Japan's Current and Future Programs in Space Exploration

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JAXA's Roadmap: 2020 and beyond

2015

▲Basic Plan for Space Policy

2020

▲Tokyo Olympics and Paralympics

2025～

H-IIA

Epsilon

First H3 Launch

International launch market

Enhanced Epsilon

GCOM-C /SLATS

GOSAT-2

EarthCARE

Advanced Optical Satellite

JDRS

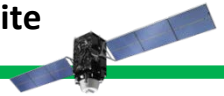
Advanced Radar Satellite

Next Engineering Test Satellite

AMSR follow-on

Social Infrastructure/ Societal Benefits

Himawari



QZSS

ISS

HTV

～2024

HTV-X

LEO and beyond LEO

KIBO Utilization

Human Space Technologies

Hayabusa2

Sample Return

Robotics Space Technologies

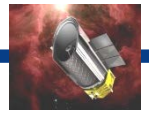
Moon, Asteroid and Mars science missions

ERG

BepiColombo

SLIM

MMX



SPICA

H3

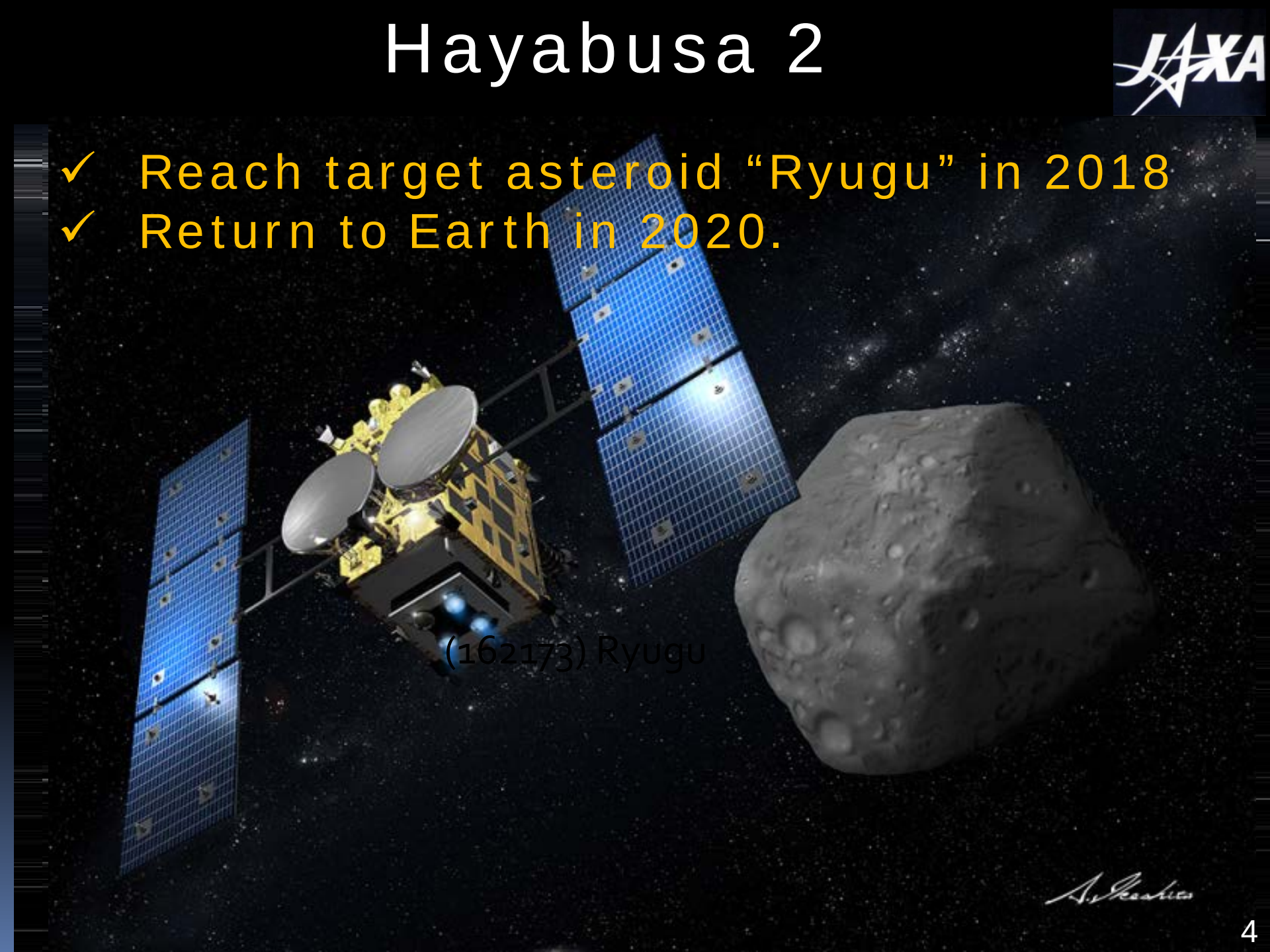
Launch in 2020

- **Launch from Tanegashima**
- **Starting engine test**

- Robust engines
- Flexible in launch service capability
- Launch cost cut by half
- High Reliability

