

# Safety and Mission Assurance Requirements for JAXA Microsatellite Launch Opportunity Programs

NEPP ETW

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JAXA Safety and Mission Assurance Department

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# Agenda

1. Purpose
2. JAXA Microsatellite Launch Opportunity Programs
3. Applicability of S&MA Requirements
4. JAXA's Support for Payload Organizations

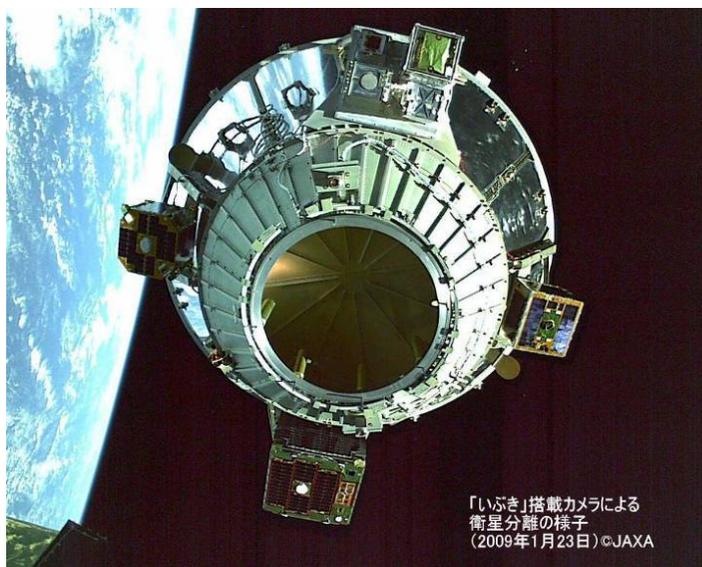
# 1. Purpose

Purpose of this presentation is:

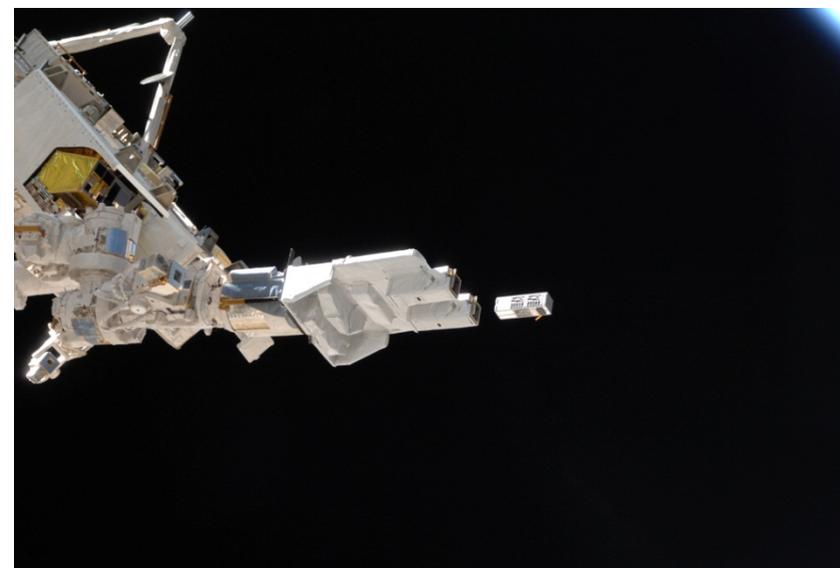
- ✓ To introduce JAXA Microsatellite Launch Opportunity Programs
- ✓ To provide JAXA's policy on S&MA requirements applicability on Microsatellite Missions

## 2. JAXA Microsatellite Launch Opportunity Programs

Launch opportunity	Type of program	Started in	First launch in
1. H-IIA Secondary Payload (Piggyback Payload)	Non-charged	2006	2009
	Charged	2014	2016(TBD)
2. CubeSat Deployment from the ISS Japanese Experiment Module "KIBO"	Non-charged	2011	2012
	Charged	2014	TBD



**H-IIA Piggyback Payload**



**CubeSat Deployment from KIBO**

## 2. JAXA Microsatellite Launch Opportunity Programs

### 1. Program objectives

- Non-charged program
  - ✓ To increase members of Japanese community for using space
  - ✓ To contribute to education by universities and other schools
- Charged program
  - ✓ To make domestic demands visible for industrialization of microsatellite development, data utilization, launch service, etc.
  - ✓ To start the program as trial

### 2. Conditions of applicant

- Japanese organization  
(JAXA accepts participation of a foreign organization in case that Japanese organization applies and makes agreement with JAXA.)

