

IM-2 PRESSES KIT

INTUITIVE
MACHINES



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INTRODUCTION

THE INTUITIVE MACHINES STORY



In 2012, Stephen Altemus, then deputy director of NASA's Johnson Space Center, found himself deep in conversation over dinner with visionary space entrepreneur Kam Ghaffarian. A simple napkin became the canvas for an ambitious idea—one that would lay the foundation for Intuitive Machines. That moment turned into a mission, and in 2013, Altemus, Ghaffarian, and Dr. Timothy Crain founded the company to tackle some of humanity's most complex challenges in space.

Years later, the United States shifted its focus back to the Moon, recognizing its strategic importance. With NASA's Artemis campaign aiming for a sustainable return, new opportunities emerged for companies that could make lunar access more efficient. In 2019, Intuitive Machines secured its first major contract, a mission to deliver scientific payloads to the lunar surface.

Over the next four years, the company expanded beyond landers, creating an entire lunar program designed to transport payloads, relay data, and build the infrastructure needed for long-term exploration. This work culminated in February 2024 with the launch and successful landing of IM-1, proving their capabilities and cementing their role in the future of lunar exploration.

What began as a conversation in Washington, D.C. evolved into a company shaping the commercial and governmental push toward the Moon, turning a bold vision into reality.

OUR MISSION



Our vision is to be the global leader in sustainable space infrastructure and services, enabling humanity's space exploration and commerce goals.

THE MISSIONS AND VISIONS FOR THE SPACE INDUSTRY ARE MORE AMBITIOUS THAN EVER.

Our three pillars of commercialization help our customers achieve their goals.

THREE PILLARS OF COMMERCIALIZATION



DELIVERY

- Transportation and delivery of payloads (satellites, scientific instruments, and cargo) to various space destinations.
- Services: Rideshare delivery and lunar surface access



DATA TRANSMISSION

- Space data collection, processing, and interpretation.
- Applications: Command, control, communications, reconnaissance, and prospecting.



INFRASTRUCTURE AS A SERVICE

- Scalable on-demand access to lunar systems needed to live and work
- Functions: Navigation, maintenance, scientific data collection, and system health monitoring.

We provide the diverse space infrastructure and services required to commercialize the Solar System, guided by the Moon as our North Star.

IM-1 Successes:

- Validated, company-owned space data network
- Downlinked 1.7GB total data
- Returned 550MB of data and analysis from the lunar surface
- Exceeded 144 mission required operations hours
- Completed 167 autonomous operation hours. First commercial company to land on the Moon
- First firing of a liquid oxygen/liquid methane (LO2/LCH4) engine in space
- Landed 9.9° from the Moon's south pole

RESOURCES AND EVENTS



News Releases and Features

Mission news, updates, and feature stories about Intuitive Machines and the IM-2 mission are available below:

[Intuitive Machines News Releases](#)
[IM-2 Mission Stream and Information](#)

The latest information about launch and landing activities can be found on the [Intuitive Machines IM-2 landing page](#).



Multimedia Resources

Intuitive Machines IM-2 mission image and video galleries include:

[Intuitive Machines Flickr Gallery](#)
[IM-2 Mission Video Gallery](#)



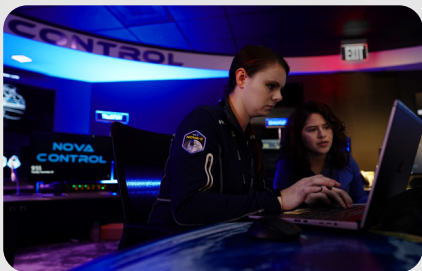
Web Resources

[Official Intuitive Machines Website](#)
[Intuitive Machines Leadership](#)
[Official NASA Commercial Lunar Payload Services \(CLPS\) initiative Website](#)



Media Events

The most up-to-date information about IM-1 media events and where they may be viewed can be found on the press section of the [IM-2 landing page](#).



How to Watch

NASA, SpaceX and Intuitive Machines will host a live launch stream on NASA TV and the [IM-2 landing page](#). Intuitive Machines will host a landing livestream on NASA TV and on the [IM-2 landing page](#).



IM-2

MISSION OVERVIEW

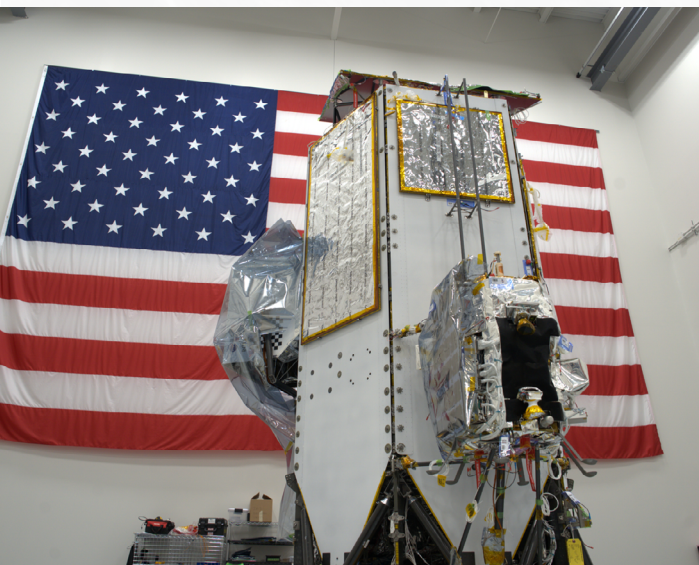
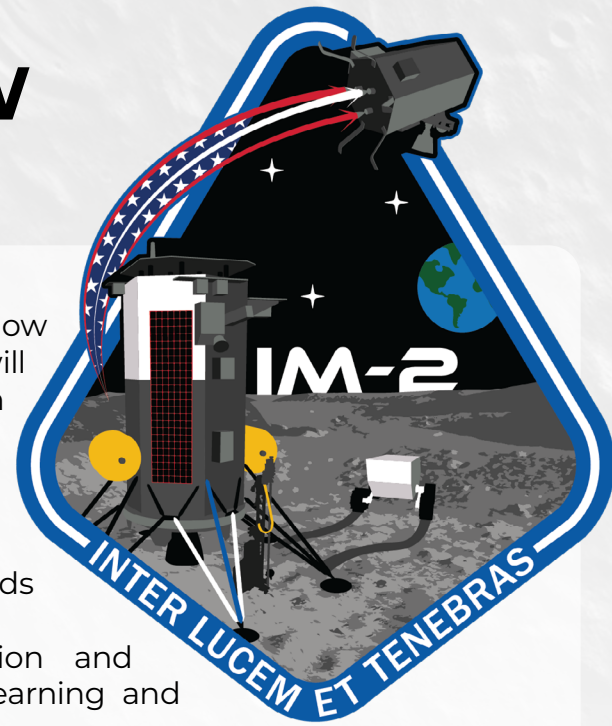
IM-2 MISSION OVERVIEW

Intuitive Machines' IM-2 mission is designed to refine how humanity may live and work on the Moon. The mission will test lunar mobility, resource prospecting, and the extraction of volatile substances from beneath the surface—key steps toward identifying water sources vital for sustainable infrastructure on the Moon and beyond.

Launching aboard a SpaceX Falcon 9 rocket, Athena builds upon Odysseus, the Nova-C lunar lander used in IM-1, incorporating enhancements such as lidar integration and advanced autonomous landing powered by machine learning and artificial intelligence.

A key objective of IM-2 is the deployment of NASA's TRIDENT Drill and MSolo mass spectrometer to probe up to one meter beneath the lunar surface, showcasing the technology needed to detect essential volatiles like water and CO₂. The mission also introduces new mobility capabilities with Intuitive Machines' Micro Nova Hopper, named Grace, which can travel up to two kilometers from the lander, capture detailed surface imagery, and explore craters. Additionally, a rover equipped with Nokia's Lunar Surface Communications System will test high-speed, long-range communication solutions tailored for future space missions.

With approximately ten days of sunlight available for operations, IM-2 presents a valuable opportunity for scientific exploration and experimentation, with ample space and payload capacity for additional instruments.

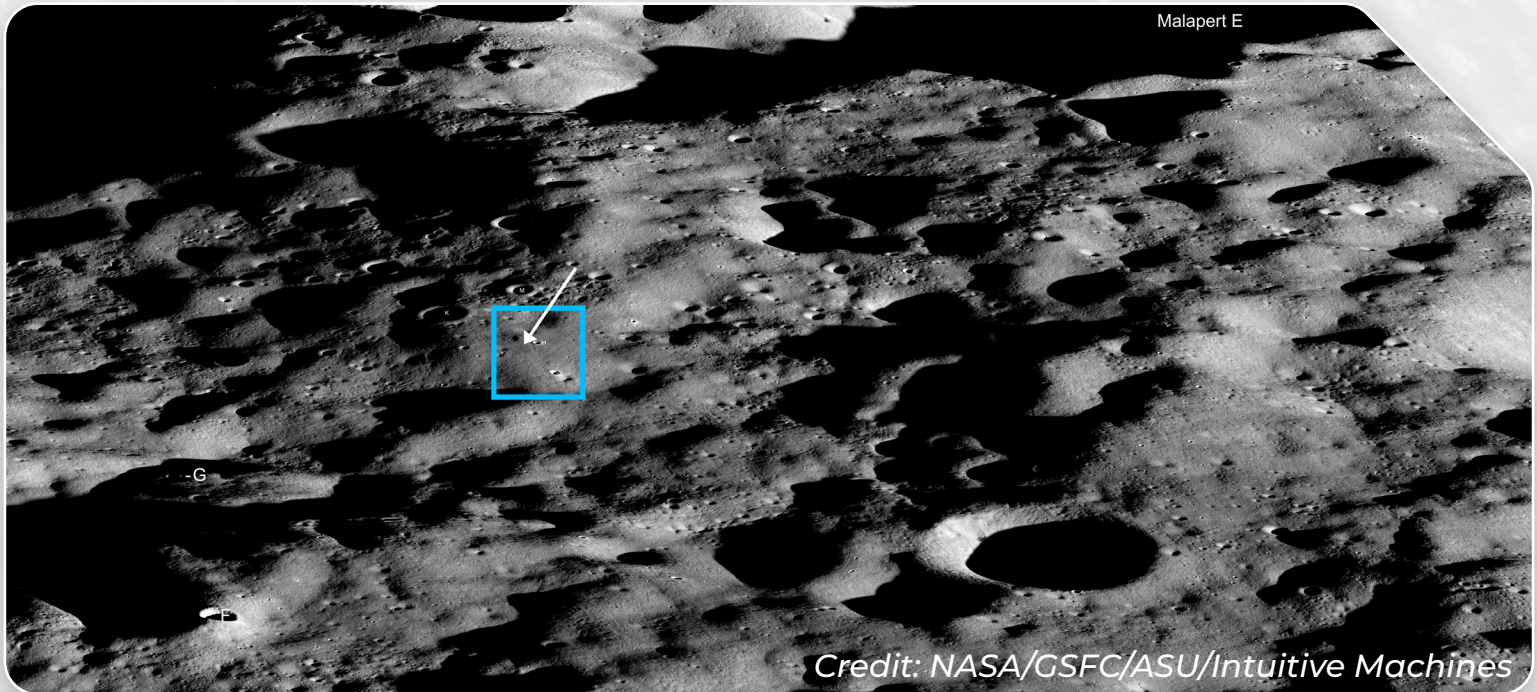


NASA COMMERCIAL LUNAR PAYLOAD SERVICES INITIATIVE



Intuitive Machines is a leading service provider in NASA's Commercial Lunar Payload Services (CLPS) initiative, part of the agency's lunar exploration efforts. The science and technology payloads sent to the Moon's surface as part of Intuitive Machines' IM-2 mission, are intended to help lay the foundation for human missions and a long-term presence on the lunar surface. With CLPS as a springboard for innovation, Intuitive Machines designed and developed a complete lunar program to help support NASA's Artemis campaign and the commercial development of the Moon.

