



Terrae Novae ESA's Exploration Programme

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National Academies Space Science Week
19 March 2024

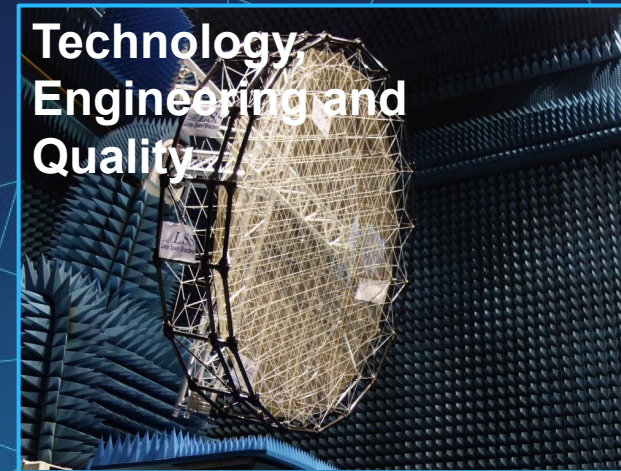
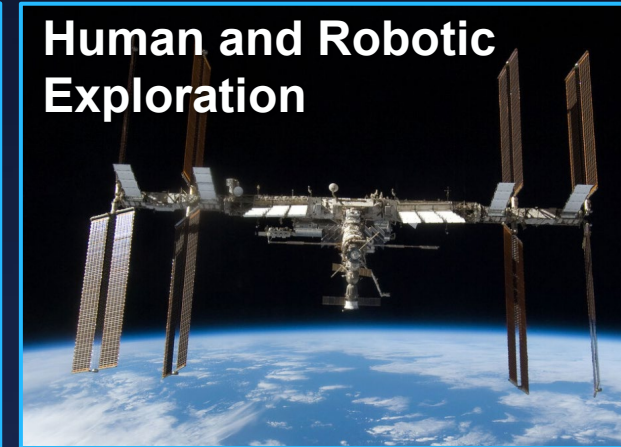


Science & Exploration

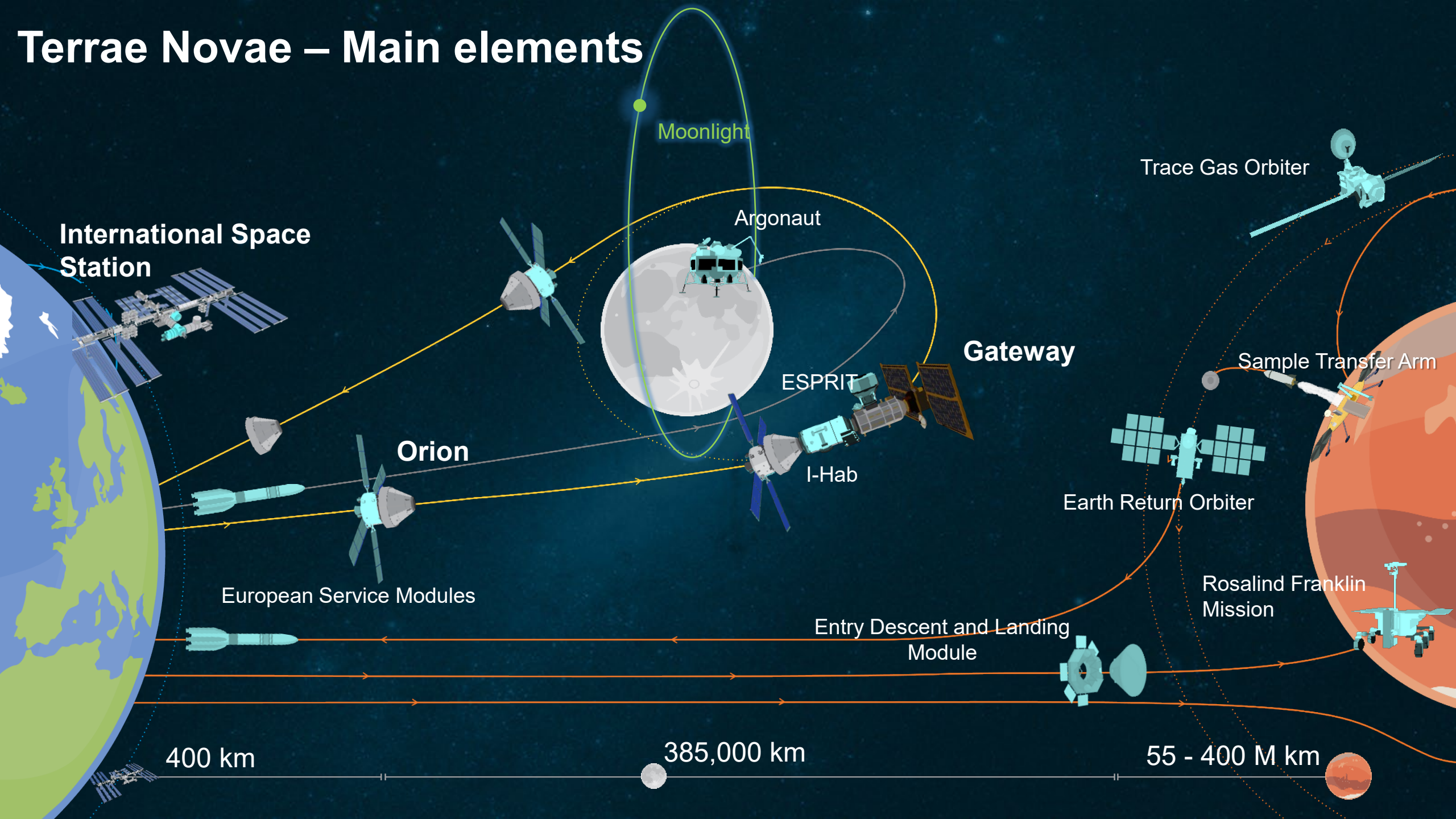


→ THE EUROPEAN SPACE AGENCY

ESA Programmes





Terrae Novae – Main elements



Strong partnership on ISS - Today and tomorrow



 Konstantin Borisov
 Andreas Mogensen

 Jasmin Moghbeli
 Satoshi Furukawa



- Crew-7: Launched on 26 August 2023 – Returned on 12 March 2024.
- Andreas is the 6th European taking the **ISS-Commander** role, leading Expedition 70.

