# UNISEC-Global The 23rd Virtual Meeting

July 16, 2022, 22:00-24:00
(Standard Japan time GMT +9)



**The following report was prepared by UNISEC-Global Secretariat**
**July 16, 2022.**
**Japan**

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# 1. Opening Remarks

George Maeda, UNISEC-Global

George Maeda graduated from the University of Maryland in 1981, with a BS degree in electrical engineering. He then received a master's degree in the same field from Cornell University in 1982. In July of 2015, he began working at Kyutech in the LaSEINE laboratory of Prof. Mengu Cho. George was involved from with the multi-award winning BIRDS program and oversaw international corporation, satellite projects and played an integral role in bringing non-space fairing nations into the BIRDS program. He recently retired in early 2022. He is currently involved with UNISEC as it is closely related to his previous work concerning nano-satellites and their aim to train young people in space-related engineering fields.


*Pictured: Maeda-san giving his opening remarks on SDG for space during the meeting*

Highlights:

- Sustainable Development Goals (SDG) adopted by United Nations in 2015
- Goal of 2030 for peace, and prosperity for all
- 17 SDGs, countries committed to prioritizing work and policies according to SDG
- Emphasis on sustainability
- **UNISEC-Global fosters capacity building in space engineering**
- Agenda 2030: key principle agenda, no one will be left behind
- **By 2030, create a world where students can participate in practical space projects everywhere**
- UNISEC local chapters coordinate within their local space
    - Focus on tech, training, education, policy and incubation
    - UNISEC-Global empowers local chapters to work with industry and gov. hand in hand
- Empowerment of local chapters by
    - Planning and activity report
    - Hosting UNISEC-Global Meeting
    - Local chapter of the year awards
    - Mission Idea Contest (MIC) and Local Competition (Pre-MIC)
    - CanSat Leadership Training Program (CLTP)
    - CLTP-11 this year, CLTP-12 next August
- **For establishing local chapter in your country, please contact:**
    - Ms. Rei Kawashima
    - Email: rei@unisec-global.org, secretariat@unisec-global.org

## 2. Presentation on “Space and SDGs”

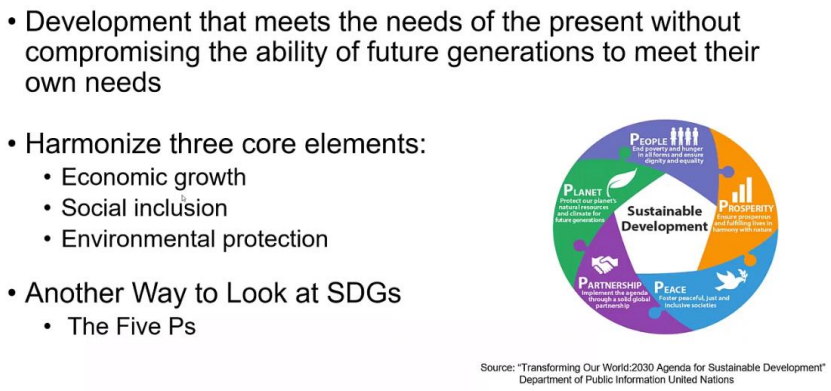
Satoru Kurosu, Yokogawa Electric Corporation

Satoru Kurosu is the founder of Space business of Yokogawa Electric Corporation. Mr. Kurosu had the role as Director, and later Executive Vice President until March 2019. In April 2019, he entered the Executive Space Course of International Space University (ISU). In 2020, he further completed Interactive Space Program (ISP20) of ISU. By July 2021, he established Space Business Development Office, the first space dedicated origination of Yokogawa. As he has the concurrent position of Chief Sustainability Officer, Mr. Kurosu is promoting space enabled solutions which can contribute to SDGs on earth. He is also the International Advisory Board Member of UNISEC.


