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Deployment Service for CubeSats from ISS

Tatsuhito Fujita

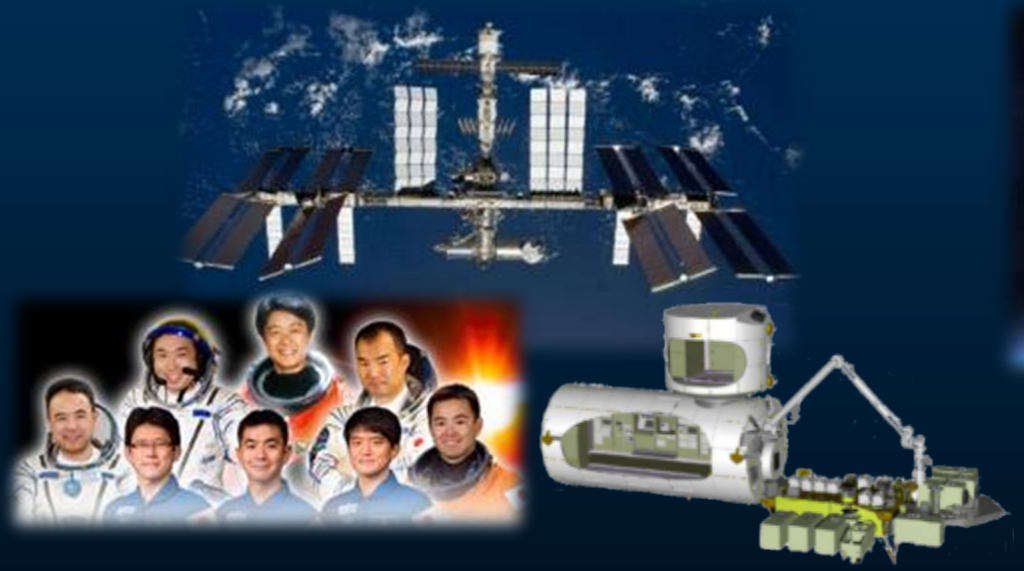
JEM Utilization Center
Human Spaceflight Technology Directorate
Japan Aerospace Exploration Agency (JAXA)

Japan Aerospace Exploration Agency

- The core implementing agency to support the Japanese government's development and utilization of space with technology.

