

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

Introduction: Intuitive Machines (IM) is a lunar services company that provides access to the Moon and its orbit for both science and exploration. Our lunar access capabilities consist of four components.

1. Fixed lunar surface services
2. Lunar rover services,
3. Lunar hopper services,
4. Satellite delivery services.

Fixed Lunar Surface Services: IM is part of NASA's Commercial Lunar Payload Services (CLPS) initiative. As of January 2024, NASA has awarded eight CLPS contracts for lunar delivery services of payloads to the Moon's surface. IM has won three of those contracts. All three will use the IM-designed Nova-C lander. Nova-C uses one VR-900 bipropellant engine to deliver over 130 kg of payload to anywhere on the Moon. It can land on slopes up to 10° and uses a hazard detection and avoidance system to ensure a safe landing. Multiple mounting points on the lander are available, and it provides power and communications to the payloads for the duration of the mission. If the mission requires it, IM can use a Nova-D lander which has payload capacity up to 2500 kg, depending on the launch vehicle.



Figure 1: The finished IM-1 Nova C, called Odysseus, just prior to shipping to KSC for launch. The Nova-C is capable of delivering more than 130 kg of payload to anywhere on the Moon

Lunar Mobility Services: IM has formed a strategic partnership with multiple rover providers (Lunar Outpost & Space Applications Services) to provide rover mobility solutions to customers. These providers offer a range of rovers with different capabilities depending on payload needs.

Lunar Hopper Services: IM has developed a hopper mobility platform, called Micro Nova, that conducts regional exploration after it is delivered to the lunar surface by a Nova-C or Nova D. Micro Nova permits extreme access by being able to visit locales not accessible to a rover, such as lunar pits, of quick access to the floor of large impact craters, including permanently shadowed regions. Micro Nova is essentially a fully independent spacecraft with its own propulsion, power, and communication systems. It can carry a maximum of 8 kg of payload and can traverse more than 25 km after

the initial landing. Different flight profiles are possible, including parabolas, and flying at a constant altitude.



Figure 2: IM hopper. Approximately 1 meter tall, and capable of flying 8 kg of payload more than 25 km.

Satellite Delivery Services: In parallel to conducting a lunar surface delivery, IM can drop off satellites into a variety of 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.

Additional Services: 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 network. We have agreements with ground stations located around the world, which combined with our own communication relay spacecraft, provide a complete lunar communications and navigation solution.

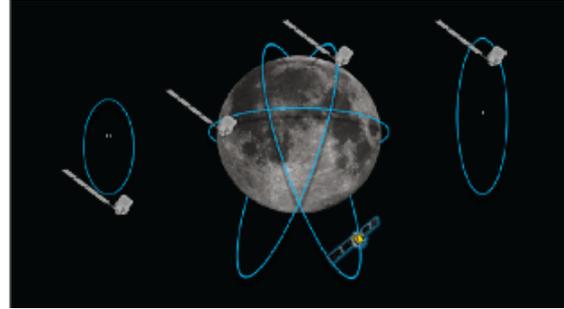


Figure 3: Depiction of the IM constellation of KHON lunar communication relays.

Upcoming Lunar Missions: IM-1, our first lunar mission, is scheduled to fly in February of 2024. A Nova-C will land near Malapert-A crater in the Moon's south polar region. The payload consists of NASA CLPS payloads as well as several commercial payloads. This is followed by IM-2, also to the south polar region. This carries the NASA PRIME-1 instrument that consists of the same Trident drill and M-SOLO mass spectrometer that are manifested to fly on NASA's VIPER rover in 2024. IM-2 also carries the IM Micro Nova hopper, two rovers and other payloads. IM-3 will land in the Moon's Reiner Gamma region, and will carry the CLPS payload Lunar Vertex as well as instruments from Korea, and the European Space Agency.

It is IM's goal to fly at least one lunar lander every year. This regular lunar access cadence permits customers the most flexibility for planning lunar exploration.