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JAXA's Lunar Exploration Activities

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JAXA's Space Exploration Scenario

Mars, others

Human Presence Expansion



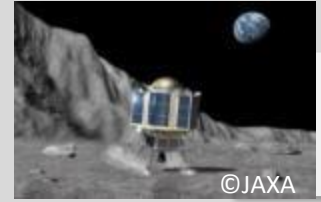
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MMX JFY2024

Activities on/beyond Mars

Moon



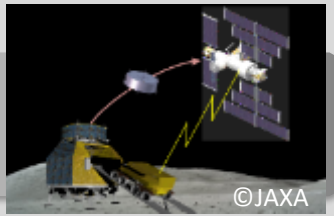
Kaguya



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SLIM
Pinpoint Landing
JFY2021



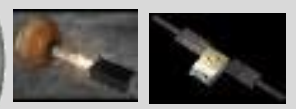
©JAXA
Lunar Polar Exploration
Water Prospecting
prox.2023-



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Robotic Sample Return (HERACLES)
Technology Demo
Approx.2026-



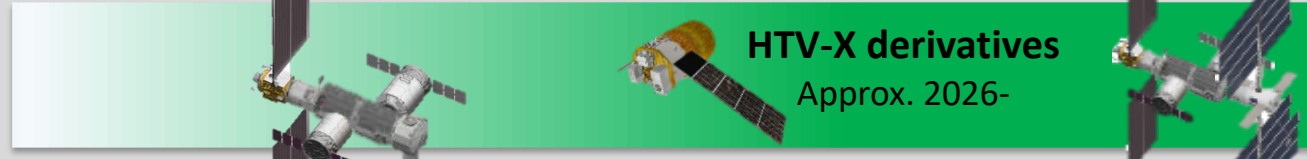
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Sustainable Exploration/Utilization