SCIENTIFIC HIGHLIGHTS

HEALTH

- Circadian Light
- SpaceWear
- Sleep in Orbit
- Immunity Assay
- VR for Mental Care

CLIMATE

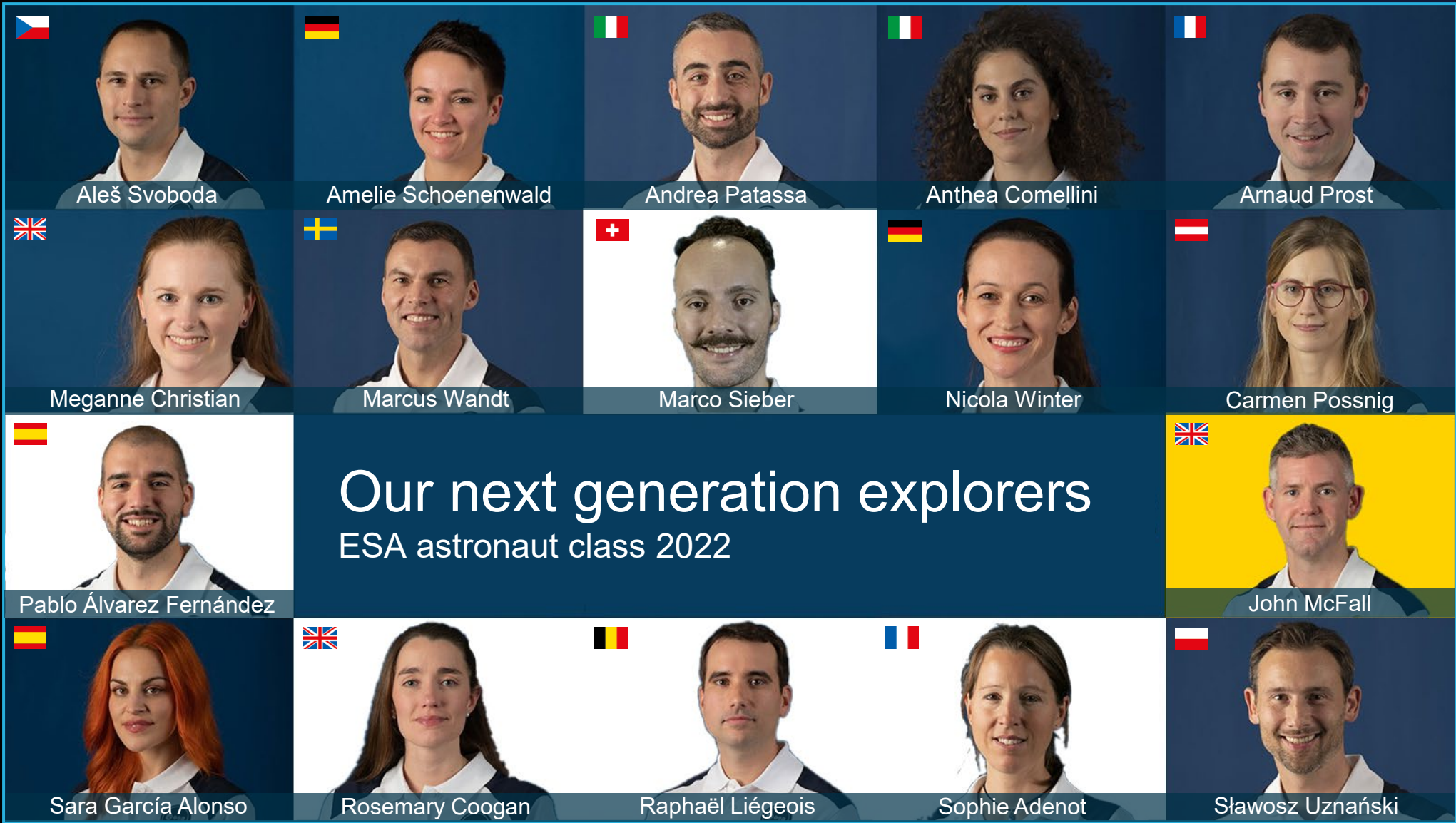
- EarthShine
- Multi-Needle
- Langmuir Probe
- Thor-Davis
- Aquamembrane
- CNES MatISS

SPACE FOR EARTH

- VR for Exercise
- Metal 3D Printer
- Surface Avatar
- ASI EVOO
- LaPlace



Astronauts – Class 2022



5

Career astronauts

1

Project astronaut

11

Members of the astronaut reserve



layer_189.g 6 189 {'X': '22.261', 'Y': '-8.439', 'Z': '27.294', 'U': '541.732'} O2 (%):0.21

3D METAL PRINTER

ESA has launched first metal 3D printer to ISS



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ATOMIC CLOCK ENSEMBLE IN SPACE (ACES)

