



The 5th UNISEC Global Meeting, Rome, Italy

Spacecraft Developments of UNISEC Japan

8

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

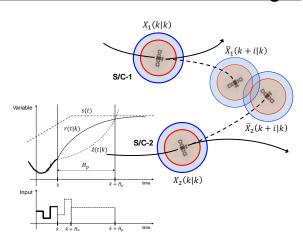
- Name : Nobuhiro Funabiki
- Nationality : Japan
- Affiliation : The University of Tokyo
- ▶ Grade : 1st year master course
- ▶ Hobby : Guitar, Anime, ...



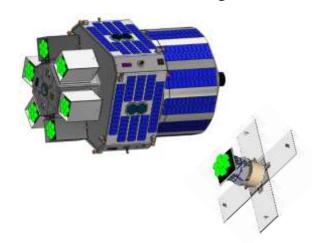
S/C Developments



Reseach 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



TSUBAME 東京工業大学 Nov 6, 2014

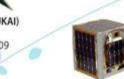


STARS-II 香川大学 Feb 28, 2014









ひとみ(PRISM) 東京大学

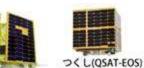
Jan 23, 2009

KSAT-II

鹿児島大学

Feb 28, 2014

XI-IV 東京大学 June 30, 2003



九州大学 Nov 6, 2014



ARTSAT1:INVADER 多摩美術大学 東京大学 Feb 28, 2014



OPUSAT 大阪府立大学 Feb 28, 2014

PROCYON



筑波大学 Feb 28, 2014



TeikyoSat-3 帝京大学 Feb 28, 2014



SPROUT 日本大学 May 24, 2014



雷神2(RISING2) 東北大学 May 24, 2014



鹿児島大学

Dec 3, 2014

和歌山大学、他 May 24, 2014



ARTSAT2:DESPATCH

多摩美術大学

東京大学

Dec 3, 2014

東京大学 June 19, 2014



S-CUBE

東北大学

千葉工業大学

Sep 17, 2015

ほどよし4号 東京大学 June 19, 2014



雷神(SPRITE-SAT) 東北大学



CUTE-I





WASEDA-SAT2 早稲田大学 May 21, 2010



Negai:☆" 創価大学 May 21, 2010



ハヤト(KSAT) May 21, 2010



鳳龍弐号(HORYU-II) 九州工業大学 May 18, 2012



PROITERES 大阪工業大学 Sep.9, 2012



東北大学/和歌山大学 July 21, 2012 (Launched) Oct 5, 2012 (Deployed from ISS)



