

Overview of ISS/Kibo and J-SSOD

2020/12/16

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

International Space Station



NASA

Russia

Canada

ESA

JAXA

72.8m

108.5m

Kibo (Japanese Experiment Module)

A photograph of the Kibo Japanese Experiment Module in space. The module is a large, cylindrical structure with a complex arrangement of external equipment. A yellow oval highlights the main body of the module. The background shows the Earth's surface and other parts of the International Space Station.

Kibo Exposed Facility

Kibo Pressurized
Module

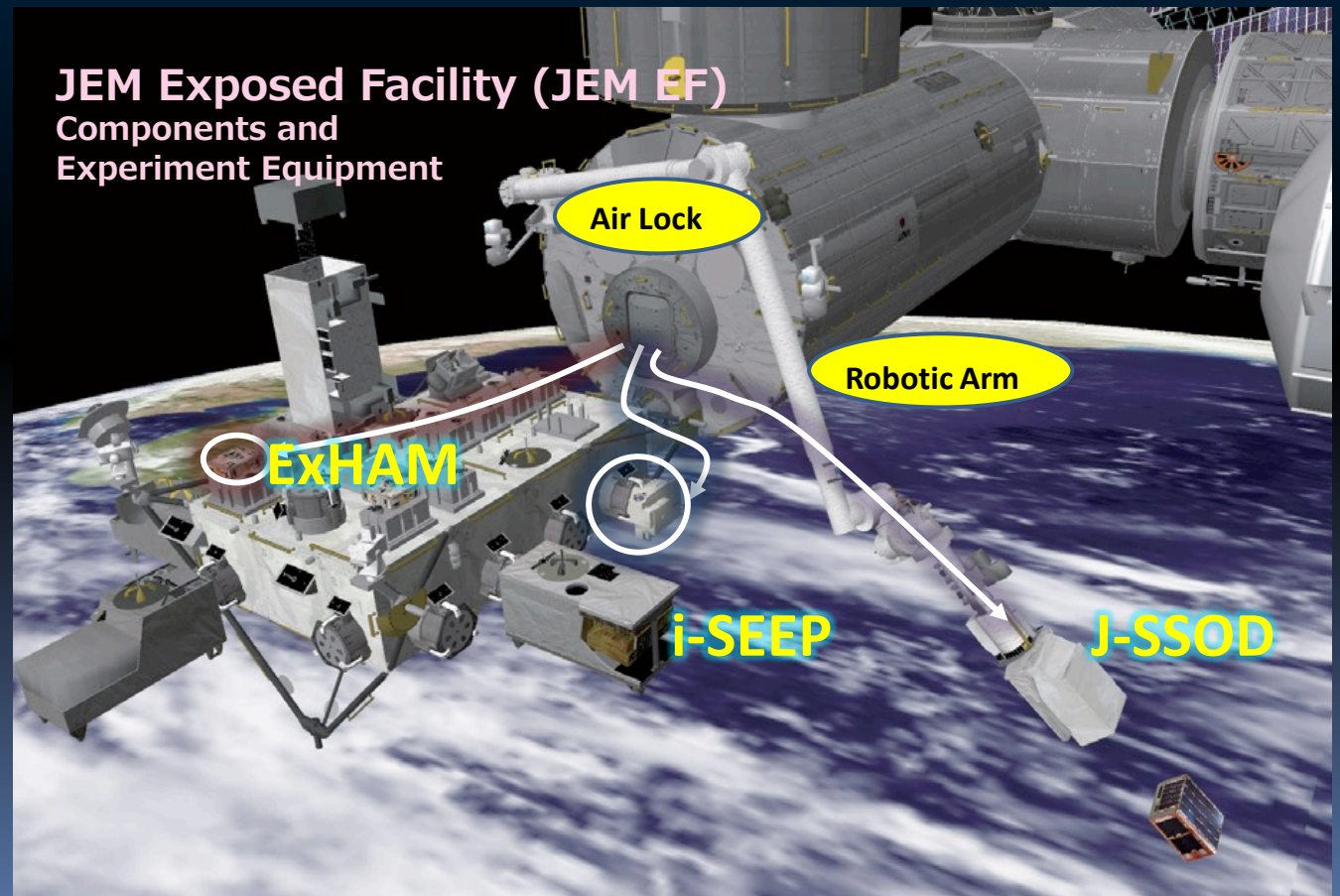
Kibo Exposed Facility



- Kibo has a unique Exposed Facility (EF) with an Airlock (AL) and a Remote Manipulator System (JEMRMS), and has a high capacity to exchange experimental equipment.
- Several JAXA's facilities such as J-SSOD, ExHAM, and i-SEEP have been open to foreign user.

