



# UNISEC-Global The 48<sup>th</sup> Virtual Meeting

September 21<sup>st</sup>, 2024, 22:00-24:00  
(Standard Japan time GMT +9)

**48th Virtual UNISEC-Global Meeting**  

**Theme: Introduction to J-CUBE**

Host: UNISEC-Japan  
Date: September 21, 2024 Time: 22:00-24:00(JST)

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 <b>Mengu Cho,</b> Kyushu Institute of Technology Moderator and Opening Remarks	 <b>Tetsuhito Fuse,</b> Kyushu Institute of Technology Introduction to J-CUBE
 <b>Tatsuhito Fujita,</b> JAXA Deployment Service of CubeSats from ISS	 <b>Angela Chua,</b> Project Member of Maya-5 and Maya-6 BIRDS-4S (Maya-5 & Maya-6): The Filipino J-Cube Experience

<https://www.unisec-global.org/virtual-meeting.html>



The following report was prepared by UNISEC-Global Secretariat  
September 26, 2024  
Japan

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# 1. Opening Remarks

Mengu Cho, Kyushu Institute of Technology

Prof. Mengu Cho is the Professor and the Director of the Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE) at Kyushu Institute of Technology. He received his B.S. and M.S. degrees from the University of Tokyo, Tokyo, Japan, in 1985 and 1987, respectively. Similarly, he received his Ph.D. degree from the Massachusetts Institute of Technology, Cambridge, in 1992.

From 1992 to 1995, he was a Research Associate with Kobe University, Kobe, Japan. from 1995 to 1996, he was a Teaching Associate with the International Space University, Illkirch-Graffenstaden, France. Since 1996, he has been with the Department of Electrical Engineering, Kyushu Institute of Technology, Kitakyushu, Japan. He was an Assistant Professor in 1996, an Associate Professor in 1997, and a professor since 2004. He has been with the Department of Applied Science for Integrated system engineering since 2010.

Prof. Cho has received various awards honoring his work. He received the **Space Development and Utilization Grand Prize** from Ministry of Economy in 2015, **GEDC Airbus Diversity Award** from Global Engineering Dean's Council in 2017, the **Frank J. Malina Astronautics Medal** from International Astronautical Federation in 2019 and Space and Satellite International's (SSPI) **Better Satellite World Award** in 2019. His research interests include spacecraft-plasma interaction, space power system, laser application, and computational electromagnetics.



*Pictured: Prof. Mengu Cho while giving the opening remarks*

## Highlights:

- Extended greetings
- J-Cube
  - Initiative between JAXA and UNISEC-Japan
  - Not to be confused with Kibo-Cube (initiative between JAXA and UNOOSA)
  - Ultra low-cost launch option
  - Requirement is
    - Satellite should be “capacity-building”
    - Partnership with any Japanese Universities
- Win-win situation where both parties can benefit and learn from each other
- Proceeded to briefly introduce the speakers

## 2. Presentation on “Deployment Service of CubeSats from ISS”

Tatsuhito Fujita, Japan Aerospace Exploration Agency

Tatsuhito Fujita is an associate senior engineer at Japan Aerospace Exploration Agency (JAXA) and is currently working for JEM Utilization Center, Human Space Development Directorate. Mr. Fujita did his undergraduate from Keio University and his Masters at International Space University. He has been with JAXA since 1992.



*Pictured: Fujita-San provides an overview of JAXA's small satellite deployment program*