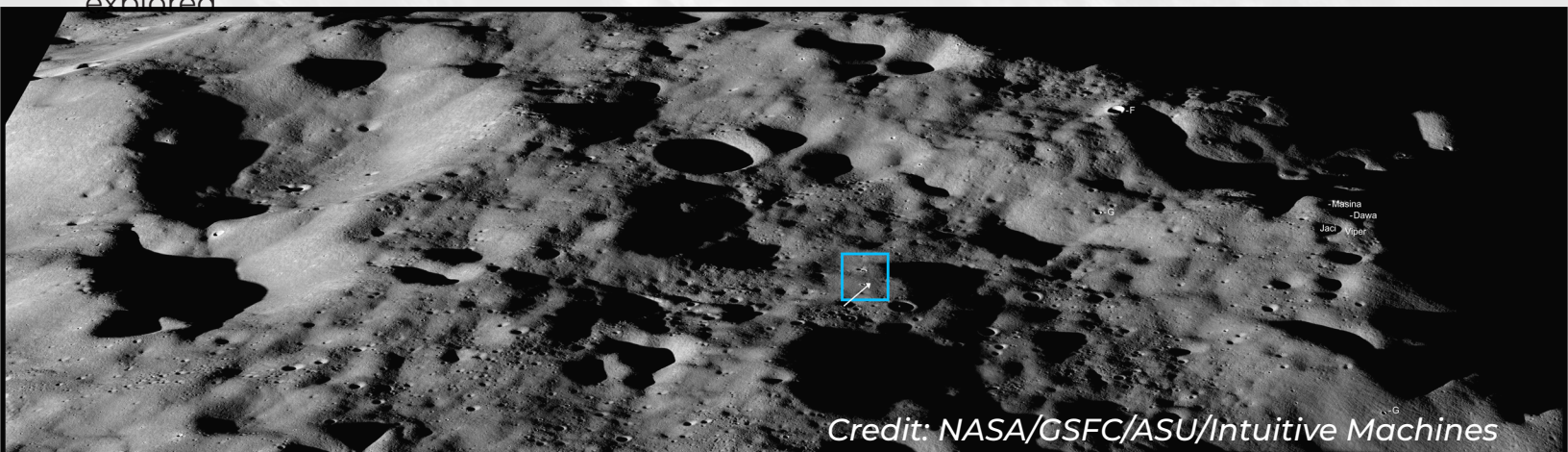
LANDING LOCATION



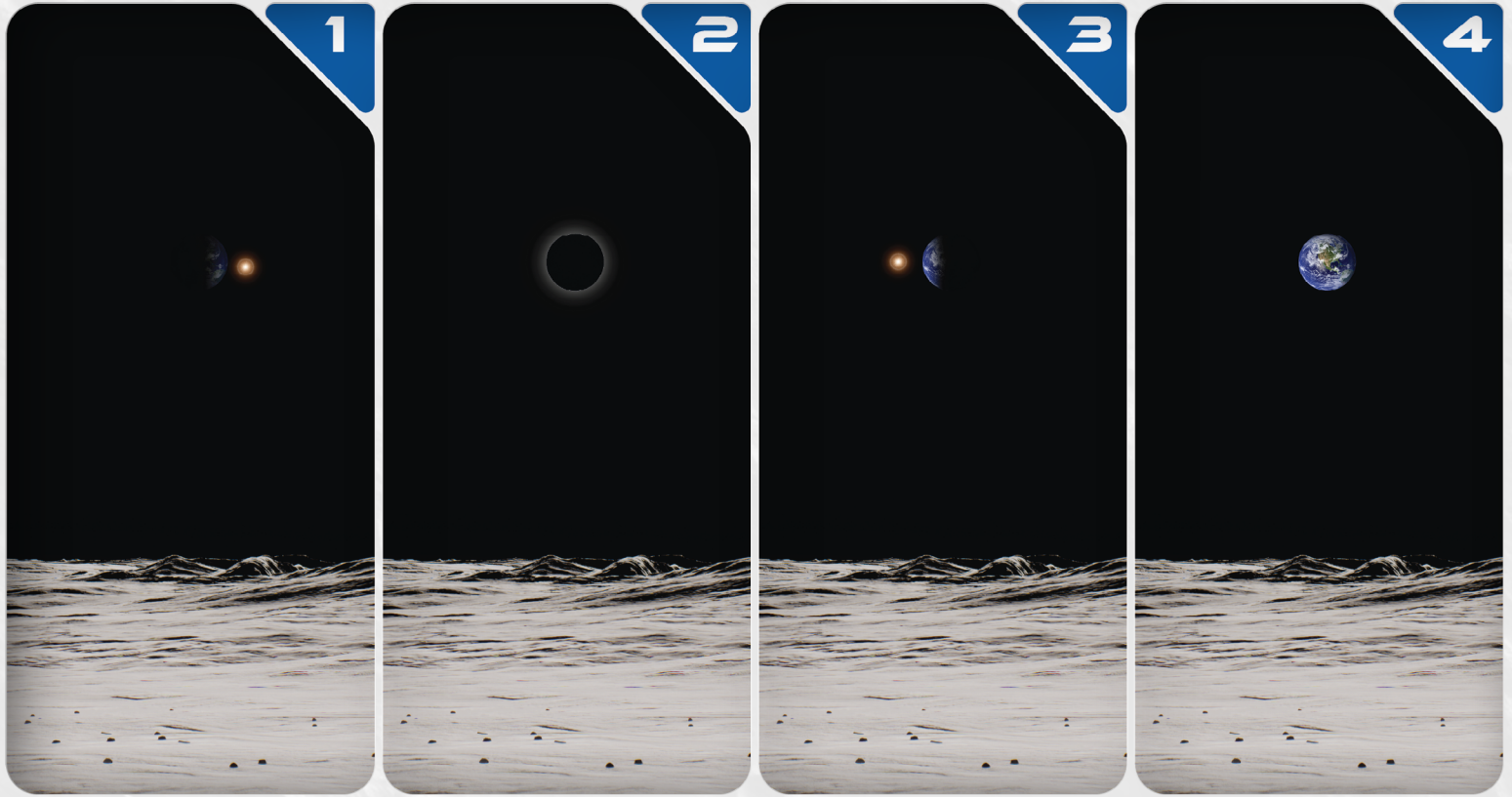
Athena is targeting the “Mons Mouton” region of the Moon. This landing site is approximately 160 kilometers from the Moon’s south pole. -84.78° , 29.13°E , closer to the pole than attempted by any previous lunar mission.

Mons Mouton is named after the mathematician Melba Mouton, one of the first “human computers” who played a key role in the early field of spacecraft trajectory and geodynamics.

Athena is expected to land in a lunar highland terrain, and will then deploy rovers and Intuitive Machines’ Micro Nova Hopper, named Grace, to explore the local area. Grace is designed to take multiple flights to collect science data using instruments from Hungary and Germany. One of these hops is expected to be into a small permanently shadowed crater approximately one quarter of a mile from the landing site. This would be the first time that a permanently shadowed crater, somewhere the sun has never shone, has been explored.



ATHENA'S LUNAR ECLIPSE PHOTO OPPORTUNITY



Intuitive Machines anticipates Athena will observe a lunar eclipse, from the Moon! It will occur on March 14, at about 2 a.m. EST, when the Moon moves into the Earth's shadow. During the eclipse the Sun, Earth and Moon are all in-line, with the Earth in the middle. From Earth we will see a lunar eclipse where the Moon seems to disappear in the night sky. On the lunar surface Athena will see the Sun sweep from right to left on the horizon, passing behind the Earth, before reappearing again. Just like with a solar eclipse on Earth, Athena will be in the dark. As she uses solar panels to generate electricity, she will need to survive on battery power until the Sun reappears.

This isn't the first time an eclipse has been seen from the Moon. The Surveyor 3 lander saw one in 1967.

COMMERCIAL LUNAR DATA NETWORK



LUNAR DATA NETWORK (LDN): A PRIVATE AND SECURE NETWORK TO SUPPORT LUNAR MISSIONS.

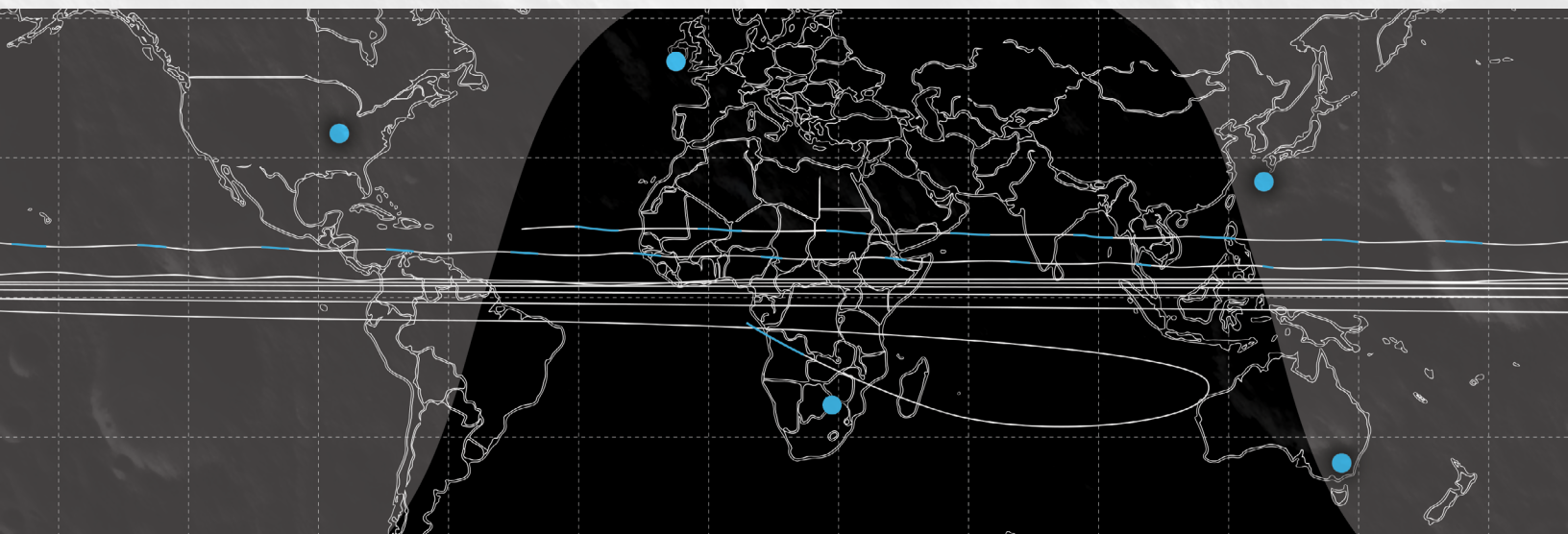
Offered commercially, LDN supports line-of-sight and data relay services for spacecraft in cislunar space and systems on the lunar surface. The secure interoperable LDN comprises of a mission control center and global ground stations with Intuitive Machines base-band units installed at each location.

Nova Control is the nerve center of Intuitive Machines' lunar mission operations in Houston, Texas. The operations center hosts mission controllers in a collaborative circular environment with access to mission-critical and support software, including VoIP voice system.

Nova Control is commercially offered, and the mission-critical command and control software, Nova Core, is developed and sustained in-house with partnership contingency operations achieved in partnership with Fugro SpAARC in Western Australia.

Intuitive Machines has long-term agreements with ground stations across the globe that comprise its Lunar Tracking, Telemetry, and Command Network (LTN), which support S-band, X-band, and Ka-band uplink and downlink.

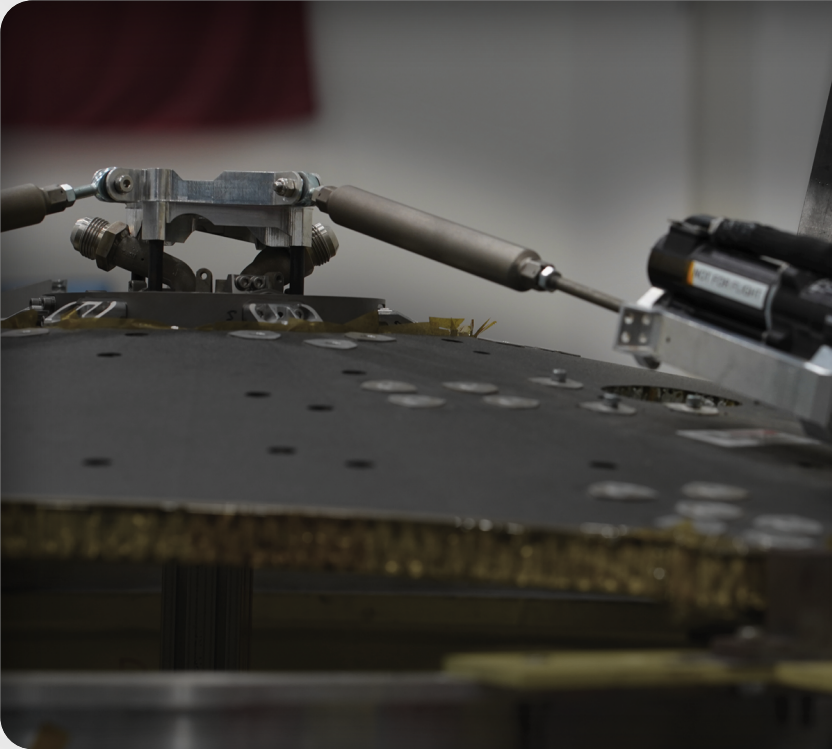
In February 2024, Intuitive Machines validated its end-to-end LDN during the successful IM-1 mission, which landed the first American spacecraft on the Moon since Apollo 17.



ROBOTIC MECHANISMS

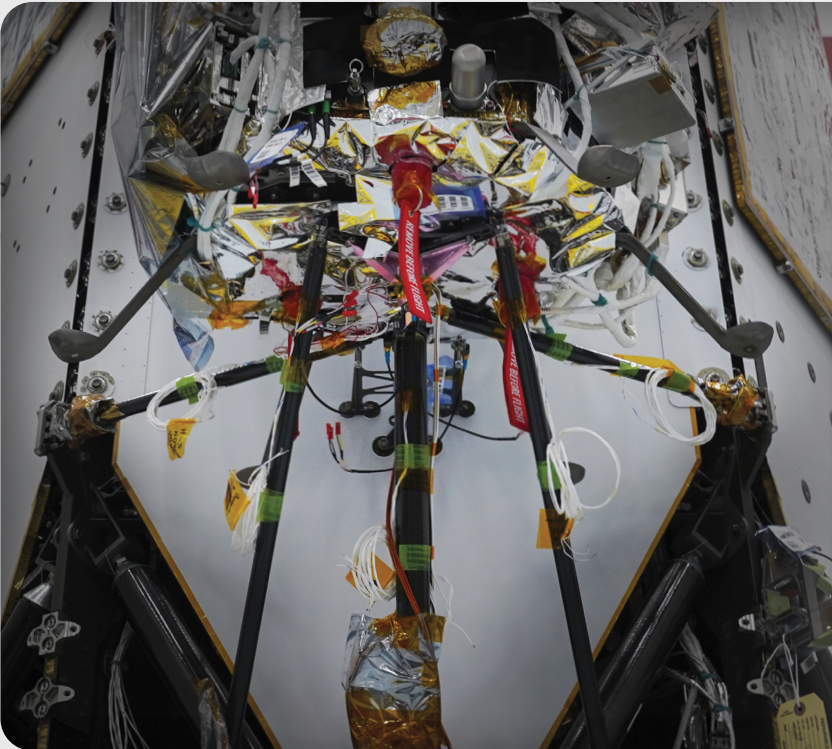
Athena will be hard at work both on the way to the Moon and after landing, using special moving parts to complete important tasks for the IM-2 mission. These parts are designed and built at Intuitive Machines' Mechanisms and Robotics facility in Glen Burnie, Maryland.

The team working on these systems includes top engineers who have worked on big projects like fixing the Hubble Space Telescope and building robotic arms for the International Space Station. Now, they are using their skills to develop new technology that will help IM-2 explore the Moon in pioneering new ways.