### 3. Conditions of satellite mission objectives

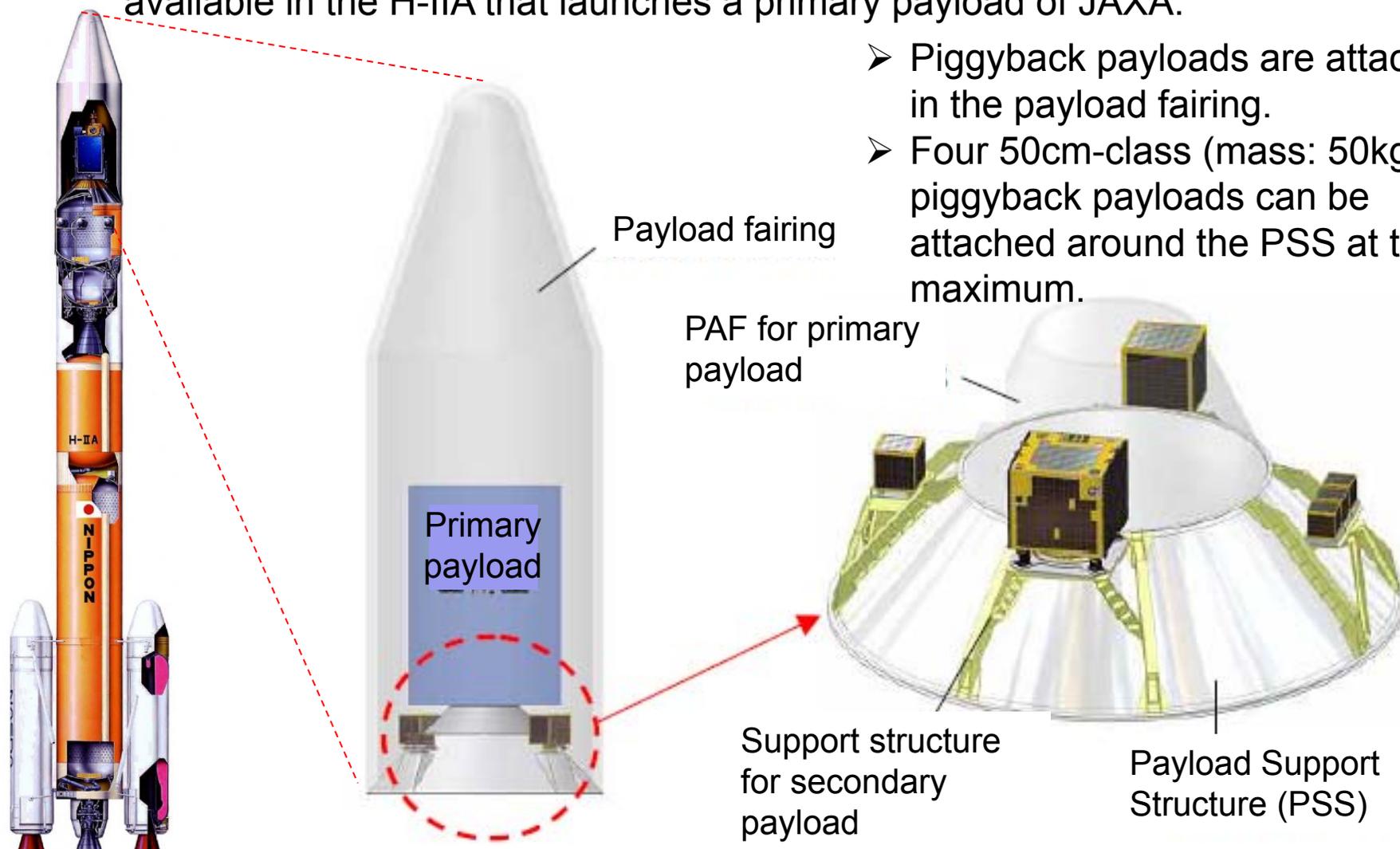
- Non-charged program
  - ✓ R&D, Education, etc. (Non-commercial use only)
- Charged program
  - ✓ Commercial use is allowed

## 2-1. H-IIA Secondary Payload (Piggyback Payload)

### Overview

A secondary payload can be accommodated when excess capability becomes available in the H-IIA that launches a primary payload of JAXA.