### Highlights:

- Japan Aerospace Exploration Agency (JAXA) was formed by merging three different institutions
- Support the Japanese governments' overall space involvement: from basic research to utilization
- CubeSat Deployment Mission:
  - ISS is 400km above earth, and was a huge construction
  - Aiming to advance science and technology
  - 50 countries have participated in ISS
- Kibo - Japanese Experimental Module in the ISS has two modules:
  - Pressured Module and Exposed Facility
- Kibo exposed facility:
  - Features Airlock (AL) and Remote Manipulator System (JEMRMS): a robotic arm
  - Holds high capacity to exchange equipment
  - Uses JEM Small Satellite Orbital Deployer (J-SSOD) to deploy small satellites- since 2012
- J-SSOD:
  - Inclination of about 51 degrees
  - The deployer can deploy satellites of sizes 1U- 6U of a max. of 50 kg
  - Deploys satellite with the spring mechanism and the separation mechanism:
    - Spring mechanism pushes the satellite
    - Separation mechanism opens and closes the door
  - Two types of cases that carry cube satellites:
    - J-SSOD case has max size is 3U in a slot
    - J-SSOD-R case:
      - Satellite is transported to ISS where it is stored in Kibo Module
      - The satellite is transferred to deployment case by astronauts
      - Can be used to repeatedly load satellites, up to 60 in a slot
  - Operation command for JEMRMS sent from ground
- Requirement of J-SSOD (JEM\_Payload\_Accommodation\_Handbook\_Vol.8) must be met by all users
  - [https://humans-in-space.jaxa.jp/kibouser/library/item/jx-espcc\\_8e\\_en.pdf](https://humans-in-space.jaxa.jp/kibouser/library/item/jx-espcc_8e_en.pdf)
- Safety Review in ISS:
  - JAXA is responsible for the safety of JEM, visiting vehicle and other payloads
  - Hazards must be identified early in design process
  - Safety review panel reviews the human payloads and collectively reviews risk hazards
  - Safety Review Procedure:
    - Preliminary Design: hazard identification

- Critical Design: designing of hazard elimination methods
- Production and testing: verifying the designed methods
- Launching and on-orbit operations
- 72 CubeSats have been deployed from a total of about 31 countries from J-SSOD from 2012 – 2024
- Programs of Capacity Building through JAXA:
  - J-Cube - a fee-based program to provide satellite deployment opportunities to many countries
  - KiboCube - collaboration with UNOOSA
  - KiboCube Academy - webinar and online lectures on UNOOSA website
    - Collaboration with UNISEC-Japan
- All programs contribute to the SDG 4, 8, and 9

### 3. Presentation on “General Overview on how to Collaborate with a Japanese University for J-Cube”

Tetsuhito Fuse, Kyushu Institute of Technology

Tetsuhito Fuse graduated from Waseda University of Japan in 2002, with a BS degree in applied physics and a master's degree in the same field in 2004. He was an engineer at Japan Aerospace Exploration Agency (JAXA) from 2004 to 2022. He worked at Satellite Operation and Network System Center, and International Space Station (ISS) Kibo utilization center as a systems engineer. After working at the management department at headquarters of JAXA, he started an open-innovation activity which is called Space Exploration Innovation Hub Center and designed and promoted its system. He finished his second master's degree in Management of Technology (MOT) at Tokyo Institute of Technology (Titech) in 2020. In 2022, he began working as associate professor at Kyushu Institute of Technology (Kyutech) at the Laboratory of Lean Satellite Enterprises and In-Orbit Experiments (LaSEINE) and coordinating collaborative activities with international and domestic partners for promoting Space Engineering International Course (SEIC) program at Kyutech.



*Pictured: Fuse-San provides an overview of J-Cube program*

#### Highlights:

- Presentation focuses on how to collaboration with a Japanese University for J-Cube
- J-Cube is a collaboration between JAXA and UNISEC to help countries deploy their CubeSat
- J-Cube and KiboCube is different
  - **KiboCube**
    - Collaboration between JAXA and UNOOSA
    - no-cost launch opportunity
    - Only 1 time per year with limited selection, extremely competitive
    - Size of CubeSat is 1U max
  - **J-Cube**
    - a wider initiative curated with collaboration between JAXA and UNOOSA
    - not free but low cost



