

CURRENT SUMMARY OF THE CONTRACTED DELIVERIES OF NASA PAYLOADS TO THE MOON VIA COMMERCIAL LUNAR PAYLOAD SERVICES (CLPS). Commercial Lunar Payload Services (CLPS) Project Office¹ and Exploration Science Strategy and Integration Office (ESSIO)¹ ¹National Aeronautics and Space Administration (corresponding author: heidi.haviland@nasa.gov, presenting authors: P. B. Niles & M. E. Banks).

Introduction: NASA's Commercial Lunar Payload Services (CLPS) initiative allows rapid acquisition of delivery services from US companies for payloads that advance capabilities for 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.

At the time of this writing, a total of 7 task orders (TOs) have been awarded with one additional selection process in progress. Payload suites have also been selected for the second Payloads and Research Investigations on the Surface of the Moon (PRISM) call. Here we provide an update to previous CLPS summaries, namely, [2].

TO 2IM: Intuitive Machines' Nova-C lunar lander is currently targeted to land in Mare Crisium in 2022. The IM1 mission will carry payloads that will focus on plume-surface interactions, space weather, radio astronomy, precision landing, and communication-navigation technologies.

TO 2AB: Astrobotic's Peregrine lunar lander is planned to land in Lacus Mortis in 2022. This delivery carries 9 NASA payloads that will investigate the lunar exosphere, regolith thermal properties, hydrogen abundances, magnetic fields, and conduct radiation environment monitoring.

TO PRIME1: Intuitive Machines-2 Nova-C lander is planned to land at the south pole, Shackleton Connecting Ridge, in 2023. This will be the first in-situ resource utilization demonstration on the Moon utilizing a drill and mass spectrometer to measure volatile content of subsurface materials. This delivery will also include a hopper demonstration that will land inside a permanently shadowed region taking images and temperature measurements.

TO 19C: Masten Space Systems is planned to land near the South Pole, near the rim of Haworth Crater in 2023 using their Xelene lunar lander (configuration XL-1). NASA payloads will investigate plume-surface interactions during landing [3], regolith geophysical properties using a robotic arm, the radiation environment, regolith thermal properties, primary mineralogy of the polar surface, and the composition of the lunar exosphere, possibly including volatiles from ices in the regolith. This delivery will also carry a small rover equipped with a neutron spectrometer.

TO 19D: Firefly Aerospace is planned to land in Mare Crisium [4] in 2024 using their Blue Ghost lander. The Blue Ghost 1 mission will deliver payloads [5] that investigate the heat flow of the lunar interior, plume-surface interactions, and regolith sampling technologies. Payloads will use X-rays of the Earth's magnetosphere and study crustal electric and magnetic fields. Technology demonstration payloads will look at regolith adherence on different materials, demonstrate the first GNSS fix on the lunar surface, test radiation tolerant computing, and perform a dust mitigation experiment using electrodynamic fields.

TO 20A (VIPER): Astrobotic's Griffin lunar lander is planned to land at the South Pole in 2023. VIPER is a rover that will characterize the distribution and physical state of lunar polar water and other volatiles in cold traps in order to evaluate the potential for in-situ resource utilization. VIPER will operate over multiple lunar days and will traverse into permanently shadowed terrain. Subsurface volatile sampling will be accomplished by a one-meter drill paired with a mass spectrometer [6].

TO CP11 (PRISM1A): Intuitive Machines-3 is planned to land at the Reiner Gamma swirl in 2024 using the Nova-C lunar lander carrying a PRISM payload suite [7] that will investigate lunar magnetic fields and the origin of the swirl. Also two international payloads and a suite of four autonomous rovers.

TO CP12 (PRISM1B): Two PRISM payload suites are included in the delivery to Schrödinger Basin on the lunar farside in 2025. Instruments include long-lived seismometers [8], a heat flow drill with a magnetotelluric sounder investigating the subsurface.

TO CS3 (Science): This science delivery is planning to land at the farside mid-latitudes in 2025. Low-frequency radio astronomy with standalone operations through the night will be performed.

TO CP21 (PRISM2A): A PRISM payload suite will be investigating the composition and origin of the Gruithuisen Domes in 2026.

TO CP22 (PRISM2B): A PRISM science suite, which will study yeast's response to radiation and lunar gravity; and will be delivered to the South Polar in 2026.

References: [1] Bussey, B., et al. (2019) *AGU Fall Meeting*, PA54B-11. [2] CLPS & ESSIO (2022) *LPSC LIII*, 2791. [3] Yingst et al. (2020) *LPSC LI*, 1439. [4] Nagihara et al. (2022) *LPSC LIII*, 1390. [5] Banks et al. (2022) *LPSC LIII*. [6] Colaprete et al. (2019) *AGU Fall Meeting*, P34B-03. [7] Blewett et al. (2022) *LPSC LIII*, 1131. [8] Panning et al. (2022). *LPSC LIII*, 1576