



# Kibo Robot Programming Challenge - UNOOSA/JAXA Education Programs on the ISS “Kibo”

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# What is Kibo?



Japanese Experiment Module "Kibo"  
(meaning "hope" in Japanese)

# Japanese Experiment Module “Kibo”

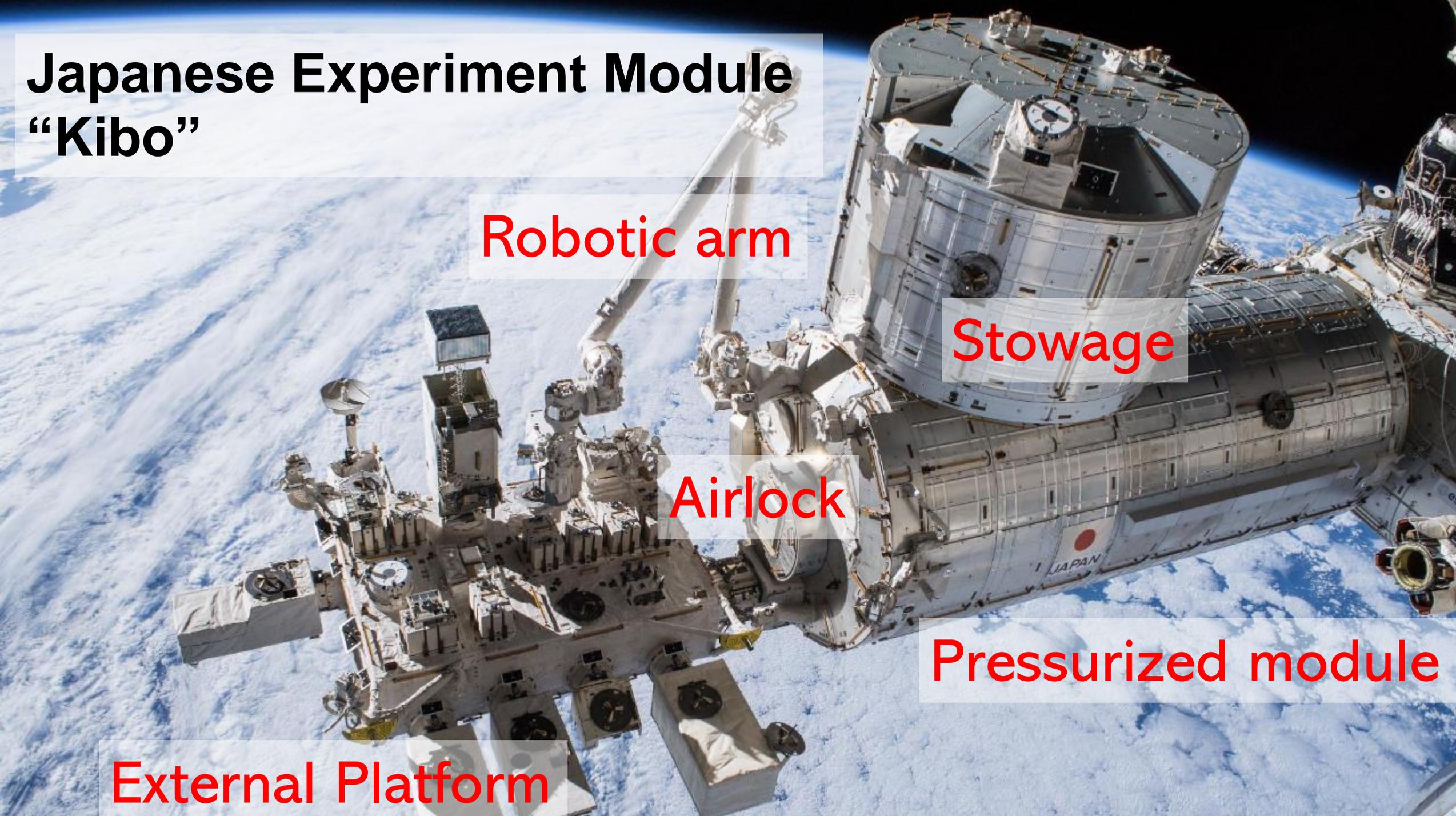
Robotic arm

Stowage

Airlock

Pressurized module

External Platform



# KiboCUBE : Program based on the United Nations/Japan collaboration on 1U CubeSat Deployment from the International Space Station (ISS) Japanese Experiment Module “Kibo”.