MEG - MAIN ENGINE GIMBAL

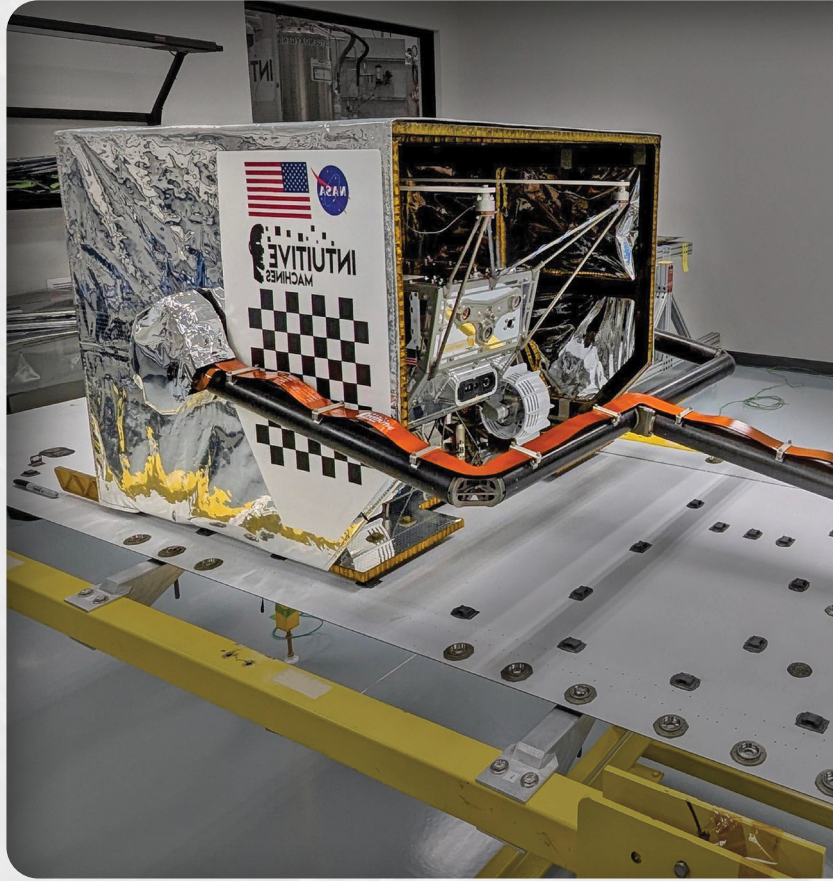
Designed and built by the Mechanisms team, the MEG is how Athena steers, providing precise control over the lander's main engine thrust vector. It features a dual-axis gyroscope-style arrangement with uniquely designed redundant rotating joints which accommodate the enormous temperature gradients generated in a cryogenic engine. Articulated by two thrust vector control (TVC) actuators, the system remains safely locked during ascent using novel fail-safe launch locks.



HDM - HOPPER DEPLOYMENT MECHANISM

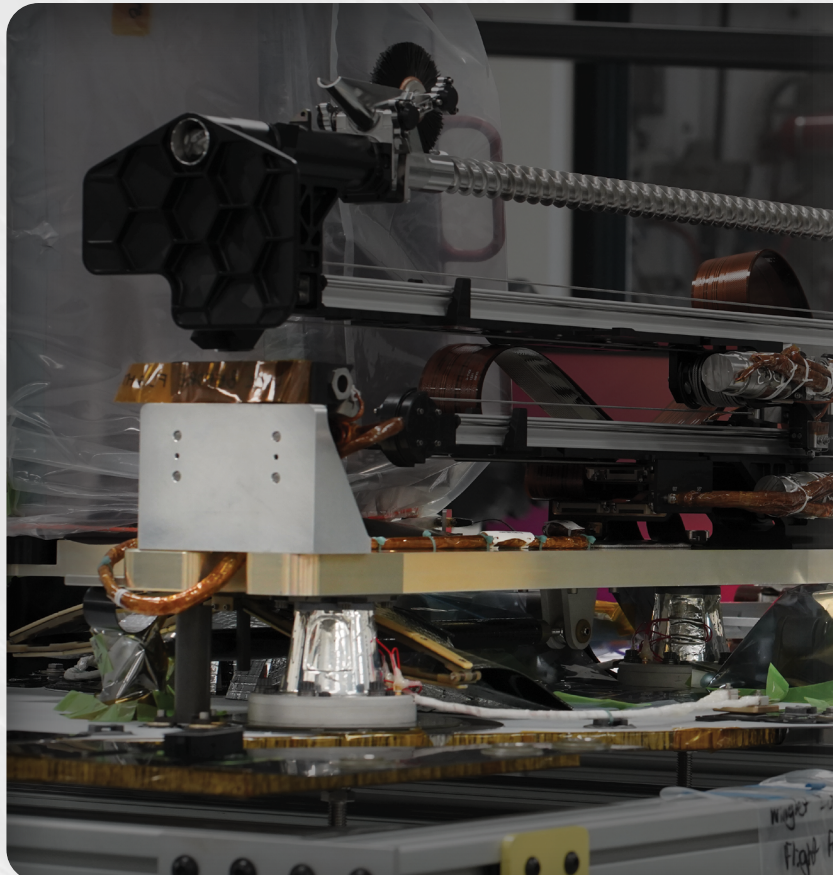
The HDM is a hybrid system which delivers, deploys, and serves as a launch pad for Intuitive Machines' Micro Nova Hopper, named Grace. Comprised of a titanium launch shelf, drop-away upper support struts, and a precision dust-tolerant rolling guide rail system to safely constrain Grace as she ascends and clears the side of Athena. The HDM underwent extensive environmental and gravity-compensated testing to ensure functionality in lunar conditions, including impressive full-length launch sequences at a variety of inclination angles.

ROBOTIC MECHANISMS



RDM - ROVER DEPLOYMENT MECHANISM

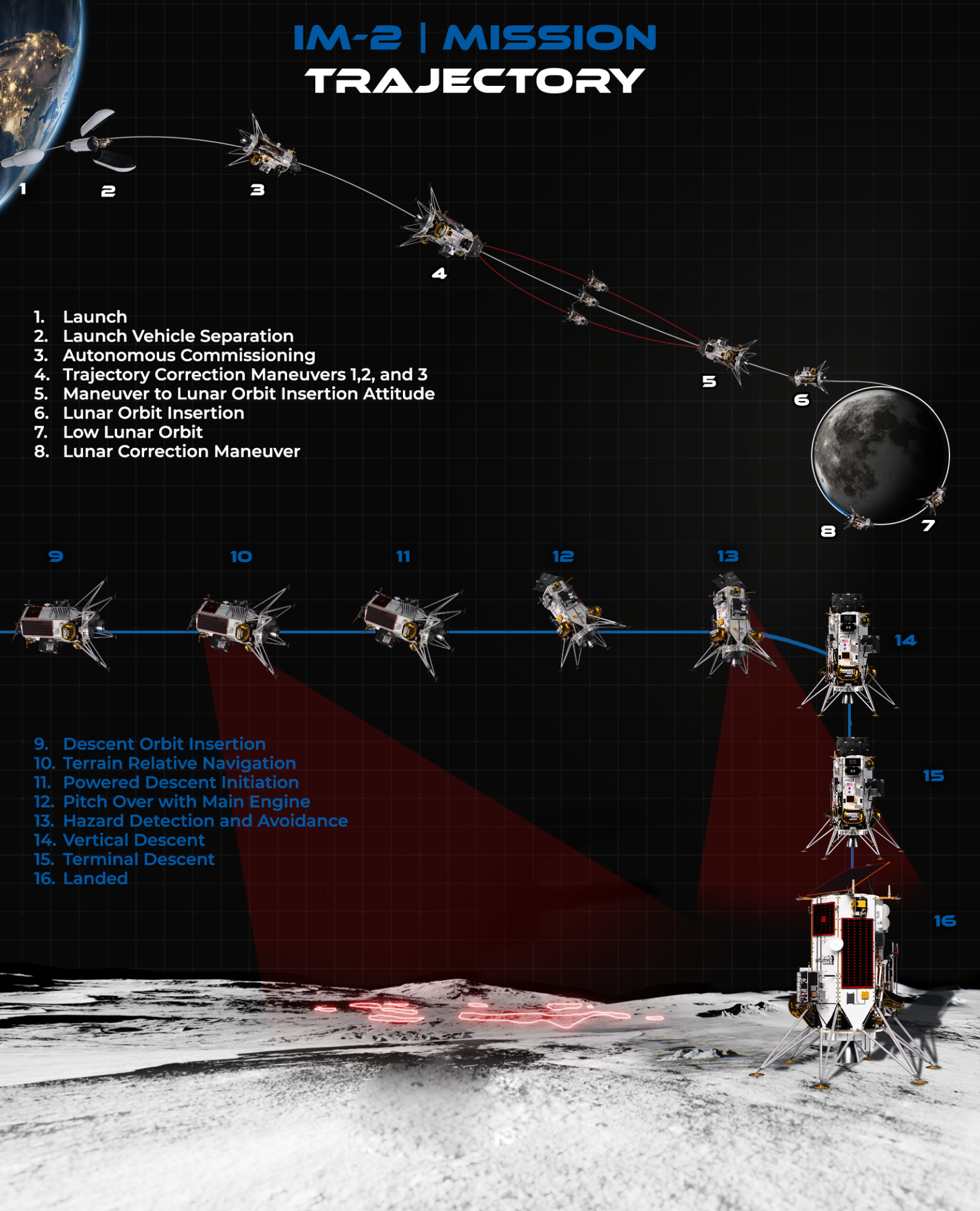
The RDM safely and gently delivers the Lunar Outpost/Nokia MAPP Rover to the lunar surface. The RDM features a drive-off composite garage structure which is cleverly hinged to a deployable boom, which allows the rover to be oriented sideways for optimal launch loading but transitions after launch lock release to a horizontal configuration which passively adapts to terrain irregularities. The boom includes a novel dust-tolerant hinge and viscous damper to control deployment velocity, and a twist capsule within the secondary hinge provides electrical services to the rover. Like the other IM-2 mechanisms, testing included vibration, thermal cycling, static loads, and full deployment functional tests at multiple inclinations.



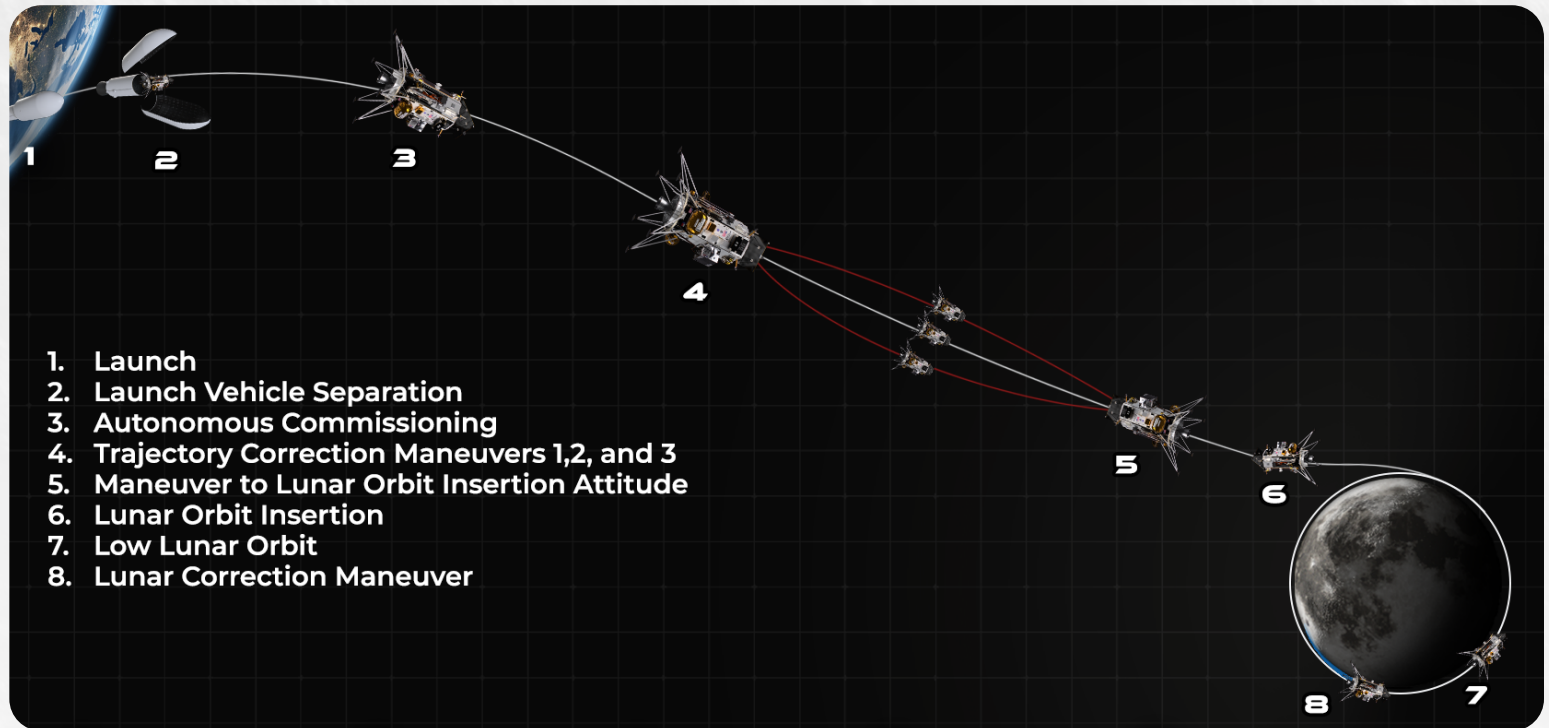
3PO - PRIME-1 PRECISION PALLET OFFLOADER

The 3PO deploys NASA's TRIDENT Drill and MSolo instruments on the lunar surface. It consists of a large pallet with hinged deployment arms that gently lower it to the surface and lock it in place for drilling operations. To maximize science gathering from the drill ejecta, it features a novel sunshade comprised of flexible deployable segments that function even when saturated with regolith. The Mechanisms team led the development, assembly, and testing of 3PO, conducting extensive gravity-negated variable-angled deployment tests to verify successful delivery of TRIDENT and MSolo under a range of inclinations.

IM-2 | MISSION TRAJECTORY



FLIGHT MANEUVER OVERVIEW



Launch

Intuitive Machines selected SpaceX to launch the Company's Nova-C class lunar lander, Athena, on a SpaceX Falcon 9 rocket from Launch Complex 39A at NASA's Kennedy Space Center in Florida.

Launch Vehicle Separation (LVSEP)

Shortly after launch, a spring force will gently push Athena away from the launch vehicle's second stage, allowing the lunar lander to deploy and drift away toward the Moon. Athena is in a standby state before separation. Break wires connected to the launch vehicle let the lander know it has deployed, and a timer starts on the lander to activate its primary systems. After completing the separation timing interval, Athena powers on, including Guidance Navigation and Control (GNC), Automated Flight Management (AFM) software, radios, and thermal control.

Autonomous Commissioning

Intuitive Machines expects to commission Athena several minutes after LVSEP autonomously. During autonomous commissioning, the lander's GNC activates the cold-gas helium Reaction Control System (RCS) to control the vehicle attitude.

At this point, Athena does not know where it's pointed, but it can stop its spin motion, much like a person spinning in a chair with closed eyes can control the spin without knowing where it stops.

After controlling the spin rate, special cameras known as star trackers autonomously match images of the distant star field and provide Athena with her orientation. Software onboard takes the star tracker

*Mission Maneuvers are Subject to Change

measurements and processes them through an algorithm known as the Kalman filter to correct the onboard orientation, known as attitude, and then estimates and rejects bad measurements.

