

Small satellites deployment mission from "Kibo"



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Opportunities for deploying small satellites from "Kibo"



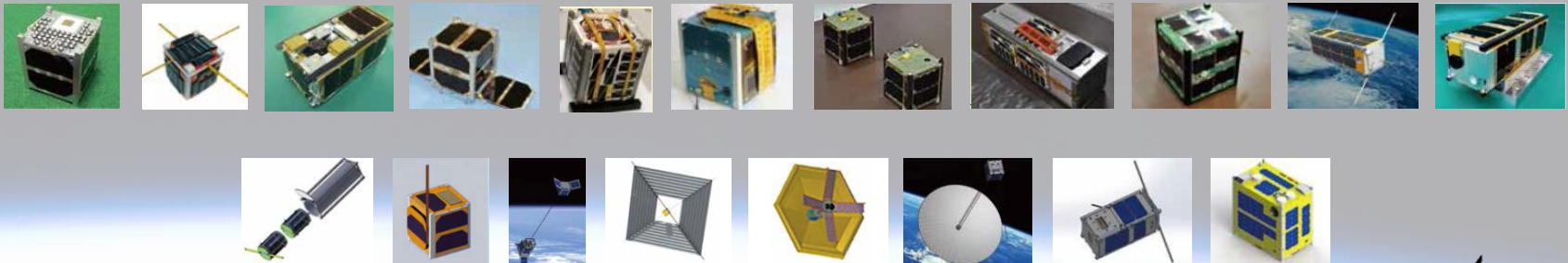
Opportunities for deploying small satellites from "Kibo"

JAXA provides opportunities for launching small satellites with the purposes shown below.

- (a) To contribute for easy and fast launch and operation of small satellites by private enterprises and universities, expanding the application of the space development and fostering human resources.
- (b) To promote a new industry with space development by using the small satellites.
- (c) To improve the developing countries space technology

<Related countries which use the opportunities >

Japan, United States, Vietnam, Brazil, Italy, Mexico, Philippines, Singapore, United Nations



System for deploying small satellites “J-SSOD”

- JEM Small Satellite Orbital Deployer -

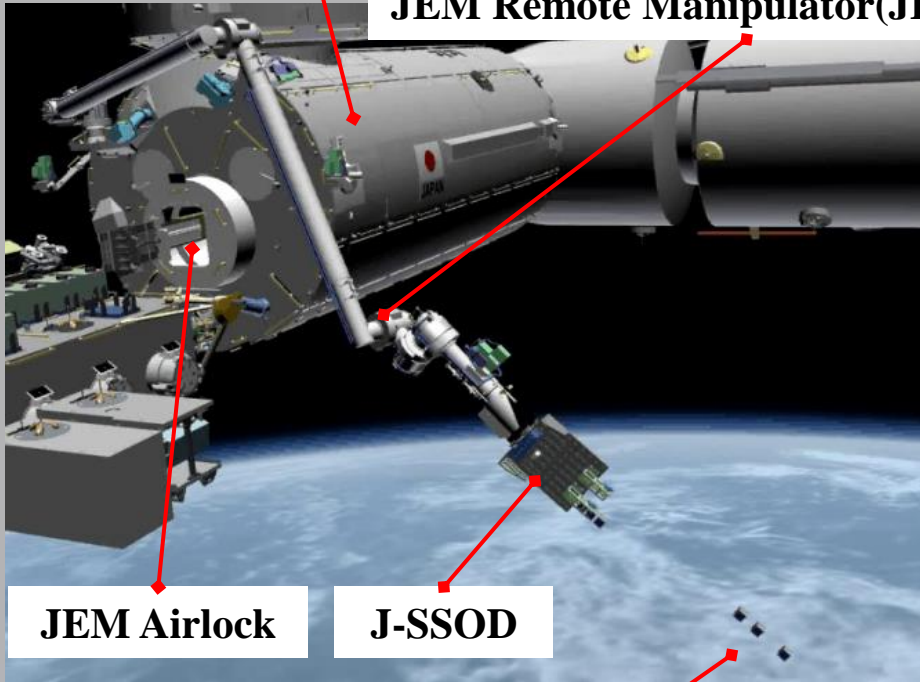


Systems for deploying small satellites “J-SSOD”

- JEM Small Satellite Orbital Deployer -

JEM Pressurized Module (JPM)