[https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE/KiboCUBE\\_Index.html](https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE/KiboCUBE_Index.html)



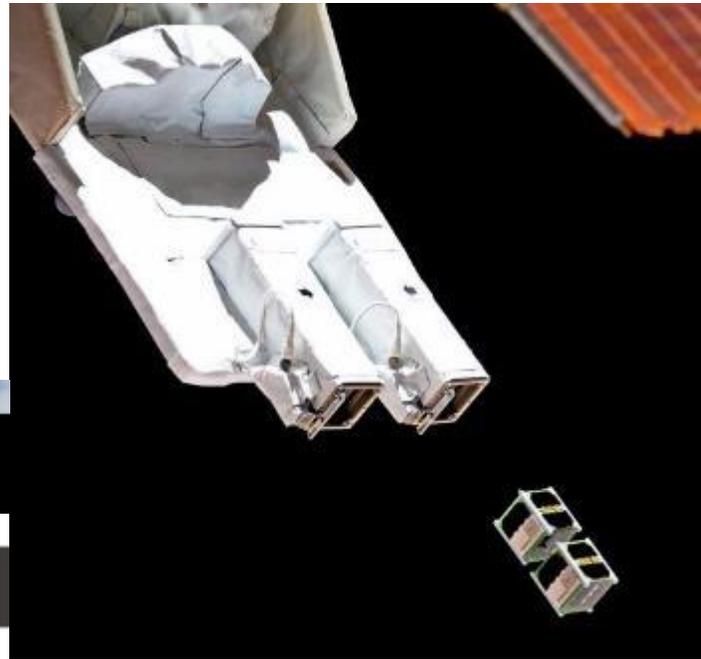
KiboCUBE in partnership with Japan Aerospace Exploration Agency provides the opportunity to develop a cube satellite (CubeSat) and have it deployed from the International Space Station Japanese module “Kibo”.

KiboCUBE enables access to space promoting the sustainability of future space activities.

Design and develop a 1U size CubeSat. Go through safety reviews and testing.

Bring it to JAXA.

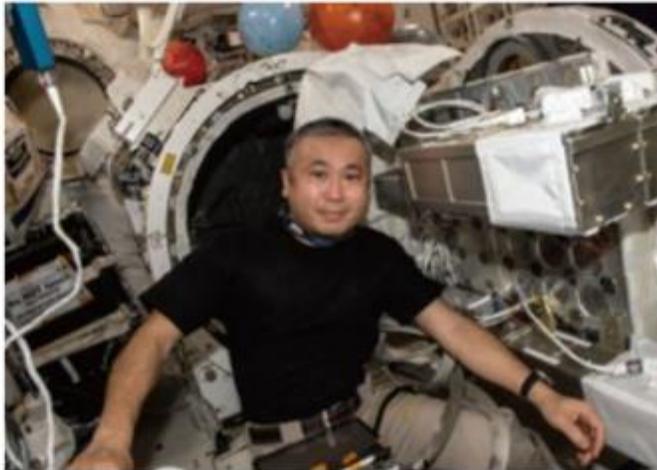
JEM Small Satellite Orbital Deployer **J-SSOD**



