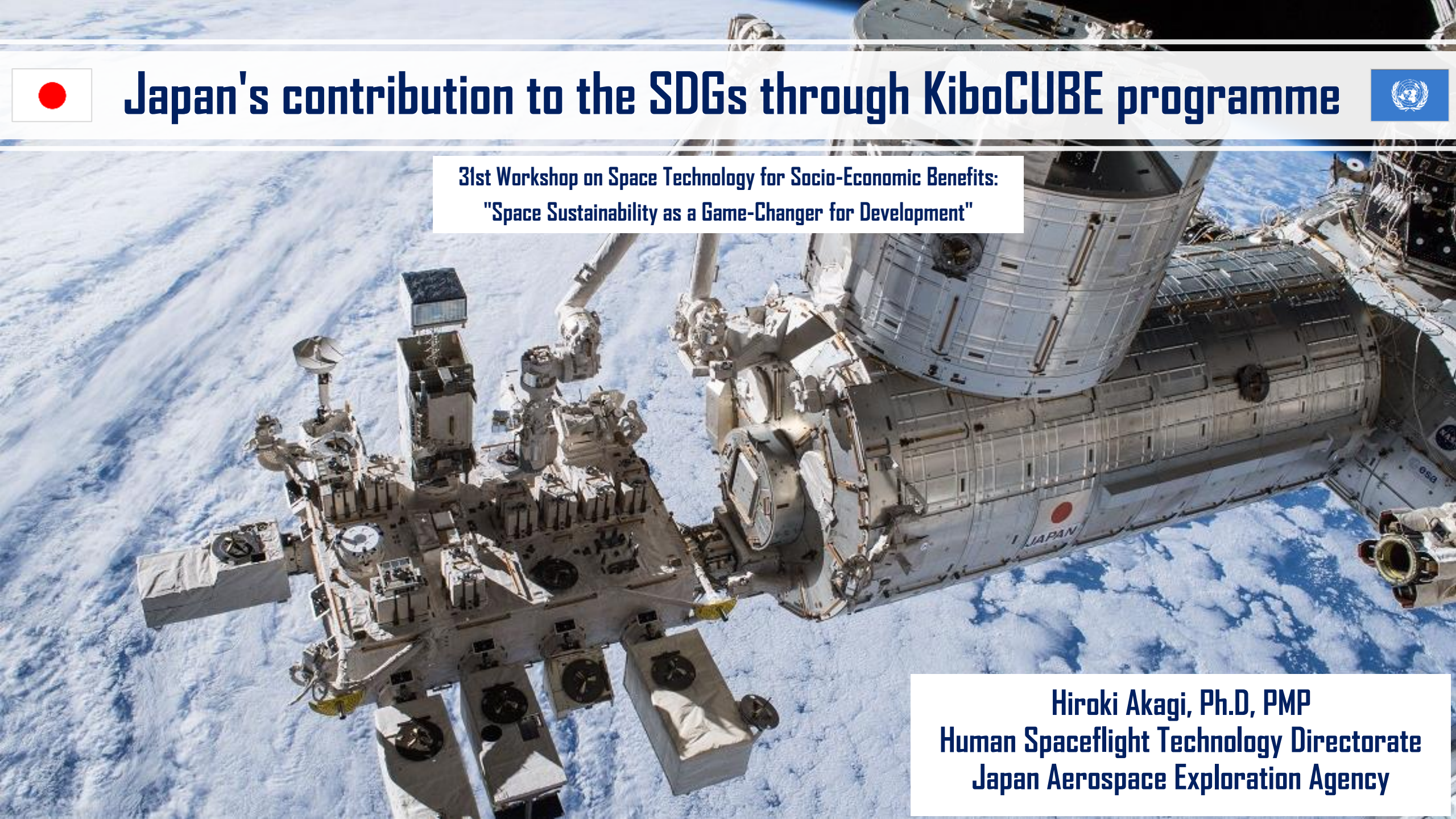
# Japan's contribution to the SDGs through KiboCUBE programme

31st Workshop on Space Technology for Socio-Economic Benefits:
"Space Sustainability as a Game-Changer for Development"

