

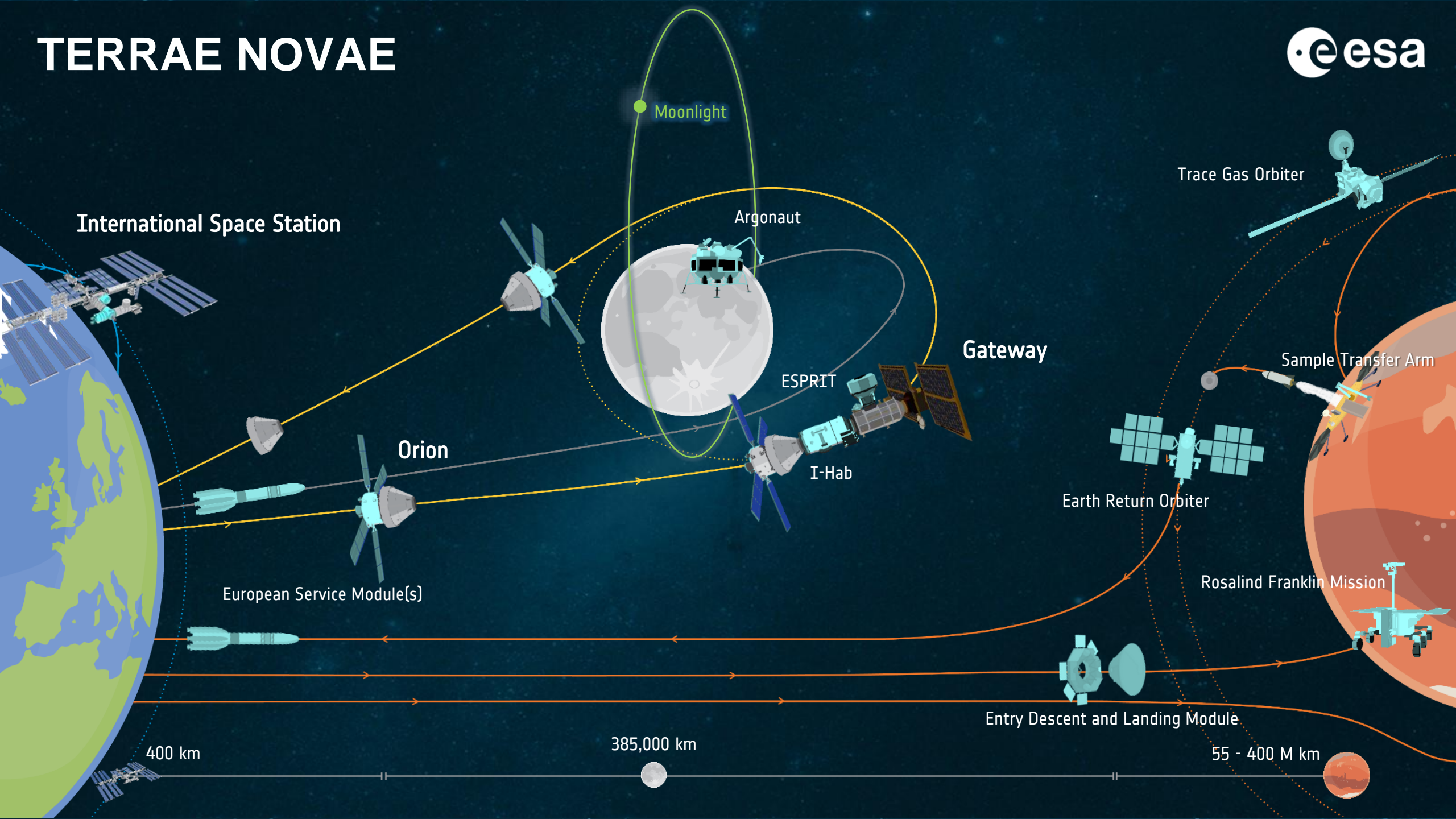


Space for Inspiration

