According to Bryce Space & Technology Co., among academic operators, Kyutech is No. 1 in number of small satellites launched

Members of BIRDS -1, -2, -3, -4 and -5, on 30-Oct-2020 in front of the lab building

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BIRDS Project Newsletter

Issue No. 67
(Monday, 23 August 2021)

Edited by:
G. Maeda
革新的宇宙利用実証ラボラトリー
Laboratory of Lean Satellite Enterprises and In-Orbit Experiments (La SEINE)
Kyushu Institute of Technology (Kyutech)
Kitakyushu, Japan

Archive website: http://birds1.birds-project.com/newsletter.html
All back issues are archived at this website.

Acknowledgment of support: This newsletter is supported, in part, by *JSPS Core-to-Core Program, B. Asia-Africa Science Platforms.*

La SEINE

SEIC Space Engineering International Course

All back issues of this newsletter can be easily downloaded.
Go to here: http://birds1.birds-project.com/newsletter.html and scroll down to the desired issue.

Table of Sections

Continued on the next page

From Honduras — The Guest Box

Macaw Mountain, Bird Park and Natural Reserve

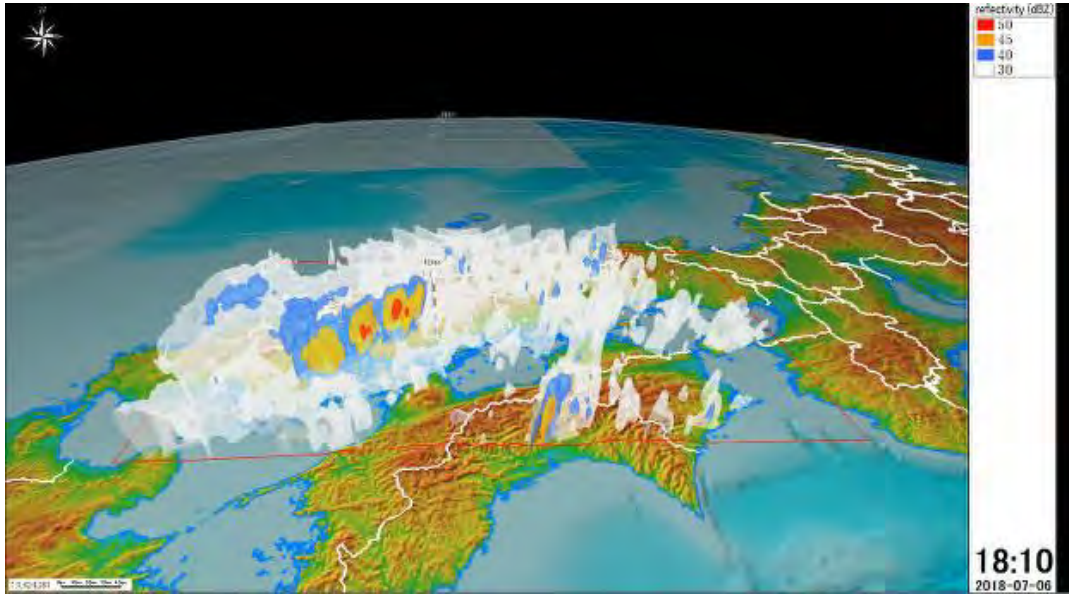
Macaw Mountain provides its visitors with a personal encounter with the fascinating birds of Honduras in a natural environment. It is located in the department of Copán and is home to Honduras national bird, the Scarlet Macaw (Ara Macao). The Park includes an outdoor information center where you can interact with some of the birds, take pictures with them and observe them closer. Image credit and more info at
http://www.macawmountain.org/

-- Reynel, SEIC student, Honduras

Table of Sections (cont'd from the previous page)

End of Table of Sections

Kyushu has been battered with massive rain storms in the past



This screen capture shows a frame from the 3-D animation of the distribution of the rain clouds over Japan at around 6:10 p.m. on July 6, 2018. (Photo courtesy of The National Research Institute for Earth Science and Disaster Resilience)

JSPS Reminder

When you publish a paper on a topic related to BIRDS, please include this acknowledgement in the paper:

This work was supported by JSPS Core-to-Core Program, B. Asia-Africa Science Platforms.

JSPS provides the airfare funds of <u>BIRDS International Workshops</u> and for <u>Ground Station Workshops</u>.

Special Report from the ESA space center in French Guyana

by Dr Paolo Marzioli

Sapienza University of Rome, Italy

7 August 2021

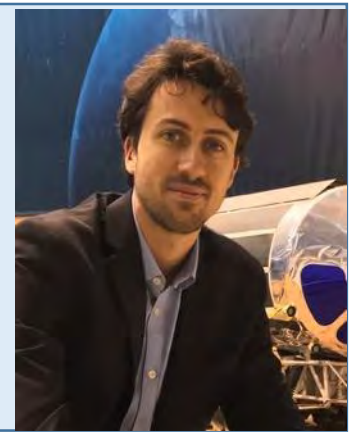
Sapienza University of Rome was founded in 1303

Editor's note: Dr Marzioli is an old friend of Kyutech. Many of our students know him.

A photo report from the integration of our satellite LEDSAT on the Vega rocket payload adapter in French Guyana

By Paolo Marzioli, Sapienza University of Rome, Italy
7 August 2021

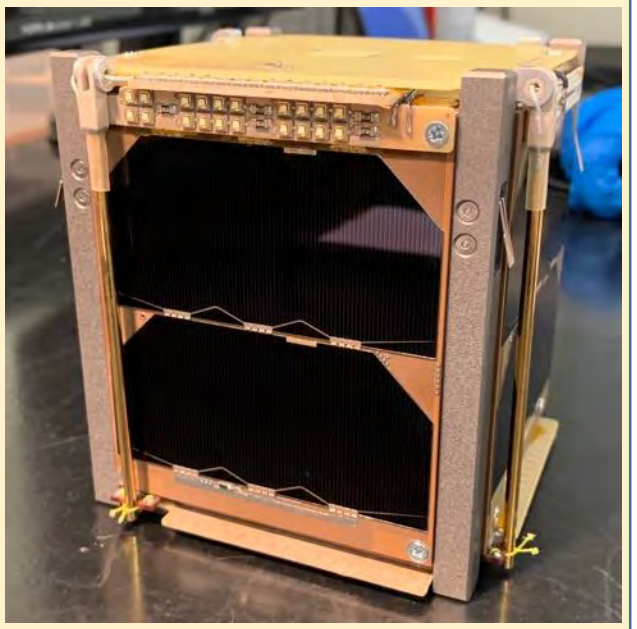
I'm Paolo, I recently gained my PhD at Sapienza University of Rome. Between 2019 and 2020, I spent five months at Kyutech as part of my PhD research. At Sapienza, I'm working on many nano-satellite projects.



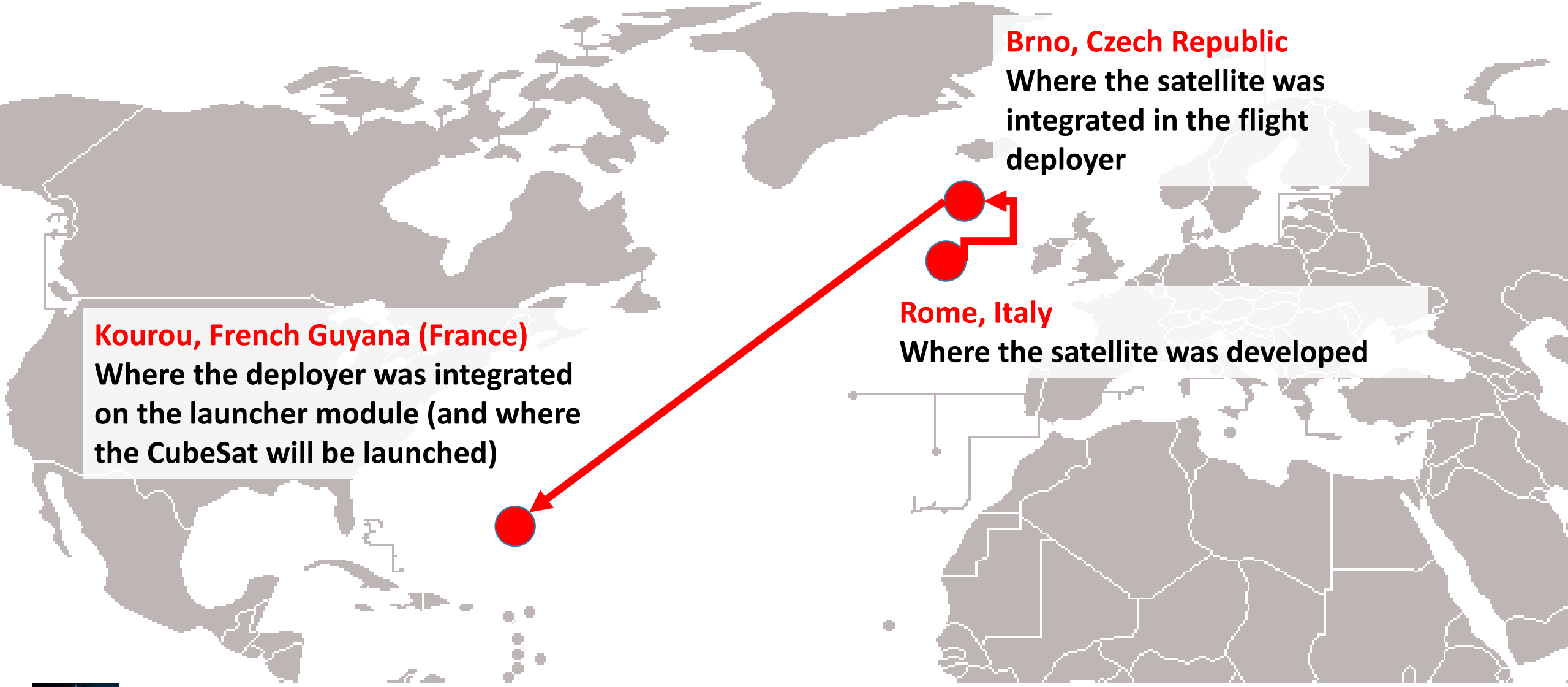
LEDSAT is a 1U CubeSat we developed between 2017 and 2021 at our lab (**S5Lab**) at Sapienza University of Rome. The project was part of the ASI IKUNS programme and it was selected for the ESA *Fly Your Satellite!* Programme. I worked on LEDSAT for all the four years of project and took part in the satellite integrations.

In July 2021, we had the pleasure to participate in the **integration activities** of the satellite in the flight deployer, concluded at the *Guyanese Space Center in Kourou, French Guyana, South America.*

The satellite equips **LED lights** on all the external surfaces. The LEDs will flash and **be tracked by ground-based telescopes** for orbit determination, attitude reconstruction and more.

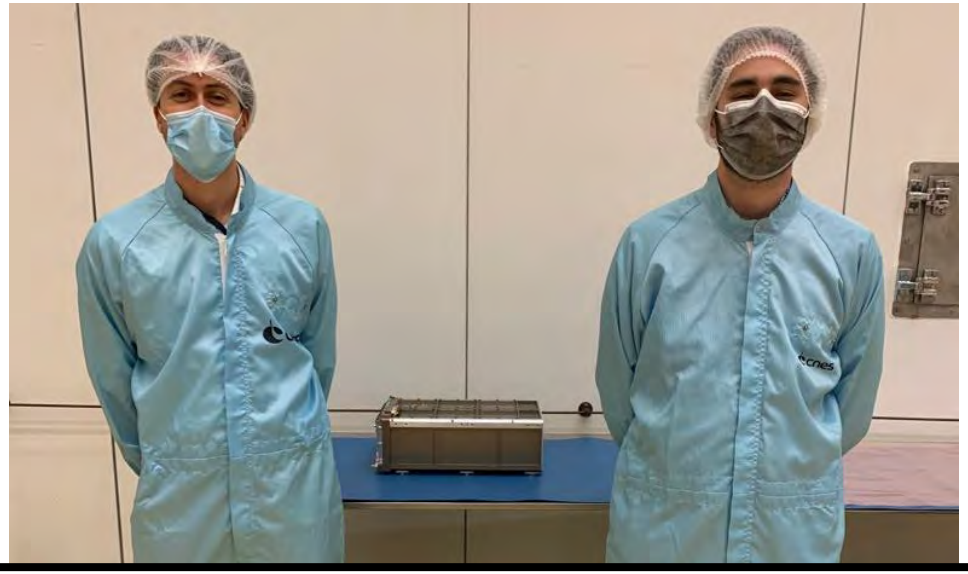


The integration activities of LEDSAT … spread around the world



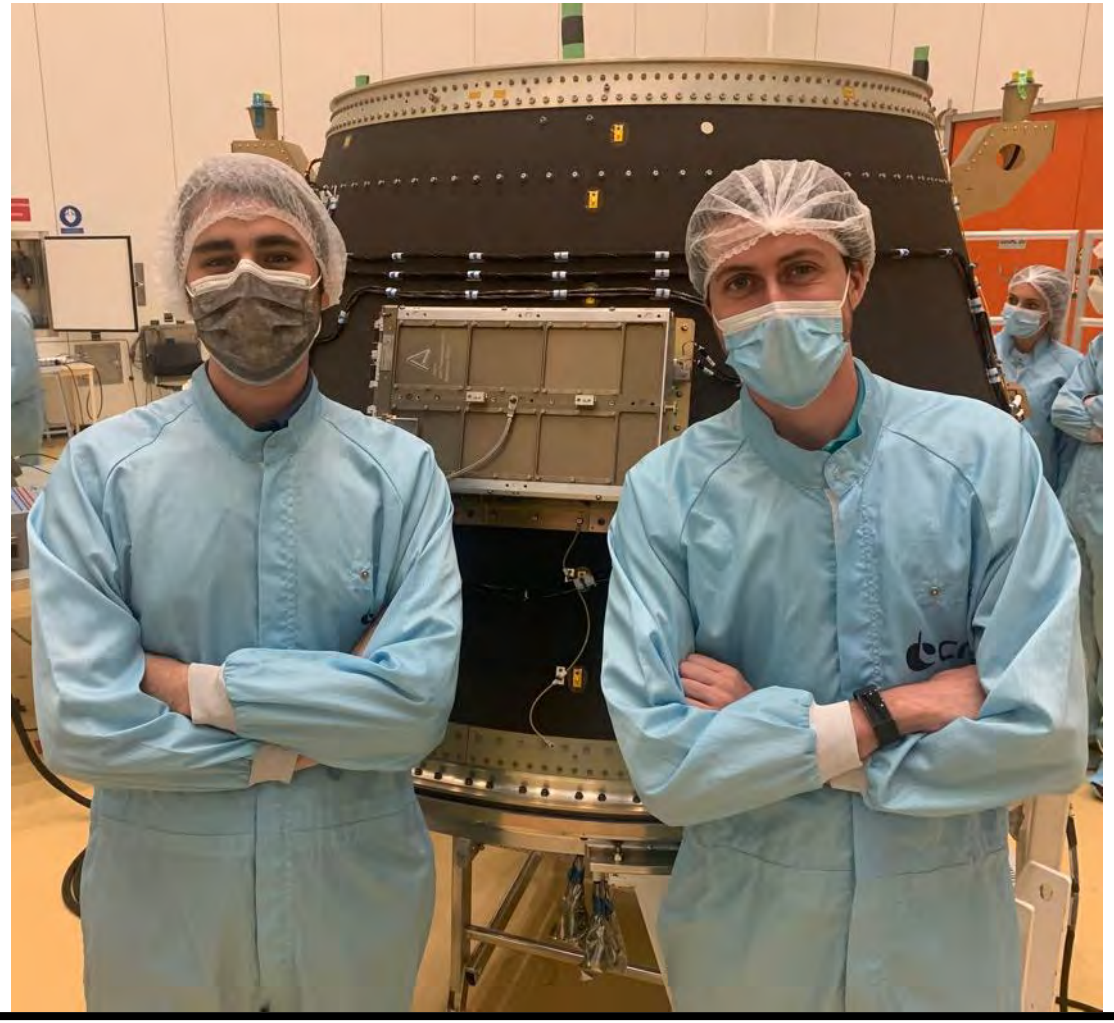
Integration Activities in French Guyana

At the Centre Spatial Guyanais (Guyanese Space Center), we were lucky to participate in the **integration of the flight deployer** (with LEDSAT inside) on the Vega PLA (payload adapter). My colleague Lorenzo and I participated in all the activities concerning the **secondary payloads**, together with the ESA Fly Your Satellite! Programme representative from ESA.



Me (left) and Lorenzo Frezza (right) with the flight deployer after the final inspection

(Credit ESA Education)



At the end of the integration with the deployer mounted on the Vega PLA stage

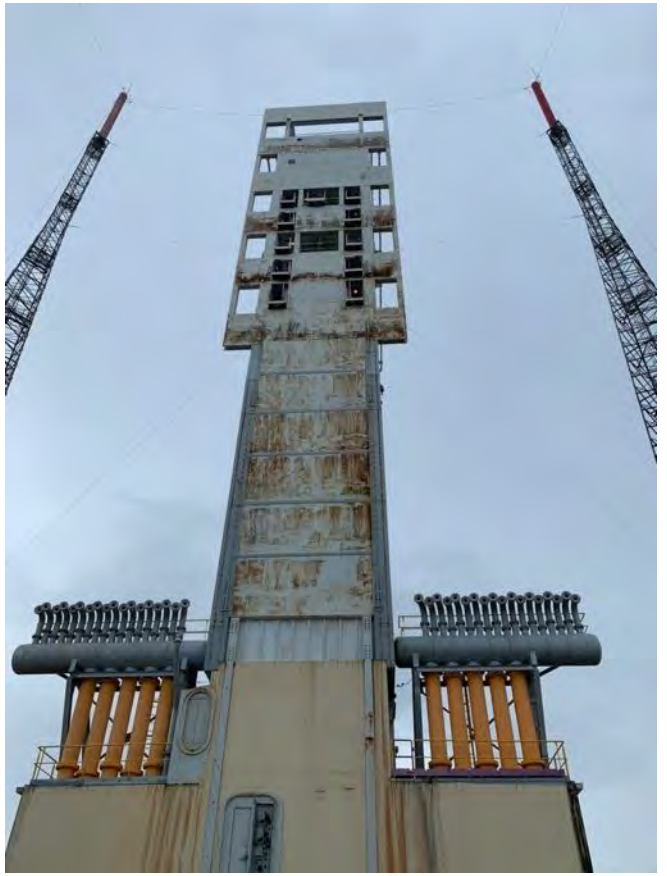
(Credit ESA Education)

The Guyanese Space Center

The Centre Spatial Guyanais (abbreviated as **CSG**) is the **main European launch site**. It is located in Kourou, French Guyana, just **500 km north of the equator**. From the CSG, three rocket families are currently launched:

- **Ariane** (currently with the Ariane 5, the heavy-lift European rocket)
- **Vega**, the light-weight launcher
- **Soyuz**, through an agreement with Roscosmos.

Future families of rockets are planned to be launched soon, such as **Ariane 6** and **Vega-C**. At the CSG, we were lucky to visit the launch pads of Vega (where LEDSAT will be launched) and Ariane (where an Ariane 5 was launched 2 days after we left)



Ariane 5 Launch pad

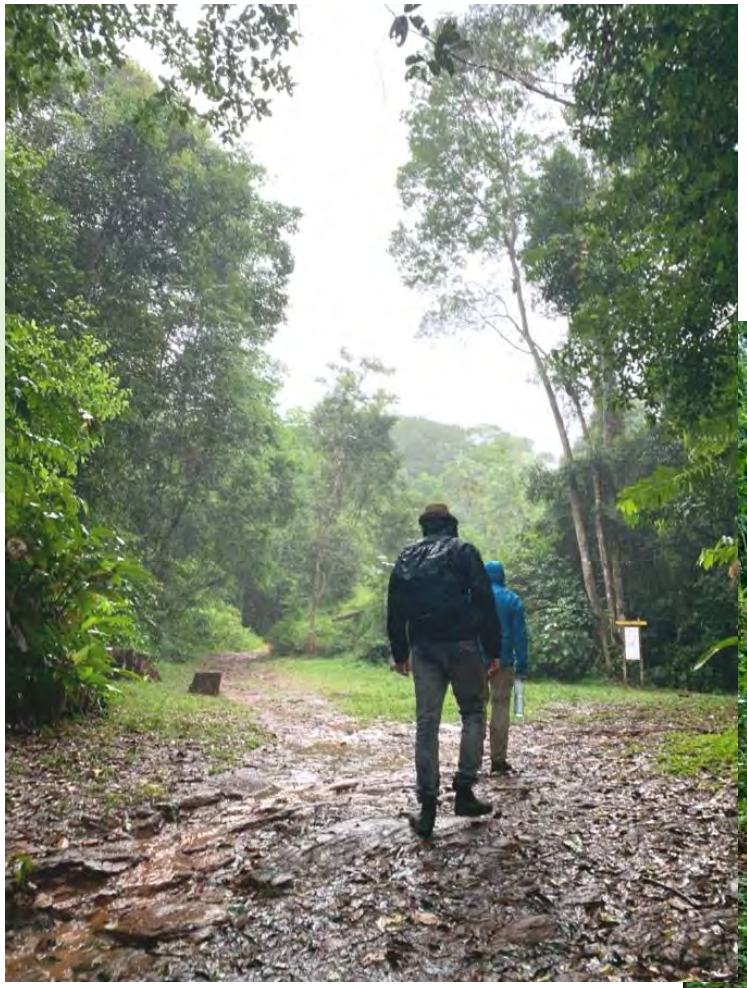
Wikipedia:
https://en.wikipedia.org/wiki/Guiana_Space_Centre

https://centrespatialguyanais.cnes.fr/en

Vega Mobile gauntry and launch pad

Postcards from French Guyana (1)

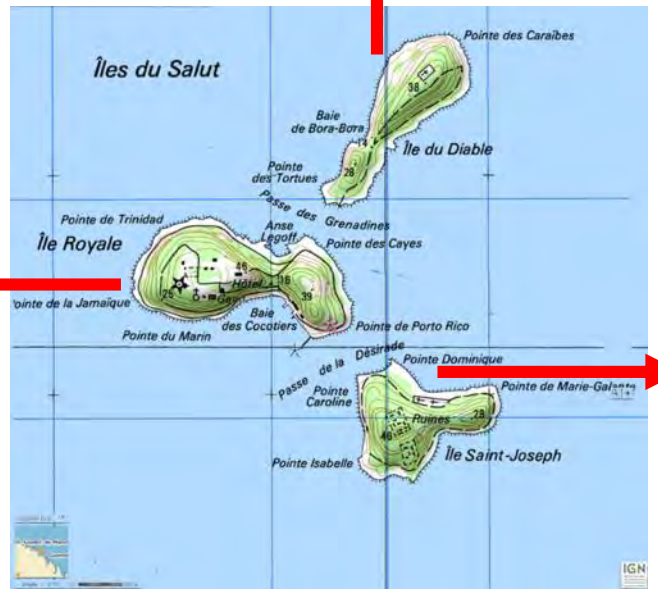
I had the chance of spending the weekend in Kourou exploring the area. Kourou is literally at the boundary of the Amazon rainforest, so hiking in some paths in the jungle is really easy and at few minutes drive from your hotel.



Postcards from French Guyana (2)

Furthermore, the «Iles du Salut» (Islands of salvation) are just 14 km away from the coast. The islands were a very famous French penal colony (the scenario for the book «Papillon» by Henri Charriere and many other books) that can now be visited by tourists. The islands are beautiful volcanic tropical isles few steps from the Guyanese coast.

Coat of arms of French Guiana



LEDSAT launch and radio amateur competition for first signals

LEDSAT will be launched in mid-August (around August 16, exact date still TBD) on the next Vega launch (VV19). *ESA Education* has organized **a competition for radio amateurs to catch the first beacon from LEDSAT** – a winner will be provided with a signed certificate for each continent.

Details of the competition can be found here:
https://www.esa.int/Education/CubeSats_-_Fly_Your_Satellite/Be_the_first_to_hear_LEDSAT_in_orbit

Details on the satellite launch, telemetry structure and packetization can be found on the brand new website of our lab:

- https://www.s5lab.space/index.php/ledsat-home/ (LEDSAT homepage)
- https://www.s5lab.space/ (Lab homepage, with some pages still under construction)

You can also find news on the satellite launch on social media!