OMOTENASHI EQUULEUS
CubeSat
launched by
SLS/EM1



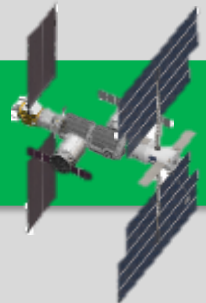
Innovative
small mission



Gateway (construction phase)
2022-



HTV-X derivatives
Approx. 2026-



Gateway Operation

Earth



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Promote Commercialization

International Space Station

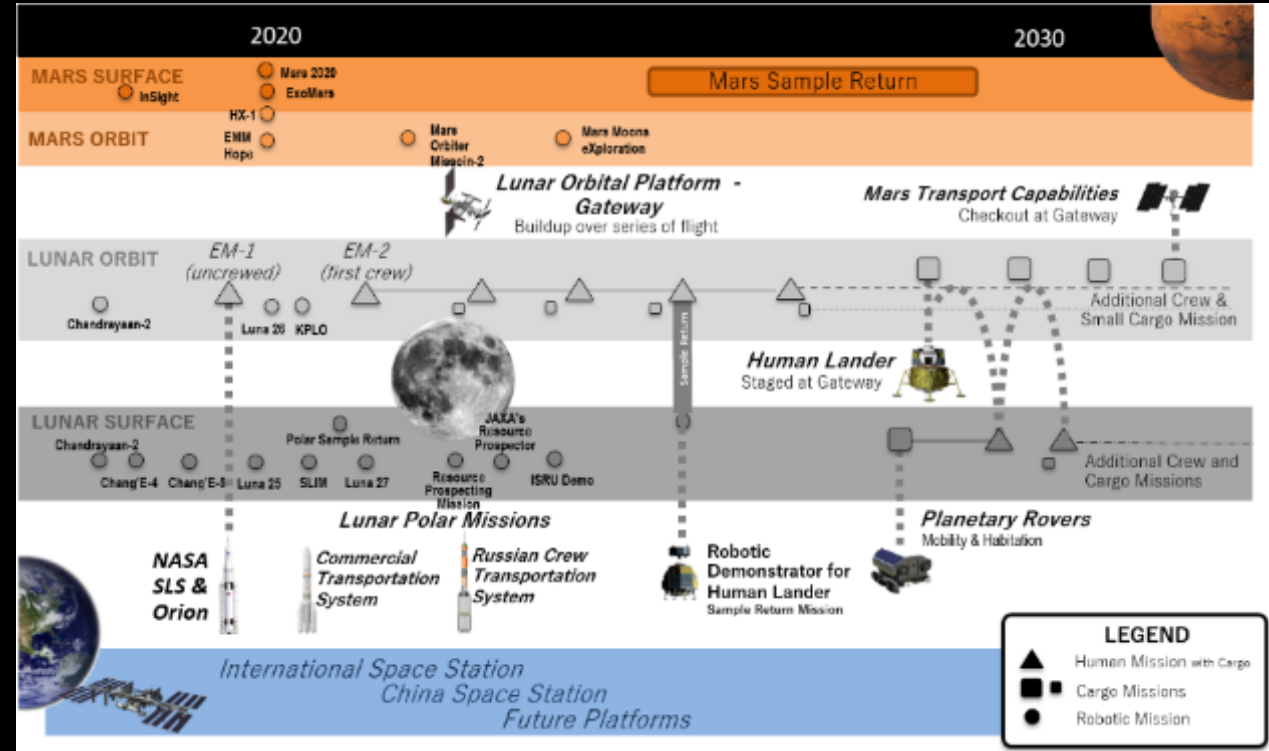
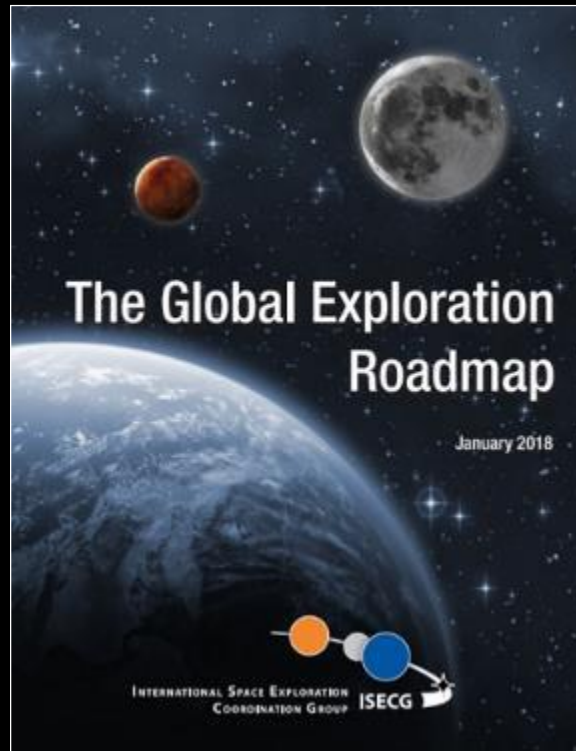
International Space Exploration Coordination Group (ISECG):

- ISECG is a non-political agency coordination forum of space organization from 18 countries and regions.
- JAXA is currently the chair of ISECG.
- ISECG agencies work collectively in a non-binding, consensus-driven manner towards advancing the Global Exploration Strategy.



The Global Exploration Roadmap (GER3) recognizes the importance of increasing synergies with robotic missions while demonstrating the role humans play in realizing societal benefits.

