

The 5th UNISEC Global Meeting, Rome, Italy

Spacecraft Developments of UNISEC Japan & EQUULEUS : 6U Deep Space CubeSat to Earth-Moon Lagrange Point

Nobuhiro Funabiki

Intelligent Space Systems Laboratory (Nakasuka & Funase Lab.)
Department of Aeronautics and Astronautics
The University of Tokyo, Japan

Self Introduction

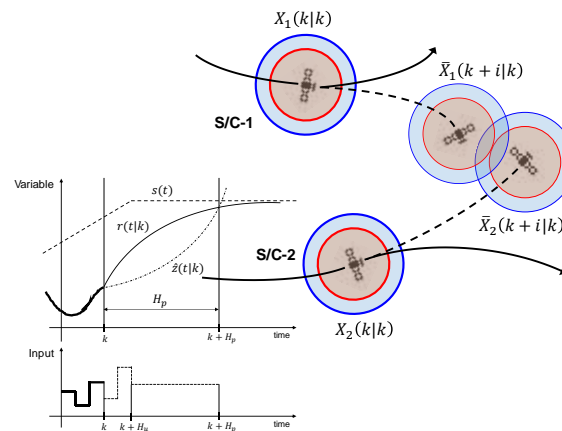
- ▶ Name : Nobuhiro Funabiki
- ▶ Nationality : Japan
- ▶ Affiliation : The University of Tokyo
- ▶ Grade : 1st year master course
- ▶ Hobby : Guitar, Anime, ...