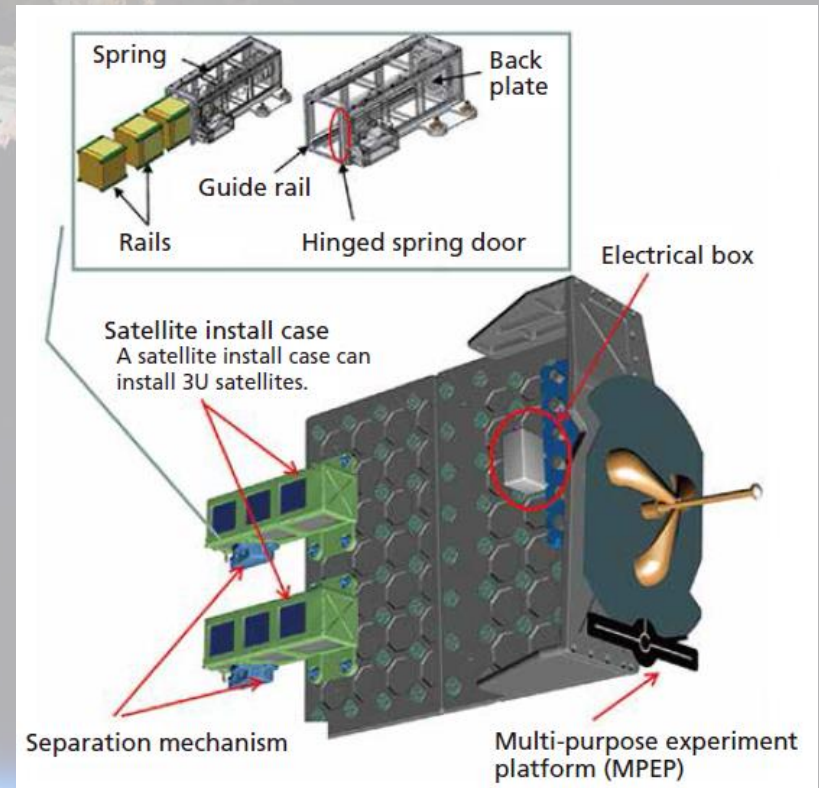
JEM Remote Manipulator(JEM-RMS)



JEM Airlock

J-SSOD

Small Satellites



Systems for deploying small satellites “J-SSOD”

- JEM Small Satellite Orbital Deployer -

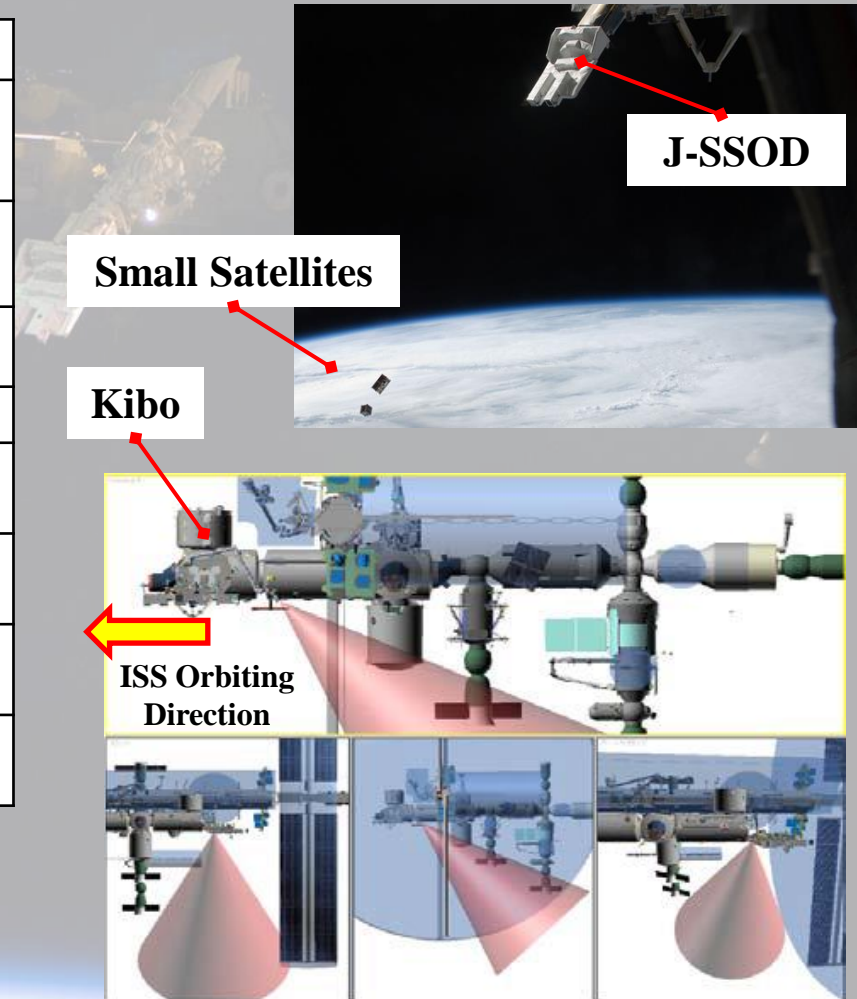
Item	Specification
Satellite Size	CubeSat : 1U, 2U, or 3U (*1) 50 kg class satellite: 55 × 35 × 55 cm
Satellite mass	CubeSat : 1.33 kg or less per 1U 50 kg class satellite: 50kg or less
Orbital altitude	approximately 380 - 420 km (*2)
Inclination	51.6°
Deployment direction	Nadir-aft 45° from the ISS nadir side
Deployment velocity	1.1 - 1.7 m/sec
Ballistic coefficient	100kg/m ² or less (*3)
Life expectancy on orbit	Approximately 100 - 250 days

*1) CubeSat specification:

10 cm (W) × 10 cm (D) Height: 1U: 10 cm, 2U: 20 cm, 3U: 30 cm

*2) Depends on ISS altitude.