GER3, released in January 2018



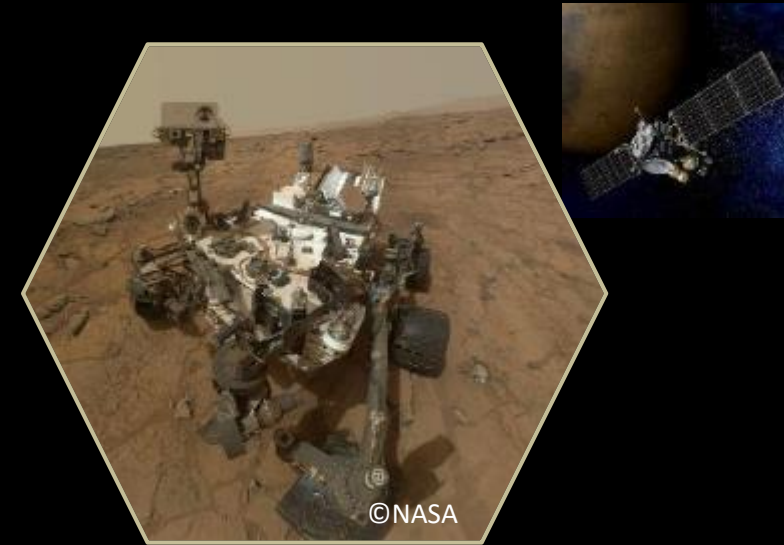
Expand Human Activities



International Cooperation



Gain Knowledge



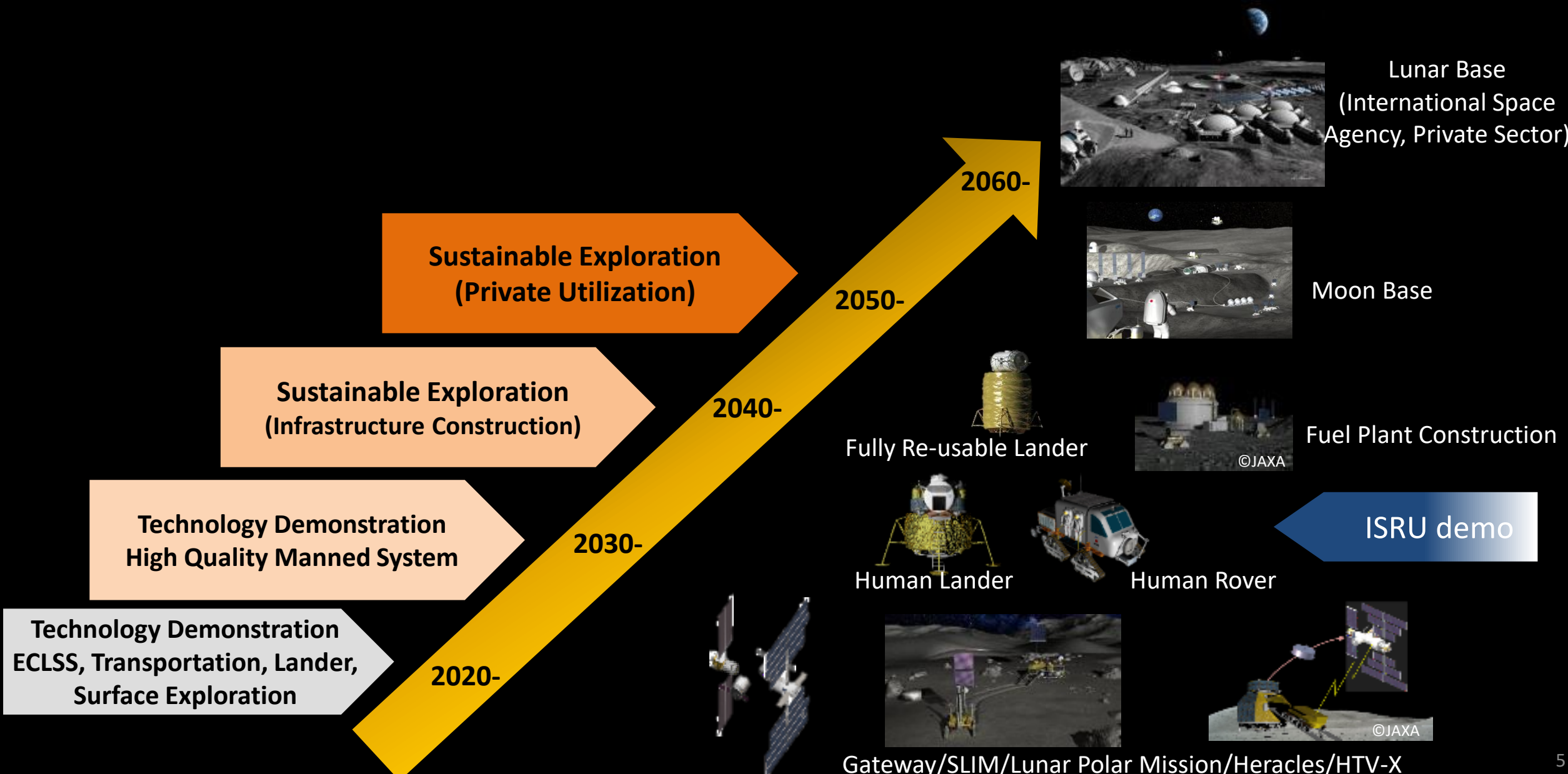
Promote Industry



Inspire Young Generation



JAXA's Lunar Exploration Roadmap (Long-Team)



Technology Demonstration
ECLSS, Transportation, Lander,
Surface Exploration

Technology Demonstration
High Quality Manned System

Sustainable Exploration
(Infrastructure Construction)

Sustainable Exploration
(Private Utilization)

2020-

2030-

2040-

2050-

2060-



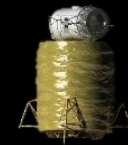
Gateway/SLIM/Lunar Polar Mission/Heracles/HTV-X



Human Lander



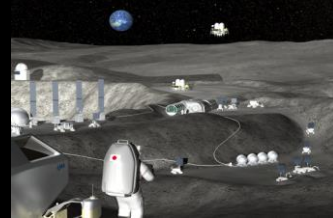
Human Rover



Fully Re-usable Lander



Fuel Plant Construction



Moon Base



Lunar Base
(International Space Agency, Private Sector)

