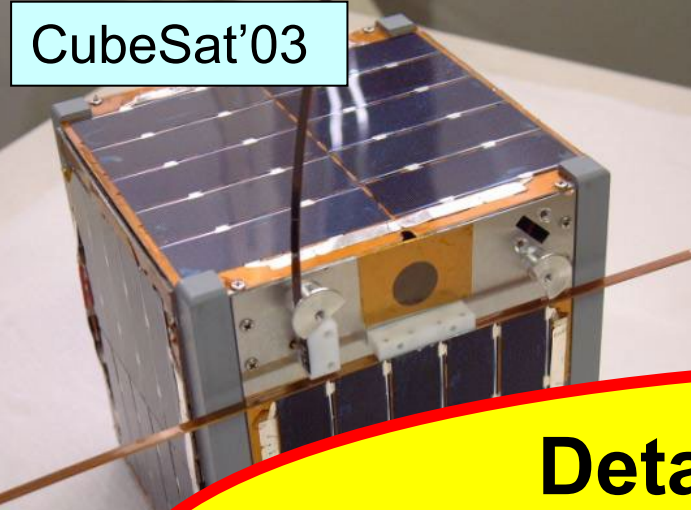
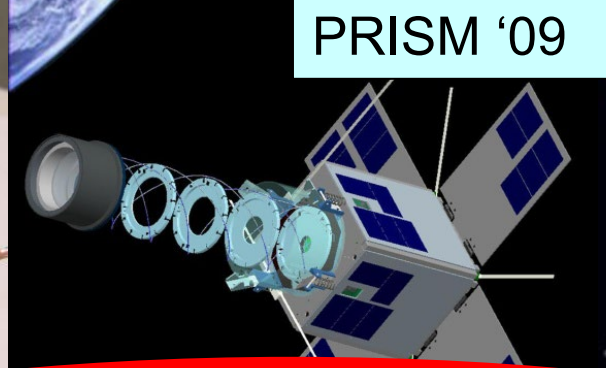