Space Transportation

Human Space Activities

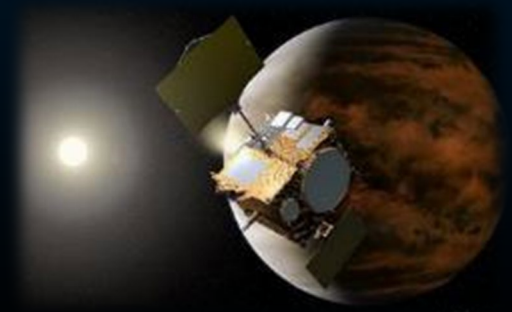


Satellite Program

Aviation Program

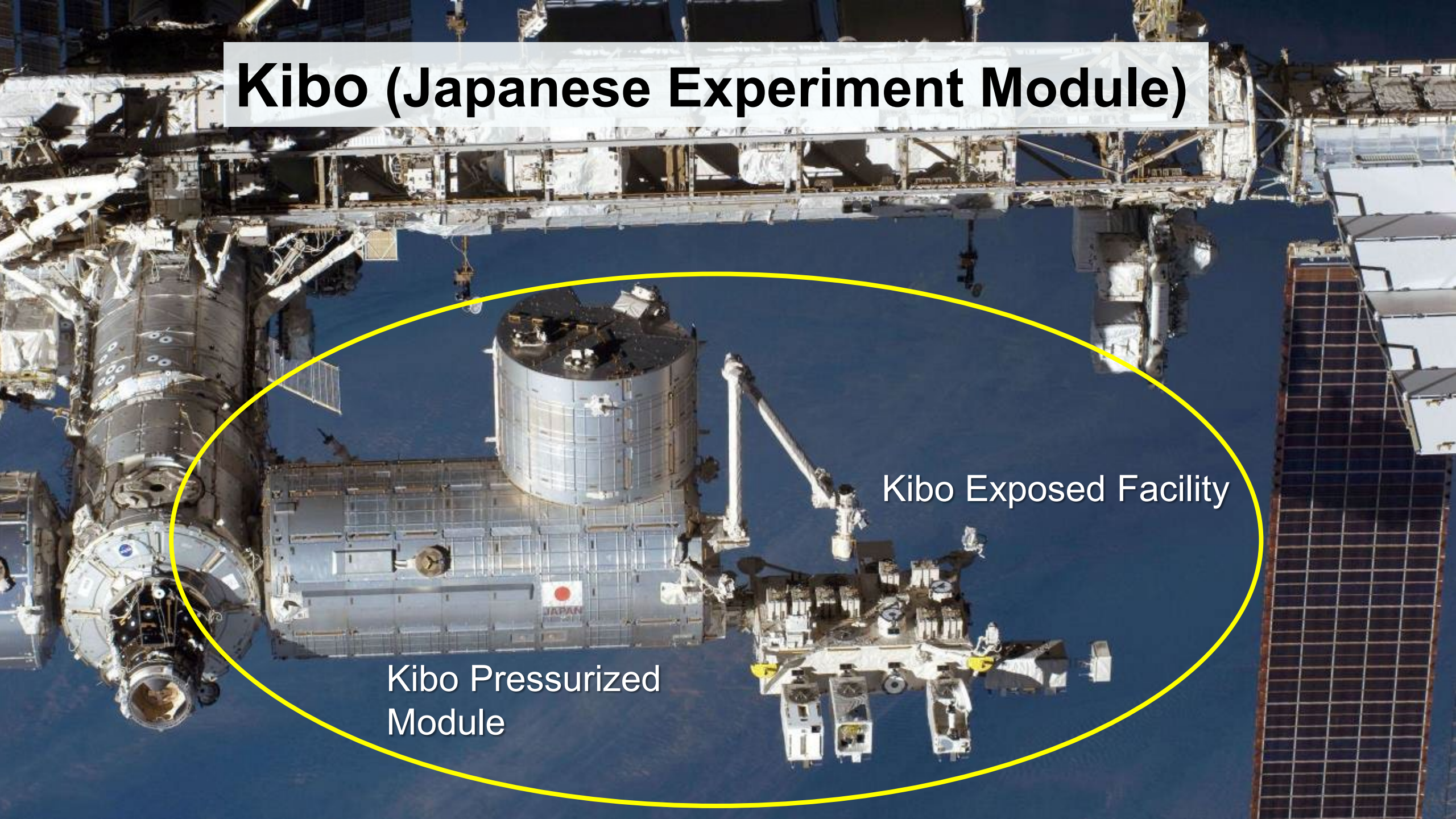
Space Science

Lunar & Planetary Exploration Program



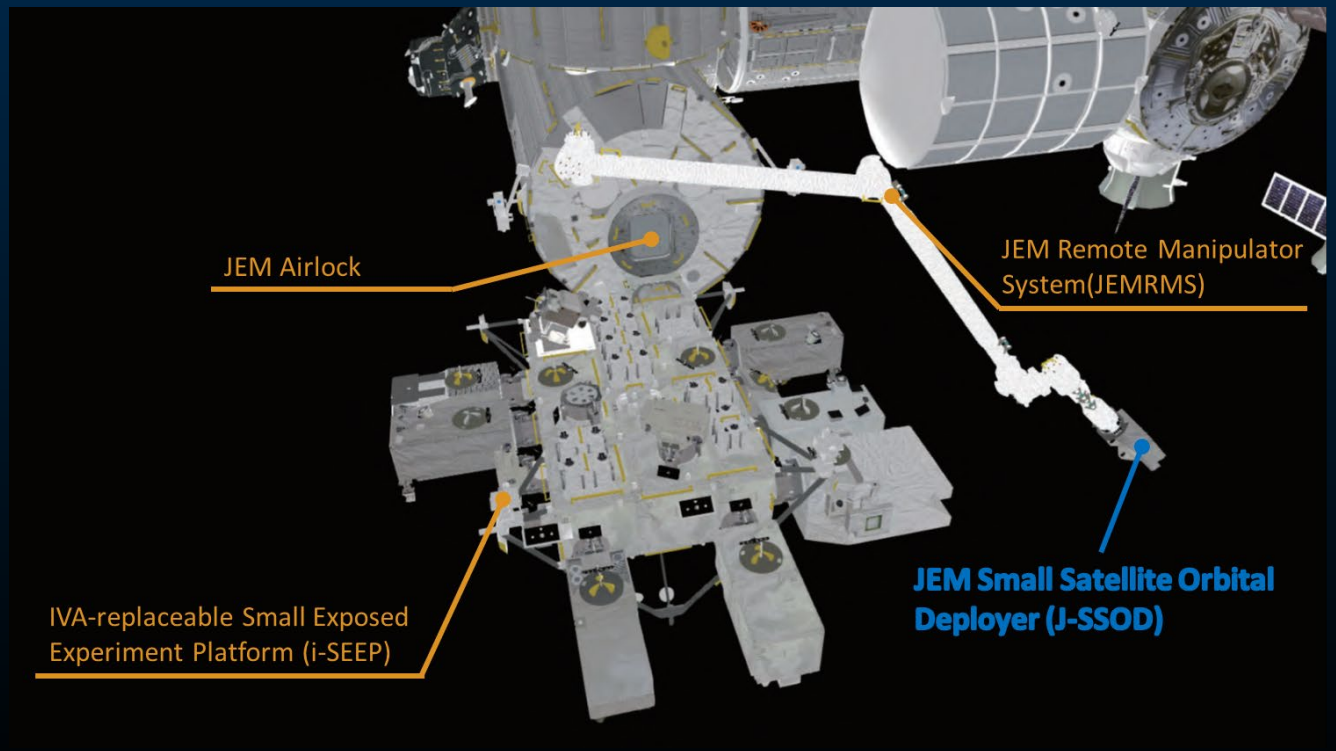
International Space Station

Kibo (Japanese Experiment Module)