Once the GNC system has autonomously determined its attitude relative to the star field, it uses a reference position from the nominal launch vector to determine the approximate location of the Sun. GNC then commands RCS jets to maneuver the lander's top deck toward the sun with a slight angle to illuminate the top deck and side solar arrays to generate maximum power.

Athena holds this approximate attitude within +/- 15 degrees for the entire mission other than when flight controllers in Nova Control are executing maneuvers or pointing the lunar lander's High Gain Antenna (HGA) used for communications back to Earth.

When Athena's top deck is pointed toward the sun, this is known as max power attitude, which also helps flight controllers in Houston, Texas, manage the lander's thermal state on the vehicle by keeping other systems in the shade of the top deck and side deck solar arrays. Each step in the commissioning process is expected to happen autonomously because flight controllers in Houston do not have communications with Athena, yet.

When autonomous commissioning is complete and max power attitude is established, Athena turns on her communication radios and makes first contact with flight controllers in Nova Control.

Trajectory Correction Maneuvers

Flight controllers expect to command three brief main engine firings in the day's following launch. These small burns are called Trajectory Correction Maneuvers (TCM). The engine firings are designed to refine Athena's trajectory before performing Lunar Orbit Insertion (LOI) to capture into lunar orbit.

Lunar Orbit Insertion

LOI is Athena's largest maneuver, between 800 and 900 meters per second to capture into a 100km circular Low Lunar Orbit (LLO). This maneuver is approximately one-third of the total capability of Athena's propulsion system.

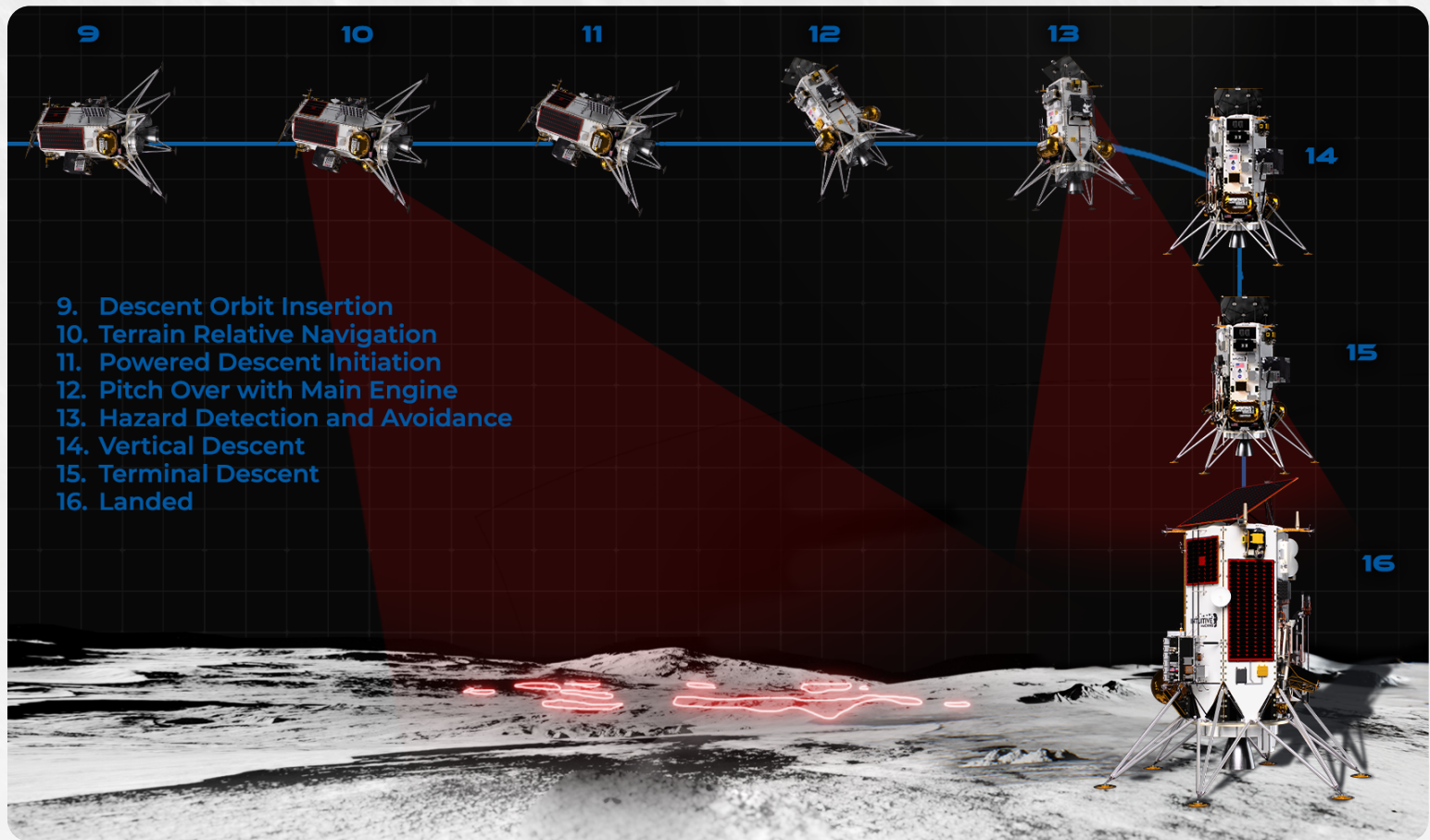
Low Lunar Orbit

For each lunar orbit, Intuitive Machines expects to have about 75 minutes of communication followed by 45 minutes where the Moon blocks Athena's direct line-of-sight radio link between the lander and Intuitive Machines' ground stations. When flight controllers lose communications and are in a communications blackout, we call it Loss of Signal (LOS). When flight controllers regain communication and are within line-of-sight, we call it Acquisition of Signal (AOS). Athena will orbit the Moon for approximately three days before descending to the surface.

Lunar Correction Maneuver

Intuitive Machines built in an optional main engine firing for the IM-2 mission called a Lunar Correction Maneuver (LCM). LCM gives the mission control team the option to adjust Athena's orbit, similar to the unplanned LCM Odysseus performed during the IM-1 mission.

*Mission Maneuvers are Subject to Change



Descent Orbit Insertion

Descent Orbit Insertion (DOI) is a small maneuver that usually happens on the far side of the Moon. The main engine fires to slow the lander so that its minimum altitude drops from 100 km to about 10 km near the landing site. The low point of an orbit around the Moon is called perilune, while the high part is apolune. In orbit, Athena travels faster near the peri condition and slower at the apo state. This effect is an exchange of potential energy like what people experience riding a bike through hills, coasting fast at the low points and slower at the peaks. Once DOI occurs, Athena is completely autonomous. The lander is expected to coast for approximately one hour after DOI; then, the GNC system will activate the main engine for Powered Descent Initiation (PDI).

Terrain Relative Navigation

Terrain Relative Navigation (TRN) cameras and lasers on the lander's downward side feed information to the navigation algorithms, which provide guidance and control. This portion may sound complicated, but it's something humans do each time they walk, ride a bike, or drive a car. Sensors are like human eyes collecting position, velocity, and orientation data. Navigation is a brain processing this information to determine where and how you move. Guidance is similar to a human brain determining, if I am here, moving in this direction, what do I need to do to get where I want to be? The answer could be to turn left or speed up. Control is the equivalent of turning the steering wheel or stepping on the accelerator to improve the guidance command. Human eyes act as sensors, seeing how things change, and the complete cycle repeats.

*Mission Maneuvers are Subject to Change

Powered Descent Initiation

Athena must reduce her velocity by approximately 1,800 meters per second to land softly on the surface of the Moon. Some lander designs have propulsion systems with multiple jets that fire on and off during descent to achieve this; however, all Intuitive Machines Nova-C class lunar landers have an engine designed to continuously burn and throttle from PDI until touchdown. This approach is similar to what the Apollo descent module did.

When the lander engine comes on at PDI, it is initially in a hard braking phase. The lander stays in the braking phase until approximately 2 km from the landing site.

Pitch Over with Main Engine

At the end of PDI, Athena pitches over using her main engine. Now, Athena is generally upright, with the Hazard Relative Navigation (HRN) sensors facing forward in the area where the lander intends to touch down.

Hazard Detection and Avoidance

Intuitive Machines designed Athena's trajectory to fly to the Intended Landing Site (ILS) on the Moon. Once the lunar lander is getting closer to its ILS, the onboard software selects a safe Designated Landing Site (DLS) with the slightest slope, free from hazards, with the range of the lander.

Athena's systems are intended to match lunar gravity to fly toward the DLS. During this time, the main engine is continually throttling down, lowering the engine power to compensate for the lander getting lighter and lighter with spend propellants spent leaving the spacecraft's mass.

Vertical Descent

Athena's GNC system flies the lander to a point approximately 30 km above the DLS, and the lander goes into a vertical descent at three meters per second. Then, the lander brakes to a one-meter-per-second descent rate 10 meters above the surface, preparing for terminal descent and landing.

Terminal Descent

At this point, Athena uses inertial measurements only. No cameras or lasers are guiding the spacecraft to the lunar surface because they would read lunar dust kicking up from the lander's engine. Athena's Inertial Measurement Unit (IMU) senses acceleration like a human's inner ears, which feel rotation and acceleration.

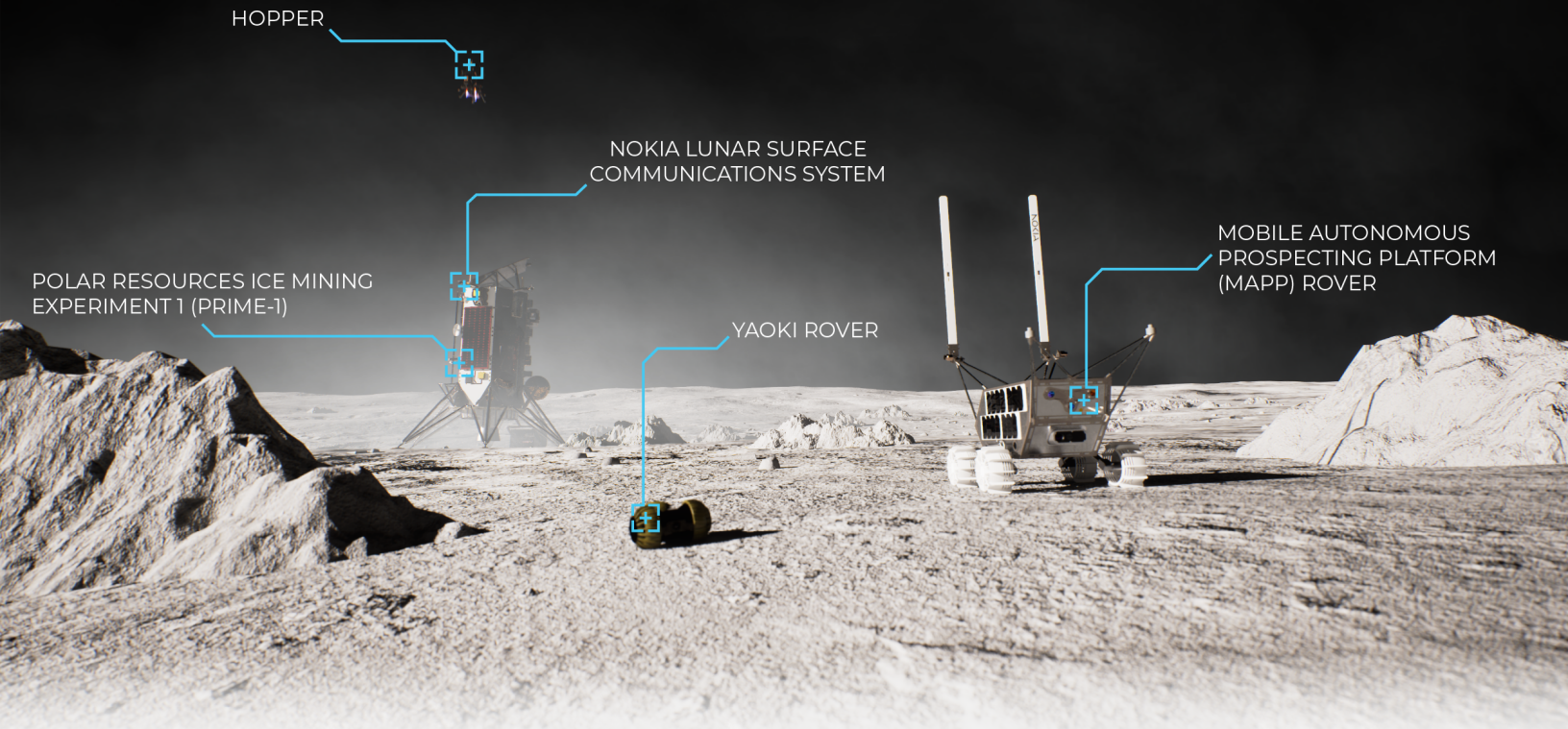
Terminal descent is like walking towards a door and closing your eyes the last three feet. You know you're close enough, but your inner ear must lead you through the door.

Landing

Athena is designed to land at one-meter-per-second velocity. Flight controllers expect about a 15-second delay before confirming the ultimate milestone, softly landing on the surface of the Moon. Intuitive Machines and its customers expect to conduct science investigations and technology demonstrations for approximately ten days before the lunar night sets on the south pole of the Moon, rendering Athena inoperable.