- Piggyback payloads are attached in the payload fairing.
- Four 50cm-class (mass: 50kg) piggyback payloads can be attached around the PSS at the maximum.

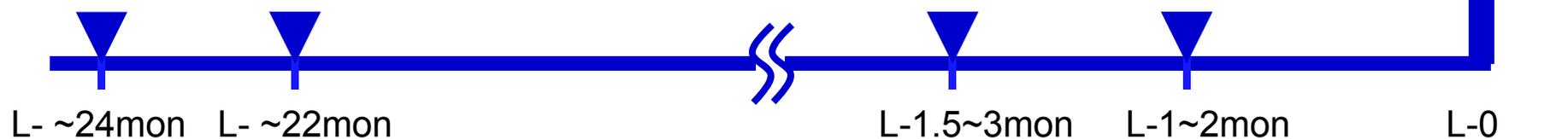


## 2-1. H-IIA Secondary Payload (Piggyback Payload)

### Typical Milestones

JAXA announces a launch opportunity

- Selection for the free program
- Contract in order of application for the charged program



Applicant

- ✓ Designs, manufactures and tests its satellite

JAXA

- ✓ Safety Review
- ✓ I/F Verification Review

No battery re-charging is allowed in principle.

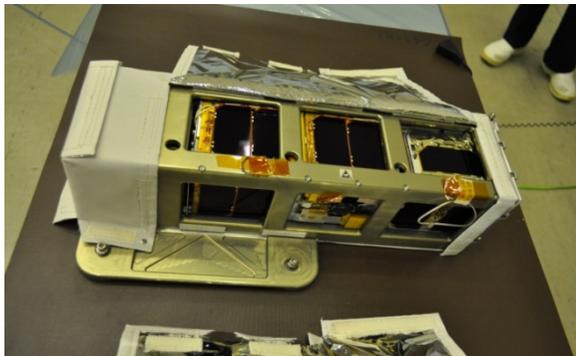
## 2-1. H-IIA Secondary Payload (Piggyback Payload)

FY2009							
FY2010							
FY2012							
FY2013							
FY2014							
FY2015							

: indicates private company.

## 2-2. CubeSat Deployment from “KIBO”

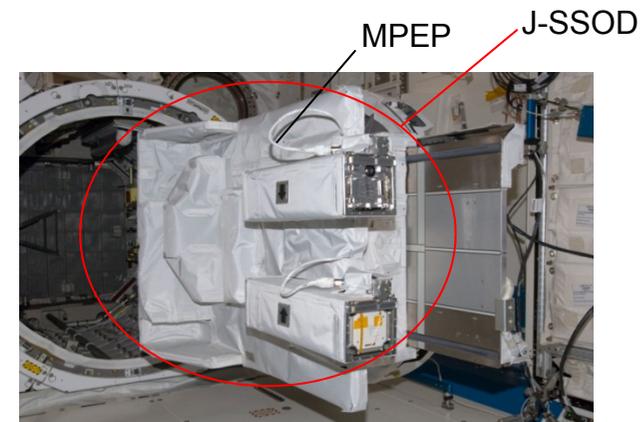
### Overview



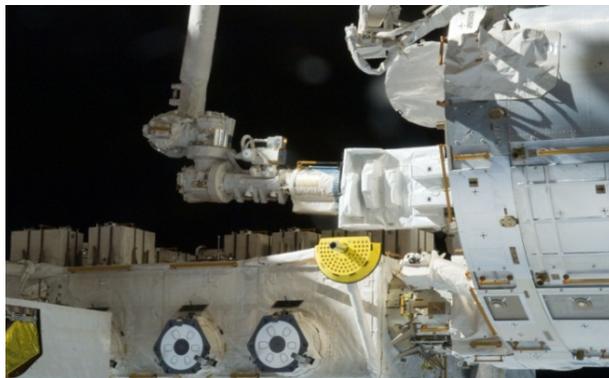
- ① CubeSats are pre-installed in the Satellite Install Cases on the ground.