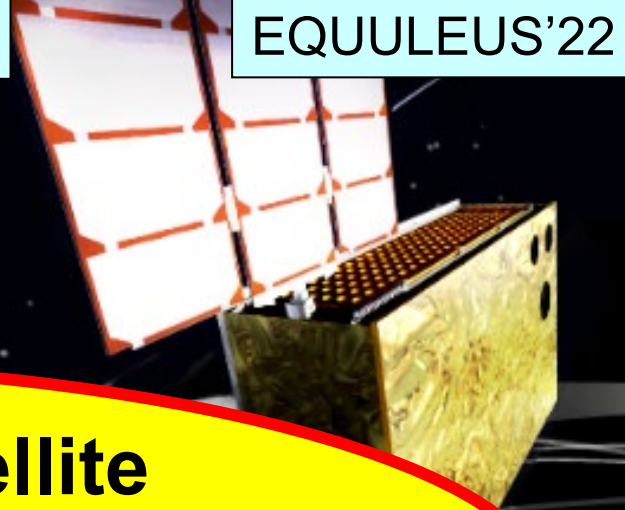
CubeSat'03



PRISM '09

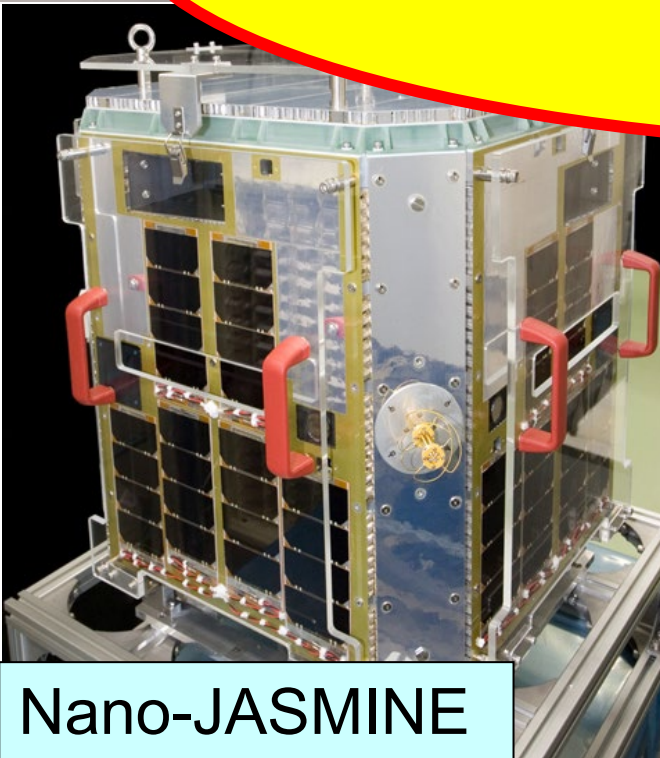


EQUULEUS'22

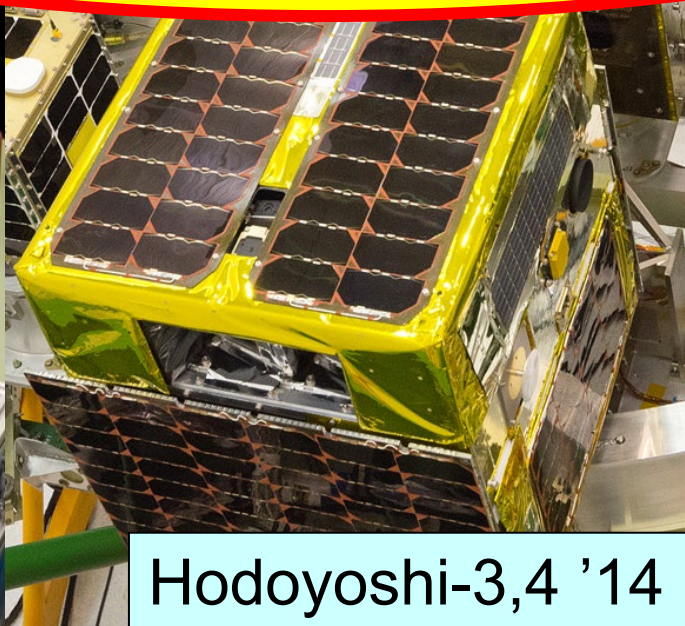


Details of Nano-satellite Symposium (NSAT) and Next Site Selection

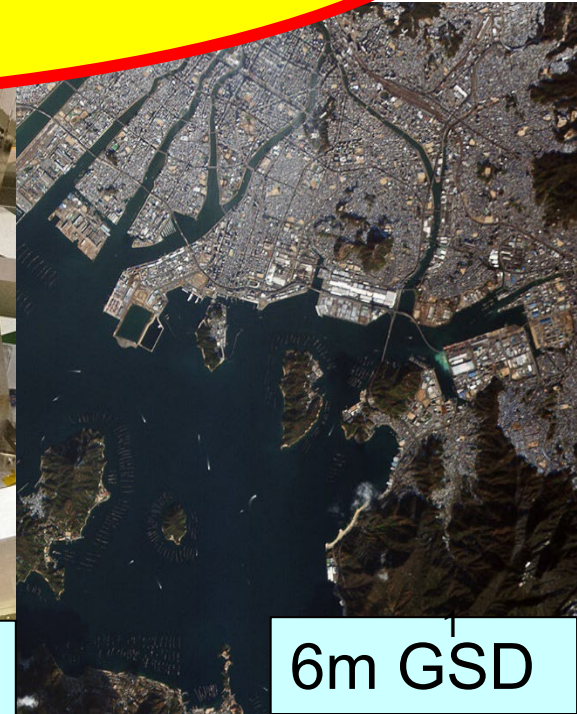
Shinichi Nakasuka
University of Tokyo



Nano-JASMINE



Hodoyoshi-3,4 '14



6m GSD

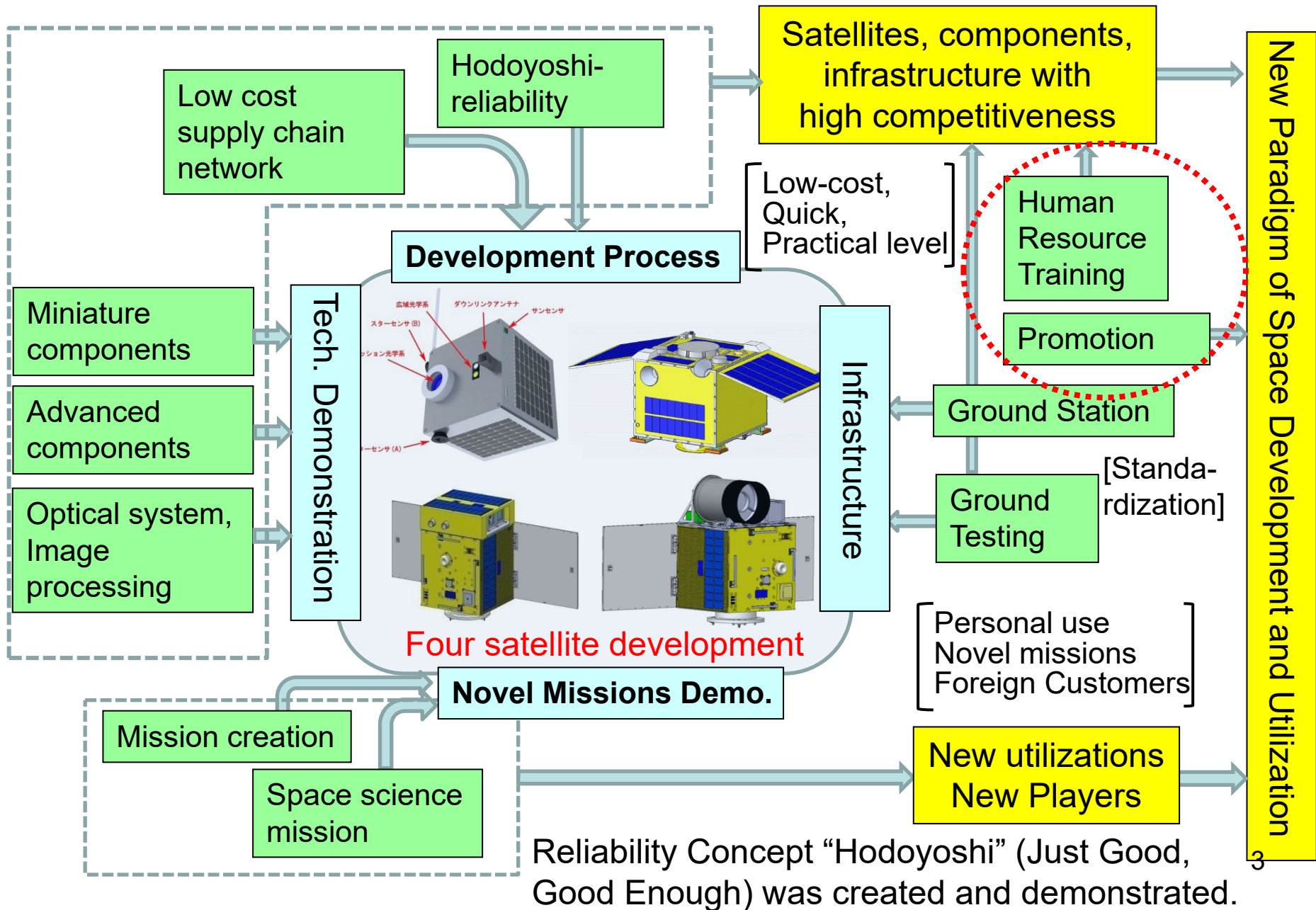
History of NSAT

Started as one educational activity of Prof. Nakasuka's "Hodoyoshi Project" (2010-2014)

- 1st Tokyo, 2010.6.10-11
- 2nd Tokyo, 2011.3.14
- 3rd Kita-Kyushu with UNISEC-
- 4th Nagoya with UNISEC-GLOBAL, 2012.10.11-13
- 5th Tokyo with UNISEC-GLOBAL, 2013.11.20-22
- 6th Kobe **with ISTS**, 2015.7.3-5
- 7th Varna, Bulgaria with UNISEC-GLOBAL, 2016.10.18-23
- 8th Matsuyama **with ISTS**, Japan, 2017. 6.5-9
- 9th , Fukui **with ISTS**, June 2019
- 10th Oita **with ISTS**, February-March 2022
- 11th Istanbul, November 2022
- 12th Kurume **with ISTS**, June 2023