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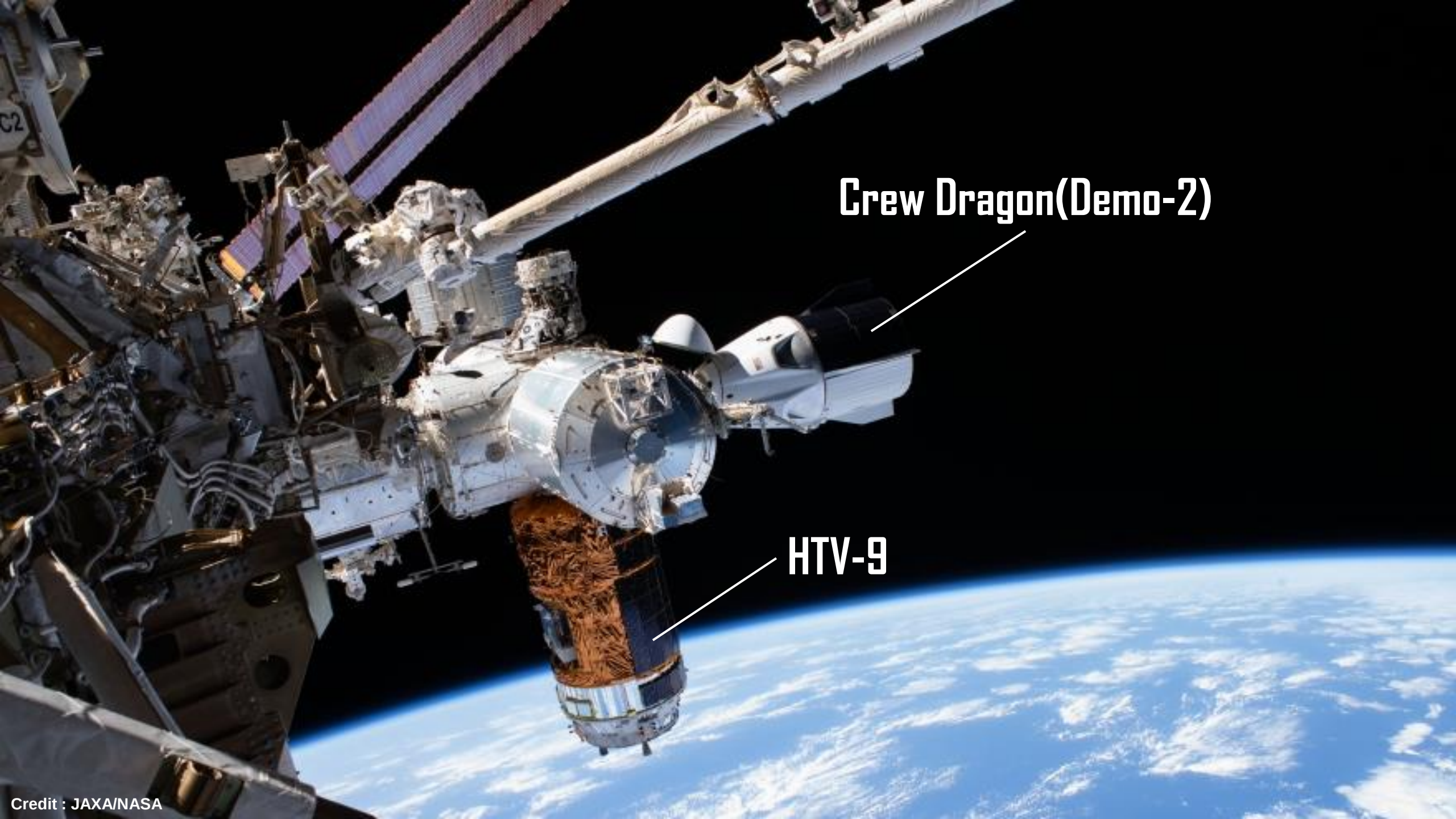
Japan Aerospace Exploration Agency

International Space Station Program

# Japan's Capabilities and Contributions

- ISS is a huge manned construction located about 400km above the Earth.
- 15 countries participate in the ISS program
- Japan strives to make concrete international contributions through extensive utilization of Kibo and HTV/HTV-X.