- ② Satellite Install Cases are delivered to the ISS as part of spaceship (such as HTV) cargo.



- ③ On KIBO, Satellite Install Cases are installed on the Multi-Purpose Experiment Platform (MPEP). Then the MPEP is installed on the airlock side table.



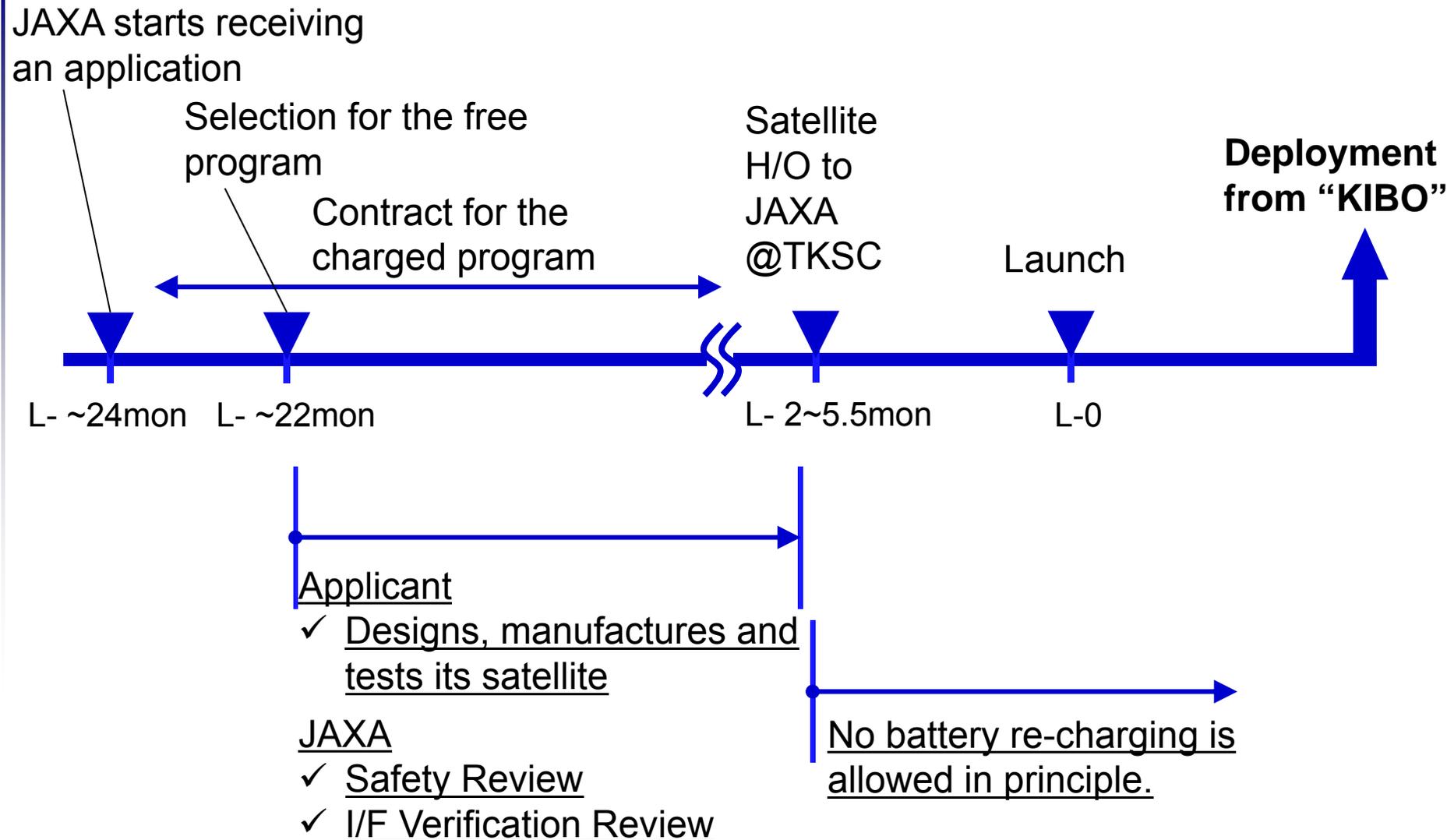
- ④ The J-SSOD (JEM-Small Satellite Orbital Deployer) attached with MPEP is transferred to the outboard. Then, KIBO robot arm grapples the MPEP and transfers it to the releasing point.