*Pictured: Kurosu-san providing insights into how SDGs and space can work together*

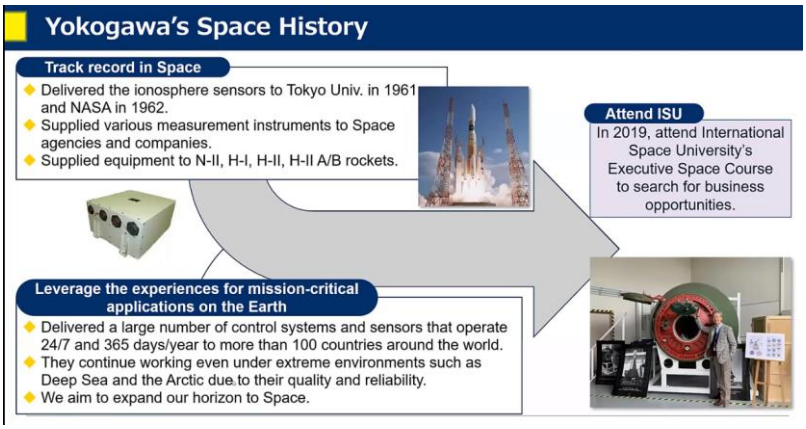
Highlights:

- UN started to tackle environmental issues in 1972 at UN Conference on Human Environment
- Called the Stockholm Declaration
- UN Conference on Environment and Development, Rio de Janerio on 3-14 June 1992
- 2012 UN Con. on Sustainable Development also called Rio 20
- Every 20 years, big summit for environment protection by the UN
- 2000 UN adopted Millennium Development Goals (MDG)
- 2002 UN started to talk about sustainable development in major meetings
- SDG declared in 25th September 2015 at 70th UN General Assembly (UNGA)
- Summary
    - In 2000s, concept to save underdeveloped by developed nation
    - In 2010s, concept to solve global problems together ("Leave no one behind")
    - In 2020s, concept to invest in business ideas to turn problems into solutions
- Businesses should invest in SDGs for license to operate
- Development needs to take place in such a way that future generations can meet their needs
- Harmonize three core elements of Economic growth, Social inclusion and Environmental protection
- Five Ps to SDG: **People, Planet, Partnership, Peace and Prosperity**
- Interactive Space Program (ISP) 20 by International Space University (ISU)
    - 86 people from 30 countries attended the program on July 20, 2021 for five weeks
    - ISP20 focused on how space enables solutions to world's problems through SDG
    - Courses ranged from policies, disaster management, food security to space activities
    - Synergy, Solutions and Potential of using space technology for SDG




*Pictured: Discussion on SGD's core elements and 5Ps*

- Yokogowa Electric was founded by Dr. Tamisuke Tokogawa as a process automation company
- **Currently ranked No.1 in Japan and top 5 in the worlds**
- Net income is 21.3 billion yen with R&D investment of 7.3% of sales
- Yokogawa Ionospher Sensor delivered to Kappa 8 rocket in 1961
- Delivered instruments to three NASA rockets including NASA's Nike Cajun rocket launched 1962
- Instruments developed and designed by Yokogawa Electric have worked in Deep Sea and Artic
- Expansion towards space, attended Executive Space Course by ISU in 2019
- After attending the course, established "StarShot" taskforce to create business in space for company
- In 2020, delivered confocal scanner to Kibo module on the ISS via Chiyoda Corporation
- In 2021, established Space Business Development Office in Yokogawa Electric
- Yokogawa Electric has focused on net-zero emissions, wellbeing and circular economy
- These sustainable goals are part of **Vision for Society 2050**
- Combine ground sensors with satellite data and provide insights to all parts of society/economy
- Case 1 for mining operations and Case 2 for forest optimization
- Space Environment Effects: Effect of gravity on humans and overcoming health risks
- In-situ space experiment on micro-gravity issues on cell tissue, live imaging system COSMIC
- Confocal microscope is a special microscope that can observe tomographic image of a sample
- **Confocal scanner CSU-W1 developed by Yokogawa Electric for ISS**
- COSMIC by CSU-W1 observes dynamic life phenomena of living cells in orbit for long periods
- Yokogawa Electric is developing a **hydrogen supply chain on the moon**
- The company will continue to create Net-zero emission and wellbeing solutions
- Create circular economy solutions and make sure to provide solutions to achieve SDGs
- SDG is divided into biosphere, society and economy on earth, where each is important to the next
- The biosphere can then also be expanded into the solar system and universe
- That is why it is very important to conserve all aspects of the environment to achieve SDGs