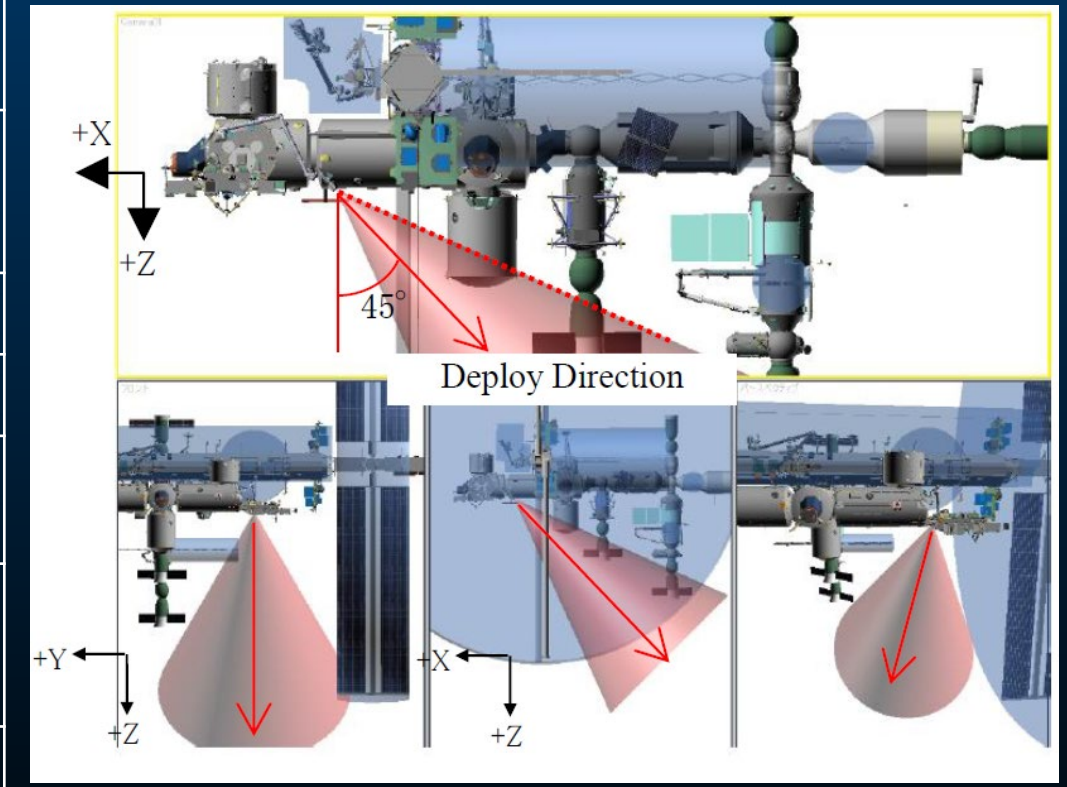
Kibo Exposed Facility

- Kibo has a unique Exposed Facility (EF) with an Airlock (AL) and a Remote Manipulator System (JEMRMS) and a high capacity to exchange experimental equipment.
- JEM Small Satellite Orbital Deployer has been operated to deploy the satellite from 2012.