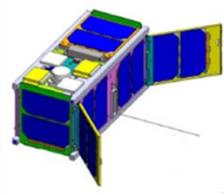
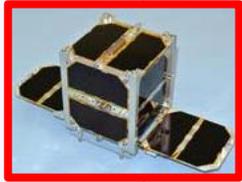
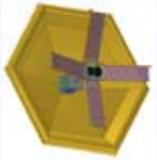
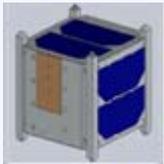
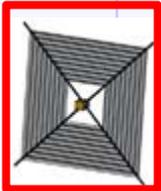
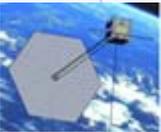
- ⑤ Deployment of CubeSats from the ISS.

## 2-2. CubeSat Deployment from “KIBO”

### Typical Milestones



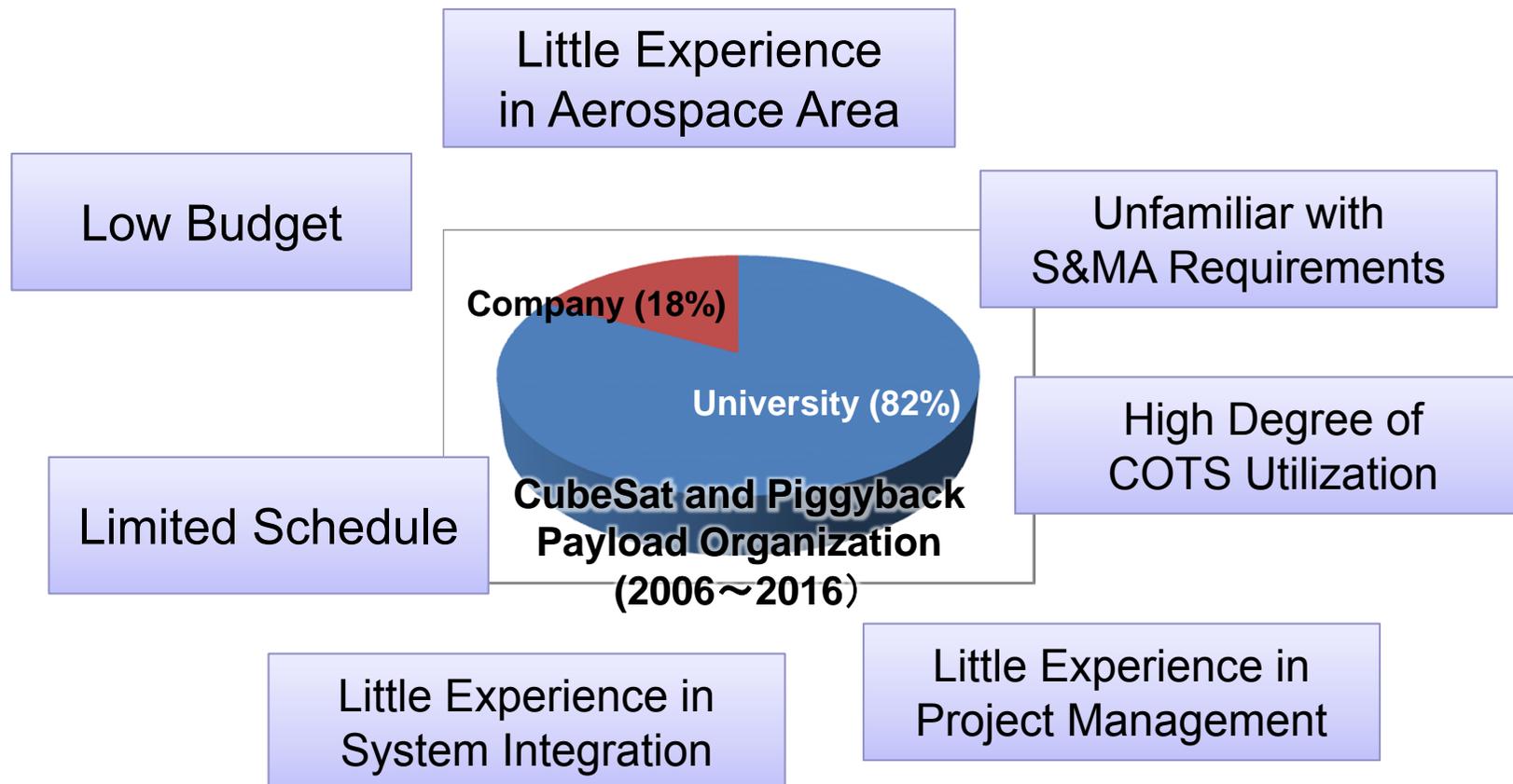
## 2-2. CubeSat Deployment from “KIBO”