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



Deployment Direction(Cone)
Nadir-aft 45° from the ISS nadir side

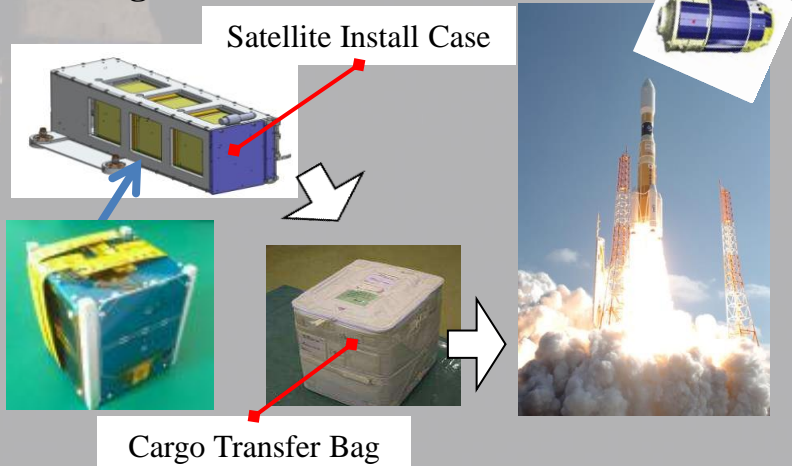


Small Satellites Deployment Mission

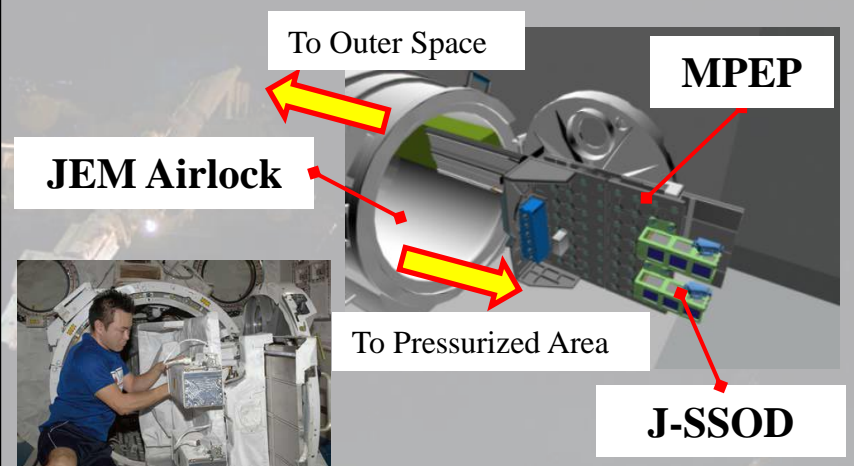


Small Satellites Deployment Mission

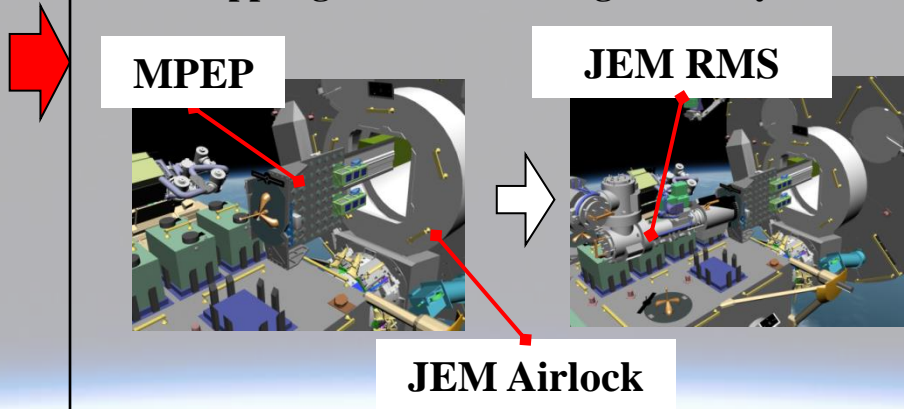
I Integration and launch



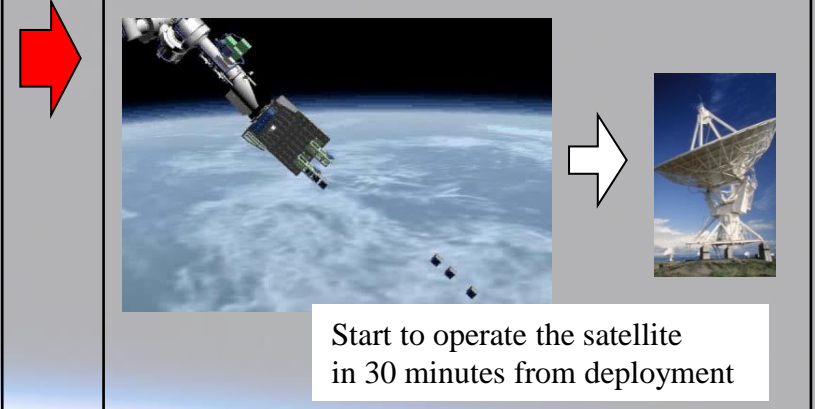
II Crew task in Kibo/ISS



III Grappling and Transferring MPEP by JEMRMS



IV Deployment small satellites







Satellite mission deployed from J-SSOD

- broadening the possibilities for Small Satellite -



Satellite mission deployed from J-SSOD

- broadening the possibilities for Small Satellite -

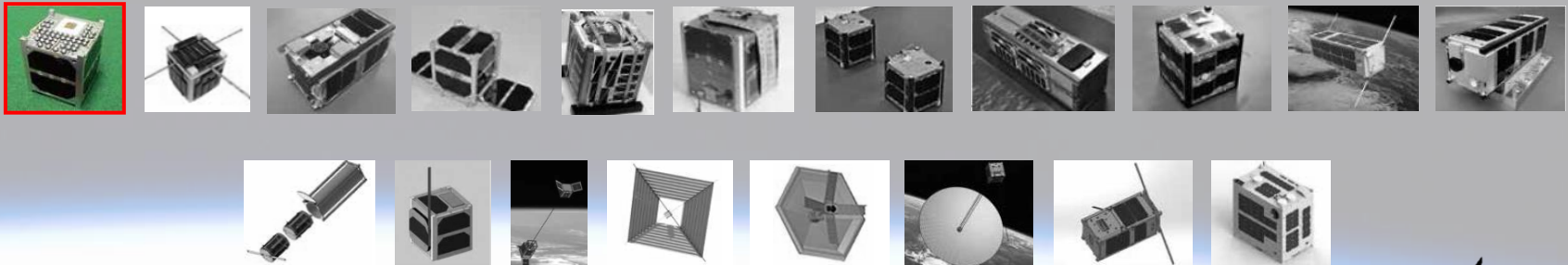
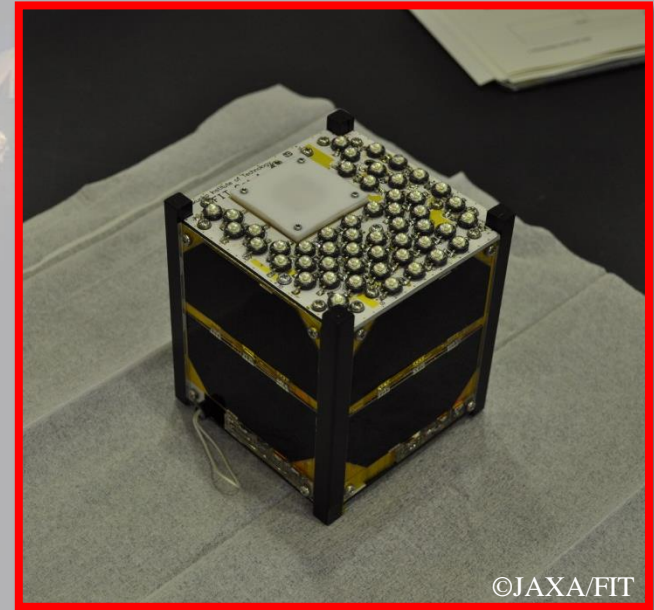