- requires collaboration with a Japanese University
- size can be up to 3U
- Kyushu Institute of Technology (Kyutech)
  - Focuses of small satellite technology development
  - has been one of the main collaborating faces for launch of CubeSats
    - Over 10 international launch projects conducted
- Main goals of collaboration with international participants
  - Assisting emerging countries to develop space technologies and access space
  - Being an agent of bringing diversity into space sector
- Finding a Japanese partner
  - Process includes contacting individuals, meetings (remote/ in-person), exchange of statement of work, discussion of responsibilities, contract signing, funding, launch and operation
  - Benefits to the Japanese Universities need to be identified
  - UNISEC-Global meetings, IAC are good platforms for individual connections
- Japanese Universities are not launch brokers
  - expect returns in forms of students, papers etc. and not money
- Suggested collaboration schemes:
  - Joint development of CubeSat
    - student exchange preferably different background
  - Satellite built in other countries but further inspection and studies in Japan
  - Students come from other countries to build satellite in Japan
- Student exchange - >1 year, preferably full graduate student
- Contract between foreign entity and Japanese University is necessary
- Contract must be legally binding covering non-military aspects, UN registration and article points dealing with currency
- Recent CubeSat projects include:
  - Maya-5 and Maya-6 (Philippines), KNACKSAT-2 (Thailand), K'OTO UNAM (Mexico)
  - ASEANSAT (Malaysia) and ACCIMT (Sri Lanka)

#### **4. Presentation on “BIRDS-4S (Maya-5 & Maya-6): The Filipino J-Cube Experience”**

Angela Chua, Analog Devices

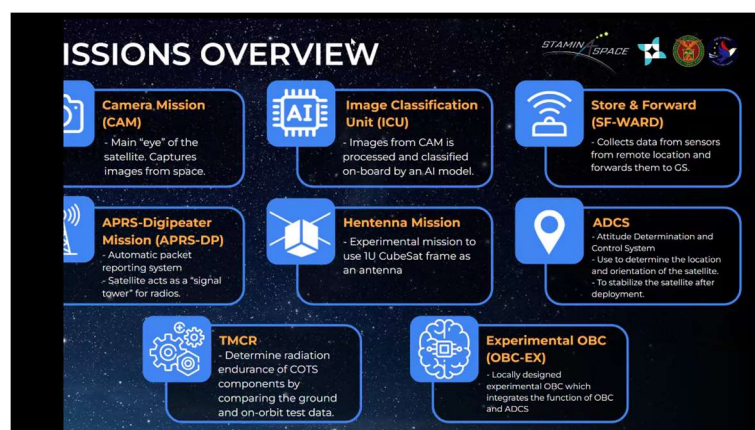
Angela "AC" Chua was the member of the team who developed the Philippines's first locally fabricated nanosatellites Maya-5 and Maya-6, also known as the BIRDS-4S satellites. She was mainly responsible for the satellites' main camera (CAM), the Image Classification Unit (ICU), which is an AI-based on-board image classifier and the Attitude Determination and Control System (ADCS) of the satellite. She was also the Mission Lead of the project, responsible for overseeing the mission payloads of the CubeSats. AC is currently a Design Verification Engineer at Analog Devices.



*Pictured: Chua-San shares her J-Cube experience*

## Highlights:

- BIRDS-4S
  - Consists of two satellites: Maya-5 and Maya-6
  - Project of Department of Science & Technology – STAMINA4Space
  - Local university partner is University of Philippines – Diliman
  - Partner university is Kyushu Institute of Technology (Kyutech)
  - Partnership made possible by UNISEC and JAXA
  - Aim is to transition to locally fabricated satellites while serving as the heritage for future CubeSats
  - 8 members assigned to specific subsystems
  - Missions Overview
    - Camera Mission
    - Image Classification Unit (ICU)
    - Store & Forward (SF-WARD)
    - ARPS-Digipeater Mission (APRS-DP)
    - Hentenna Mission – To use satellite frame as antenna
    - Altitude Determination and Control System (ADCS)
    - TMCR - to determine radiation endurance
    - Experimental OBC Mission (OBC-EX)
- Project timeline included self-research, MDR, PDR, Procurement, EM testing
- Space Environment Testing, FM testing, CDR, FM integration, FM testing at Kyutech
- Satellite was turned over to JAXA on Feb 24, 2023
- Launched in June 5, 2023 to ISS and Deployed from ISS on July 19, 2023
- Deployed from ISS
- Japanese Experiment Module (JEM) Small Satellite Orbital Deployer-26 (J-SSOD-26) or “KIBO”
- On behalf of Birds-4S team, her gratitude to DOST, UP-Diliman, Kyutech, UNISEC and JAXA



