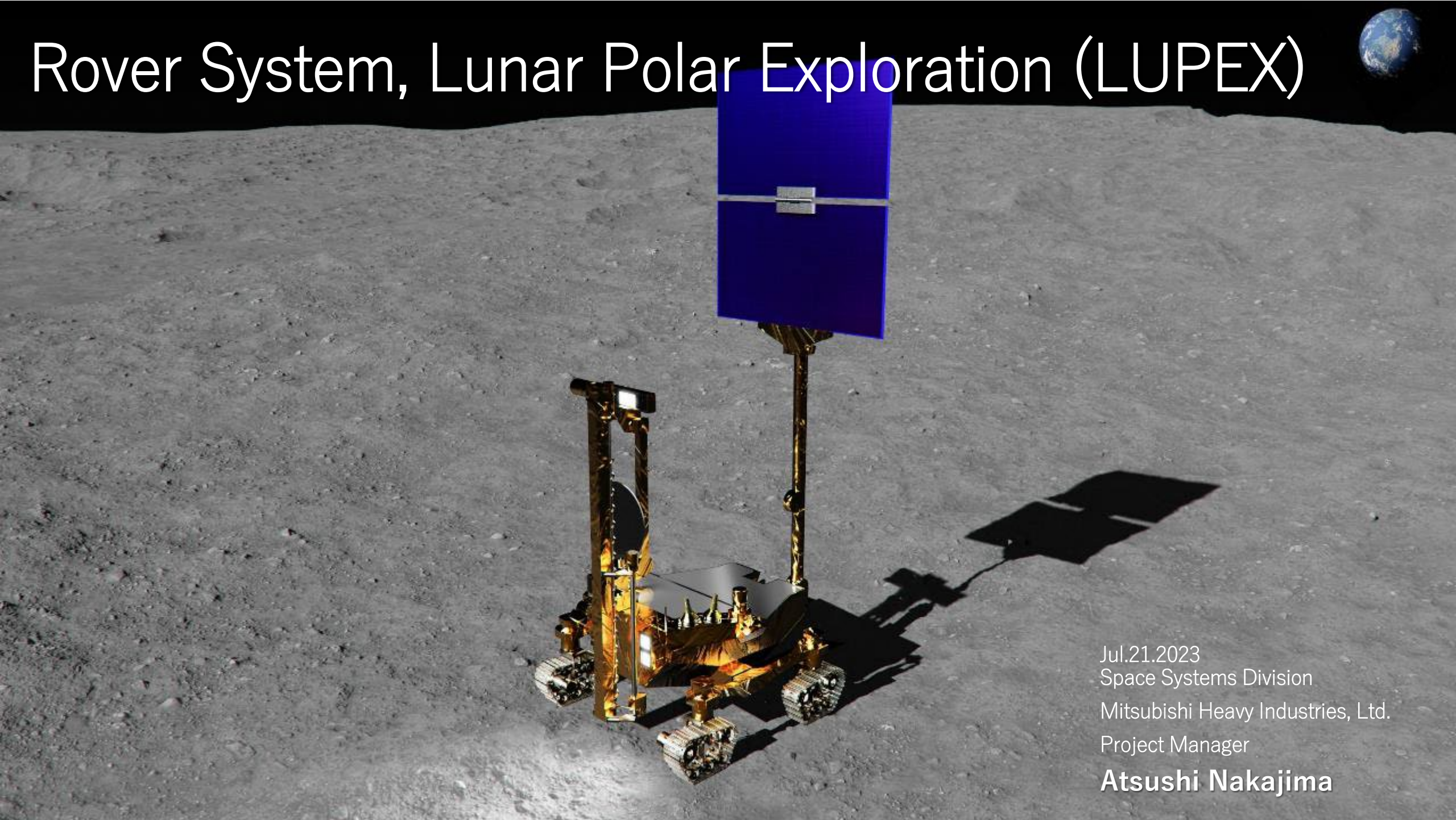
Rover System, Lunar Polar Exploration (LUPEX)