Specification of J-SSOD

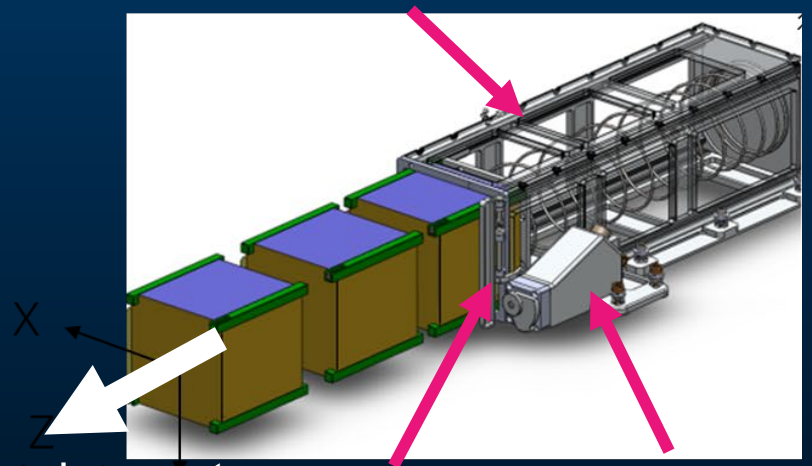
Item	Specifications
Satellite size	CubeSat: 1U*1, 2U, 3U, 4U, 5U, 6U, W6U 50-kg class satellite: 55 × 35 × 55 cm
Satellite mass	CubeSat: 1.33 kg or less per 1U 50-kg class satellite: 50 kg or less
Orbital altitude	approximately 380 - 420 km*2
Inclination	51.6°
Deployment direction	Nadir-aft 45° from the ISS nadir side
Deployment velocity	CubeSat: 1.1 - 1.7 m/sec. 50-kg Microsat: 0.4 m/sec.
Ballistic coefficient	CubeSat: 120 kg/m^2 or less*3 50-kg Microsat: 100 kg/m^2 or less*3



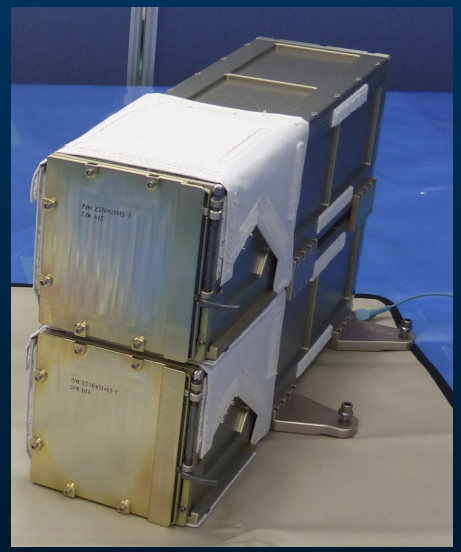
*1) CubeSat specifications:1U : 10 cm (W) x 10 cm (D) x 10 cm (H)
*2) Depends on the ISS altitude.
*3) Depends on the ballistic coefficient, altitude at release, solar activity, etc.