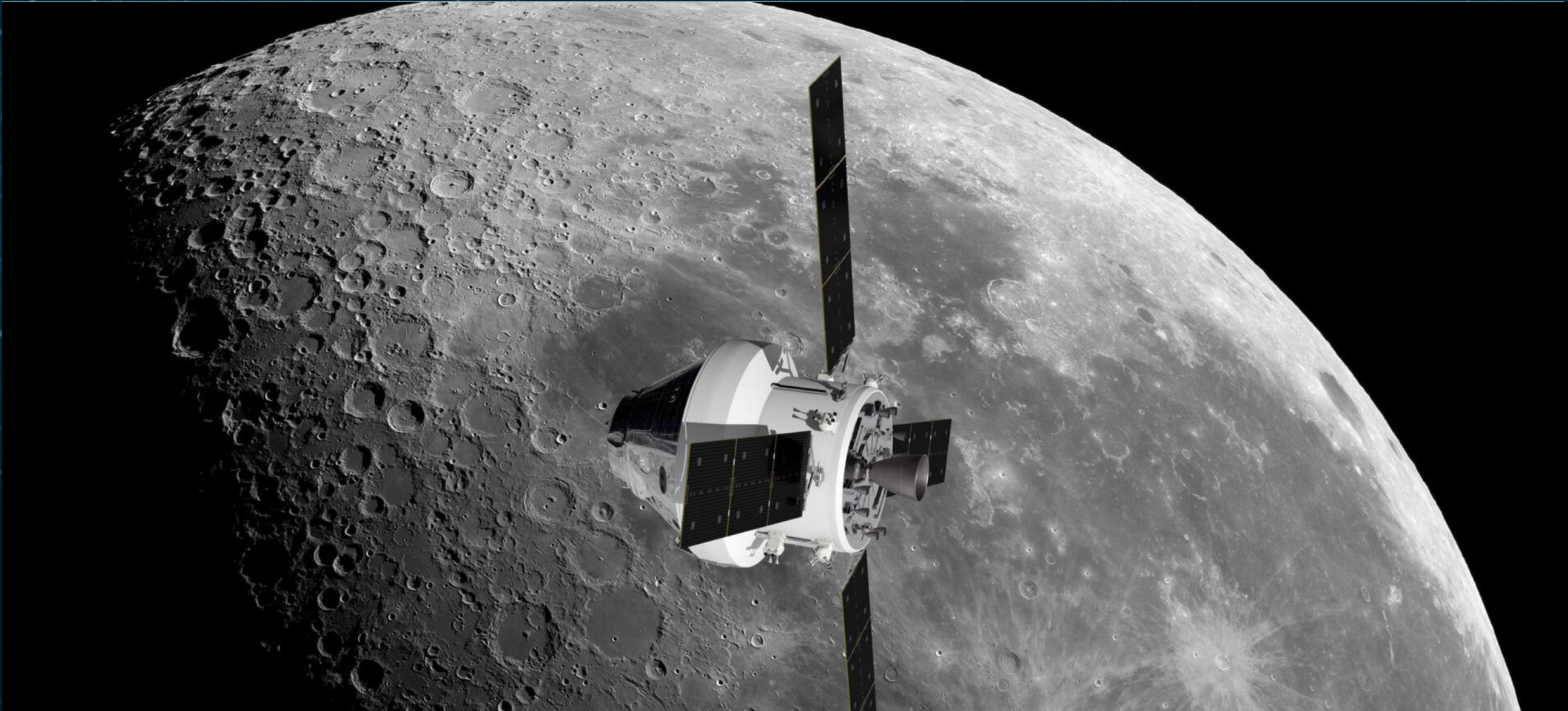
Lunar Communication & Navigation Session