ISRU demo

KAGUYA (SELENE: SELenological and Engineering Explorer)

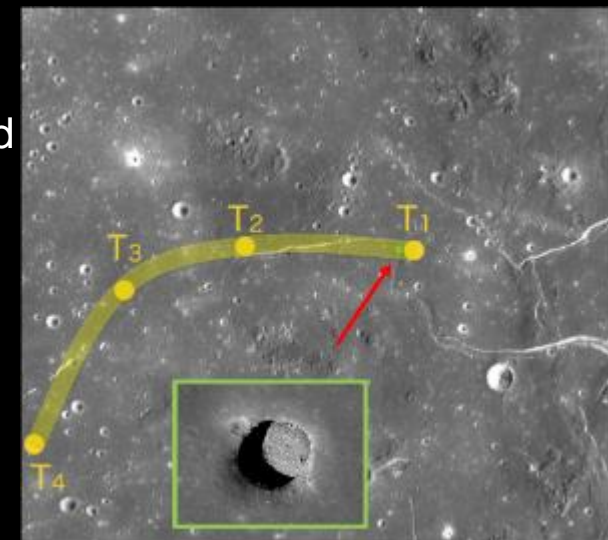
Launch:
2007

- Japan's first large lunar explorer, consisting of the Main Orbiter and two sub-satellites
- Scientific data from Kaguya is important for future lunar exploration.
- 15 observation missions on the Moon, including observation of elemental and mineralogical distribution of the Moon, geography, surface and subsurface structure, magnetic field and gravity field.



Detection of intact lunar lava tubes in the data from SELENE (Kaguya) radar sounding (2017)

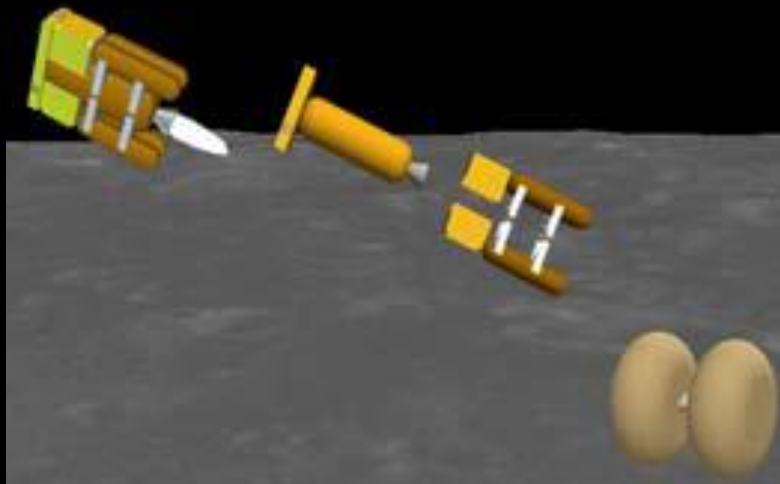
- Detection of a 50-km long intact lava tube underground along a lava flow river "rille" on the Marius Hills of the Moon
- Unique values for both science and human expansion to space