Deployment Mechanism of J-SSOD

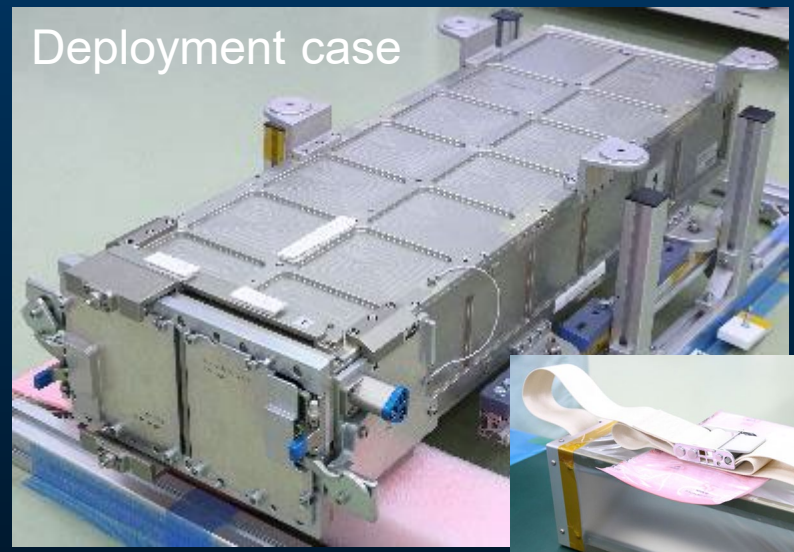
The spring mechanism

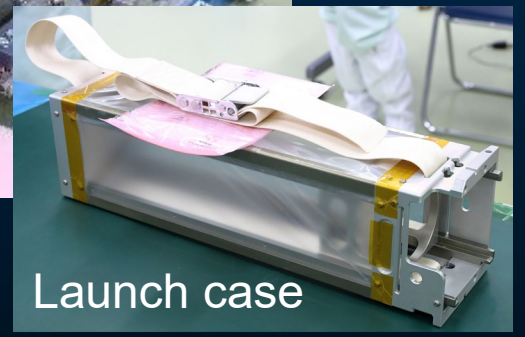


J-SSOD case(Twin type)



J-SSOD-R case



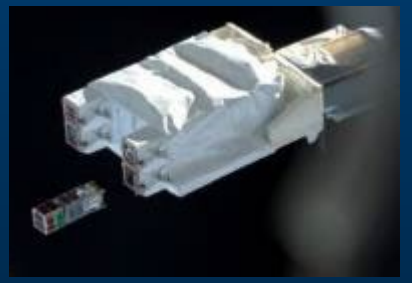


- The spring mechanism and the separation mechanism are installed on the J-SSOD case to deploy the satellites.
- A new deployment case (J-SSOD-R), which can be used repeatedly and can release 6U satellites in a slot.

Support from the ground





Flight Control Team
and
Engineering Team

Requirement of J-SSOD and Safety Review

◆ Requirement of J-SSOD

- JEM Payload Accommodation Handbook -Vol.8-
  Small Satellite Deployment Interface Control Document(JX-ESPC-101133)
- https://humans-in-space.jaxa.jp/kibouser/library/item/jx-espc_8e_en.pdf