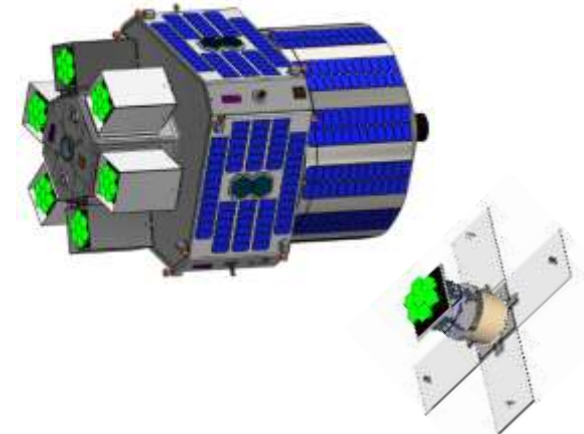
S/C Developments



Research on Formation Flight

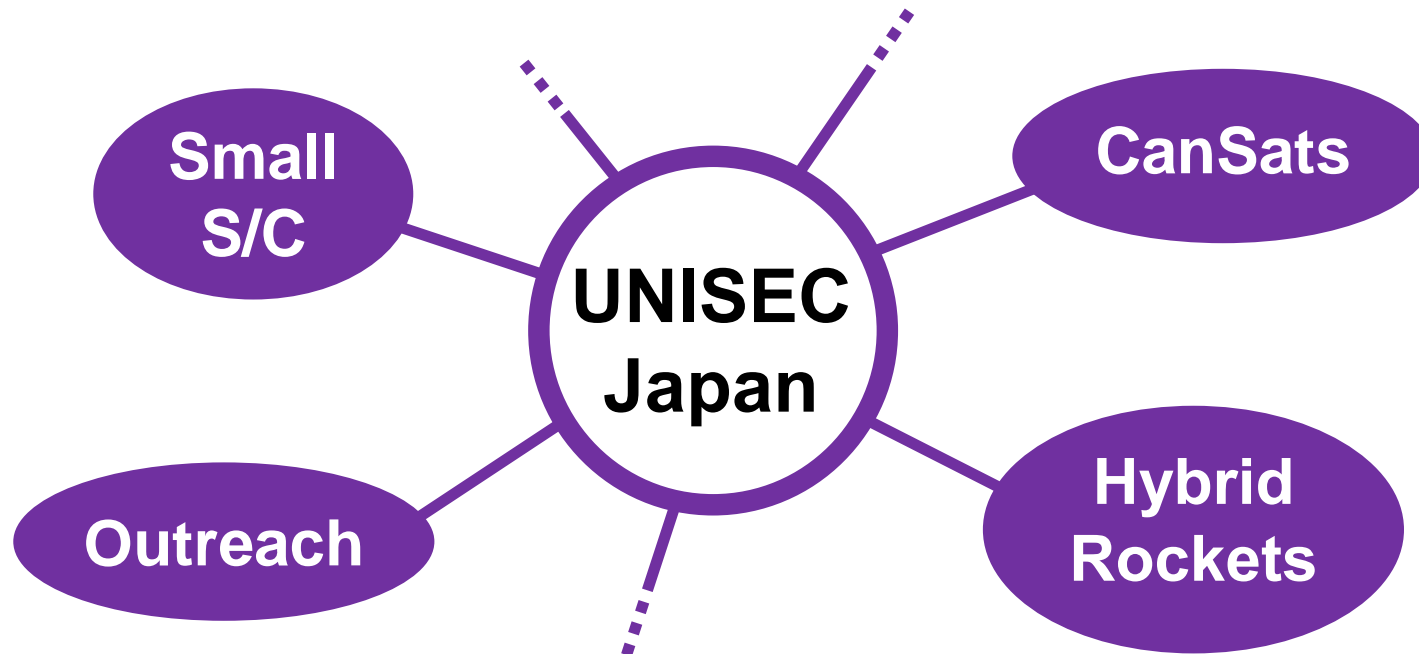


S/C Design



UNISEC Japan

- NPO/NGO to facilitate/promote university level students' practical space development activities, such as designing, manufacturing and launching small satellites and hybrid rockets
- Established in 2002



Achievement of UNISEC-Japan



ISSL : Intelligent Space Systems Laboratory

The University of Tokyo, Japan



ISSL : Relationship with “UNISEC”

Prof. Shinichi Nakasuka



One of the major founders of **UNISEC Japan**
Now : Member of the executive board, **UNISEC Japan**

Assoc. Prof. Ryu Funase



Past : Student member of **UNISEC Japan**
Now : Member of the executive board, **UNISEC Japan**
EQUULEUS mission : Project Manager (PM)



