29th Virtual UNISEC Global Meeting

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Tohoku University

January 21, 2023

UNISEC University Space Engineering Consortium JAPAN

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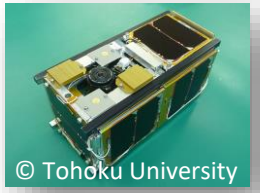
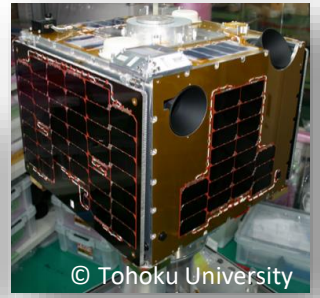
1. New Year Greetings / Self-introduction





Toshinori Kuwahara, Dr. –Ing.

Position:

2015 - Associate Professor, Department of Aerospace Engineering, Tohoku University
2017 - Technical Advisor, Nakashimada Engineering Works, Ltd.
2017 - Technical Advisor, ALE Co., Ltd.
2020 - Chairperson, University Space Engineering Consortium Japan (UNISEC)
2021 - Co-founder/CTO, ElevationSpace Inc.

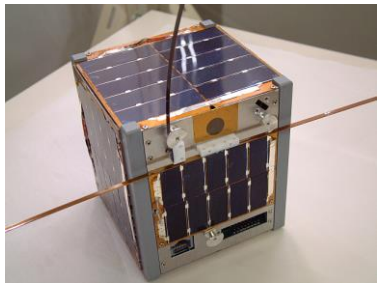
Research Topics:

Space Development, Utilization, and Exploration by Small Spacecraft Technologies

2. UNISEC: University Space Engineering Consortium

What is UNISEC?

- UNISEC since 2002 is a non-profitable organization to support practical space development activities in universities and colleges, such as small satellite and hybrid rockets. World-first two CubeSats XI-IV and CUTE-I were UNISEC CubeSats. (2003)
- Three main subjects:
  - Human Resource Development
  - Technological Development
  - Outreach.
- UNISEC-Global is established in 2013.
- COPUOS permanent observer 2017~
- UNISEC Visions
  - Vision 2020-100
  - Vision 2030-All



XI-IV
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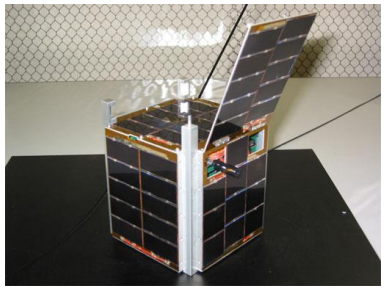
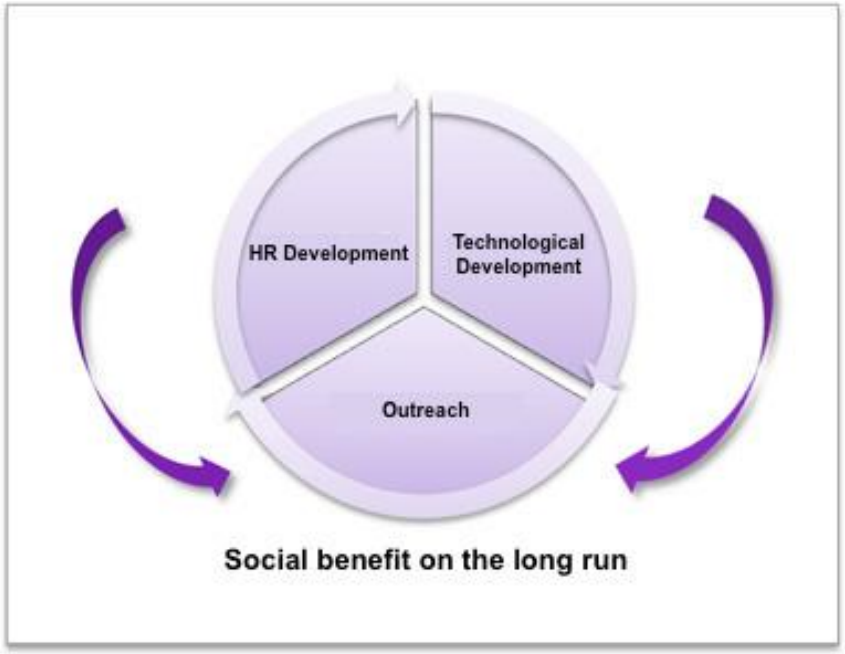


CUTE-I
© Tokyo Institute of Technology



2. UNISEC: University Space Engineering Consortium

UNISEC-Global

- UNISEC-Global is an international nonprofit, non-governmental organization, consisting of local-chapters across the world.
- Established in 2013.
- Permanent observer status of UNCOPUOS (The United Nations committee on the Peaceful Uses of Outer Space) since 2017
- Aim to create a world where space science and technology is used by individuals and institutions in every country and offers opportunities across the whole structure of society for peaceful purposes and for the benefit of humankind.