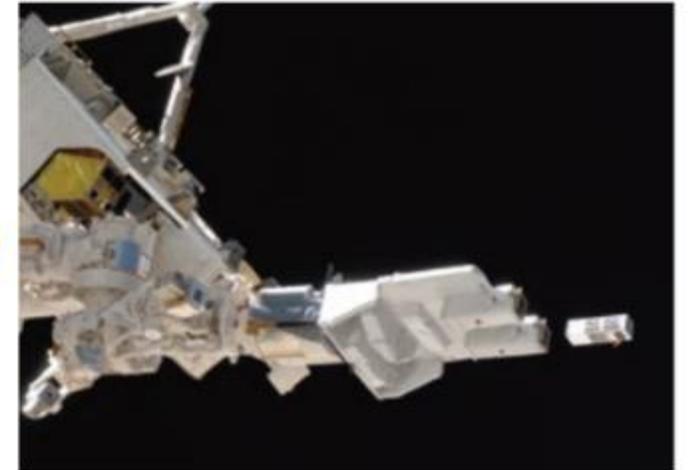
### CubeSat deployment mission using J-SSOD



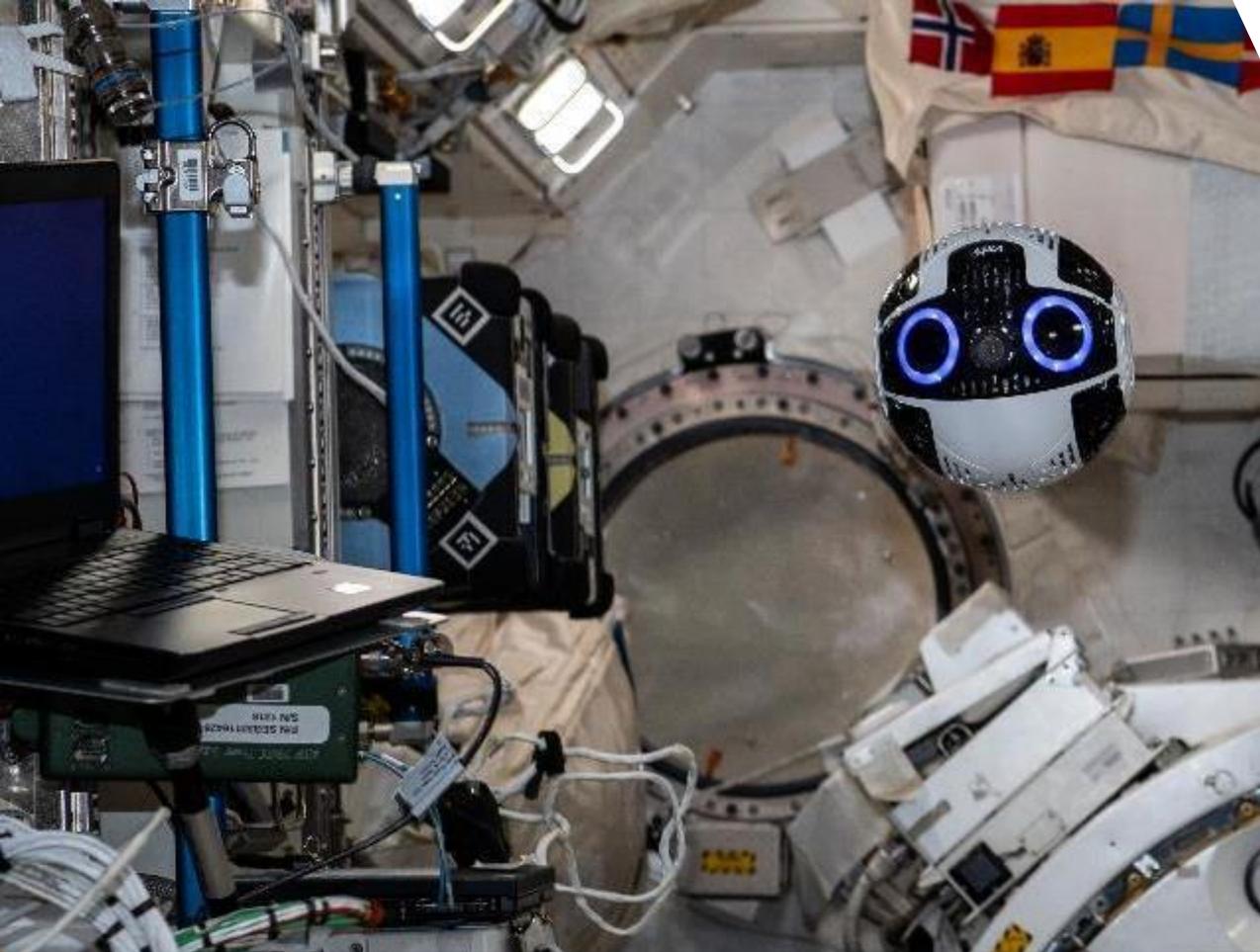
**1** The satellite install case which installs CubeSats is stowed in a soft-cushion bag for shipping. The satellite install case is launched by a cargo transfer vehicle to ISS.