Guidance & Training



Students



ISSL lab's students (like me)
Now : Student member of **UNISEC Japan**

EQUULEUS mission : Main Developers

EQUULEUS

EQUilibriUm Lunar-Earth point 6U Spacecraft

Development

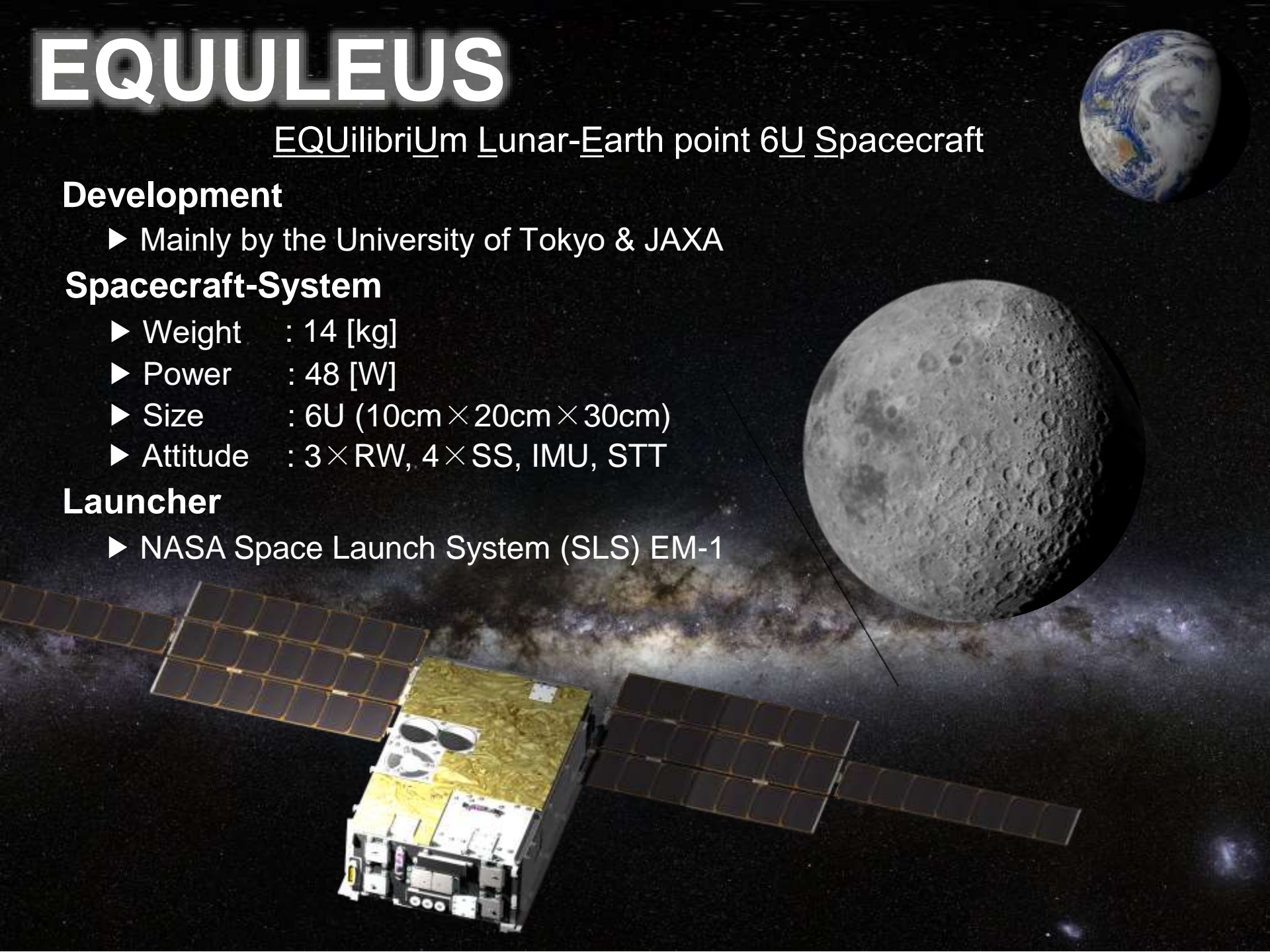
- ▶ Mainly by the University of Tokyo & JAXA

Spacecraft-System

- ▶ Weight : 14 [kg]
- ▶ Power : 48 [W]
- ▶ Size : 6U (10cm × 20cm × 30cm)
- ▶ Attitude : 3 × RW, 4 × SS, IMU, STT