21 Local Chapters with 54 POC.

Vision 2030-All

"By the end of 2030, let's create a world where university students can participate in practical space projects in all countries."

3. Activity of UNISEC-Japan

Hands-on Training

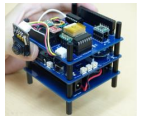
- CANSAT
- CLTP: CANSAT Leader Training Program
- HEPTA-Sat Training
- Hybrid Rocket
- ARLISS: A Rocket Launch for International Student Satellites

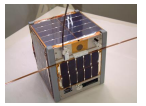
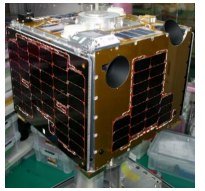
Practical Implementation

- CANSAT Working Group
- Rocket Working Group → Commercial Rocket
- Satellite Working Group → Commercial Micro-satellites
- UNISEC Academy – Space Engineering Lecture Series

Academic Research Advancement

- UNISEC Space Takumi Conference / Journal
- Micro and Nano-satellite Lessons Learned Research Group
- Publications
- MIC: Mission Idea Contest / Debris Mitigation Competition
- Workshop
- Safety Assurance Support
- Frequency Allocation Support (for satellites)
- Various diverse events (Such as Space Job Fair)

3. Activity of UNISEC-Japan

HEPTA-Sat Training

Host countries

9

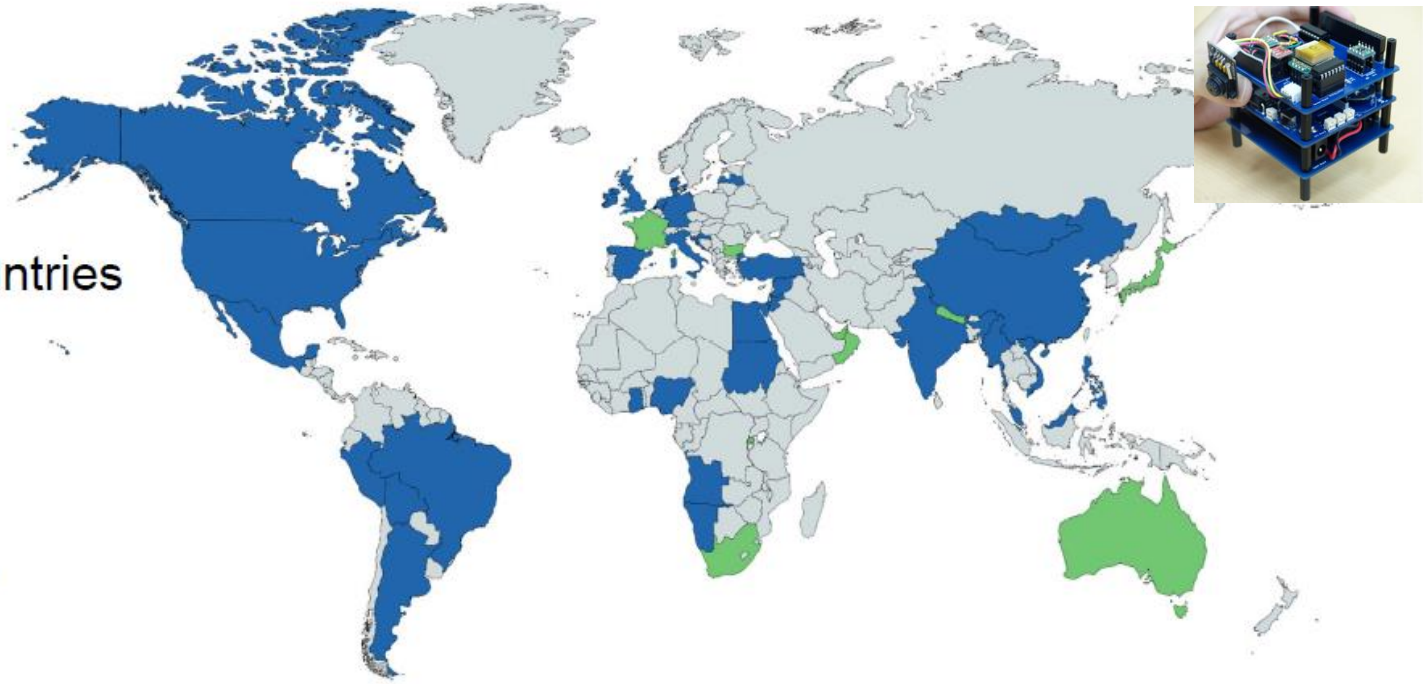
Participating countries

53

Trainees

400+

During 2017.10～2019.11

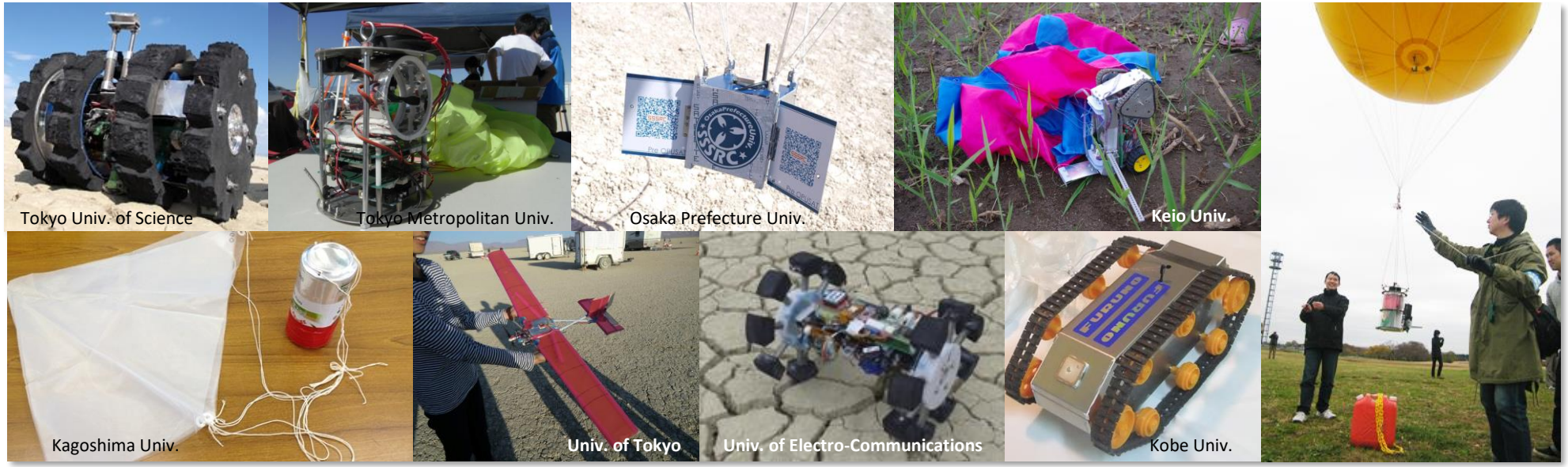


- Annual Training for Instructors
- International Space University (France)
  - SHSSP(2019,2020), SSP(2019)
- Japan International Cooperation Agency(JICA) (Japan)
- Space and Space related Agency (Kenya, Oman, etc.)
- University (UAE University, Titec, etc.)
- United Nation Workshop (South Africa)
- Science Museum
- Company

3. Activity of UNISEC-Japan

CANSAT / ARLISS

- An ultra-compact "simulated" artificial satellite for Engineering hands-on training
- Equipped with control equipment and observation equipment mounted in an empty can weighing approximately 300g or less.
- Since CANSAT can be released from the sky with a small rocket or balloon and lowered to the ground for data collection and communication experiments, it is used in high schools and universities as a practical and effective educational tool.