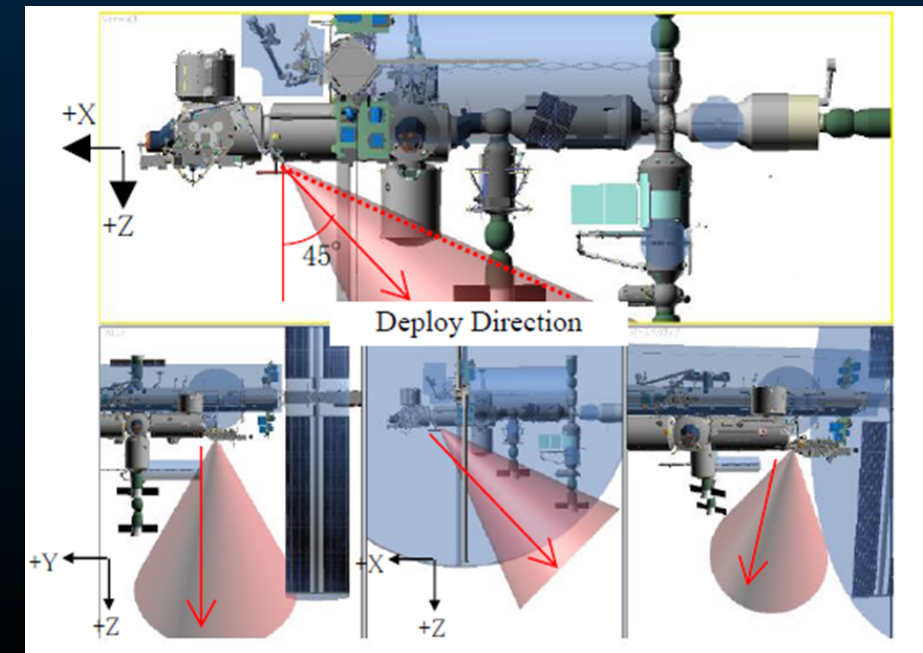
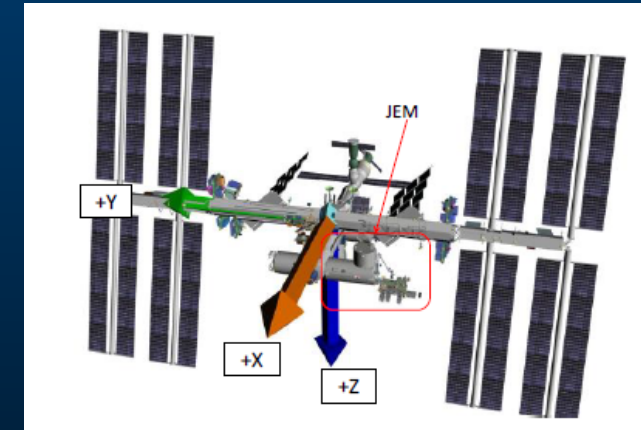
JEM Small Satellite Orbital Deployer (J-SSOD)

In 2012, JAXA developed the unique system “J-SSOD” (JEM Small Satellite Orbital Deployer) to deploy the satellite and inject the orbit from Kibo by using One and Only function on the ISS.



Specification of J-SSOD

Item	Specifications
Satellite size	CubeSat: 1U, 2U, 3U, 4U, 5U, 6U, W6U* ¹ 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