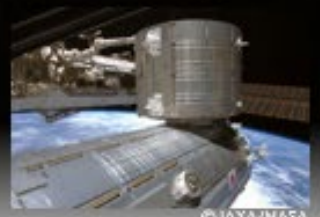


Jul.21.2023
Space Systems Division
Mitsubishi Heavy Industries, Ltd.
Project Manager
Atsushi Nakajima

Partnership Between Toyota and Mitsubishi Heavy Industries

Mid-2020s — 2029

Support exploration with human spaceflight technology



International Space Station

H-II Transfer Vehicle(HTV)

Gateway I-Hab

- Human space stay technology (Pressurized spaces, Environmental Control and Life Support System)


Lunar base construction

Support exploration with mobility technology

- Driving demonstration expertise
- Lunar surface data

- Living space + mobility function
- Driving for more than 10 years/10,000 km

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- Spacecraft integration technology
- Space environment resistance technology
- Human space stay technology

TOYOTA

- Quality, durability, reliability (QDR)
- Driving performance, fuel cells, automated driving
- People-centric mobility development

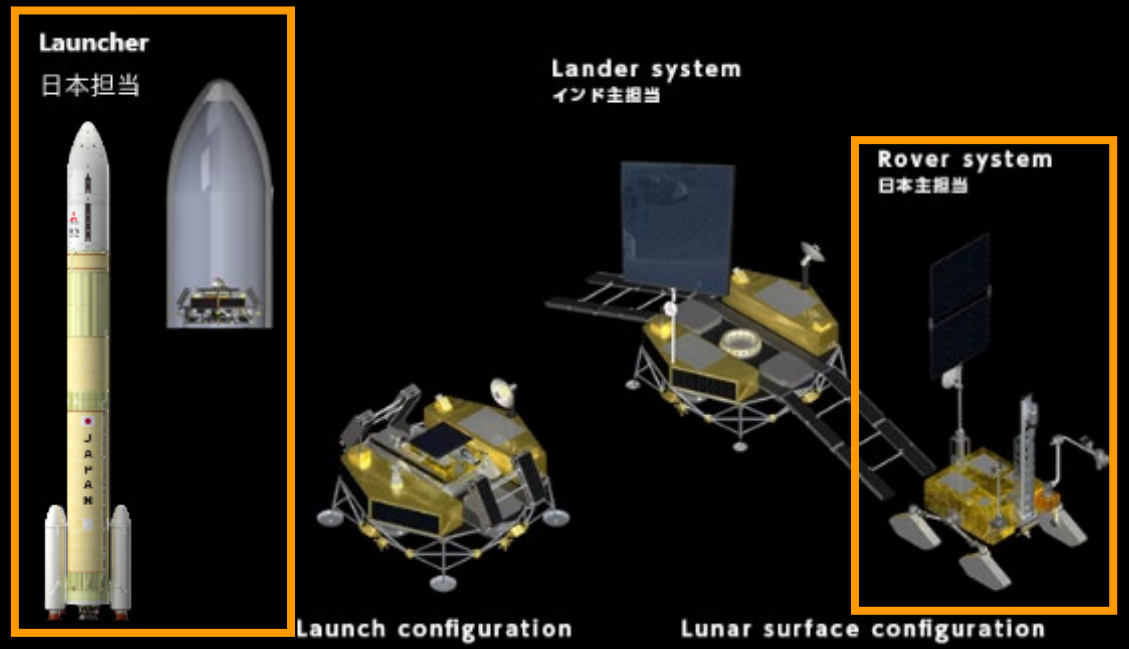
2. LUPEX Overview

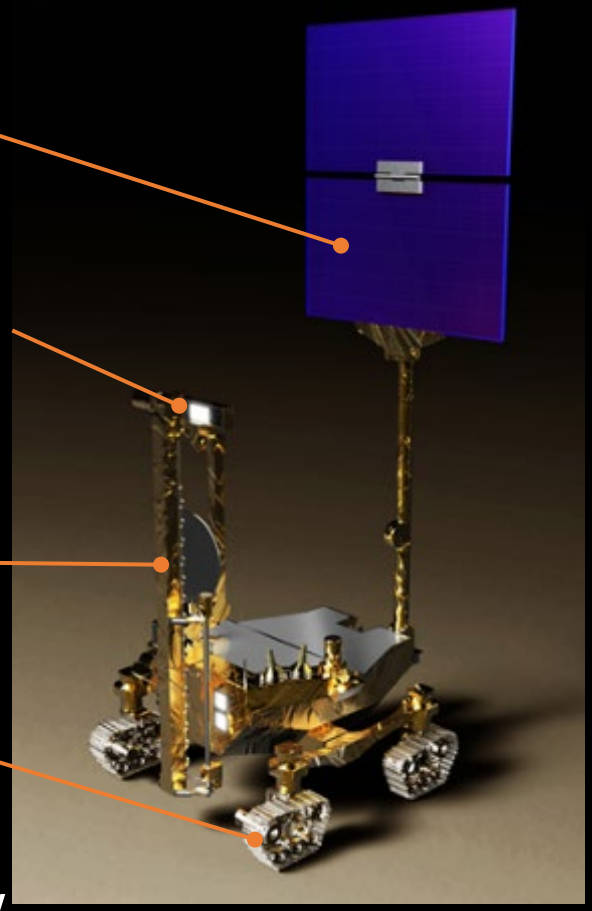
○ Objectives for LUPEX ：

- Investigate the availability of “usable” water resources on the moon
- Acquisition of technology for surface exploration of gravitational bodies

○ International Cooperation (Major Responsibilities)

Japan(JAXA) ：Launcher (H3), Rover System etc.,
India(ISRO) ：Lander System etc.,



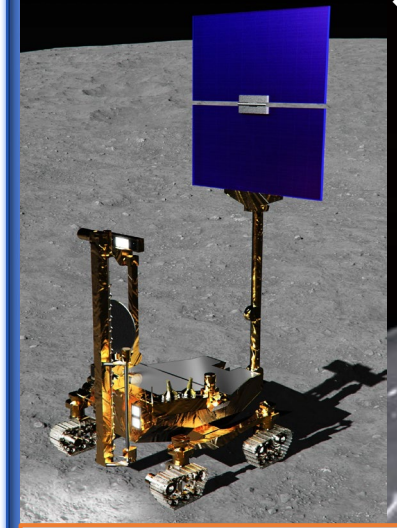


○ Rover system overview

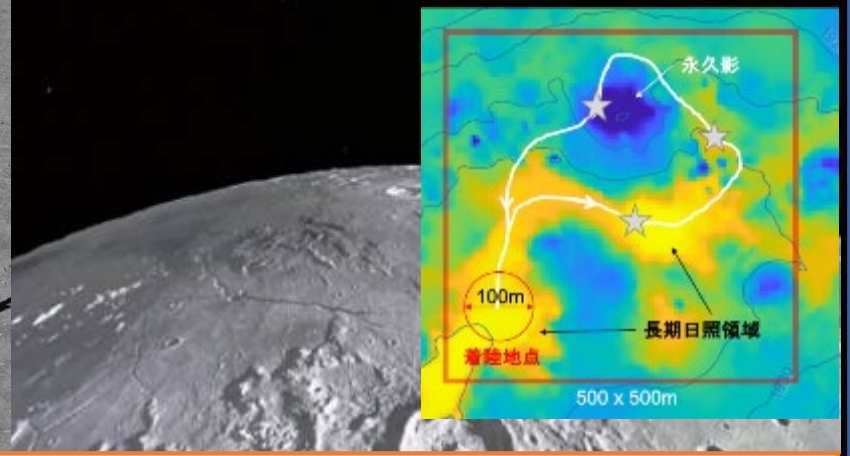
Mass	Around 350kg（including Mission Instruments）
Size	L1.75m × W1.46m × H1.50m（Launch configuration ）

