



LUNAR PAYLOAD DELIVERY & MOBILITY SERVICE

January 2024



Space Applications Services NV/SA is a private Belgian company

The company is headquartered in Belgium with a subsidiary, Aerospace Applications North America in Houston, USA and an office in the Netherlands close to ESTEC

We develop and operate manned and unmanned systems for terrestrial, LEO and lunar destinations

The company facilities include clean room, laboratory, payload integration bay and control centre

Our capabilities cover ground segment and control centre, platform and payloads, avionics, advanced robotics and mechanisms

We regularly deliver and operate payloads in LEO with the ICE Cubes service

We also provide services including scientific, engineering, mission integration and astronaut training

A flexible modular PSR capable lunar rover, LUVMI-X, is in development

Headquarters

Sint Stevens Woluwe (Brussels area), Belgium

Number of employees

100

Website

spaceapplications.com



Intuitive Machines, LLC is a private American company headquartered in Houston, Texas. It was founded in 2013 by Stephen Altemus, Kam Ghaffarian, Tim Crain.

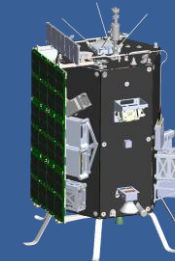
Intuitive Machines is completing its lunar program which will provide lunar surface access, lunar orbit delivery, and communications at lunar distance.

Intuitive Machines holds three NASA contracts, under the space agency's Commercial Lunar Payload Services (CLPS) initiative, to deliver payloads to the lunar surface.

Headquarters	Houston, Texas, United States
Number of employees	180
Website	intuitivemachines.com



- TLI payloads – up to 1,000kg
- Lunar orbit payloads - cubesat dispenser
- Landed payloads (NOVA-C)
 - Payload Mass - 130-150kg of payload to lunar surface
 - Data - Up to 8 Mbps from lunar surface. Ability to send data through relay satellites (Khon-store and forward / bent pipe)
 - Power - 300-400 W for payload (800W total)
 - Delivery - Fast trip (4-6 days from launch to landing)
 - Precision - Land within 15m of target site
- Surface mobility Hopper – microNOVA 2kg up to 25km range
- Surface mobility rover (LUVMI-S and LUVMI-M)
 - Payload mass - 8-40kg max.
 - Power to payloads - 95-225 W (28V, 12V, 5V)
 - Data - RS422, Can, SpW, Ethernet
 - Communications via lander
 - Range – 10km, Speed 10 cm/s, Slope 25-30 degrees
 - Dropable/retrievable payload accommodation
 - Propelled payloads
- Real time and non-real time payload communications with customer





Service Maturity

- Extensive reuse of existing systems
 - Reduced risk
 - Low price
 - Regular deliveries

Customers

- Individual payload accommodation, rideshare or full capacity available (lander and rover)
- Internet protocol interfaces (YAMCS payload operations software freely available)
 - End users receive their data directly and commanding is coordinated through the payload operations management centres
 - Data confidentiality and security is ensured

Payload accommodation available

- 2025 on IM4 (very limited availability)
- 2026 on IM5 landed payloads only
- 2026 on IM6 orbital, landed and mobile payloads
- 2027 on IM7 orbital, landed and mobile payloads

Additional services

- Mission and lunar traverse design and planning



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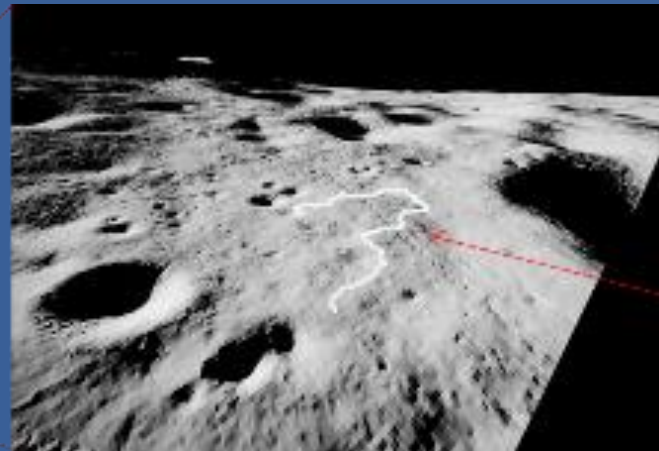
Aerospace Applications North America Inc.