@sapienza.s5lab @S5Lab S5Lab

END OF REPORT BY PAOLO

02. Article about small satellites by Paolo is published by a newspaper in Rome

Piccoli satelliti per grandi missioni

Dante tra le stelle

«E

Subject: My article in a newspaper - mentioning BIRDS
From: Paolo Marzioli <paolo.marzioli*uniroma1.it>
Date: 2021/July/14
To: George Maeda

Dear Prof Maeda,

I'm happy to share this with you: it's about one year that I write short newspaper articles for "L'Osservatore Romano", which is the official Vatican City's newspaper -- and a popular newspaper in Italy as well. I normally write some fun facts about astronomy but I've been asked to talk about satellites this time and I immediately wrote about CubeSats. The article is titled, "Piccoli satelliti per grandi missioni" (Small satellites for great missions). [see photo at the left]

I felt free to mention some important projects: I included a reference to some of our satellites, but I wanted to mention the BIRDS project and Kyutech as well.

I can send you a translation of my article in English in the next few days -- you'll find the mentioning of BIRDS in the second half :)
Hope you like it! I couldn't avoid to mention the "Republic of Kyutech"!

All the best,
Paolo

English translation starts on the next page

Article: https://www.osservatoreromano.va/it/news/2021-07/quo-153/piccoli-satelliti-br-per-grandi-missioni.html

Small satellites for bigger missions: CubeSats and New Space Economy

"L'Osservatore Romano" (Vatican City's newspaper), 2021/July/09
Original article link (in Italian):
https://www.osservatoreromano.va/it/news/2021-07/quo-153/piccoli-satelliti-br-per-grandi-missioni.html
Translation into English by Paolo Marzioli

"Non est ad astra mollis e terris via" (There is no easy way from Earth to the stars): Seneca's warning from two thousand years ago could be a perfect summary of the epic of the conquest of space by humanity, which sixty years after the flight of Jurij Gagarin has arrived today to interesting perspectives in view of the return to the moon and future journeys to Mars. If the first years of exploration are remembered for the impressive governmental flight programs that have led us, in just over a decade, from launching a simple satellite into low earth orbit to landing humans on the Moon, the last decades of aerospace have managed to bring space technology closer to us all than ever before.

There is really a lot of "space" in everyday life: just think of the weather forecast, calculated thanks to the images of meteorological satellites, satellite navigation, now used and abused by each of us, not to mention technology transfer, thanks to which cardiologists around the world use lasers initially designed for satellite environmental monitoring platforms or where sensors similar to those of the Hubble Space Telescope have been able to break down the invasiveness of biopsies for breast cancer. But how easy has it become for all of us to send something into space? With Seneca's approval, it has become impressively common. From an old system made up of a few major players and major development programs, in a few years the aerospace world has arrived at a "New Space Economy", centered on hundreds of actors able to build a satellite and launch it in a sufficiently short time to orbit.

A sort of technological miracle, the frightening increase in satellite developers in the world, made possible also thanks to the introduction of miniaturized satellites, capable of carrying out their mission with much smaller masses and dimensions than usual. From platforms that in most cases exceeded the tonne, typically of a size similar to an SUV, the space economy has reached a drastic turning point thanks to the introduction of small satellites, smaller than 500 kg, and its subclasses. As for boxers, it is the weight (or rather, the mass) of the satellite that defines the category: mini-satellites under 250 kg, micro-satellites under 50 kg, nano-satellites under 10 kg, up to the most ambitious. pico-satellites (less than 1 kg) and femto-satellites (with masses less than one hectogram).

How is it possible to switch from satellites weighing an elephant to that of a cat (or, in some cases, a mouse)? The first answer is under the eyes of all of us: processors tend to "lose weight" over time, making enormous computing powers available in ever smaller dimensions. It is no coincidence that the computer from which I am writing to you has a computing capacity and speed that would have required several rooms, if not an entire building, just forty years ago. Satellite on-board computers are no exception, although they are often slower than a mobile phone: smaller processors, smaller components, smaller satellites. With enormous benefits: the price to put an object into orbit is, as one of my professors told us in the third year of university, how to pay a weight in gold for the satellite. Literally: the price per 1 kg launched into low orbit is in fact often similar to the price of a kilo of gold: a few years ago it was close to 50 thousand euros per kilogram. Imagine the impact of an important "weight loss" on the pockets of your company: miniaturizing can become, in this sector, a literal gold mine.

A huge boost to the small satellite sector was also given by the introduction of standard form factors in the world (especially) of micro- and nano-satellites. In fact, the introduction of standard dimensions for small satellites has generalized the interfaces between rocket and satellite (trivially, how to mount your satellite on the rocket), eliminating a priori one of the most complex problems to face to jump from the prototype to the flight model. ready for the countdown. A bit like our life got simpler when phone charging cables all became more and more equal (and adherent to the USB standard), new satellite developers were able to access standard sizes, weights, interfaces for their small satellites. The black belt in this matter is the CubeSat standard, born in California in the late 90s. Despite the fascination that the most futuristic geometries could have exerted on the general public, the CubeSat is nothing more than a cubic satellite with 10 cm of side and 1.3 kg of mass. A liter of volume, 10 centimeters per side, just over a kilo available.

An enormous simplification of the geometries that has made the growth of the CubeSats resemble an exponential curve, with almost 1500 satellites launched since the first flight in 2003.

A framework that points to the involvement of new protagonists that is as broad as possible: if the initial aim of the CubeSats was education, where young university students could touch their first space mission already in the years of training as engineers or scientists, the enormous diffusion of the standard is due to the chance of re-adapting them for research or commercial applications: the small size, the forced simplification of projects that lead to rapid development cycles (and therefore to completed technological demonstrations in orbit) play in their favor. in a short time) and a great modularity that favors the creation of identical CubeSat constellations with relatively low costs. The virtuous example is offered by companies such as *Planet* and *Spire*, small giants able to readjust the CubeSat standard to constellations of hundreds of satellites, able to provide monitoring services with databases of dimensions never reached in the history of space exploration.

The blossoming of this "small" satellite world has also given everyone easier access to space: many nations, often with limited experience in the space field, have chosen CubeSats to build and launch their first satellite. Often not without strong international partnerships: think of programs such as the KiboCube of the United Nations and the Japanese space agency JAXA, born with the specific mission of offering launch opportunities to CubeSat developed by developing countries (including beneficiaries 'is 1KUNS-PF, Kenya's first nano-satellite, developed in collaboration with the University "La Sapienza" of Rome and supported by ASI, to which the writer was lucky enough to collaborate a few years ago), or to Birds program, born at the Kyushu Institute of Technology in Japan and responsible, among others, for the launch of the first satellites ever in countries such as Nepal, Bhutan, Sri Lanka or Paraguay. All programs that aim at strengthening the presence in this new space economy of all the nations of the world, first of all those that have taken their first steps into orbit thanks to small satellites.

English translation by Paolo

The involvement of all aims at increasingly distant objectives: the frontier of small satellites is to "accompany" the next trips to the Moon and Mars, with the future Artemis program and the next projects for Martian exploration. After the experimentation of MarCO, the first CubeSat on Mars, developed by NASA, numerous technological demonstrations for exploration outside the Earth's orbit are now entrusted to small satellites and CubeSats: small missions that will contribute significantly to a “big” space exploration of our tomorrow, making the way to the stars a little easier than it was just a few years ago.

23 Oct 2019 – Part of Italian delegation to the IAC in Washington, DC (standing at far right)

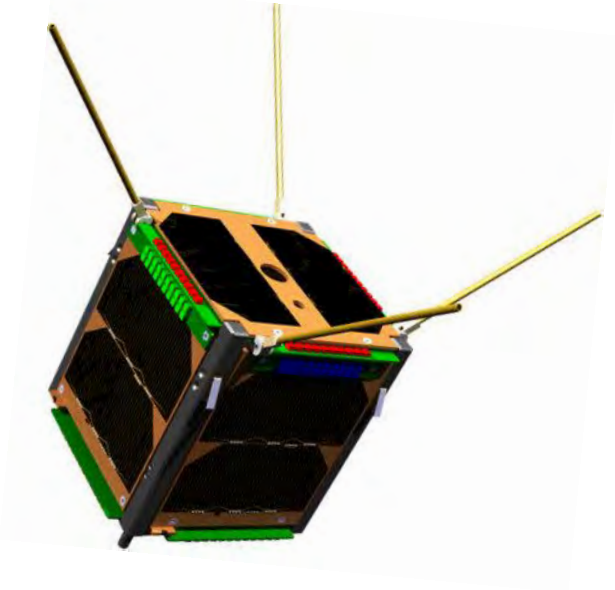
End of translation from Italian into English

Meet the team: LEDSAT

ESA / Education / CubeSats - Fly Your Satellite!

The LEDSAT 1U CubeSat is currently under development at the Space Systems and Space Surveillance Laboratory (S5Lab) of Sapienza – University of Rome. The educational aim of this university nanosatellite is to offer to the students of Aerospace Engineering to participate in a real space project, allowing them to understand the main aspects and criticalities of a complete spacecraft development cycle, from requirements definition and preliminary design to launch, operations and disposal of the satellite.

LEDSAT (LED-based small SATellite) is a 1-Unit CubeSat aimed at investigating the performances of a LED-based payload and at verifying and improving the current methodologies for optical LEO satellite tracking.



SEE THE ENTIRE ARTICLE: https://www.esa.int/Education/CubeSats_-_Fly_Your_Satellite/Meet_the_team_LEDSAT

The Mission

The LEDSAT mission has been conceived to investigate the performances of a technology based on Light Emitting Diodes (LEDs) for the optical stand-alone Low-Earth Orbit satellites tracking. Moreover, the collected photometric optical measurements will be used to verify the possibility to acquire information about the spacecraft attitude and to test a LED-based optical communication system to be used as back-up strategy in case of failure of the Telemetry, Tracking and Command (TT&C) subsystem.

The increasing of uncontrolled objects and space debris orbiting around the Earth is leading to need of an improved asset survey to be able to find their position, predict their trajectories and avoid possible collisions with operative spacecraft with very high reliability and accuracy. The possibility to have an on-board autonomous system to illuminate the spacecraft immediately after its in-orbit deployment and during its lifetime will permit to immediately recognize it and to ensure its observability with ground-based telescopes, also during its eclipse period.

The Team

The LEDSAT team is composed of M.Sc. students of Space and Astronautical Engineering and PhD. Students of Aeronautical and Space Engineering from Sapienza – University of Rome. Students participate in the project in the framework of the hands-on activities offered by S5Lab. At the completion of each FYS Programme phase, the students have an opportunity of gaining University credits.

Although being all students of aerospace engineering (at different levels), the full set of needed expertise (optics, electronics, ADCS, structures, software…) is covered by the student team members. The experience in optical systems derives from the activities on space debris optical observation carried out at S5Lab. The lab team has also experience in the development of space systems, since LEDSAT will be the third CubeSat assembled at S5Lab.

CubeSat Quick Facts

Payload	High-powered LEDs external arrays in three colors (Red, Green and Blue, with same LED color on opposite faces of the spacecraft)
Ground station	Optical Ground Stations (Rome and Matera , Italy; Malindi, Kenya; Bern, Switzerland; Ann Arbor, Michigan, USA and Cerro Tololo, Chile), RF Network (Rome, Italy; Nairobi, Kenya and Ann Arbor, Michigan, USA) Laser Ranging Network (Matera, Italy and Bern, Switzerland)
Dimensions	Stowed <100, 100, 113.5 mm>
Mass	1.325 kg
Power consumption	5.26 W in Sunlight and 28.32 W in Eclipse
Solar panels	Five COTS high efficiency triple-junction solar panels, mounted on five of the CubeSat faces. All the panels are provided, on the rear side, with magneto-torquers for attitude control
Mission lifetime	1.5 years
Website	*Under construction*

LEDSAT team members during the TID tests at ESA/ESTEC

Acta Astronautica
Volume 179, February 2021, Pages 228-237

Usage of Light Emitting Diodes (LEDs) for improved satellite tracking

Paolo Marzioli [a], Andrea Gianfermo [a], Lorenzo Frezza [a], Diego Amadio [a], Niccolò Picci [a], Federico Curianò [a], Maria Giulia Pancalli [a], Eleonora Vestito [a], Justin Schächter [b], Matt Szczerba [b], Daniel Gu [b], Anny Lin [b], James Cutler [b], Simone Pirrotta [c], Fabio Santoni [d], Patrick Seitzer [e], Fabrizio Piergentili [a]

Paper by Dr Paolo:
https://www.sciencedirect.com/science/article/pii/S0094576520306184?dgcid=rss_sd_all

END OF THIS SECTION

04. New arrival at Kyutech from University of Tokyo; Max will be joining us in October-November, helping on mechanical tasks for satellites

Biography

- Name: Maximilien BERTHET
- Nationality: British / French*
- Place of birth: Paris, France
- Position: PhD student, University of Tokyo (JP)

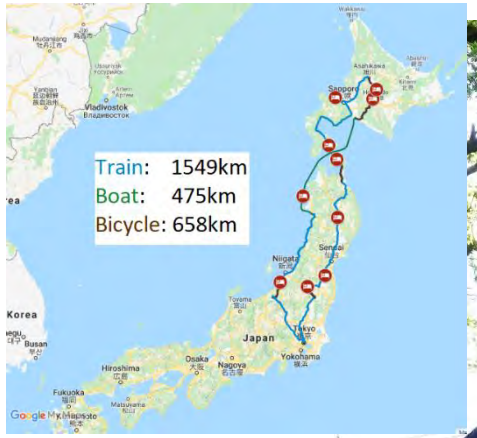
Bonjour!

*My mum is British, and my dad is French.
(During some critical sports events, I choose strategically!)

I will be coming to Kyutech for 2 months, as a visiting researcher in Oct.-Nov. 2021!

Path until now

- Master's, Aeronautics and Astronautics, University of Tokyo (2019)
- Master's, General Engineering, Durham University (UK) (2017)
- Exchange program at the University of Hong Kong (CN) (2015-16), mechanical engineering
- Internships at Renault (assembly line worker) and Air France (database management + aircraft engine maintenance)



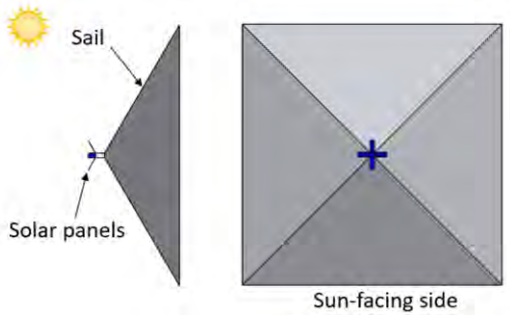
Cycling enthusiast (2019 trip)

Taken while hiking on Mt. Tsukuba: recommended spot near Tokyo.

My research

- Small satellites: design and simulation.
- Question I want to answer in my PhD: can the flight dynamics of small satellites be controlled by, and provide information on, natural perturbations in low Earth orbit?

Satellite design



Easier space science and navigation via LEO perturbations?

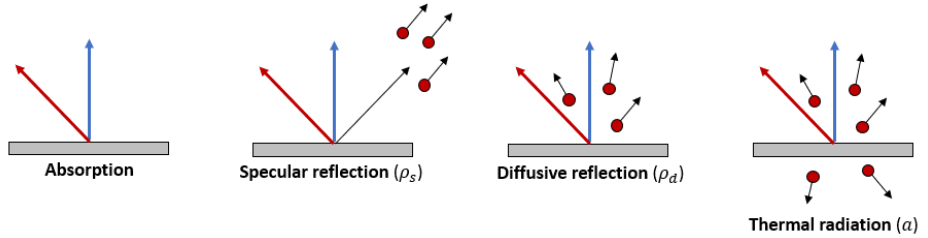
鈴木宏二郎研究室
SUZUKI K. LABORATORY

↑ I am a researcher in the Kojiro Suzuki laboratory
(stay tuned for Professor Suzuki's SEIC talk in Oct. 2021)

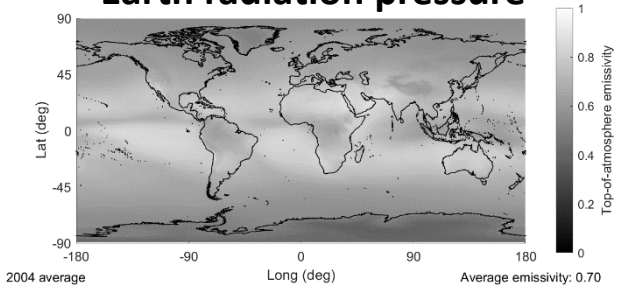
More about my lab: https://www.youtube.com/watch?v=xZjUtglMLf8

LEO environment modelling

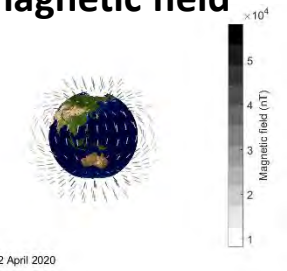
Solar radiation pressure



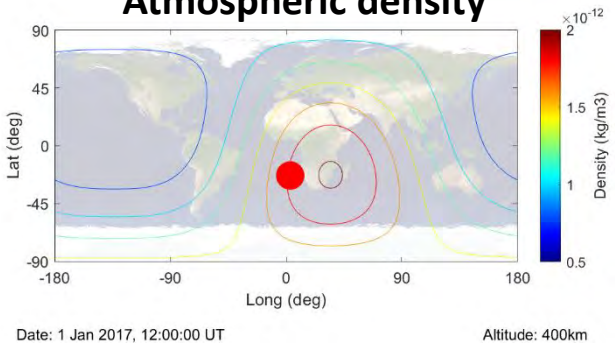
Earth radiation pressure



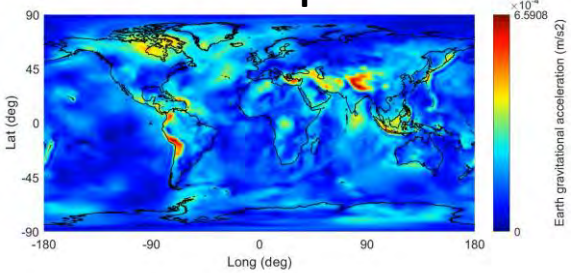
Geomagnetic field



Atmospheric density



Gravitational potential



n=5,m=0 to n,m=100 part of Earth's gravity field (@150km altitude)

What I will be doing at Kyutech

See you soon

In the next BPN, I will talk about my capacity building activities with the Institute of Technology of Cambodia.

Small satellite design and testing

My research is mostly about simulation, and I would like to learn more about the hardware side. It is really exciting that Kyutech has many ongoing projects where actual satellite hardware is being designed, built and tested. Joining a satellite development team will be a fantastic opportunity.

CAD software and mechanical design is where I have the most experience, so my work will likely be focused on these areas.

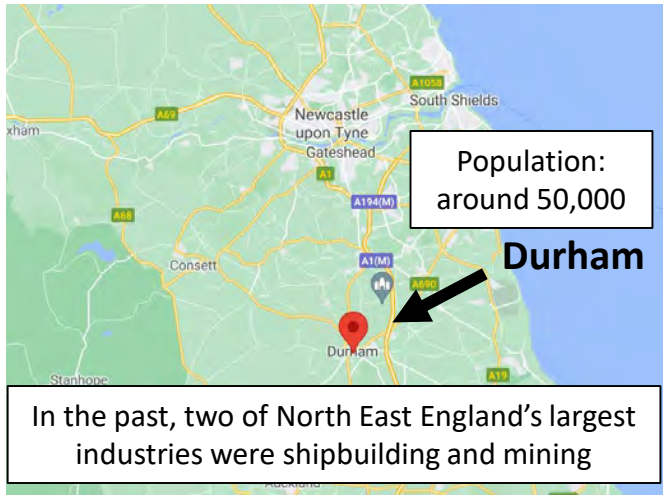
Languages, and experiencing different cultures. These are things I enjoy very much. If you see me around at Kyutech, let's have a chat!

Interviews, for capacity building research

At UTokyo, I am part of the GSDM program.* This means that alongside my engineering work, I am involved in projects with a social and policy focus. One of my interests is space capacity building.

At Kyutech, I will be holding interviews to understand how LaSEINE, the SEIC, BIRDS, and other capacity building frameworks have been affected by COVID-19.

GSDM https://gsdm.u-tokyo.ac.jp/en/



Population: around 50,000

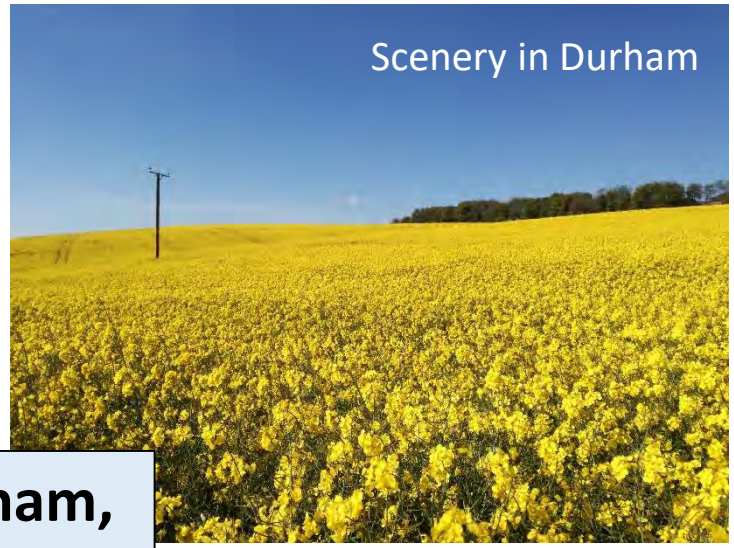
Durham

In the past, two of North East England's largest industries were shipbuilding and mining

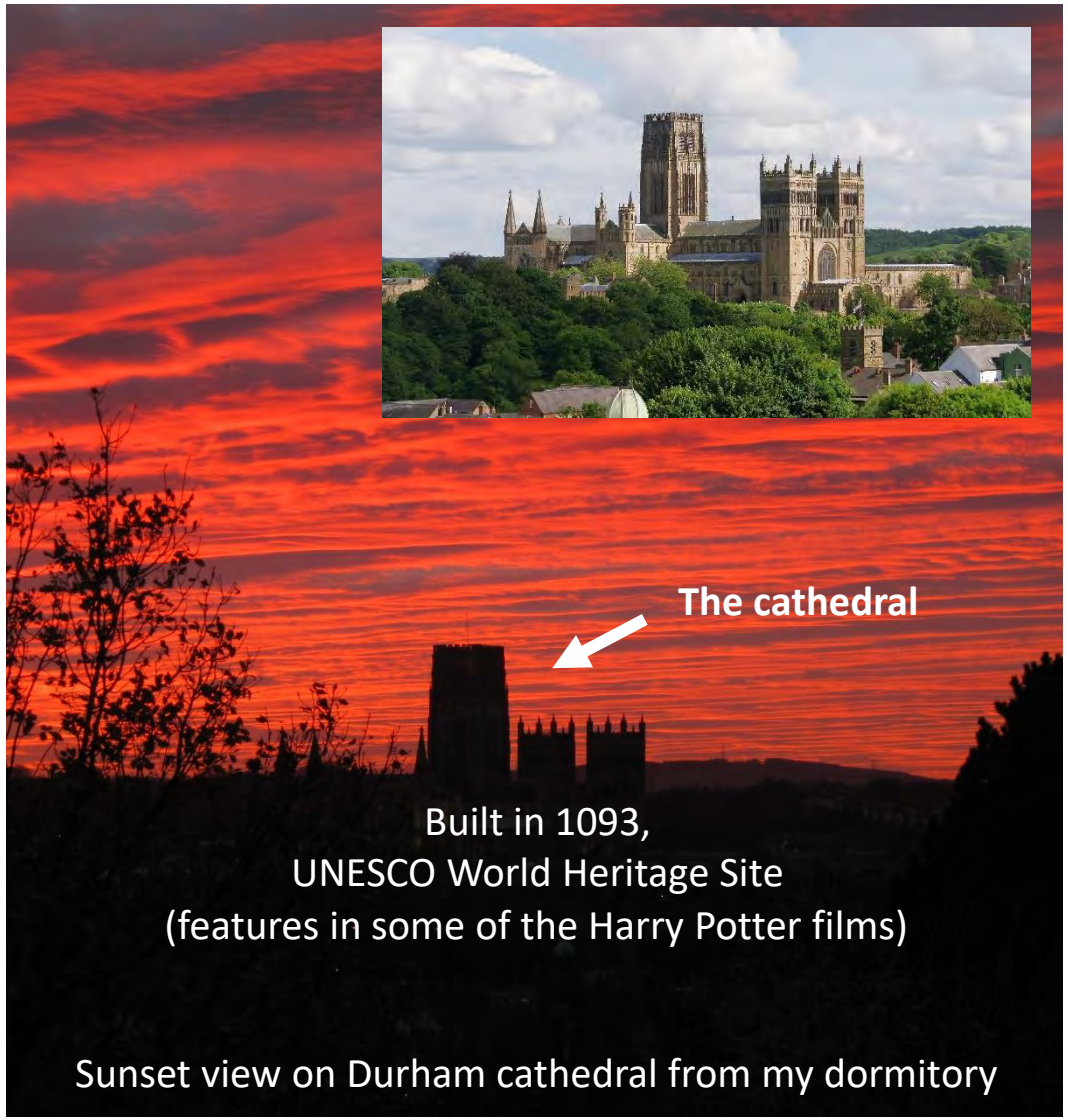
I studied in Durham from 2013-2017 (except during my exchange at HKU)

An introduction to Durham, a country town in the UK

Shared student dormitory where I lived for 1 year



Scenery in Durham



The cathedral

Built in 1093,
UNESCO World Heritage Site
(features in some of the Harry Potter films)

Sunset view on Durham cathedral from my dormitory

End of Self Intro by Max of 東大

05. The Japanese and the forests

PUBLIC RELATIONS OFFICE
GOVERNMENT OF JAPAN

MAFF
Ministry of Agriculture, Forestry and Fisheries
農林水産省

This newsletter is published monthly by the Government of Japan.