3． To Pressurized Rover development

Rover System,
LUPEX



＜Moon conditions＞
◆rugged terrain (Craters, rocky mountains, regolith)
◆having few identifiable characteristics
(Desolate, monochrome)



Technology to safely and accurately move a rover to its destination in the lunar environment

Navigation Guidance and Control Technology

Driving demonstration and data acquisition in the lunar environment

Pressurized Rover

supportive use

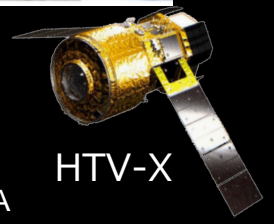
apply

TOYOTA

Automatic driving technology cultivated in ground vehicles

3. To Pressurized Rover development

International Space Station / HTV-X



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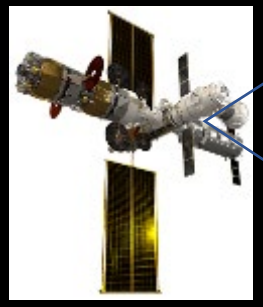
Pressurized Structure Technologies

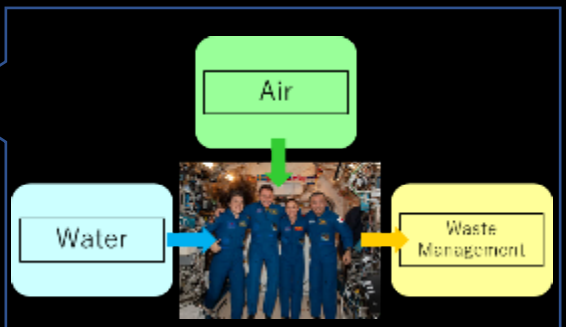
apply

Environmental Control and Life Support System Technologies

Gateway I-HAB ECLSS



Gateway



ECLSS equipments

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Pressurized Rover

4． Future plan and vision

MHI'd contribute to enhancement of human space activity


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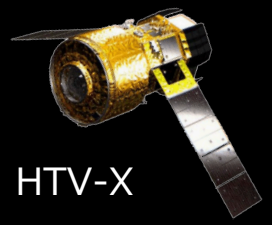
International Space Station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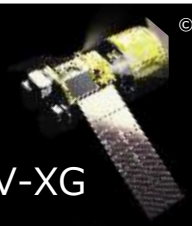
HTV-X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HTV-XG


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H-II Transfer Vehicle(HTV)

H3 Launch Vehicle

Low Earth Orbit

Lunar Orbit


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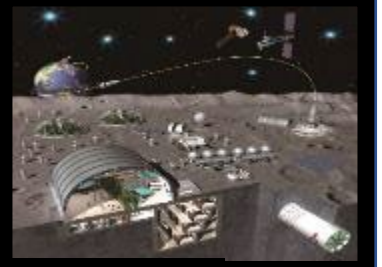
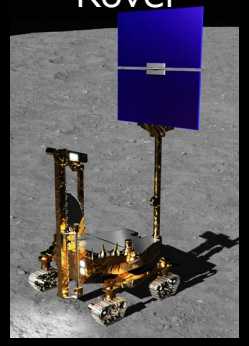
Gateway