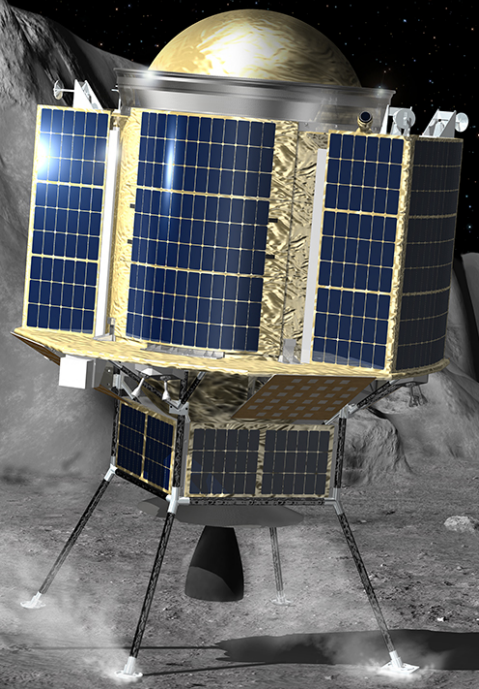
Hayabusa 2

- ✓ Reach target asteroid “Ryugu” in 2018
- ✓ Return to Earth in 2020.



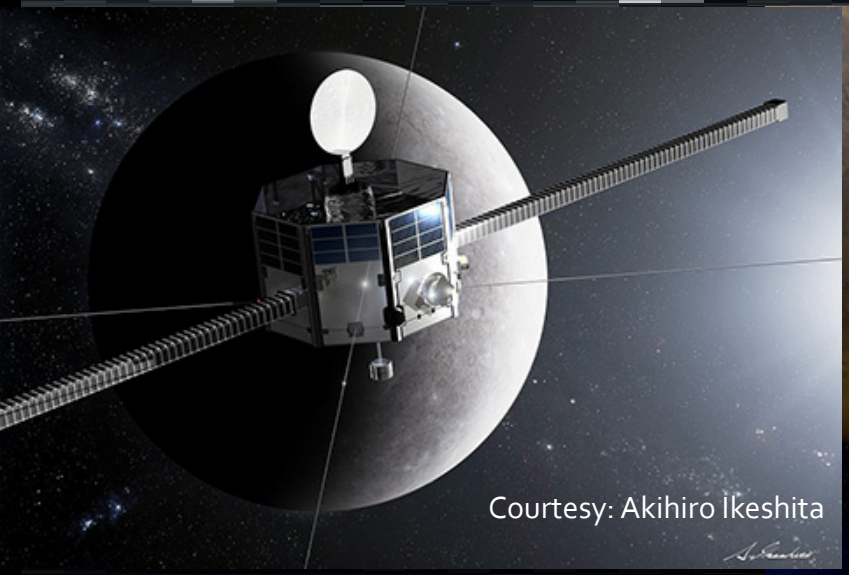
Small lunar-lander (SLIM) to pinpoint landing technology demonstration

Precursor of full-scale lunar or planetary missions



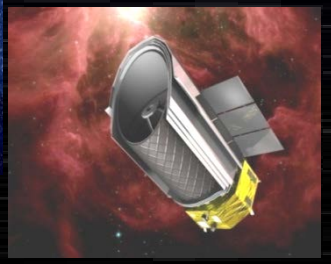
- **Image-based navigation utilizing Lunar terrain**
- **Autonomous obstacle detection**
- **Robust pin-point guidance**
- **Landing shock absorber**
- **High-performance propulsion**

Future Exploration and Science Missions



BepiColombo

Mars Moon eXploration **(MMX)**



Space Infrared Telescope for Cosmology and Astrophysics **(SPICA)**

- ✓ **BepiColombo –a joint mission between ESA and JAXA, planned to reach Mercury in 2024.**
- ✓ **After 2020, MMX, a sample return mission to the two moons of Mars, and SPICA, a joint astrophysics mission with Europe, are JAXA's top priority missions, although still in concept phase.**