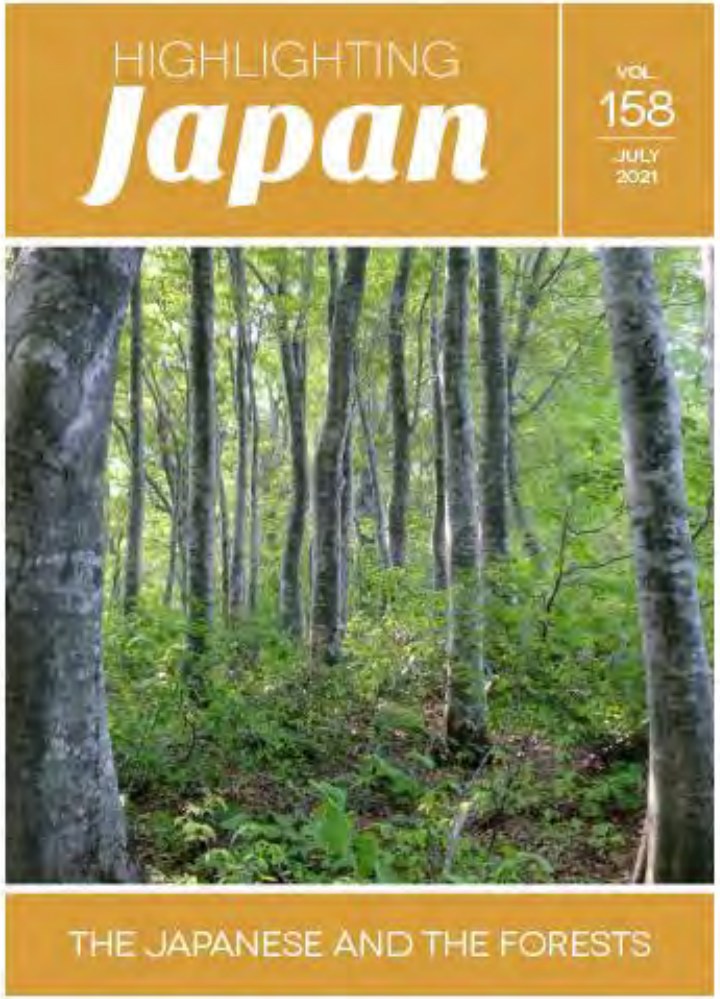
You can down load this issue by using the link below

#158 July 2021

THE JAPANESE AND THE FORESTS

According to the Government of Japan's Forestry Agency, approximately two thirds of Japan's land is covered in forest. What are the characteristics of Japan's forests? What are their functions? And how do Japanese people utilize this most abundant of natural resources? In this month's Highlighting Japan, we introduce some examples of the mutual relationship between the Japanese and the forests.

INDEX | HTML | 日本語訳 | PDF | 中文目录



USE THIS LINK: https://www.gov-online.go.jp/eng/publicity/book/hlj/index.html

06. BIRDS-3 announces a ground station competition

Ground Station Competition

Dear Members of the BIRDS Ground Station Network,

BIRDS-3 satellites have been operational for more than 2 years now and are rapidly decreasing in altitude. According to our recent simulations and predictions, we have less than 2 months of operation. During these last months, we would like to hold competitions within the BIRDS Ground Station Network.

We have different categories of competitions so that everyone can participate and win prizes. The last competition was about the first uplink to the satellites. This time we will have competition for:

① Ground station with the highest number of CWs received from August 11th (00:00 UTC) to September 11th 00:00 UTC 2021
② Ground station with the maximum amount of data downlink from August 11th (00:00 UTC) to September 11th 00:00 UTC 2021
③ Ground station with the highest number of CWs received from deployment to end of life of the satellites.
④ Ground station that takes the best picture of their country.

We would also like to request support to download data. The downloaded data will also be considered for the competition. Therefore, please let us know which ground stations can download data. We will send the address to download once you inform us. If you have any questions about the operations or the competition, please feel free to contact us anytime.

Best regards,
Pooja for BIRDS-3

07. BIRDS-4 participation in iGARSS2021 Conference

Article by:
Yasir ABBAS, 14 Aug.

The *International Geoscience and Remote Sensing Symposium* (iGARSS) is an annual conference organized by IEEE GRSS society. Every year it is in a different country. But this year, iGARSS2021 was held virtually because of the COVID-19 situation 12-16 July 2021. It was a joint initiative of Belgium and The Netherlands.

Four papers were presented in iGARSS2021 by Kyutech students:

- Mohamed Hasif bin Azami presented a paper with the title "*DEMONSTRATION OF WILDFIRE DETECTION USING IMAGE CLASSIFICATION ONBOARD CUBESAT*", the paper was co-authored by Necmi Cihan Orger, Victor Hugo Schulz, KITSUNE Members and Prof. Mengu Cho.
- Timothy Leong who is graduated from Kyutech last year presented a paper entitled "*IMAGE CLASSIFICATION UNIT: A U-NET CONVOLUTIONAL NEURAL NETWORK FOR ON- ORBIT CLOUD DETECTION ABOARD CUBESATS*". The paper was co-authored by Yasir Abbas, Mark Angelo Purio, Hoda Elmegharbel.

CONTINUED ON THE NEXT PAGE

BIRDS-4 participation in iGARSS2021 Conference (continued)

- Mark Angelo Purio presented his research paper "*A TEMPORAL ANALYSIS OF THE RELATIONSHIP BETWEEN SYNOPTIC WEATHER STATION AIR TEMPERATURE MEASUREMENT AND SATELLITE-DERIVED LAND SURFACE TEMPERATURE A CASE STUDY IN PORT AREA, MANILA CITY, PHILIPPINES*". The paper was co-authored by his supervisor Prof. Mengu Cho and Tetsunobu Yoshitake.

- Finally, I (Yasir ABBAS) presented a paper related to my work in BIRDS-4 satellites. The paper is entitled "*STORE AND FORWARD MISSION DESIGN IN BIRDS-4 SATELLITES*" and co-authored by Marloun Sejera, Izrael Bautista and Prof. Mengu Cho.

Next year's iGARSS is planned to be held in-person in Kuala Lumpur, Malaysia.

BIRDS-4
Joint Global Multi-Nation Birds Satellite Project

Article by:

Yasir ABBAS

END OF ARTICLE

08. Let’s join UNISEC Road-to-SPACE Club

UNISECは、みんなで宇宙を目指したい。だから、みんなに正しく伝えたい。

提供開始の背景
世界を見渡しても数少ない成長市場である宇宙。市場規模は、2018年時点で約40兆円、2040年には約160兆円に上る可能性があると言われています。

これから以下の三点が主な理由で市場の成長が加速する事が見込まれています。
- 宇宙関連機器の性能向上・製造コストの顕著な低減
- 「アルテミス計画」の本格的な始動事業形態の多角化
- 民間ビジネスの拡大

UNISEC
University Space Engineering Consortium

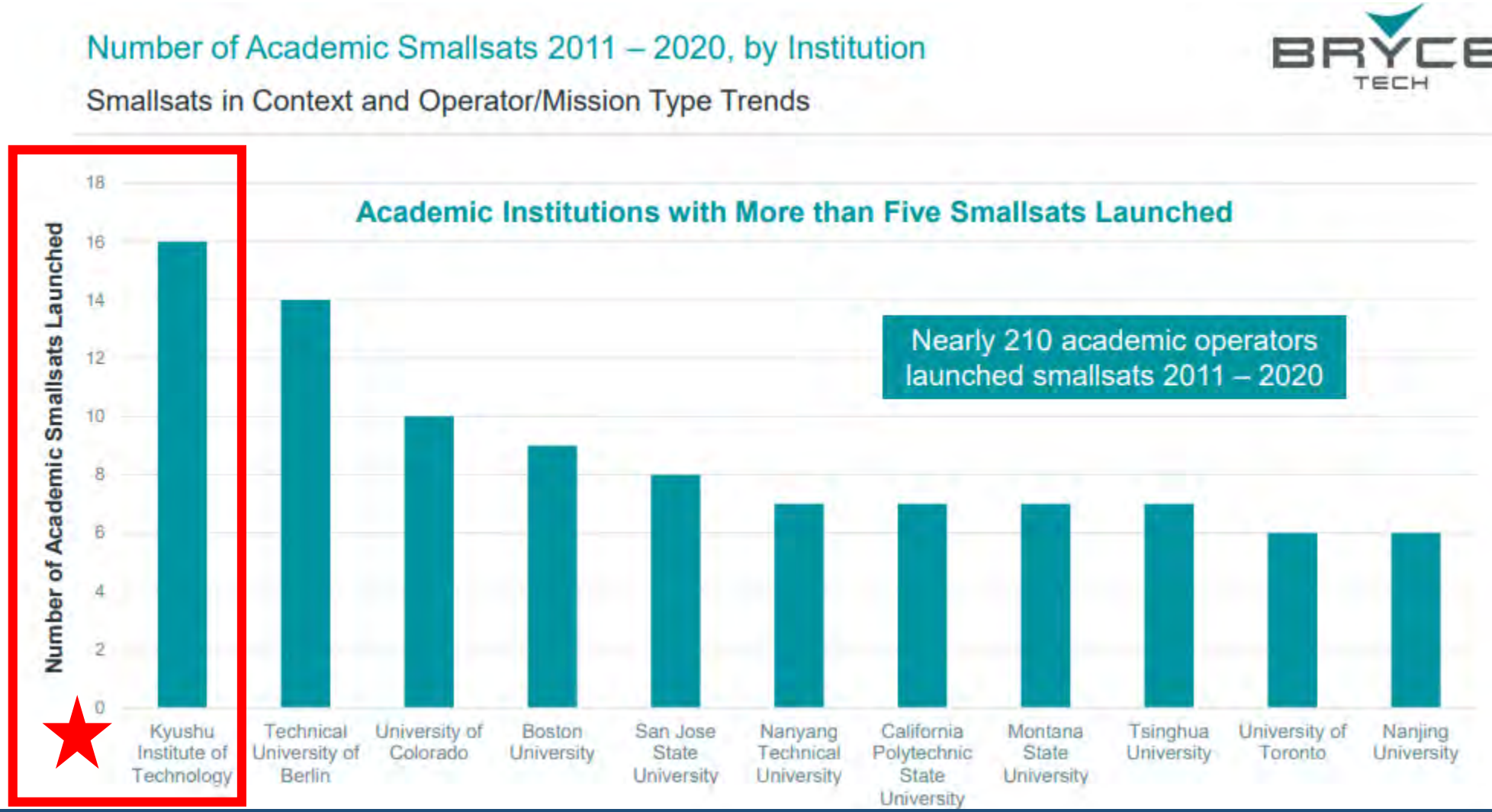
ただ、宇宙市場を拡大させるには人が必要です。
そして、日本には宇宙業界を牽引出来る多くの優秀な人材がいるとUNISECは信じています。

この様な背景もあり、UNISECは一人でも多くの人に宇宙業界を一緒に発展させる仲間になって欲しいと思い、「UNISEC Road-to-SPACE Club」を始める事にしました。「業界の最新動向」、「宇宙工学が学べる大学」、「宇宙産業への就職」を柱とし、宇宙関連の情報を毎月メールマガジン形式で提供します。
それ以外にも、「宇宙に関する基礎知識」やUNISEC主催イベント情報をお伝えします。
また、メンバー特典のイベント・ツアーも開催する予定です。

「情報を正しく伝えたい」、「出来るだけ幅広い世代の人達に宇宙教育を行いたい」。
そんな思いの中、この事業を開始しています。以下の様な方々は入会をご検討下さい。

UNISEC Road-to-SPACE Club に参加しましょう: http://unisec.jp/support/unisec-road-to-space

09. Kyutech continues to be No. 1 among academic institutions with small satellites



This is page 18 of the Bryce report.

Note:
The current total for Kyutech is not 16. It is 21.

The link for this Bryce report is on the next page.

This is the email was sent out by Bryce on 14 August 2021:

Bryce is proud to introduce its annual Smallsats by the Numbers report
(https://brycetech.com/download.php?f=Bryce_Smallsats_2021.pdf) .

In 2020, a record number of 1,202 smallsats (≤600kg) were launched. Smallsat telecommunications operators dominated smallsat activity in 2020 and are continuing deployments in 2021.
It is anticipated that the launch of these large constellations will influence smallsat activity in the next few years.

More highlights from the report:
* 40% of all total smallsats launched in the last 10 years were launched in 2020
* 43% of total upmass in 2020 was represented by smallsats
* The number of commercial smallsats launched increased from three smallsats in 2011 to 1,111 in 2020
* The number of smallsats launched in the first six months of 2021 already surpassed the 2020 record

Download the full report on the BryceTech website
(https://brycetech.com/download.php?f=Bryce_Smallsats_2021.pdf) .

END OF THIS SECTION

10. The 7th round of KiboCUBE is now open for applications

UNITED NATIONS
Office for Outer Space Affairs

About Us | Our Work | Space4SDGs | Information for... | Events | Space Object Register

Our Work > Access to Space for All

KiboCUBE Rounds

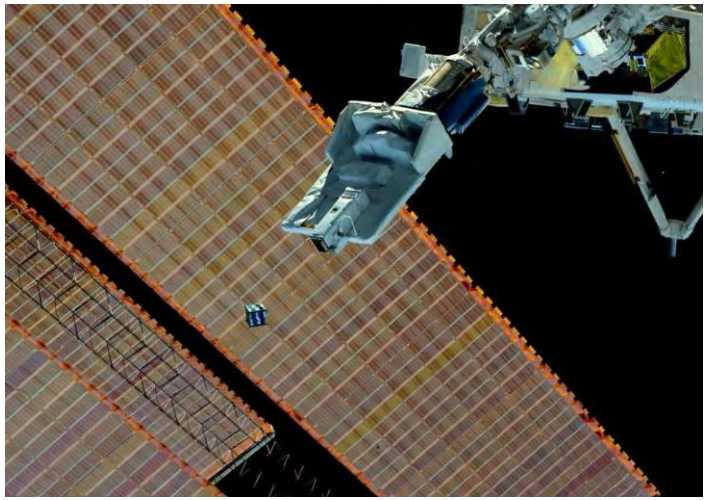
Get a free CubeSat deployment from the ISS !

OPEN FOR APPLICATION (7th Round): from 15 July to 31 December 2021

7TH ROUND DOCUMENTS

- Announcement of Opportunity (.pdf)
- CubeSat Mission Application template (.word)
- JEM Payload Accommodation Handbook (.pdf)
- Guidance on Space Object Registration and Frequency Management for Small and Very Small Satellites

In partnership with: JAXA



Deployment of a CubeSat from the ISS ©JAXA

GO HERE FOR DETAILS:
https://www.unoosa.org/oosa/en/ourwork/access2space4all/KiboCUBE/KiboCUBERounds.html

UNITED NATIONS
Office for Outer Space Affairs

About Us · Our Work · Space4SDGs · Information for... · Events · Space Object Register · Docume

Our Work > Programme on Space Applications > Human Space Technology Initiative (HSTI) > Orbital Opportunities > KiboCUBE

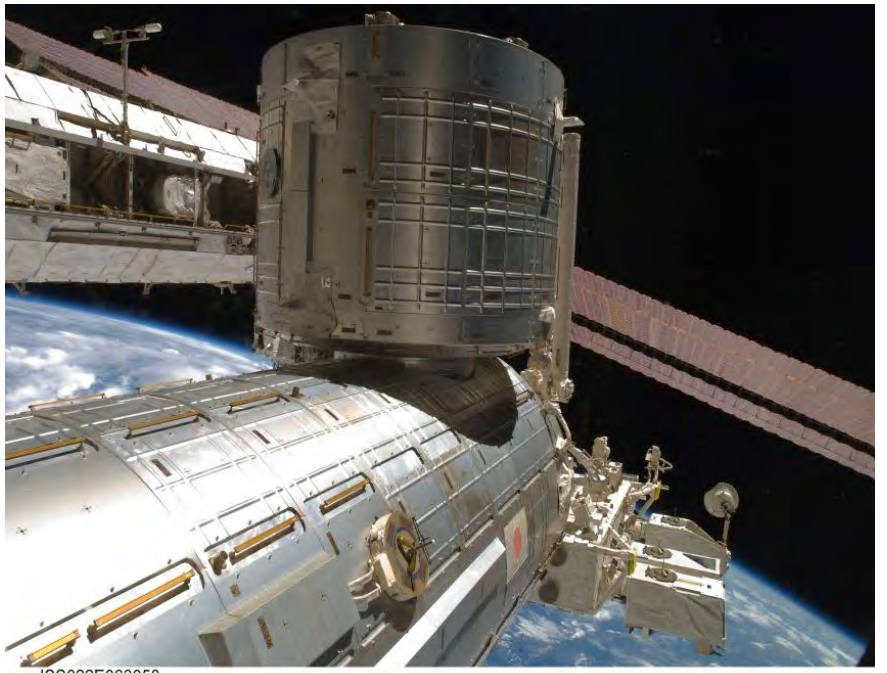
The United Nations/Japan Cooperation Programme on CubeSat Deployment from the International Space Station (ISS) Japanese Experiment Module (Kibo) "KiboCUBE"

THE 7TH ROUND IS OPEN FOR APPLICATIONS!

MIR-SAT 1 from Mauritius Research Innovation Council has been successfully deployed on 22 June 2021! See the YouTube streaming here.

Check out our new brochure: "KiboCUBE: Expanding Possibilities for Space Emerging Countries"

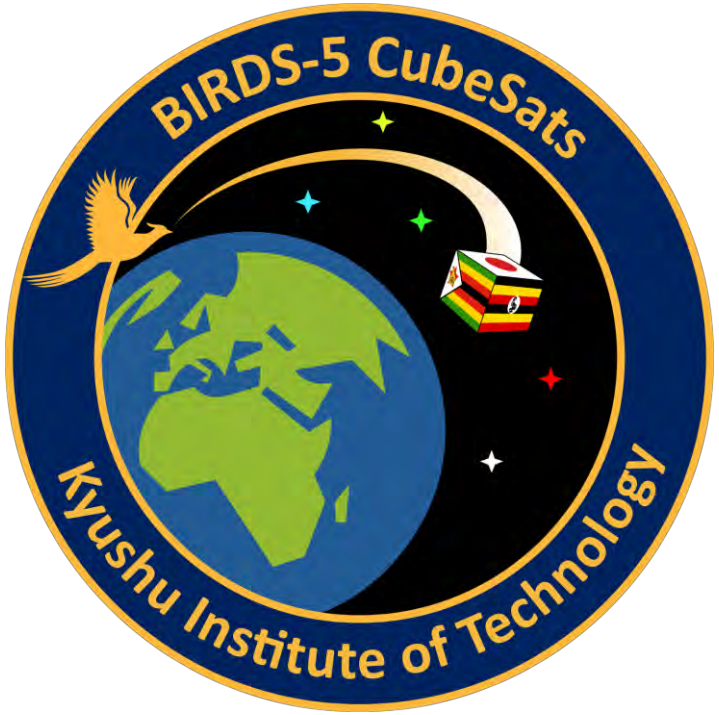
Read stories from the winning teams from Kenya and Guatemala: Testimonies



JAXA's "Kibo Module" on the ISS ©JAXA

Regarding the KiboCUBE program, UNOOSA is providing a wealth of info at its various websites.

VIEW THE AFOREMENTIONED STUFF RIGHT HERE: https://www.unoosa.org/oosa/en/ourwork/psa/hsti/kibocube.html



The following sections are the BIRDS-5 articles for August 2021

(compiled by Timothy of Zimbabwe)

11. BIRDS-5: Safety review

UGANDA

JAPAN

ZIMBABWE

By : Victor Mukungunugwa

(BIRDS-5 Project Manager)

& the designing team

09/AUG/2021

Safety Review

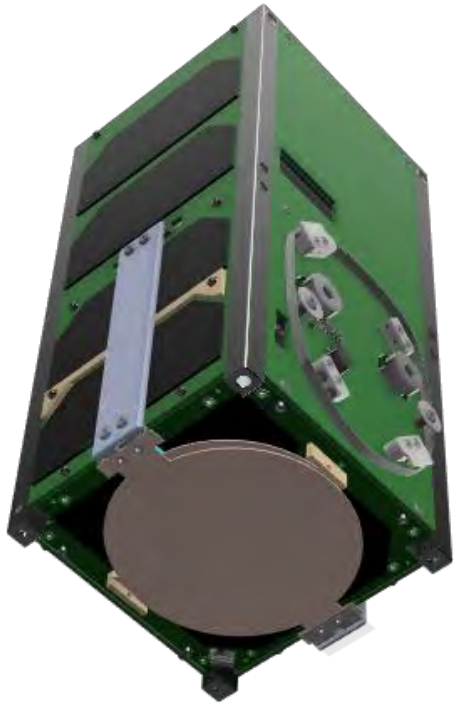
- Is basically a safety standard documentation promulgated by the system integrator that seeks to check the system conformity with the launcher requirements.
- According to JAXA JMR-001C (E) System Safety Standard, the contractors (integrators)should identify , eliminate, mitigate and control the hazards of the system to protect human life, properties and environment from mishaps by the system safety program through the system life cycle ; eg research, design, production, test, launch operation , support and disposal.
- In the instance the system refers to system, subsystem and components and for BIRDS 5 it is a 1U and “U size satellites.

Subjects of the safety review

1U size

* *PearlAfricaSat-1*: Uganda
* *ZIMSAT-1*: Zimbabwe

These are the first satellites for Uganda and Zimbabwe



2U size

TAKA: Japan

TAKA is designed jointly by Kyutech and JAXA

Safety Review Documents

Main Editor	Document No.	Document Name	Purpose of each document
Victor	BIRDS5-SAT-INFO	Satellite information of BIRDS-5	To show the general information of the satellite. These information will be used for JAXA internal coordination or NASA coordination.
Derrick	BIRDS5-EP-01	BIRDS-5 Battery Description Form	To show the characteristics of battery/EPS/inhibit and the test plan to confirm soundness of battery.
Victor & Oshiro	BIRDS5-SR-01	BIRDS-5 Structural Analysis Report	To show the result of structural analysis.
Victor	BIRDS5-MIUL-01	BIRDS-5 MIUL	To show verification result of material used in BIRDS-5
Victor	BIRDS5-HMST-01	BIRDS-5 HMST Input Form	To assess hazard of liquid, gas or powder included in BIRDS-5
Victor & Oshiro	BIRDS5-AD-01	BIRDS-5 Assembly Drawing	To show the assembly drawing of BIRDS-5
Victor & Oshiro	BIRDS5-AP-01	BIRDS-5 Assembly Procedure	To show the procedure to assemble BIRDS-5
Victor	BIRDS5-FRC-01	BIRDS-5 Franchise Criteria Check Sheet	To assess safety level of BIRDS-5
Victor	BIRDS5-FCE-01	BIRDS-5 Fracture Control Evaluation Form for Phase II	To show the verification result of BIRDS-5 regarding to each requirement of JMX-2012694 Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD for SFCB Phase 012.
Victor	BIRDS5-SAR-01	BIRDS-5 Safety Assessment Report for Phase II	To show compliance with ISS safety requirement and verification of BIRDS-5 for Safety review panel 012
Victor	BIRDS5-STD-01	BIRDS-5 Standard Hazard Report	To show control and verification result of BIRDS-5 regarding to general hazards.
Victor	BIRDS5-UNQ-01	BIRDS-5 Unique Hazard Report for Structure Failure	To show control and verification result of BIRDS-5 regarding to specific structure breakage hazard.
Derrick	BIRDS5-UNQ-02	BIRDS-5 Unique Hazard Report for Battery Leakage/Rupture	To show control and verification result result of BIRDS-5 regarding to specific battery failure hazard.
Iwase & Kamitani	BIRDS5-UNQ-03	BIRDS-5 Unique Hazard Report for Deployment	To show control and verification result of BIRDS-5 regarding to specific inadvertently deployment hazard.
Edgar & Ramson	BIRDS5-UNQ-04	BIRDS-5 Unique Hazard Report for RF radiation	To show control and verification result of BIRDS5 regarding to specific RF radiation hazard.