*Pictured: Yokogawa Electric Corporation's slide on the company's space history*

## 3. Presentation on “Introduction to Pre-MIC8 Workshop – Constellation and Formation Flying Mission Design”

Shinichi Nakasuka, The University of Tokyo

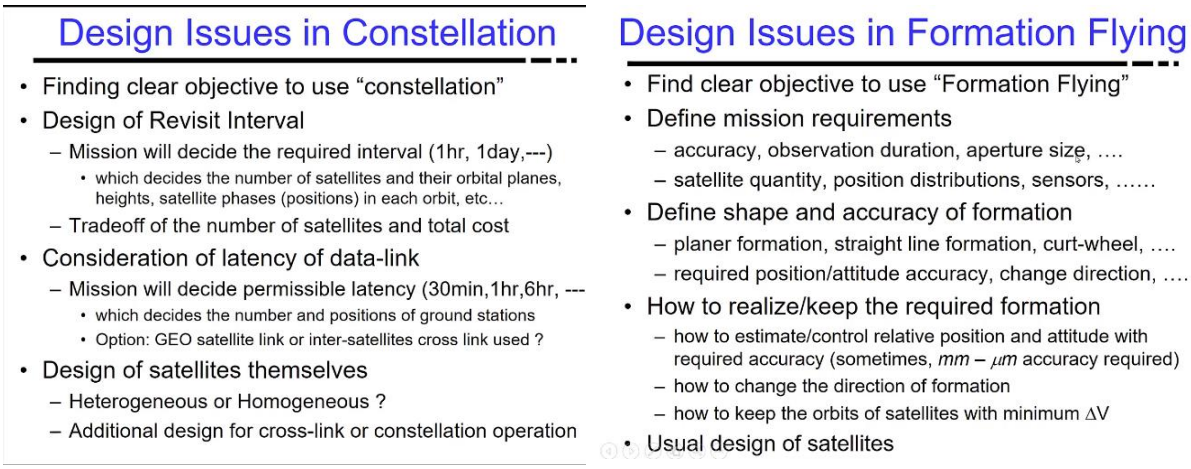
Prof. Nakasuka graduated with a Ph.D. in Aeronautics and Astronautics at the University of Tokyo. His main research is on astrodynamics and artificial intelligence. He had joined a computer manufacturer and became involved in research around Artificial Intelligence and automated manufacturing. He became a lecturer at the University of Tokyo in 1990. He has been a professor at the Department of Aeronautics and Astronautics since 2004. He has led the students in his lab, ISSL (Intelligent Space Systems Lab) in developing CubeSat and small satellite. He has been one of the pioneers of small satellite development.


*Pictured: Nakasuka-sensei providing information on PreMIC-8 topics of constellations and formation flying*

Highlights:

- MIC8: Constellation and Formation Flying Mission Design
- LEO (500-800km alt.) has higher spatial resolution but revisit time is high
- GEO (36,000km alt) can monitor continuously but low spatial resolution
- To combine both good attributes of LEO and GEO, constellation of LEO satellites is an option
- Mega-Constellation
    - Startlink by SpaceX for internet
    - Altitude 550km, 1150km, 340km
    - Total of 12000 (or 42000), 3000 launched already
    - Many other companies are targeting launching constellation for communication as well
- GEO and LEO satellites co-exist, some have Position, Navigation and Time (PNT)
- Planet has already launched more than 200+ 3U CubeSat constellation for earth observation
    - Images obtained every 5-8 minutes
    - Many different orbits
- Optical constellation by Axelspace called "GRUS"
    - 10-20 satellite constellation called AXELGLOBE by 202X
    - 2.5m resolution image
    - Additional 4 satellites launched in March 22, 2021
- Synthetic Aperture Radar (SAR) Constellation by Synspective
    - 20-30 satellite launched by 2025-26
    - First satellite "StiX-$\alpha$" launched in Dec 15, 2020 which is 140kg, 0.7m cubic size
    - "StiX-$\beta$" launched on March 1, 2022
    - Based on Hodoyoshi technology (satellite bus developed by University of Tokyo)
    - 3m ground resolution
- SPIRE Global has 100 3U satellite constellations for GNSS occultation observation

- Myriota has 25 3U satellite constellation to receive weak sign from ground
    - IoT communication used for agriculture, transportation, defense, mining
- **Merits of Constellations**
    - Earth Observation: frequent observation, resilient design and quick data downlink
    - Communication: multiple cross-links, low RF requirement and latency
    - Navigation: stronger received power, quick convergence of precise positioning
- Most importantly, rapid iteration allows reliability (R) to improve exponentially
- **$R = (1+Y)^t$** where Y is improvement in one iteration, t is time for iteration
- If things are not failing, you are not innovating enough (Elon Musk)
- **Rapid iterative improvements are occurring in SpaceX**
- While designing satellite, find clear objective, revisit interval consider latency and design satellite
- JAXA's ALOS Program launches new satellite every 7 years
- Constellation required for disaster Prevention and Mitigation (P&M)
    - Performance in such a way that disaster area is identified and delivered within 12hrs
    - Period information every 3-6hrs
    - All-weather 24hrs information is important
- Example: SAR satellite with large swath (200km) is good
- But one is not enough because needs high temporal resolution (<12hrs)
- **Formation Flying (FF)**
    - Technology for coordinated control of multiple spacecraft flying near
    - Can obtain high-level astronomical (SEIRIOS, MIXIM-SF) or earth observation (FFSAT)
    - Suitable for micro/nano/pico satellites
- Meter to centimeter accuracy of FF is already achieved, mm is being demonstrated (ongoing)
- Interferometer or SAR require higher accuracy level of um-mm
- Low accuracy of cm-m level also can have useful missions
- SEIRIOS has docking of mother/daughter, accurate FF can produce good image reconstruction
- Starshade mission aligns straight with mother and daughter satellite (occulter) to block light of star
- Important to understand how to keep a straight line formation
- FF in GEO to virtually configure large aperture for SAR which allows high resolution + responsiveness
- **Usage of FF include**
    - Improve resolution of interferometric observation
    - Increase focal length of observational telescopes
    - Virtually increase aperture by using multiple mirroring satellites
    - Simultaneous obervations at many points
- For designing FF, find clear objective, find mission requirement, deign shape and accuracy, design sat
- **At Pre-MIC-8 in Istanbul, mini-lecture (Workshop) on how to design constellation or FF**
- Join us at UNISEC-GLOBAL meeting in Turkey held this October




*Pictured: Guidelines prepared by Nakasuka-sensei for Constellation design (left) and Formation Flying (right)*

# 4. Regional Report by UNISEC-Kazakhstan

Zaure Rakisheva, al-Farabi Kazakh National University

Prof. Zaure Rakisheva graduated from M.V.Lomonosov Moscow State University in 1986, and received the PhD degree from al-Farabi Kazakh National University in 1993. From this year, she worked as a researcher in the laboratory of mechanics in the Institute of Mechanics and Engineering Sciences of Republic of Kazakhstan (RK). From 1996 to the present, she works at al-Farabi KazNU. In 2010, she had launched the specialty "Space Engineering and Technology" at the university. Prof. Rakisheva led programs that built two nanosatellites of al-Farabi KazNU which were launched in 2017 and 2018. Her research interests include space education, theoretical and orbital mechanics, control theory. She sits in several government councils and committees for space.