HTV-X: ISS Cargo Transportation

HTV

HTV-X

Launch in FY2021 by H3 Rocket

- ✓ **Leverage technology with international advantage; enhance transport capability and operability, while reducing cost**
- ✓ **Technology demonstration using ISS cargo transportation opportunities**
- ✓ **Use for potential future missions**

JAXA's Space Exploration: 2020 and beyond

2015 2020 2025～

LEO

Space Exploration Technology Demonstration using ISS such as ECLSS, Radiation Monitoring, Space Medicine, etc.

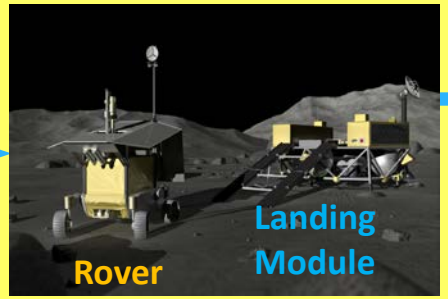
HTV-X will be leveraged for future LEO activity and Cis-Lunar mission

Moon

Cis-Lunar Missions preparing for Moon and Mars

Step wise lunar missions for key technologies such as landing, roving and robots.

SLIM
(Pin point Landing Tech Demo)



Water ice prospecting mission to the pole

Lunar Exploration with Partners

Mars & Asteroids

Top science missions using Hayabusa heritage

Hayabusa2

Phobos/Dimos Sample Return Mission(MMX)

ISS Kibo as a Test-Bed to Demonstrate On-Orbit Technology For Future Exploration

Radiation Measurement

PADLES (Passive Dosimeter for Life-Science Experiments in Space)

- Compact / battery-less passive dosimeter
- High accuracy

PS-TEPC (The Position Sensitive Tissue-Equivalent Proportional Counter)

- Real-time measurement of Linear Energy Transfer

Environment Control and Life Support System (ECLSS)

JAXA's ECLSS Goals

- ✓ **No water and oxygen supply**
- ✓ **No consumables**
- ✓ **High Reliability**

Water Recovery System

Air-Recycling System

Water Recovery System

- Recovery Rate exceeding 85%
- Low-Power System
- Small / Light weight

Air- Recycling System

- Low temperature CO2 Reduction
- Cathode-Feed type water electrolysis (O2 Generation)
- Methan Decomposition

Three Research Areas for Exploration

As a joint endeavor with the private sector.

Exploration technology in a wide range of unexplored areas

- Target: Actualize wide-ranging yet in-depth exploration of unexplored areas by distributing functions through multiple small spacecraft.

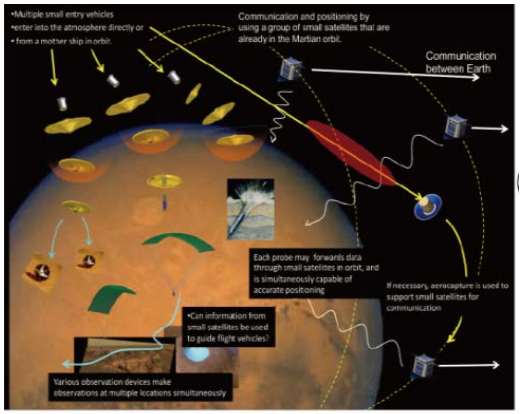


Image of cooperative exploration with multilanders

Automatic and autonomous exploration technology

- Target: Development of the construction technology for space bases to be constructed on the Moon and Mars in the future.

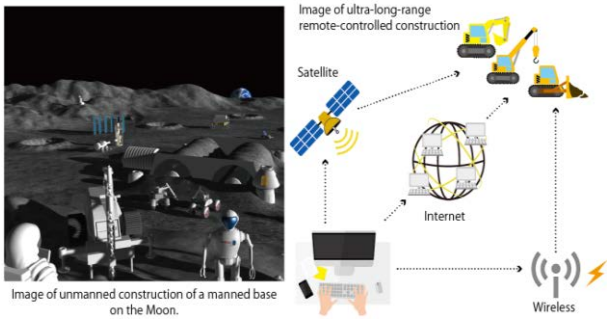
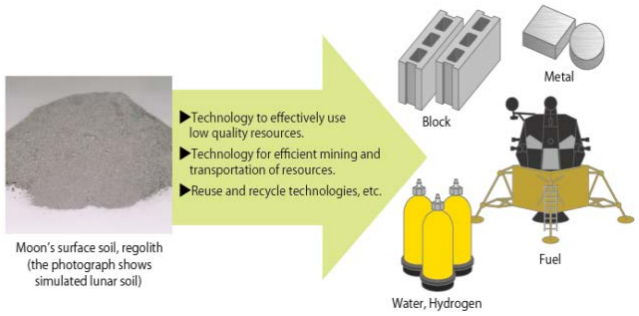


Image of unmanned construction of a manned base on the Moon.