*Mission Maneuvers are Subject to Change

LUNAR SURFACE OPERATIONS OVERVIEW

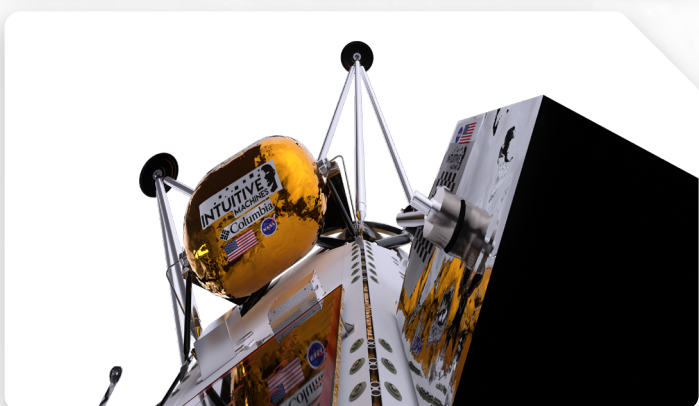
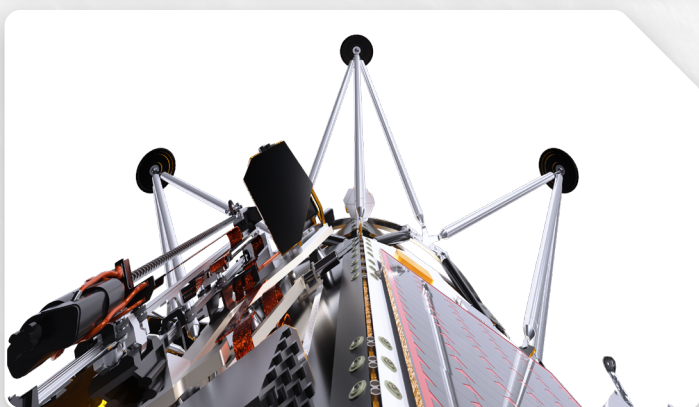
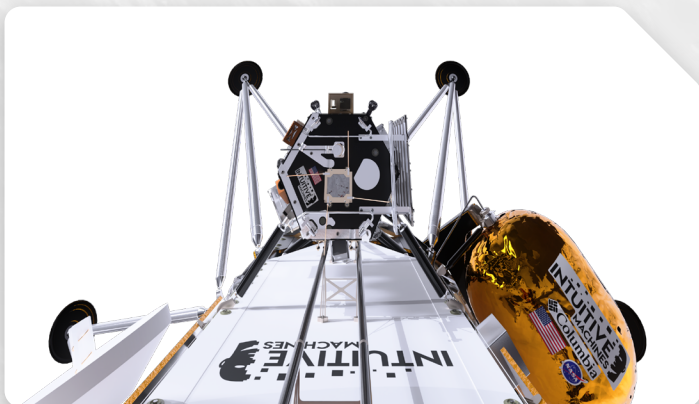


Intuitive Machines' IM-2 mission represents a major leap in lunar surface operations, integrating mobility, advanced communications, drilling, data transmission, and off-world data storage. Following a successful landing, the first priority is to establish a power-positive state, ensuring that Athena generates more energy than it consumes. Once stable, Intuitive Machines expects Athena will capture and transmit images of the landing site before deploying the Lunar Outpost MAPP rover, the Micro Nova Hopper named Grace, and NASA's PRIME-1 drill suite in sequence. These assets will begin their respective operations—mobility across the lunar surface, precision hopping for data collection, and drilling for subsurface analysis—while Athena continuously transmits critical scientific data and imagery back to Earth, including Lonestar's data center, Freedom, the first physical data center beyond Earth.

Complementing these efforts, Nokia's Lunar Surface Communications System will utilize its 4G/LTE network to connect Athena with its mobility assets, ensuring seamless data transfer and control. After five days of cyclical operations, the Dymon Co. Ltd. Yaoki Rover will be deployed, further expanding the mission's exploration footprint. Intuitive Machines expects to complete these mission objectives over approximately ten days of lunar surface operations before the sun sets on the lunar south pole, rendering Athena inoperable as extreme temperatures take hold.

*Mission Maneuvers are Subject to Change

PUBLIC AFFAIRS OFFICE (PAO) CAMERAS



Overview

There are a total of seven PAO cameras for the IM-2 Mission. There will be four cameras on the lander that may provide a 360-degree view of the Nova-C lander at critical portions of the mission for IM public affairs. There will be one camera located near the PRIME-1 payload to capture images of the drill cycle. There will be two cameras on the Grace Micro Nova Hopper to capture images of the lunar terrain.

Mission Objectives

The high-level objectives for the PAO cameras are to collect imagery over the course of the mission to be released to the public for marketing purposes, to provide more refined imagery of the lunar surface to enhance Digital Terrain Models (DTM), and to image the drill pile for the PRIME-1 payload.

Communications and Operation Control Center

The PAO cameras are owned and operated by Intuitive Machines in Nova Control by the Payload Controller. There are a total of seven PAO cameras that will be on the IM-2 mission: five on Athena and two on Grace. Grace's cameras will be operated by the Hopper Payload controller while the lander Payload controller will operate the lander cameras. The lander Payload Controller will be responsible for managing the flow of data to be downlinked by all cameras.

System Environment

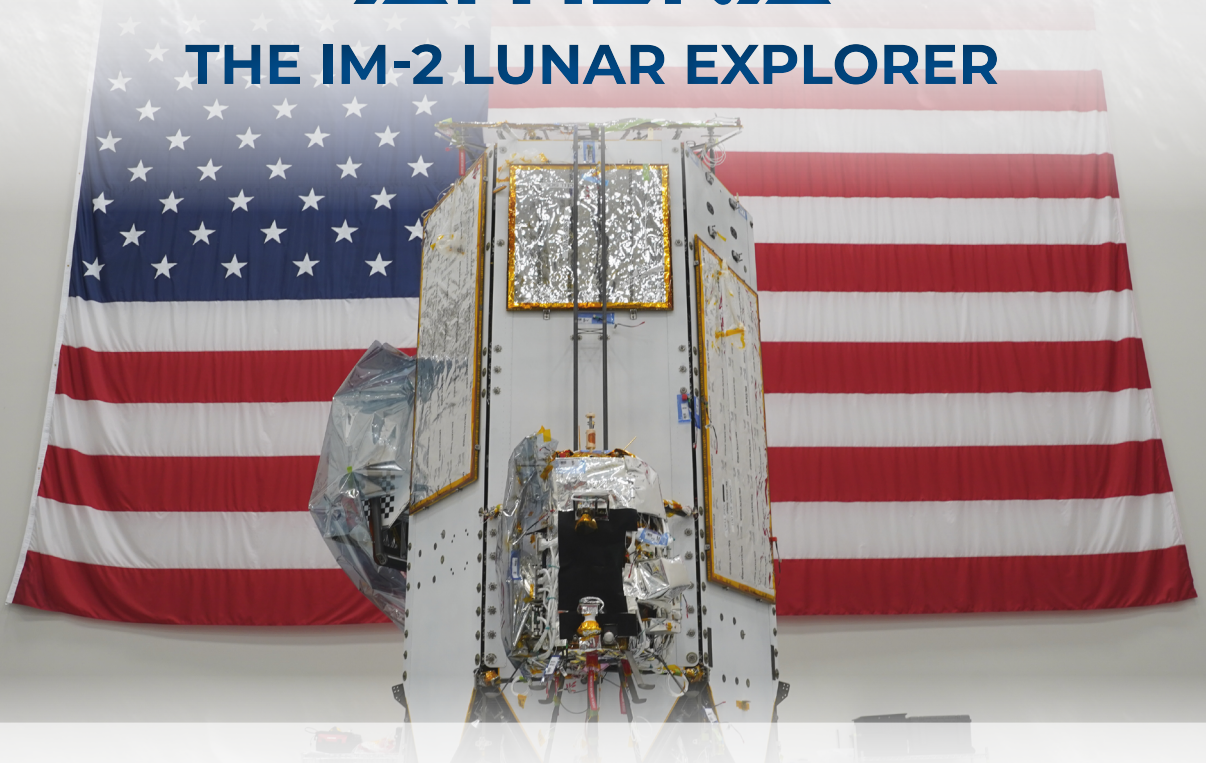
There are four PAO cameras that will be located on the ends of the Reaction Control System (RCS) booms. These cameras may experience high temperatures when exposed to direct sunlight and need to be monitored before power on. The drill camera will be in shade during the PRIME-1 mission and should not pose a problem for image capture. Grace's two cameras will experience a wide range of temperatures due to the nature of the mission. They will also experience very cold temperatures when in the Permanently Shadowed Region (PSR).



SPACECRAFT OVERVIEW

ATHENA

THE IM-2 LUNAR EXPLORER



Intuitive Machines proudly announced the debut of its latest Nova-C class lunar lander, named Athena in May 2024.

Much like the figure from Greek mythology, Athena embodies qualities of wisdom and strategic thinking, pushing Intuitive Machines engineers to excel in their daily technical efforts as they explore the lunar surface.

During a two-week collaborative effort, employees pitched various names for the lunar lander. Athena emerged as a finalist alongside Poseidon, Jerrie, and Archimedes.

Assembly, Integration, and Test Engineer, Mario Romero, advocated strongly for the name Athena. He explained how the goddess symbolizes wisdom and courage in Greek mythology, traits that align with the mission's objectives.

Romero drew parallels between Athena's journey and the challenges faced in lunar exploration, highlighting the mission's pursuit of knowledge and practical application.

Athena's inclusion as the mission's namesake reflects a storytelling element, honoring the feminine aspect after the masculine portrayal of Odysseus in the previous mission.

Payloads like Intuitive Machines' Micro Nova Hopper, tasked with crater investigations, echo Athena's wise companion, the owl, known for revealing truths.



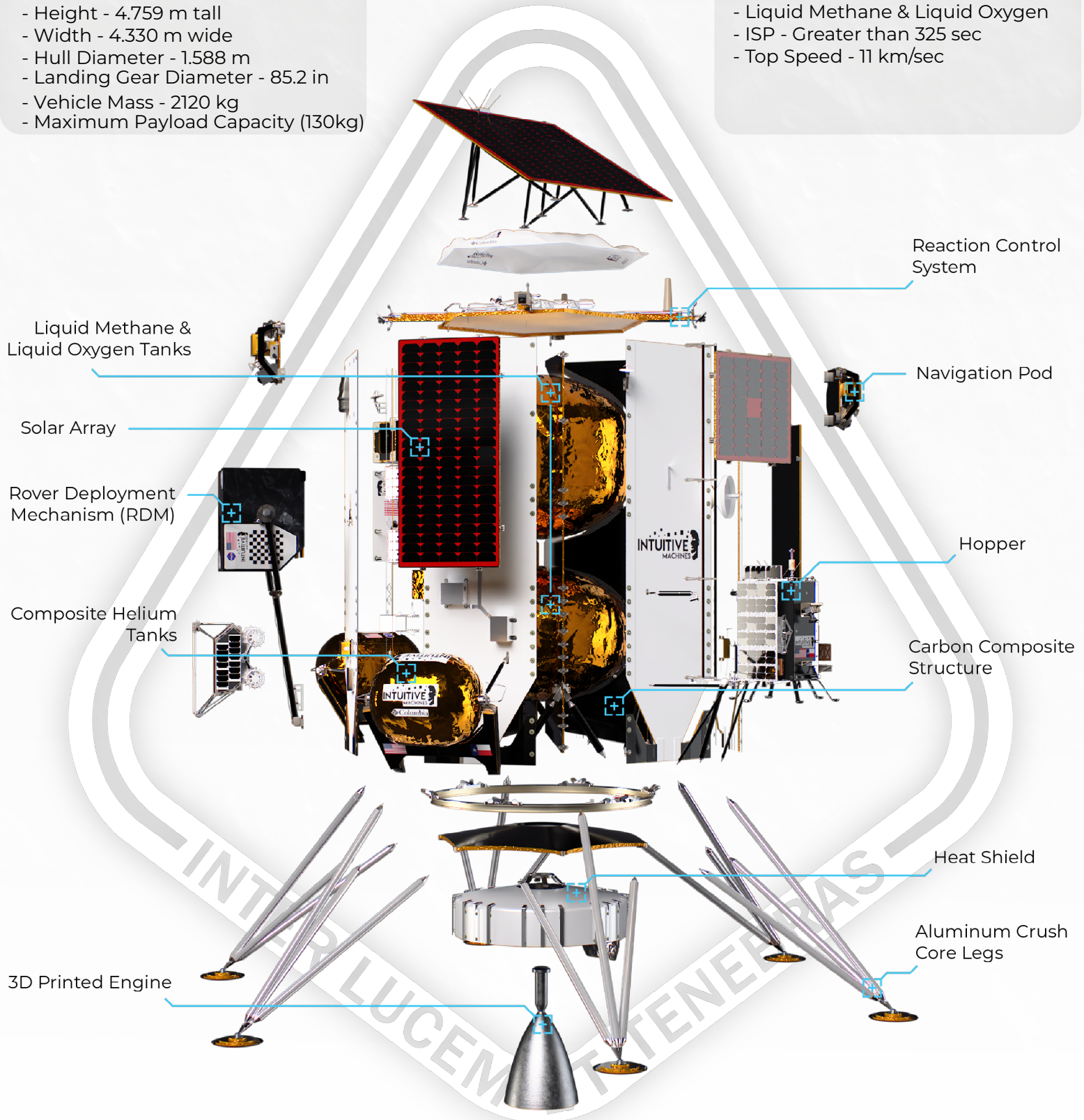
IM-2 ATHENA

NOVA-C

- Height - 4.759 m tall
- Width - 4.330 m wide
- Hull Diameter - 1.588 m
- Landing Gear Diameter - 85.2 in
- Vehicle Mass - 2120 kg
- Maximum Payload Capacity (130kg)

ENGINE:

- Liquid Methane & Liquid Oxygen
- ISP - Greater than 325 sec
- Top Speed - 11 km/sec

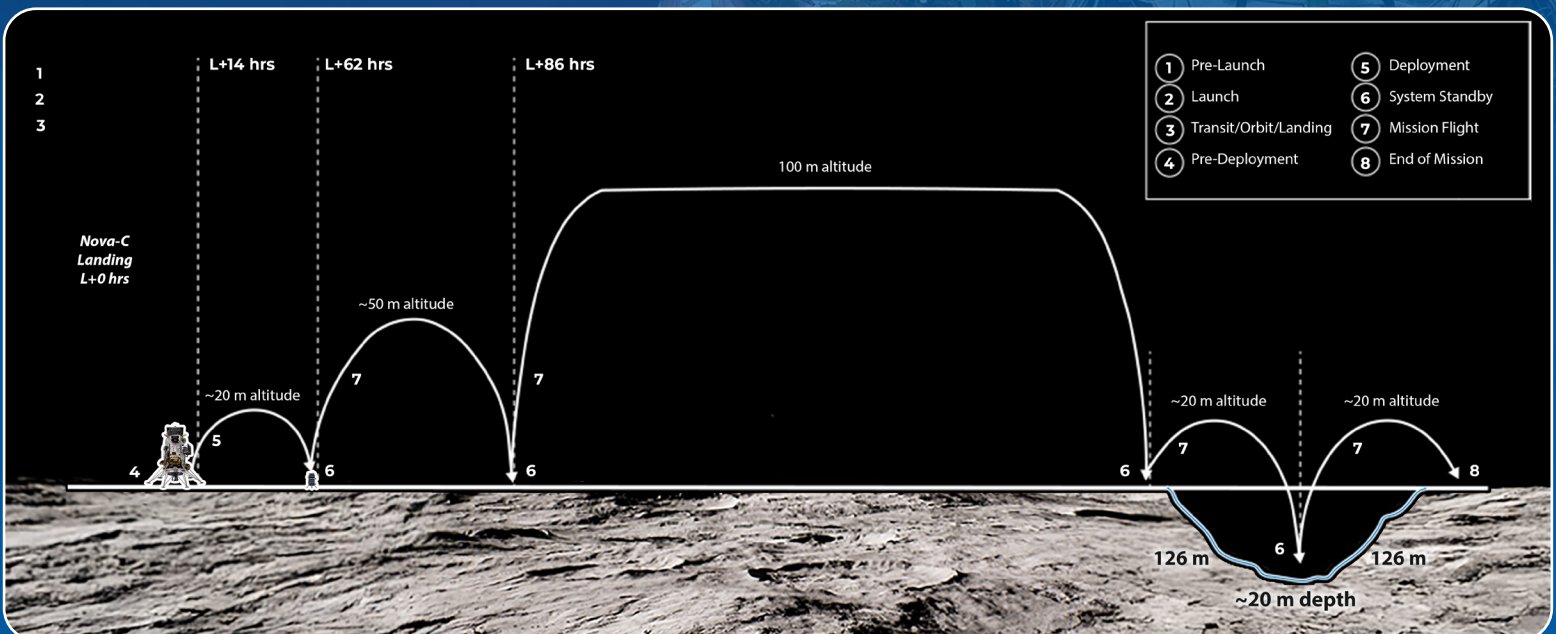


"GRACE" HOPPER

THE IM-2 MICRO NOVA HOPPER



The IM-2 Micro Nova Hopper is named for Grace Hopper, the pioneer in mathematics and programming who worked on some of the earliest computers, and developed the first compiler and COBOL, a language still used today. She was an advocate for accessible programming, wishing to bring the world of computers to people outside of academia; similarly, our Grace will make the darkest reaches of the Moon accessible to the world. We hope the IM-2 Micro Nova Hopper will symbolize and honor Grace Hopper's trailblazing spirit and dedication.