*Pictured: Prof. Rakisheva giving information about space development progress in Kazakhstan*

Highlights:

- al-Farabi KazNU ranked as **150$^{th}$ in QS world rankings** with five stars in excellence
- University profile: 16 faculties with 67 departments and 32 scientific research institutes
- 2000+ professors, doctors and PhDs, **25000+ students enrolled**
- Department of Mechanics is oldest departments, established in 1935
- Specialization in theoretical and celestial, fluid and machines
- **Development of Space Engineering and Technology from 2010**, Robotic Systems from 2019
- Two directions: Spacecraft development and motion control, Space monitoring
- **Kazakhstan own space program began in 2005**
- 2015: National Program of Innovative Industry Development (NPIID-2) allowed new master program
- Master's program using information technology for space monitoring systems
- Space monitoring program from NPIID-2 include Tempus-SESREMO
- Design of spacecraft as a new program introduced in 2016
- Foreign academic partners include University of Tokyo and Nagoya University of Japan
- 2017: Prof. Shinichi Nakasuka gave lecture at al-Farabi KazNU
- PhD supervisors, internship collaboration with University of Tokyo
- Projects: hardware/software of spacecraft, attitude control system, first nano-satellite, formation flying
- **al-Farabi-1 and al-Farabi-2 nano-satellite projects launched**
- Department attends programs from international educational programs including Erasmus Mundus
- Research include satellite monitoring of oil in water reservoirs and prediction of mudflow
- 3D mapping and vertical displacement measurements
- Internships at numerous other institutes and industries working in space science and systems
- Summer schools and competitions in Germany and Russia respectively
- Kazakh cosmonauts involved in outreach inside schools
- Infrastructure development: Center of Remote Sensing (2017) and Center of Flight Control (2018)

# 5. Regional Report by UNISEC-Zimbabwe

Timothy Kudzanayi Kuhamba, Kyushu Institute of Technology

Timothy Kudzanayi Kuhamba is one of the three Engineers who built Zimbabwe's first satellite ZIMSAT-1 at Kyushu Institute of Technology in Japan. He is also a pioneer of Space Education awareness in Zimbabwe. Kuhamba funded the World Space Week celebrations from 2014 to 2017 until the Government of Zimbabwe realized his efforts single efforts by sponsoring the World Space Week Quiz 2018 which was aired on National Television. Kuhamba is the National Coordinator for World Space Week Zimbabwe since 2014. He is also a recipient of the Space Generation Advisory Council (SGAC) 2019 Africa Space Leader Award.


*Pictured: Timothy updating UNISEC about Zimbabwe's activity in space*

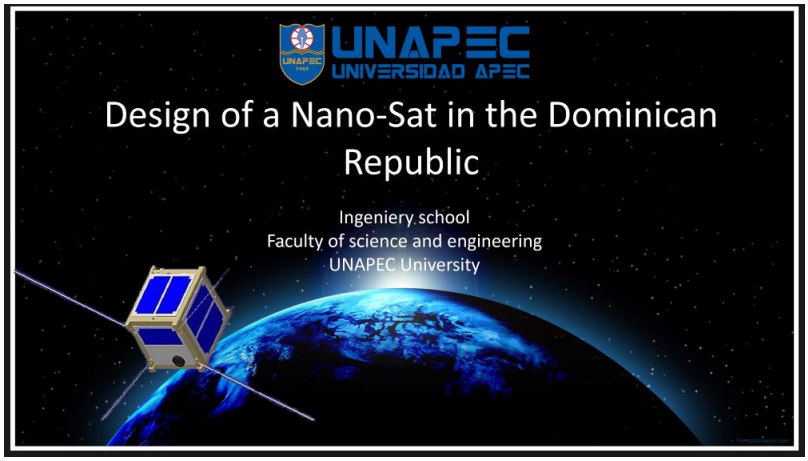
Highlights:

- ZINGSA state sponsored agency **established in 10th July 2018**
- Promotion of space activity, geospatial/remote sensing science, advancement and cooperation in space
- Zimbabwe Science Park 1 established on 13th Sep 2021 by President Dr. Mnangagwa
- Departments:
    - Science, Space Engineering, Space Observation, Geospatial and Admin at ZINGSA
- Ground station control and antenna installation done for Zimbabwe's first satellite, ZIMSAT-1
- **2021-22 flagship project called ZIMSAT-1**
- 1U Cubesat developed at Kyutech for earth observation
- Launch is in 2022
- Geospatial/Earth Observation projects include Caledonia and National Wetland Project
- 100% owned and funded by the government
- **Prioritization of projects and service delivery based on national demand**
    - City Planning (UAV-based aerial survey)
    - Geospatial data (Acquisition, storage, security and management)
    - Ground based Measurements (GNSS, radars, Ground Sensor Terminals (GST)
    - Technology Advancements (Labs, satellite manufacturing)
- Human Capital Development and Collaborations
    - Training, research and outreach
    - Collaboration with city councils, ministries and departments
    - International collaboration with other space agencies
- Short term planning including missions, policy, GST, map updates
- **Long term planning** includes **satellite development and assembling, integration with partners**

# 6. Regional Report by UNISEC-Dominican Republic

Gorki Ernesto Encarnacion Morrobel, The APEC University

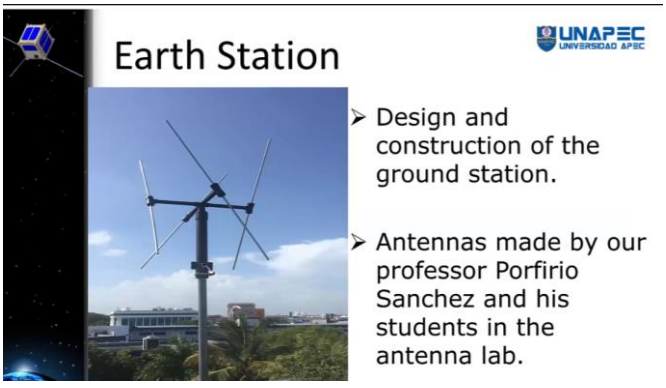
Prof. Gorki Morrobel is a professor of engineering at the APEC University (UNAPEC), Dominican Republic since 2005. Computer Electronic Engineer from UNAPEC, with a Master's degree in Communications Electronics with a double degree from the UNAPEC (Dominican Republic) / UPRM (Puerto Rico) universities.). In addition, he has a postgraduate degree in Data Telecommunications at INTEC University. Since 2016, he has been participating in nanosatellite training activities, first at the University of Nuevo Leon (Mexico), and then in the UNISEC CLTP7 program, in Sapporo, Japan. In 2017, he participated in Samara Russia in the Summer Space School course. Currently, he is working in developing satellites and ground infrastructure at the university.




*Pictured: Prof. Morrobel providing updates on Dominican Republic's space activities*

Highlights:

- Dominican Republic is located in the Caribbean next to Haiti
- Mission: Development of nano-satellite or detection of forest fires in the Dominican Republic
- Forest fires have increased in the last 20 years
- No efficient system for early detection of forest fires
- Stage I is design of satellite, Stage II is development of testing facility, Stage III Ground Station (GS)
- **Antenna for GS designed by Prof. Porfirio Sanchez from antenna lab**
- Funding to finance different stages of our mission
- Collaboration of institutions and experts to share experience for CubeSat projects
- Vision is for Dominican Republic to become regional center for testing and developing small satellites
- **Provide our infrastructure to institutions such as UNISEC** for true global collaboration/exchange




*Pictured: In-house developed antenna design at Prof. Porfirio Sanchez's lab for ground station*

# 7. Regional Report by UNISEC-Colombia

Giovanna Ramirez/Jose Fernando Jimenez, UNISEC-Colombia

Giovanna Estefanía Ramírez Ruiz is an Electronic Engineer who graduated from the Escuela Colombiana de Ingeniería Julio Garavito in Bogotá, Colombia. She is doing a master's degree in development and integral project management. Giovana participated in the Cansat Leadership Training Program (CLTP10, UNISEC Japan 2019) and was involved in building the first Colombian satellite mission in Japan as the first Colombian researcher in her field.