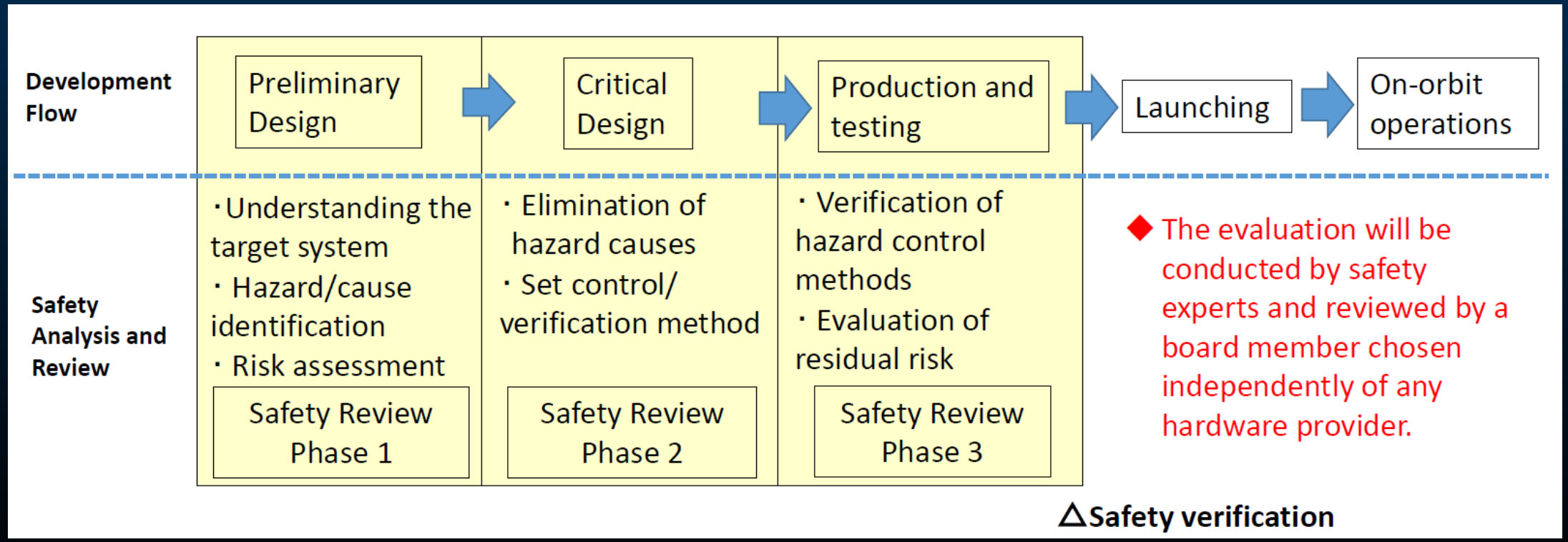
◆ Safety Review in ISS

- JAXA is responsible for guaranteeing the safety of the Japan Experiment Module (JEM, also called Kibo), the Visiting Vehicle, and other payloads.
- The JAXA Safety Review Panel, chaired by the Director of Human Space Safety and Mission Assurance Office under the Safety Review Board, will review human systems, including experimental payloads.
- According to the System Safety Standard and the Safety Review Process Requirements, risks will be minimized as much as possible by managing hazards.

Requirement of J-SSOD and Safety Review

◆ Proceed of Safety Review

- Hazards that may loss of the ISS and directly harm crews or indirectly harm crews by damaging safety-related systems should be identified early in the design process.