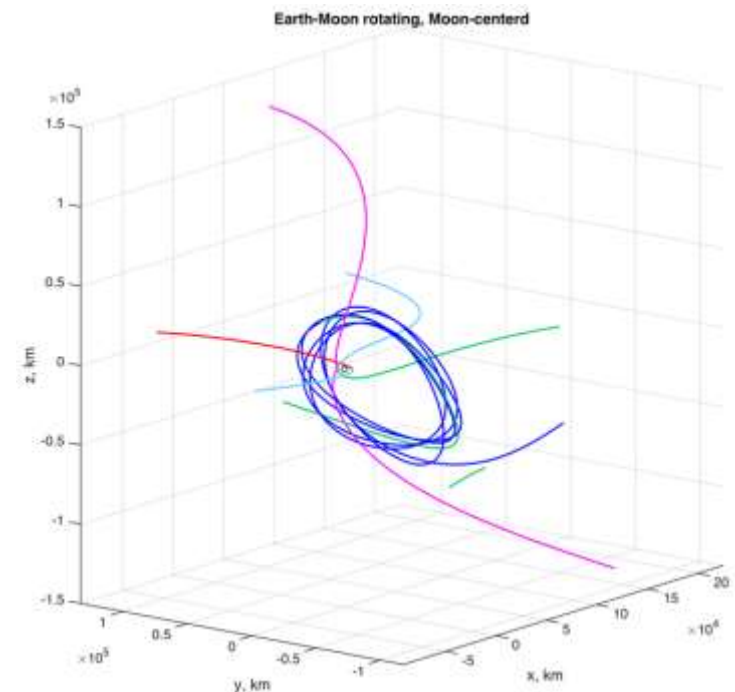
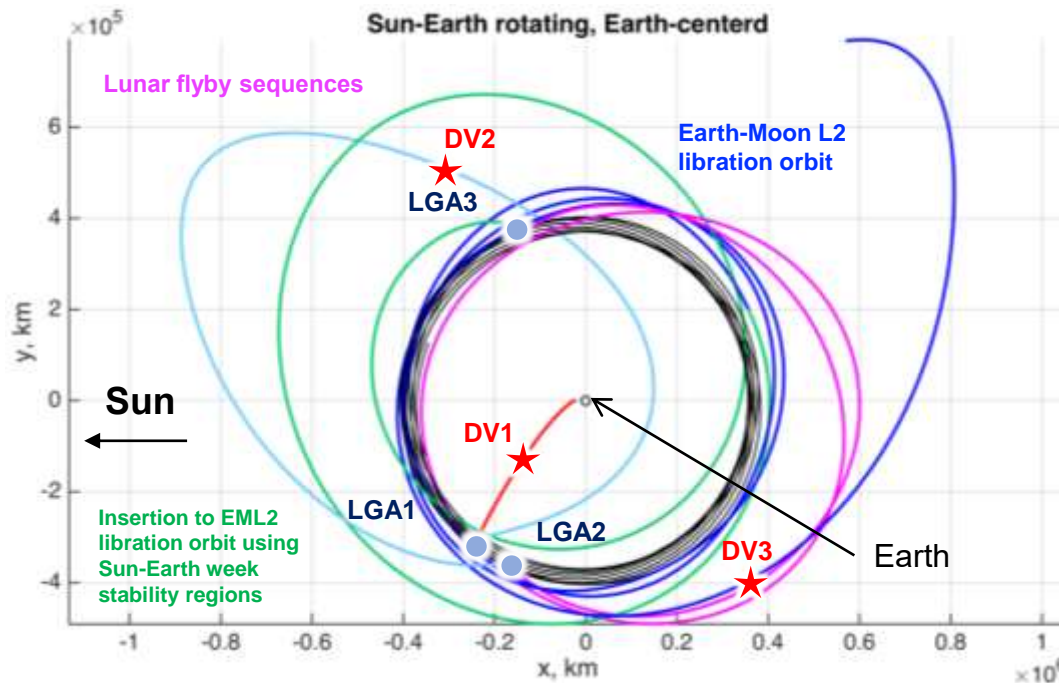
Launcher

- ▶ NASA Space Launch System (SLS) EM-1



Mission : Trajectory Control to EML2

- ▶ ~6 months flight to Earth-Moon Lagrange Point 2 with ΔV of as low as ~10m/s
- ▶ Multiple lunar gravity assists