Clocks, gravity, and the limits of relativity

2023 portfolio

Status Dec 2023

241

Investigations*

1611

Scientists**

228

Publications***

112

In preparation

93

Ongoing

36

Complete

37

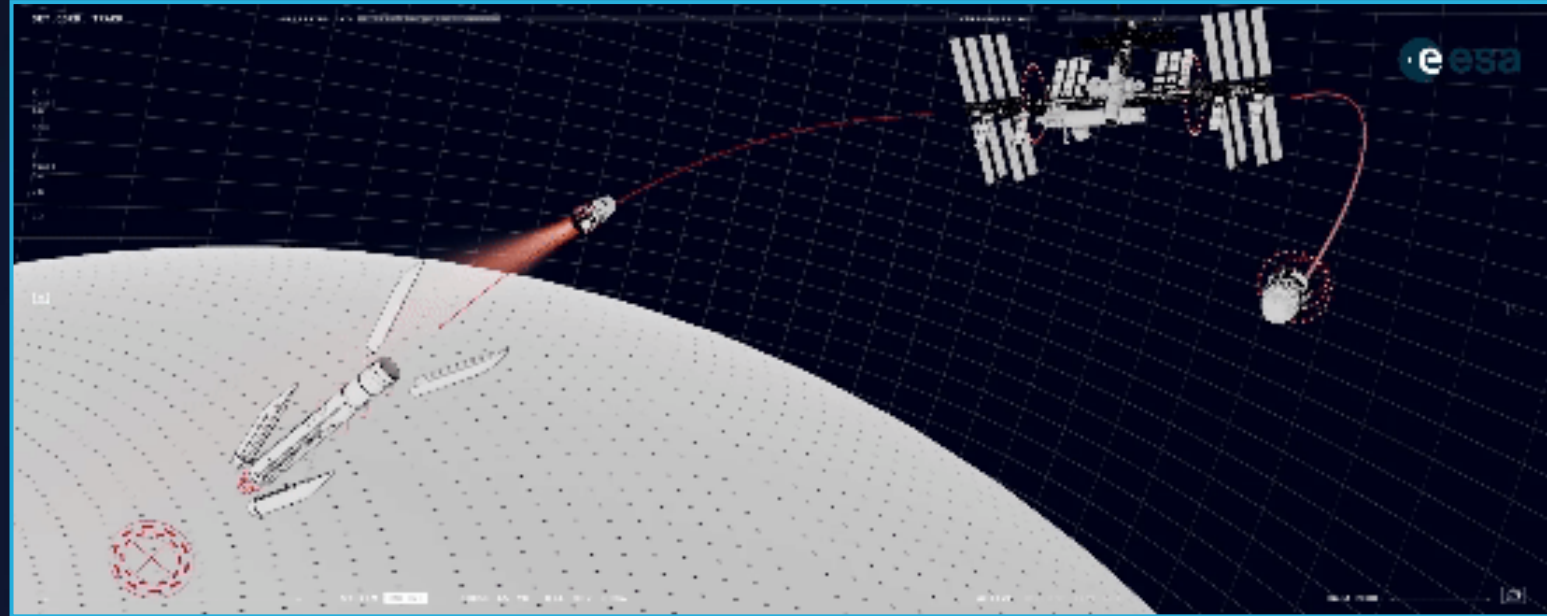
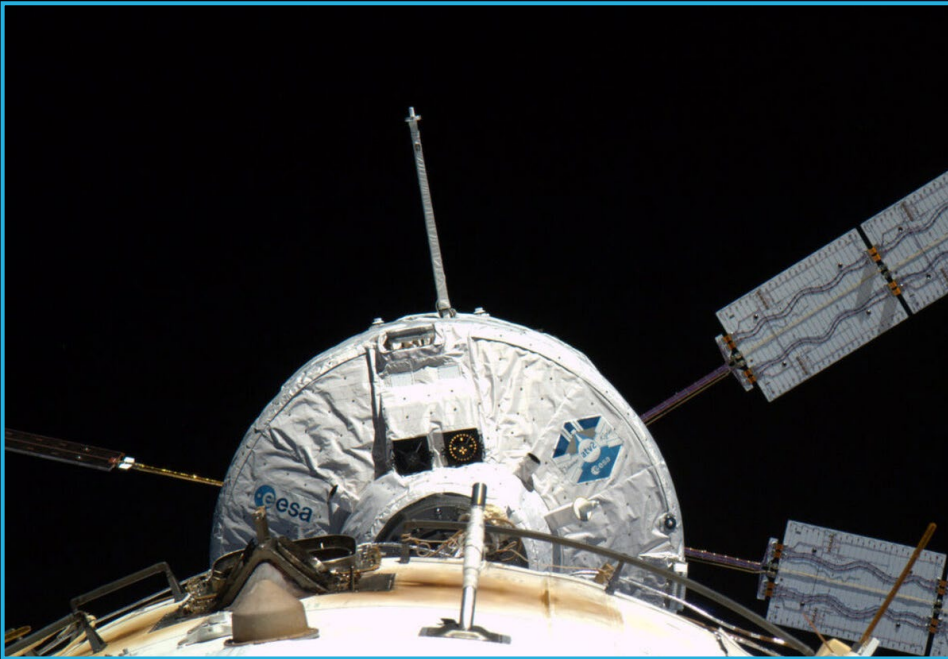
Countries

(*) 136 on ISS

(**) 84% from ESA MS and CS

(***) recorded in physical & life sciences domains in 2023 (175 published in 2023)