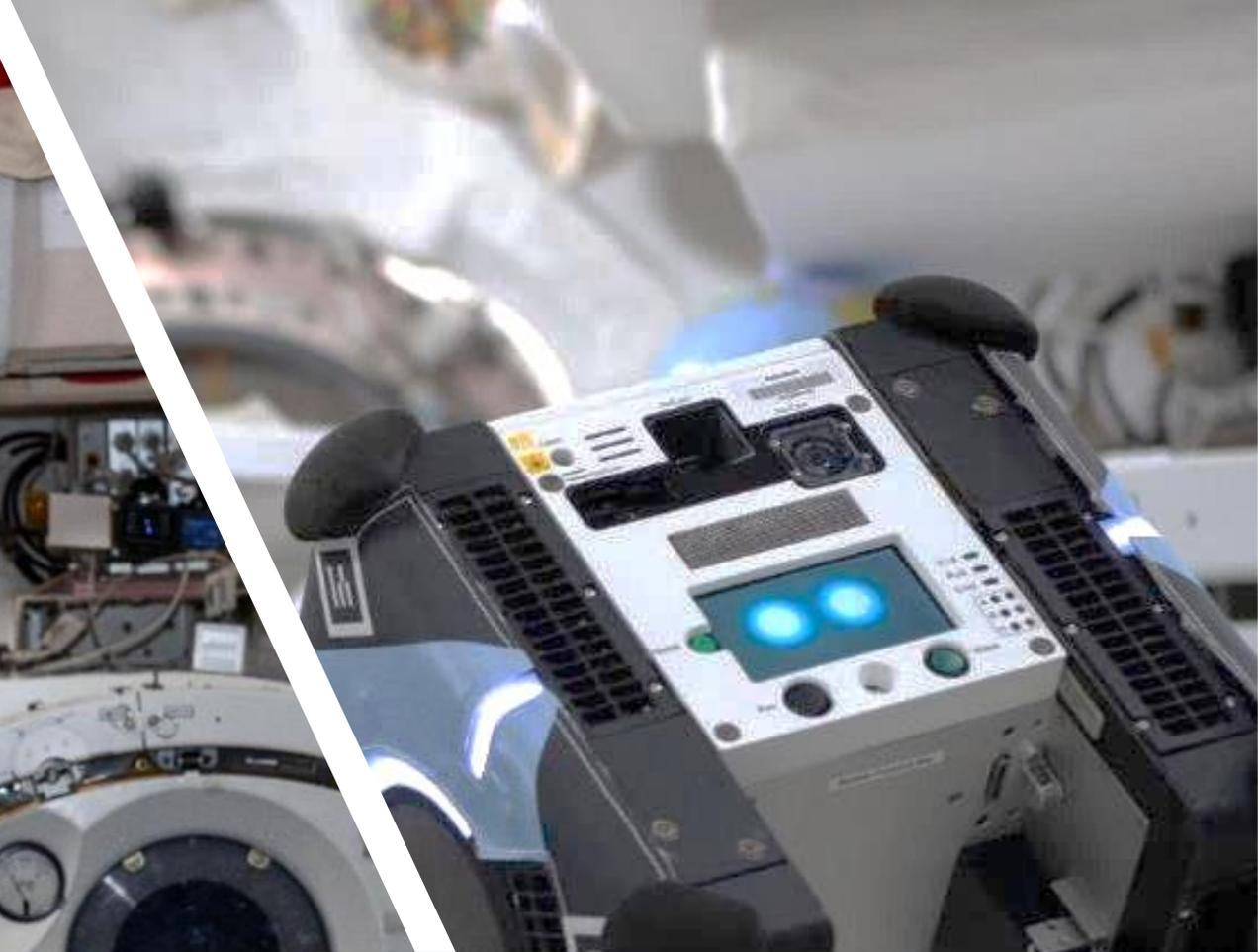
**2** The satellite install case is installed on the MPEP by the crew member in Japanese Experiment Module "Kibo", and then transferred from the airlock to the outside.



