

CanSat & Rocket Experiment('99~)



ISS
Deployment



**New Way of
International Space Collaboration
- University-based “UNISEC-Global” -
Shinichi NAKASUKA
University of Tokyo**



CubeSat 03,05



PRISM '09



Nano-JASMINE (TBD)

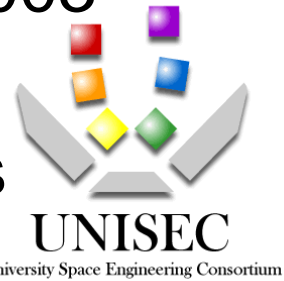
“University-based” space community (1)

- **Uniqueness of “University” in Space Development**
 1. Almost all the countries have universities, even without space agency or space industry
 2. Universities have been participating in practical space development/utilizations activities through research projects
 3. Education and technological development are performed in parallel by combination of professors and students
 - Professors sometimes support government’s space policy
 - Students can be strong workforce for actual development
 4. Universities are usually “open”
 5. Professors in different countries easily get acquainted with each other through academic meetings & conferences, etc.

Example in Japan: **UNISEC**

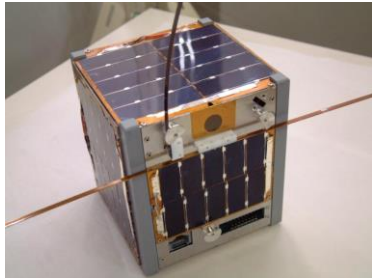
(UNiversity Space Engineering Consortium)

- Founded in 2002, obtained the legal status in 2003
- 79 laboratories from 58 universities
- 783 students, 271 individual/company members
- **UNISEC Missions:** <http://www.unisec.jp>
 - Education and human resource training for space development and utilizations
 - Innovative space technology “seeds” development
- **Activities to be Supported:**
 - Joint experiment, joint development, joint education, etc.
 - Workshop, symposium, technology exchange, etc.
 - Consultation on legal matters (frequency, export law, etc.)
 - “UNISEC Lecture Series”
 - **Seeing each others’ activities gives strong motivation**

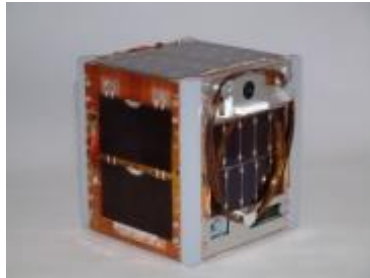


University of Tokyo's Growth within UNISEC Community

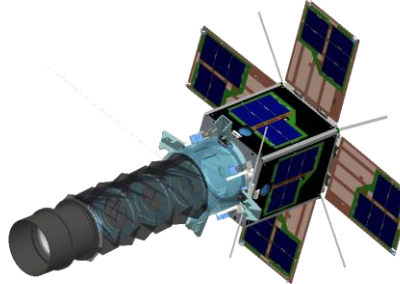
11 micro/nano/pico-satellites successfully launched (2003-2019)



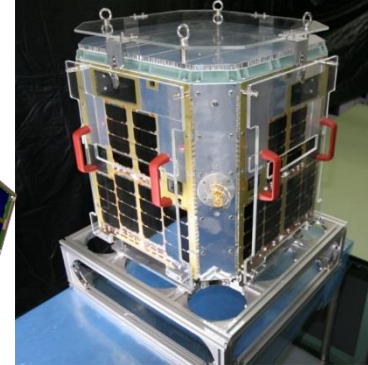
World first Cube-Sat **XI-IV(2003)**



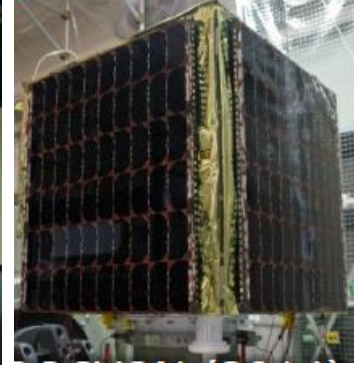
New Technology Test **XI-V(2005)**



8kg, 30m GSD **PRISM(2009)**



Space Science **Nano-JASMINE**
(wait for launch)