Satellite information of BIRDS-5

The satellite information document clarifies the following :

- Details of Principal Investigator and in this case, it is Kyutech
- Details for the Sponsoring Cooperating Agency.
- General information the purpose, description including figures of different views of the satellite.
- Birds 5 has the following missions:
  1. PINO carries solid-state detectors, which are designed to detect high-energy electrons in space.
  2. A Double Langmuir Probe (DLP) is a device which consists of two metal electrode probes. It is for measuring the electron temperature and electron density in orbit
  3. Land Use and Cover: The satellite images taken by COTS multispectral camera with a spatial resolution of 100m shall be used to investigate land Use and cover such as water quality, soil fertility crop health, soil adjusted vegetation index, cultivated area and leaf chlorophyll index using NDVI Images.
  4. On-board Image Classification, the satellite classifies the images based on machine learning algorithms and downlink the results. This improves the efficiency of the data downlink process and a large CubeSat image dataset shall be created for future machine learning applications.
  5. Automatic Packet Reporting System (APRS) digipeater shall provide digital message relay service to the amateur radio community by means of digipeating.
  6. Store-and-Forward (S&F) mission demonstrates data/message system in line with the Universal Amateur Radio Text. S&F mission has 2 primary aims:
     - To collect solar illumination measurements from remote sensors and forward the data to the ground stations.
     - To collect data related to possible disaster predictions such as landslides.
  7. BIRDS-NEST (NEST = Network of Educational Satellite's) is a phone application displaying data of BIRDS satellites. BIRDS-NEST is free, providing knowledge and raising awareness about space around the world.
  8. Satellites attitude visualization is obtained by getting the gyro data and solar panel voltage. 3D satellite models are also visualized based on these results. This mission assists in accurate image capturing of targeted areas of concern from the participating countries.

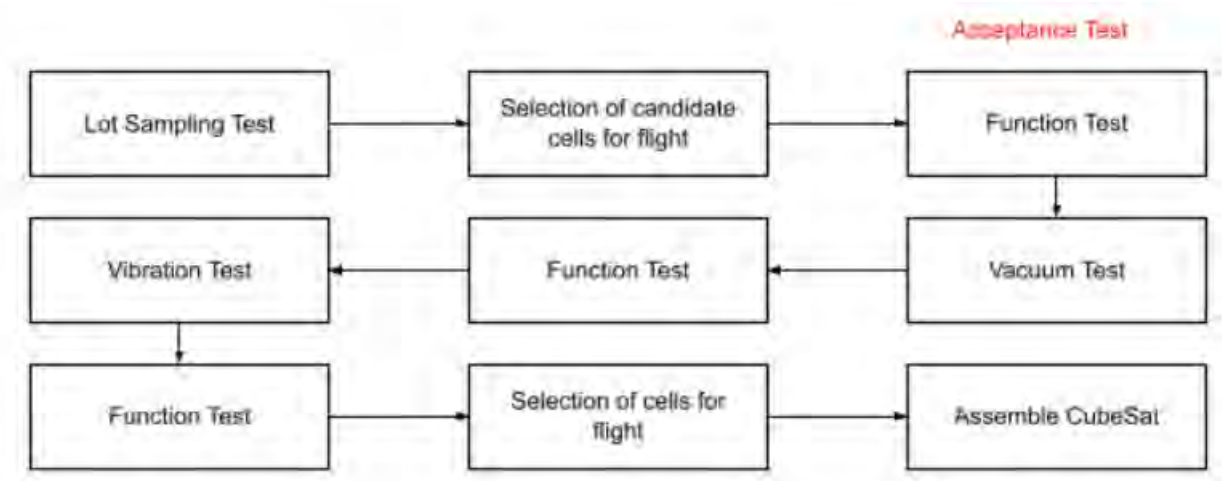
BIRDS-5 Battery Description Form

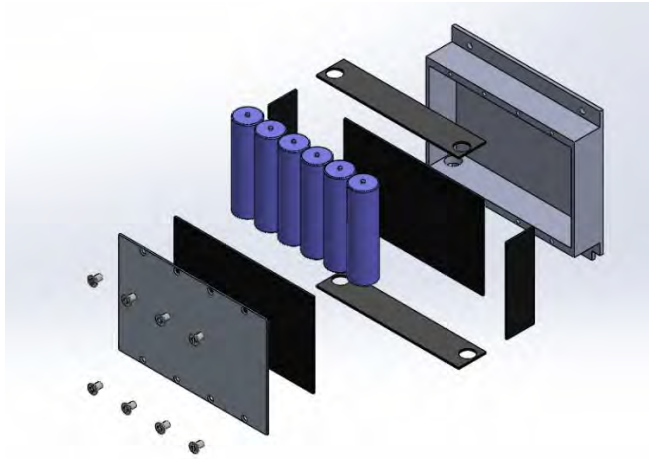
Battery Description form covered the following

- Hardware and Battery Environmental Requirements.
- Battery and Hardware Description.
- Battery overcharge protection
- Battery over dis-charge protection
- Battery external short protection

Cell Description:
Chemistry (If li-ion, what type: NMC, NCA, FePO4, etc.):
Ni-MH
Cell size:14.35 mm dia. x 50.4 mm
Manufacture and Model:
Panasonic
Nominal OCV: 1.2 V
Maximum Voltage:1.6 V
Minimum Voltage:0.9 V
Rated Capacity:2000 mAh

Summary of safety testing performed

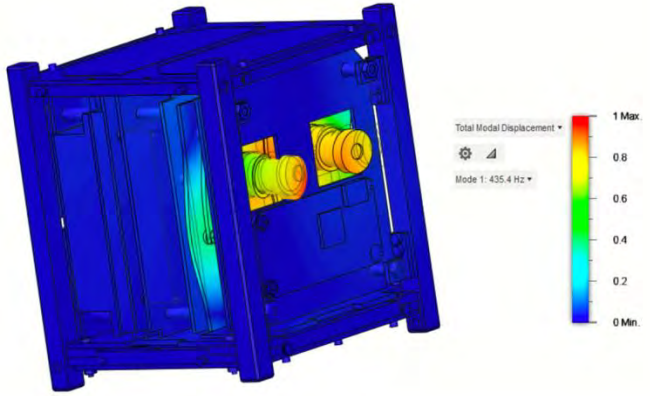


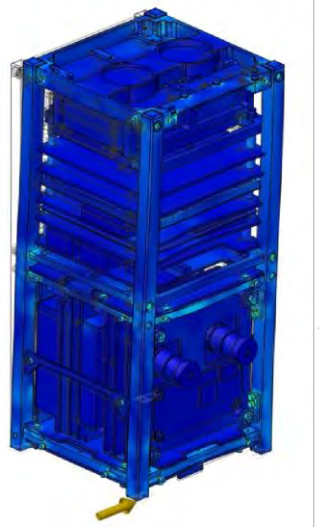


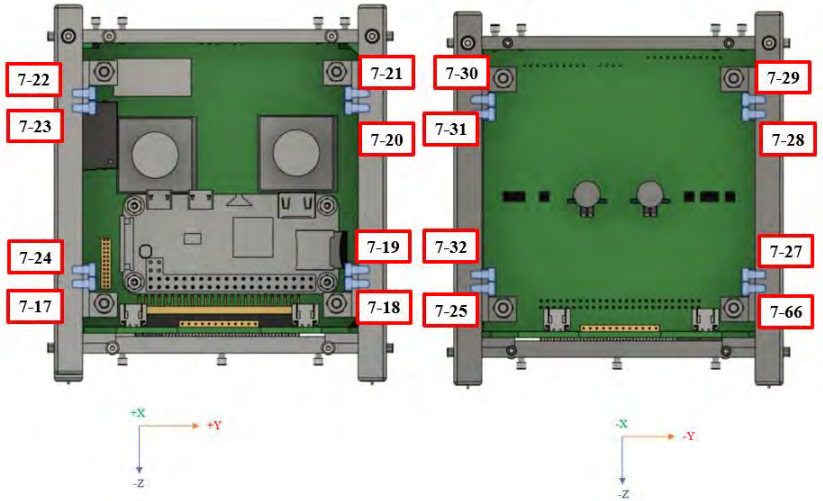
BIRDS-5 Structural Analysis Report

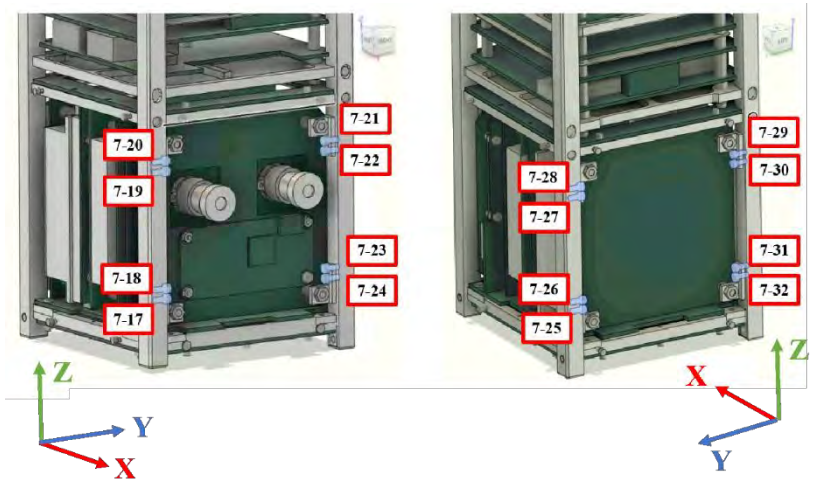
The Structural Analysis Report addresses the following aspects

- Structure Analysis
- Structural Design
- Finite Element Modeling (FEM)
- Analysis result
- Finite Element Modeling (FEM)
- Natural Frequency Analysis
- Static Load Analysis
- Fastener Analysis
- Structure Fracture Control
- Fail-Safe Parts
- Low Risk Fracture Parts
- Fracture Critical Parts
- Potentially Fracture Critical Parts Identification



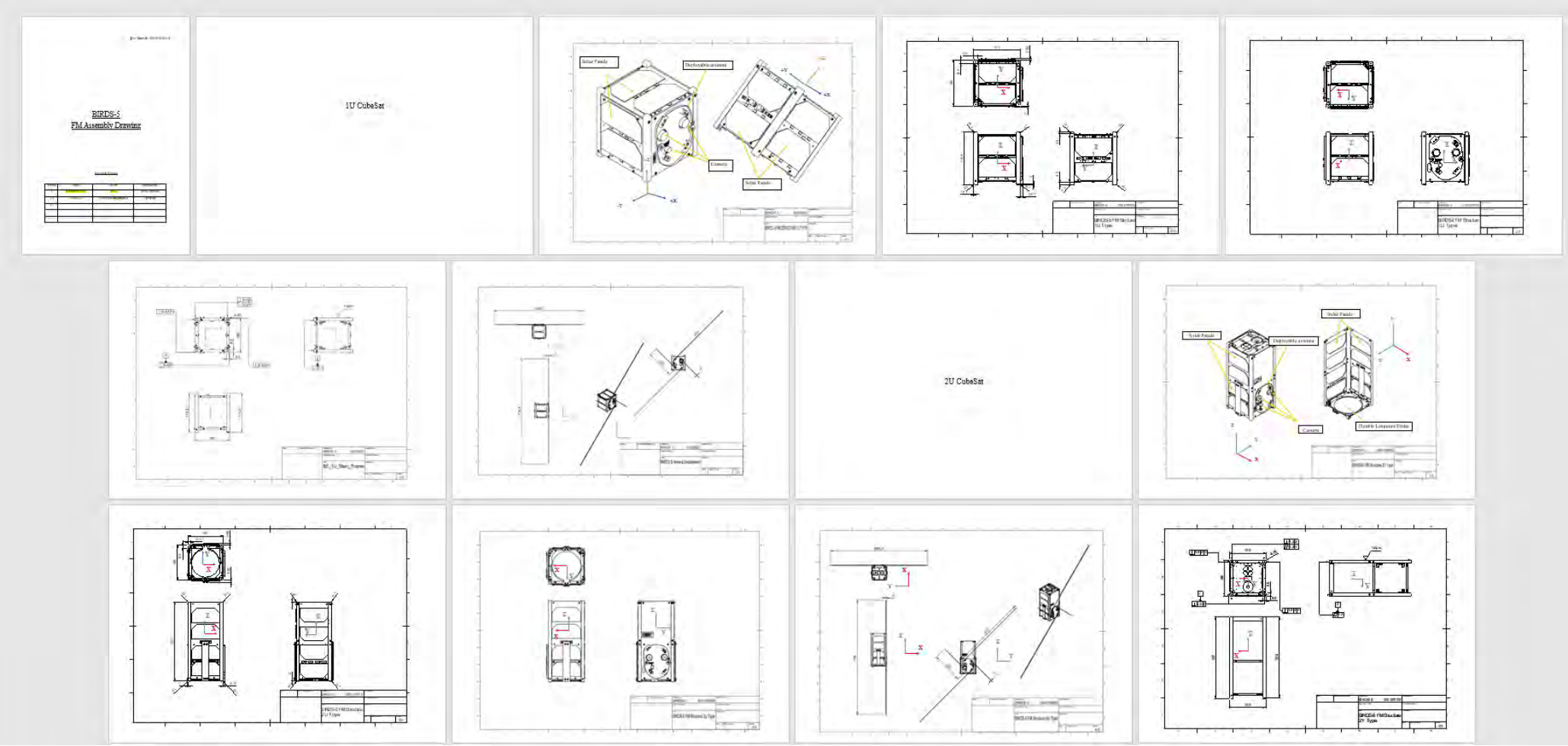






Each screw, component, is analyzed and given an identity

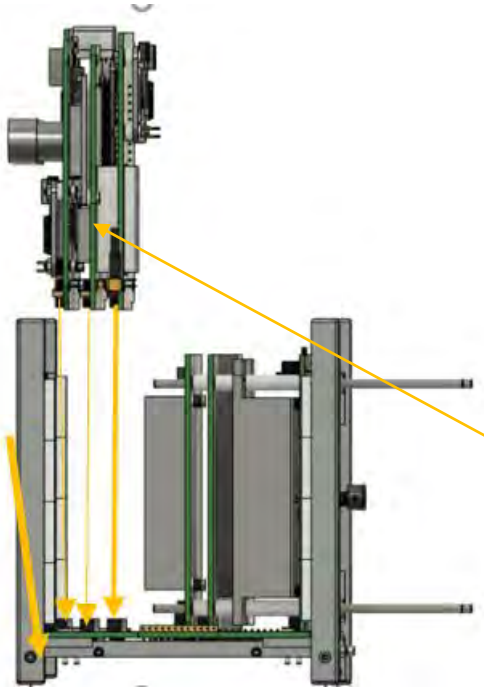
BIRDS-5 Assembly Drawing



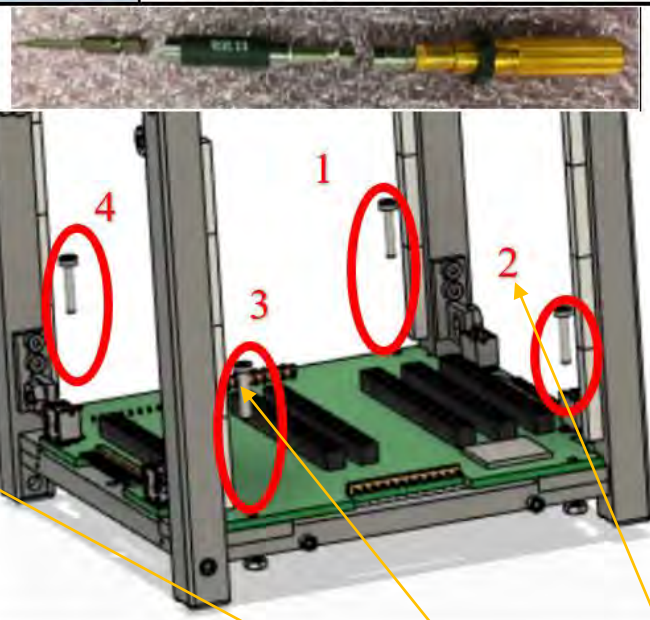
The Assembly Drawing document shows the 2D diagrams for the satellites in various views and configuration

BIRDS-5 Assembly Procedure

The Assemble procedure is a detailed methodical guide that shows step by step assembly of the satellite. This document requires a lot of imagination and extensive CAD skills for it was made using a CAD model not the actual satellite.



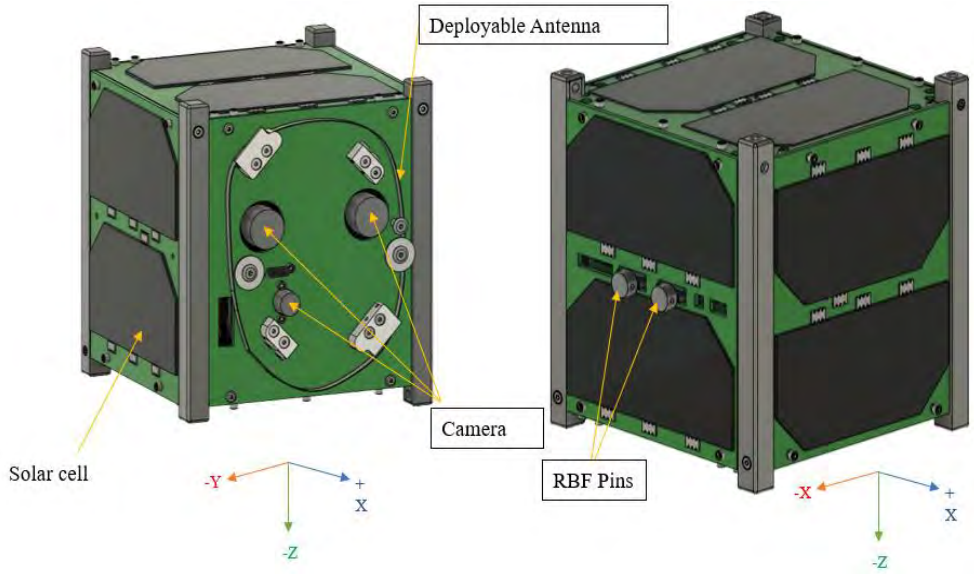
Step#	41	Fix the back plane board to the Baseplates 1 and 3
Note	Please attach the extension bit to the torque driver and tighten the screw. Apply Loctite to Fasteners.	

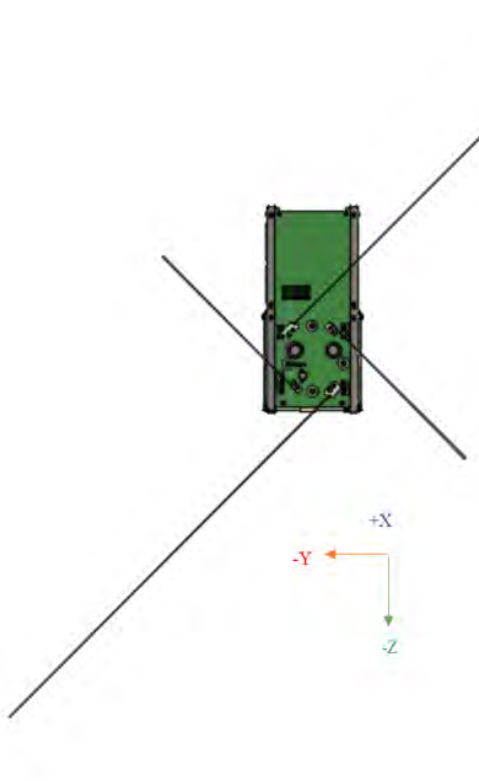


Parts					
Name				Qty.	Check
Main structure				1	
Fasteners					
Model		Bit size	Torque [N·m]	Qty.	Check
Screw	SLHS-M2-10	1.27	0.088	4	
Checklist					
Double Check			Picture		
Torque mark			Loctite		
Responsible					

This step 41 is an extract from the assembly procedure and all components ,screws are numbered, torque value screw specifications and tools to use. The assembly procedure is made in such a way that even a lay man can assemble the satellite.

BIRDS-5 Franchise Criteria Check Sheet





This document addresses the following:

- Satellite (Purpose, Mission period, Operation outline, etc.)
- Size (multiple of 1U size)
- Dimension (mm) in stowed configuration and in deployment configuration.

BIRDS-5 Fracture Control Evaluation

To show the verification result of BIRDS-5 regarding to each requirement of JMX-2012694 Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD. The table below is an extract from the fracture control evaluation

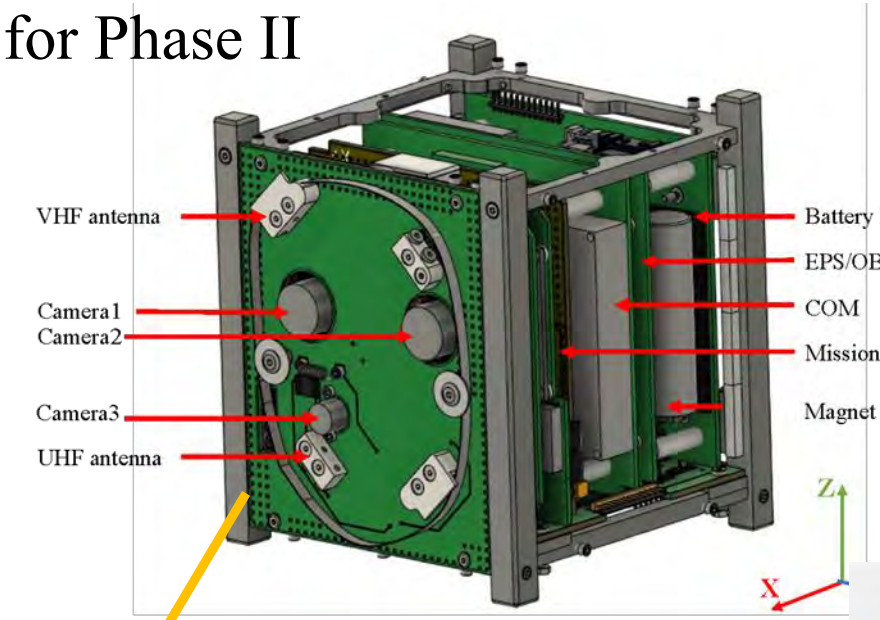
If the satellite consists of the following items, applicable section (H) to N)) should be fulfilled.

