

INTUITIVE MACHINES: ENABLING COMMERCIAL INTERNATIONAL LUNAR SCIENTIFIC EXPLORATION. D. B. J Bussey¹, T. D. Martin¹ & the IM Team, ¹Intuitive Machines, 13467 Columbia Shuttle St., Houston, TX 77059, USA, bbussey@intuitivemachines.com.

Introduction: Intuitive Machines (IM) is diversified space technology, infrastructure, and services company providing access to lunar orbit and the surface for science and exploration. Our lunar access capabilities consist of several components.

1. Fixed lunar surface services
2. Lunar rover services,
3. Lunar hopper services,
4. Satellite delivery services.
5. Lunar communication & PNT services

Fixed Lunar Surface Services: IM is a participant in the NASA Commercial Lunar Payload Services (CLPS) initiative. As of March 2025, NASA has awarded ten CLPS contracts to deliver payloads to the lunar surface. IM has won four of those contracts. All four deliveries use the IM-designed Nova-C lander. Nova-C uses one, IM designed & built, VR-900 bipropellant engine to deliver over 130 kg of payload anywhere on the Moon. Multiple payload mounting points are available on the Nova-C, which provides power and communications to the payloads for the mission duration. IM can also deliver up to 2500 kg of payload to the lunar surface with the Nova-D lander.



Figure 1: The finished IM-1 Nova C, called Odysseus, just prior to shipping to KSC for launch.

IM has conducted two lunar landing missions. Both landers carried NASA CLPS payloads as well as several commercial payloads.

IM-1: The IM-1 mission (February 2024) landed near Malapert-A crater ([80.13°S, 1.44°E](#)) in the lunar south polar region. The Odysseus Nova-C spacecraft landed in an off nominal surface orientation due to a cabling issue with the laser altimeter. However, the vehicle operated for over six Earth days, returning more than 550 Megabytes of engineering and image data, demonstrating the robust system design

IM-2: The Athena lander touched down in the Mons Mouton region of the Moon on March 6th 2025. Unfortunately the lander ended up on its side, in a small crater. Despite this, it operated on the surface for approximately 14 hours, allowing several of the instruments to operate and download data.

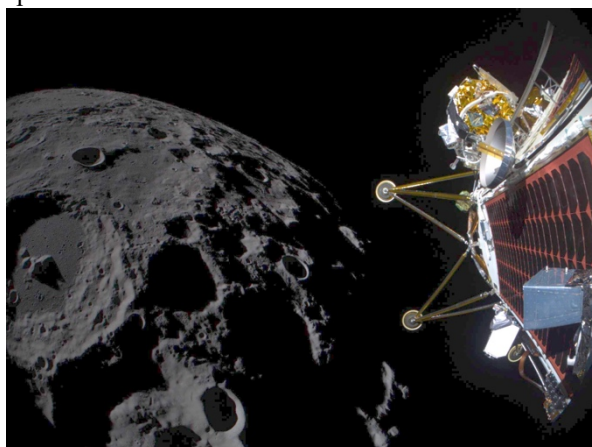


Figure 2: Athena flying over the south pole.

Lunar Mobility Services: IM has formed a strategic partnership with multiple rover providers to offer rover mobility solutions to customers. These companies have a portfolio of rovers with different capabilities depending on payload needs.

Lunar Hopper Services: The IM-developed hopper mobility platform, called μ Nova [1,2], enables regional exploration deploying from a Nova-C or Nova-D. The μ Nova enables access to terrain not accessible to a rover, such as lunar pits, or quick access to the floor of large impact craters, including permanently shadowed regions. The μ Nova is a fully independent spacecraft with propulsion, power, and communication systems. It can carry 8 kg of payload a distance of several kilometres. Flight profiles are tailored to mission needs, including parabolas and flying a constant altitude traverse.