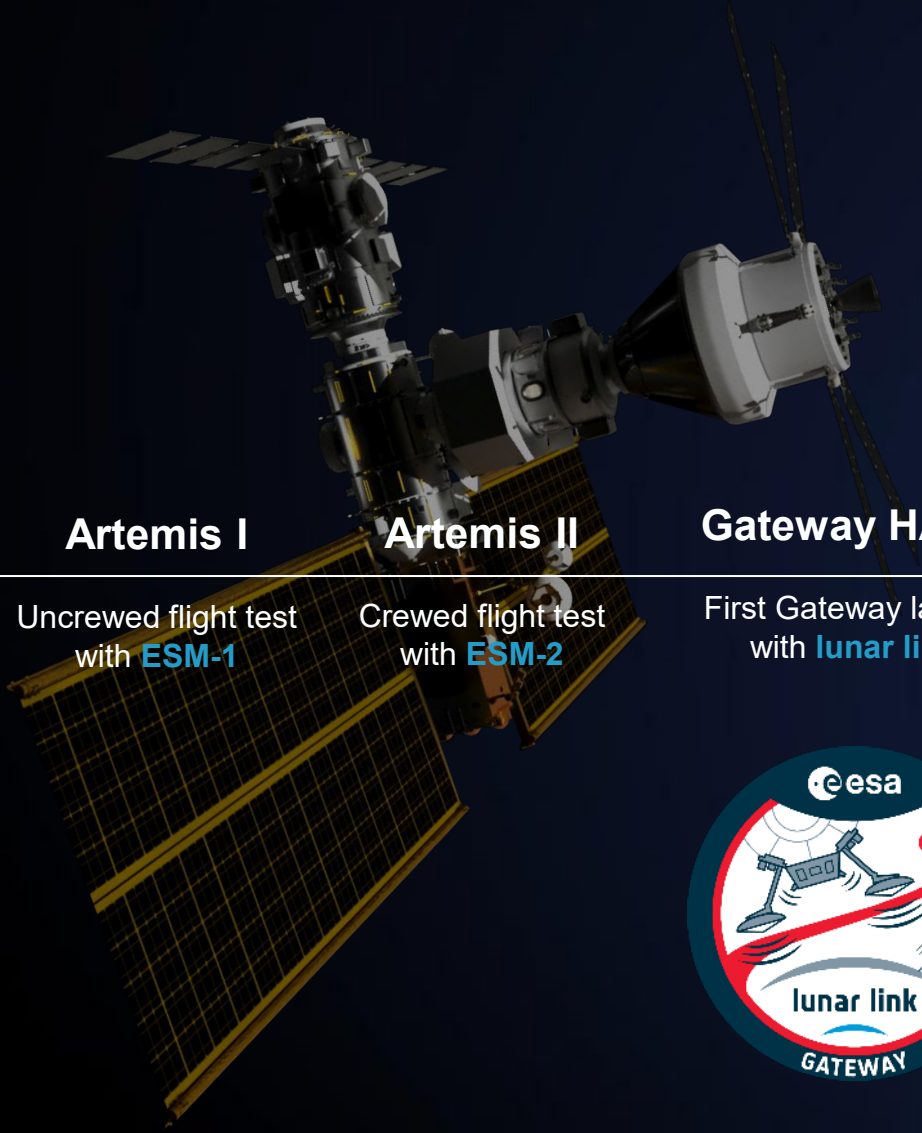
Explore2040 – LEO Cargo Return Service



DESTINATION MOON

Where Terrae Novae meets Artemis

ESA on the critical path of Orion and Gateway



Artemis I

Uncrewed flight test
with **ESM-1**

Artemis II

Crewed flight test
with **ESM-2**

Gateway HALO

First Gateway launch
with **lunar link**



Artemis III

Moon landing
with **ESM-3**

Artemis IV

Moon landing
with **ESM-4** and **lunar i-hab**
and **ESA astronaut**



Artemis V

Moon landing
with **ESM-5** and **lunar view**
and **ESA astronaut**



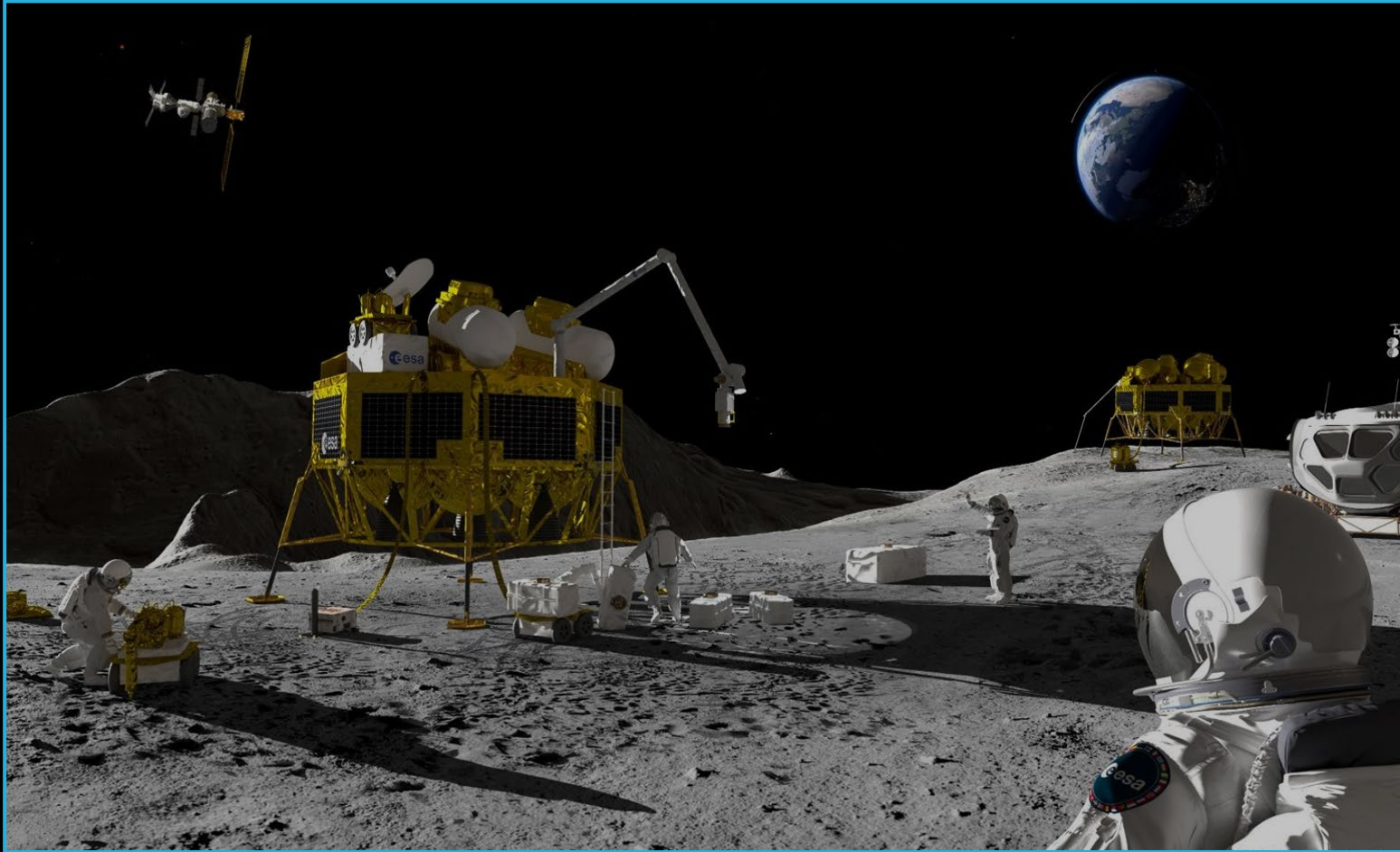
Artemis VI

Moon landing
with **ESM-6**
...