Dr. Jose Fernando Jimenez is an Electric Engineer who graduated from University of the Andes (Uniandes), Colombia. He received the Diplôme d'études approfondies in Automatic Control from The Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-SUPAERO) in 1983, and PhD in Industrial Systems from INSA, Toulouse and Uniandes in 2000. Since 1994, he is an associate professor in the Department of Electric and Electronic Engineering at Uniandes. Dr. Jimenez leads the creation of the Colombian Aerospace Consortium, seeking the opportunity of creating the first Colombian Space Agency in cooperation with Colombian Air Force, universities and government.


*Pictured: Giovana (left) and Dr. Jimenez (right) presenting about Colombia's programs for space*

Highlights:

- **UNISEC-Colombia established in 2022**
- Participated in CLTP-10 Japan in 2019
- POC: Prof. Jose Fernando Jimenez
- Sub-POC: Giovanna Estefania Ramirez Ruiz
- Aerospace activities also including courses, research projects, conferences (satellites, robotics, AI)
- Aerospace sector of Colombia including Colombian Airforce are collaborators
- Current statistics of UNISEC-Colombia
    - 5 Universities
    - 23 Students
    - 6 Professors
    - 8 Corporative members
- **Creation of UNISEC committee in Colombia** and **proposal for new aerospace research project**
- Plan for 2022 and beyond
    - Organizing fifth version of Cansat Colombia Competition and Training
    - Participation in CLTP-11
    - Organizing HEPTA-Sat training
    - Continue with ongoing Space Research Projects
- University space program launched with a heritage of about 20 rocket launches in the last 7 years
- **Increase industry for aerospace alongside the improvement of military industry for aerospace**
- Target is to reach 120km through the University Launch Services by 2025
- Academia, industry, and government collaboration

# 8. Announcement and Acknowledgement

Rei Kawashima, UNISEC-Global


*Pictured: Kawashima-san giving the closing remarks*

- **New Local Chapters**
  - UNISEC-Ethiopia POC: **Yeshurun Alemayehu Adde**
    - Addis Ababa University
    - Ethiopian Space Science and Technology Institute
    - Addis Ababa Science and Technology University
    - Al-Farabi Kazakh National University
  - UNISEC Corporate Members
    - AXELSPACE
    - Yokogawa Electric Corporation

- **11th Nano-satellite Symposium**
  - **Abstract Submission Deadline: July 31, 2022**
  - Notification: August 15, 2022
  - Early Bird Registration: September 15, 2022
  - Full Paper Submission: October 3, 2022
  - Presentation: October 17, 18, 19 (morning)
  - Pre-MIC 8 workshop during the event
  - Official website: http://nanosat11th.itu.edu.tr/index.php

- **Pre-MIC 8**
  - **Abstract Submission Deadline: July 25, 2022**
  - Notification: August 31, 2022
  - Presentation at workshop (not contest), October 19, 2022
  - Official website: http://spacemic.net/

- **8th UNISEC-Global Meeting**
  - Local chapter registration for presentation: September 5, 2022
  - UNIGLO opening: October 19, 2022
  - Local chapter presentation and breakout session: October 20, 2022
  - Local chapter empowerment workshop: October 21, 2022

- **Next virtual meeting:** August 20, 2022 10:00 pm – 0:00 am (JST)
  - Theme: TBD
  - Confirmed speakers: TBD
  - Host: UNISEC-Philippines
- Seeking local chapters to host virtual meetings for **Sep 17, Nov 19, and Dec 17**
- Virtual UNISEC-Global meetings take place on the third Saturday of almost every month in 2022