Hop timing is estimated and actual timing will vary

IM-2 HOPPER

MICRO NOVA

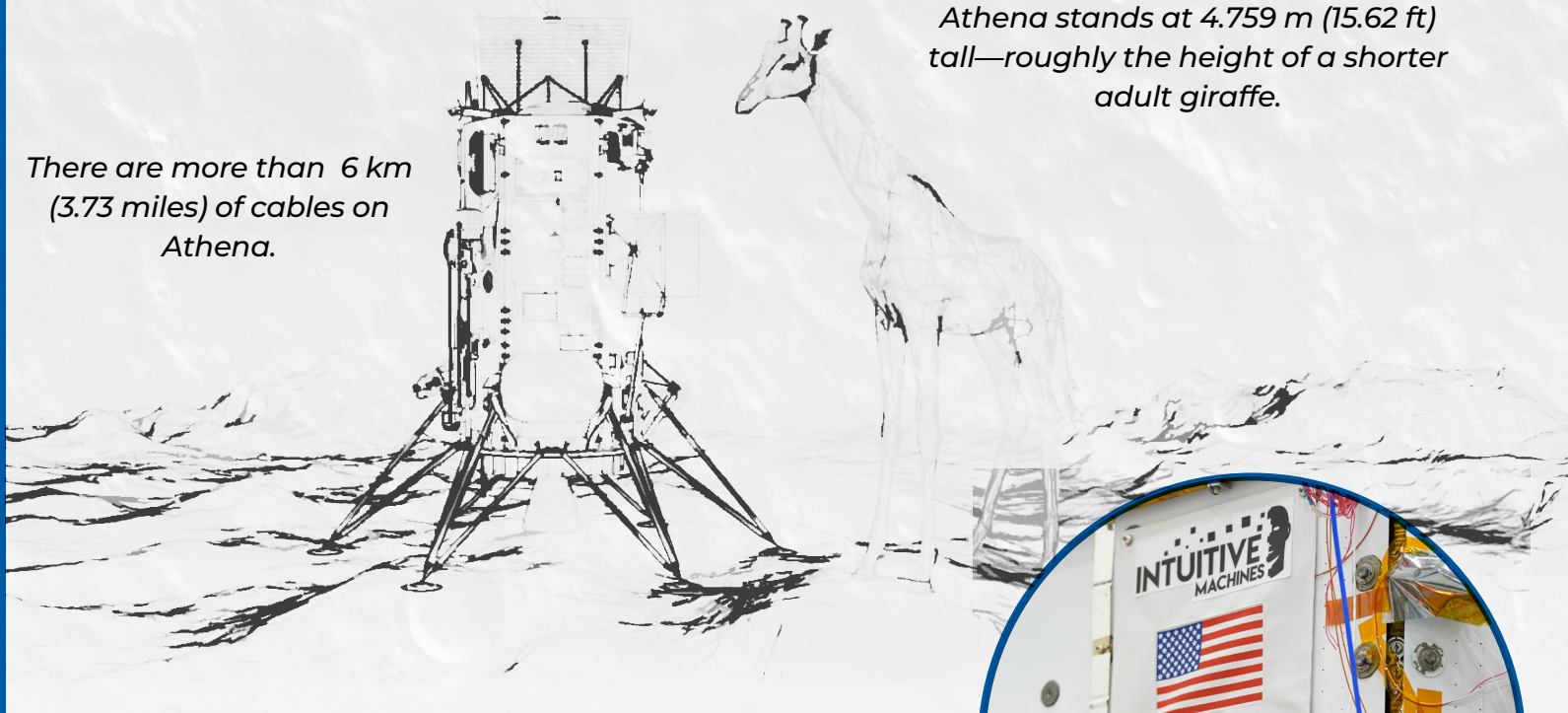
- Height: 0.975 m
- Hull Diameter: 0.439 m
- Landing Gear Diameter: 0.714 m
- Vehicle Mass: 39 kg



FUN FACTS

There are more than 6 km (3.73 miles) of cables on Athena.

Athena stands at 4.759 m (15.62 ft) tall—roughly the height of a shorter adult giraffe.



The American flag mounted to Athena's side closeout panel was certified for flight on March 2, 1970, during the height of the Apollo program. While this NASA-donated flag never left Earth during the Apollo missions, Athena is continuing the tradition established by Odysseus, carrying the Apollo-era American flag on her journey to the lunar surface.



The Intuitive Machines' Nova-C lunar landers are the first spacecraft to do deep space maneuvering with a cryogenic engine and the first to use linerless carbon fiber cryogenic tanks.

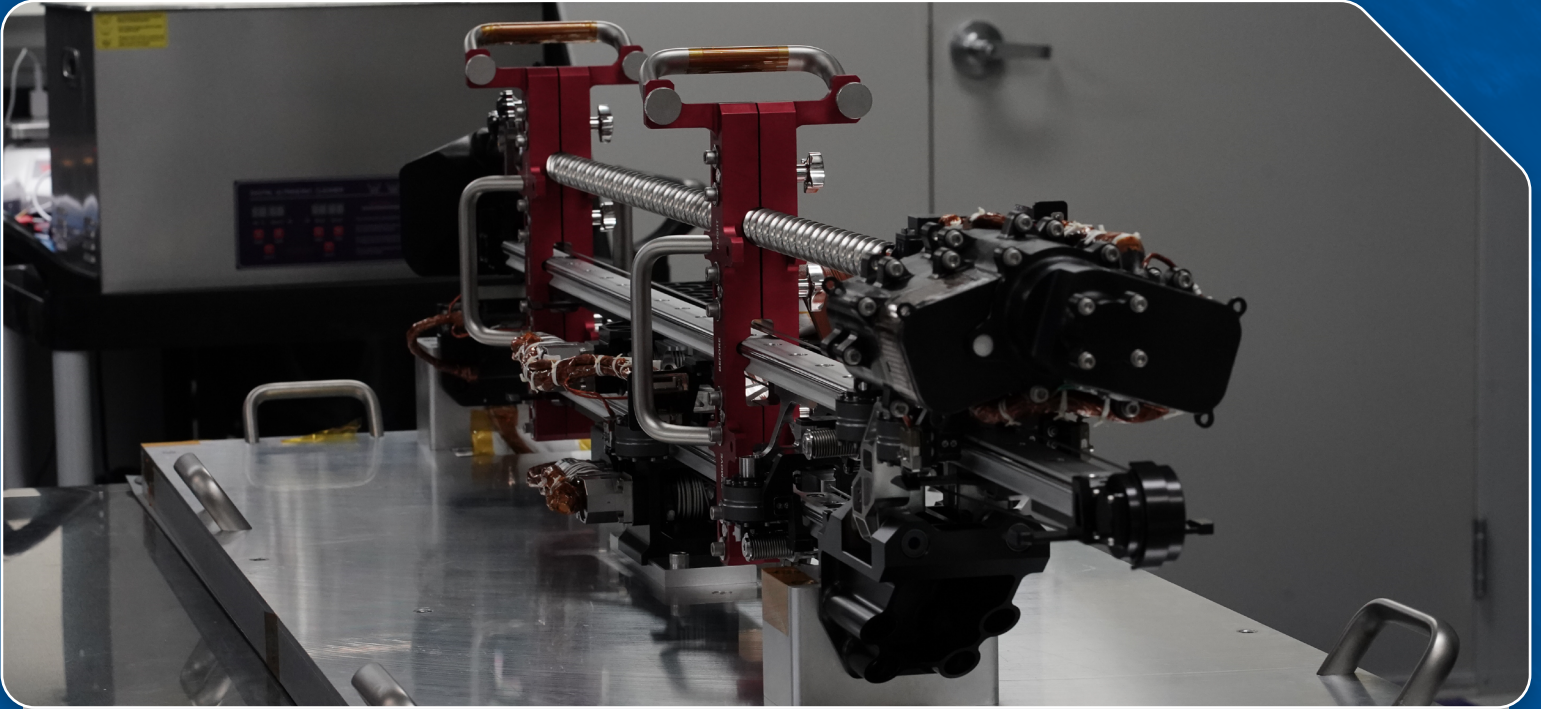
Athena's laser altimeters use a 1.2-megawatt laser that fires for a few nanoseconds and has a range of 80km. The laser enables mission controllers to know the distance to the Moon's surface within a meter... and we triple checked it this time.

Two of Athena's panels are signed by astronauts: Apollo 16 astronaut, Charlie Duke, and Apollo 17 astronaut, Harrison "Jack" Schmidt.

Athena's hazard detection software is designed to detect unsafe terrain such as craters, boulders, and steep slopes at over 1300 feet in altitude in around 7 seconds as she glides in for her landing.

NOVA-C
NASA PAYLOADS

POLAR RESOURCES ICE MINING EXPERIMENT 1 (PRIME-1)



Organization

NASA Kennedy Space Center

PRIME-1

NASA's Polar Resources Ice Mining Experiment 1 (PRIME-1) will demonstrate drilling into the Moon's surface where it lands, drill down to one-meter below the surface, and use a mass spectrometer to look for the possible presence of volatiles.

The PRIME-1 payload is a two-instrument suite made up of a meter-long drill (TRIDENT, The Regolith Ice Drill for Exploring New Terrain) and a mass spectrometer (MSolo, Mass Spectrometer observing lunar operations).

Mass Spectrometer Observing Lunar Operations (MSolo) will identify low-molecular weight volatiles. It can be installed to either measure the lunar exosphere or the spacecraft outgassing and contamination.

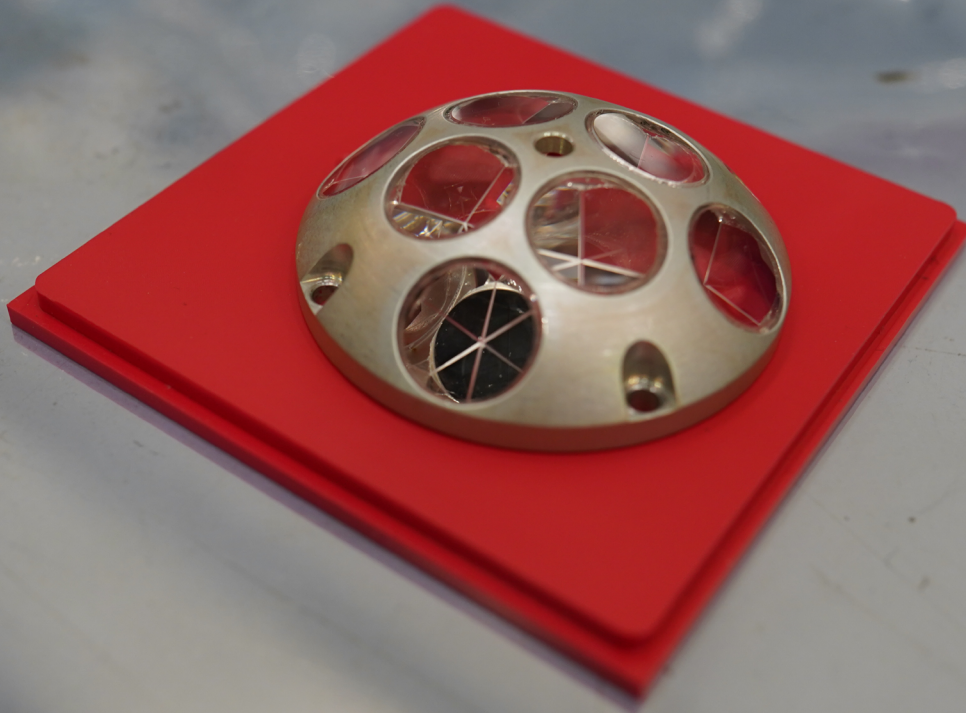
Data gathered from MSolo will help determine the composition and concentration of potentially accessible resources.

MSolo will be the first use of a commercial-off-the-shelf mass spectrometer that was ruggedized for spaceflight.

The PRIME-1 drill, known as The Regolith Ice Drill for Exploring New Terrain (TRIDENT), will attempt to drill up to three feet deep, extract lunar soil – called regolith – and deposit it on the surface for analysis. PRIME-1's other instrument, MSolo, will measure volatile gases that readily escape from the material excavated by TRIDENT.

The TRIDENT drill also measures soil temperature at depth, which will help to validate existing lunar thermal models.

