Overview of ISS/Kibo and J-SSOD

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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)
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

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
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</table>
| 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/m² or less*3  
50-kg Microsat: 100 kg/m² 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.
The spring mechanism and the separation mechanism are installed on the J-SSOD case.
- The spring is compressed when the 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

◆ **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

◆ **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

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

Snapshot of Banana farm, Mindanao, the Philippines
(provided by PHL-MICROSAT, DIWATA-1)
In 2012, the J-SSOD technical demonstration was presented and carried 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.

### Deployment Achievements from Kibo

<table>
<thead>
<tr>
<th>Year</th>
<th>Launched Satellites</th>
<th>Deployed from Kibo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>2013</td>
<td>88</td>
<td>4</td>
</tr>
<tr>
<td>2014</td>
<td>142</td>
<td>46</td>
</tr>
<tr>
<td>2015</td>
<td>129</td>
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<td>2016</td>
<td>88</td>
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<td>2017</td>
<td>297</td>
<td>57</td>
</tr>
<tr>
<td>2018</td>
<td>244</td>
<td>19</td>
</tr>
<tr>
<td>2019</td>
<td>188</td>
<td>20</td>
</tr>
</tbody>
</table>

Credit: JAXA/NASA
Small Satellite Deployment Process

CubeSat  →  J-SSOD Satellite Install Case  →  Cargo Transfer Bag  →  Launch

Copyright: JAXA
Support from the ground

Flight Control Team and Engineering Team

Credit: JAXA/NASA
Thank you for your kind attention!