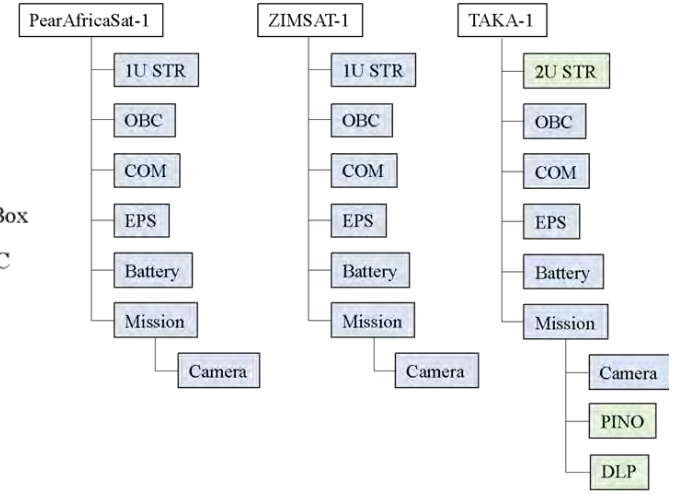
☑applicable	**H) Shatterable Structure**	**Shatterable Structure (Camera Lens, Solar Cell Cover etc.)**	–
☑	H-1) Vibration Test or H-2) Containment Structure	1. Verified by visual inspection after vibration test under the condition specified in JX-ESPC-101132/101133 or 2. Contained in Low Risk Fracture Part	[Phase3] Open, Document No. :25_BIRDS5-VT-01 Vibration Test Report (To be closed at Ph3)
☑applicable	**J) Deployment Structure**	**Deployment restraint wire whose fracture could cause hazard.**	
☑	J-1) Fail Safe Approach	Redundant wire	[Phase 012] Open, Document No. :06_BIRDS5-AP-01 Assembly Procedure(2021/06/01) [Phase 3] Open, Document No. :18_BIRDS5-AR-01 Assembly Record (To be closed at Ph3)
☑	J-2) Proof Test	Each wire is proof-tested and visual-inspected	[Phase 3] Open, Document No. :27_BIRDS5-WTR-01 Wire Strength Test Report (To be closed at Ph3)
☑	J-3) Assembly Procedure	Wire handling process is defined in assembly procedure.	[Phase 012] Open, Document No. :06_BIRDS5-AP-01 Assembly Procedure(2021/06/01)
☑	J-4) Round	(If any) The part touching the wire is rounded appropriately.	[Phase 012] Open, Document No. :06_BIRDS5-AP-01 Assembly Procedure(2021/06/01)
☑	J-5) Loosening Prevention	(If any) Loose prevention is provided on the tied portion.	[Phase 012] Open, Document No. :06_BIRDS5-AP-01 Assembly Procedure(2021/06/01) [Phase 3] Open, Document No. :18_BIRDS5-AR-01 Assembly Record (To be closed at Ph3)
☑ applicable	**K) Fail Safe Fastener**	**Fail Safe Fastener**	–
☑	K-1) Fail Safe Analysis	K-1) Fail safety analysis shows MS >0. (F.S = 1.0)	[Phase012] Open, Document No. :02_BIRDS5-SR-01 Structural Analysis Report (2021/06/01)
☑	K-2) Quality Control	Quality Control meets the condition L-2) to L-5).	Please refer from L-2) to L-5).
☑applicable	**L) Safety Critical Fastener**	**Safety Critical Fastener**	–
☑	L-1-1) Secondary Locking Feature	L-1-1b) Locking compound of which the application process MUA is approved.	②Loctite263 [Phase 012] Open, Document No. :06_BIRDS5-AP-01 Assembly Procedure(2021/06/01) [Phase 3] Open, Document No. :18_BIRDS5-AR-01

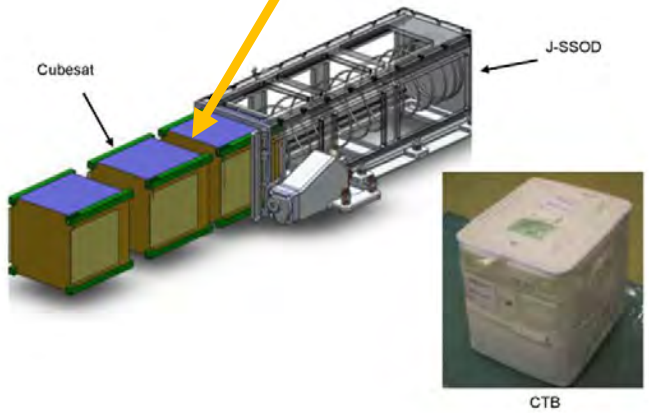
BIRDS-5 Safety Assessment Report

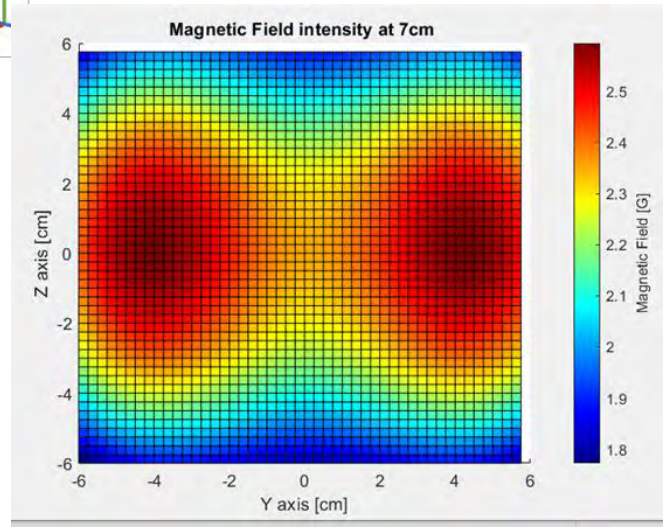
BIRDS-5 Safety Assessment Report for Phase II

- Safety Analysis Methodology
- Safety Requirements
- System Description
- Subsystems
- Launch Configuration
- Operation
- Hazard Analysis Results
- Safety Features









2D Map of magnetic field intensity of 16 bar magnets a parallel plane 7cm apart

BIRDS-5 Unique Hazard Report for Structure Failure

To show control and verification result of BIRDS-5 regarding to specific structure breakage hazard.

Structural Analysis Results (Acceleration Load along X axis)

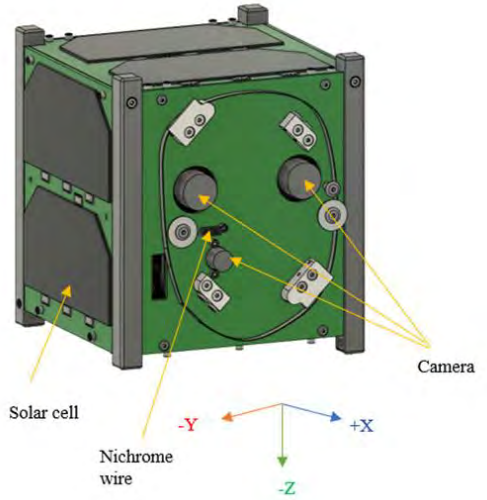
Part	Material	Max Stress (Smax) (MPa)	Yield Strength (MPa)	Ultimate Strength, Ftu(MPa)	MS*1 ≥1 (yield) FS*2=1.5	MS*1 ≥1 (Ultimate) FS*2=2	Smax/Ftu <30[%]
Main structure Frame	Al 6061	65.08	276	310	1.8	1.4	21
Stacking Rod	Al 6061	30.46	275	310	5	4.1	9.8

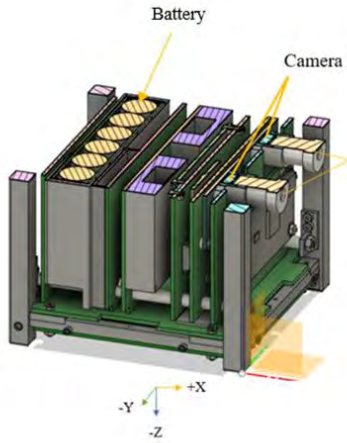
Structural Analysis Results (Acceleration Load along Y axis)

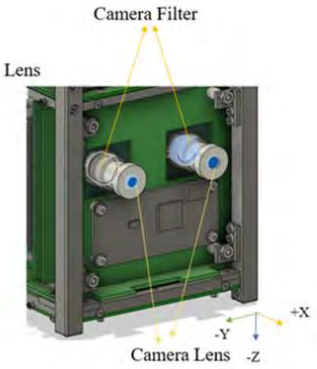
Main structure Frame	Al 6061	66.55	276	310	1.8	1.3	21.5
Stacking Rod	Al 6061	32.24	276	310	5.6	6.0	7.2

Structural Analysis Results (Acceleration Load along Z axis)

Main structure Frame	Al 6061	69.49	276	310	1.6	1.2	25.06
Stacking Rod	Al 6061	27.57	276	310	5.0	4.1	9.8



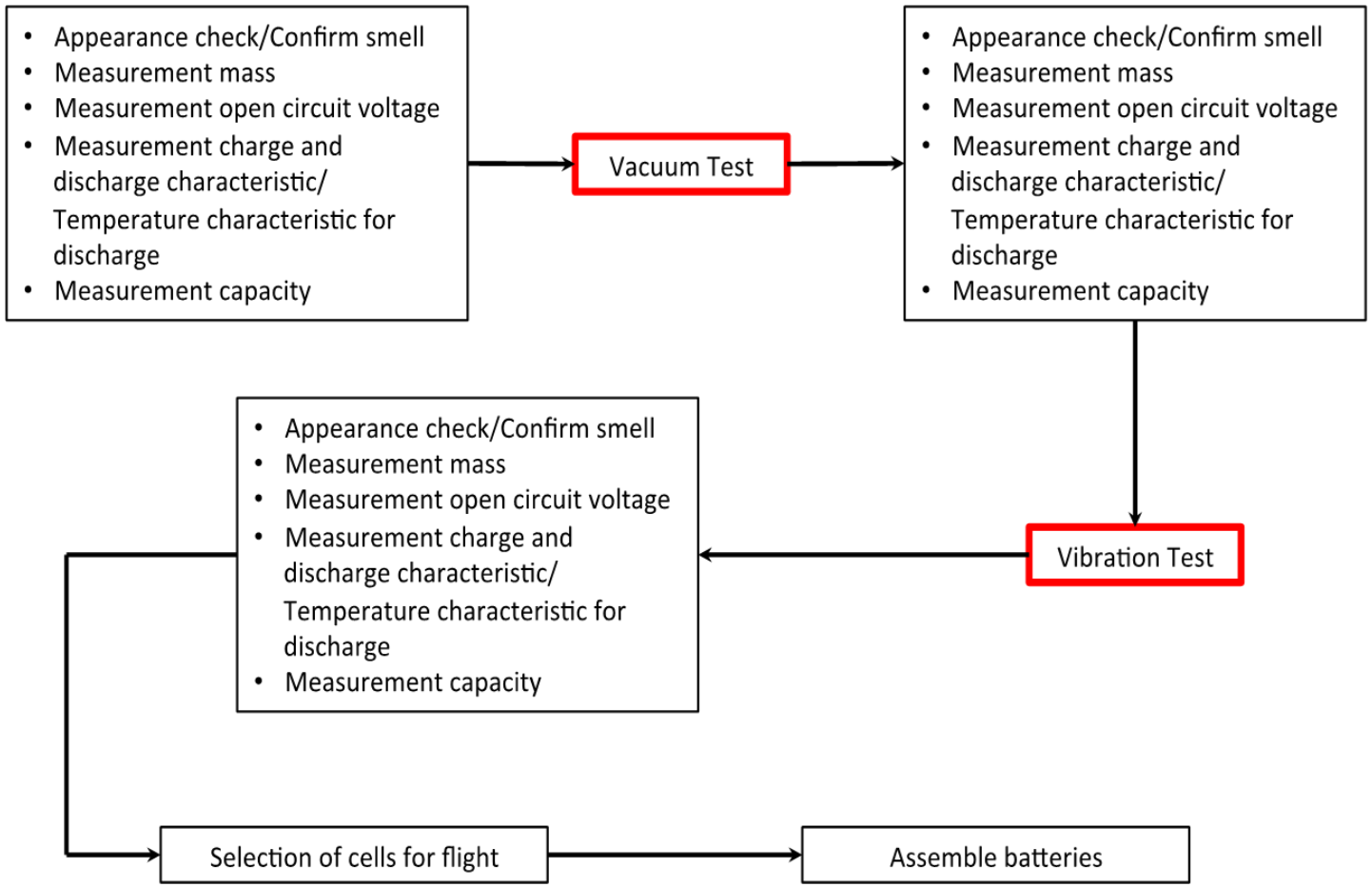




Hazard Cause Description:

- Inadequate structural strength for launch, ascent, On-orbit load (excluding crew applied load) and depressurization.
- Improper material selection and processing, including usage of stress corrosion sensitive materials.
- Material fatigue or propagation of inherent cracks or internal flaws.
- Use of counterfeit fasteners
- Loosening of fasteners during launch and on-orbit
- Improper manufacturing and/or assembly

BIRDS-5 Unique Hazard Report for Battery Leak/ Rupture



Flowchart for screening test

Controls:

1. Screening by environment test such as vibration and vacuum tests are performed to check that there is no defect in the battery cells

2. Battery pack is designed / assembled with appropriate electrical isolation between each cell and wiring

3. Protection devices for short circuit are equipped to protect from external short. The protection devices are DepSW3, SepSW1, SepSW2 and Insulation.

4. Protection devices are equipped to protect from overcharging.
   The protection devices are DepSW3, SepSW1 and DCDC converter.
   Note: The battery cells would not be charged even if a fluorescent light shines on the solar cells while on ISS

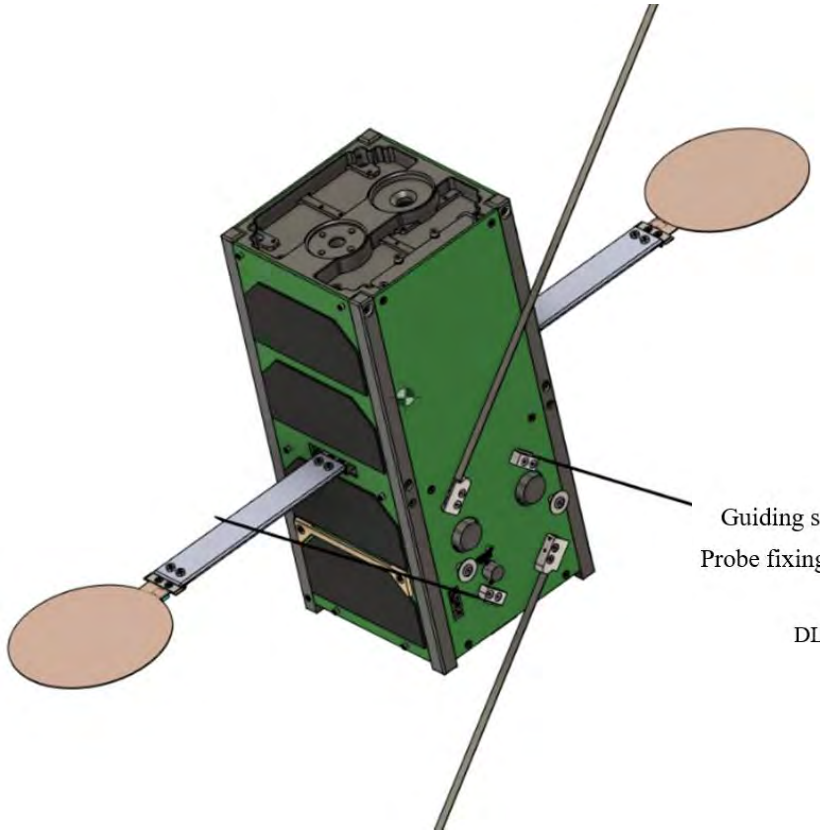
5. Protection device is equipped to protect from over-discharging.
   The protection devices are DepSW3, SepSW1, SepSW2, SepSW3 and Diode.

6. Battery cells which meet the thermal environment condition defined in JX-ESPC-101132C(Japanese)/101133C(English) JPAH Vol.8 Small Satellite Deployment ICD, are selected.

7. Protective device is equipped to turn off the battery heater in load side while satellite is installed in J-SSOD. The protection devices are Separation SW2, Separation SW3, Separation SW4.

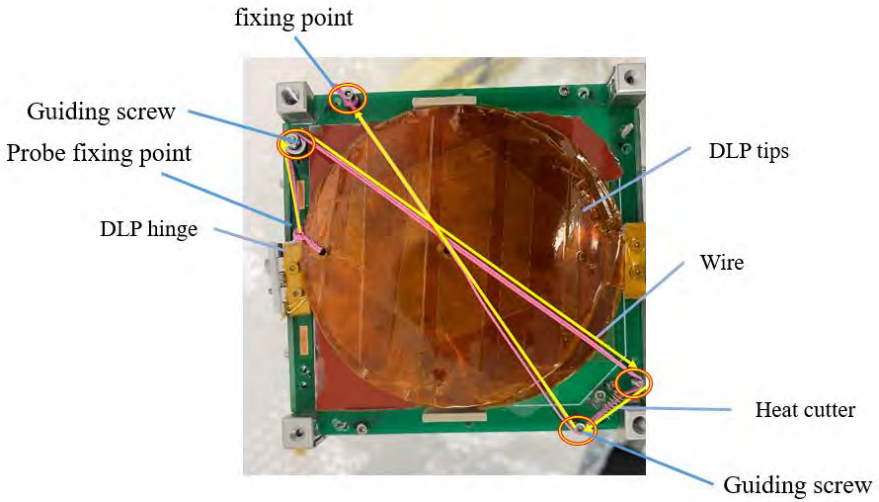
BIRDS-5 Unique Hazard Report for Deployment

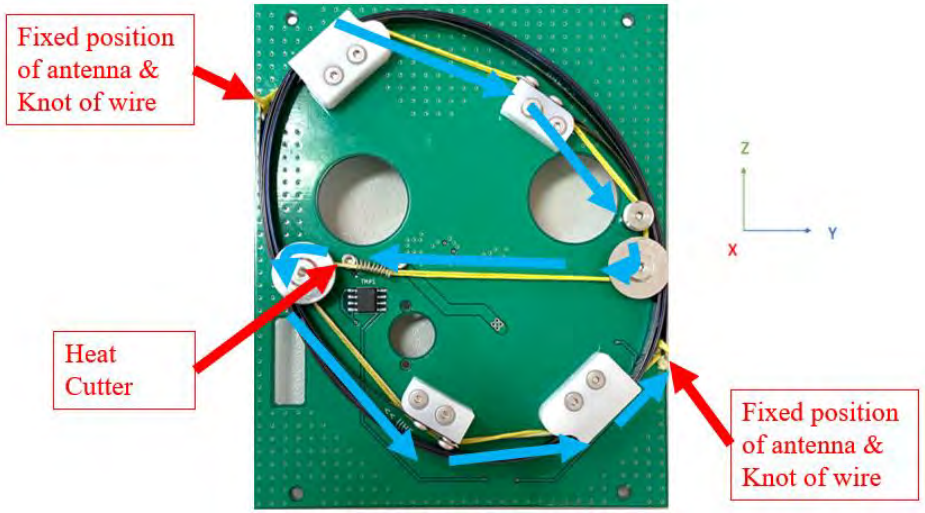
Shows control and verification result of BIRDS-5 regarding to specific inadvertently deployment hazard.



Note 1. Unintentional deployment of the DLP is controlled by three deployment switches. These three deployment switches are released after deploying the CubeSat from the Satellite Install Case, then the CubeSat activates, and the DLP are deployed after antenna deployed.

Note 2. Inner surface of the J-SSOD Satellite Install Case is flat to prevent appendages stuck inside the case.





End of this safety review report

Clean room

By : Takashi Oshiro

2021/AUG/11

Clean room

- In several industries, a clean place is required. They can be separated into two. One is industrial, the other is biological.

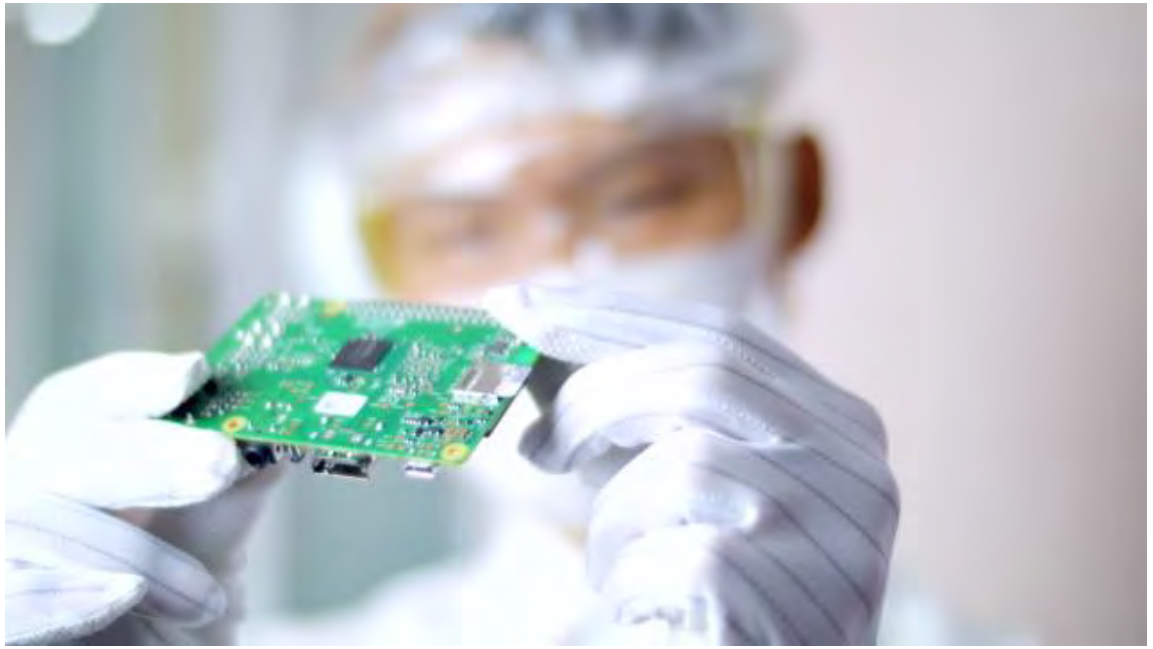
Industrial clean room

- Semi-conductors, Liquid crystal, PCBs, Optical devices…

Biological clean room

- Surgical operation, Food manufacturing…

Importance of a clean place



In electrical equipment, contamination such as human hair and dust can be a cause of short circuits.

Human oil can also be a contamination.

We should care about the environment of work place if necessary.

Satellite assembly requires a clean place.

Classification of clean rooms

In satellite assembly, **ISO 7** (Class 10,000) is required.

ISO 14644-1 Cleanroom Standards

Class	maximum particles/m³						FED STD 209E equivalent
	≥0.1 µm	≥0.2 µm	≥0.3 µm	≥0.5 µm	≥1 µm	≥5 µm	
ISO 1	10	2.37	1.02	0.35	0.083	0.0029	
ISO 2	100	23.7	10.2	3.5	0.83	0.029	
ISO 3	1,000	237	102	35	8.3	0.29	Class 1
ISO 4	10,000	2,370	1,020	352	83	2.9	Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1.0×10^{6}	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7	1.0×10^{7}	2.37×10^{6}	1,020,000	352,000	83,200	2,930	Class 10,000
ISO 8	1.0×10^{8}	2.37×10^{7}	1.02×10^{7}	3,520,000	832,000	29,300	Class 100,000
ISO 9	1.0×10^{9}	2.37×10^{8}	1.02×10^{8}	35,200,000	8,320,000	293,000	Room air

https://blog.gotopac.com/2015/01/22/the-seven-deadly-sins-of-cleanroom-wiping-and-how-to-avoid-them/

Clean room and clean booth

It costs a lot to establish a clean room. Instead, you can think of installation of clean booth. In clean booth, there is basically no advanced air conditioning equipment, and the fan filter unit mounted on the ceiling allows clean air to flow downward and is discharged from the bottom of the booth. Detailed temperature / humidity / room pressure control cannot be performed.

Kyutech SVBL-3F Clean room

Clean booth

https://axel.as-1.co.jp/asone/d/1-8714-01/?cfrom=I0010100

Things to wear in a clean room

In the clean room, you should wear clean-ware, gloves, a cap, and clean room shoes.

https://axel.as-1.co.jp/asone/g/NCGH038709/

https://www.askul.co.jp/p/1260069/

https://www.monotaro.com/g/00026428/?t.q=%83N%83%8A%81%5B%83%93%83L%83%83%83b%83v

https://www.monotaro.com/g/00249893/

END

BIRDS-5 CubeSat TVT Exhibition

By : Derrick TEBUSWEKE

Date: 12th August, 2021

CubeSat TVT Exhibition

What is TVT:

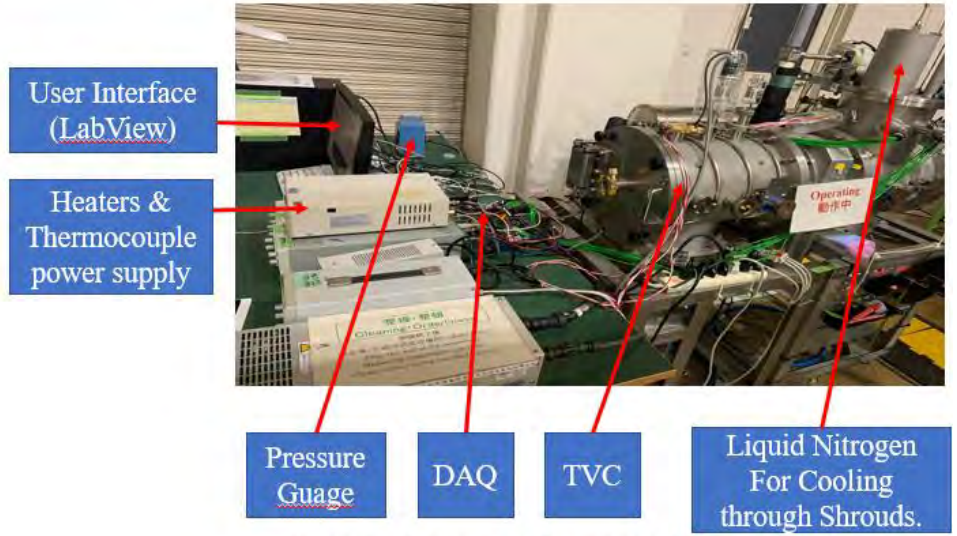
Thermal Vacuum Test (TVT) allows for the simulation of space and upper atmosphere conditions including temperature and vacuum.