In the year we have ISTS in Japan, we organize NSAT as one session of ISTS ("Small satellite session")

Overview of Hodoyoshi PJ (2010-2014)



Objectives of NSAT

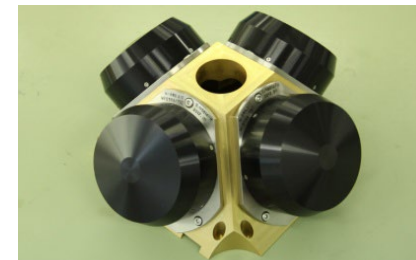
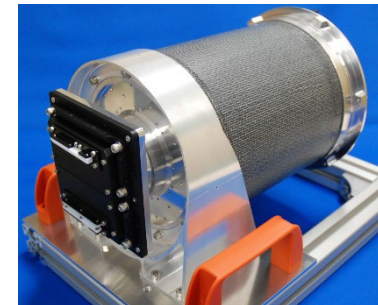
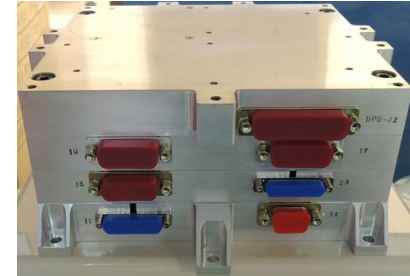
- Nano-satellite Symposium will cover all the aspects of micro/nano/pico-satellites including;
 - architecture
 - component technologies
 - guidance/ navigation/control
 - infrastructure
 - applications and missions
 - lessons learned
 - regulatory issues
 - Education
- For technology exchange, human resource training, promotion of micro/nano/pico-satellites to many countries, and **community development**

Why we started NSAT?

- Initially, micro/nano/pico-satellites are still at **infant stage** in the world, so we expect...
 - Many people (including students and general public) get to know the importance of these satellites
 - Get some hints for solving technological/legal issues
 - Get ideas on utilizations leading to new missions
 - Human resource training (with MIC, etc.)
 - Collaborations on projects may occur
- In later years, micro/nano/pico-satellites' new wave is making a big **“Game Change”** in the world
 - More focusing on cutting edge technologies and utilizations, legal matter solution, etc.
 - Educational objectives still remain from low to high level

Examples of Presentations in NSAT

- Radiation-hardened SOI-SoC onboard computer
- Software architecture (SDK, HILS, etc.)
- Optical camera with 2.5 - 200m GSD
- Li-Ion battery and power control unit
- Low-shock lock/release & deployable mechanism
- High speed and versatile data handling unit
- High speed, low power RF transmitter(>500Mbps)
- Electric propulsion system (Ion thruster)
- Attitude control system for micro/nano-satellite
 - Fiber optical gyro, Reaction wheel, CMG, etc.
- Debris mitigation device (deployable membrane)
- Optical communication system (with NICT)



Cutting edge technologies for 50kg class satellites

Nakasuka, Funase Lab.

Intelligent Space Systems Laboratory
The University of Tokyo

15

Satellites Launched

1

Satellites will be
launched soon

19

Years of In-orbit
Satellite Operations

125

Students Graduated
@2020

Capacity
Building
Support

XI-IV
(2003)

In operation (17 years)

Education
Experiment

XI-V
(2005)

In operation (15 years)

Nano-JASMINE

Awaiting launch
Collaborator: NAOJ

Space Science

Practical
Projects

PRISM (2009)

In operation (11 years)

HODOYOSHI 1, 3, 4 (2014)

In operation (6 years) Collaborator: Axelspace, NESTRA

TRICOM-1R
(2018)

End of operation (0.5 years)
Collaborator: JAXA

Technology
Demonstration

MicroDragon
(2019)

In operation
Collaborator: VNSC

RWASAT-1
(2019)

In operation (1 years)
Collaborator: Rwanda

G-Satellite (2020)