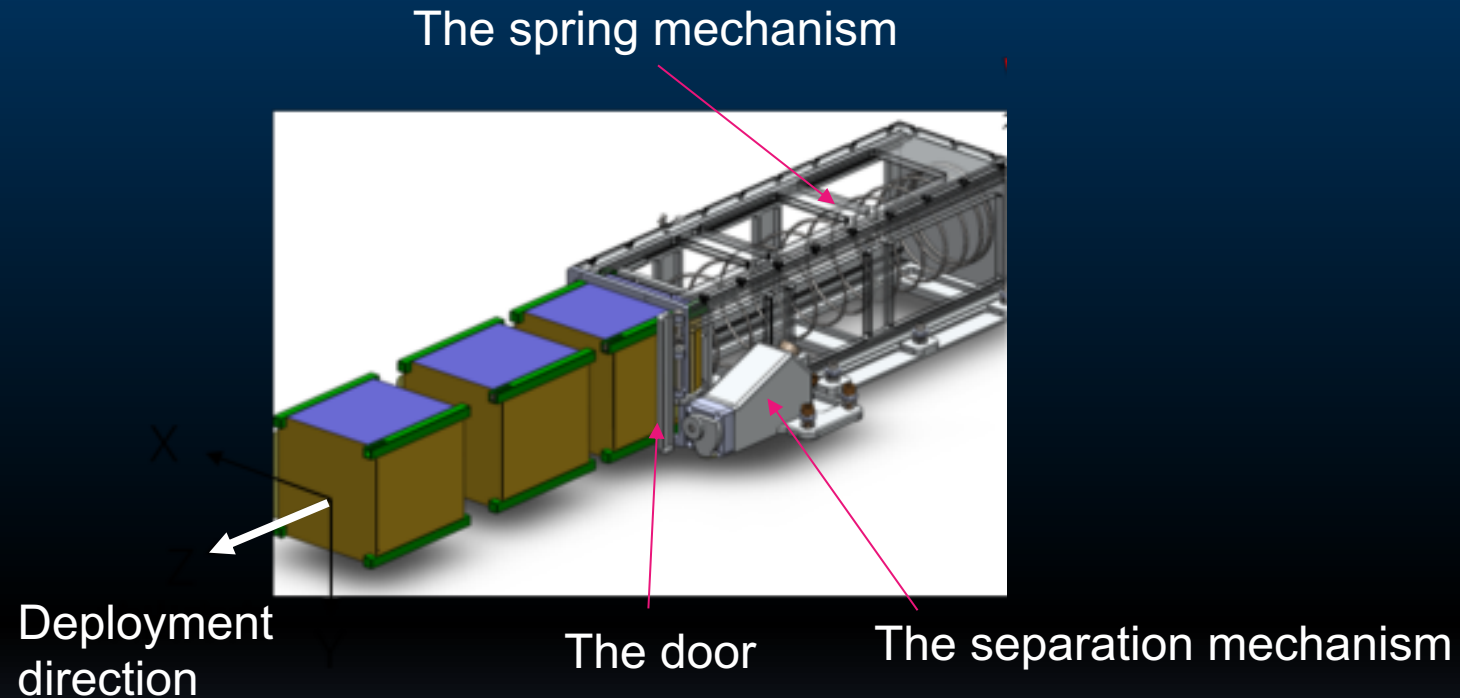


*1) CubeSat specifications: 10 cm (W) x 10 cm (D) Height: 1U: 10 cm, 2U: 20 cm, 3U: 30 cm / W6U 10 cm (W) x 20 cm (D) x 30 cm (H)

*2) Depends on the ISS altitude.

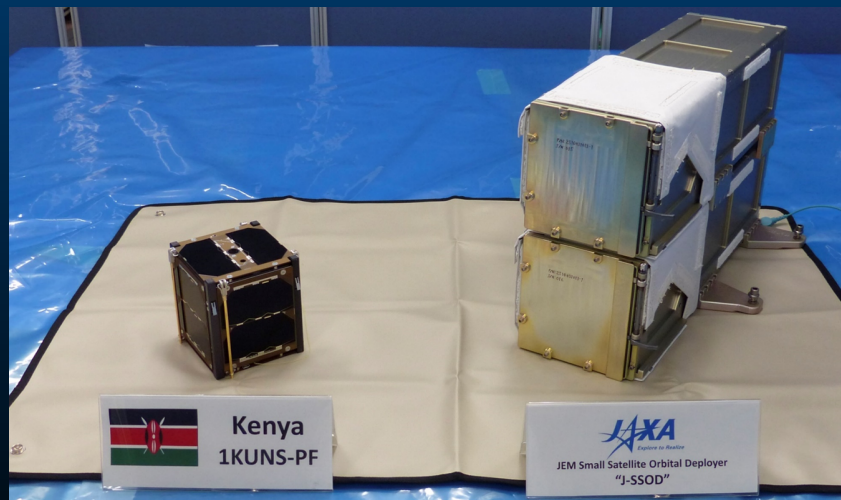
*3) Depends on the ballistic coefficient, altitude at release, solar activity, etc.

Deployment Mechanism of J-SSOD



- The spring mechanism and the separation mechanism are installed on the J-SSOD case.
- The spring is compressed when satellite are installed, and the satellite are kept in the J-SSOD case by the door.
- When the separation mechanism receives the command, the door is opened and the satellite in the case are pushed by the spring.