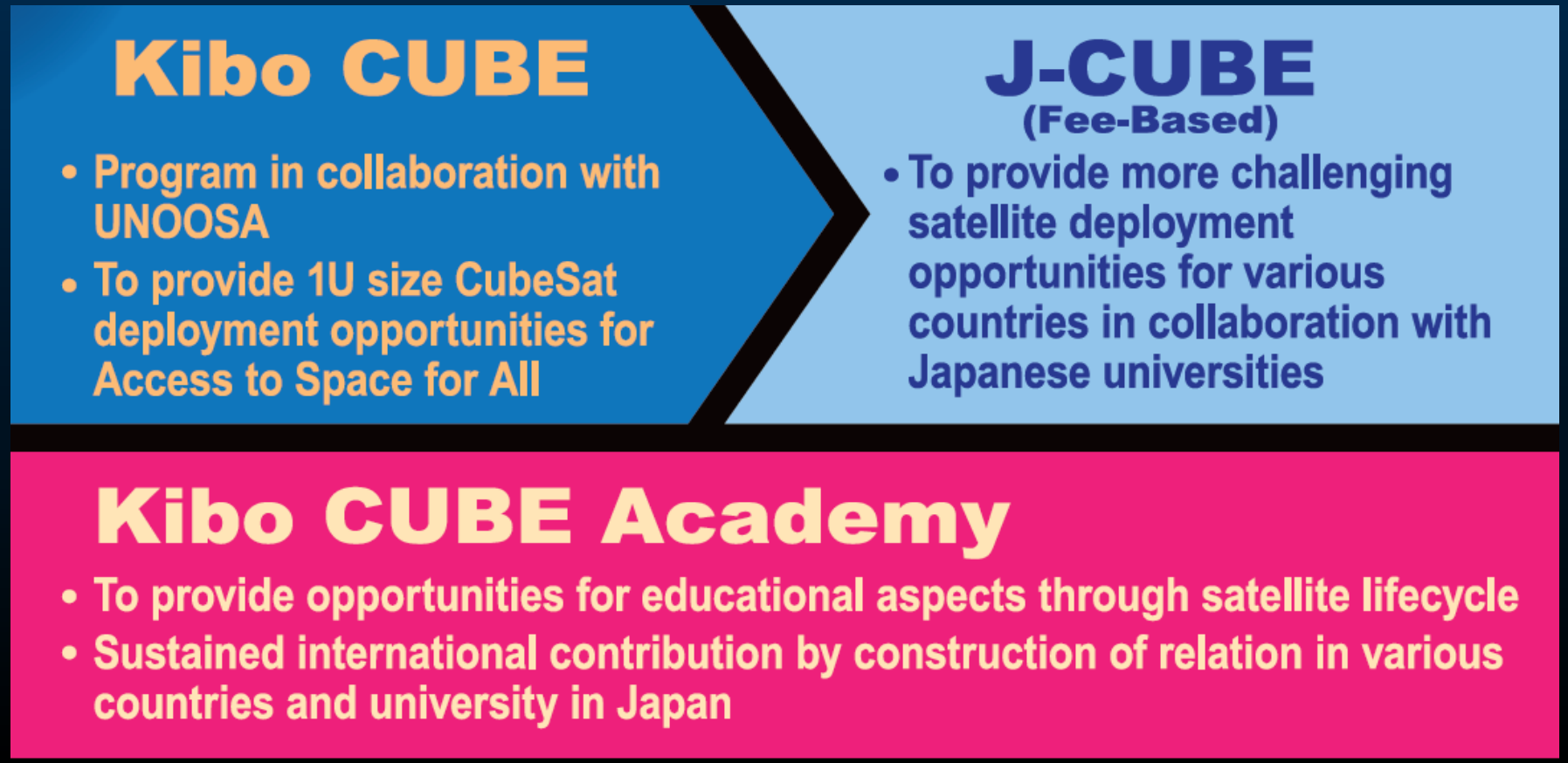
Deployment Achievements from J-SSOD

- Cubesats from 31 countries were deployed using J-SSOD.
- 86 Cubesats were successfully deployed from J-SSOD from 2012 to 2024.

- NASA and the U.S. private sector can operate the satellite deployment missions from Kibo. Including these deployment, **354** satellites have been successfully deployment from Kibo by August 2024.

Capacity building through J-SSOD

- JAXA has provided the opportunities of satellite deployment to various countries as a gateway for sharing the values of ISS/Kibo for the purpose of enhancing satellite development and operation technology.
- JAXA launched new comprehensive capacity building measures to provide the educational programs and sustainable satellite deployment opportunities, which finally contribute the SDGs Goal 4, 8 and 9.



KiboCUBE Academy (Webinar based Education Program)

- JAXA and UNOOSA launched the KiboCUBE Academy and posted a series of on-line lectures on the UNOOSA website in order to enhance opportunities for the educational aspects of the satellite development, its operation, the project managements and systems engineering.
- JAXA also provided the technical consultations for potential applicants of KiboCUBE by the collaboration with University Space Engineering Consortium (UNISEC-Japan).
- You can find webinars on a “webinar” section of the following website;

https://www.unoosa.org/oosa/en/ourwork/access2space4all/SatDevTrack_Webinars.html

List of On-line Lecture Uploaded

Lecture #1 Introduction to Small Satellite Mission and Utilization
Lecture #2 CubeSats for Capacity Building
Lecture #3 Overview of Project Management of Satellite Development
Lecture #4 Systems Engineering for Micro/nano/pico-satellites
Lecture #5 Introduction of Safety Review Process
Lecture #6 CubeSat Design for Safety Requirements
Lecture #7 Introduction to CubeSat Technologies
Lecture #8 Subsystem Lecture for CubeSat: Power Control System
Lecture #9 Subsystem Lecture for CubeSat: Communication System
Lecture #10 Subsystem Lecture for CubeSat: Command and Data Handling System
Lecture 11 Subsystem Lecture for CubeSat: Structure System
Lecture 12 Subsystem Lecture for CubeSat: Mechanism System
Lecture 13 Subsystem Lecture for CubeSat: Thermal Control System
Lecture 14 Subsystem Lecture for CubeSat: Attitude Control System
Lecture 15 Introduction to CubeSat Environmental Testing
Lecture 16: Introduction to Orbital Mechanics for Microsatellites
Lecture 17: Introduction to CubeSat Operation and Ground Systems
Lecture 18: Introduction to CubeSat Payload Systems
Lecture 19: CubeSat System Integration and Electrical Testing
Lecture 20: Space Debris Problems and Countermeasures
Lecture 21: Lessons Learned of CubeSat Missions
Lecture 22: Propulsion Systems for Microsatellite
Lecture 23: CubeSat Mission Assurance
Lecture 24: Optical Earth Observation with Microsatellites


Thank you for your kind attention!!