19th of January 2024

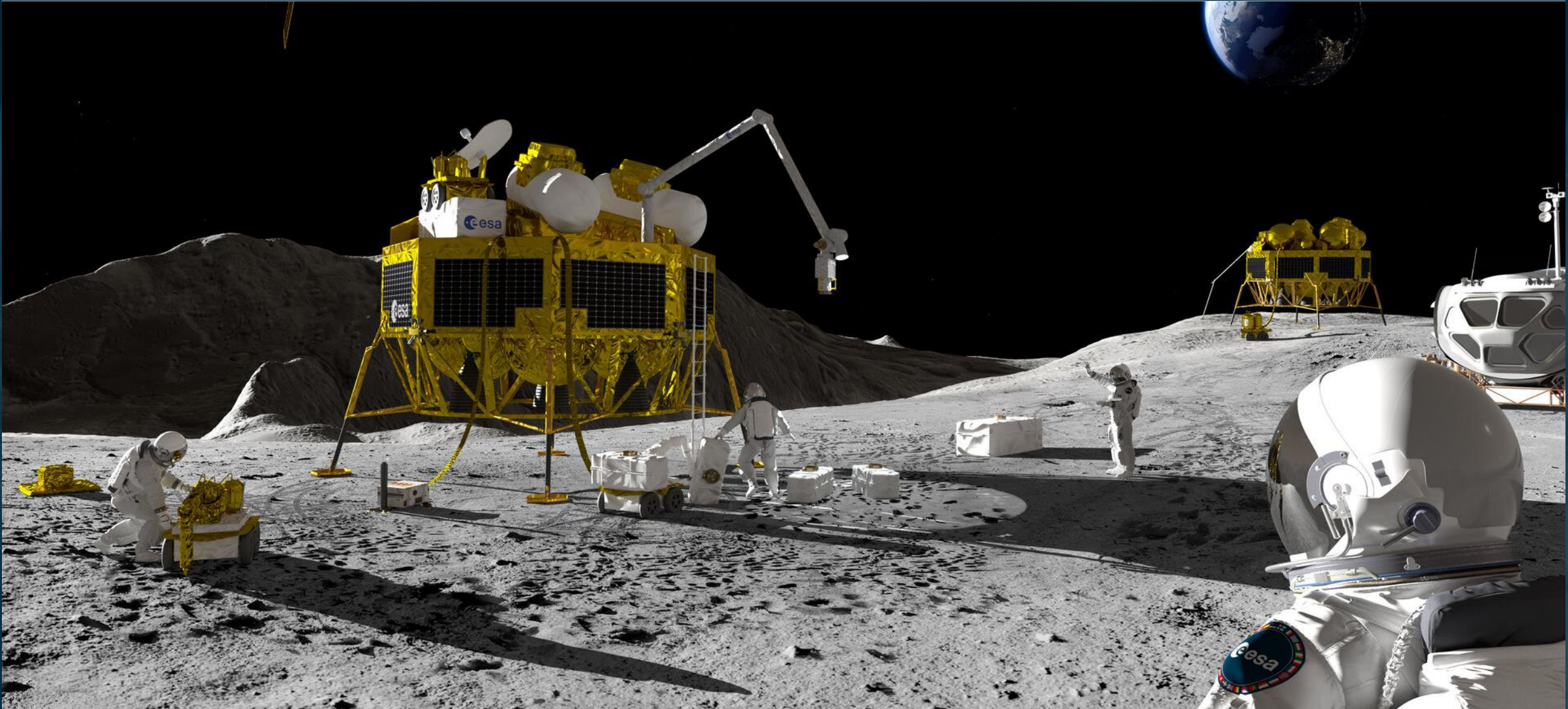
TERRAE NOVAE



ORION and the European Service Module

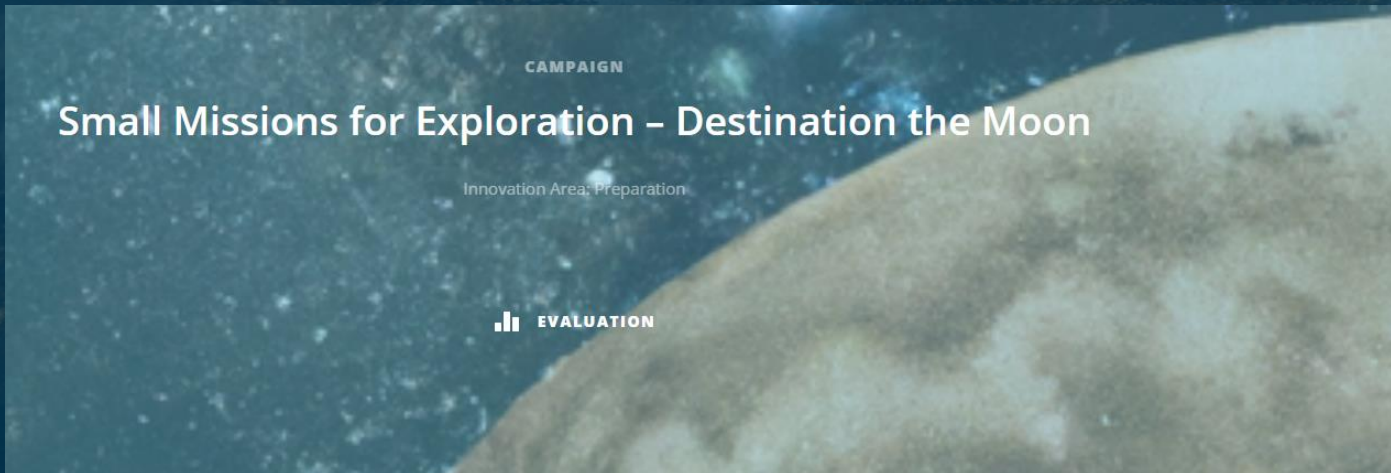


Argonaut – the European Large Logistic Lander



Small Missions

- New initiative: offer programmatic opportunity to entities from Participating States with small to medium contributions to the E3P Programme.