**3** The robotic arm of "Kibo" holds the MPEP to transfer it to the release point. The satellites are deployed by a command signal sent from ground.



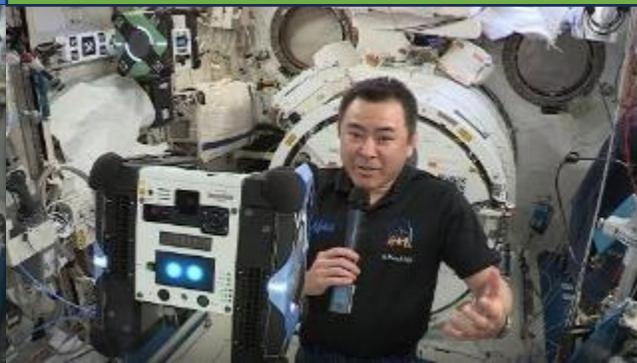
1<sup>st</sup> KRPC 2020



2<sup>nd</sup> KRPC 2021

3<sup>rd</sup> KRPC 2022

4<sup>th</sup> KRPC 2023



# Background

- **Japan-U.S. Open Platform Partnership Programs (JP-US OP3)**
  - On December 22, 2015, the Japanese and U.S. governments agreed on a new cooperation framework for the ISS Program.
    - Japan decided to extend its participation in the ISS operations until 2024.
    - An outline of JP-US OP3 is as follows:

1. Promotion of mutual use of experiment facilities
2. Increased cooperation in the Asia-Pacific region
3. Promotion of new uses for the ISS: technology demonstration, and use of HTV and HTV-X
4. Promotion of use of effective and efficient space-related technologies

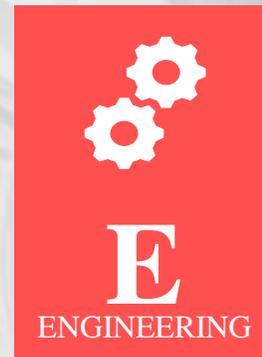
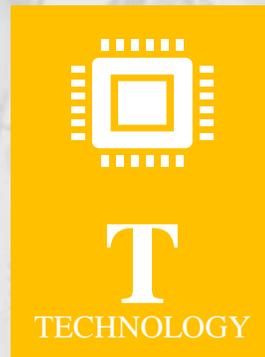
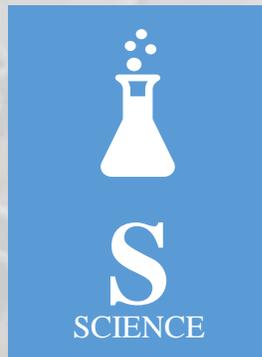


**JAXA and NASA are pursuing implementation of JP-US OP3.  
Kibo-RPC is based on JP-US OP3.**

# Background

- **About the Kibo Robot Programming Challenge**

- The Kibo Robot Programming Challenge is **an educational program**.
  - Students solve various problems by **programming free-flying robots (Astrobee and Int-Ball) in the International Space Station (ISS)**.
- Participants will have the chance to learn cutting-edge methodologies and **to hone their skills in science, technology, engineering and mathematics (STEM)**.
- **Expand international exchange by encouraging students** to interact with other participants from around the world.
- **To expand Kibo utilization in the Asia-Pacific region**, an educational program for operating robots and computer programming is being offered to students in Japan and the Asia-Pacific region.