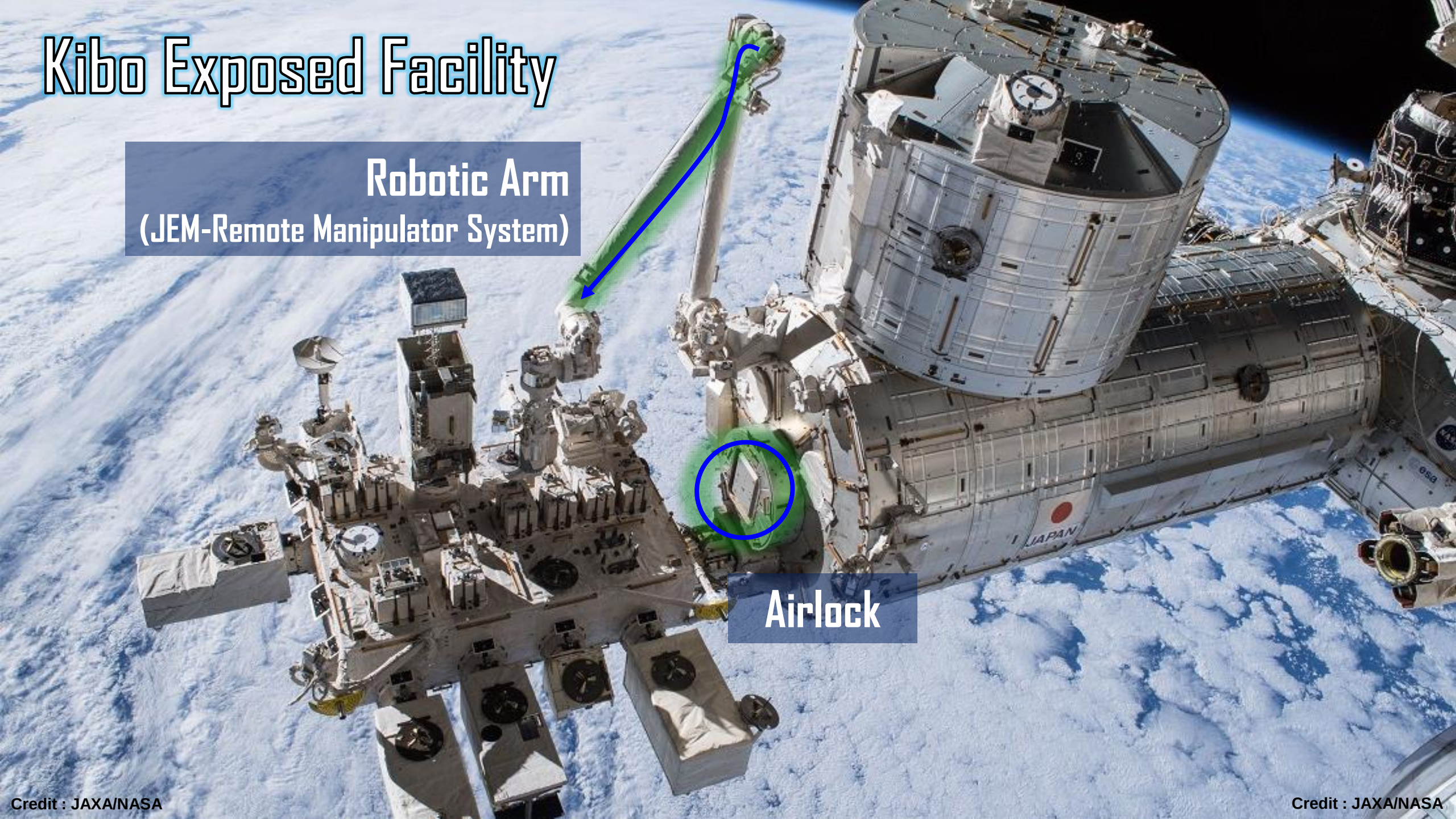
Credit : JAXA/NASA




Credit : JAXA/NASA

Credit : JAXA

# Kibo Exposed Facility




Credit : JAXA/NASA

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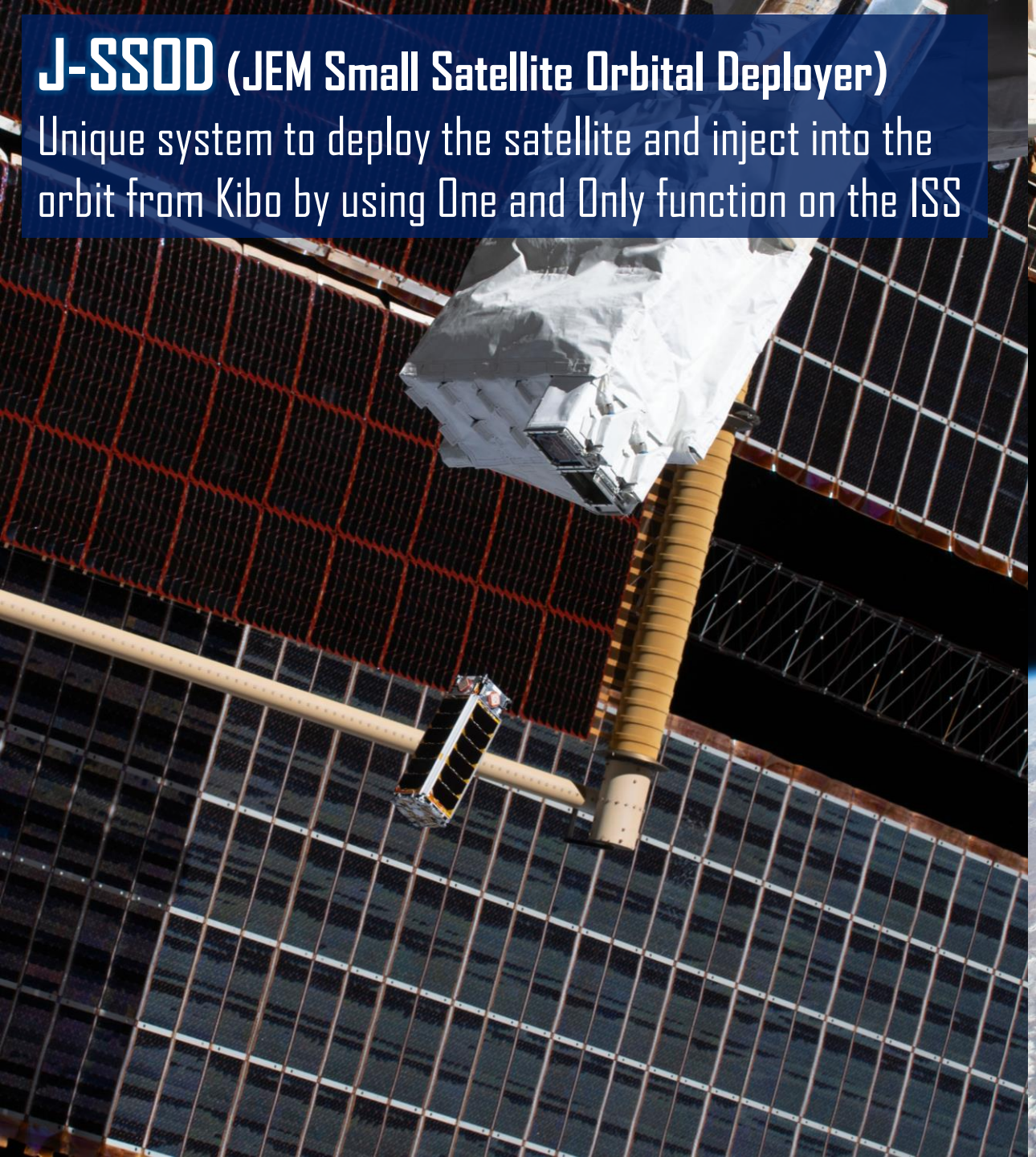
# J-SSOD (JEM Small Satellite Orbital Deployer)

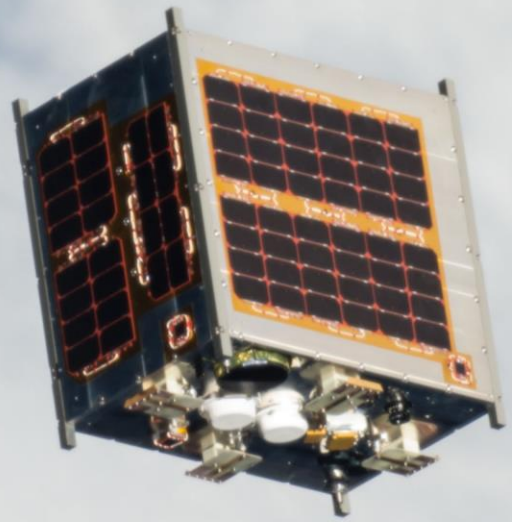
Unique system to deploy the satellite and inject into the orbit from Kibo by using One and Only function on the ISS