- 1st Call on OSIP: Destination the Moon
- Key defining features: target cost to completion 50 M€; deliver innovative exploration and scientific content; Phase A to launch within 4.5 years



*Evaluation Phase, outcome of selection: pre-Phase A studies
(...later steps towards mission selection and implementation)*

OSIP – Open Space Innovation Platform

Small Missions Call & Moonlight

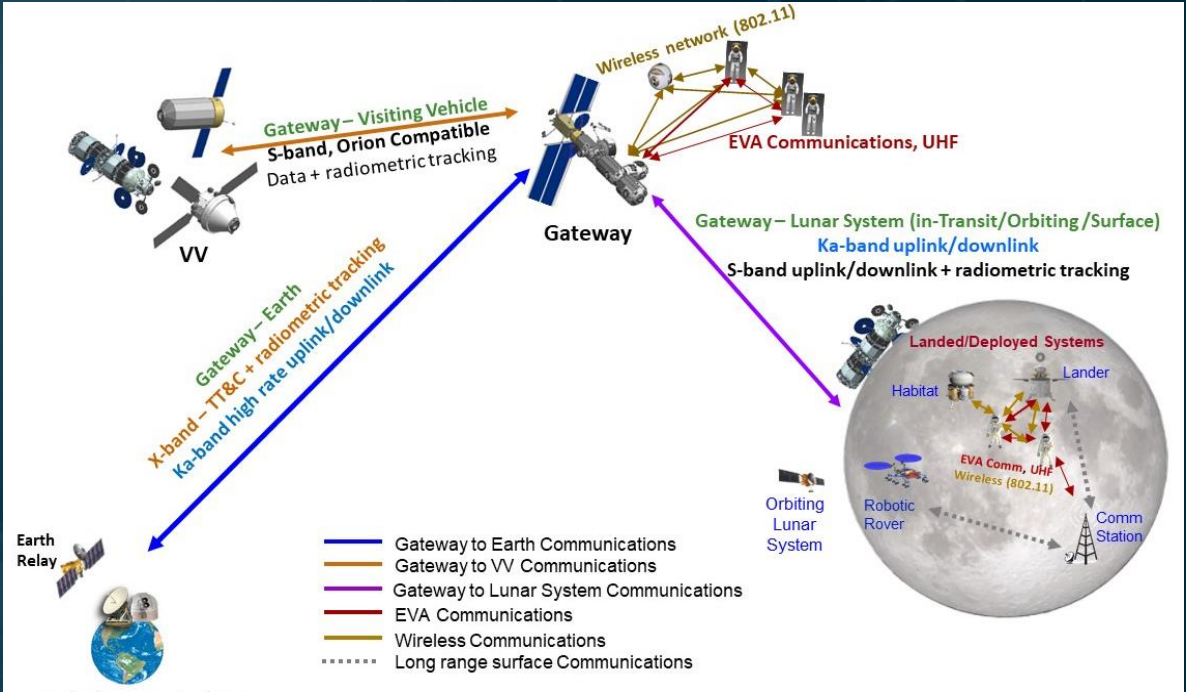
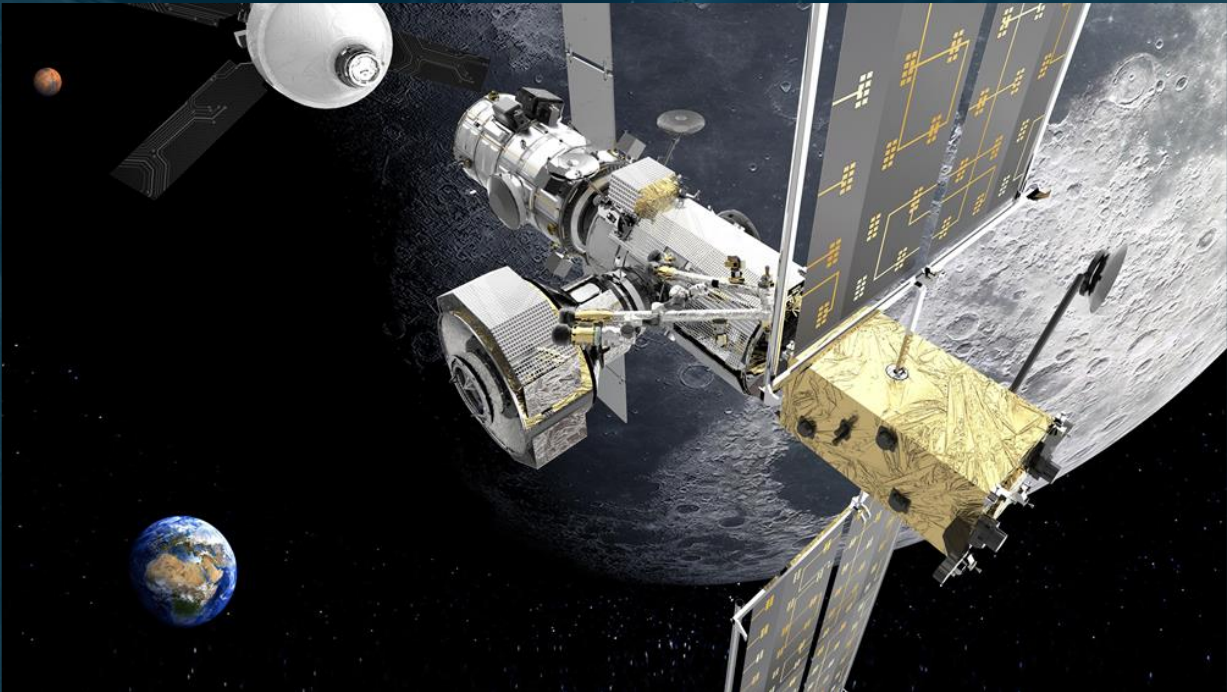
- Call for Mission Outline Proposals: 21 September – 14 December 2023
- 62 Outlines eligible for evaluation; entities from 23 Participating States involved; lead proposers from 19 countries.