Mission : 3 Characteristic Science Missions

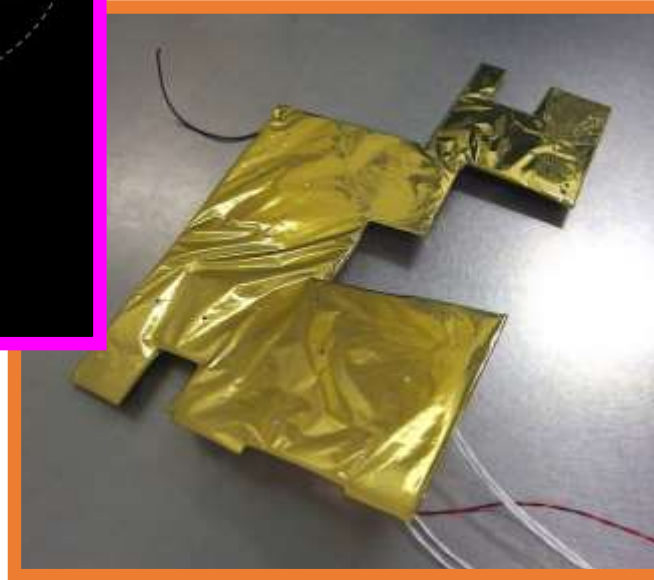
PHOENIX

- ▷ Observation of the Earth's plasmaphere



DELPHINUS

- ▷ Observation of Lunar Impact Flash



CLOTH

- ▷ Measurement of dust environment in cis-lunar region

Mission : Advanced Technologies