OMOTENASHI

*Outstanding **MO**on exploration **TE**chnologies demonstrated by **NA**no **S**emi-**H**ard **I**mpactor

The World's Smallest Moon Lander

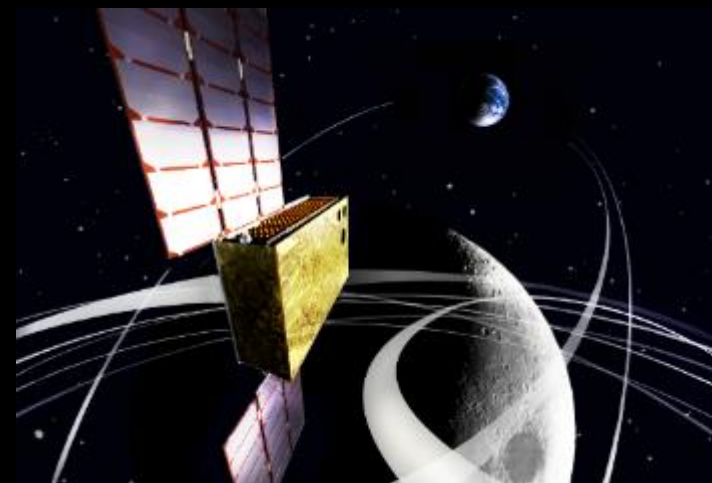


- The technologies will enable multi-point observation with low cost.
- Observe radiation environment in cis-lunar region.

EQUULEUS

***EQU**ilibriUm **L**unar-**E**arth point **6U** **S**pacecraft

Trajectory control demonstration within Sun-Earth-Moon region

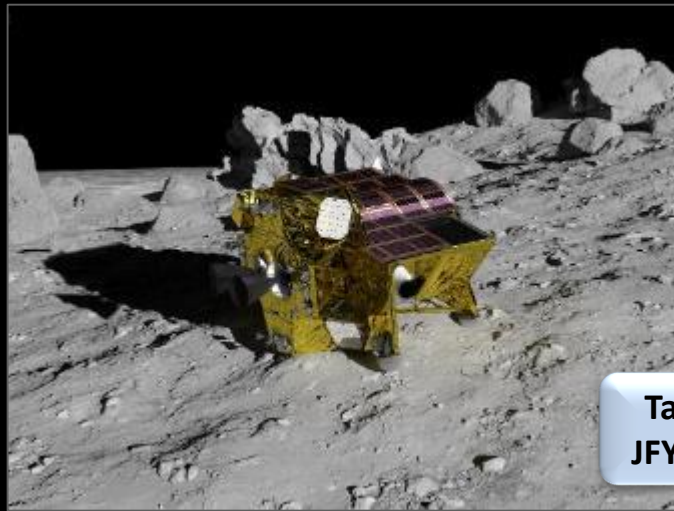


- Imaging of the Earth's plasmasphere
 - Lunar impact flash observation
 - Dust detection at EML2
- (Developed by JAXA and The University of Tokyo)