First 50kg Deep Space Probe **PROCYON(2014)**

- Start for education and experiment
- Step up to Cutting edge technologies
- Practical applications and business starting at 2010-14 Hodoyoshi PJ

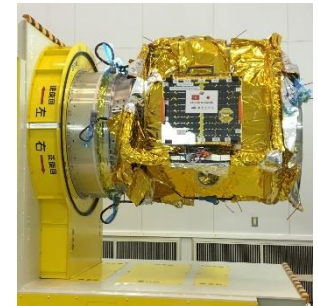
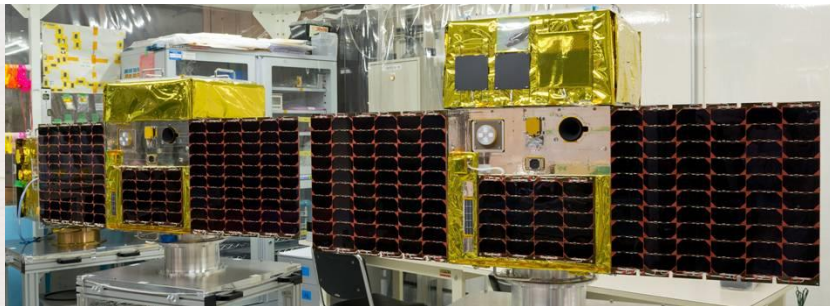


- Axelspace (Optical Sat)
- Synspective (SAR Sat)
- Space Edge Lab (3U Cube)
- Infostellar (Ground Station)

< ventures >

60kg-class 6mGSD Remote Sensing (< \$3M, 2 years)
Hodoyoshi-1 **Hodoyoshi-3 and -4 (2014)**

TRICOM-1R **MicroDragon**
(2018) Comm. (2019) Educa.



“University-based” space community (2)

- **Merits of “International University Community”**
 1. Emerging countries can see “models” of their own futures
 - How to grow up after the first CubeSat success ?
 2. Rivalry feeling encourages efforts to improve themselves
 3. Advanced universities can teach novice universities
 - Teaching itself can be education for advanced universities
 4. Usually “open atmosphere,” which accelerates innovations by integration of varied technologies and needs
- **Why “Universities” can do space activities now?**
 - Micro/nano/pico-satellites provide universities with easiness to participate in practical space asset development
 - Recent IC technologies, open data platform of remote sensing images, etc. make space utilizations far easier

To International Level: “UNISEC-Global”



Mutual Exposures of Activities

- UNISEC-Global meetings
 - Regional reports highlight each others 1 year activities
 - ◆1st : Nov 23-24, 2013, Tokyo, Japan
 - ◆2nd : Nov 18-20, 2014, Kitakyushu, Japan
 - ◆3rd : July 3-5, 2015, Tokyo, Japan
 - ◆4th : Oct 18-23, 2016, Kamchia, Bulgaria (with 7th Nano-Sat Symposium)
 - ◆5th : Dec 2-4, 2017, Rome, Italy
 - ◆6th : Nov 19-21, 2018, Strasbourg, France
 - ◆7th : Nov 30-Dec 3, 2019, Tokyo, Japan
- Discussions towards better performance



UNIGLO-Education Programs

- Mission Idea Contest
 - Education on how to create missions and basic satellite design
- Debris Mitigation Competition
 - Education on international code of conduct which every country should keep in mind
- CanSat Leader training Program (CLTP)
 - Education with hands-on training