In operation
Collaborator: TOCOG, JAXA

Entertainment

Earth
Observation

Strix-α
(2020)

In operation

Collaborator: Synspec

PROCYON
(2014)

End of operation (3 years)
Collaborator: JAXA

EQUULEUS

will be launched in 2021
Collaborator: JAXA

Space
Exploration

Next-Generation
6U CubeSat
under development

Versatile 6U

Space Exploration mission can be realized with just 10kg class satellites

Lessons learned from projects

Solar Array Paddles with SADM (MMA)
50W@1AU

Chip-Scale Atomic Clock (CSAC) (JAXA)

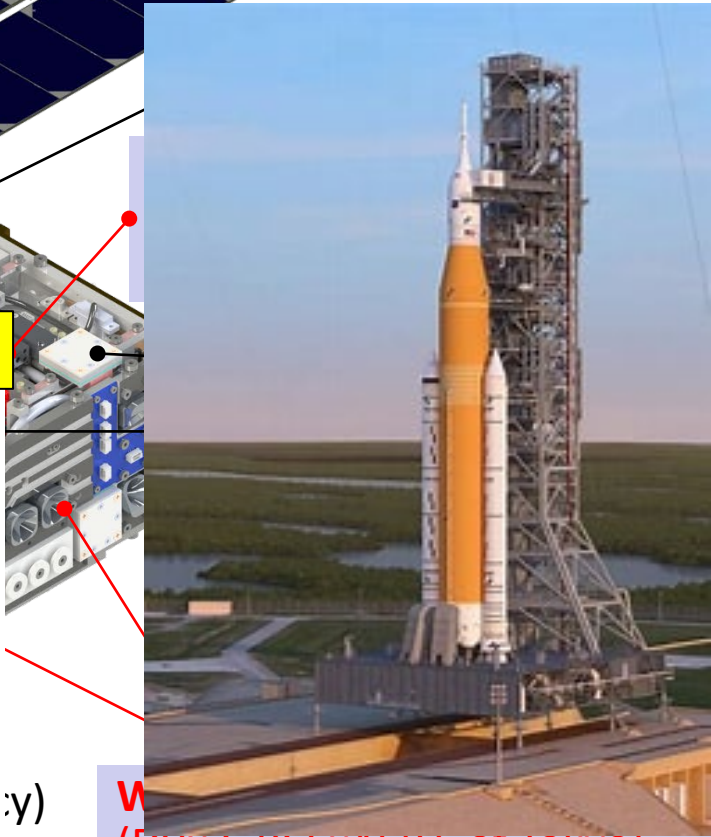
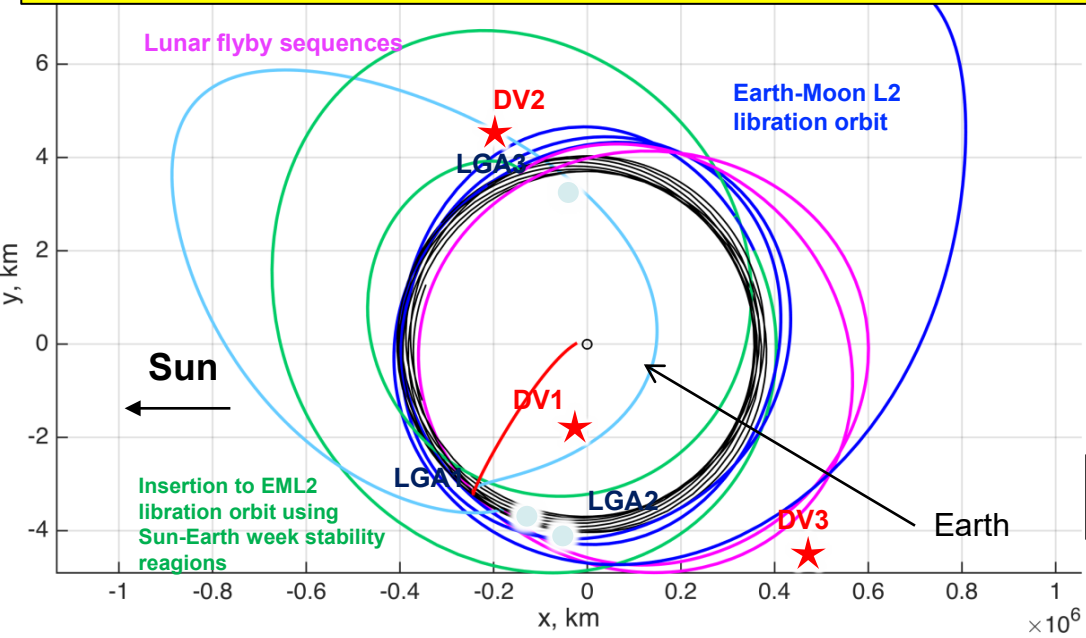
Battery (U. of Tokyo)