XTRP for a CubSat

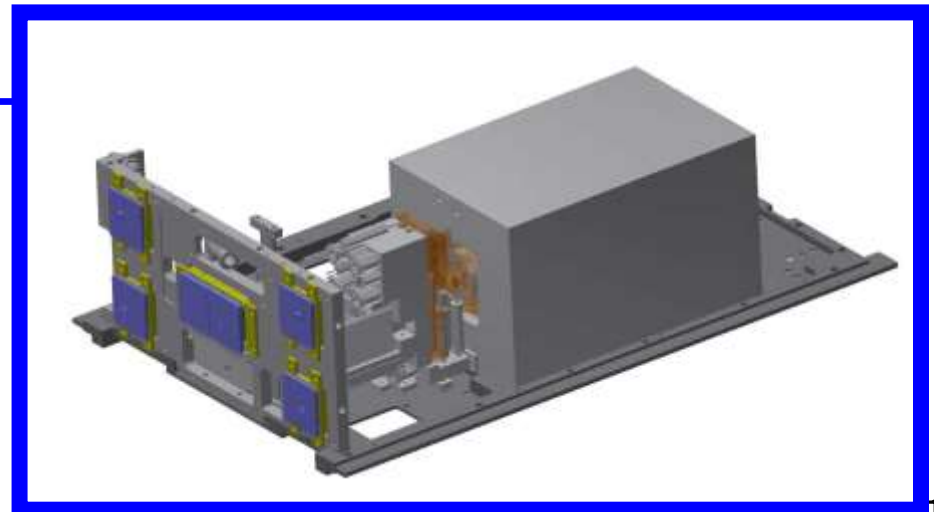
- ▶ Miniaturization of the deep space communication transponder into the CubeSat
- ▶ XTRP, XLGA, XMGA, USO

AQUARIUS

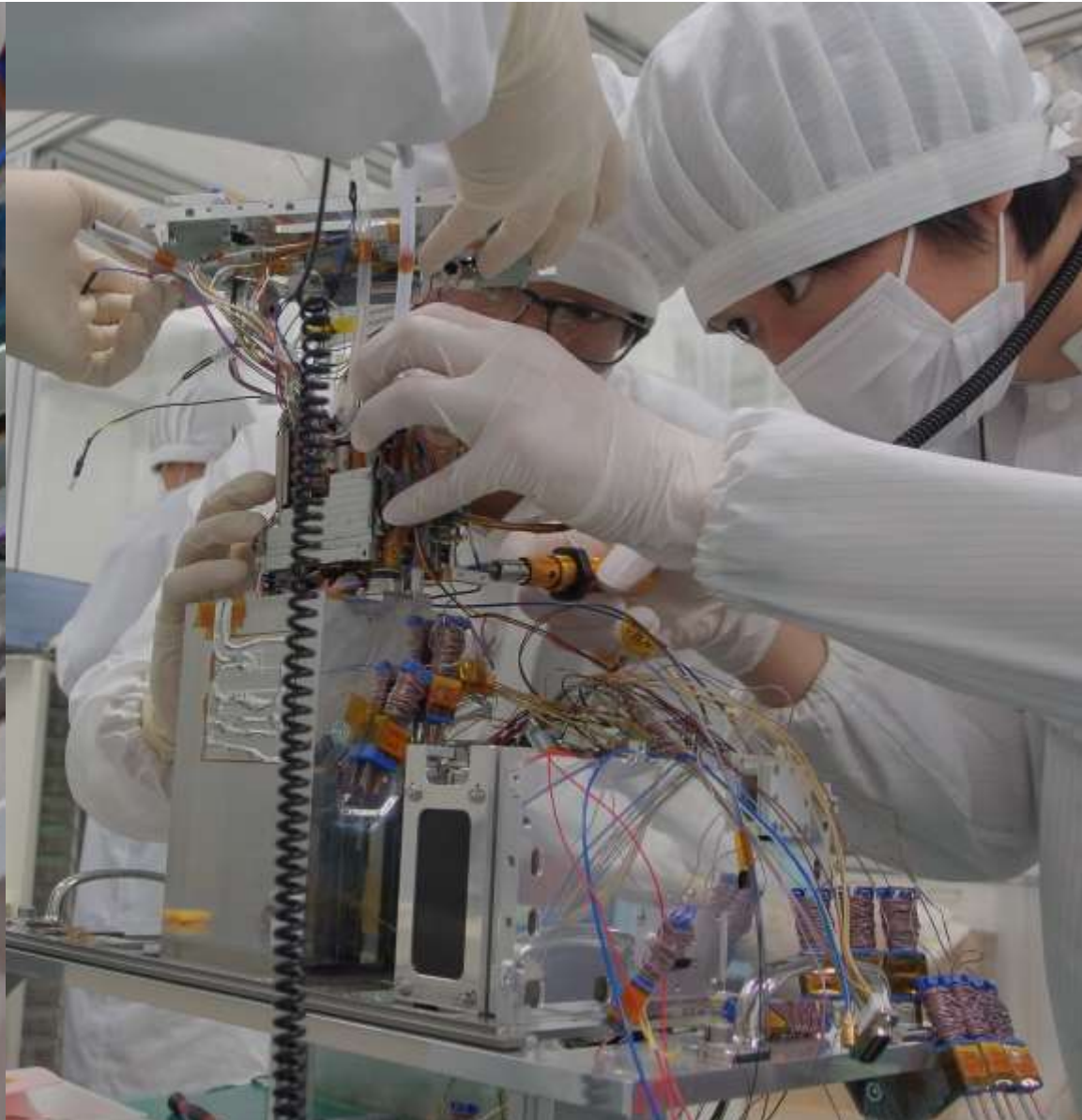
- ▶ The new resistojet **water** propulsion system