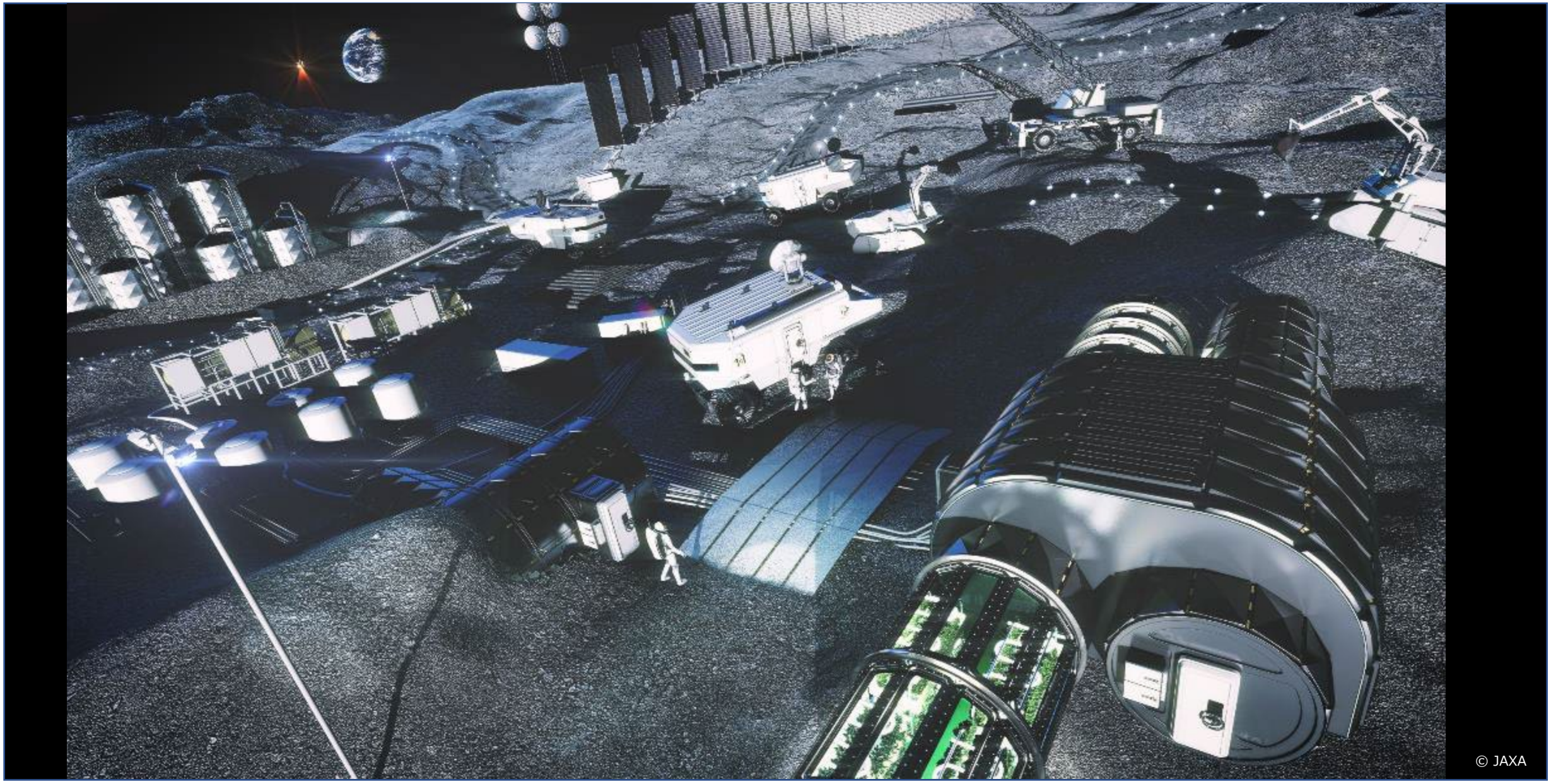
Lunar Surface

Pressurized Rover



LUPEX

4． Future plan and vision



MOVE THE WORLD FORWARD

略語集

ECLSS	:Environmental Control and Life Support System	環境制御・生命維持装置
ESA	:European Space Agency	欧州宇宙機関
HTV	:H-II Transfer Vehicle	宇宙ステーション補給機
HTV-X	:ー	新型宇宙ステーション補給機
HTV-XG	:ー	Gateway物資補給機
ISRO	:Indian Space Research Organization	インド宇宙研究機関
ISS	:International Space Station	国際宇宙ステーション
I-HAB	:International Habitation Module	Gatewayの国際居住棟
LUPEX	:LUnar Polar EXploration	月極域探査ミッション
NASA	:National Aeronautics and Space Administration	アメリカ航空宇宙局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