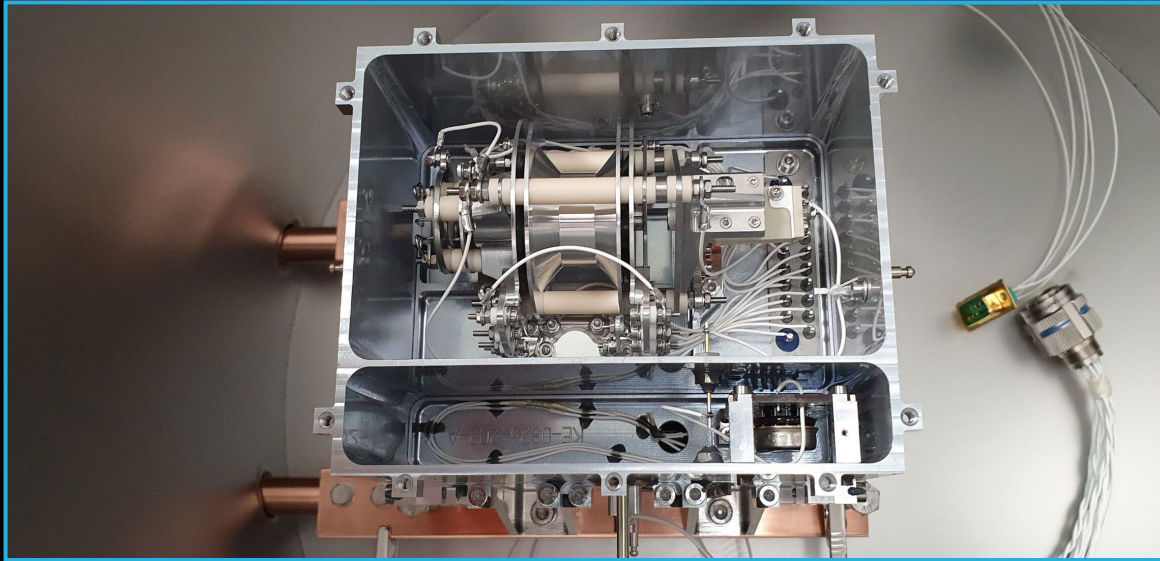
Where Terrae Novae meets Artemis

Argonauts

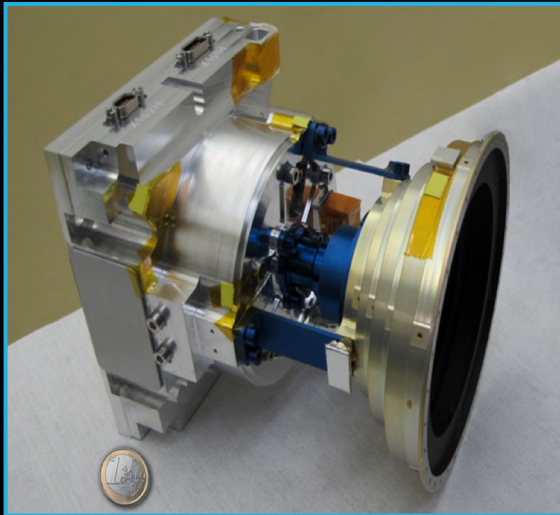


- Navigation, communication and power.
- Cargo for human missions.
- Science and technology payloads.
- Lunar prospecting and sampling rover.
- Telerobotics and co-botics.

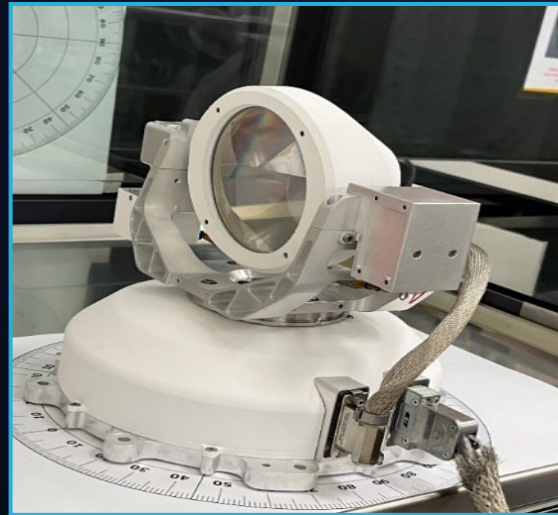
Lunar surface payload in the 2020s



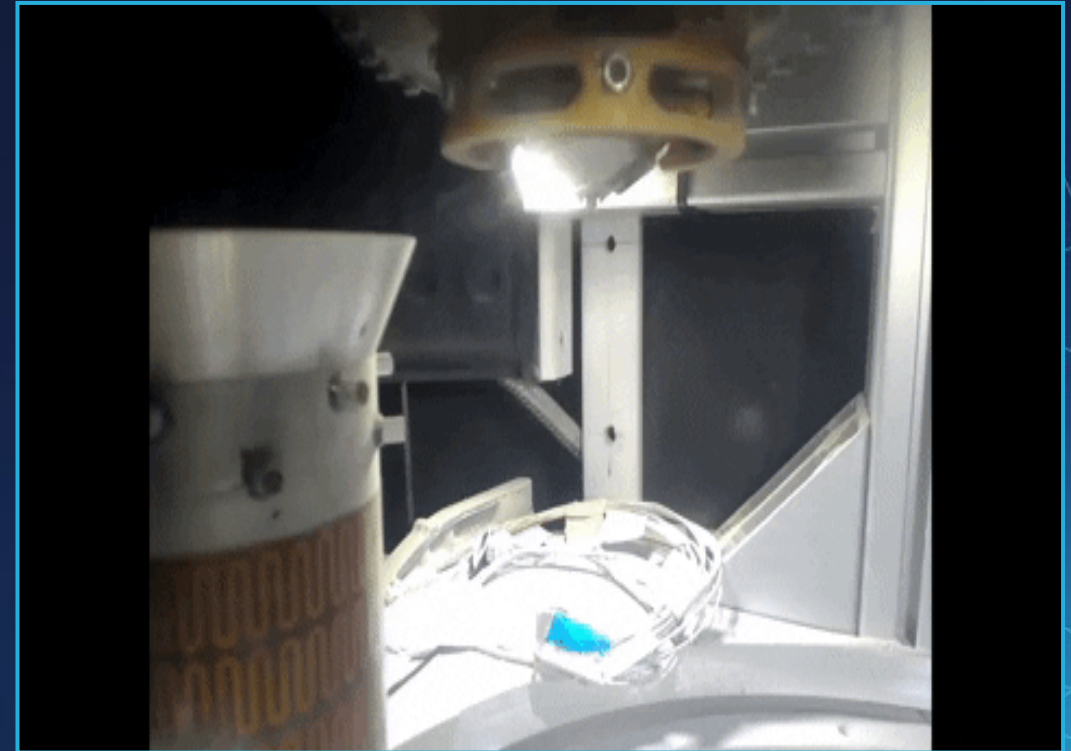
*PROA robotic Peregrine –
Exospheric Mass
Spectrometer
EMS – LUPEX
SPECT*