PCU (U. of Tokyo)

CDH (U. of Tokyo)

Size: 6U
Weight: 11kg

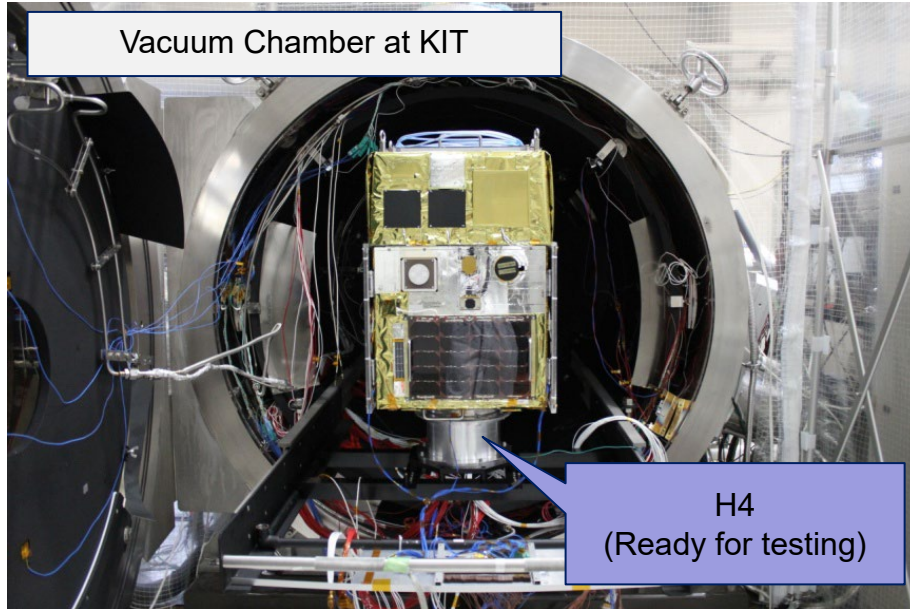
Orbital Mechanics, Guidance/Navigation/Control