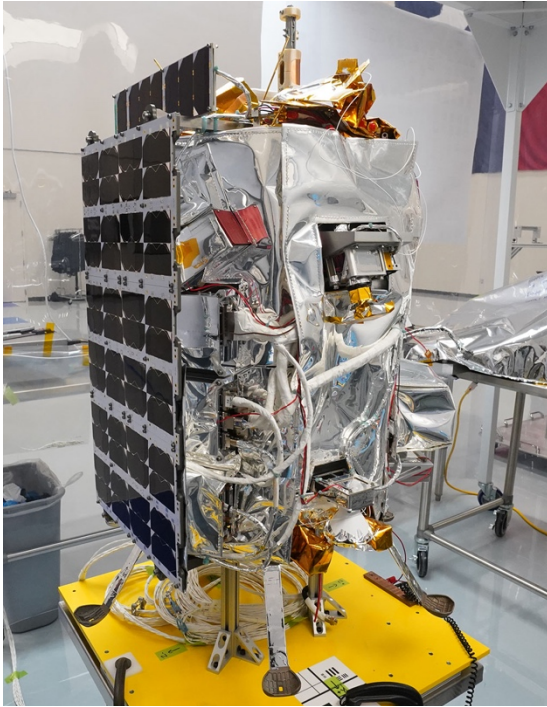


Figure 3: IM hopper. Approximately 70 cm tall, and capable of flying 8 kg of payload several kilometres.

Satellite Delivery Services: In parallel to conducting a lunar surface delivery, IM can deliver satellites into various lunar orbits. These range from deploying up to 1000 kg into a 185 km x 380 000 km translunar injection orbit to deploying a 375 kg satellite into a 100 km circular lunar orbit.

Lunar Communications and Precise Navigation & Timing (PNT): In addition to the four core services described above, IM offers ancillary capabilities to enhance data return from the Moon. A key one is our

communications infrastructure. IM has developed the first private, secure, interoperable lunar distance communication network. We have agreements with ground stations located worldwide, which, combined with our communication relay spacecraft, provide a complete lunar communications and navigation solution. The first communication relay spacecraft, will be delivered into lunar orbit in early 2026.

Upcoming Lunar Missions: IM-3, scheduled for flight in 2026, will land on the Reiner Gamma formation, and will carry the CLPS payload Lunar Vertex as well as instruments from Korea, and the European Space Agency. IM-4, scheduled for launch in late 2027, will carry an ESA payload to the lunar south polar region.

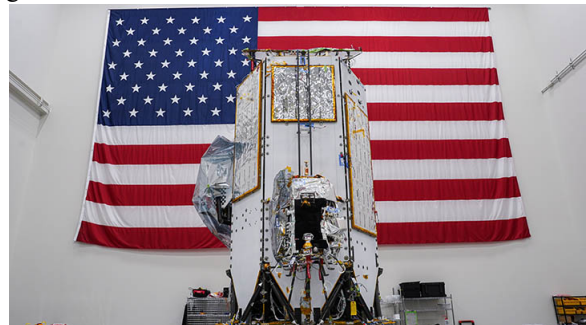


Figure 4: The IM-2 lander, "Athena". Note the attached μ Nova hopper

We aim to provide a reliable cadence of lander missions. This regular lunar access cadence provides the lunar science community the maximum flexibility when planning lunar exploration.

References:

- [1] Atwell M. et al. (2022) *LEAG* Abs #5037. [2] Martin T. et al. (2025) *LPSC LVI*

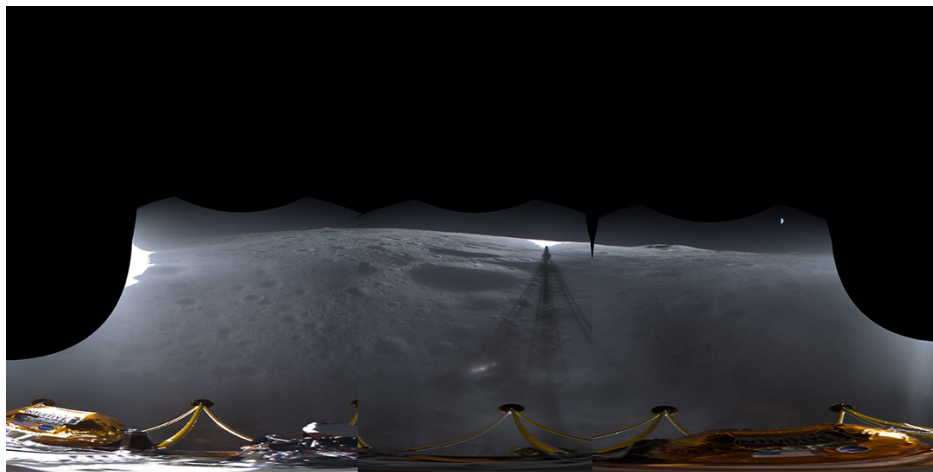


Figure 5: Panorama of images taken by Athena when just above the lunar surface