Moonlight quoted in 40 mission outlines, in most of them as baseline, sometimes as a mission-critical asset

GATEWAY

Gateway will bring connectivity in Sband and KaBand to incoming vehicles and assets on the Moon

Sband support with PRN-based ranging
Kaband support at high rate
Long communication session duration for South Pole coverage from 70000km orbit



MOONLIGHT

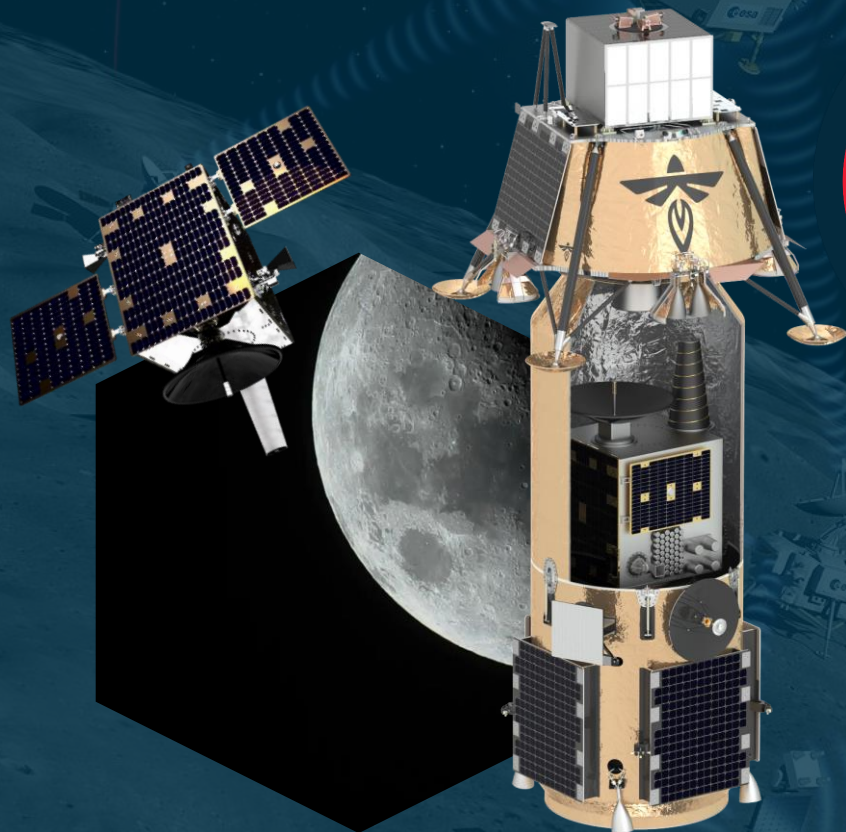


Lunar Pathfinder

(Launch End of 2025)

First ever GPS/GALILEO reception on lunar orbit

Relay for the first US lander on the far side of the Moon



Lunar Communication & Navigation Services

(Launch 2027 NET)

High performance, broad range of services

Constellation of satellites

Data Transport

Absolute Position

Audio/Video Streaming

Absolute Velocity

Tele-Operations

Universal Time

Alert & Information

Third-party Payloads

Search and Rescue

Over-the-top Services

Both Lunar Pathfinder and Moonlight LCNS will be procured as a commercial service with ESA acting as an anchor customer, bringing communication and navigation services around the Moon

Lunar Communication & Navigation Services

Lunar Pathfinder

Includes Sband communication relay & navigation experiments
Lunar Pathfinder is a precursor mission to Moonlight
Schedule for Launch in Q4 2025 with CLPS-CS3 (NASA)

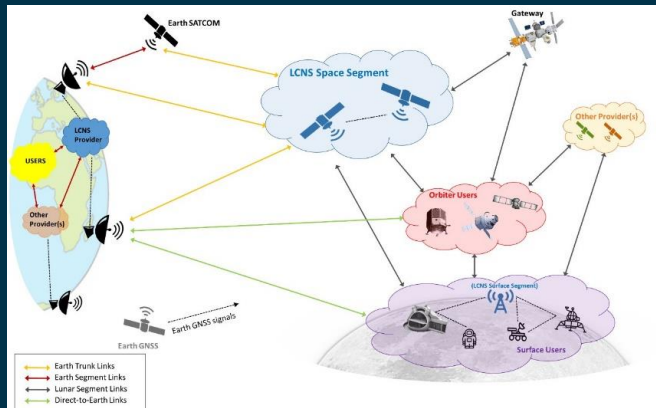


Moonlight - LCNS

Call for Proposal released – TEB on-going
Includes Sband & Kaband high perf. Communication & GNSS-type navigation services
Kick-Off Q1 2024, Launch NET 2027 for IOC

LunaNet – Global Lunar NavCom Architecture

- LNIS = LunaNet Interoperability Specification
- Moonlight LCNS (ESA), LCRNS (NASA) and LNSS (JAXA) are using LNIS
- Ground Segment upgrades
- *LNISv5 draft published and is currently under review*



Users & Business cases

The Moonlight infrastructure aims at servicing a broad range of missions with a commercial approach



Landers



Low Lunar Orbit Satellites



High Lunar Orbit Cubesats



Standards & Interoperability

The purpose of the LunaNet Interoperability Specification (LNIS) is to define a framework of mutually agreed-upon standards to be applied by users and service providers in a cooperative network supporting missions on and around the Moon

Multiple challenges are related to this process:

- CCSDS selection and updates for Lunar communications
- SFCG/ITU frequency coordination & governance
- Security Access Standards & network management
- Time/space reference frame for Navigation
- Frequency sharing & multiple link access management



Space4Inspiration: Lunar Communications & Navigation



Phil Davies - SSTL: Lunar Pathfinder – Launching Next Year !



Ahmed Fadl - NASA: CLPS missions & LCRNS update status



Mehran Sarkati - ESA: Ground Segment for Lunar Communications and Navigation

Roundtable on Future Lunar Communication and Navigation Services and their interoperability



Fabrice Joly - ESA: Moonlight – LCNS & Lunar economy applications



Murata Masaya - JAXA: Japan Lunar Navigation Satellite System and Its Contribution Towards the 'Moon GNSS'



Javier Ventura-Traueset - ESA: Moonlight Lunar Navigation: a change of paradigm for lunar exploration