FITSAT-1 Launch and Deploy:2012

Investigator: Fukuoka Institute of Technology (JAPAN)

Size: 1U

Mission:

FITSAT-1 achieved an experiment of **high-speed transmission with microwaves** for the first time as an ultra-small-sized satellite, and took images of ISS and the ground surface at deployment and transferred them to the earth.



Satellite mission deployed from J-SSOD

- broadening the possibilities for Small Satellite -

TechEdSat3 Launch and Deploy:2013

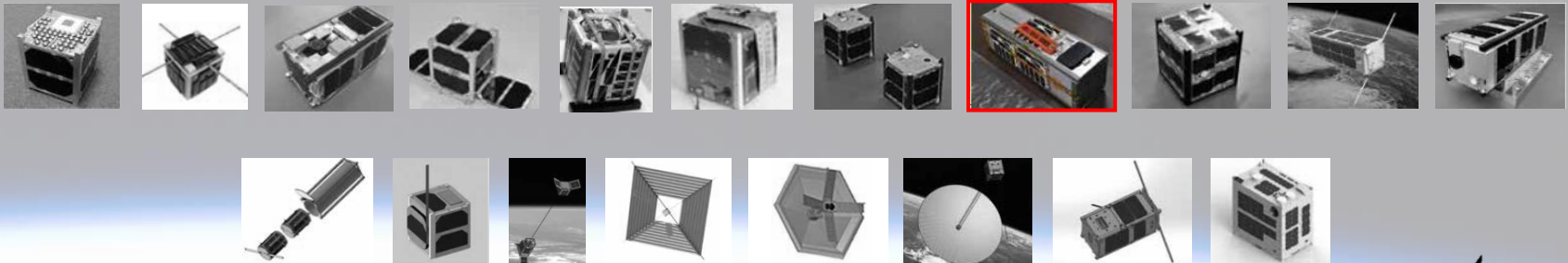
Technical and Educational Satellite 3

Investigator: NASA Ames Research Center
/San Jose State Univ.(USA)

Size: 3U

Mission:

- The first orbit system experiment using the **aero braking mechanism** called Exo-brake on its deorbiting.