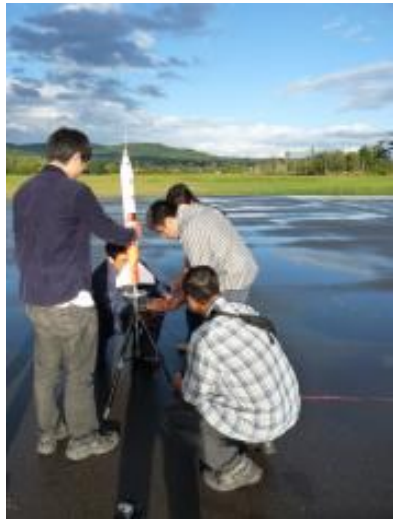
3. Activity of UNISEC-Japan

CLTP: CANSAT Leader Training Program

Objective: CLTP is a training program for professors/instructors to learn how to conduct satellite hands-on training by experiencing whole process. Participants are expected to teach their students after training. It has contributed to capacity building in basic space engineering and technology.

Launched: October 2010

Offered: Annually



Launch Experiment

CanSat Manufacturing

Testing

Paper Craft Rocket

3. Activity of UNISEC-Japan

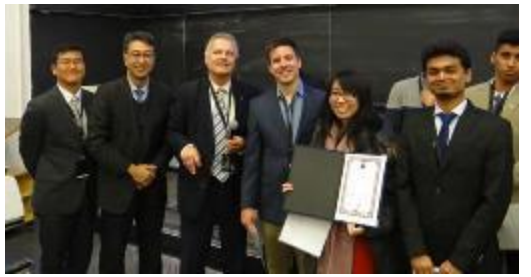
MIC: Mission Idea Contest / Debris Mitigation Competition

Objective: The Mission Idea Contest (MIC) is encouraging aerospace engineers, college students, consultants, and anybody interested in space to share their ideas on how to use micro/nano/pico satellites, and provides opportunities to present their ideas and gain attention internationally.

Launched: June 2010

Conducted: Annually as PreMIC or MIC

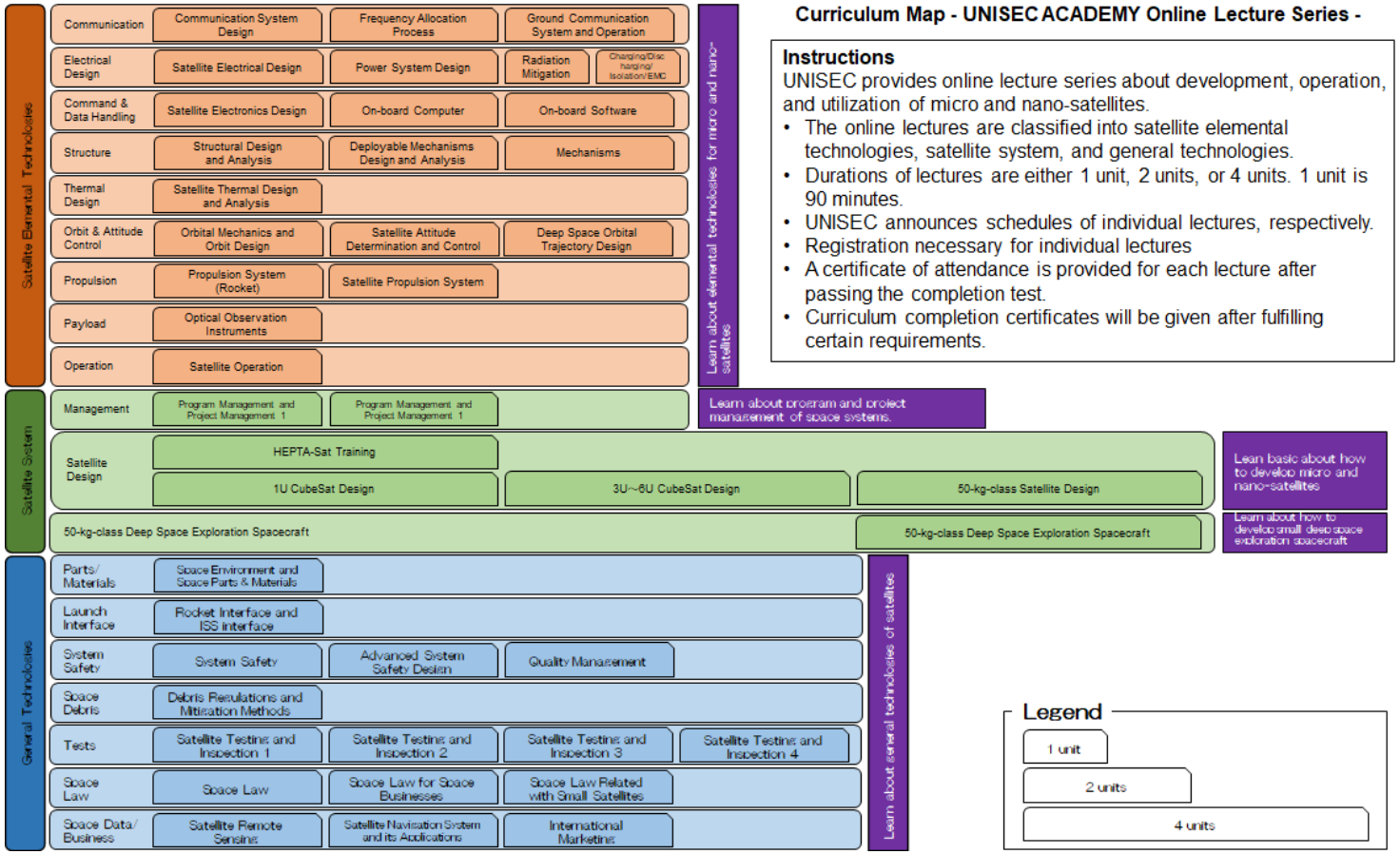
- Regional coordinators from 45 countries/regions
- Four books were published as a part of the IAA book series.