SLIM

*Smart Lander for Investigating the Moon

Demonstration of pin-point lunar landing technologies

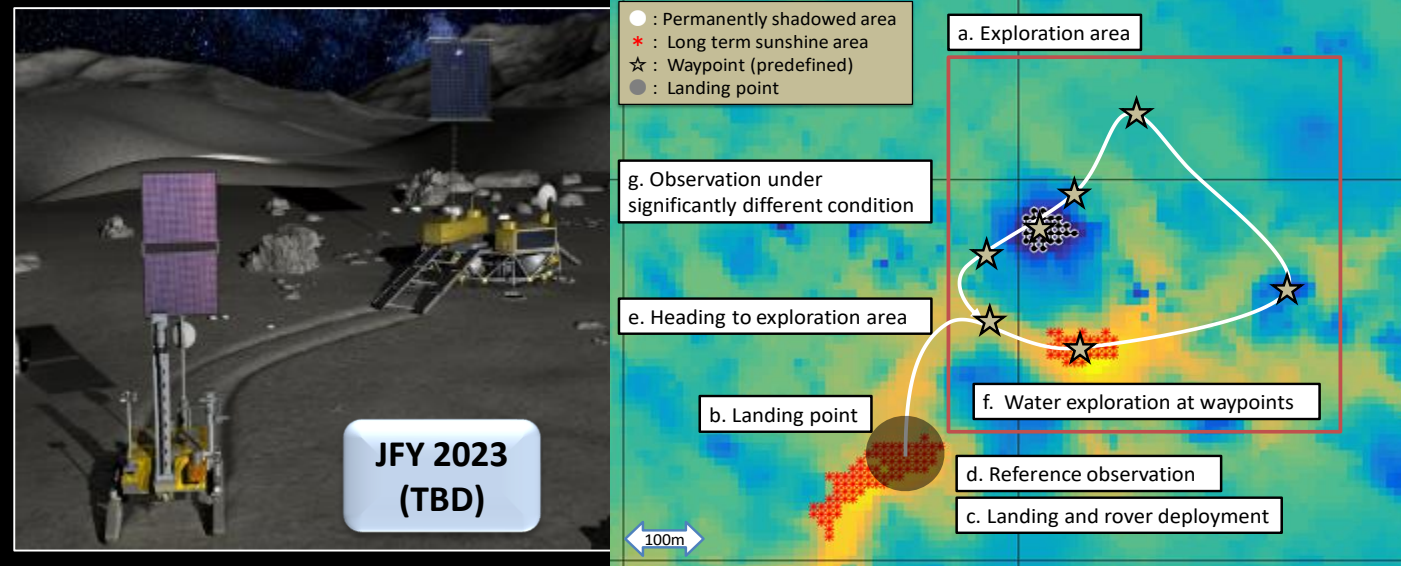


Target:
JFY 2021

Mass	210 kg at the time of landing
Landing Accuracy	Up to 100m
Science instruments	Multi-band camera for mineralogical characterization
Science objective	Characterization of rocks from deep interior