Since the satellites installed into J-SSOD will be transported to the ISS as pressurized cargo, Dust, Toxic, or Biological Hazardous Material evaluations are conducted before launch for human spaceflight safety. It's Eco-Friendly Satellite.

Credit : JAXA/NASA

# Small Satellite



## Extremely Low-cost (more than 200 M$ → less than 5 M$ )

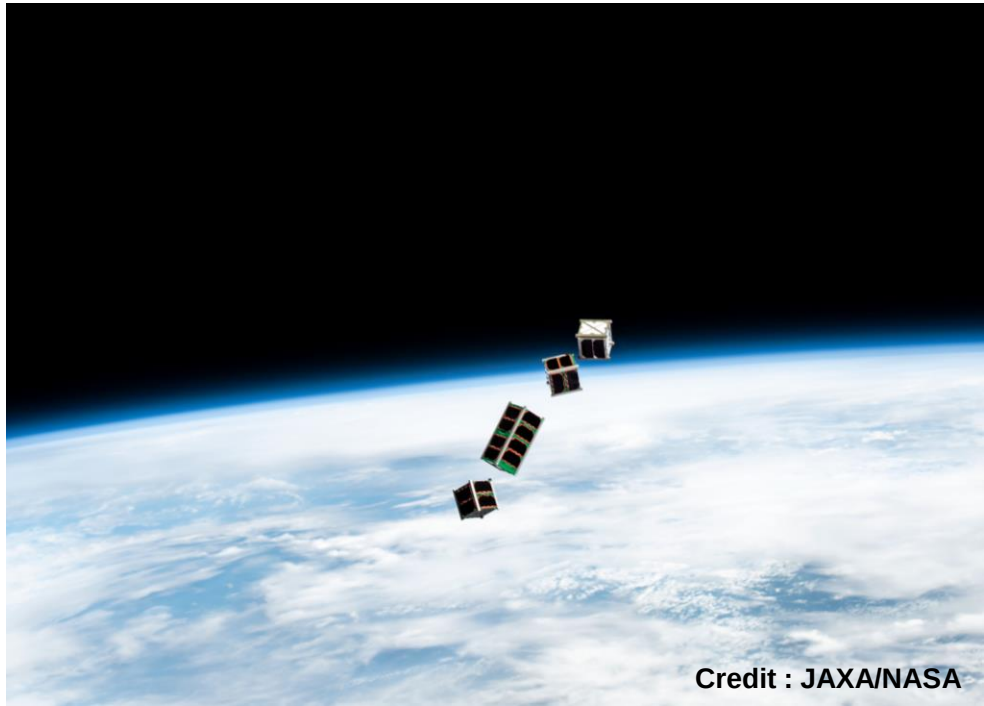
- New players are welcome to join (enterprises, local governments, developing countries etc.)
- Great opportunity for education tools and challenging missions

## Short Turn Around Life Cycle (more than 5 years → less than 1-2 years)

- College students can experience whole development cycle
- Curriculum can be standardized as sustainable program
- Quick return on your business investments, technology demonstration