Satellite mission deployed from J-SSOD

- broadening the possibilities for Small Satellite -

AESP-14 Launch and Deploy:2015

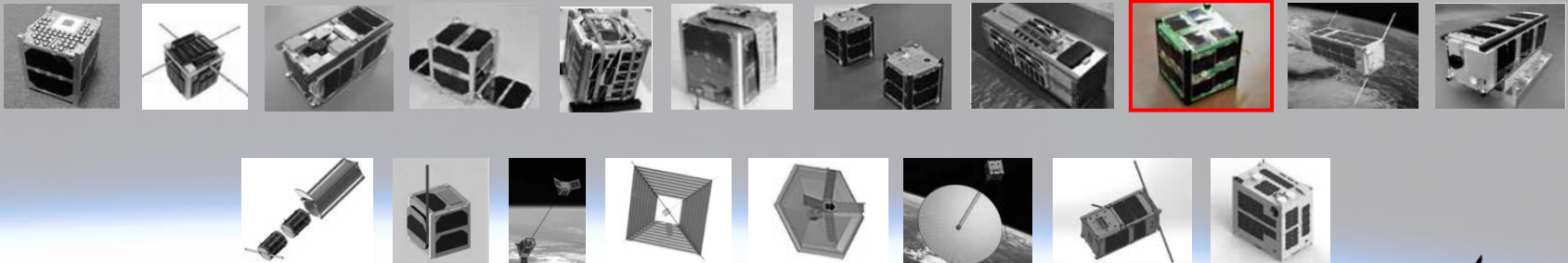
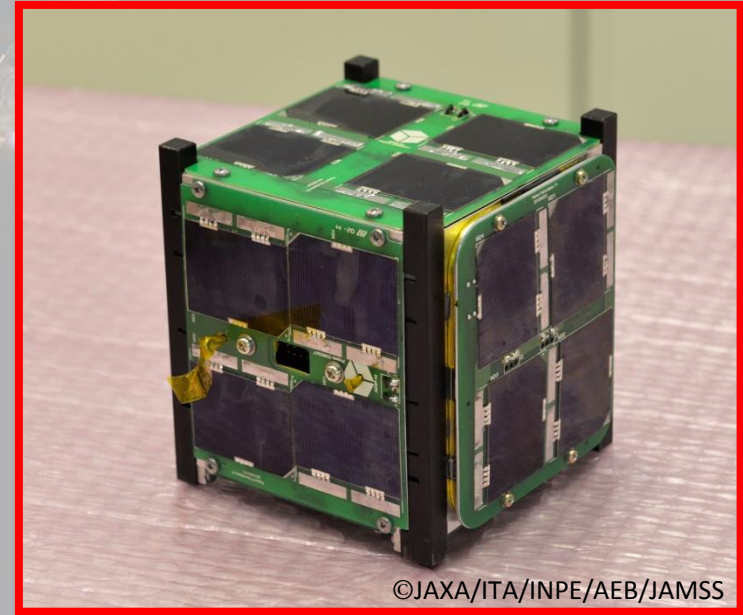
Investigator:

Technological Institute of Aeronautics (Brazil)
National Institute for Space Research (INPE)
Japan Manned Space Systems Corporation (JAMSS)

Size: 1U

Mission:

- Demonstrates the first CubeSat platform developed by Brazil in orbit.
- INPE and ITA of Brazil develop human resources in the spacedevelopment field.



Satellite mission deployed from J-SSOD

- broadening the possibilities for Small Satellite -

S-CUBE Launch and Deploy:2015

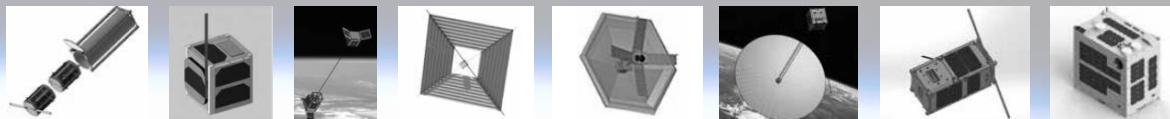
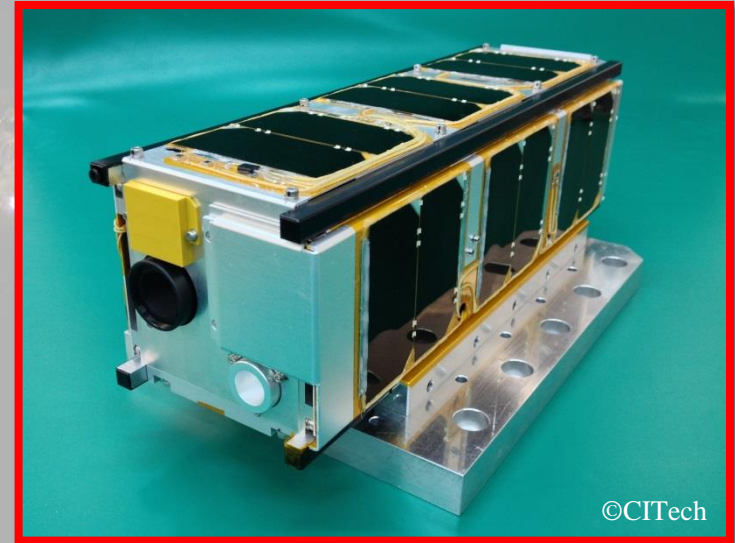
Shootingstar Sensing Satellite (S3) Science-oriented Cubesat