Pictured: AC Chua describing the missions of Maya-6

## 5. Question and Answer (Q&A) session

**Q:** Joseph/DIT: If we want to apply for the J-Cube, can you suggest the Japanese university that we can collaborate with that have similar mission as LaSEINE?

**A:** Prof. Mengu Cho: Yes, you can contact J-Cube office or UNISEC Japan, and UNISEC Japan will co-ordinate with Japanese Universities, and find the partner. UNISEC Japan will act as a one-stop shop. So, you can send the message to them.

**Satomi Tanaka:** Yes, I will post the contact information of J-Cube office in the chat. Please contact J-Cube office if you have any request to collaborate with Japanese Universities or UNISEC Team.

**Q:** Daliso Banda: Apart from Student Exchange, Is there also the possibility of a post doc route?

**A: Prof. Mengu Cho:** Yes, anything is open depending on the universities that you collaborate with. From Kyutech point of view, Post doctorate is fine. Some universities really want the students, because students will mean a lot to the university. Especially to the Japanese students due to the interaction between Japanese students and foreign students.

**Q: Elia: How long does it take to get into orbit?**

**A: Prof. Mengu Cho:** Depends. There are two time limiting issues. One is frequency coordination. It also depends on the country. It takes at least a year. Another issue is safety review. If you use very standardized designs and very typical designs which pose very little issue of safety, it will be quick. If you have a new design which may pose safety risk, especially to astronomers, it will take long. Minimum 1 year, could be 2, or 3.

**Q: Elia: What is the lifespan of the satellite?**

**A: Prof. Mengu Cho:** Lifetime depends on the fall activities. 1U CubeSat which was recently launched from ISS, it deorbited in 4 months. The 3U satellite didn't stay for 3 months. If you launch it three years from now, it will stay much longer. The longest time is 2 years that a CubeSat survived. Depends on time of launch.

**Q: Joseph/DIT: From the 3rd presentation, can we get the design documents of the BIRDS satellite for learning purposes?**

**A: Angela Chua:** I'm not sure about the design documents. Our documents are also from the Kyutech. But I can share the presentation.

**Q: Joseph/DIT: What are the typical specs of Onboard Computer and what Operating system does it run?**

**A: Prof. Mengu Cho:** It's PIC microcontroller. It's a very primitive microcontroller. There's no operating system, just a microcontroller.

**Q: Paul Mmbaga: Are Maya 5 and Maya 6 missions constructed in different two CubeSats or one CubeSat? if it is only one CubeSat how could it handle all the mentioned payloads?**

**A: Angela Chua:** All the missions are included in both the satellites, except for OBC-Ex, or Experimental OBC, which was only in Maya-6. So basically, the difference between the two satellites is that Maya-5 is a literal copy of birds-4 satellite. Whereas Maya-6 has an additional OBC-Ex. So, in only one cube sat how it could handle all the payloads is, the missions are included in each of their mission boards. The mission is also handled by each member so that way we can properly test the satellite. There's a separate subsystem that can calculate the power supply so it can supply it to all the missions. We also had integration testing so all the missions can talk and communicate to each other. So, that's how the satellite can handle all the payloads

**Q: Asinta: Can UNISEC or JAXA arrange for practical training like the one that was offered in South Africa last year?**

**A: Rei Kawashima:** Yes, we will organize the Hepta-Sat training, which is United Nations', UNOOSA's and JAXA's training. Last time we had 3-day session but this time we will have a one-day session, and it's going to be free of charge, due to our sponsor, JAXA and UNOOSA. So, if someone wants to come, please join. The application cycle will be open very soon in the end of September or beginning of October. We will let you know when we're ready. The date is Nov 30<sup>th</sup>, after UNISEC Global meeting, in South Africa, Cape Town.