FY2012							
FY2013							
FY2016							

 : indicates private company.

### 3. Applicability of S&MA Requirements

Features of the CubeSat and Piggyback Payload Organizations are:



### 3. Applicability of S&MA Requirements

- JAXA imposes only the Safety Requirements on the CubeSat and Piggyback Payload Organizations since our primary concern is safety for the public and ground crews during launch site ground operations and launch.
- JAXA does not require CubeSat and Piggyback Payload Organizations to apply JAXA's Reliability/Quality Assurance Requirements. The mission assurance is up to the payload organization.

JAXA S&MA Requirements	Non JAXA P/L
Safety	A
Reliability	N/A
Quality Assurance	N/A

### 3. Applicability of S&MA Requirements

- Question:  
In the case that a CubeSat or Piggyback Payload organization does not apply JAXA's reliability/quality assurance requirements, can a control method function properly to prevent a certain hazard cause from being activated?
- Answer:  
JAXA confirms functionality of hazard control methods by assessing results of verification methods on hazard control methods through safety review activities.



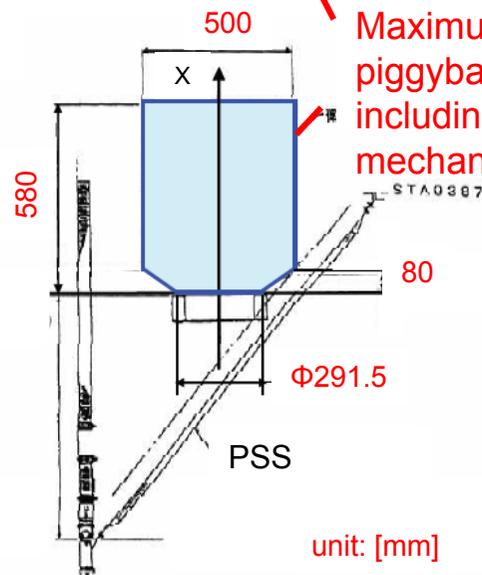
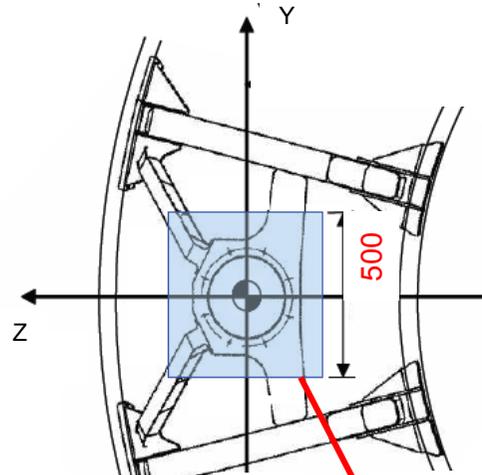
## 4. JAXA's Support for Payload Organizations

- What we have done to support payload organizations for their safety related activities are as follows:
  - ✓ A standard hazard report format to assess generic hazards easily
  - ✓ Guideline/interpretation documents of safety requirements
  - ✓ System safety training courses for payload organizations
  - ✓ Technical coordination with payload organization to conduct appropriate hazard analyses prior to the safety review meeting