Overview of Small Satellites



Credit : JAXA

◆ 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

Ref: Prof. Nakasuka, Tokyo Univ. (2017.6.12) (modified by JAXA)

◆ 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

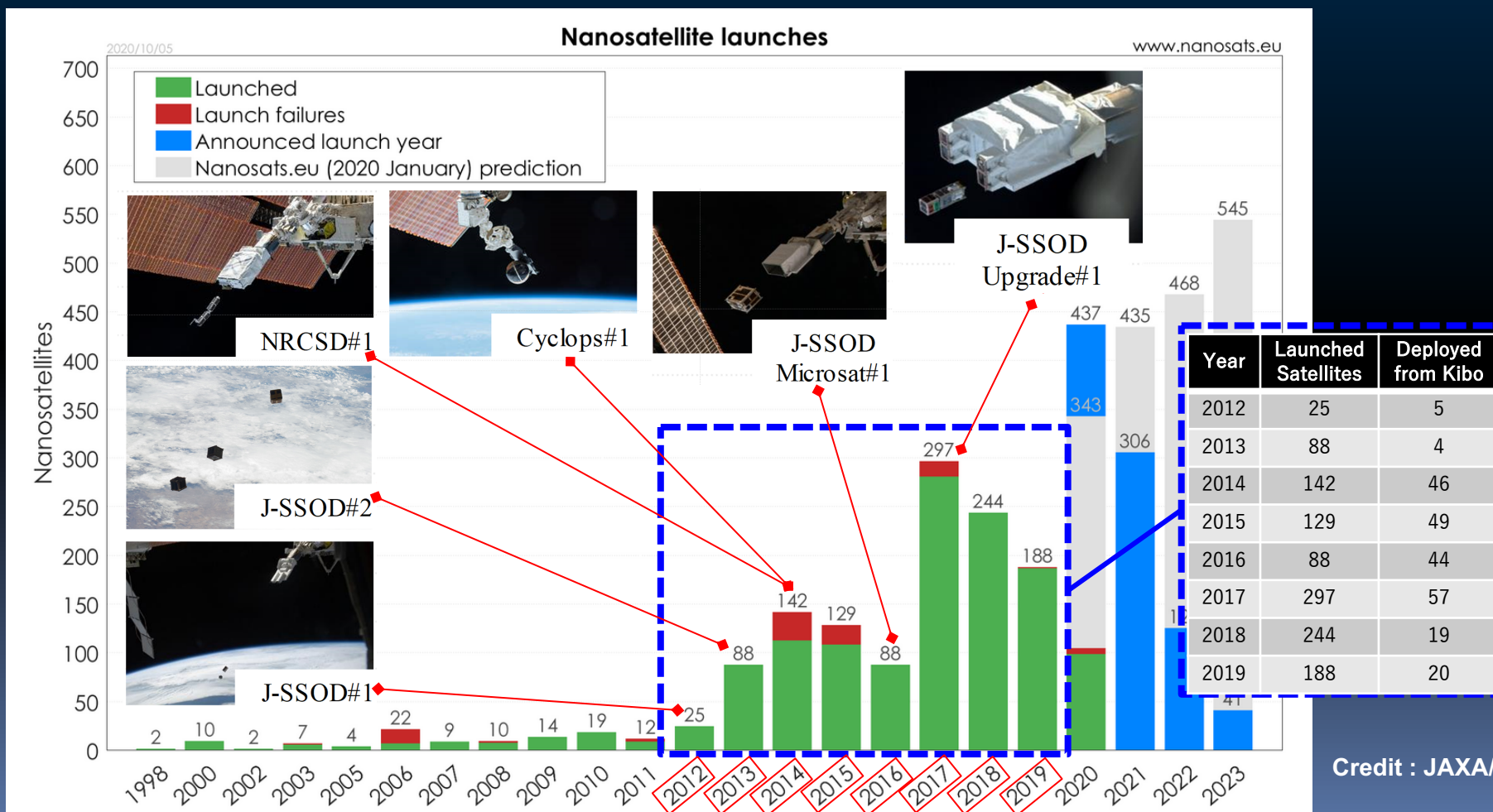


Snapshot of Banana farm, Mindanao, the Philippines
(provided by PHL-MICROSAT, DIWATA-1)

Deployment Achievements from Kibo



- ◆ In 2012, the J-SSOD technical demonstration was presenercdcarried out.
- ◆ NASA and the U.S. private sector can operate the satellite release missions from Kibo.
- ◆ By November 2020, **267** satellites have been successfully released from Kibo.



Small Satellite Deployment Process

CubeSat

J-SSOD Satellite Install Case

Cargo Transfer Bag



Support from the ground



Credit : JAXA/NASA



Flight Control Team
and
Engineering Team



Thank you for your kind attention!