**Q: Asinta: Can we arrange a meeting related to J-Cube during IAC in Italy?**

**A: Prof. Mengu Cho:** We currently don't have any plans for IAC.

**Tatsuhito Fujita:** I may not be attending IAC either, if possible, I can setup a meet with any member of J-cube team who will be attending IAC.



**Q: Jesus D. Gonzalez: Is Signing the contract between universities required before applying to J-Cube?**

**A: Rei Kawashima:** *It's not required but most Japanese universities will require the contract before applying J-Cube.*

**Prof. Mengu Cho:** *This year's J-Cube deadline is in December. So, before that, no need to have contract. Japanese Universities will need to sign a launch contract by JAXA by end of March. So, by then, there must be some written agreement between Japanese University and the foreign partners.*

**Q: Ted Tagami: Is it possible to build a cube lab that stays on the ISS instead of a CubeSat? We can investigate life science technology and bring it home then.**

**A: Tatsuhito Fujita:** *If you want to use cube lab in pressurized module you try to contact Kibo Research Center. If you try to contact, you can coordinate some science demonstration in the ISS.*

**Q: Daliso Banda: what is the approximate cost of Maya 6 hardware?**

**A: Prof. Mengu Cho:** *It depends on where you build it. If we build all the hardware in Japan, procure everything in Japan, it is less than 10 million yen. You need 5-6 million yen if you do everything in Japan. If you do everything outside Japan, especially in developing countries, it is very difficult to deal with the custom issues. Especially in Philippines, I think they have a hard time in customs. The satellite stays in customs for about a month. So, if you procure parts from other countries, the cost depends on the country. I'll tell you the market price. The cheapest one is where you buy the entire satellite bus from one single vender. It cost around 60k or 70k euro. Hardware cost for IU won't be more than 100k dollars. However, all the custom issues really drive up the costs. In some countries, accessing simple internet stores like Digi Key is not possible. Also importing the parts is a headache. So, you need to talk with Japanese partners.*

## 6. Announcement and Acknowledgment

Haruka Yasuda, UNISEC-Global



*Pictured: Yasuda-San announcing the latest updates from UNISEC-Global*

### Highlights:

- **CLTP13 (CubeSat Leader training Program)**
  - Date: August 19-29, 2024
  - Venue: Nihon University, Chiba, Japan
  - CLTP13 was successfully completed and 10 trainees from 7 countries completed the course
  - CLTP Website: <http://cltp.info/index.html>
  - Contact: [secretariat@cltp.info](mailto:secretariat@cltp.info)
  
- **The 9th Mission Idea Contest (Preliminary Workshop)**
  - The MIC9 theme is "Lunar Mission"
  - Received 24 abstracts from 14 countries
  - 10 finalists were selected who will make a presentation at Preliminary Workshop on November 27
  - Website: <https://www.spacemic.net/>

- Important Dates:
  - Final Presentation: November 27, 2024 (South Africa)
- Contact: [info@spacemic.net](mailto:info@spacemic.net)
- **13<sup>th</sup> Nano- Satellite Symposium**
  - Date: November 25-27, 2024
  - Venue: Protea Hotel Technopark, Stellenbosch, South Africa
    - [https://www0.sun.ac.za/UNISEC-SAR/nanosat13/call\\_for\\_papers/](https://www0.sun.ac.za/UNISEC-SAR/nanosat13/call_for_papers/)
  - Registration for 13<sup>th</sup> Nanosatellite Symposium and 10<sup>th</sup> UNISEC-Global Meeting
    - <https://www0.sun.ac.za/UNISEC-SAR/nanosat13/>
- **HEPTA-Sat Training in South Africa (UN Workshop)**
  - Date: November 30, 2024
  - Venue: Stellenbosch University, South Africa
  - Capacity: 40 people
  - Tuition: Free of Charge
  - Application: Coming soon at the UNOOSA website
  - [https://www0.sun.ac.za/UNISEC-SAR/nanosat13/hepta\\_workshop/](https://www0.sun.ac.za/UNISEC-SAR/nanosat13/hepta_workshop/)
- **Launch Opportunity: J-Cube**
  - Special Discounted opportunities
  - 1U, 2U, 3U, deployment from International Space Station
  - Collaborate with UNISEC-Japan's University
  - Technical support will be provided
  - Contact: [info-jcube@unisec.jp](mailto:info-jcube@unisec.jp) , <http://unisec.jp/serviceen/j-cube>