Encouragement of Collaborations

Global Space Projects by Member Universities



Store & Forward CubeSat
“IoT” network



BIRDS project

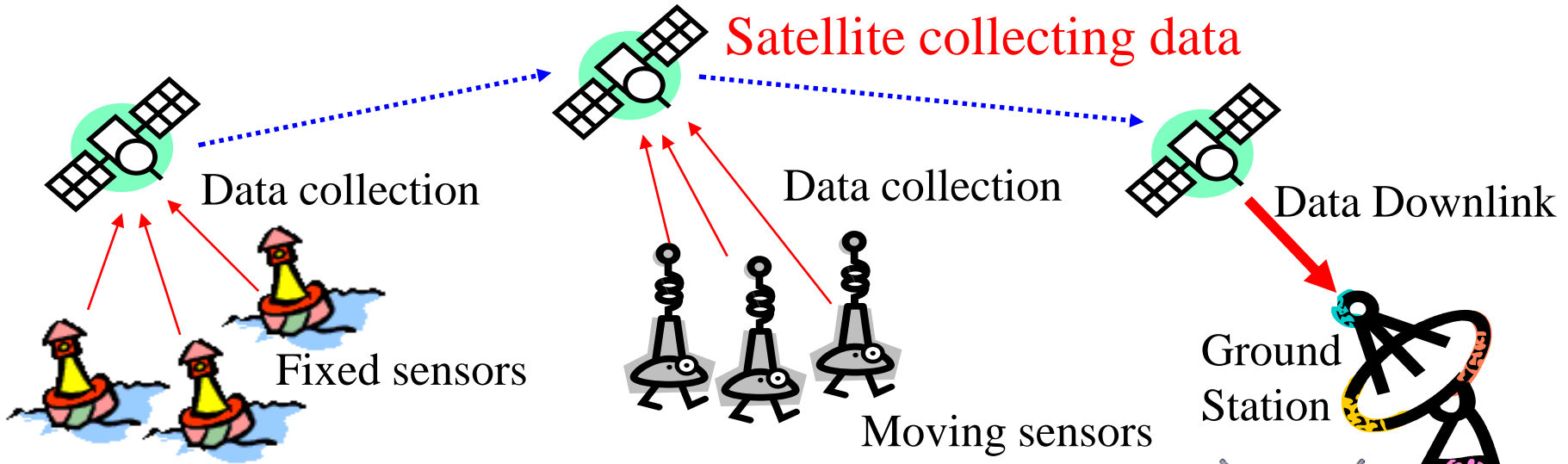


Standardization of
CubeSat interface



Global University Space Debris
Observation Network(GUSDON)

“Store & Forward” IoT Satellite collects ground information

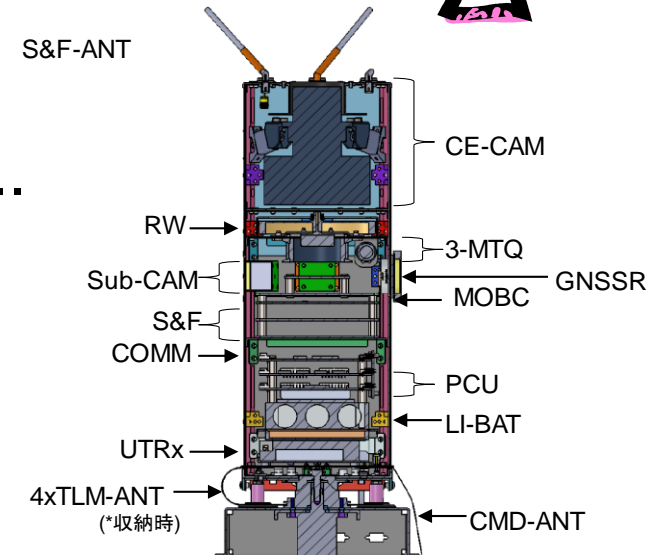


Application areas: disaster prediction, water level monitoring, soil moisture, PH.....

Key Issue: How to send data with very low RF power to the satellite ?



8 - 20mW RF power, low data rate (300bps) transmission was successful.



3kg TRICOM-1R

Summary

- International university community will be able to make unique contributions to space development and utilizations through;
 1. Education to emerging countries (code of conduct, etc.)
 2. Open innovations joint projects to solve global issues
 3. Glue for peaceful nation-to-nation collaborations
 4. Task sharing of research and development of cutting-edge satellite technologies
- UNISEC-Global community will continue facilitating such university level collaborations
 - Providing effective education and inspiring to younger generations is key issue