Lunar Polar Exploration Mission

Obtain knowledge of water resource on the Moon

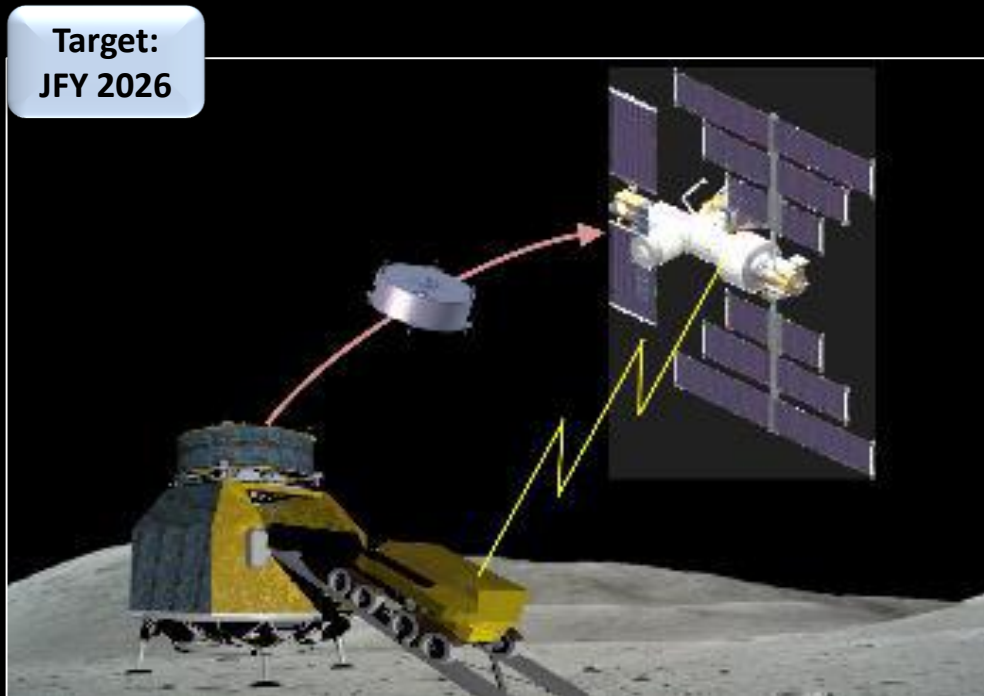


- Explore lunar polar region suitability for establishing a lunar base for sustainable activities
- JAXA and ISRO are conducting joint study on lunar polar exploration mission.
- Demonstrate lunar and planetary surface exploration technologies e.g. vehicular transport and overnight survival.

HERACLES

*Human Enhanced Robotic Architecture for Lunar Exploration and Science

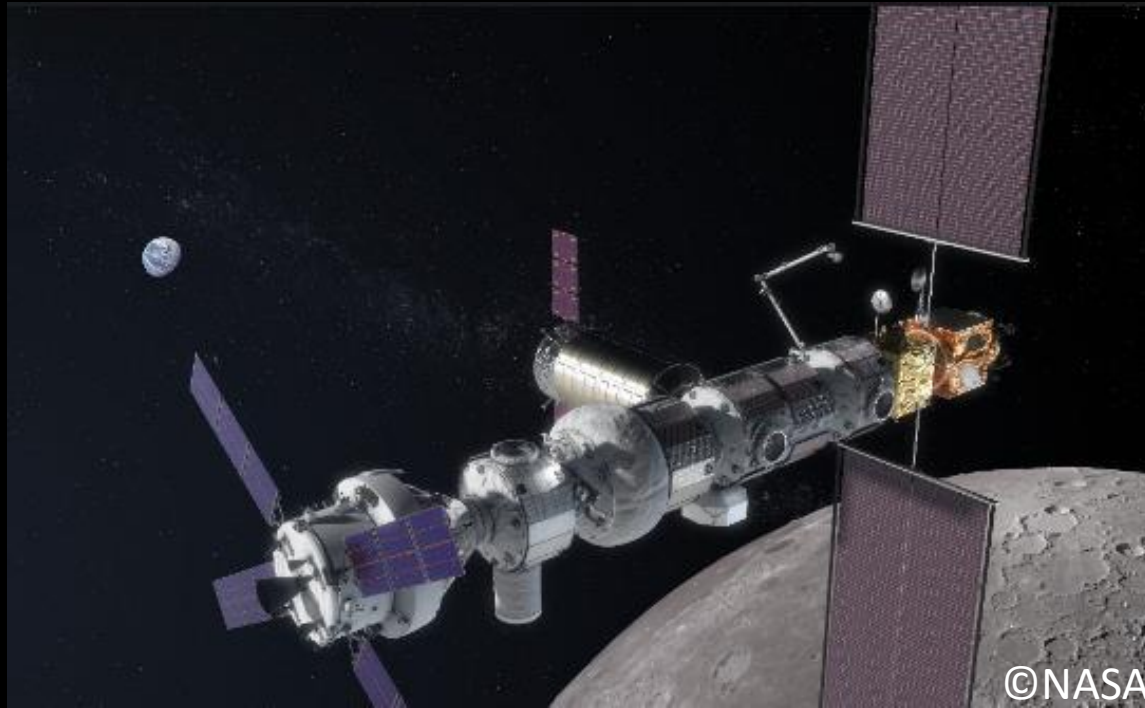
Technology demonstrations for lunar landings, surface exploration, and sample return



- Targeted for JFY2026, jointly with ESA and CSA
- Technology demonstration for human lunar surface mission and sample return through Gateway
- Contributing by;
 - collected sample on lunar surface
 - share-ride of mission equipment

