The KiboCUBE Programme

December 14, 2017
United Nations / South Africa
Symposium on Basic Space Technology
“Small satellite missions for scientific and technological advancement”

Masanobu TSUJI
Japan Aerospace Exploration Agency (JAXA)
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.

Credit: JAXA/NASA
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.
In recent years, a growing number of universities and companies around the world have been developing the Micro/Nano-satellite (under 100kg, mainly CubeSat).

At present, satellite deployers other than J-SSOD that use Kibo include the NanoRacks CubeSat Deployer (NRCSD) and Cyclops (Space Station Integrated Kinetic Launcher for Orbital Payload Systems).

Ref: Prof. 2017 Nano/Microsatellite Market Forecast (SpaceWorks Enterprises Inc.)
“Kibo” is Unique! – Exposed Facility

Small Satellite Deployment platform using J-SSOD

As of today, **200 satellites** have been successfully deployed from Kibo. JAXA operates the innovative launch opportunity by using one and only function on Kibo/ISS

From JAXA Tsukuba Space Center (TKSC) in JAPAN

Credit: JAXA/NASA
• **Lower vibration environment** are provided since Small Satellites are stowed in a soft bag and carried to the ISS together with other cargo.

• **Use the Airlock and Robotic Arm of Kibo without Extra-Vehicular Activity (EVA) of astronauts.**

### Item Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite Size</td>
<td>CubeSat: 1U, 2U, or 3U (*1) 6U: 10 cm (W) × 20 cm (D) × 30 cm (H) (*2) 50 kg class satellite: 55 cm × 35 cm × 55 cm</td>
</tr>
<tr>
<td>Satellite mass</td>
<td>CubeSat: 1.33 kg or less per 1U 50 kg class satellite: 50 kg or less</td>
</tr>
<tr>
<td>Orbital altitude</td>
<td>approximately 380 - 420 km (*3)</td>
</tr>
<tr>
<td>Inclination</td>
<td>51.6°</td>
</tr>
<tr>
<td>Deployment direction</td>
<td>Nadir-aft 45° from the ISS nadir side</td>
</tr>
<tr>
<td>Deployment velocity</td>
<td>CubeSat: 1.1 - 1.7 m/sec 50 kg Microsat: 0.4 m/sec</td>
</tr>
<tr>
<td>Ballistic coefficient</td>
<td>100 kg/m² or less (*4)</td>
</tr>
</tbody>
</table>

*1) CubeSat specification: 10 cm (W) × 10 cm (D) Height: 1U: 10 cm, 2U: 20 cm, 3U: 30 cm  
*2) Available from April 2018  
*3) Depends on ISS altitude.  
*4) Depends on ballistic coefficient, altitude at release, solar activity, etc.
“Kibo” is Unique! – Exposed Facility

Small Satellite Deployment platform using J-SSOD

Schedule for the satellite using the J-SSOD

The verification results are also reviewed by JAXA to verify that the satellite complies the J-SSOD interface.

Safety Reviews are typically conducted two to three times according to the phase of development of the satellite. The safety review at this point is the final to review the verification results related to the safety.

Timing of “Ship to Launch Site” is negotiable if time is critical. To be coordinated as early as possible with JAXA.

- Typically, the batteries cannot be recharged from this point.

Example (J-SSOD#4 Schedule)

Verifying Complete 
& Safety Data Package Release for Review 

Safety Review Complete  Sats H/O to JAXA  Shipment to Launch site  Launch  Deployment !

Contract  L-1.5 year  L-4.5 to 7.5 mon  L-3 to 6 mon  L-2.5 to 5.5 mon  L-2-5 mon  L-0  L+1

On-orbit stowage duration depends on. (Typically it is up to about 6 months.)

- NASA Review for 45 days

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract</td>
<td>Feb. 2015</td>
</tr>
<tr>
<td>Verification Complete</td>
<td>Apr. 27.2015</td>
</tr>
<tr>
<td>Safety Review Complete</td>
<td>Jun. 11</td>
</tr>
<tr>
<td>Sats H/O to JAXA</td>
<td>Jul. 14</td>
</tr>
<tr>
<td>Integrated J-SSOD with Sats H/O to HTV</td>
<td>Jul. 25</td>
</tr>
<tr>
<td>Launch</td>
<td>Aug. 19</td>
</tr>
<tr>
<td>Deployment</td>
<td>Sep. 17.2015</td>
</tr>
</tbody>
</table>

Typical, the batteries cannot be recharged from this point.
“Kibo” is Unique! – Exposed Facility
Small Satellite Deployment platform using J-SSOD