Launch opportunity and interface

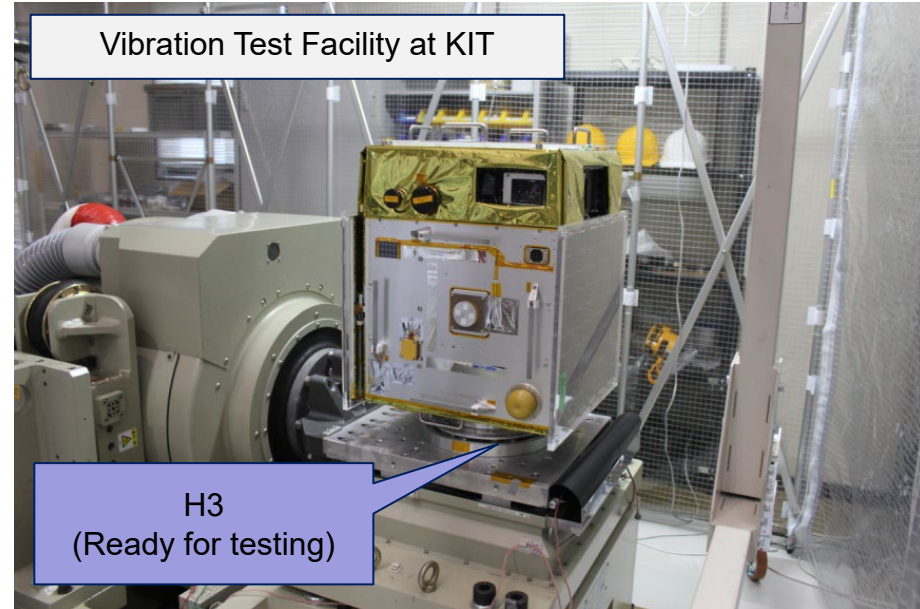
Hodoyoshi Ground Test Facilities

Vacuum Chamber at KIT



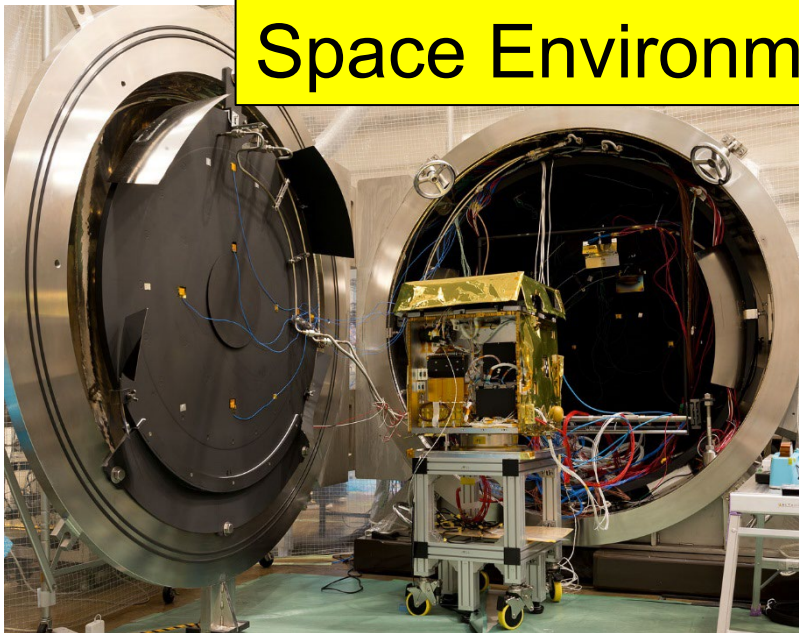
H4
(Ready for testing)

Vibration Test Facility at KIT



H3
(Ready for testing)

Space Environment and Ground Tests



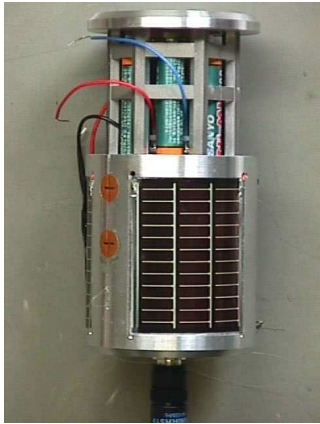
Ground Station Antenna and Operation Room

Ground stations and satellite operations



Education

CanSat and ARLISS (A Rocket Launch for International Student Satellites, 1999-), USA



Various CanSats developed by students



CanSat development and field tests provide excellent opportunity of training for satellite development, project management and systems engineering

Student Activities and Management



Regulatory Issues

International Collaborations

How to organize NSAT ?

1. Organize domestic team and start planning
 - 1) Search for funds from domestic organization
 - 2) Decide time and site of NSAT by discussing with UNISEC-GLOBAL international teams
 - 3) Apply for a site candidate at a UNIGLO meeting
 - Joint with UNIGLO-meeting and MIC preferable
2. Issuing “Call for paper” by 10 months before
 - 1) Period and site, financial plan should be already fixed
 - 2) Session organization, search for chairs, keynote speakers, welcome speech, technical visit, excursion, reception, banquet, etc. should be done concurrently
3. Management of NSAT
 - 1) Participants list management, registration fees, Visa
 - 2) IT related management (projector, mic, online, etc.)

Selection of Next NSAT Site

- Today, we will hear several proposals for 13th NSAT 2024 and 10th UNIGLO Meeting
- Please evaluate the proposals from various perspectives (Each local chapter has one vote.)
- The final votes will be made during the 9th Annual UNIGLO Meeting.

(We will make an opportunity for absent voting.)