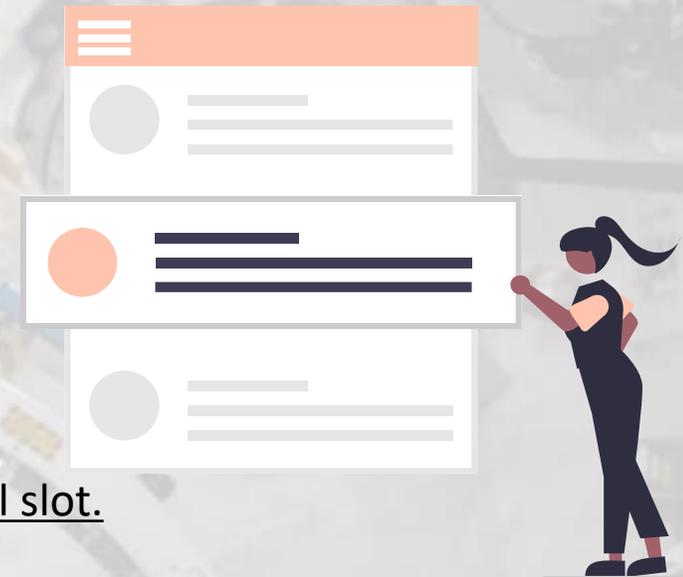
# Preliminary Round / Final Round

- Preliminary Round
  - Held in each country/region using simulator.
  - Program **stability** and **robustness** are important
  - The winning teams will advance to the Final Round as the representatives of their own countries/regions.
- Final Round
  - Held in the ISS/Kibo module.
  - Finalists' programs will be installed on Astrobees on-board and run on the day of the Final Round.