3. Activity of UNISEC-Japan

UNISEC Academy – Space Engineering Lecture Series

- UNISEC is offering a series of lectures for space development and utilization in Japanese. (English curriculum is coming soon.)



http://unisec.jp/service/lecture (Jp)

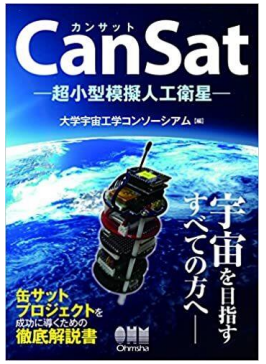
3. Activity of UNISEC-Japan

Accumulate Best Practices and Encourage Competitions

「上がれ！空き缶衛星」
川島レイ（2004年 新潮社）

「マイクロサット開発入門」
東北大学超小型衛星開発チーム（著）
吉田 和哉（監修）
（2011年、東北大学出版会）

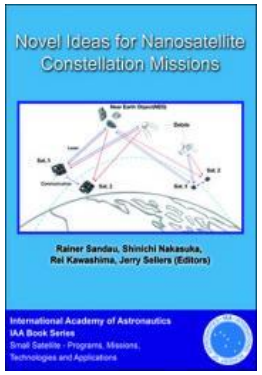
「人工衛星をつくる
－設計から打ち上げまで－」
宮崎 康行（2011年、オーム社）
（日本大学理工学部 航空宇宙工学科 教授）



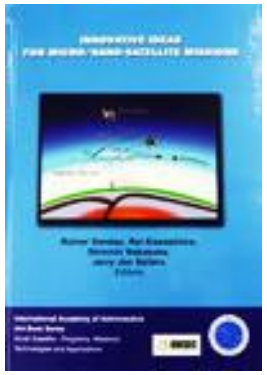
「CanSat−超小型模擬人工衛星」 大学宇宙工学コンソーシアム著
（2014年、オーム社）

「上がれ！空き缶衛星−20年後のメッセージ集録」
川島レイ（2020年 Kindle版）

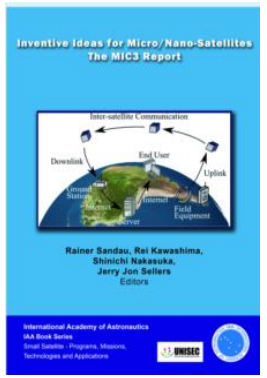
「キューブサット物語
川島レイ（2005年 エクスナレッジ）



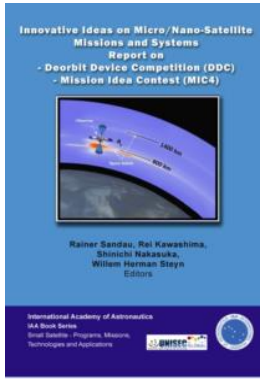
「Novel Ideas for Nanosatellite Constellation Missions」
（2012年、IAA出版）