- ▶ Perfectly safe, non-toxic
- ▶ Easy to handle

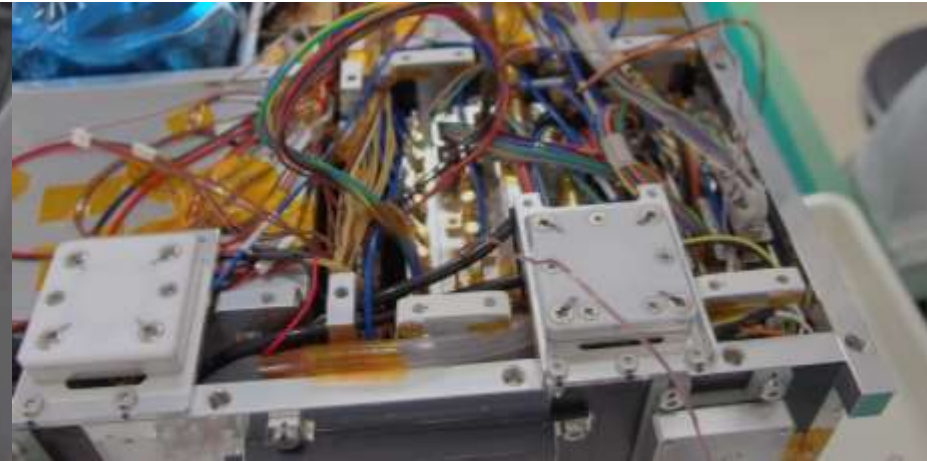


Assembly

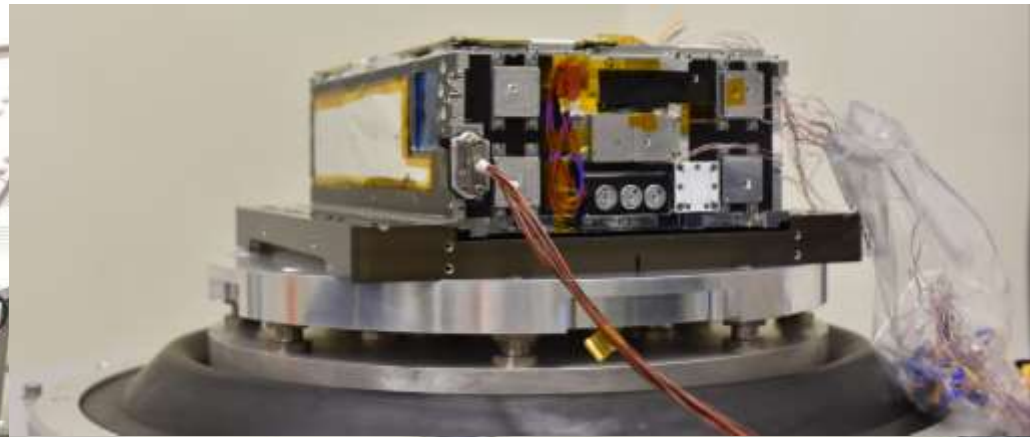
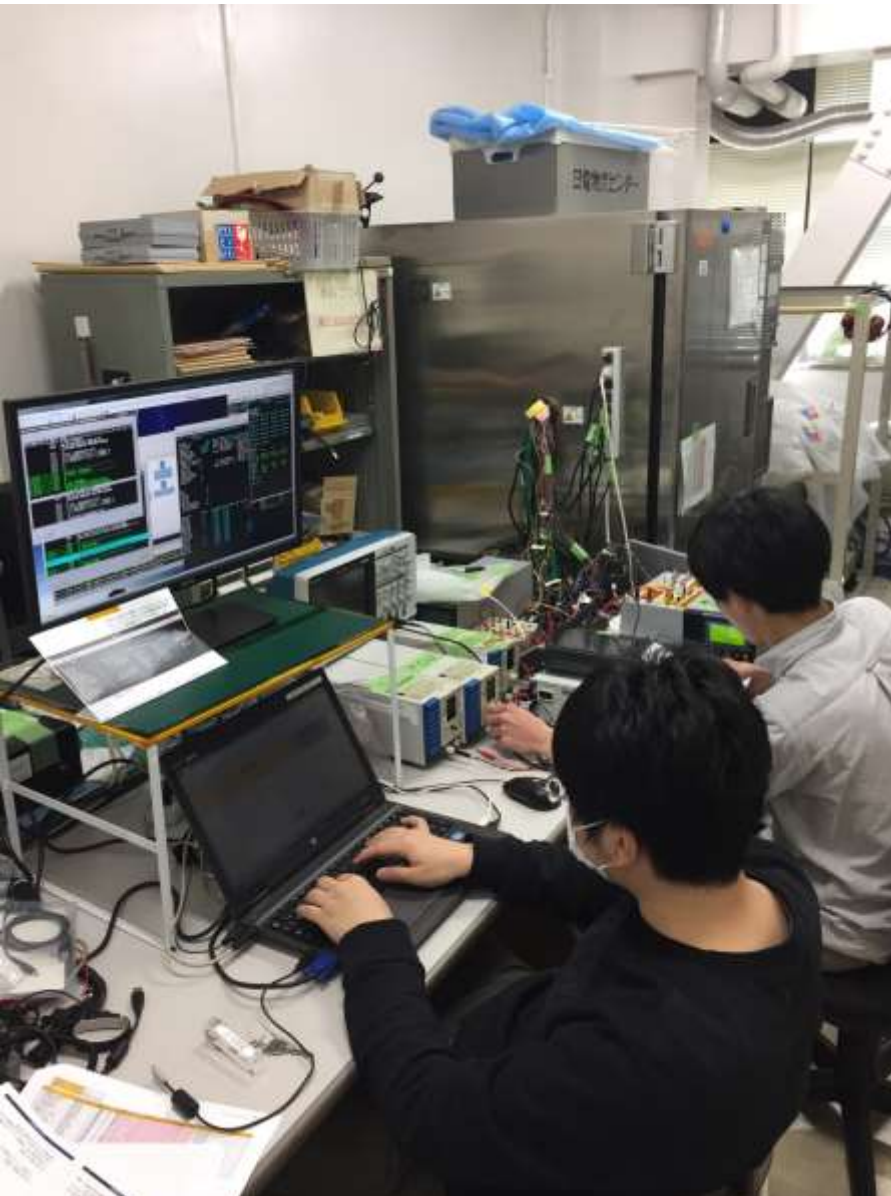




Assembly



EM Temperature & Vibration Test



EM Thermal Vacuum Test