## Cost-Effective Method for Various Missions

- Practical remote sensing data can be obtained from small satellites

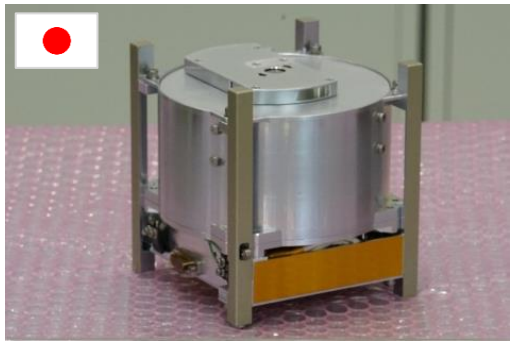


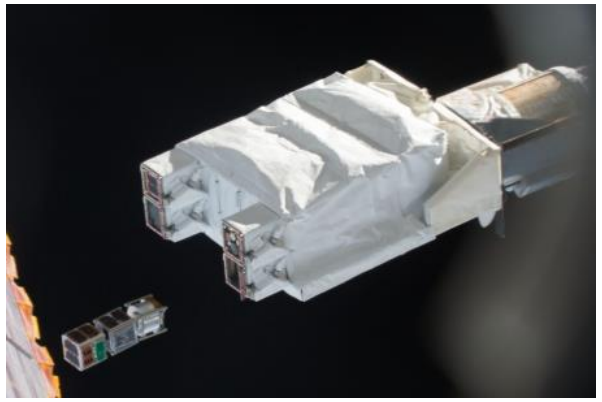
Credit : JAXA/NASA

# Small Satellites which were deployed from J-SSOD

## Contribution to Space Sustainability

## FREEDOM





Mission: Demonstrate a thin film deployment mechanism called the De-Orbit Mechanism (DOM) for space debris prevention, and includes deployment of the thin film, early de-orbiting, and tracking of its orbit transition. Developed by Nakashimada Engineering Works/Tohoku Univ.

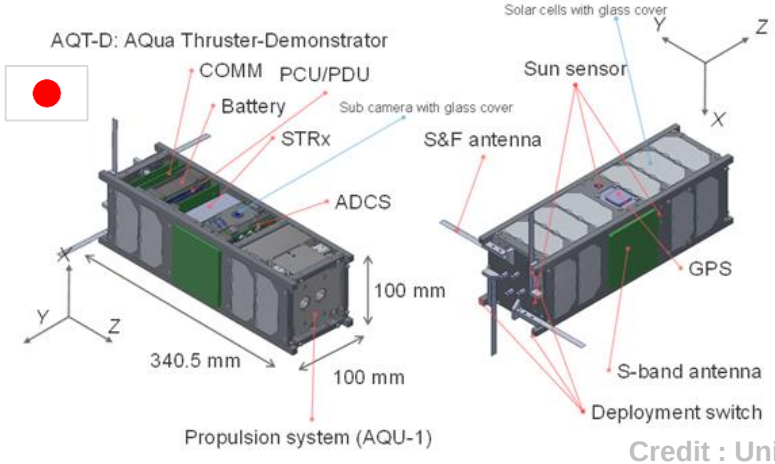
**Specification for J-SSOD platform**

| Item | Specification |
|---|---|
| Satellite Size | CubeSat : 1U, 2U, 3U or 6U (*1)<br>50 kg class satellite: 55×35×55 cm |
| Satellite mass | CubeSat : 1.33 kg or less per 1U<br>50 kg class satellite: 50kg or less |
| Orbital altitude | approximately 380 - 420 km (*2) |
| Inclination | 51.6° |
| Deployment direction | Nadir-aft 45° from the ISS nadir side |
| Deployment velocity | CubeSat : 1.1 - 1.7 m/sec<br>50 kg Microsat : 0.4 m/sec |
| Ballistic coefficient | 100kg/m$^2$ or less |
| Life expectancy on orbit | About a year (*3) |

**Contribution to space debris mitigation**

*1) CubeSat specification:
For 1U,2U and 3U: 10cm(W)×10cm(D) Height: 1U: 10cm, 2U: 20cm, 3U: 30cm
For 6U: 10cm(W)×20cm(D) ×30cm(H)
*2) Depends on ISS altitude.
*3) Depends on ballistic coefficient, altitude at deployment, solar activity, etc.

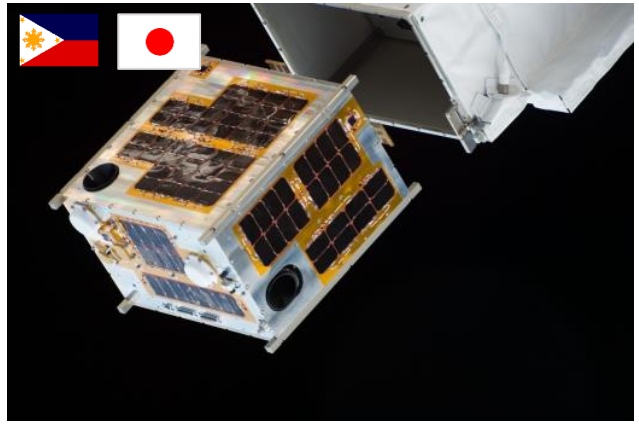
## AQT-D(Aqua Thruster-Demonstrator)




Credit : Univ. of Tokyo

Mission: 3U CubeSat for demonstrating the water resistojet propulsion system developed by the University of Tokyo.