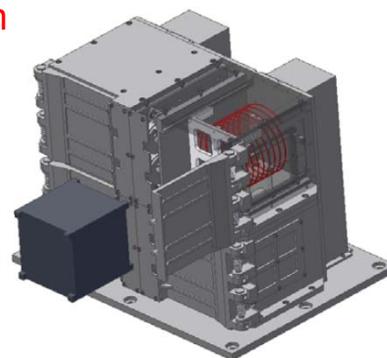
# Back-up charts

# Technical Requirements for Piggyback Payload

✓ **Envelope:**



- ✓ **Mass:**  $\leq 50\text{kg}$
- ✓ **Stiffness (the first mode frequency) :**
  - X axis:  $\geq 100\text{Hz}$
  - Y and Z axis:  $\geq 50\text{Hz}$
- ✓ **Cold Launch:** RF irradiation and antenna deployment can be done 200s after separation.
- ✓ **JAXA can provide a separation mechanism.**
  - PAF239M for 50cm-class microsatellite
  - J-POD for 1U CubeSat



J-POD outside view

Pyrotechnics



Small satellite  
 Separation plane  
 Separation mecha.  
 Marman Clamp Band

PAF239M outside view

\* All of the requirements will be provided to an applicant with NDA.

# Technical Requirements for CubeSat Deployment from “KIBO”

✓ **Size (X x Y x Z)**

- 1U: 100 x 100 x 113.5mm
- 2U: 100 x 100 x 227.0mm
- 3U: 100 x 100 x 340.5mm
- 50cm-class: 550 x 350 x 550mm

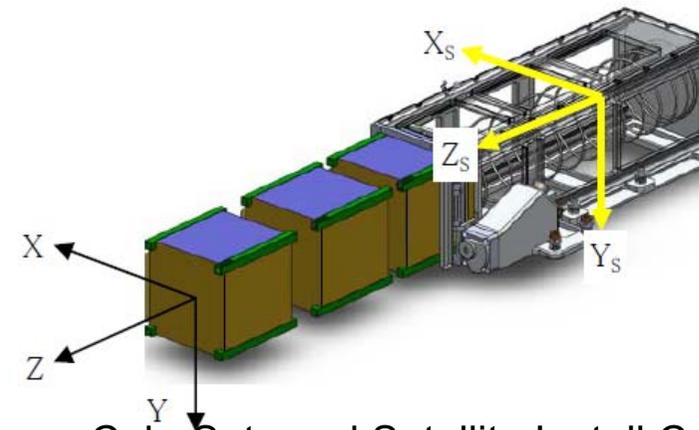
✓ **Mass**

- 1U: 0.13~1.33kg
- 2U: 0.26~2.66kg
- 3U: 0.39~3.99kg
- 50cm-class: 50kg or less

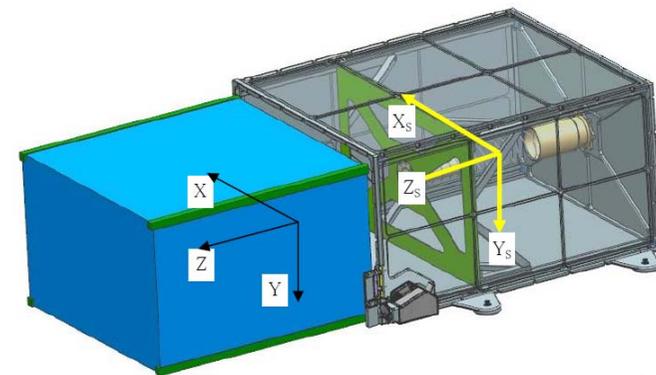
✓ **Ballistic Coefficient:** 100kg/m<sup>2</sup> or less

✓ **Stiffness (the first mode frequency) :**  
 $\geq 100\text{Hz}$

✓ **Cold Launch:** RF irradiation and antenna deployment can be done 30min after deployment from ISS.