LRA (LASER RETRO-REFLECTOR ARRAY)

**Organization**

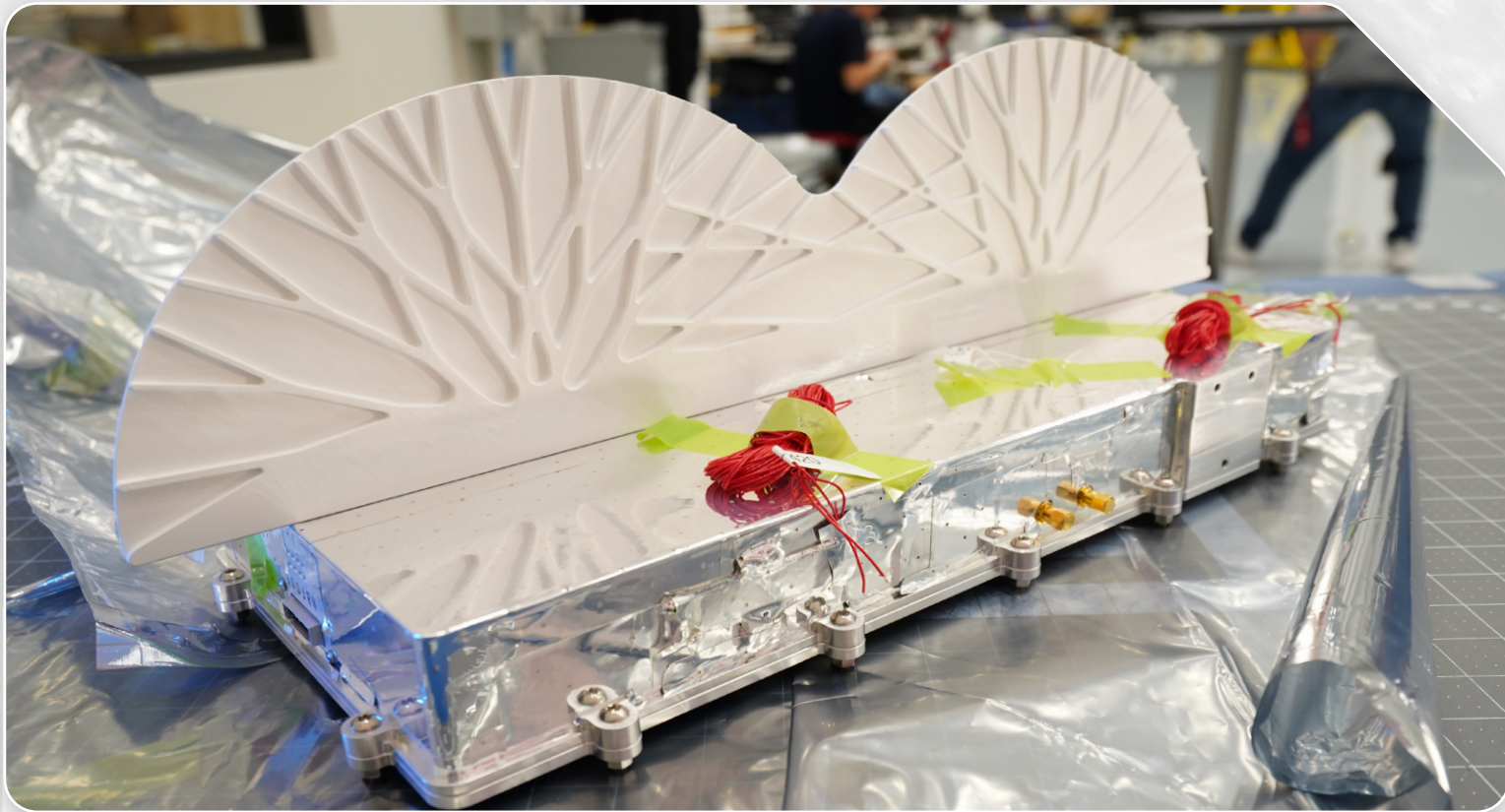
NASA Goddard Space Flight Center

LRA

LRA is a collection of eight approximately half-inch retro-reflectors – a unique collection of mirrors that is used for measuring distance – mounted to the lander. The mirror system reflects laser light directly backward to the orbiting spacecraft that emitted the laser light to precisely determine the lander's location on the surface of the Moon. LRAs are valuable because they can continue to be used as precision landmarks for guidance and navigation during the lunar day or night. A few LRAs surrounding an Artemis landing site or base camp can serve as precision landmarks to guide the arriving landers by aiding in autonomous and safe landing.

NOVA-C
COMMERCIAL PAYLOADS

NOKIA LUNAR SURFACE COMMUNICATIONS SYSTEM



Organizations

NASA Commercial Lunar Payload Services (CLPS) and Space Technology Mission Directorate (STMD), and NOKIA

Overview

The IM-2 mission will carry two commercial Tipping Point technology demonstrations from NASA's STMD: a small hopper robot (Intuitive Machines) and Nokia's Lunar Surface Communications System (LSCS). Nokia's cellular network will be a key element in several mission tasks, providing the underlying connectivity between the Nova-C lander, two mission vehicles and the sensors they carry.

Mission Objectives

Nokia aims to demonstrate that cellular technologies can offer dependable, high-capacity and efficient connectivity and communication capabilities for both crewed and uncrewed lunar and planetary missions for tasks including voice, video, data communication, telemetry and biometric data.

To support communications on the lunar surface, Nokia Bell Labs developed a space-hardened cellular network, the LSCS, that uses some of the same commercial-off-the-shelf components used in 4G/LTE networks across the globe. While it is a cellular system at its heart, it is unlike any cellular network on Earth. Nokia Bell Labs has completely reconceptualized the cellular network, engineering a highly resilient, fully integrated, and extremely compact 4G/LTE system capable of operating autonomously under the harsh environmental conditions of the Moon. The network system's size, weight and power consumption have been optimized for operations in space while carefully engineering its network elements to withstand the journey to the Moon and operate under the extreme temperature, radiation, and environmental conditions of the lunar surface. This network will deploy, configure, and operate itself autonomously, and it will be remotely monitored and controlled from Intuitive Machines' mission control on Earth.

YAOKI ROVER



Organization

Dymon Co. Ltd.

Overview

The YAOKI Rover payload is a small, lightweight rover that will examine and demonstrate mobility and adaptability on the lunar surface close to the lander. The agreement with Dymon leverages Intuitive Machines' Lunar Access Services and Lunar Data Services business segments to land the rover on the Moon and control it via secure lunar communications.

Mission Objectives

The high-level objectives from the YAOKI rover are to capture images of the lunar surface while maneuvering quickly and efficiently within a 50-meter radius of the lander. The rover also will demonstrate the versatility of the design which will enable it to be dropped in any orientation without a mechanism. The YAOKI rover will be Intuitive Machines' first Japanese commercial payload.

FREEDOM



Organization

Lonestar Data Holdings

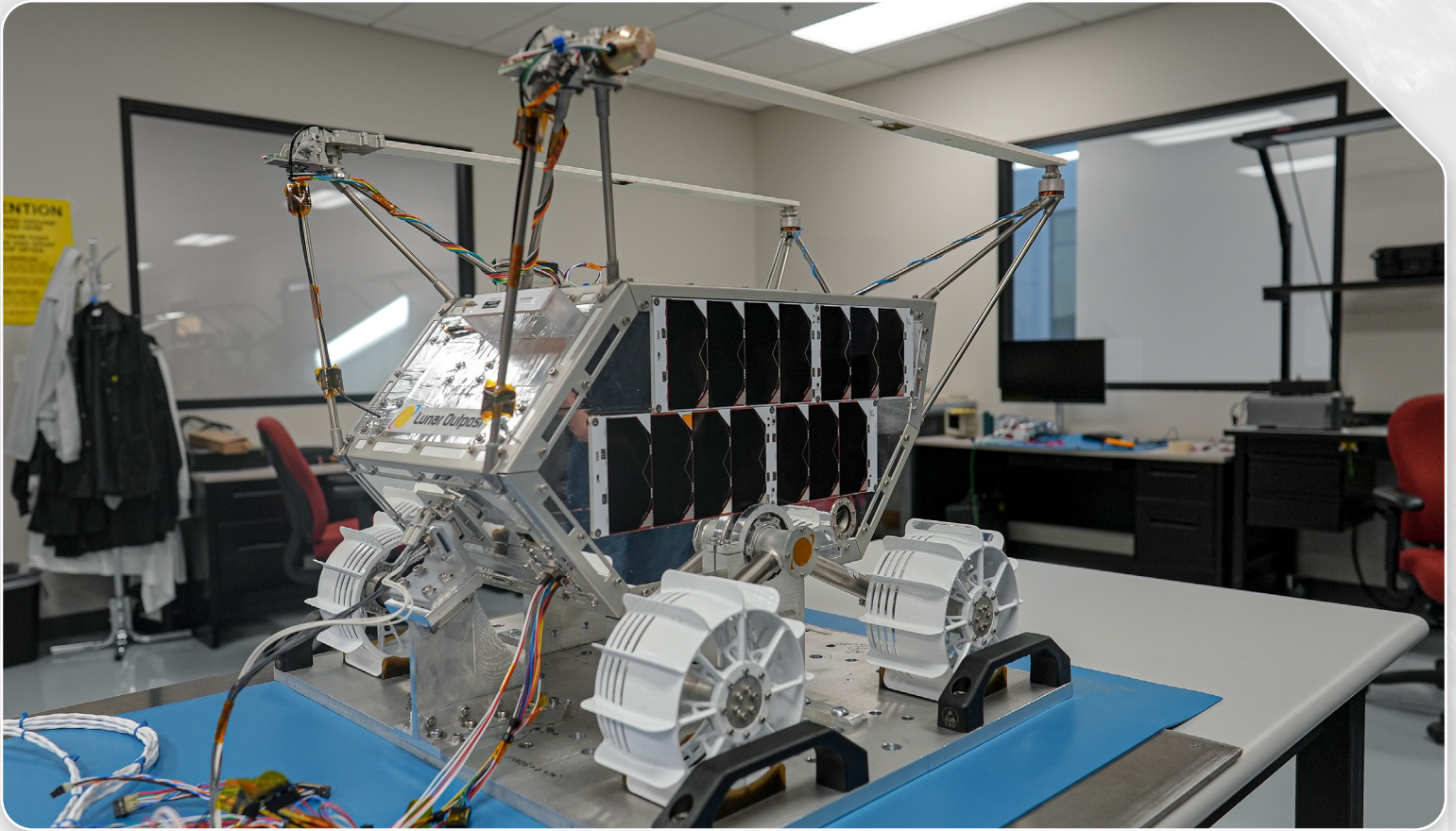
Overview

Lonestar Data Holdings, the first company in the world to provide a commercial service from the surface of the Moon and the leader in lunar edge processing and data storage, is thrilled to announce its Freedom Payload as its second flight to the Moon with Intuitive Machines. This landmark mission follows the success of Lonestar's Independence payload, delivered as part of the successful Intuitive Machines IM-1 Odyssey Nova-C lander mission, which set a new standard in the growing field of space-based data services.

Mission Objectives

The Freedom payload marks a significant leap forward in Lonestar's ambitious vision to provide global backup, global refresh, and global restore, by establishing the first physical data center beyond Earth, offering Disaster Recovery as a Service (DRaaS), premium data backup services, and edge processing capabilities from the ultimate edge—cislunar space and the lunar surface. Freedom is serving a host of data storage and edge processing customers.

MOBILE AUTONOMOUS PROSPECTING PLATFORM (MAPP) ROVER



Organization

Lunar Outpost

Overview

Lunar Outpost's MAPP (Mobile Autonomous Prospecting Platform) rover is leading the industry in efficiency and autonomy. With advanced navigation systems that operate without GPS, MAPP uses visual cues and sensors to autonomously navigate and avoid hazards, ensuring reliable performance in the challenging lunar environment. Its specialized wheels and rocker arm suspension allow it to traverse difficult terrain with precision, granting access to previously unreachable regions.

Mission Objectives

During Lunar Outpost's Lunar Voyage 1, MAPP is slated to be the first rover at the lunar South Pole, the first commercial rover on another planetary body, and complete the first sale of space resources in human history - setting the stage for the next era in space.

OMNI-HEAT INFINITY AND OMNI-SHADE SUN DEFLECTOR



Organization

Columbia Sportswear

Overview

Expanding its partnership with Intuitive Machines, Columbia is continuing to test the limits of its innovative outdoor technologies by helping protect Athena from the extreme temperatures of space. Similar to IM-1, Columbia will help insulate the helium tanks on this mission with Omni-Heat™ Infinity, the same reflective insulation used throughout Columbia's award-winning line of winter products. In this next phase of this scientific partnership, Columbia will also provide Omni-Shade™ Sun Deflector technology to help protect the lander by deflecting intense heat from the sun.

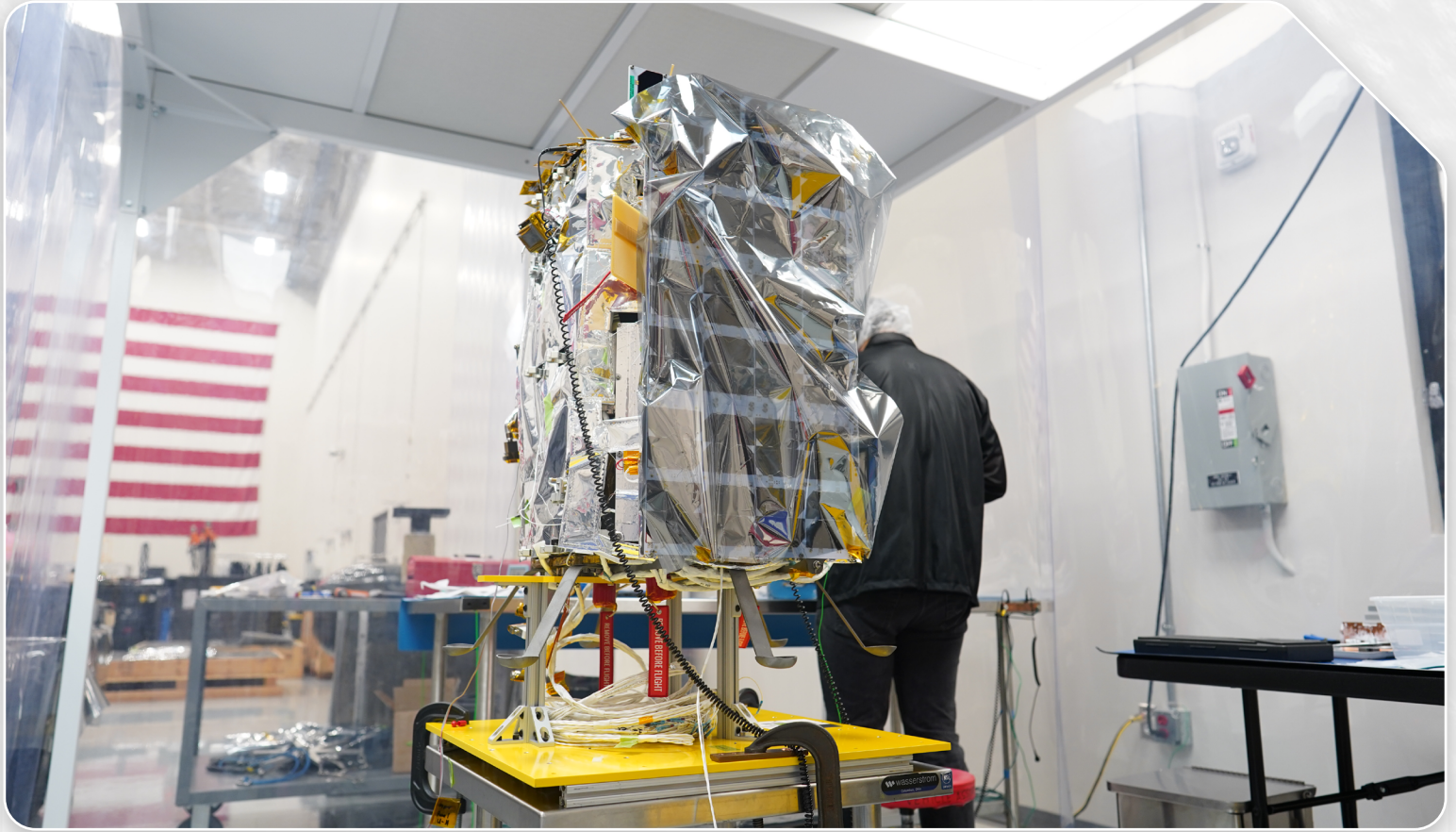
-208F (-133C) / 250F (121C)

Intuitive Machines and Columbia tested Columbia's technologies to aerospace industry standards. Thermal modeling revealed that Omni-Heat™ Infinity provides a benefit for heat reflection when used as a helium tank covering, and that is where the technology will be used on Nova-C.