## 7. Participant Statistics

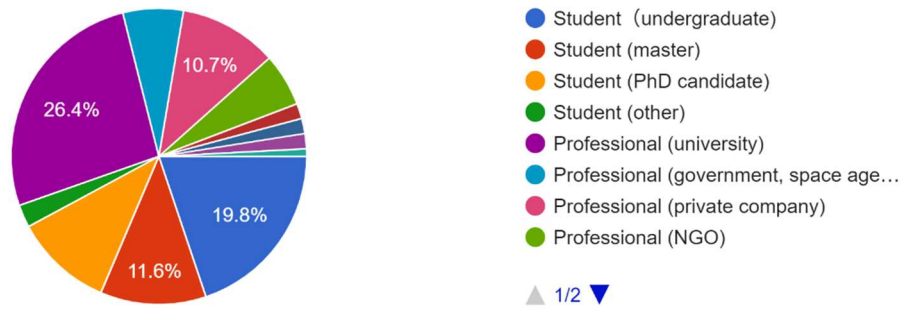
121 registered participants from 35 countries and regions for the 48<sup>th</sup> Virtual UNISEC-Global Meeting.

Registrants			
Country	Registrants	Country	Registrants
Argentina	2	Nigeria	2
Australia	1	Norway	1
Bangladesh	2	Peru	3
Country	Registrants	Country	Registrants
Bhutan	1	Philippines	11
Brazil	1	Portugal	1
Bulgaria	4	Romania	1
Burkina Faso	3	Russia	1
Colombia	4	Rwanda	2
Dominican Republic	1	Taiwan	1

Egypt	4	Tanzania	26
El Salvador	2	Thailand	1
Germany	1	Tunisia	2
India	8	UAE	1
Indonesia	1	UK	1
Japan	15	US	5
Malaysia	2	Zambia	1
Mexico	3	Nepal	4
Myanmar	2		

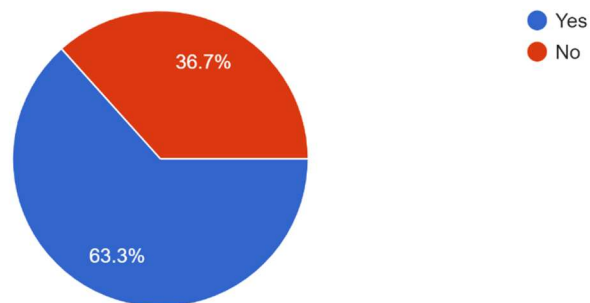
### Student or professional?

121 responses



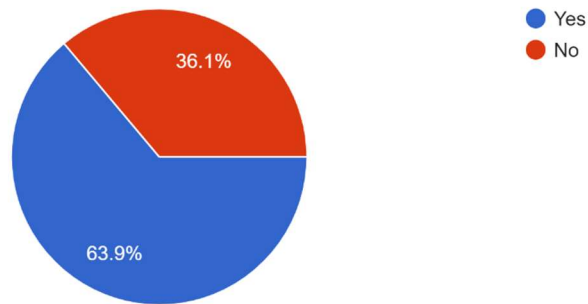
### Have you participated in the UNISEC-Global Meeting previously?

120 responses



Have you ever considered applying to J-CUBE?

119 responses



Talking the

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**Thank you**