Astrobotic Griffin – LandCam-X



Intuitive Machines 3 – MoonLIGHT

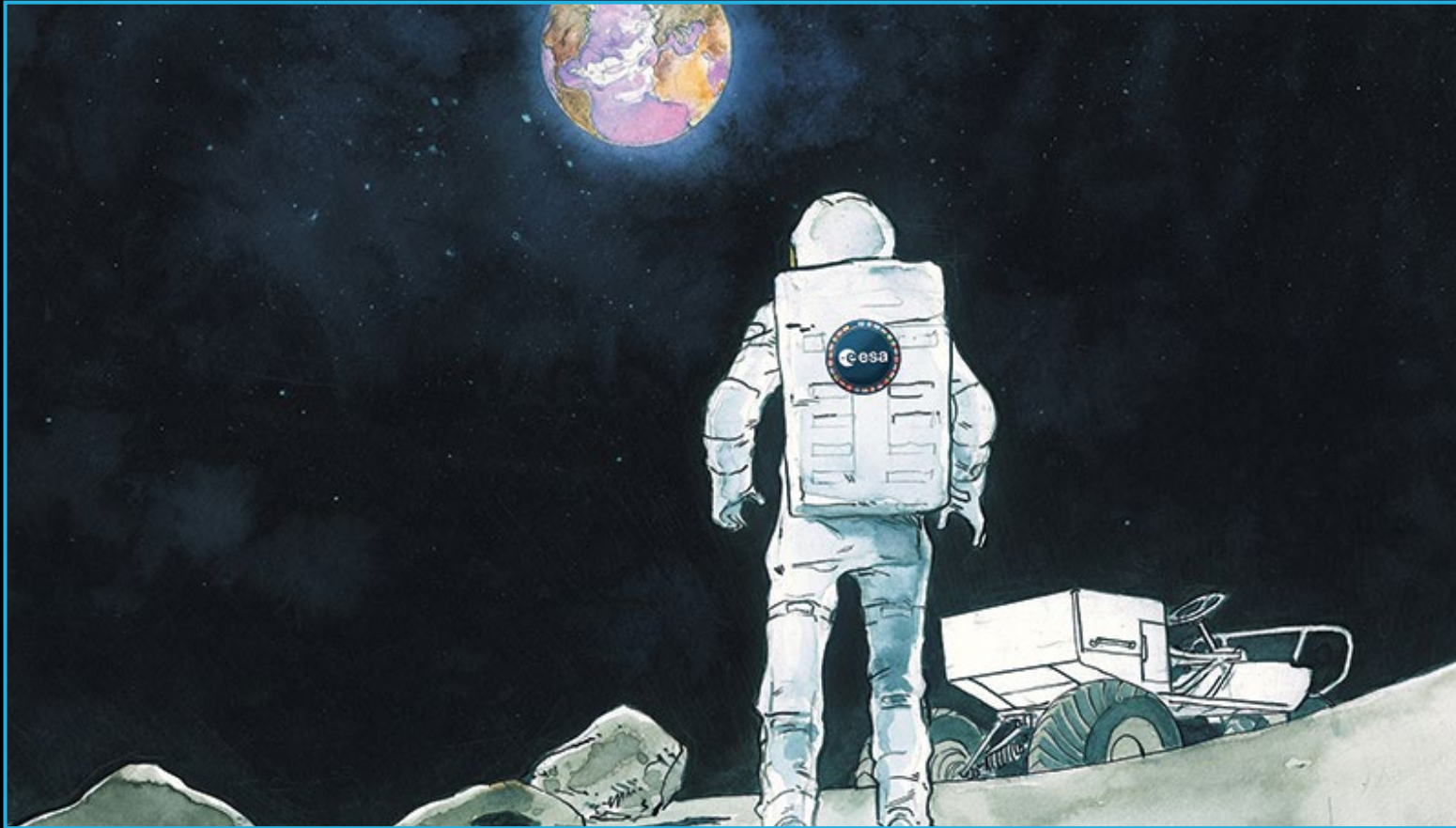


PROSPECT

LUNA analogue facility



Explore2040 – End-to-end sample return narrative



- Lunar Prospecting & Sampling Rover.
- Moon Base Camp.
- Cislunar cargo return vehicle.

DESTINATION MARS



ExoMars – Trace Gas Orbiter



Launched in 2016

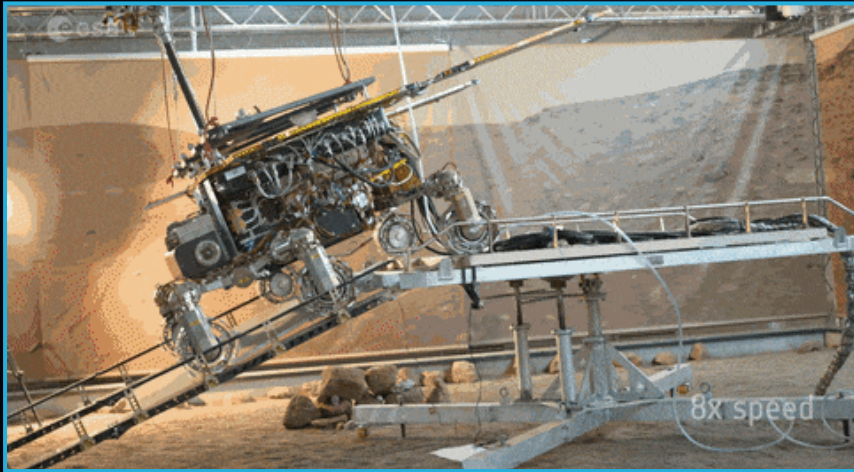
*Layered terrain in Juventæ Chasma
02 October 2018*

Help untangling the Mars methane mystery while delivering communication relay services.