Columbia's Omni-Heat™ Infinity heat-reflective insulation was used on the IM-1 lunar lander to help protect against the extreme temperatures encountered during its journey to the Moon and during its operational phase on the lunar surface. This insulation was the same exact fabrication used in Columbia's outerwear and footwear available to consumers in the cold winter months on Earth. On this second mission, Columbia's Omni-Heat™ heat-reflective insulation will again be used in select locations on the IM-2 lander for the same functional purpose.

In addition, a second innovative material developed by Columbia will be used to help protect the lander. Columbia's Omni-Shade™ will be integrated onto select exposed surfaces of the IM-2 lander to help prevent overheating by reflecting solar radiation away from the lander. Omni-Shade™ Sun Deflector is a patented material developed by Columbia for mitigating heat generation in outdoor apparel. Columbia is excited to deploy both technologies to assist with thermal management on Intuitive Machines' IM-2 lander and contribute to the overall success of this historic mission.

MICRO NOVA HOPPER



Organization

Intuitive Machines

Overview

Under a NASA Space Technology Mission Directorate's Tipping Point initiative, Intuitive Machines developed the Micro Nova Hopper, named Grace, which is a propulsive drone that is designed to land, deploy, and hop on the company's IM-2 mission. The Micro Nova Hopper can accommodate up to 10 kg of scientific payloads and expand the exploration footprint for up to 25 km from the initial landing location. Grace is designed to hop into and out of permanently shadowed regions, providing a first look into undiscovered regions that may provide the critical science needed to sustain a human presence on the Moon.

Range: Up to 25km ballistic transfer with current tank configuration

Payload Capacity: Up to 10 kg, range dependent

On Board Sensors: Inertial Measurement Unit, Star Tracker, Optical Navigation Camera, Lidar, Situational Awareness Camera

Deployment: Rail system from lander

Communications: UHF and Nokia 4G/LTE on surface, S-band to Intuitive Machines' Lunar Data Network

LUNAR RADIOMETER (LRAD)



Organizer

German Aerospace Center (DLR)

Overview

As part of Intuitive Machines' second lunar mission (IM-2), the Lunar Radiometer (LRAD) will study surface temperatures at the Moon's South Pole, particularly in permanently shadowed regions where water ice may be stable. Developed by the Institute of Planetary Research at DLR and Freie Universität Berlin, LRAD is integrated into Intuitive Machines' Micro Nova Hopper, which will make a series of short flights across the lunar terrain to collect critical thermal data.

Mission Objectives

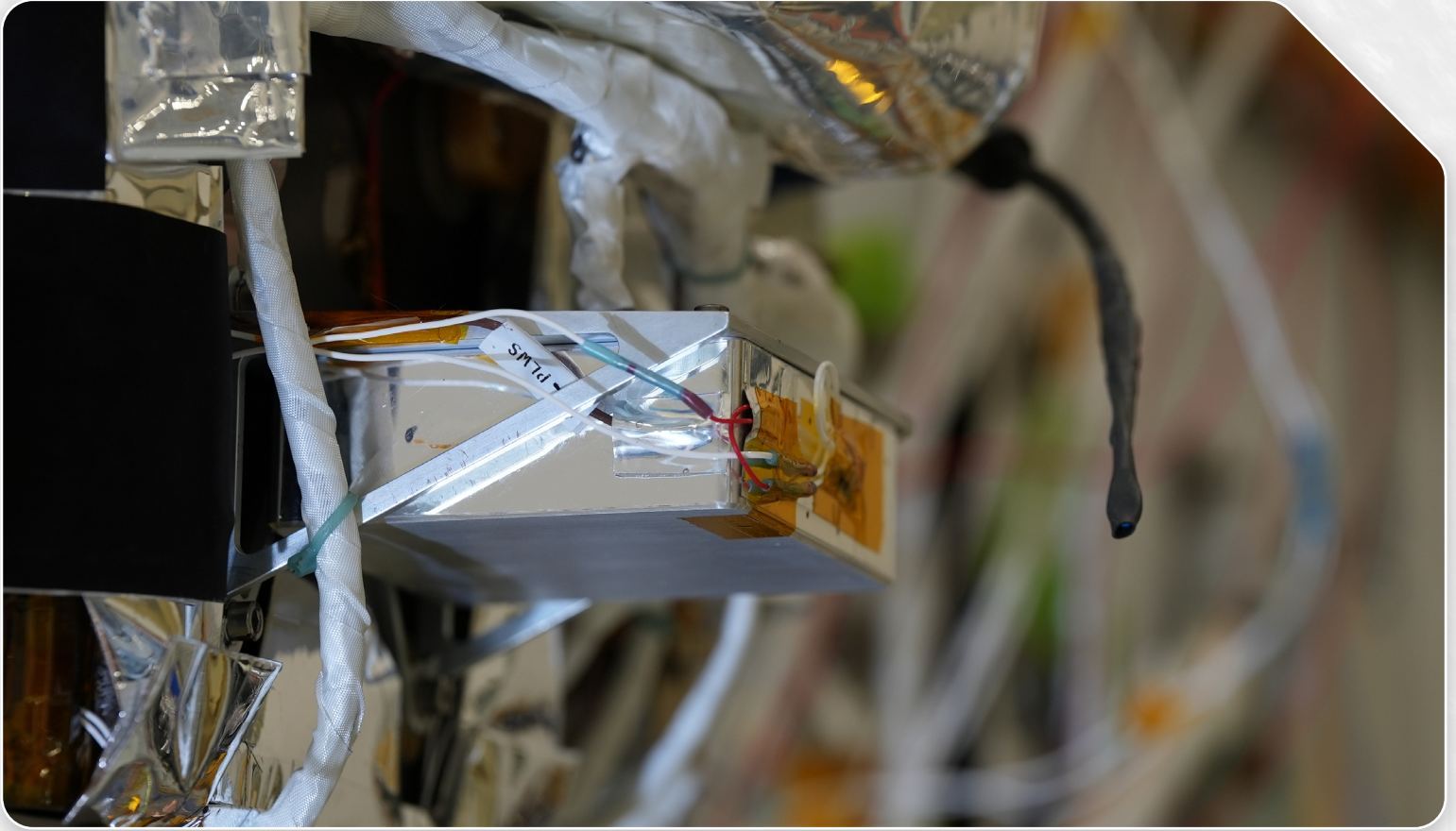
LRAD will provide key measurements to:

- Characterize lunar surface temperatures in permanently shadowed regions.
- Identify locations cold enough to support stable water ice deposits.
- Support future lunar resource utilization by mapping temperature variations.

The Moon's South Pole features extreme lighting conditions, with deep craters remaining in permanent shadow. These regions maintain temperatures low enough to preserve water ice over geological timescales. LRAD's radiometric measurements will help determine the thermal environment of these regions, supporting efforts to locate and utilize lunar water resources.

Successfully integrated into Intuitive Machines' Micro Nova Hopper earlier this year, LRAD has passed critical testing milestones and is ready for flight. This collaboration demonstrates how commercial lunar missions can enable cutting-edge planetary research.

PULI LUNAR WATER SNOOPER (PLWS)



Organizations

Puli Space Technologies Ltd.

Overview

Flying aboard Intuitive Machines' second lunar mission (IM-2), the Puli Lunar Water Snooper (PLWS) is a NASA-awarded neutron spectrometer developed by Hungary-based Puli Space Technologies. This miniature instrument, weighing just 400 grams, will collect water ice indicator data from the Moon's South Pole region. Mounted on Intuitive Machines' Micro Nova Hopper, PLWS will conduct the first-ever direct surface measurements from a permanently shadowed crater, supporting critical in-situ resource utilization (ISRU) efforts for future lunar exploration.

Mission Objectives

PLWS is designed to:

- Identify and measure the concentration of water ice in lunar soil using neutron spectroscopy.
- Conduct radiation measurements to characterize the Moon's albedo neutron environment.
- Explore and map challenging terrains, including permanently shadowed regions.
- Acquire and transmit scientific data to enhance lunar resource mapping and future mining potential.

IM-2
RIDESHARES

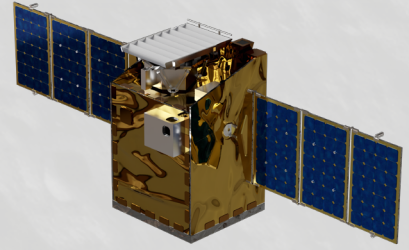
IM-2 RIDESHARE DELIVERY PAYLOADS

Intuitive Machines launches into a 185 km by 380,000 km translunar orbit for lunar missions. With the excess payload capacity, the company can launch spacecraft or payloads on an Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) for deployment after the launch vehicle separates from the lunar lander. The spacecraft or payload is responsible for any orbital maneuvering required post-launch vehicle separation.

LUNAR TRAILBLAZER

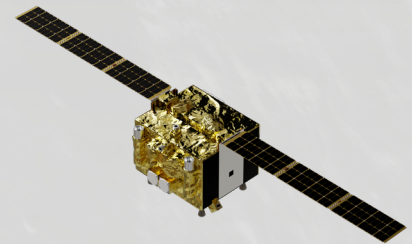
NASA JET PROPULSION LAB
CALIFORNIA INSTITUTE OF TECHNOLOGY

Selected by NASA's Small Innovative Missions for Planetary Exploration (SIMPLEX) program in 2019, Lunar Trailblazer will map the distribution of the different forms of water that exist on the surface of the Moon.



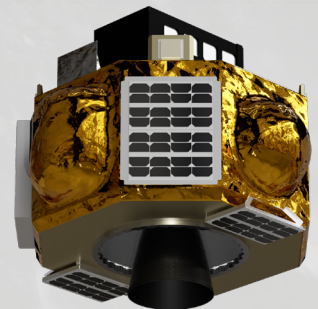
ODIN ASTROFORGE

AstroForge, the ambitious three-year-old startup out of LA, is over the Moon about the upcoming launch of its spacecraft, Odin. Odin is poised to become the first privately funded commercial vehicle to venture into deep space. In November 2024, AstroForge was awarded the first-ever FCC commercial license for operating and communicating with a spacecraft in deep space. AstroForge aims to gather high-resolution imagery of a target near-Earth asteroid—the first step in establishing a cost-effective, repeatable playbook for turning deep space into the next frontier for resource extraction and exploration.



CHIMERA EPIC AEROSPACE

Chimera is a unique vehicle family with a common propulsion system, based around the densest and highest specific impulse non-toxic propellants, simple ACS and propellant management devices, and easy-to-build structures that can accommodate a multitude of payloads and avionics configurations.



L.A.S.T PAGE

AFM - Automated Flight Management

AOS - Acquisition of Signal

ASU - Arizona State University

CLPS - Commercial Lunar Payload Services

ConOps - Concept of Operations

COMM - Communications

CW - Continuous Wave

DLS - Designated Landing Site

DOI - Descent Orbit Insertion

DraaS - Disaster Recovery as a Service

DSN - Deep Space Network

DTM - Digital Terrain Model

FDO - Flight Dynamics Officer

FM - Flight Manager

GNC - Guidance Navigation and Control

GSFC - Goddard Space Flight Center

GLL - Galactic Legacy Labs

HGA - High Gain Antenna

HRN - Hazard Relative Navigation

IM - Intuitive Machines

IM-1 - Intuitive Machines Mission One

ILS - Intended Landing Site

IMU - Inertial Measurement Unit

ILOA - International Lunar Observatory Association

ILO-X - International Lunar Observatory X

JPL - Jet Propulsion Lab

LN-1 - Lunar Node One

LTN - Lunar Tracking Network

LVSEP - Launch Vehicle Separation

LO - Lunar Outpost

LOI - Lunar Orbit Insertion

LLO - Low Lunar Orbit

LOS - Loss of Signal

LRA - Laser Retro-Reflector Array

LRAD - Lunar Radiometer

LTE - Long-Term Evolution

MAPS - Multi-spacecraft Autonomous Positioning System

MAPP - Mobile Autonomous Prospecting Platform

MECO - Main Engine Cut Off

MIT - Massachusetts Institute of Technology

MLI - Multi Layered Insulation

Msolo - Mass Spectrometer observing lunar operations

NASA - National Aeronautics and Space Administration

NDL - Navigation Doppler Lidar

NFT - Non-Fungible Token

NTE - Not to Exceed

OD - Orbit Determination

PAO - Public Affairs Office

PDI - Powered Descent Initiation

PLWS - Puli Lunar Water Snooper

PN - Position Navigation

PN - Pseudo-Random Noise

PRIME-1 - Polar Resources Ice Mining Experiment 1

PSR - Permanently Shadowed Region

P/L - Payload

RDM - Rover Deployment Mechanism

ROLSSES - Radio Observations of the Lunar Surface photo Electron Sheath

RCS - Reaction Control System

SCALPSS - Stereo Cameras for Lunar Plume-Surface Studies

TCM - Trajectory Correction Maneuver

TIG - Time of Ignition

TRIDENT - the Regolith and Ice Drill for Exploring New Terrain

TRN - Terrain Relative Navigation

UHF - Ultra High Frequency

USB - Universal Serial Bus

3PO - Primary Payload Precision Offloader