Objective

To demonstrate BIRDS-5 CubeSat can operate in extreme Space conditions of high vacuum and varying thermal conditions.

This Demonstration was conducted for a company that had paid a visit to LaSEINE (Laboratory of Lean Satellite Enterprises and In-Orbit Experiment) at KYUTECH.

A satellite in Low Earth Orbit
Source: http://soreq.gov.il/mmg/eng/Pages/Low-Earth-Orbit-(LEO).aspx



A Thermal Vacuum Chamber at KYUTECH, Cho Lab

Preparation

We demonstrated Battery functionality in TVT chamber. During Lower Temperatures (<8°C) the Battery heater should turn ON to warm the battery. For higher temperatures, it should be OFF.

Success Criteria: Successful obtaining and interpretation of Housekeeping data during temperature and Vacuum variations of the satellite inside the chamber was to show that the satellite operated as intended to operate.

Housekeeping Data: The information about satellite health status. It includes Battery voltage, solar panel voltages, etc

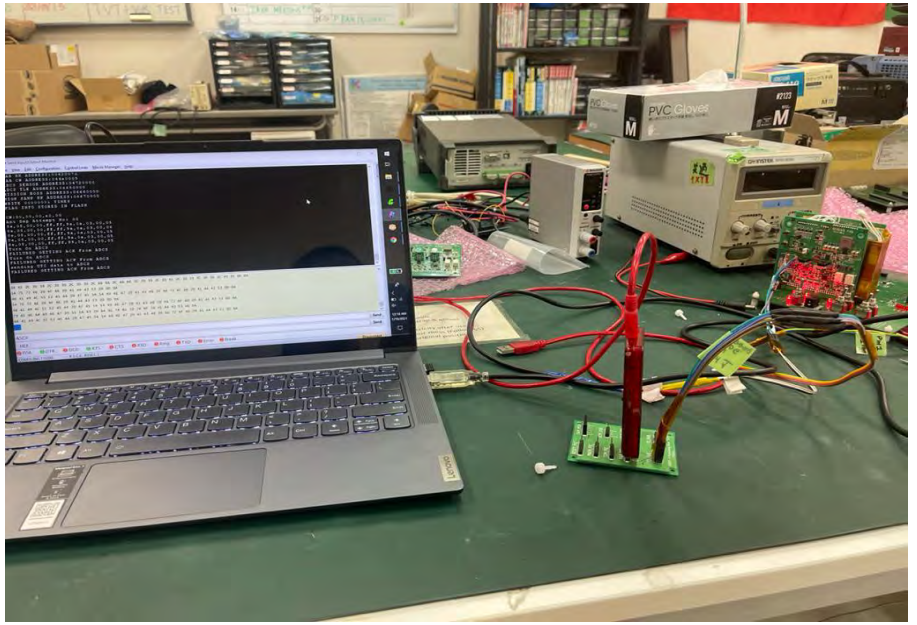
Test Preparation:

```
        check=1;
        write_eeprom(memory,1);
        kill_flag=1;
       }
/*Command for Battery Heater*/
       if(rx_chars[0] == 0x01)
       {
        rx_chars[0]=0;
        delay_ms(10);
        RD0 = 1;
        fabData[37] = 1;
        heaterManual = 1;
       }

       if(rx_chars[0] == 0x02)
       {
        rx_chars[0]=0;
        delay_ms(10);
        RD0 = 0;
        fabData[37] = 0;
        heaterManual = 1;
       }

       if(rx_chars[0] == 0x03)
       {
        rx_chars[0]=0;
        delay_ms(10);
        heaterManual = 0;
       }
  }
```

We tested Manual Command for Battery Heater Operation

```
PIC_FM.c | ADC_reading_func.c

//==================================end of reading battery Current==========

        fabData[36] = READ_PIC_ADC(13);
}

void battery_heater()
{
      fabData[36] = READ_PIC_ADC(13);
      fabData[33] = READ_PIC_ADC(10);
      if (heaterManual==0)
      {
         if ((fabData[36] > 0xB0) && (fabData[33] > 0x93))
            {
            RD0 = 1;
            fabData[37] = 1;
            }

         else
           {
            RD0 = 0;
            fabData[37] = 0;
           }
      }
}

void kill_status(void)
{
   if(RD3 == 1 && RC1 == 0){

    fabData[38] = 0x10;
```

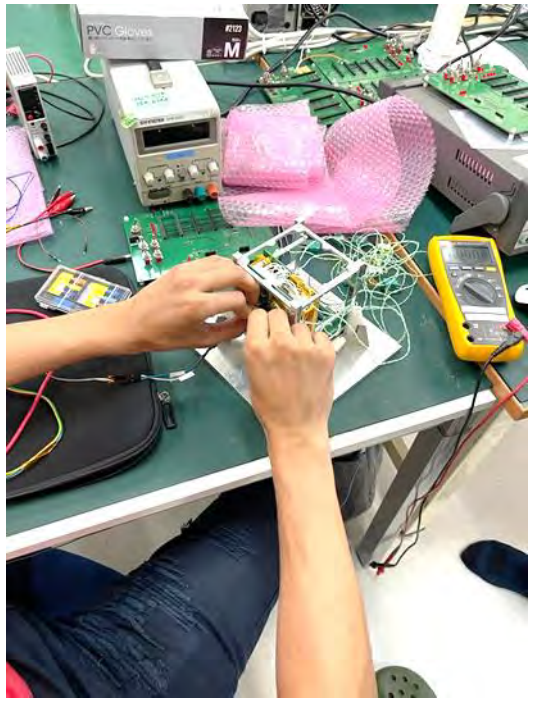
We tested Auto Command for Battery Heater Operation. This is the Command we used.



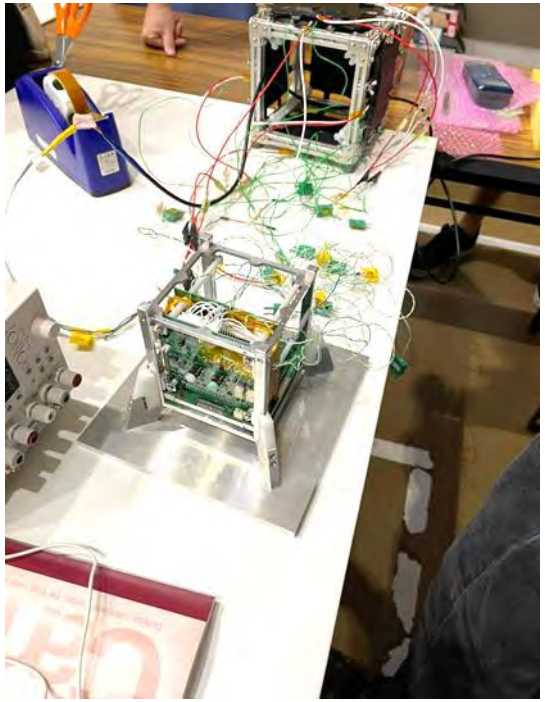
We first obtained Housekeeping Data inside our lab before the TVT test.

Preparation

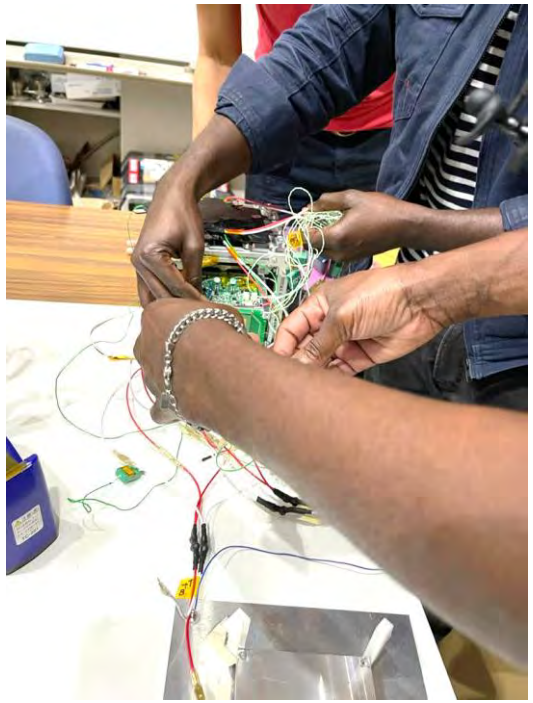
Inside the TVT Chamber, hot temperatures are generated by heater cube, and cold temperatures are generated by Liquid Nitrogen, so we needed Thermocouples to measure Temperature at various points of the CubeSat.



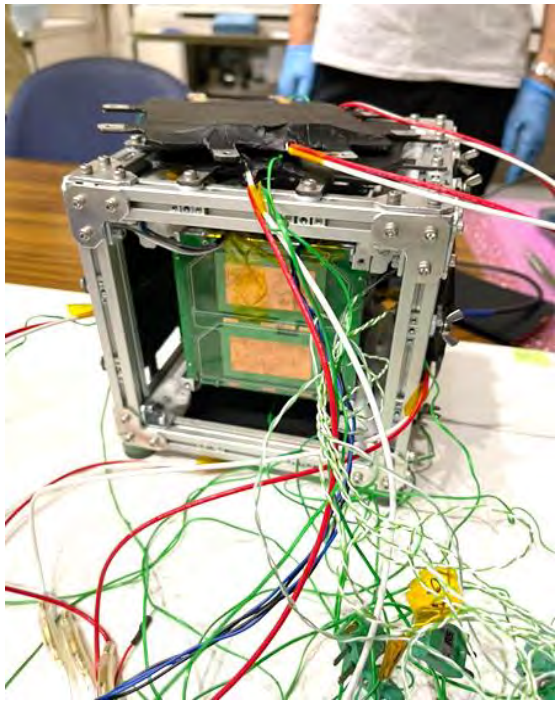
BIRDS5 Members attaching thermocouples to various parts of the CubeSat.



Attached thermocouples on the CubeSat. The bigger heater cage is for heating.



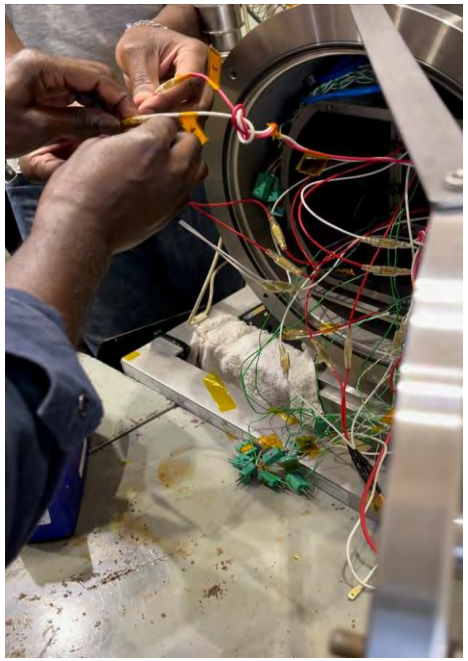
BIRDS5 Members fitting in the CubeSat inside the 1U Heater.



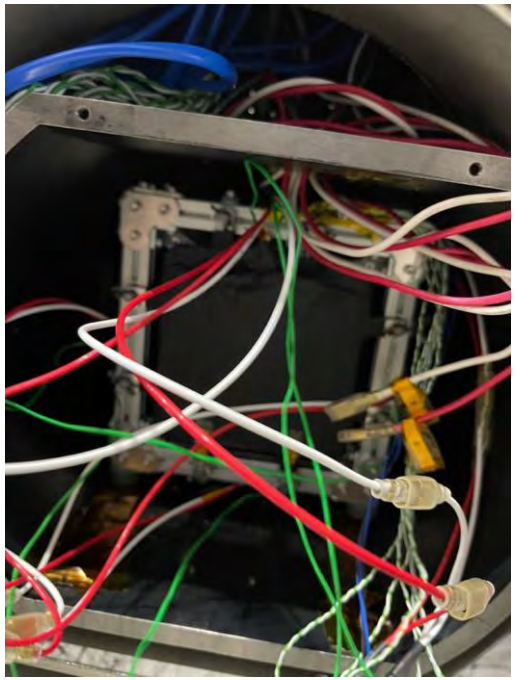
BIRDS-5 CubeSat fitted into the Heater box.

Preparation

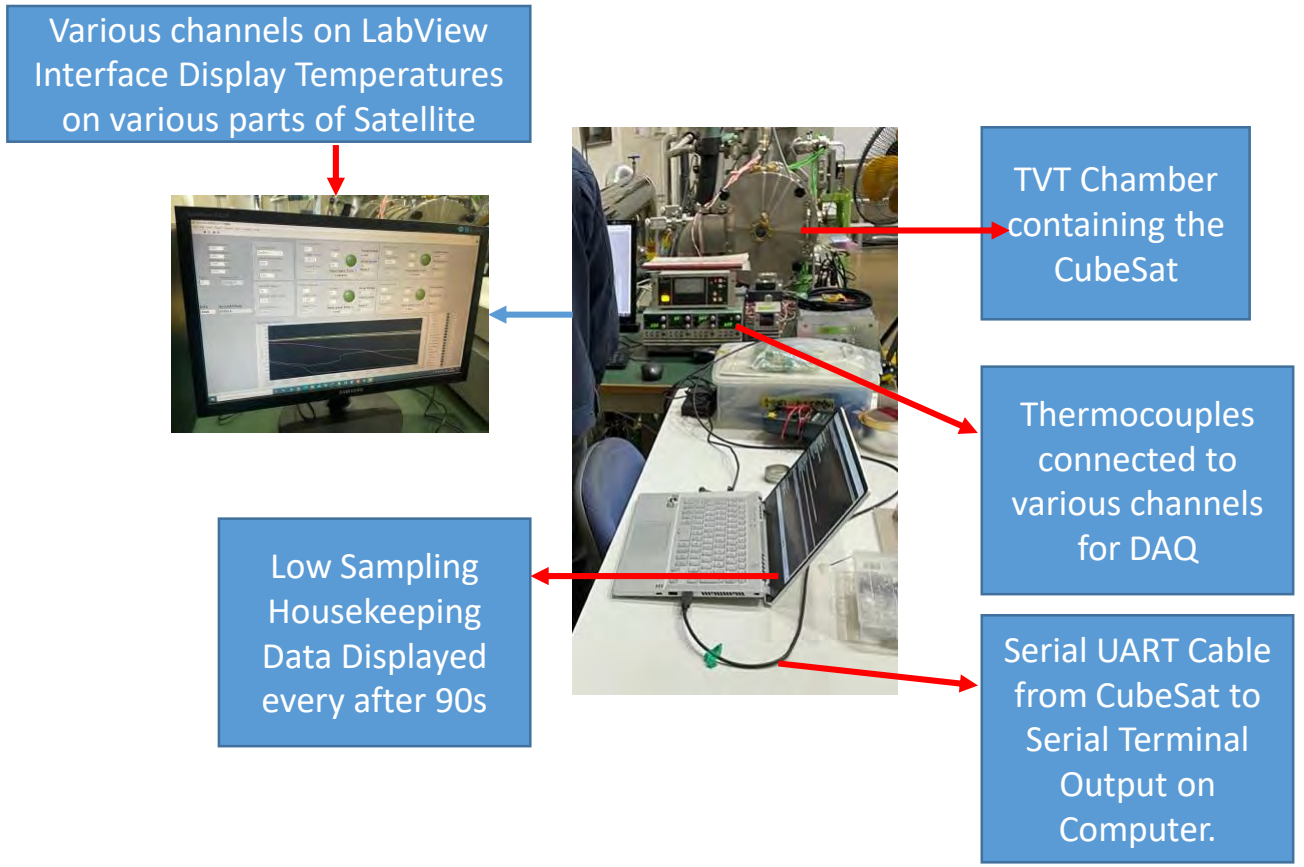
The CubeSat was placed inside the Heater Cube, which was placed inside the TVT chamber. Thermocouples were connected to various channels for DAQ (Data Acquisition) on LabView Interface, and Serial Terminal on computer displayed Housekeeping Data.



BIRDS-5 Members attaching Thermocouples to respective channels of Data Acquisition Interface.



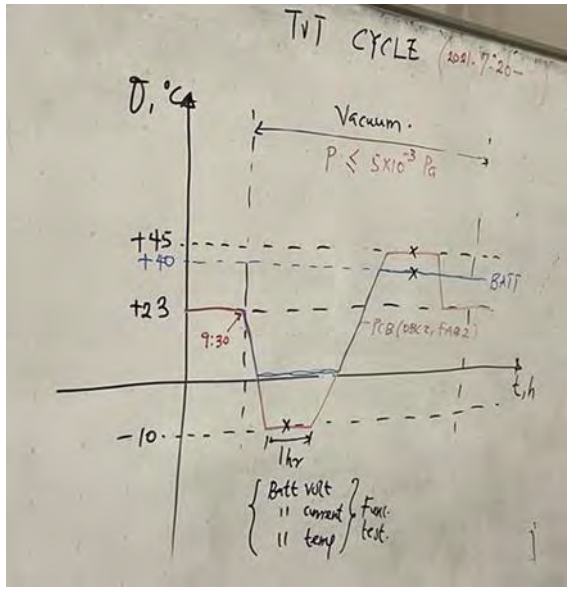
Attached thermocouples on the CubeSat inside the TVT Chamber.



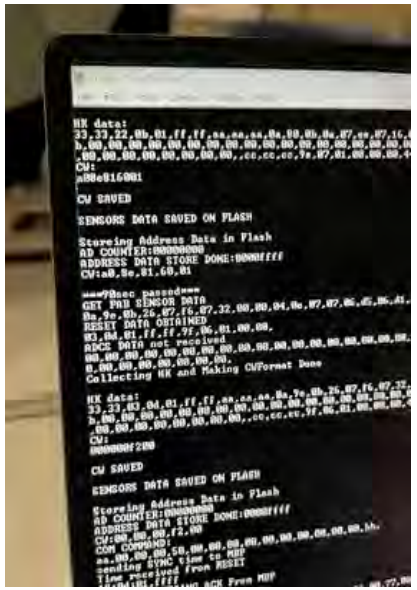
Test arrangement and (DAQ) Data Acquisition on LabView and Serial Terminal.

Results

Temperature inside the TVT Chamber was varied from -10 °C to +45 °C and housekeeping data analyzed for correct readings. From obtained readings, the battery heater turned on when temperatures were low at the pre-set level, and it turned off successfully when the temperature was above 8°C, Hence we succeeded in demonstrating our CubeSat Operation in Low Earth Orbit space conditions.



This graph was followed.



A sample of Housekeeping Data In HEX format on Serial Terminal.

	A	B	C	D	E	F	G	H	I	J	K	L
1			1	2	3	4	5					
2	CW	a08e816001	a0	8e	81	60	01	CW Type1		CW Type2		
3				8e0			010	Bat Vol [V]	4.07	Gyro X [deg/sec]	-96	
4								Bat Cur [mA]	-676.877	Gyro Y [deg/sec]	-114	
5								Bat Temp	25.77844	Gyro Z [deg/sec]	-127	
6								Format (0)	0	Format (1)	0	
7								OP Mode	nominal	Auto HSSC	1	
8								Kill Main	0	Auto CAM	1	
9								Kill FAB	0	Auto MBP	0	
10								ANT Dep	0	Auto ADCS	0	
11								Solar Cell +Y	0	Bat Heater	0	
12								Solar Cell +X	0	RSV_CHECK	0	
13								Solar Cell -Z	0	UPLINK Success	0	
14								Solar Cell -X	0	Backplane Temp	-49.0234	
15								Solar Cell +Z	0			
16								Time	1			
17												
18												
19												

Excel Conversion table to convert HEX data to Decimal data.

THE END

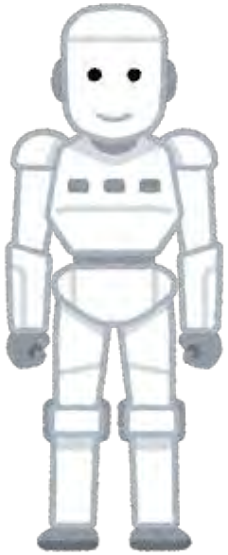
Magnetometer Calibration

By : Fukudome Shoma

2021/AUG/11

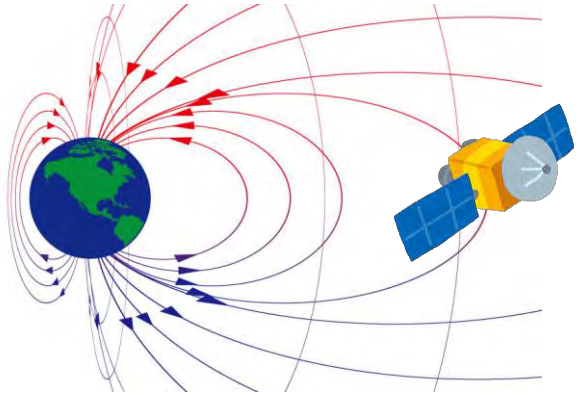
Magnetometers

- Magnetometer is a sensor that detects the magnitude and direction of magnetism or geomagnetism emitted by a magnet or electric current.
- They are used in many places around us even in your phone.



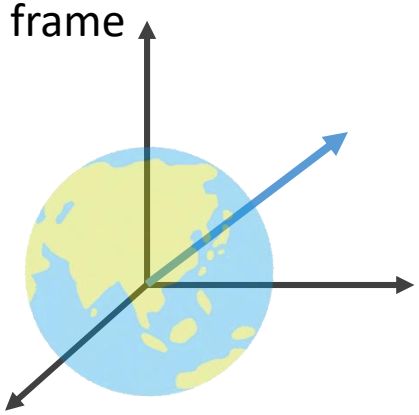
Magnetometers

- Magnetometers are used to determine the attitude of satellites in orbit.
- We compare the magnetic field measured by the magnetic sensor on board the satellite with the theoretical value of the magnetic field in an inertial frame.
- In order to know the attitude, we need another comparison object, which is the sun vector.

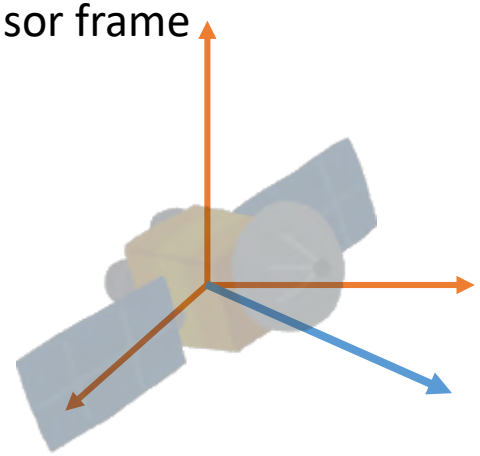


Magnetometers

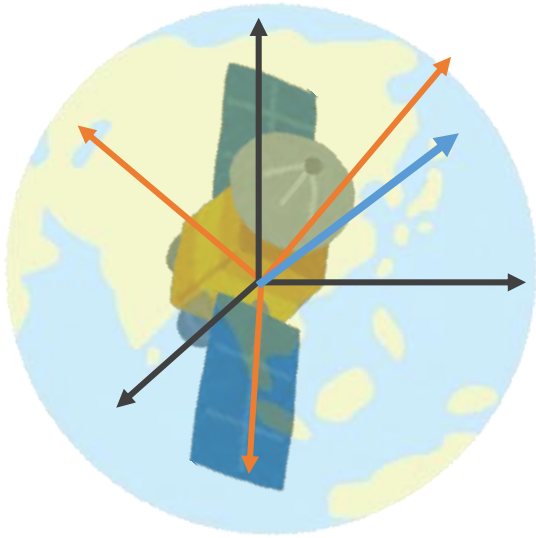
Inertial frame



Sensor frame



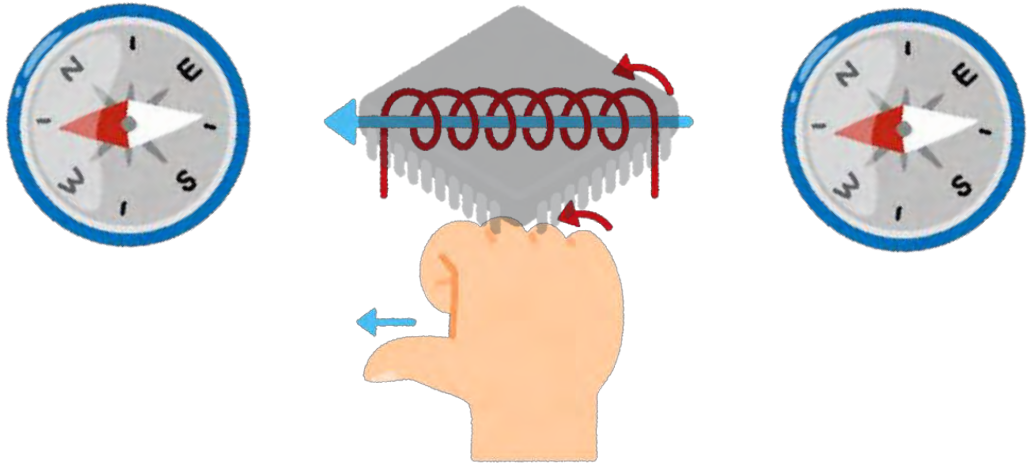
The blue arrows indicate the measured vectors.
The important thing is these blue arrows are supposed to be same.