# 4th Kibo-RPC Major Update

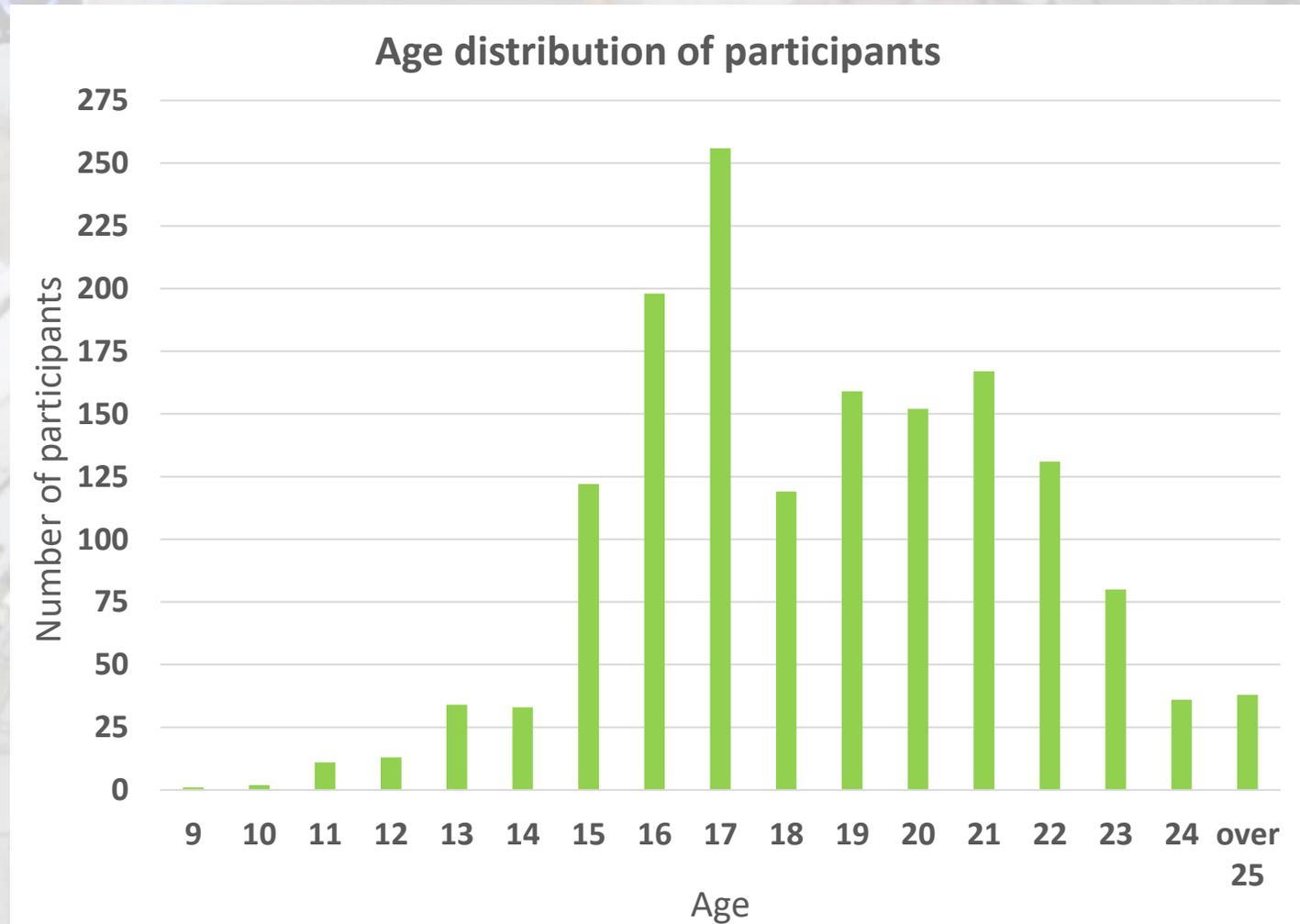
- Established the UNOOSA international slot
  - Collaboration between the United Nations Office for Outer Space Affairs (UNOOSA)
  - This allows participation from all over the world.
- Number of participants
  - **30 countries/region** have been participating.
    - includes participation from 19 countries through the UNOOSA international slot.
  - A total of **over 1,685 students on 421 teams** entered.
    - 3rd Kibo-RPC : 1,431 students / 351 teams



With UNOOSA, we were able to expand the participation of this program to 50 teams from 19 countries in Africa, Latin America and the Caribbeans, and Asia Pacific region.

# 4th Kibo-RPC Participation Results

- Age distribution
  - University students or older : approximately 50%
  - High school students : approximately 36%
  - The youngest was 9 years old.



# 4th Kibo-RPC Preliminary Round



# 4th Kibo-RPC Final Round

- Held on Oct 21, 2023
- Hybrid of on-site and on-line
- Finalist teams visited Tsukuba Space Center for the first time after COVID-19.
- 10 teams from Asia Pacific, USA, UNOOSA.