## DIWATA-1

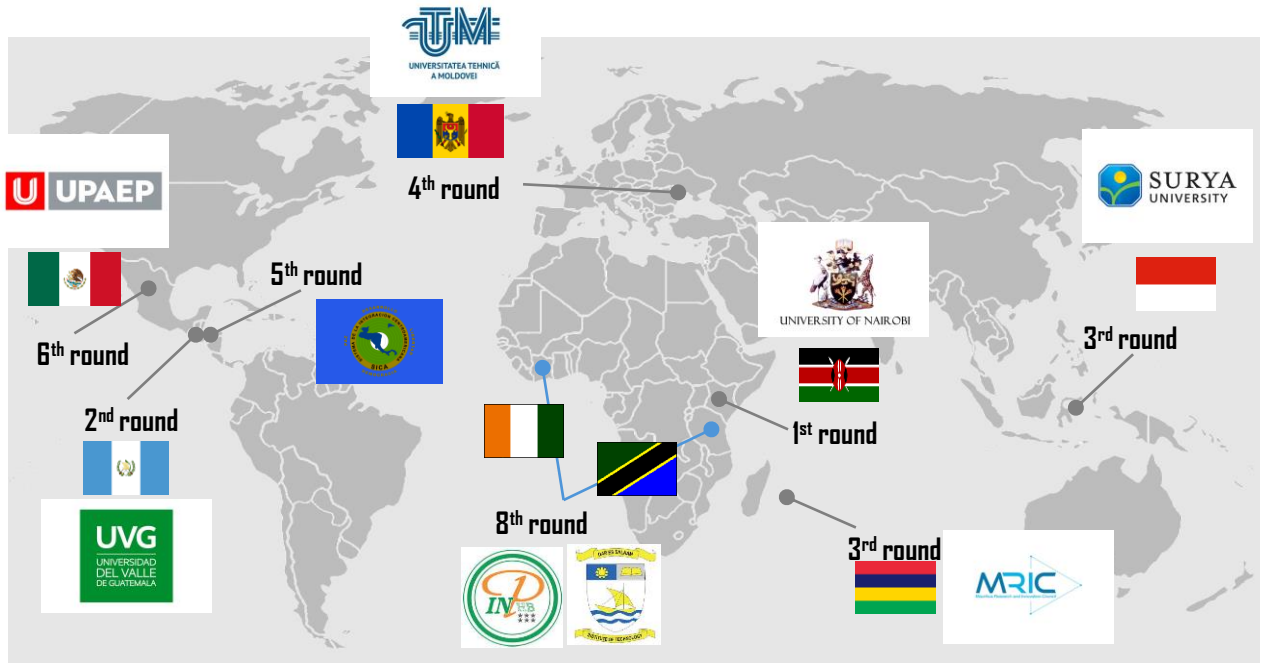


Snapshot of Banana farm, Mindanao, the Philippines
(provided by PHL-MICROSAT, DIWATA-1)

The microsatellite was developed by Tohoku University, Hokkaido University, the Department of Science and Technology (DOST) of the Republic of the Philippines and the University of the Philippines Diliman under the DOST-funded research program, "Development of the Philippine Scientific Earth Observation Microsatellite (PHL-MICROSAT) ."

# UNOOSA-JAXA Cooperation "KiboCUBE"

**Collaboration between UNOOSA and JAXA to offer small satellite deployment opportunities from Kibo in order to facilitate improved space technologies in developing countries.**





Announcing the first round of the KiboCUBE program at the International Astronautical Congress (IAC) in September 2016.