Partner to promote J-SSOD programme

<table>
<thead>
<tr>
<th>Partner</th>
<th>Target</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido and Tohoku University (Strategic Partner)</td>
<td>Especially University’s Students for Asian region</td>
<td>Capacity building through developing Microsat (50kg) (DIWATA-1: refer to Page 10)</td>
</tr>
<tr>
<td>Kyushu Institute of Technology (Strategic Partner)</td>
<td>Especially University’s Students for developing country</td>
<td>Capacity building through developing CubeSat such as BIRDS project (BIRDS: refer to Page 11)</td>
</tr>
<tr>
<td>UNITED NATIONS Office for Outer Space Affairs (KiboCUBE:Free Programme)</td>
<td>Educational or research institutions from developing countries of United Nations member states</td>
<td>Provide developing countries with opportunity to deploy CubeSat (KiboCUBE: refer to Page 12 to 14)</td>
</tr>
<tr>
<td>Japanese Private Companies/Japanese Universities</td>
<td>Does not matter</td>
<td>Does not matters</td>
</tr>
</tbody>
</table>

(1) Fee-Based service is available for any users at this moment.
(2) Early 2018, JAXA will establish the new framework of J-SSOD service for overseas users.
“Kibo” is Unique! – Exposed Facility
Small Satellite Deployment platform using J-SSOD

✓ First Philippine’s satellite
✓ First J-SSOD mission for 50 kg satellite deployment

DIWATA-1 Launch and Deploy: 2016

Investigator:
University of the Philippines (Philippine)
Department of Science and Technology (DOST)
Tohoku University/Hokkaido University

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

High Precision Telescope image captured on August 2016, (image credit: DOST/ASTI)
“Kibo” is Unique! – Exposed Facility

Small Satellite Deployment platform using J-SSOD

✓ Capacity building of developing country
✓ First Deployment after conclusion of a partnership agreement between JAXA and Kyutech
✓ First Satellite for Ghana, Bangladesh, and Mongolia

BIRDS-1 Launch and Deploy: 2017

Investigator: Kyushu Institute of Technology (KyuTech)
Japan, Ghana, Bangladesh, Mongolia, Nigeria, (For operation) Taiwan, Thailand
Size: 1U, 5 satellites
KiboCUBE

Collaboration between UNOOSA and JAXA to offer small satellite deployment opportunities from Kibo in order to facilitate improved space technologies in developing countries. (CubeSat (1U)/ once a year from 2017-2019)

- UNOOSA and JAXA have selected a team from the University of Nairobi to be the first to benefit from the KiboCUBE programme.
- We are going to launch a 1st Kenyan University NanoSatellite called 1KUNS-PF (1st Kenyan University NanoSatellite-Precursor Flight) in JFY2017. Its mission is Technology Demonstration.
- As for 2nd round opportunity, we have selected a team from the Universidad del Valle de Guatemala to be the second to benefit from the KiboCUBE programme.
UNOOSA-JAXA Cooperation “KiboCUBE”

[1st Round ] Schedule of KiboCUBE

**UNOOSA-JAXA Cooperation “KiboCUBE”**

**[1st Round ] Schedule of KiboCUBE**

---

**Media Briefing**

**Kick-off Meeting with JAXA**

**Technical Meeting with JAXA**

---

**Announcement of Opportunity**

- 15 Sep 2015

**Application Submission**

- 31 Mar 2016

---

**Selection Phase**

- 1 Aug 2016

**Selection and notification of applicants**

- Sep. 2016

---

**Deployment**

- Expected in early 2018

---

**Media Briefing**

**Kick-off Meeting with JAXA**

**Technical Meeting with JAXA**
UNOOSA-JAXA Cooperation “KiboCUBE”


◆ Announcement of Opportunity has started from September in 2017 for 3rd round KiboCUBE project.

◆ Application Submission will be due no later than 31 March 2018

The entity shall be...

- Located in developing countries
- Located in a country without the means to transport artificial satellites into space and place them in orbit
- A head of research institutes, universities, or other public organizations
- Responsible for the development, operation and utilization of their CubeSat
## UNOOSA-JAXA Cooperation “KiboCUBE”

### [3rd Round] Announcement of Opportunity

<table>
<thead>
<tr>
<th>Selection Milestone of 3rd Round</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement of Opportunity</td>
<td>26 September 2017 - 31 March 2018</td>
</tr>
<tr>
<td>Submitting application to UNOOSA</td>
<td></td>
</tr>
<tr>
<td>Several entities will be selected as “short listed entities” and notified before 1 July 2018.</td>
<td></td>
</tr>
<tr>
<td>One entity will be selected among the short-listed entities and <strong>notified by 1 August 2018</strong></td>
<td></td>
</tr>
<tr>
<td>Signing of an arrangement (contract) and Technical coordination</td>
<td>1-2 months</td>
</tr>
<tr>
<td>Signing of an agreement(contract) between JAXA and the Selected Entity.</td>
<td></td>
</tr>
<tr>
<td>Technical coordination in preparation of the CubeSat deployment between JAXA and the Selected Entity.</td>
<td>5-10 months</td>
</tr>
</tbody>
</table>

Application Submission will be due no later than 31 March 2018

http://www.unoosa.org/oosa/en/informationfor/media/2017-unis-os-484.html
Thank you for your attention!!

If you are interested in these activities, please contact

z-kibo-promotion@ml.jaxa.jp