YouTube live streaming

<https://www.youtube.com/watch?v=DBKVAojl0GQ>

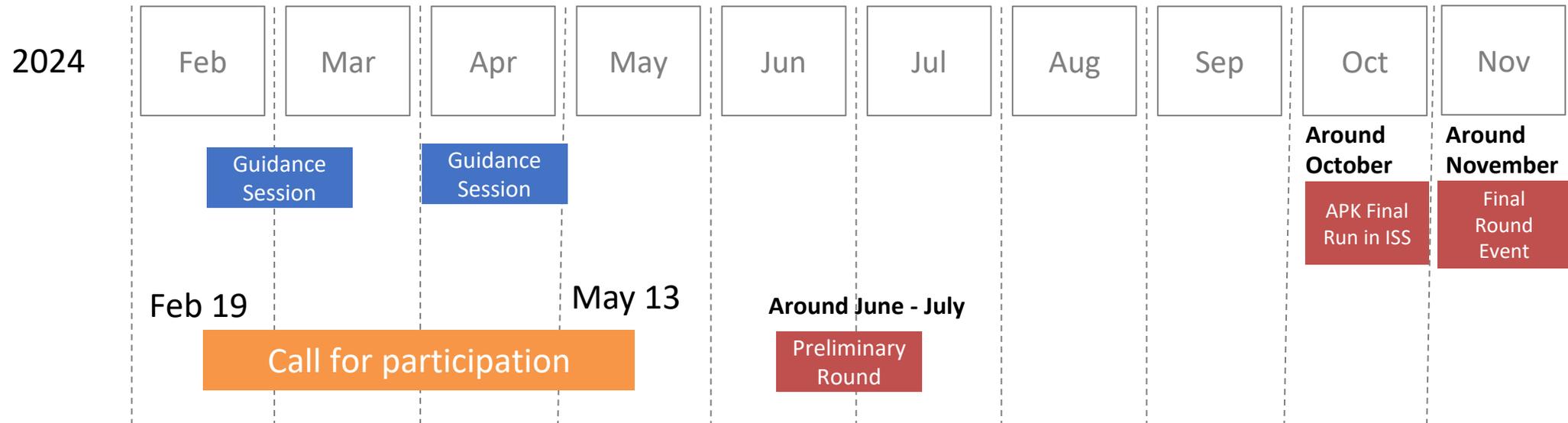


# 4th Kibo-RPC Workshop

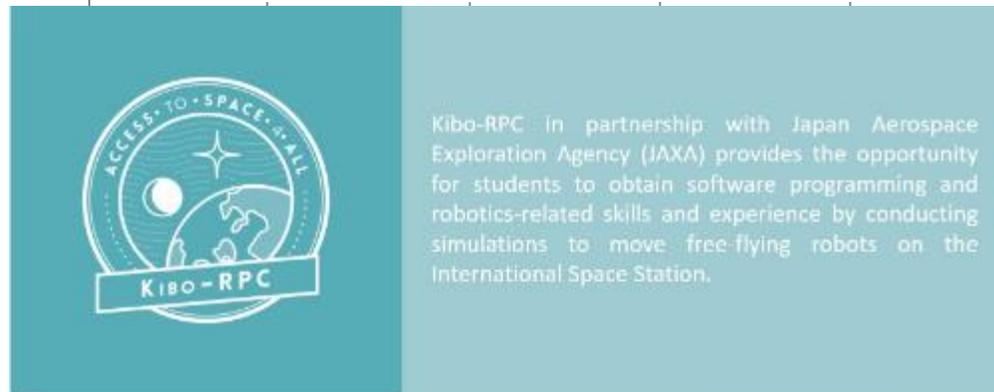
- Held on Oct 21, 2023, right after Final Round.
- Closed meeting with students, JAXA staff, academia, professionals from private company, and a Japanese astronaut.
- Feedback to programming and strategy.
- International communications with participants.



# 5<sup>th</sup> Kibo Robot Programming Challenge Schedule (Tentative)



Please join the next Kibo-RPC from UNOOSA international slot!



- Kibo-RPC Portal site :  
<https://jaxa.krpc.jp/ja>  
All documents will be available.
- Guidebook
  - Rulebook
  - Tutorial Videos

[https://www.unoosa.org/oosa/en/ourwork/access2space4all/Kibo-RPC/Kibo-RPC\\_Index.html](https://www.unoosa.org/oosa/en/ourwork/access2space4all/Kibo-RPC/Kibo-RPC_Index.html)



*Thank you*