Sensor frame has this attitude toward Inertial frame.

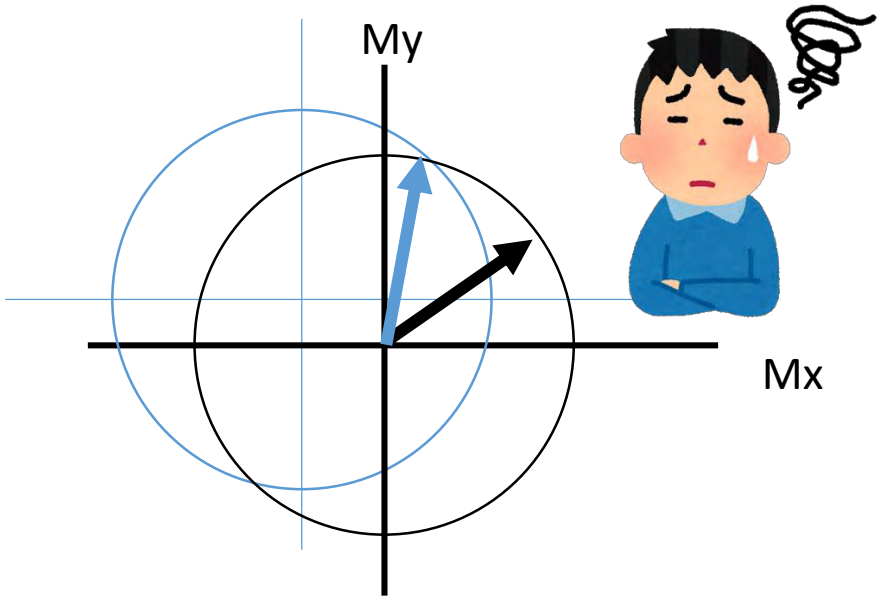
Calibration

- BIRDS-5 satellites are equipped with magnetometer called MMC5883.
- Since the measured value of a magnetic sensor depends on the magnetization status of the surrounding parts, calibration is required when using the sensor.



Calibration

Before calibration, the origin of the measured values is shifted.

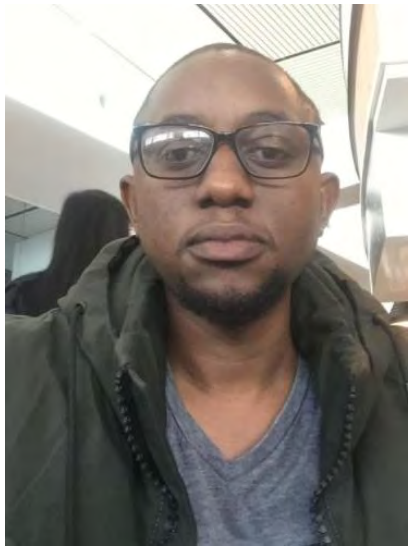


Calibration of magnetometer aims to align the origin of the circle.

Blue arrows indicate the measured values before calibration,
black arrows indicate the measured values after calibration

THE END

JAXA PINO Researchers' Kyutech Visit



By : Timothy Kudzanayi Kuhamba

Date: 9 August 2021

Mission

- Mitani Sensei and Asamura Sensei visited Kyutech on 27 July 2021 to check the
  - Electrical interface
  - Mechanical interface
- This was done to check whether PINO module can;
  - interface or communicate well with the other subsystems in the 2U structure
  - also that it can fit into the 2U structure

Welcoming the JAXA team

Project Manager Victor Welcoming PINO Team

Communication

Communication is important during Satellite Integration

Discussion before checking Mechanical Interface

Mechanical Interfacing

Mechanical Interfacing Checking in the Clean room

Oshiro under watchful eye of Mitani Sensei and Victor

Mechanical Interference Checking

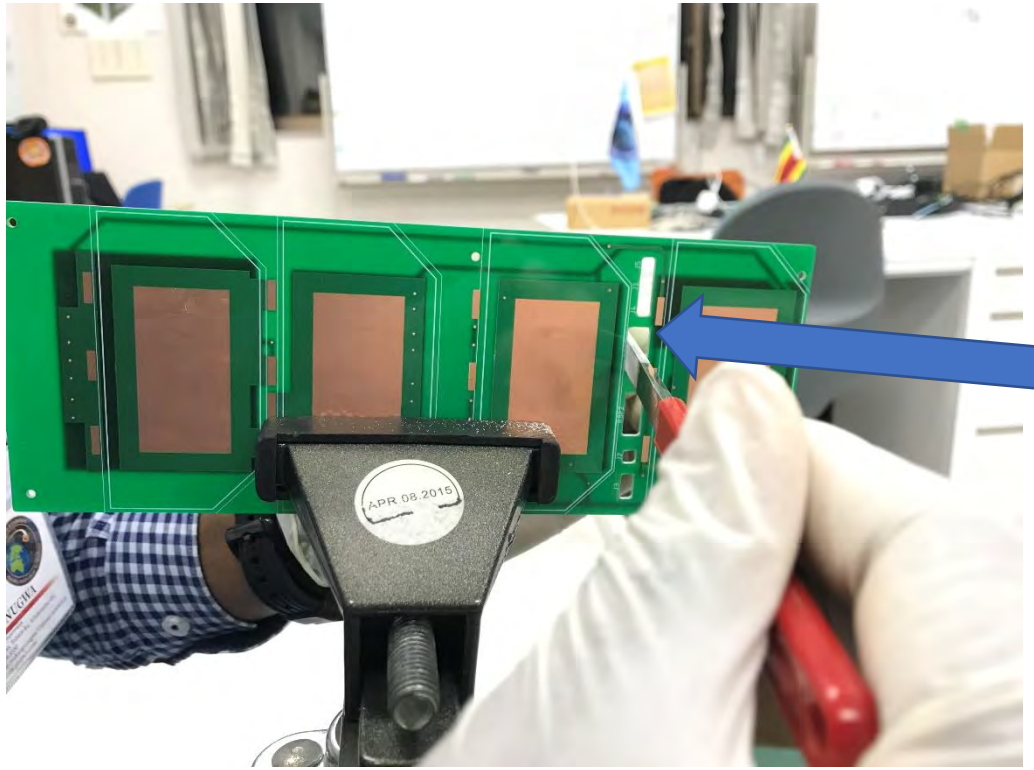
Victor trying to fit PINO module into 2U structure

Mechanical Interference assessment

Mechanical interference Checking

Mitani Sensei and Asamura discussing about causes of mechanical interference on PINO module

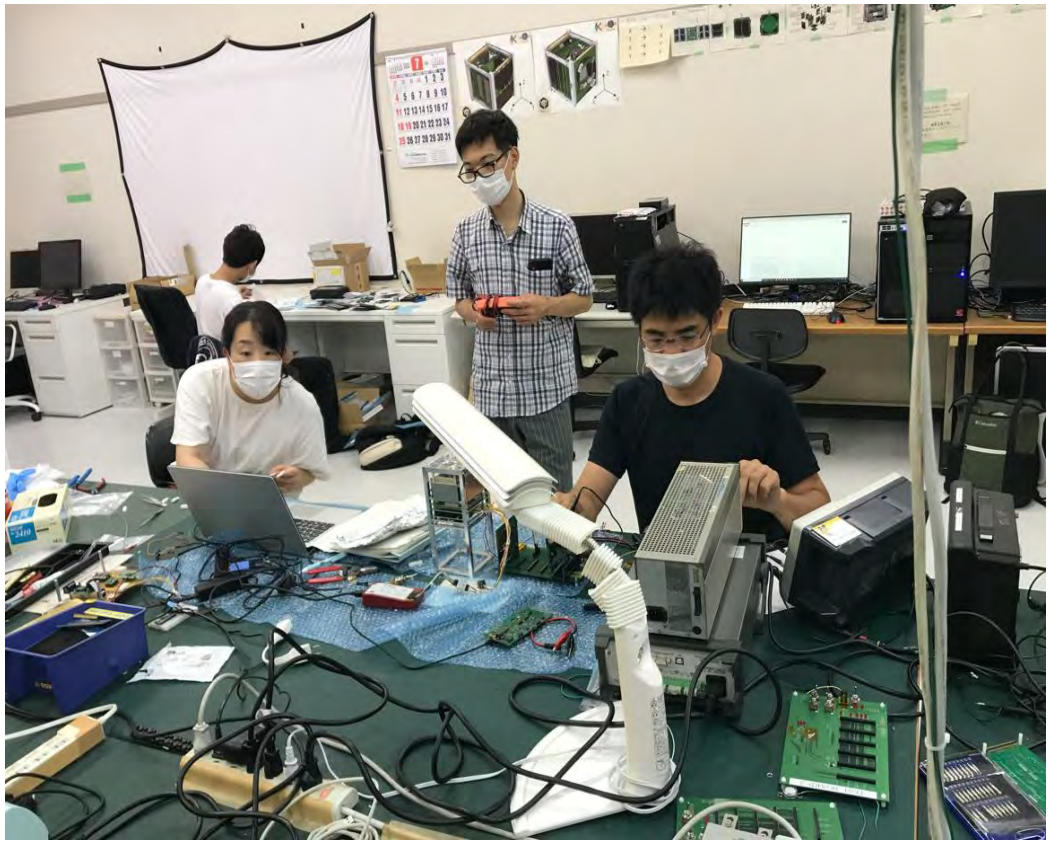
Mechanical Interference fixing

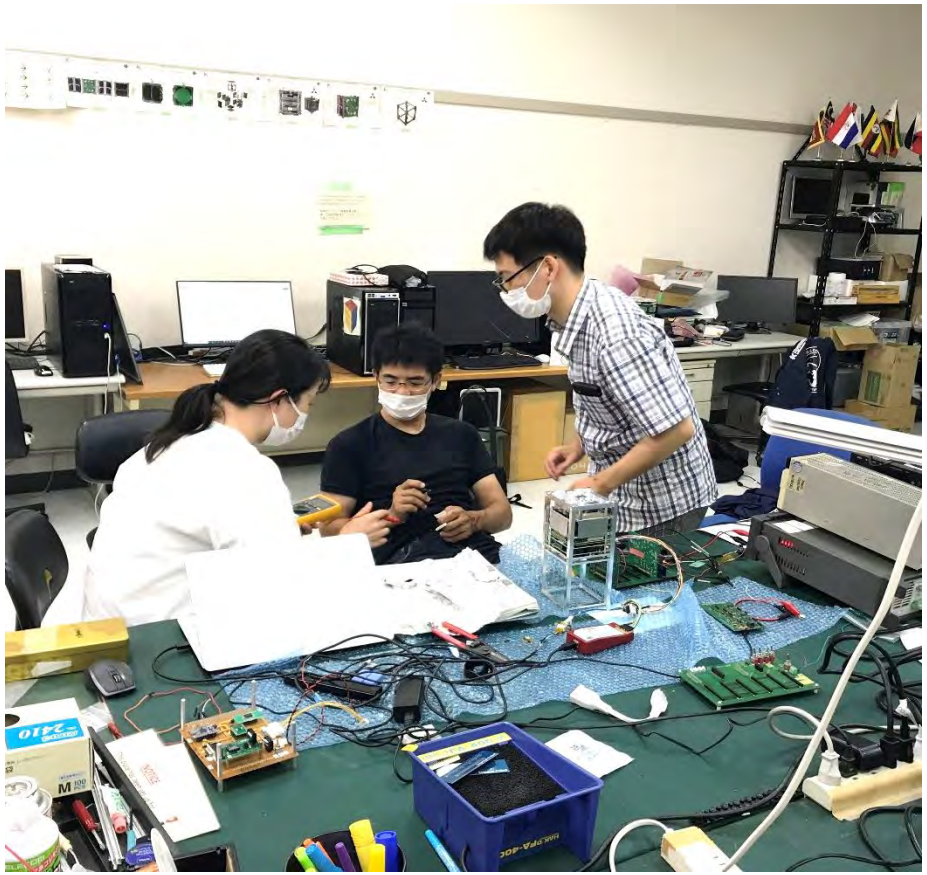


Victor fixing some interference

This was misalignment of the opening; adjustments were required.

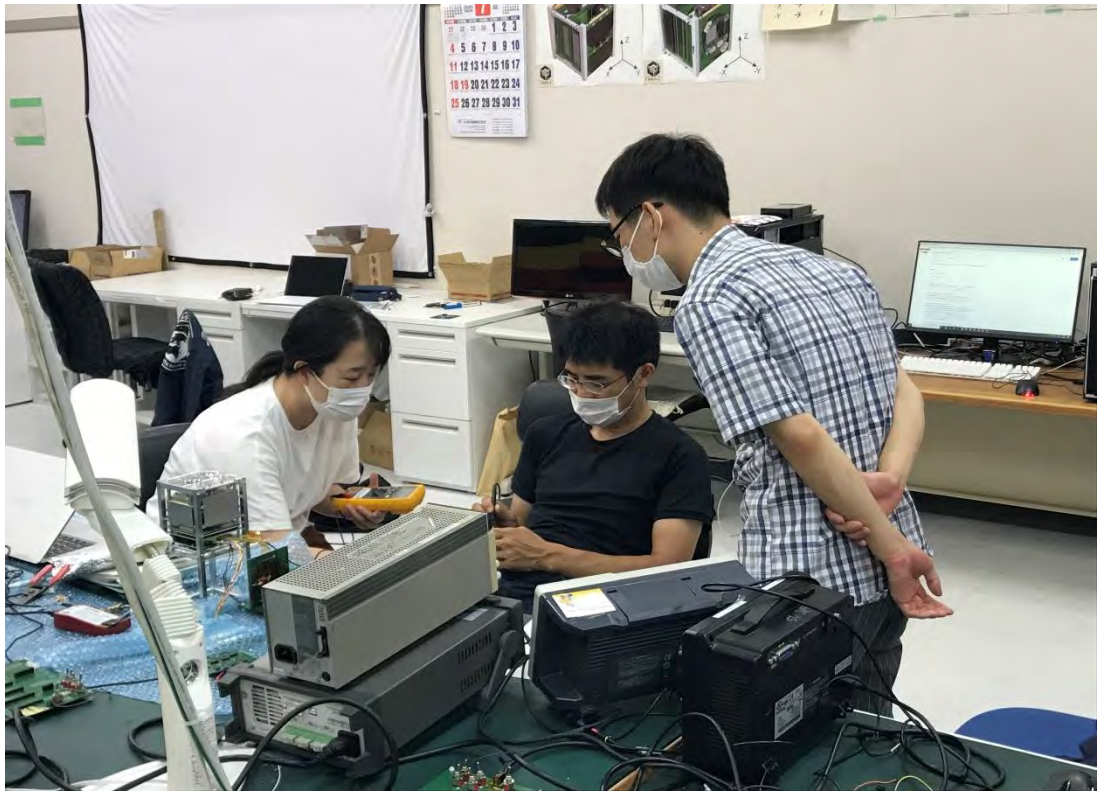
Electrical Interface Checking





Teramoto Sensei checking some diagrams on electrical interface

Electrical Interface checking



Teramoto Sensei, Asamura Sensei, and Otani, checking current of the PINO module

Otani and Asamura Sensei checking electrical interface

Dinner

The team took dinner at 1:00 AM … Ohh, what a long day !

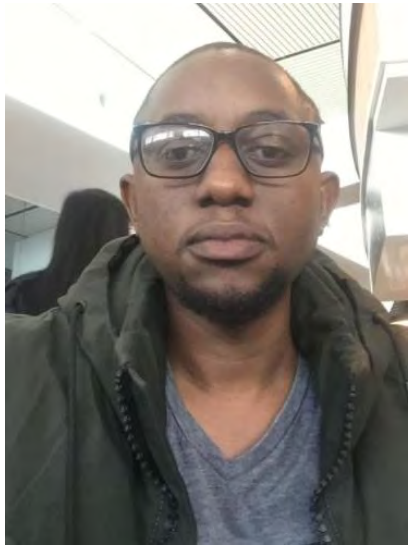
Gifts

Victor receiving gifts from Asamura Sensei

Thank you to the JAXA team

-- from BIRDS-5 Kyutech team

Attitude Visualisation



By : Timothy Kudzanayi Kuhamba

Date: 9 August 2021

Mission Scenario

1. Swaths of the satellite to different target areas
2. Check which target areas can be covered (water quality and land cover missions)
3. Compute the access times
4. *Check the orientation of the satellite sensor before satellite passes the target*
5. *If the satellite sensor is facing to the earth*
6. Send a shutter command to the satellite when the satellite is passing the target area

Visualisation

Inputs

- Moment of Inertia of Satellite
- Mass of the Satellite
- Two Line Elements
- Altitude of the Satellite
- Target Areas (Water Bodies or land areas)
- Field of View (FOV)
- Magnetometer and Sun Vector Data

Systems Tool Kit (STK) is a platform for analyzing and visualizing complex systems in the context of your mission. Interact with data from platforms across the aerospace, defense, telecommunications, and other industries. Simulate your intended missions and communicate the results with reports, graphs, and stunning 3D animations. That's what STK is.

AGI: Systems Tool Kit (STK)

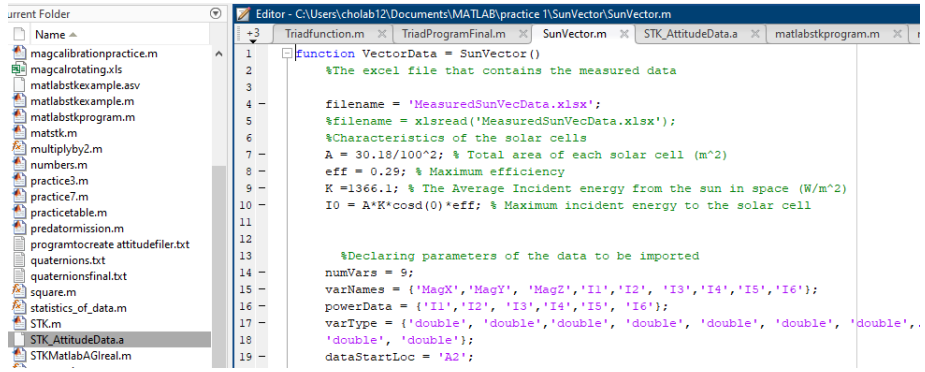
Quaternion Approach

- **Input STK**
  - **Inertia Frame**
    - MAG (IGRF)
    - SUN (ICRF)
  - **Body Frame**
    - **MAG (body)-**Magnetometer High Sampling Data
    - **SUN (body)-**Calculated Sun Vector from Solar panel currents
    - These inputs with for the same timestamp
- **Calculation**
  - TRIAD
- **Output:**
  - **Quaternion**
- Prepare a file with attitude for STK simulation

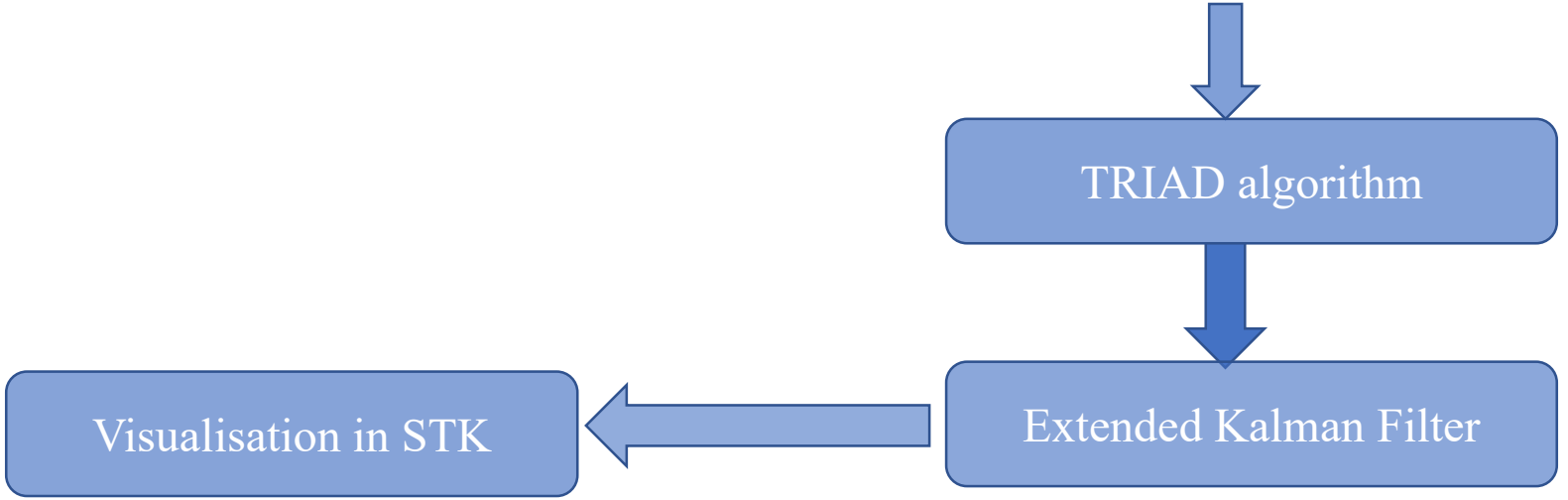
BIRDS-3 High Sampling Data

Time(s)	MAG [mG]			Current						
	X	Y	Z	+X [mA]	-Y [mA]	-Z [mA]	+Y [mA]	+Z [mA]	RAW [mA]	SRC [mA]
17	106.14	-70.272	84.912	80	0	300	440	5	145	-1220.9
21	83.448	-102.48	63.196	175	0	235	450	5	155	-1178
26	54.9	-134.688	22.692	265	0	130	455	10	155	-1194.5
32	30.988	-58.072	38.796	325	0	20	440	10	155	-1247.3
37	30.988	-58.072	38.796	350	0	5	420	30	155	-1240.7
41	4.392	-152.5	-138.836	355	0	5	370	150	155	-1148.3
46	4.392	-152.5	-138.836	330	0	5	330	250	150	-1092.2
51	9.272	-97.356	-242.78	280	0	5	265	350	155	-1102.1
56	25.132	-53.68	-283.772	205	0	5	205	415	150	-1141.7
61	47.58	-2.196	325.496	105	0	5	140	460	155	-1250.6
66	73.932	47.824	-329.644	20	0	10	95	485	155	815.2
71	102.968	98.576	-334.28	5	0	10	60	485	155	772.3
76	131.76	145.424	-326.96	5	0	10	45	475	150	732.7
81	160.308	187.148	-307.684	5	0	10	45	435	160	709.6
86	193.248	221.308	-279.136	5	0	10	45	390	155	656.8
91	223.016	244.732	-240.096	10	0	10	50	325	155	590.8
96	252.54	257.176	-195.444	10	0	10	55	250	155	514.9
101	276.94	256.932	-146.156	10	0	10	65	165	160	429.1
106	291.336	164.212	108.336	15	0	10	95	75	155	353.2
111	296.704	218.38	-45.628	15	0	5	145	20	160	343.3
116	291.58	181.78	0.244	15	0	30	200	20	150	415.9