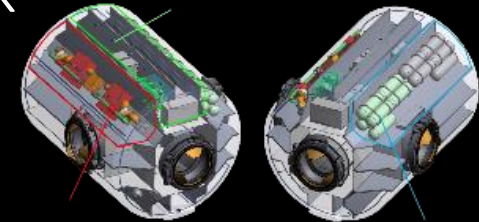
Mass	Spacecraft mass: 8500 kg (wet) Payload: 1430kg
Operational period	> 6 months
Landing site	Selection is on going
Technologies to be demonstrated	Human rated landing Ascent and RVD to Gateway Large scale rover

Lunar Orbital Platform – Gateway: (JAXA's Potential Contribution)



Habitation technology

- Contributing by
 - ECLSS system
 - Thermal control system
 - Power system component
 - Air(O₂/N₂) high-pressure tank



Logistics resupply by HTV-X



Kounotori (HTV)



HTV-X

- Targeted for JFY2025~2026(1st flight)
- Resupply logistics and utilization for the Gateway including lunar lander support
- Contributing by:
 - Transport utilization on the Gateway
 - Transport small probe and equipment on lunar orbit.
 - Share-ride of mission equipment.

■ Human Pressurized Rover

Contributing by long range excursion capability for human lunar surface exploration as well as autonomous or remote operated excursion capability during unmanned period.



Specification

No. of Crew:	2 (4 for contingency)
Cabin function:	ECLSS, TCS, Autonomy
Travel distance:	10,000 km (total life)
Max speed:	20km/hour
Power:	Fuel cell + Solar panel
Chassis:	6 wheels
Size:	6m x 5.2m x 3.8m
Space suits:	2

- Targeted for 2029~
- Jointly studying with TOYOTA.

■ Space Exploration Innovation Hub Center

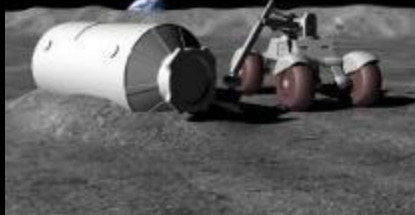


Cooperating with private companies/research institutes to bring together cutting-edge technologies for creating innovation in Space Exploration and on Earth.

Examples of Projects:

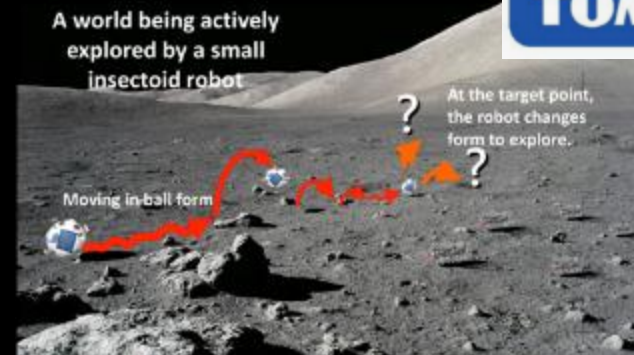
Construction

Remotely controlled/ automated construction technology



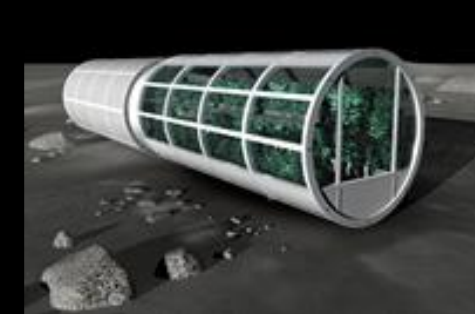
Mini Robots Technology

Develop low cost insectoid robot for lunar surface activities



Agri Technology

Concept study for lunar plant factory



袋培養設備

- ❑ JAXA will continue to actively participate in space exploration.
- ❑ For realizing our challenging missions based on the common goals, JAXA will cooperate with international and industrial partners, and looks forward to working widely with new players from diverse background.
- ❑ International frameworks such ISECG, and COPUOS will stimulate discussions for coordinating and creating cooperation. By using such frameworks, JAXA hopes to continue discussion among various players.