16850 Saturn Ln, Ste 100

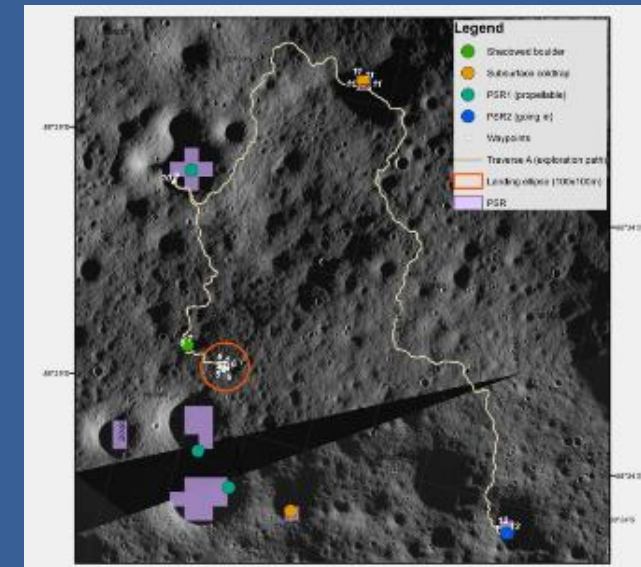
Houston TX 77058

USA

- South pole => Shackleton crater vicinity
- 14-days mission
- Volatiles prospecting
- Excursions of 8-10 hours in PSRs
- Total traverse of ~5km
- Majority of tasks achieved in first ~40% of the traverse path

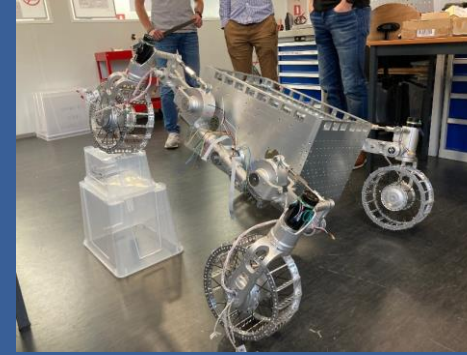


Traverse

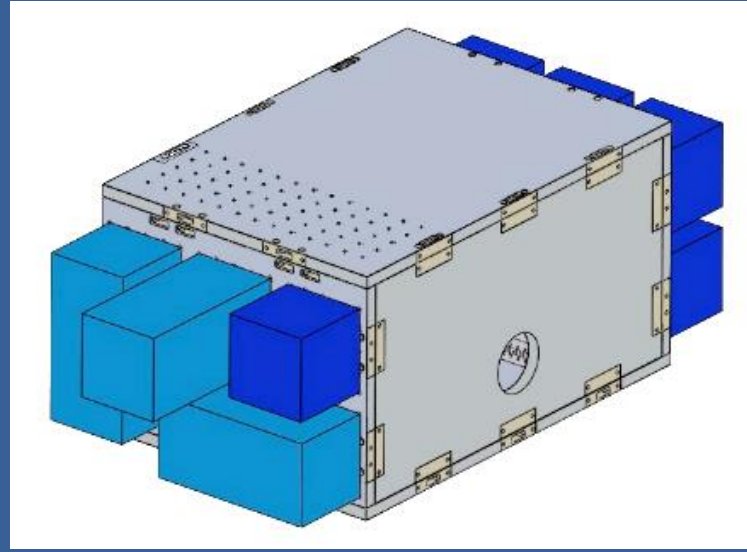
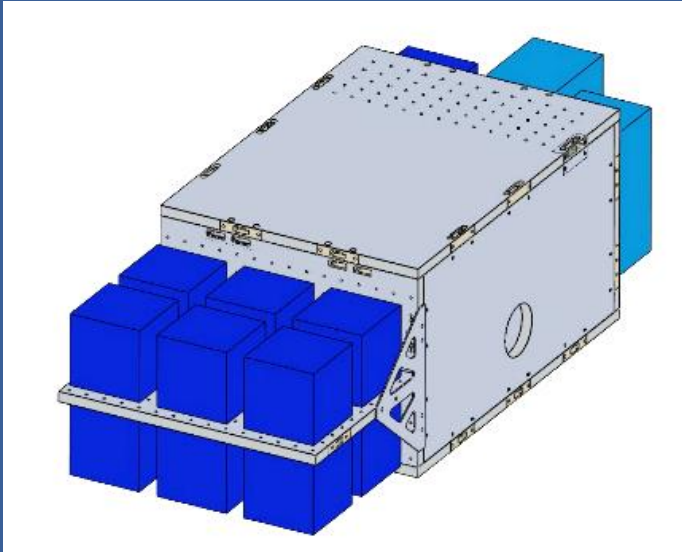


Locomotion/trafficability performances

- Obstacles clearance : up to 40cm (with rocker mechanism)
- Maximum speed : up to 0.8m/s (0.05 to 0.1m/s in nominal navigation)
- Ground Model validated on sandy slope of up to 25deg (under 1g, outdoor analogue)
- Adjustable suspension height for each wheel (20cm stroke) - allowing for center of mass adjustment.
- Intensive locomotion tests (including autonomous navigation) carried out in analogue (outdoor and indoor) over 2 years.



Payload interfaces



Up to 12U x2 can be accommodated.

Multiple configurations available – compatible with payloads adhering to cubesat standard dimensions, but not only (c.f. payloads mounted on GM)

Each payload have access to an asynchronous RS-422 connection running at 1 Mbit/s.

Payloads are provided a 28 V unregulated power supply

Payloads interfaces informed based on wide user survey (60+).



Examples of payloads mounted on front and aft bays on the LUVMI-X GM