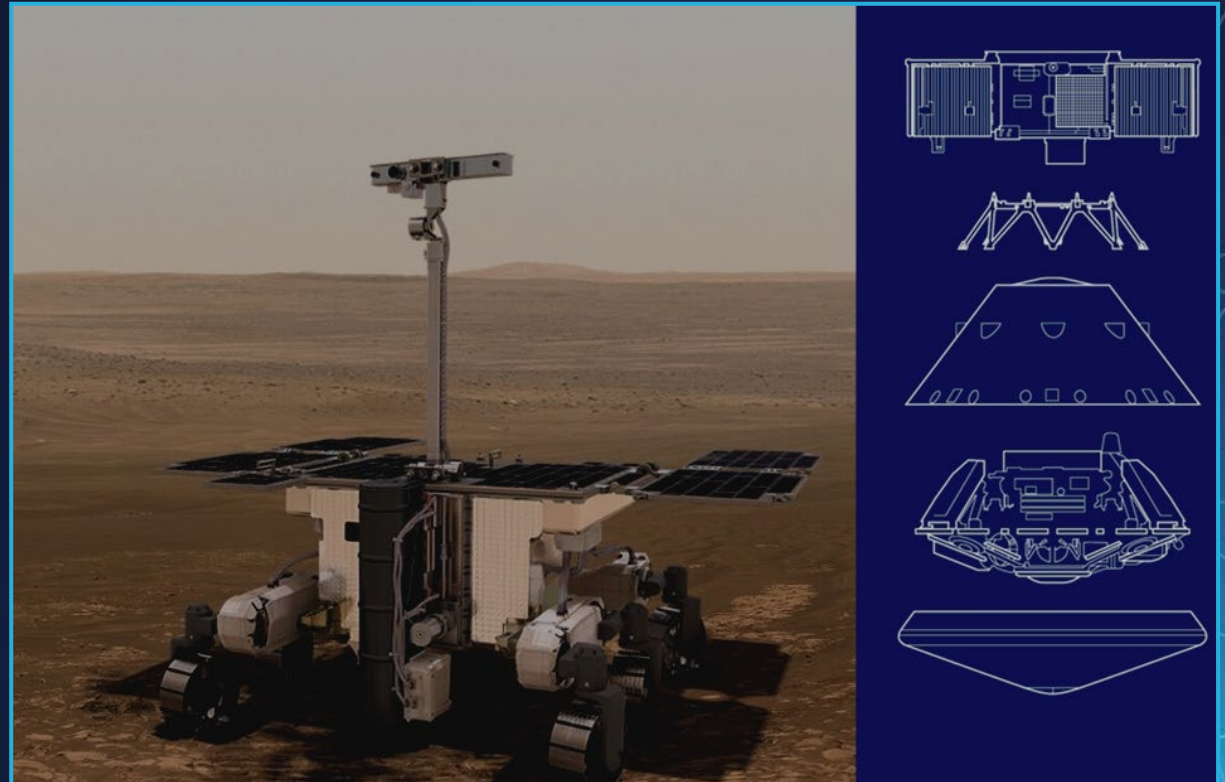
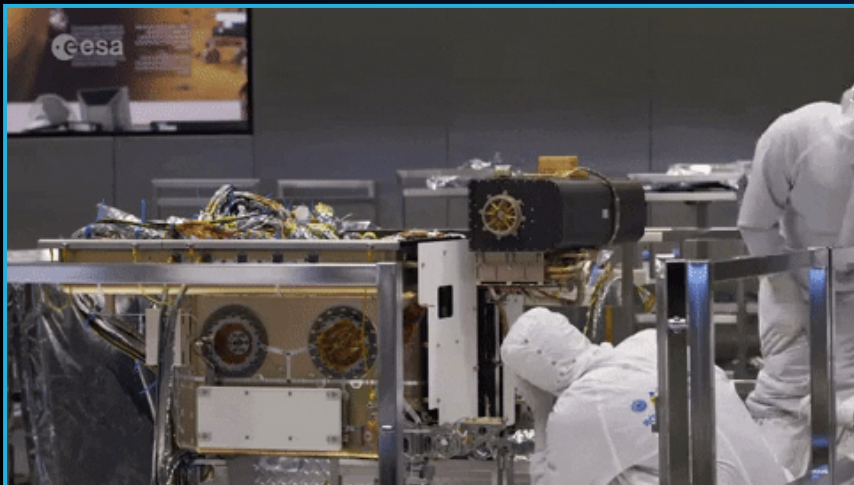


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ExoMars – Rosalind Franklin Rover