『Innovative Ideas for Micro/Nano-Satellite Missions』（2013年、IAA Book Series）



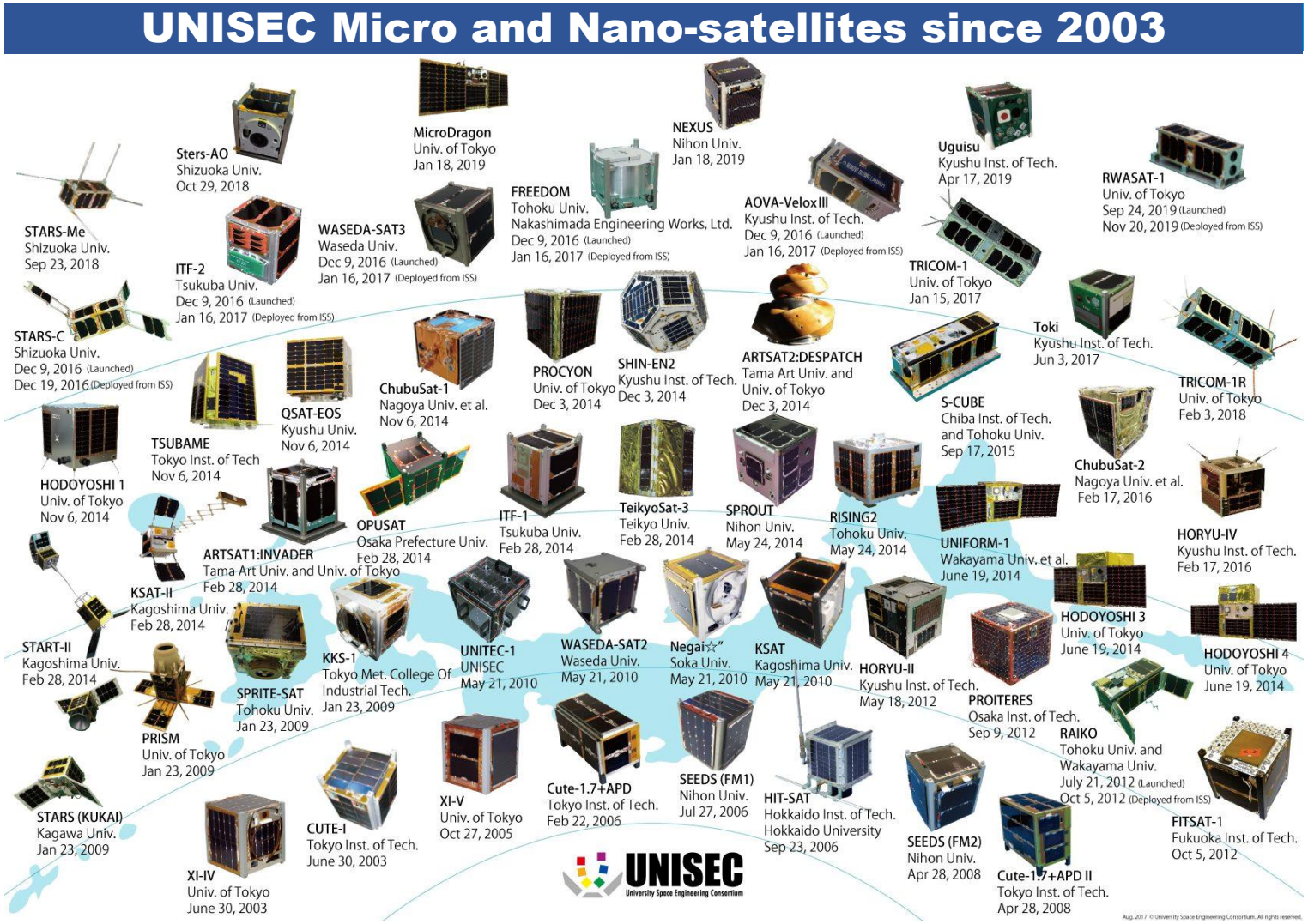
INVENTIVE IDEAS FOR MICRO/NANO-SATELLITE THE MIC3 REPORT
(2015年 IAA出版)