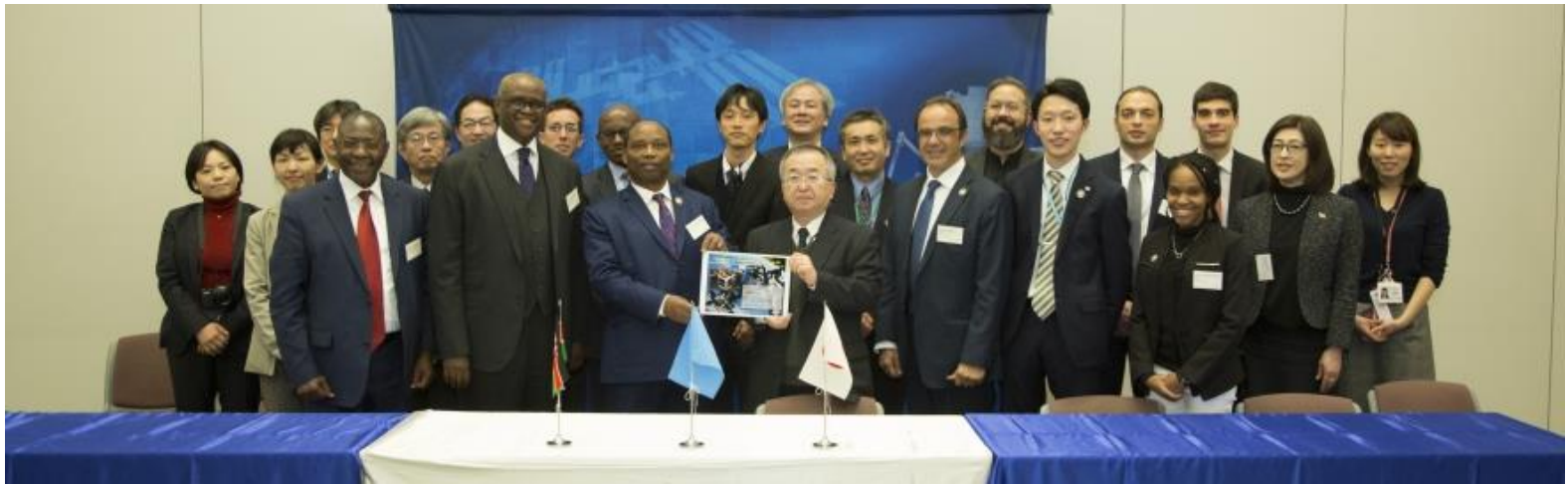

Announcing the third round of the KiboCUBE program at the International Astronautical Congress (IAC) in October 2018.


Announcing the second round of the KiboCUBE program at the IAC in September 2017.

Guatemalan team are ready for launch to the ISS, Guatemalan Cubesat "Quezal-1", in 2020

One of the selection criteria;
Compliance with the **Space Debris Mitigation Guidelines** and **Guidelines for the Long-term Sustainability of Outer Space Activities**.

# UNOOSA-JAXA Cooperation "KiboCUBE"

# Japan's contribution to the SDGs through KiboCUBE programme

# UNOOSA-JAXA Cooperation "KiboCUBE"

## KiboCUBE Academy: An activity under the educational component of the UNOOSA Access to Space for All initiative

This cooperation is between UNOOSA and JAXA with the support of UNISEC Global. KiboCUBE Academy provides theoretical knowledge to develop, operate, and utilize small satellites for future KiboCUBE applicants, but also to anyone who is interested in CubeSat development.



KiboCUBE Academy onsite event at Tunisia, in 2022 during TICAD8.

KiboCUBE Academy onsite event at Baku, Azerbaijan, in 2023

LECTURE 0


Introduction to KiboCUBE Academy ( pdf and video ) *updated in April 2023

LECTURE 1


Introduction to Small Satellite Mission and Utilization ( pdf and video ) *updated April 2023

LECTURE 2


CubeSats for Capacity Building ( pdf and video )

LECTURE 3


Overview of Project Management of Satellite Development ( pdf and video)

LECTURE 4


Systems Engineering for Micro/nano/pico-satellites ( pdf and video )

LECTURE 5


Introduction of Safety Review Process ( pdf and video )

LECTURE 6


CubeSat Design for Safety Requirements ( pdf and video ) *updated April 2023

LECTURE 7


Introduction to CubeSat Technologies ( pdf and video )

LECTURE 8


Subsystem Lecture for CubeSat: Power Control System ( pdf and video )

KiboCUBE Academy Wbiners

# Thank you for your kind attention