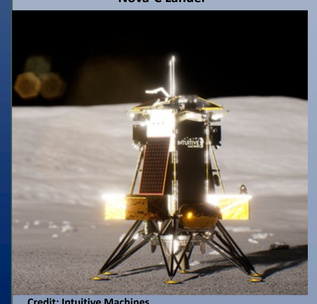
Athena in lunar orbit
Credit: Intuitive Machines



Athena on the surface
Credit: Intuitive Machines

Awarded to Intuitive Machines (IM-2) and landed on Mons Mouton near the South Pole on March 6, 2025 and operated for 13 hrs using the Nova-C lander Athena. The NASA payloads included the Polar Resources Ice Mining Experiment-1 (**PRIME-1)** an in-situ resource utilization demonstration on the Moon utilizing a drill (The Regolith and Ice Drill for Exploring New Terrain, **TRIDENT**) and the Mass Spectrometer Observing Lunar Operations (**MSolo**) intended to measure volatile content from the subsurface, a Laser Retroreflector Array (**LRA)**, the IM Grace-Hopper **micro-Nova Hopper** demonstration intended to land inside a permanently shadowed region to take Lunar RADiometer (**LRAD**) temperature measurements, and a small **Lunar Outpost rover** intended to test Long Term Evolution (**LTE**) wireless communications. MSolo measured propellant vented from Athena's tanks; TRIDENT successfully exercised all drill operational functions.

Nova-C Lander



Credit: Intuitive Machines

TO CP-11

Awarded to Intuitive Machines, the IM-3 mission is slated to land at the Reiner Gamma swirl using their Nova-C lunar lander. Payloads include the **Lunar Vertex** suite consisting of a magnetometer, camera, and an electron and ion spectrometer on the lander, and a small rover with a second magnetometer and a multispectral microscope. Lunar Vertex will study the properties of the Reiner Gamma swirl and its mini-magnetosphere. Two international payloads will investigate the near-surface radiation environment (**LUSEM**, provided by South Korea) and an actuated retroreflector (**MPAc**) provided by the European Space Agency that will make high resolution Earth-Moon distance measurements.

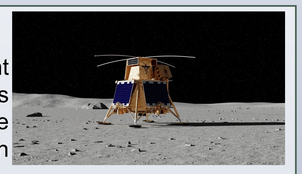
TO CP-12

Image credit: Team Draper

Awarded to Draper Labs, their mission will carry three NASA science payloads to the outer ring of Schrödinger Basin on the farside of the Moon. The Farside Seismic Suite **(FSS)** is a set of two seismometers that will study tectonic activity within the deep lunar interior and micrometeorite impact flux for over a year on the lunar surface. The Lunar Interior Temperature and Materials Suite **(LITMS)** is a combination of a drill to measure heat flow and four electrical conductivity probes to investigate the near sub-surface. The Lunar Surface Electromagnetics Experiment **(LuSEE-Lite)** will measure the electromagnetic and electrostatic environment of the lunar surface.

TO CS-3,4

Awarded to Firefly Aerospace, the Blue Ghost 2 lander will carry the **LuSEE-Night** experiment to the farside mid-latitudes in 2026. Low-frequency radio astronomy with standalone operations through the night will be performed. This task order will also include the deployment of the Lunar Pathfinder orbiter built by Surrey Satellite Technology Ltd. sponsored by the European Space Agency (ESA).



Credit: Firefly Aerospace

TO CP-22

Awarded to Intuitive Machines, the Nova-C lander will land in the Mons Mouton region. NASA payloads include: the Lunar Explorer Instrument for space biology Applications (**LEIA**) science suite, which will study the biological response of yeast to the lunar environment and measure the radiation levels at the lunar surface, and the Lunar Compact Infrared Imaging System (**L-CIRiS**) a multispectral imaging radiometer designed to take mineralogical and thermophysical measurements on the lunar surface. The Package for Resource Observation and in-Situ Prospecting for Exploration, Characterization, and Testing (**PROSPECT**), is sponsored by ESA to assess the potential use of resources for human exploration by drilling at a given location. Also included are Surface and Exosphere Alterations by Landers (**SEAL**), Fluxgate Magnetometer (**MAG**), and a Lunar Retroreflector Array (**LRA**) that will measure the lunar exosphere and lander gases, lunar magnetic field, and lunar landing location, respectively.

Intuitive Machines Nova-C Lander. Credit: Intuitive Machines

TO CP-21

Firefly Aerospace Blue Ghost Mission 3 Lander with Rover. Credit: Firefly Aerospace

Awarded to Firefly Aerospace, Blue Ghost Mission 3 will land on the Gruithuisen Domes. The payloads include the Lunar Vulkan Imaging and Spectroscopy Explorer (**Lunar-VISE**) to investigate the composition and origin of the domes. Lunar-VISE consists of a suite of instruments, with some on the lander and some mounted on a rover provided by the CLPS vendor. CP-21 also includes the **Heimdall** imaging suite to analyze regolith during all mission phases; the Sample Acquisition, Morphology Filtering & Probing of Lunar Regolith (**SAMPLR**) robotic arm; a low-frequency radio spectrometer (Radio-wave Observation at the Lunar Surface of the photo-Electron Sheath, **ROLSES)**; the Photovoltaic Investigation on the Lunar Surface (**PILS**) experiment; and the Neutron Measurements at the Lunar Surface (**NMLS**) instrument.

TO CT-3

Awarded to Blue Origin and landing in the south polar region. The Blue Moon Mark 1 lander will carry the Stereo Cameras for Lunar Plume-Surface Studies (**SCALPSS**) instrument to study plume-surface interactions.

Blue Moon Mark 1 Lander. Credit: Blue Origin

Upcoming Task Orders:

- **TO 20-A:** Awarded to Astrobotic. Scheduled to land near the South Pole using their Griffin lunar lander (Griffin Mission 1). It will carry a Lunar Retroreflector Array (**LRA**).
- **TO CS-6**: Awarded to Firefly and scheduled to land near Haworth crater at the South pole. This Lunar Delivery includes the Swiss Laser Ablation Ionization Mass Spectrometer (**LIMS**) to analyze the chemical composition of lunar regolith**, t**he Canadian Space Agency (**CSA**) Rover, the Astrobotic **MoonRanger** Rover with the Neutron Spectrometer System (**NSS**) on board, Stereo Cameras for Lunar Plume-Surface Studies (**SCALPSS**), and the Laser Retroreflector (**LRA**).
- **TO CT-4:** This task order will deliver the Australian Space Agency's lunar rover "**Roo-ver**" along with **SCALPSS**, Near-IR Volatile Spectrometer System (**NIRVSS)**, Mass Spectrometer Observing Lunar Operations (**MSolo)** and Lunar Vehicle Radiation Dosimeter (**LVRAD)**. It's scheduled to land near the South Pole.
- **TO CP-32:** This task order will deliver the Dating an Irregular Mare Patch with a Lunar Explorer **(DIMPLE)** suite to Ina to investigate the formation of a geologically young lunar volcanic feature. The future selected lander vendor will conduct traverses to collect rocks and return them to the DIMPLE payload on the lander for radioisotope age-dating.

References

[1] Bussey, B. et al. (2019) AGU Fall Meeting. PA54B-11.