In-situ resource utilization (ISRU) technology

- Target: A paradigm shift from “shipping all necessities from Earth” to “procuring necessities on site”.



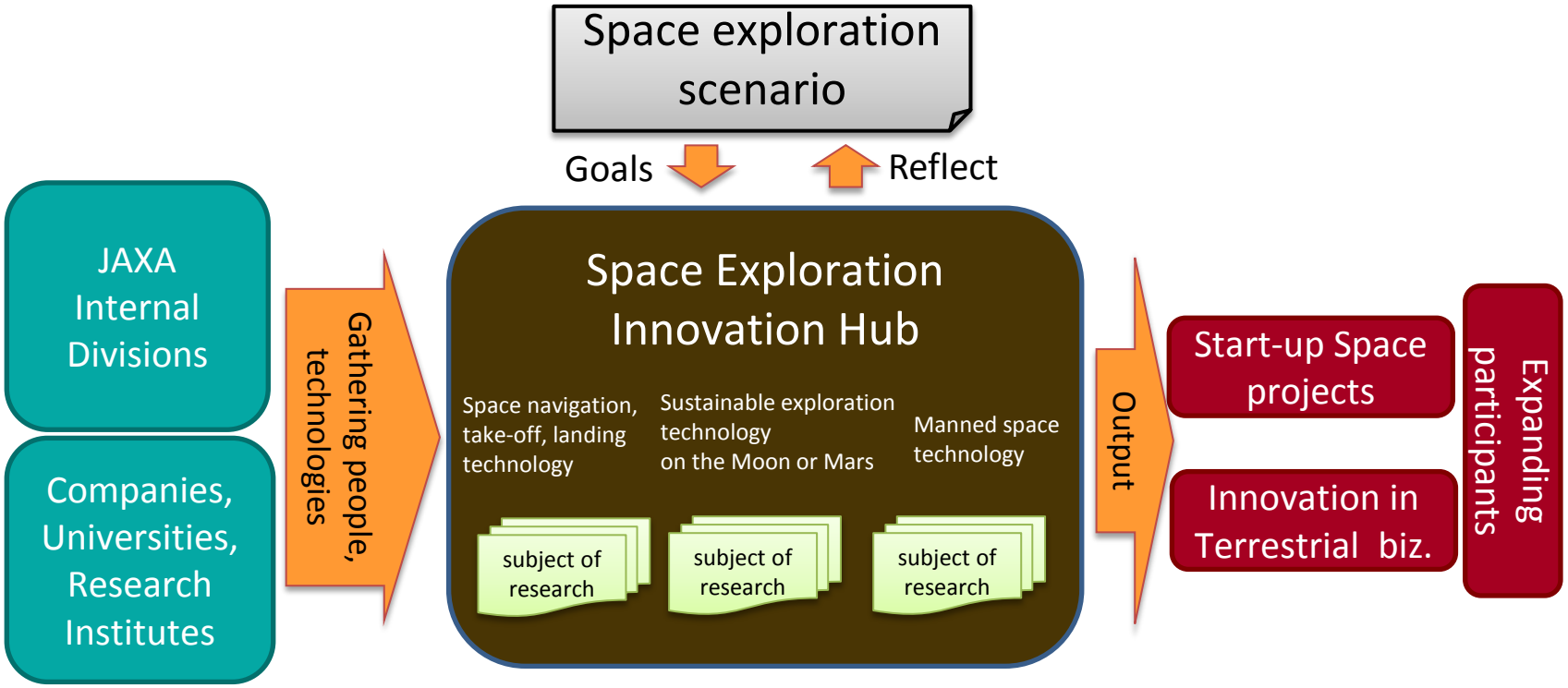
Moon's surface soil, regolith (the photograph shows simulated lunar soil)

JAXA Space Exploration Innovation Hub Center

- A new organization within JAXA starting from April 1, 2015.
- Aspiring towards open innovation through space exploration related researches.