Investigator: Chiba Institute of Technology
/ Tohoku University(JAPAN)

Size: 3U

Mission:

- Satellite for observation of meteor's ultraviolet rays
- The world's first "Meteor Observation Project from Space"
- The first 3U CubeSat in Japan



Asia satellite mission deploy from J-SSOD



Asia satellite mission deploy from J-SSOD

PicoDragon

Launch and Deploy:2013

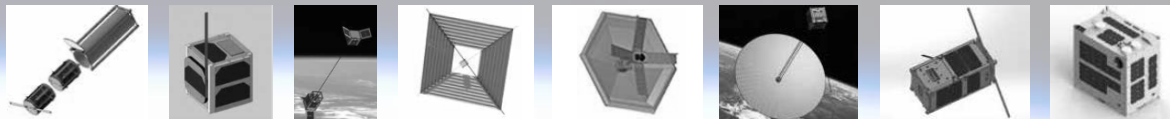
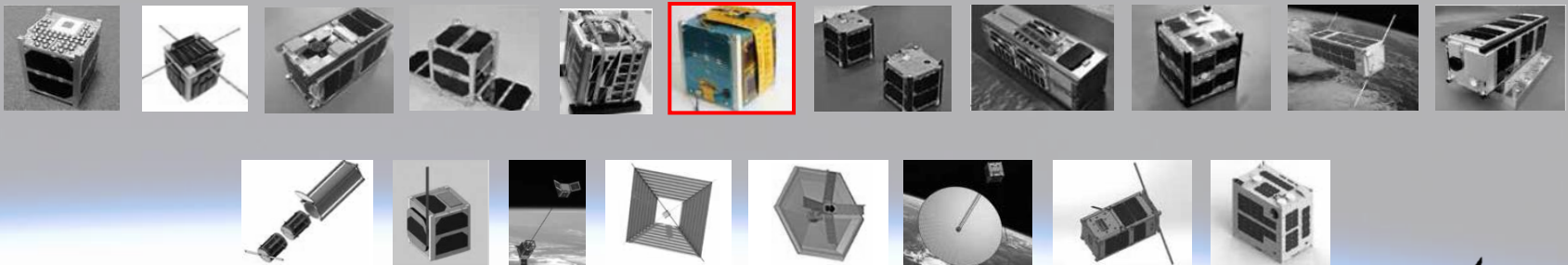
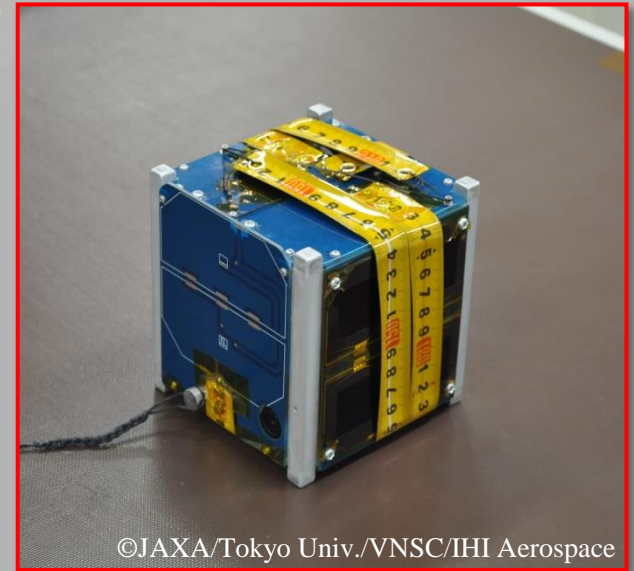
Investigator: Vietnam National Satellite Center(**Vietnam**) /
/The University of Tokyo/IHI Aerospace

Size: 1U

Mission:

The first satellite in Vietnam was developed by cooperation between Japan and Vietnam, in order to spread space development and develop human resources in the field. It took images of the earth and achieved wireless communications by using amateur radio.

Capacity Building
(develop satellite system)



Asia satellite mission deploy from J-SSOD

AOBA-VELOX-III

Launch and Deploy:2016

Investigator:Nanyang Technological University(Singapore)
/Kyushu Institute of Technology

Size: 2U

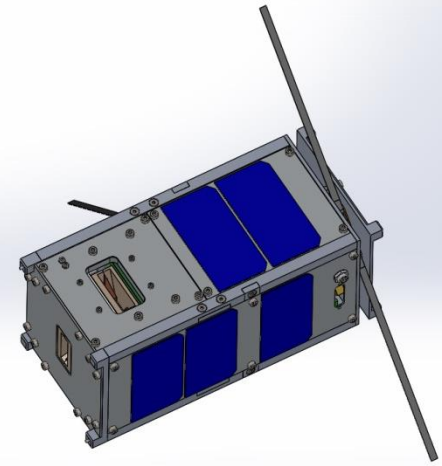
Mission:

Pulsed Plasma Thruster(PPT) demonstration satellite

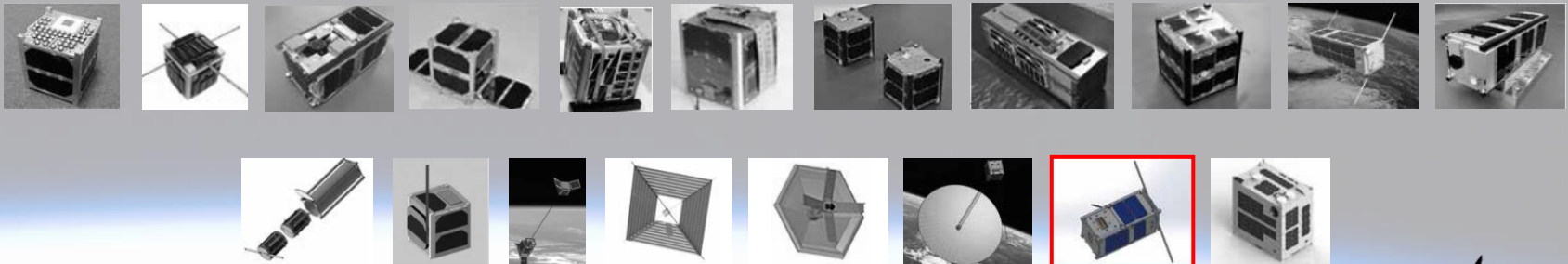
A radio communication experiment in the satellite

Satellite Bus:Kyushu Tech. / PPT : Nanyang Tech.

Technical demonstration
(Pulsed Plasma Thruster)



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Asia satellite mission deploy from J-SSOD

Diwata-1 Launch and Deploy: 2016 (PHL-MICROSAT)

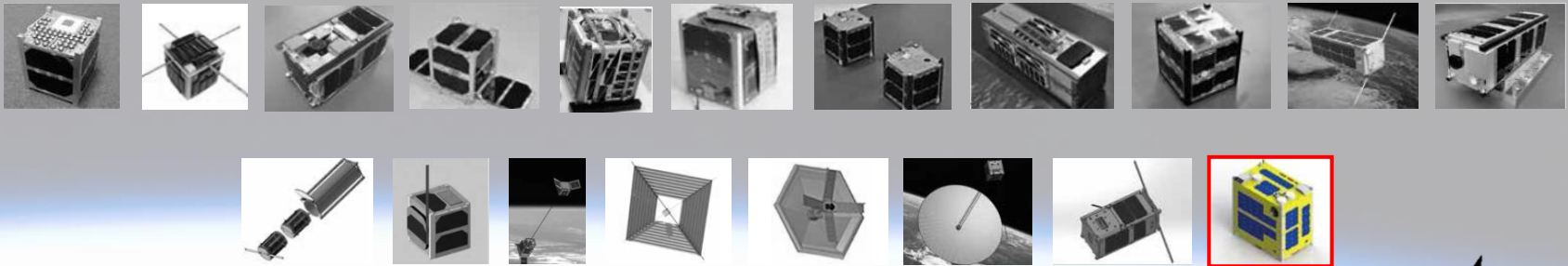
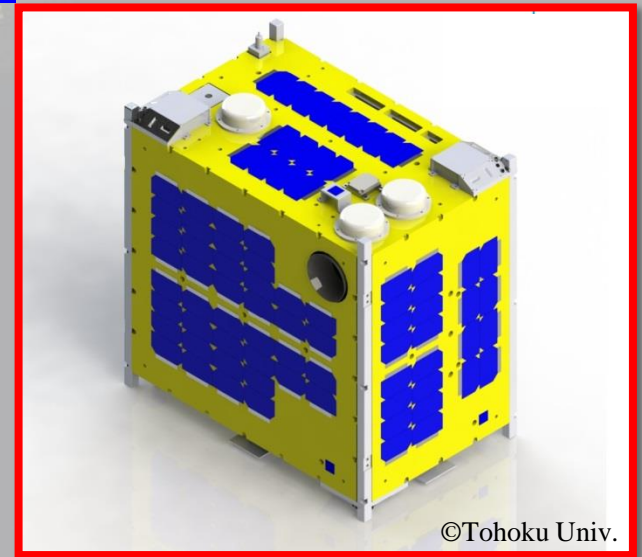
Investigator: University of the Philippines (Philippine)
Tohoku University/Hokkaido University

Size: Micro-Satellite (55cm × 35cm × 55cm)

Mission:

Demonstrates natural resources and
disaster monitoring in the Philippines
with the first microsatellite in the country

Capacity Building
(develop satellite system)



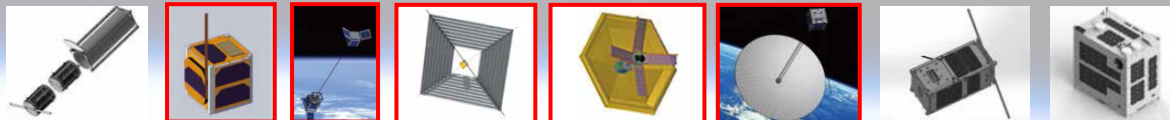
Future mission with J-SSOD in 2016



Future mission with J-SSOD in 2016

Demonstration of ...