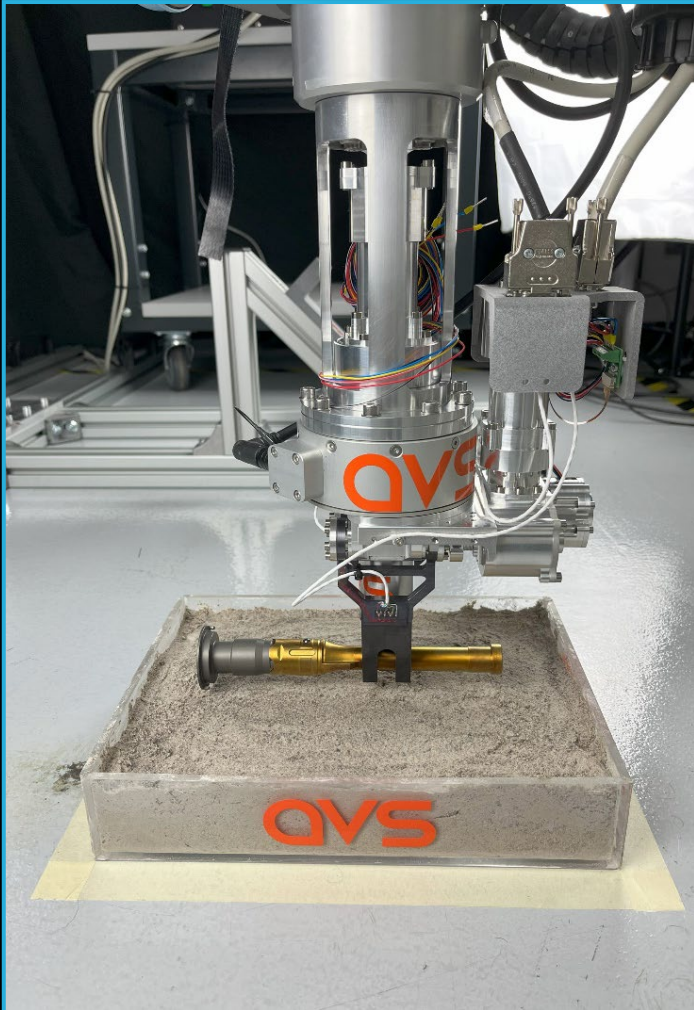


- A time machine in search of ancient life on Mars.
- Launch in 2028.



Mars Sample Return

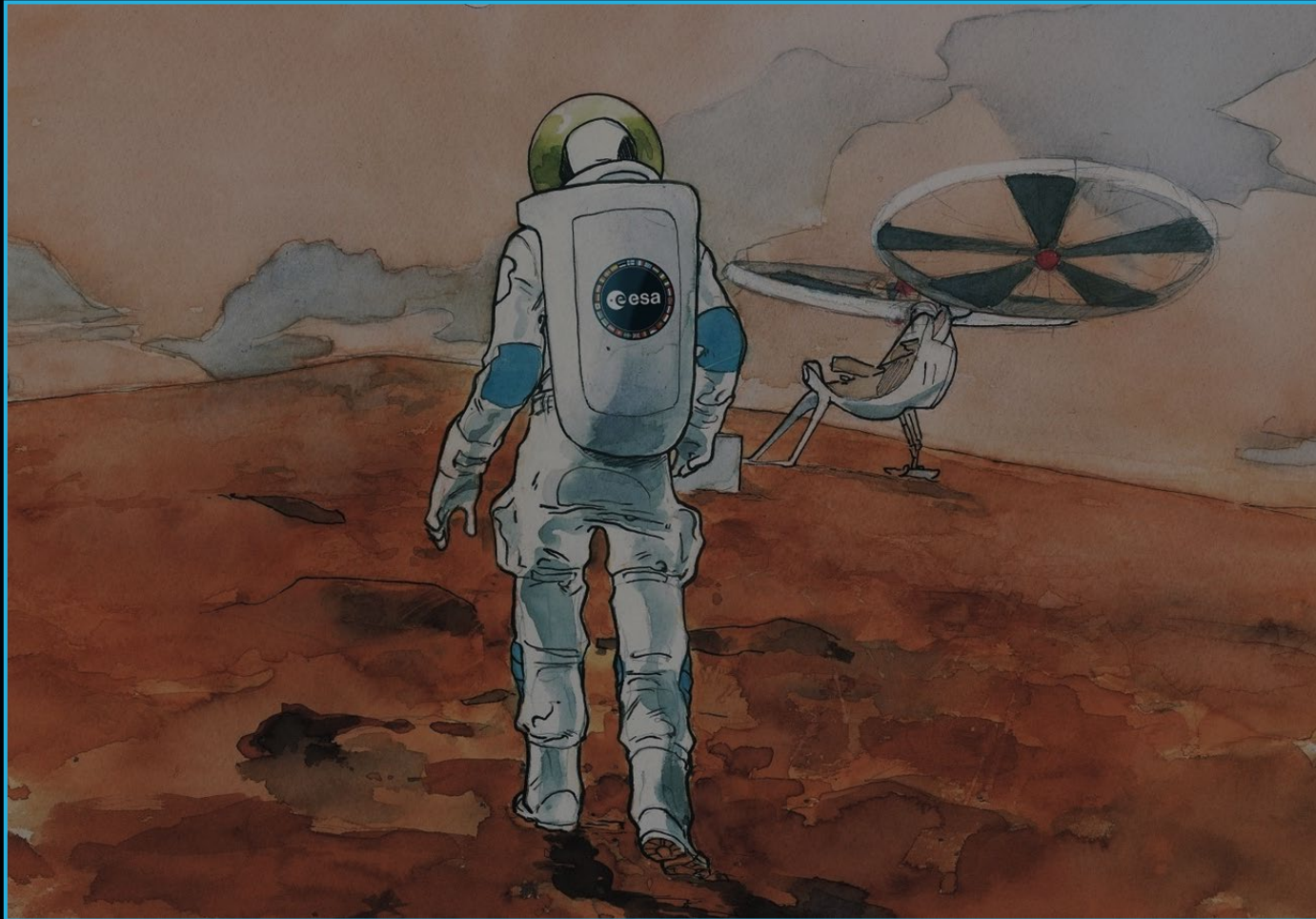
Earth Return Orbiter (ERO) & Sample Transfer Arm (STA)



- Will handle samples tubes that NASA's Perseverance rover is currently collecting from the surface.
- Will identify, pick up and transfer the tubes into the first rocket fired off another planet.



Explore2040 – Mars EP TUG & EDL



- Explore concepts for Propulsive transfer services and Mars Communication & Navigation Infrastructure services and science.
- Explore concepts for precision Entry Descent & Landing capability.

Explore2040 – Refined European exploration strategy



- Uplift science and socio-economic impact on Earth.
- Sustained + sustainable + responsible exploration.



European
architecture
open to
cooperation

- Key enablers
- ▲ Opportunities for excellence
- Leaps

Maintain a
human presence
in and utilisation
of LEO



Allow Europeans to
explore the Moon in the
2030s

Prepare for taking
Europeans to explore
Mars at the end of the
2040s



Inspiring the current and next generations

Thank you