Tansa

Technology Advancement Node for SpAce eXploration



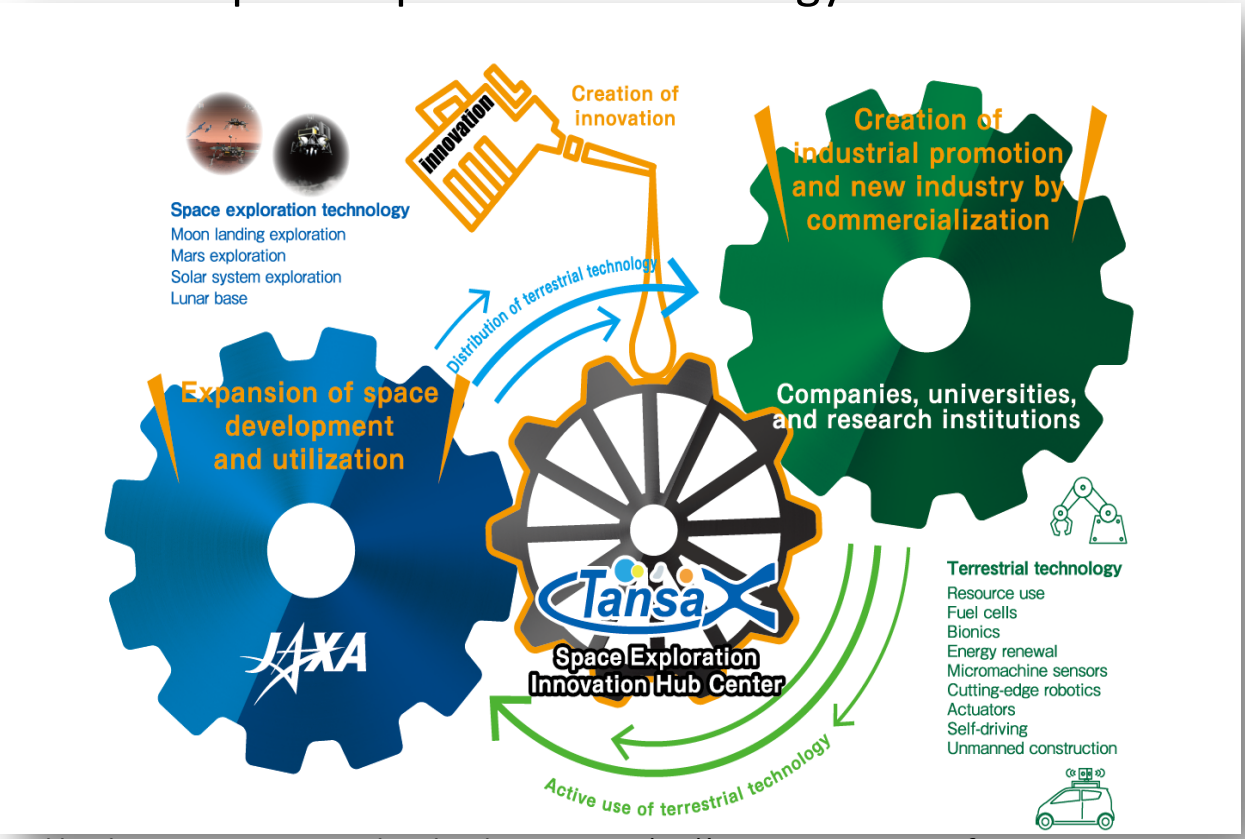
Innovation in Space and on Earth

Space exploration technology

- Expansion of space development and utilization.
- Active use of terrestrial technology.

Terrestrial technology

- Creation of industrial promotion and new industry by commercialization.
- Distribution of space exploration technology.



Sponsored by the Japan Science and Technology Agency (JST)'s support program for starting up innovation hub

Space Exploration as a Global Endeavour

Space Exploration Dialogues at Global Level

- 2nd International Space Exploration Forum (ISEF-2)
  - Hosted by the Government of Japan, JAXA
  - Early 2018 in Tokyo
  - Will bring together Ministers and high-level officials from approximately 50 nations to discuss the opportunities and challenges they share.

Global initiatives toward promoting space exploration

- **IAF Global Space Exploration Symposium (GLEX)** Beijing, June 2017
- **UNISPACE-50, June 2018**

  Global partnership in space exploration and innovation
- **+ other initiatives including ISECG**

JAXA
Explore to Realize

Tansa
Technology Advancement Node for
SpAce eXploration