INNOVATIVE IDEAS ON MICRO NANO-SATELLITE
（2017年、IAA出版）

3. Activity of UNISEC-Japan

Micro and Nano-satellite Development Support



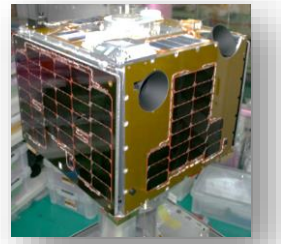
3. Activity of UNISEC-Japan

Examples of Advanced Small Missions

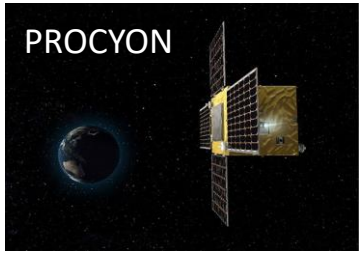
Advanced Small Missions

- UNISEC member Universities are starting space exploration beyond the Earth orbit with small space systems.
- PROCYON
  - An asteroid flyby micro-space probe that was launched together with Hayabusa2 on Dec. 3 2014.
  - Developed by the University of Tokyo and JAXA.
  - ~70 kg, approx. 60 cm cube.
- EQUULEUS
  - A nano-satellite of the 6U CubeSat format that will demonstrate low-thrust trajectory control techniques within the Earth-Moon region using water steam as propellant.
  - Developed by the University of Tokyo and JAXA.
  - ~14 kg, 10 cm × 20 cm × 30 cm
- Motivation: Investigate miniaturized, low-power, high-performance on-board devices to realize innovative space development, utilization, and exploration!

Earth Orbit Advanced Small Space Systems



Space Exploration



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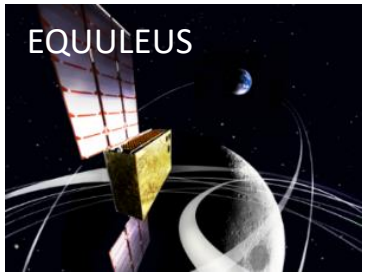

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4. Future Outlook

Vision 2030-All

"By the end of 2030, let's create a world where university students can participate in practical space projects in all countries." – No one will be left behind.

Training Program **HEPTA – Sat Training** **CanSat Leader Training Program**	**Forum, Conferences, Technical competitions** **Mission Idea Contest** **Nano-satellite Symposium** **CanSat Competition**
VISION 2030-ALL	
Debris Awareness and Solutions **Debris Mitigation Competition** **IAA Study Report: A Handbook for Post-Mission Disposal of Satellites less than 100kg**	**Support Global Space Projects initiated by member universities** **UNISEC-Global Meeting**

http://www.unisec-global.org/whatwedo.html

4. Future Outlook

- The activities of UNISEC have been developing for about 20 years internationally and providing opportunities of space engineering education and cooperation between the member organizations.
- Micro and nano-satellite technologies, which have been researched and developed mainly by Universities and educational institutions, have reached the stage of practical application, and has brought business development of NewSpace.
- UNISEC poses new goals of space technology development and focuses on ensuring the technology level of S&MA for small space systems, and promote practical and rapid space development, utilization, and exploration.

5. 29th Virtual UNISEC-Global Meeting

Program and Timetable

The 29th Virtual UNISEC-Global Meeting Timetable

Theme: "Space Weather Research Using Nano Satellites"

Date: January 21st, 2023
Time: 22:00-24:00 (Japan standard time, GMT+9)
Please check your time.(https://24timezones.com/difference)
HOST: UNISEC-Japan

Moderator: George Maeda

(subject to change, as of Dec 23, 2022)

Japan Time	Title of presentation	Presenter
22:00 - 22:05	**Opening Remarks**	**George Maeda, ArkEdge Space**
22:05 - 22:15	**New Year Greeting Speech**	**Prof. Toshinori Kuwahara,** Tohoku University
22:15 - 22:25	**Brief Introduction on the importance space wearther research with CubeSat**	**Prof. Kentaro Kitamura**, Kyushu Institute of Technology
22:25 - 22:40	**Geomagnetic Observation by Yotsuba-KUlover**	**Dr. Shuji Abe,** Kyushu University
22:40 -22:55	**High-energy Electron Observation by PINO/Birds5**	**Prof. Iku Shinohara,** ISAS/JAXA
22:55 - 23:10	**Technology Demonstration Mission of SPATIUM- II Towards to Ionospheric TEC Mission Measurement**	**Dr.Orger Necmi Cihan**, Kyushu Institute of Technology
23:10 - 23:25	**Q & A and Discussion for above presentations**	All participants
23:25 - 23:30	**Group Photos**	All participants
23:30 - 23:50	**Amateur Radio Satellite Communication Competion**	Prof Mengu Cho, Kyush Institute of Technology
23:50 - 24:00	**Announcement and Closing**	**Rei Kawashima**, UNISEC-Global and those who have announcements