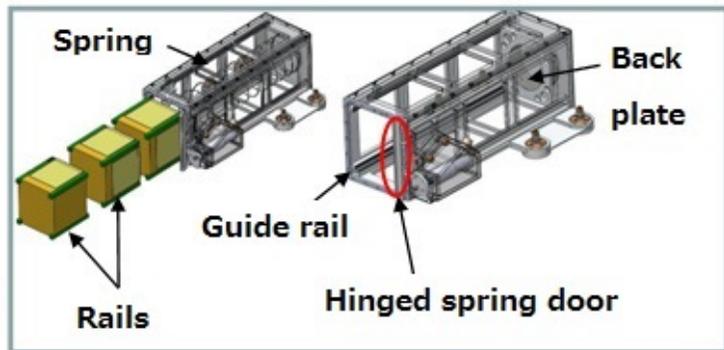
CubeSats and Satellite Install Case



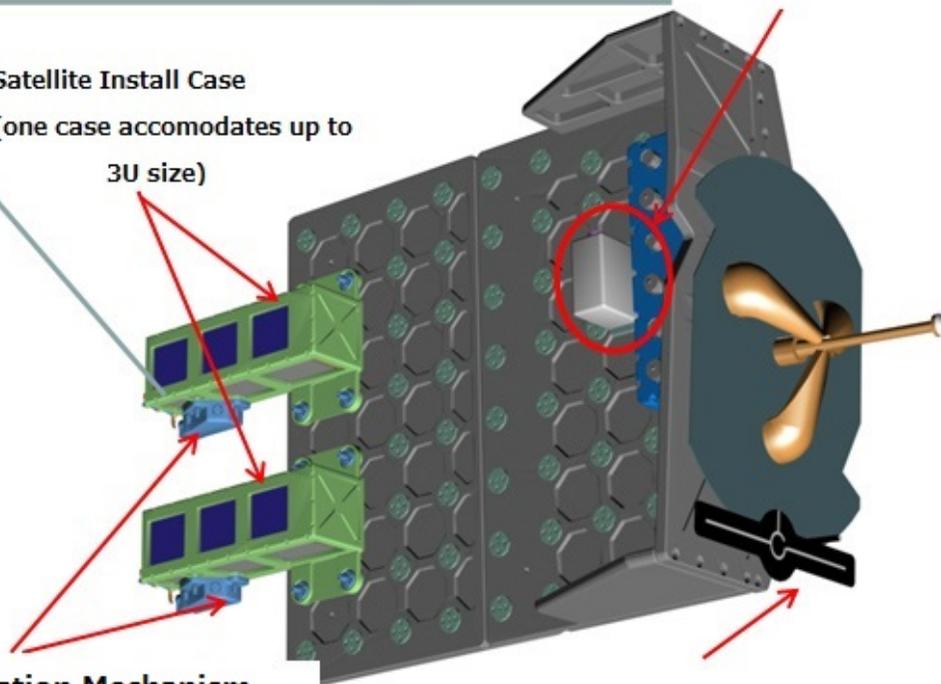
50cm-class microsat and Satellite Install Case

\* All of the requirements are available on the WEB  
 ([http://aerospacebiz.jaxa.jp/jp/ainori/kibo\\_yusyou.html](http://aerospacebiz.jaxa.jp/jp/ainori/kibo_yusyou.html)).

# J-SSOD



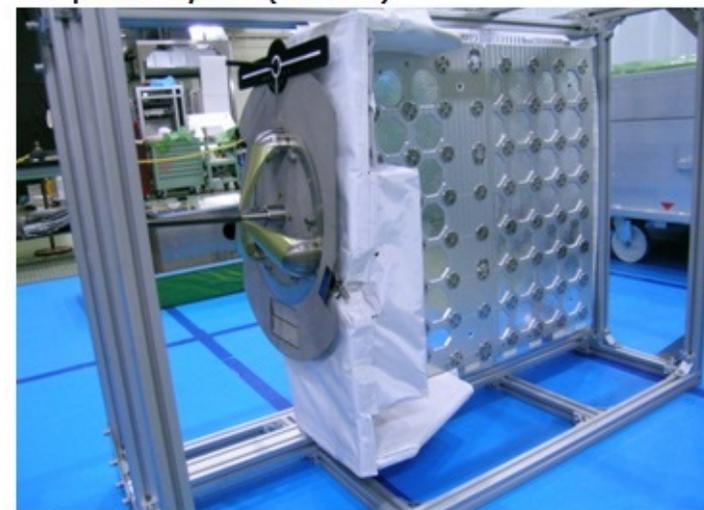
Satellite Install Case  
(one case accommodates up to  
3U size)



(Thermal cover and cables are omitted from this image)



Edge of the Japanese Experiment Module Remote Manipulator System (JEMRMS)



Multi-Purpose Experiment Platform (MPEP)