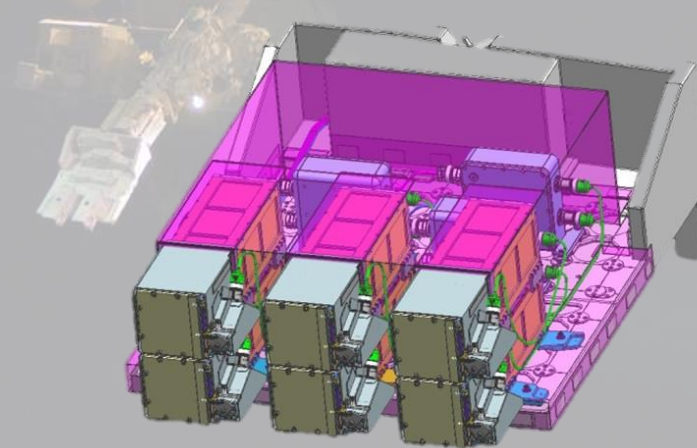
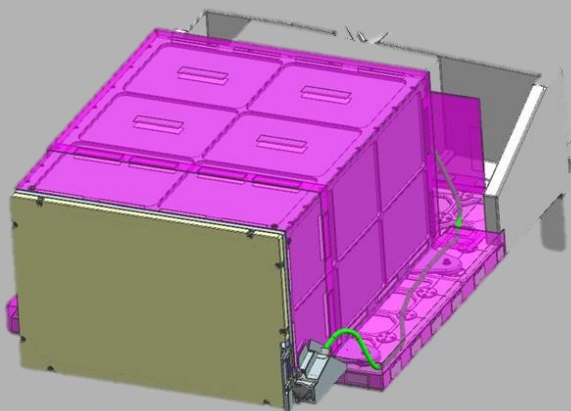
- the operation of a **micro antenna**
- a **tether extending system** by using a mother and a daughter satellites
- a **de-orbit device** using a thin-film unfolding mechanism in space
- unfold a toroidal inflatable structure for **aeroshells**,
and an orbit collapse due to atmospheric drag
- a de-orbit system by extending and unfolding a parabolic **drag chute**
- an **active heat control mechanism** of LCD in orbit



Future mission with J-SSOD in 2016

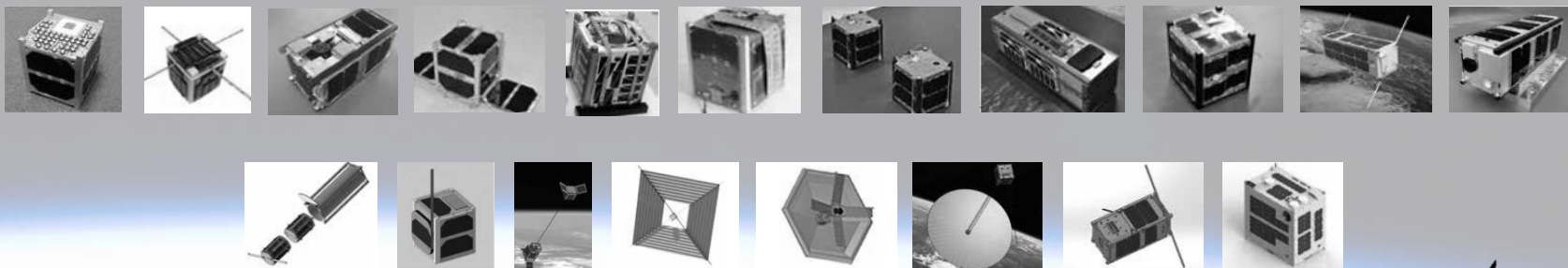
- broadening the possibilities for Small Satellite -

JAXA will provide the new system for more opportunities for launching small satellites.



Micro-Satellite Deployer(~50kg)

J-SSOD Upgrade Deployer (3U × 6 : up to 18U)



New Space Environment Utilization with J-SSOD



New Space Environment Utilization with J-SSOD

More Opportunities for Launch

The satellite install case can be transferred to the ISS not only by “Kounotori”, which was developed by JAXA, but also other transfer vehicles for ISS developed and operated by various countries.



Mitigation for Mechanical Environment during Launch

The satellite install case is stowed in CTB (Cargo Transfer Bag), which is a soft-cushion bag filled with cushion foam as cargo for ISS. Therefore the mechanical environmental such as random vibration and quasi-static acceleration during the rocket launch are mitigated, and shock testing with a payload attach fitting (PAF), usually required for a piggyback payload rocket, is not needed.



New Space Environment Utilization with J-SSOD

Technical coordination with JAXA for safety review and verification review

(1) Safety Review

As for a JAXA selected satellite, JAXA is responsible for conducting safety reviews for the satellite in primary design phase (phase 0/I), in detailed design phase (phase II) and in acceptance test phase (phase III). A satellite provider shall submit Safety Assessment Report (SAR) and necessary support documents for review by JAXA.

(2) Compatibility Verification Review

JAXA is responsible for conducting a review to confirm that the satellite verification results comply with the requirements defined in this document before the satellite delivery to JAXA. A satellite provider shall conduct necessary verifications and submit necessary documents such as drawings, analysis reports and test reports for review by JAXA.

Opportunities for deploying satellites developed by Asia-Pacific region

Launch and deployment : 2016-2018

Number of Satellites : approximately 2-5 satellites from 5 country

*Satellite provider bear the expenses for launch, deployment and technical coordination.



Thank you for your attention