FITSAT-1

福岡工業大学 Oct 5, 2012



東京工業大学 June 30, 2003



東京大学。 Oct 27, 2005



Cute-1.7+APD 東京工業大学 Feb 22, 2006



SEEDS (FM1) 日本大学 Jul 27, 2006



Sep 23, 2006



日本大学 Apr 28, 2008



東京工業大学 Apr 28, 2008





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)**

Students



Guidance & Training





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

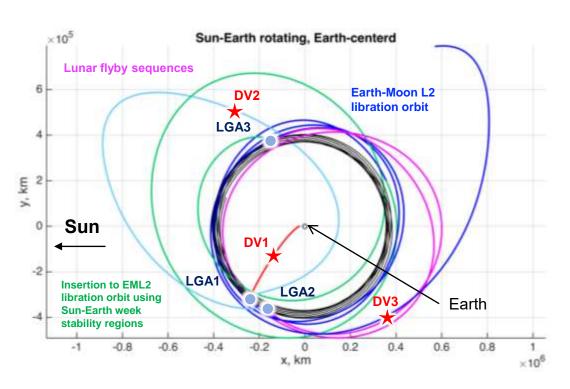
► NASA Space Launch System (SLS) EM-1

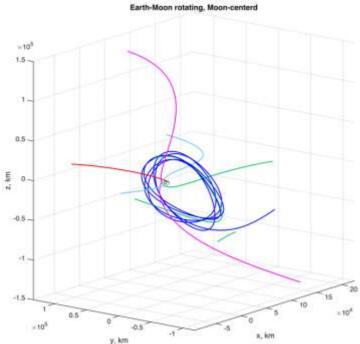




Mission: Trajectory Control to EML2

- ~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



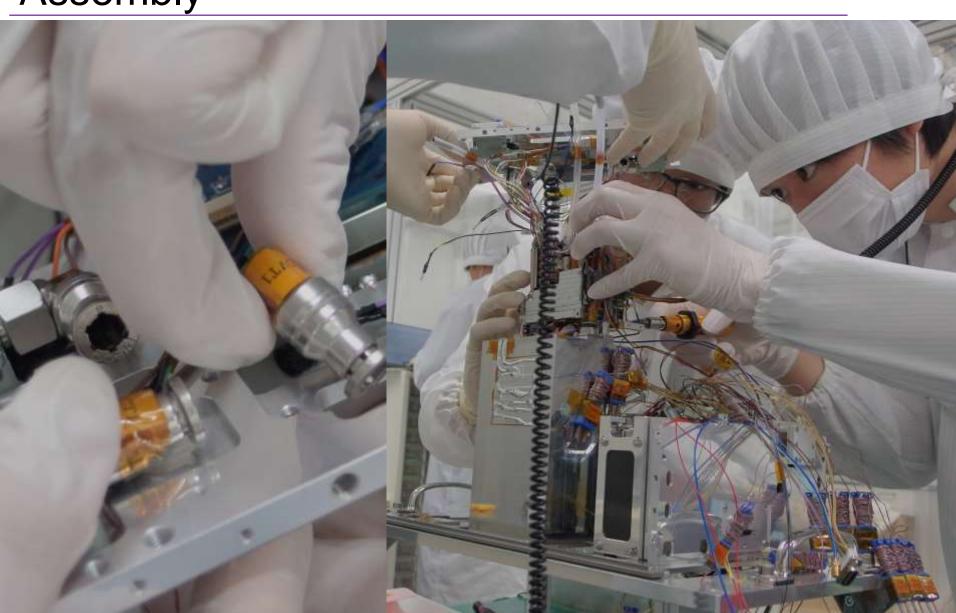
- Perfectly safe, non-toxic
- Easy to handle







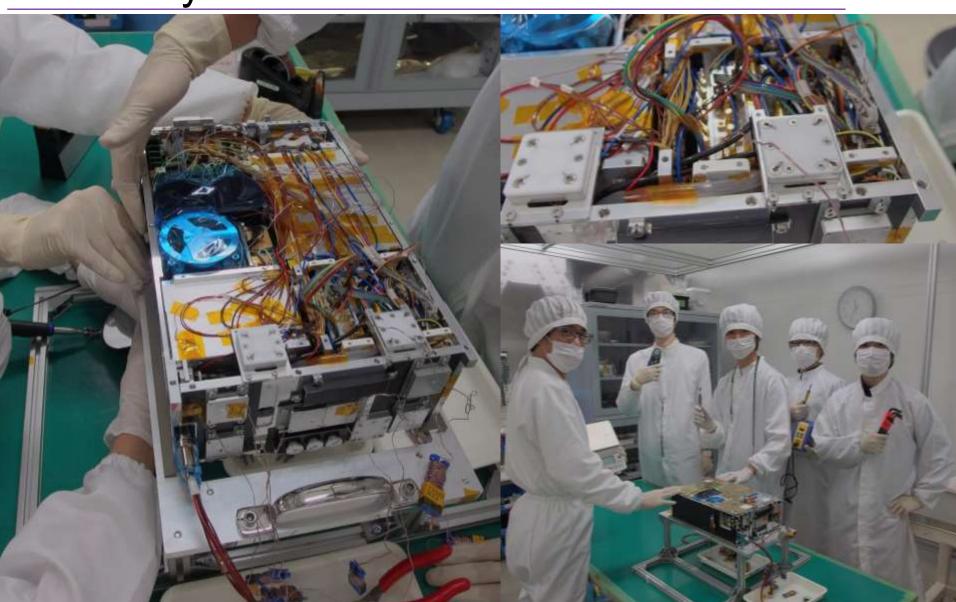
Assembly







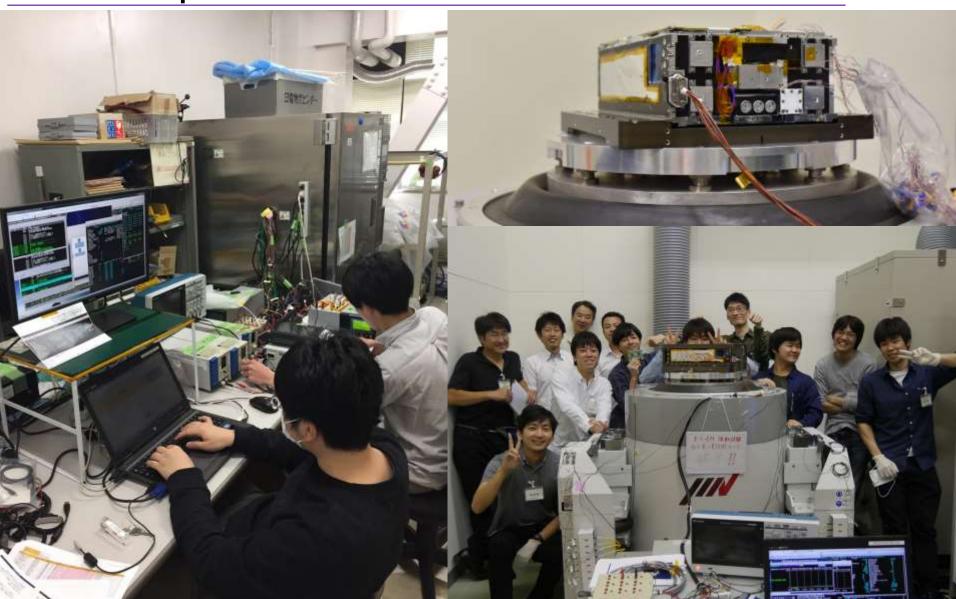
Assembly







EM Temperature & Vibration Test







EM Thermal Vaccum Test