- **Future Planning**
  - Small Satellite Conference, Utah, USA: August 6-11, 2022
  - 11th CanSat Leader Training Program: August 18-31, 2022
  - 73rd IAC, Paris: September 18-22, 2022
  - 11th Nano-satellite Symposium, 8th UNISEC-Global Meeting, Pre-Workshop for the 8th Mission Idea Contest (PreMIC8: Online or in-person TBD), Turkey: October 17-21, 2022

- Details of **Pre-8th Mission Idea Contest (PreMIC8)**
  - MIC8 will be held in 2023
  - In 2022, hosting regional competition is encouraged
  - Pre-MIC8 workshop will be held in Istanbul (or virtually) in October 2022
  - Mission carried by multiple satellites made of 6U CubeSat or smaller
  - No restriction on the number of satellites as long as there is logic to support that
  - Constellation with no inter-satellite link missions and formation missions with inter-satellite link both are encouraged

- Details of **J-CUBE** opportunity
  - Special (discounted) launch opportunities (1U-3U)
  - Collaboration with UNISEC-Japan's university
  - Application deadline: October 13, 2022
  - Website: http://unisec.jp/serviceen/j-cube

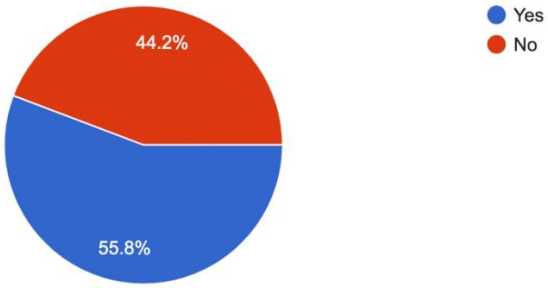
# 9. Participant Statistics

**105** registered participants from **36** countries/regions participated in the 23rd Virtual UNISEC-Global Meeting.

| Country/Region | Number of registrations | Country/Region | Number of registrations |
|---|---|---|---|
| Angola | 1 | Kenya | 11 |
| Argentina | 1 | New Zealand | 1 |
| Australia | 1 | Kuwait | 1 |
| Austria | 1 | Laos | 1 |
| Bangladesh | 2 | Mexico | 1 |
| Bulgaria | 2 | Morocco | 1 |
| Chile | 1 | Nepal | 1 |
| Colombia | 3 | Pakistan | 4 |
| Dominican Republic | 8 | Peru | 1 |
| Egypt | 4 | Philippines | 9 |
| Ethiopia | 1 | Rwanda | 2 |
| Finland | 1 | Somalia | 1 |
| Germany | 1 | South Africa | 1 |
| Ghana | 1 | Thailand | 1 |
| Hong Kong | 1 | Turkey | 3 |
| India | 11 | UK | 1 |
| Italy | 1 | USA | 2 |
| Japan | 18 | Zimbabwe | 5 |

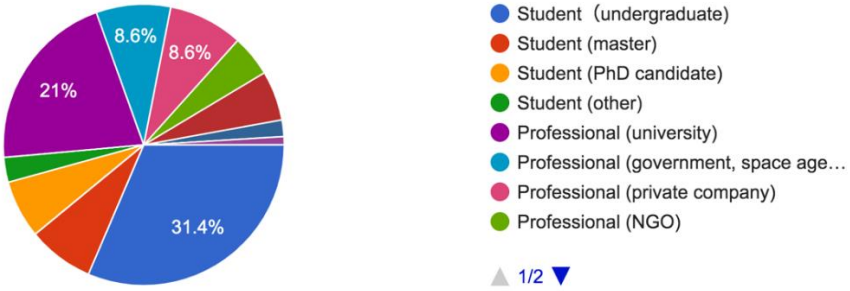
Have you participated in the UNISEC-Global Meeting previously?

104 responses




Student or professional?

105 responses





**Thank you**