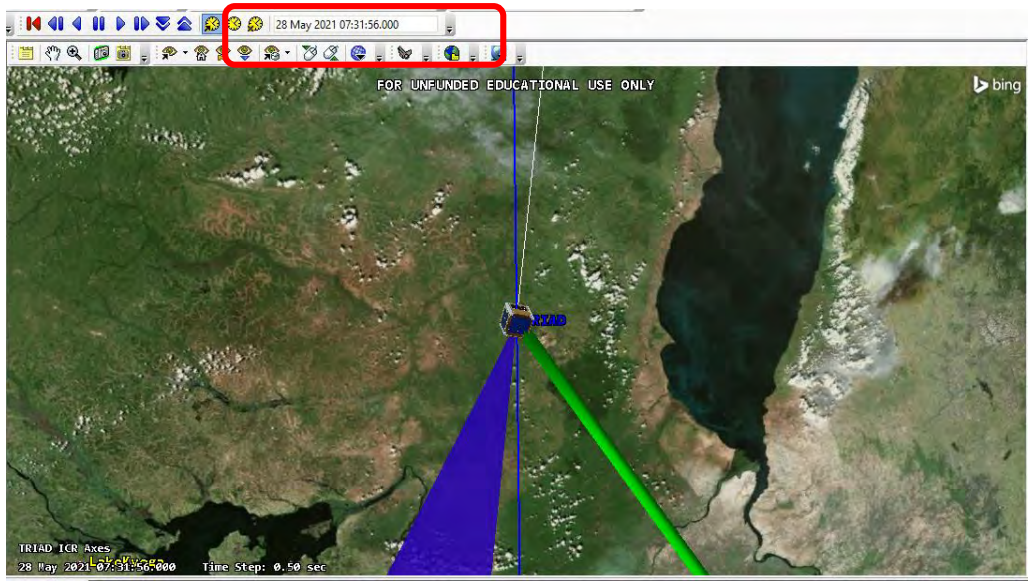
Input Data from Satellite



Sun Vector Calculation



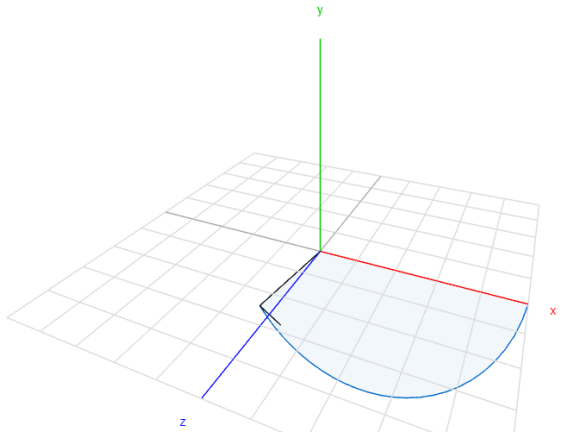
Quaternion Visualisation



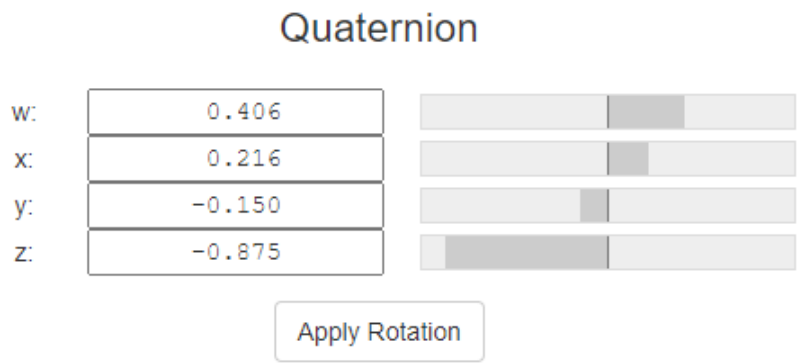
FOR UNFUNDED EDUCATIONAL USE ONLY
Satellite-TRIAD: Attitude Quaternions

Time (UTCG)	q1	q2	q3	q4
28 May 2021 07:28:56.000	-0.092591	-0.646141	0.386115	0.651801
28 May 2021 07:29:56.000	0.682266	-0.174191	0.703996	0.092524
28 May 2021 07:30:56.000	0.729313	-0.001774	0.262892	-0.631655
28 May 2021 07:31:56.000	0.405835	0.215553	-0.149961	-0.875412
28 May 2021 07:32:56.000	0.685175	0.345898	0.578493	0.276108
28 May 2021 07:33:56.000	0.287159	0.782393	0.541579	-0.109971
28 May 2021 07:34:56.000	-0.078362	0.001620	0.445202	0.891993
28 May 2021 07:35:56.000	0.197035	0.525759	0.203409	0.802109

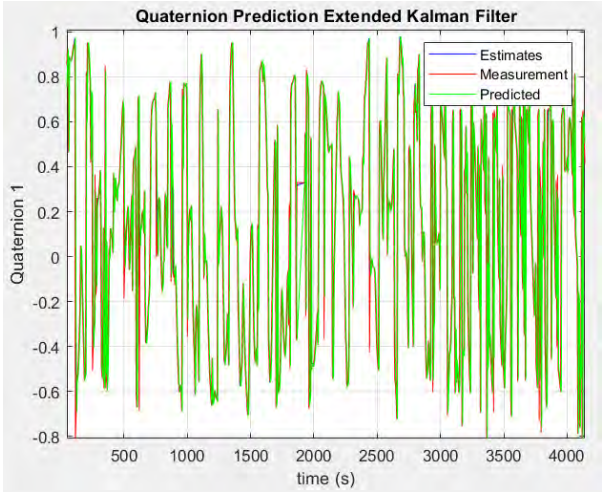
STK Quaternion Report



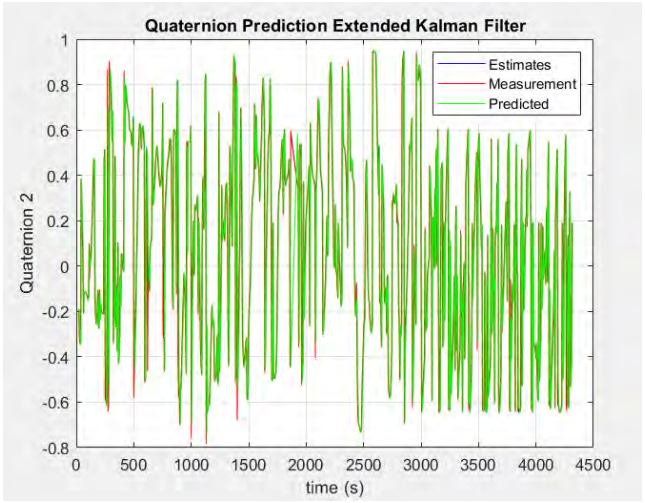
https://quaternions.online



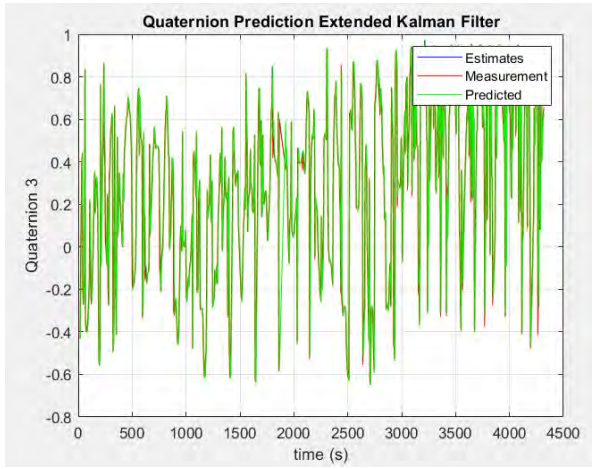
Quaternion prediction



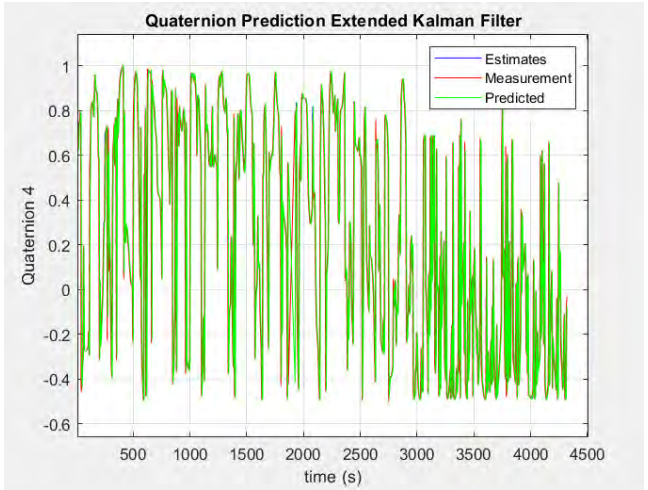
Q1



Q2



Q3



Q4

Attitude file with the predicted quaternions

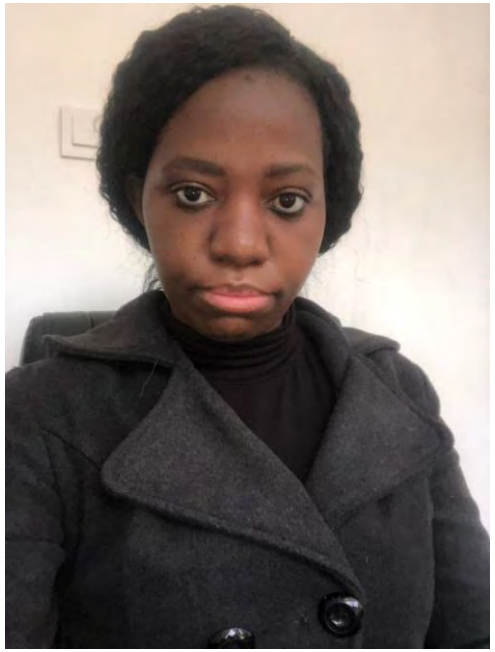
```
1  stk.v.12.1
2  BEGIN Attitude
3  NumberOfEphemerisPoints 851
4  ScenarioEpoch 28 May 2021 07:28:56.000
5  BlockingFactor          20
6  InterpolationOrder      1
7  CentralBody             Earth
8  CoordinateSystem        J2000
9  AttitudeTimeQuaternions
10 17.000000 -0.196078 -0.431330 0.626872 -0.618497
11 21.000000 -0.190455 -0.108050 0.746259 -0.633772
12 26.000000 -0.309639 0.137175 0.743125 -0.577934
13 32.000000 -0.345884 0.395978 0.793913 -0.308714
14 37.000000 -0.339011 0.443527 0.784604 -0.269342
15 41.000000 0.385694 -0.160695 -0.374907 0.713017
16 46.000000 0.283133 -0.272007 -0.436980 0.803934
17 51.000000 0.164801 -0.195885 -0.334217 0.907026
18 56.000000 0.064056 -0.221476 -0.307640 0.923163
19 61.000000 -0.208803 0.834349 0.195088 0.465818
20 66.000000 -0.111444 -0.343044 -0.268556 0.887184
21 71.000000 -0.115997 -0.388892 -0.270701 0.872943
22 76.000000 -0.112136 -0.402352 -0.272704 0.866717
23 81.000000 -0.113963 -0.395549 -0.272875 0.869527
24 86.000000 -0.122272 -0.365069 -0.270191 0.882422
25 91.000000 -0.128539 -0.311392 -0.267801 0.902522
26 96.000000 -0.141351 -0.244615 -0.262099 0.922483
27 101.000000 -0.150562 -0.163347 -0.258620 0.939502
```

Time(s)

Quaternions

The End

ZIMBABWE NATIONAL GEOSPATIAL AND SPACE AGENCY



By: Marie-Ann

Outreach officer

15 August 2021

Multi-Spectral Sensor Testing

- The agenda was to test the ability of the multi spectral sensor to extract physical features on the earth taking advantage of the reflectance and absorption of surface features.
- Vegetation/Water indices are spectral transformations of two or more bands in a GIS designed to enhance the contribution of physical properties of surface features
- Allow reliable spatial and temporal inter comparisons of terrestrial photosynthetic activity and structural variations

The following indices were quantified in a GIS environment :

A) Normalized Difference Water Index
B) Normalized Difference Vegetation Index
C) Soil Adjusted Vegetation Index

Spectral Resolution

The spectral resolution of the sensor is key to determine the appropriate indices to quantify. sensor can detect specific wavelength bands within the Green to the Near infrared regions (spectral resolution of the sensor). The wavelength range is measured in nanometers (nm)

The wavelength ranges for the sensor are shown below

Band	**Wavelength Range**
Green	550 nm
Red	680 nm
Red Edge	720 nm
Near Infra-Red	790 nm

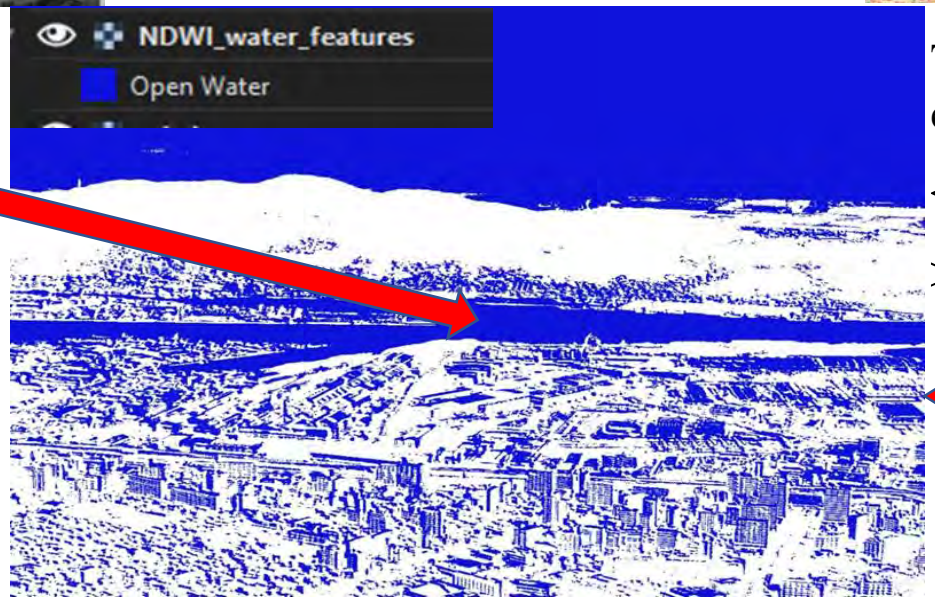
Water Features Extraction

- The Normalized Difference Water Index was used to extract water features (NDWI) taking in to account the sensor spectral resolution
- It used the Green and Shortwave Infrared wavelength bands for the enhancement of open water features
- The index is designed to maximize reflectance of water by using the green bands and minimize the low reflectance of Near Infrared by water features, taking advantage of high reflectance of Near Infrared by vegetation and soil features
- The quantification of NWDI enhances water features by giving positive values while vegetation/ soil features have zero or negative values ranging between -1 to +1

Water Feature Extraction

Raw bands(Green and SWIR bands)

Using the water index formula
NDWI = (Green –SWIR) /
(Green + SWIR)
the classification was
determined



Open Water

Thresholds for open water feature extraction

< 0 = Vegetation/soil

> 0 = Open water

Vegetation Feature Extraction

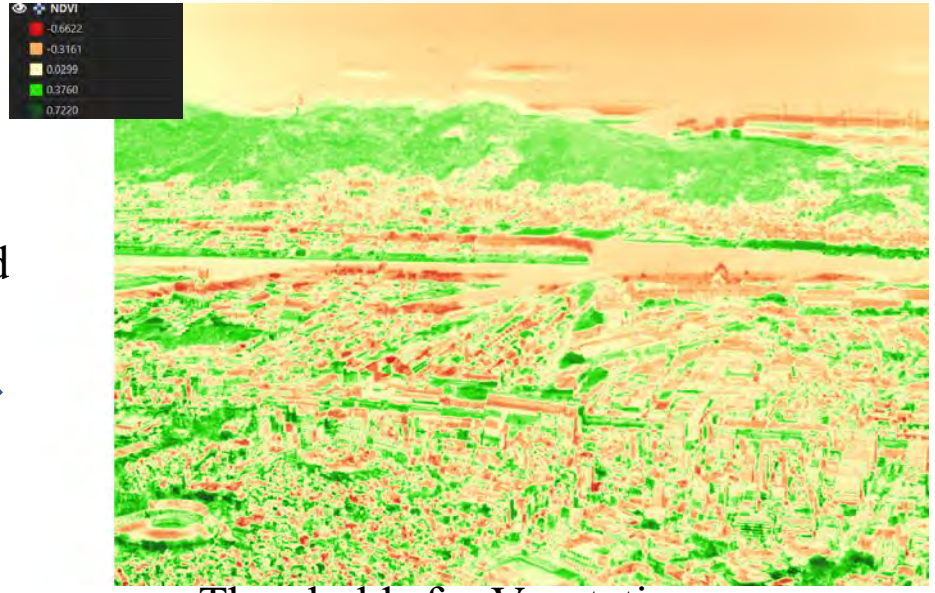
Normalized Difference Vegetation Index (NDVI)

- NDVI is used to quantify vegetation greenness and useful in understanding vegetation density and assessing changes in plant health
- It quantifies vegetation by measuring the difference between Near Infrared wavelength (*which vegetation strongly reflects*) and Red wavelength (*which vegetation absorbs)*
- The quantification of NDVI enhances vegetation features by giving the positive values while water/built up area have zero or negative values
- The result of the NDVI generates image values which range between -1 and +1

Vegetation Feature Extraction (NDVI)

Raw Bands (NIR &Red Bands)

Using the NDVI formula
NDVI = (NIR –Red) / (NIR +Red)
Vegetation extraction was determined



Thresholds for Vegetation Feature Extraction

-0.5 thru 0.07 = Built up/Open Water

0.08 thru 0.09 = Possible Shadow Effects

0.1 thru 0.73= Vegetation

Vegetation Feature Extraction
Soil Adjusted Vegetation Index (SAVI)

- SAVI is structured similar to the NDVI but it uses the soil brightness correction factor
- The spectral indice is calibrated in a way that the variation of soils are normalized and do not influence measurements of vegetation canopy
- The transformation technique is presented to minimize soil brightness influences from spectral vegetation indices involving Red and Near Infrared Bands
- These enhancements are useful because SAVI accounts for variation in soil brightness
- The output of SAVI is a new layer with values from -1 to +1, the lower the value the lower the amount/cover of green vegetation

Vegetation Feature Extraction (SAVI)

Raw Bands (NIR &Red Bands)

Using the SAVI formula
SAVI = {(NIR –Red) / (NIR + Red +L)}* (1+L)
Vegetation extraction was determined
Where L = 0.5

Thresholds for Vegetation Feature Extraction

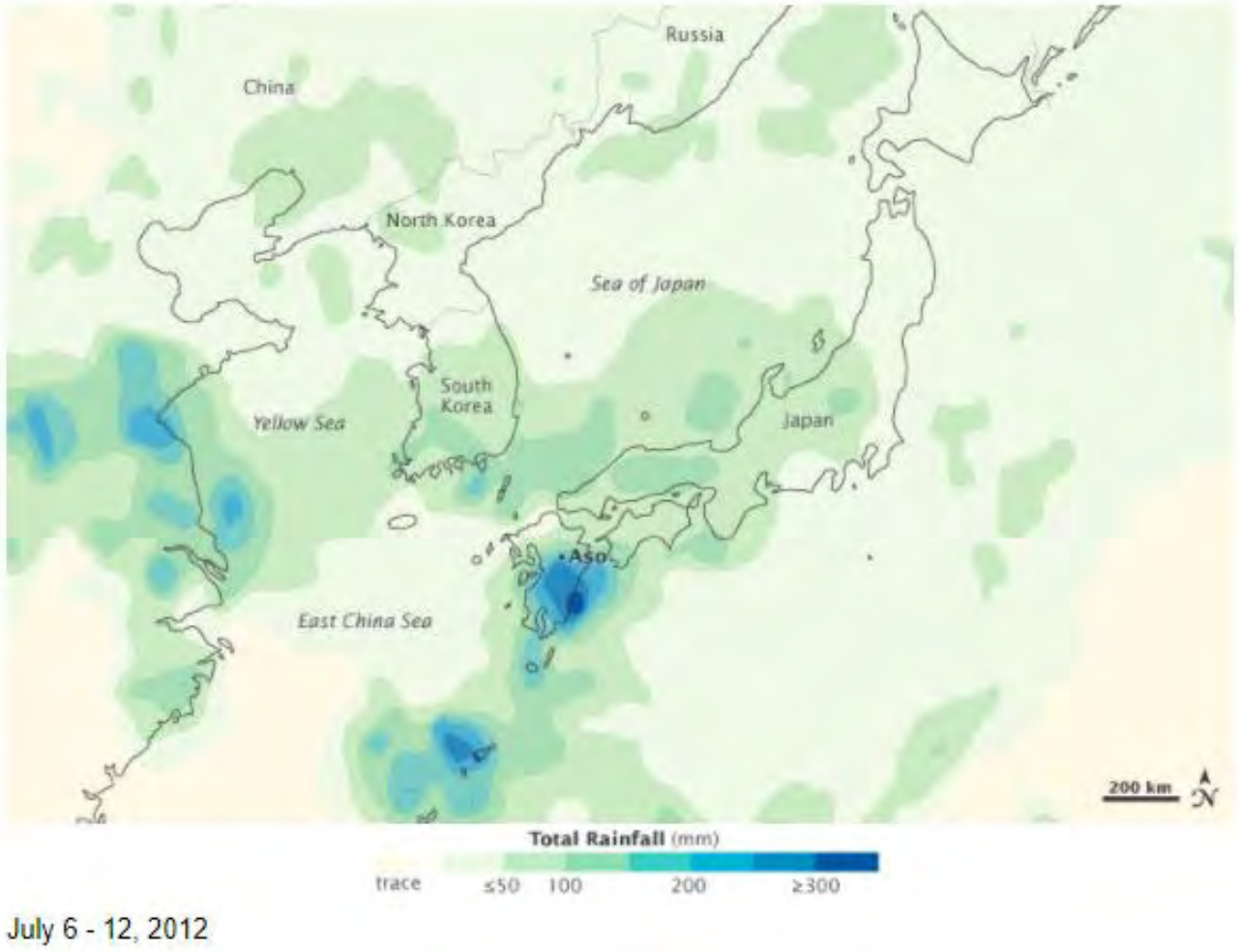
-0.1 thru 0 = Built up/Open water

0.1 thru 1 = Vegetation

END OF THIS REPORT FROM ZINGSA

End of BIRDS-5 reports for this month

18. Heavy rains batter Kyushu during 6-12 July 2012 (NASA data)



In early July, torrential rainfall caused floods on Japan's island of Kyushu. News reports described rainfall totals in some areas as unprecedented, with as much as 20 inches (500 millimeters) falling on the town of Aso. Flood waters submerged fields and swept away cars, and mudslides destroyed homes.

This color-coded image shows rainfall totals from July 6 to 12, 2012. The heaviest rainfall—more than 300 millimeters or over 12 inches—appears in dark blue. The lightest rainfall—less than 50 millimeters or 2 inches—appears in light green. Trace amounts of rain appear in yellow. A pocket of intense rain appears immediately south of the town of Aso on the island of Kyushu, with the heaviest rain occurring along the coast.

This image is based on data from the Multisatellite Precipitation Analysis produced at NASA's Goddard Space Flight Center, which estimates rainfall by combining measurements from many satellites and calibrating them using rainfall measurements from the Tropical Rainfall Measuring Mission (TRMM) satellite …. ***SEE LINK BELOW***

FULL ARTICLE IS HERE: https://earthobservatory.nasa.gov/images/78537/heavy-rains-in-kyushu-japan

Magnetic Field Test at ISAS

14 August 2021

by Dulani Chamika
BIRDS-3 member
from Sri Lanka

“ISAS” as explained by Wikipedia:
https://en.wikipedia.org/wiki/Institute_of_Space_and_Astronautical_Science

Magnetic Field Testing

I went to ISAS/JAXA to do a magnetic field test with Teramoto sensei. ISAS/JAXA is located in Sagamihara. ISAS stands *for Institute of Space and Astronautical Science*.

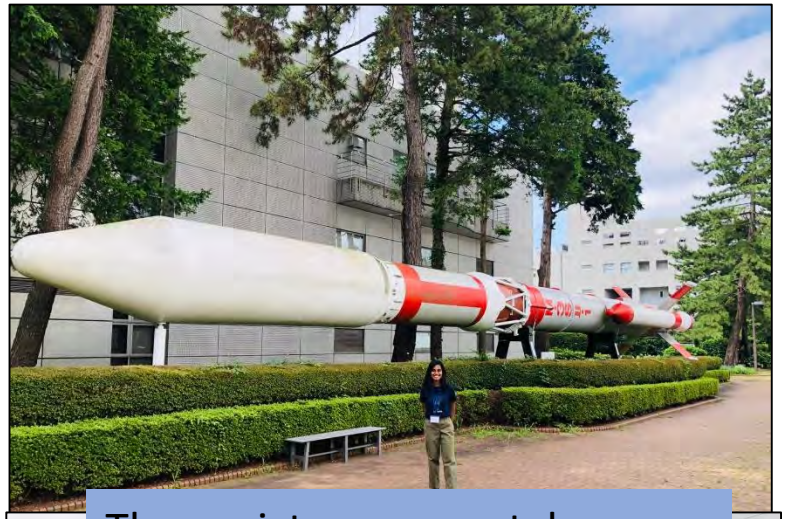
We took the Shinkansen til Shin-Yokohoma and then took a local train. This test was done last month (July 2021). First day we had lunch in a Thai restaurant near the hotel we stayed. And for dinner we went to an Indian restaurant.

The Thai green curry and rice which I had for lunch

Fuchinobe station was quite interesting with these kind of space posters. So I took a picture with one of the posters.

Some of the pictures taken on this journey

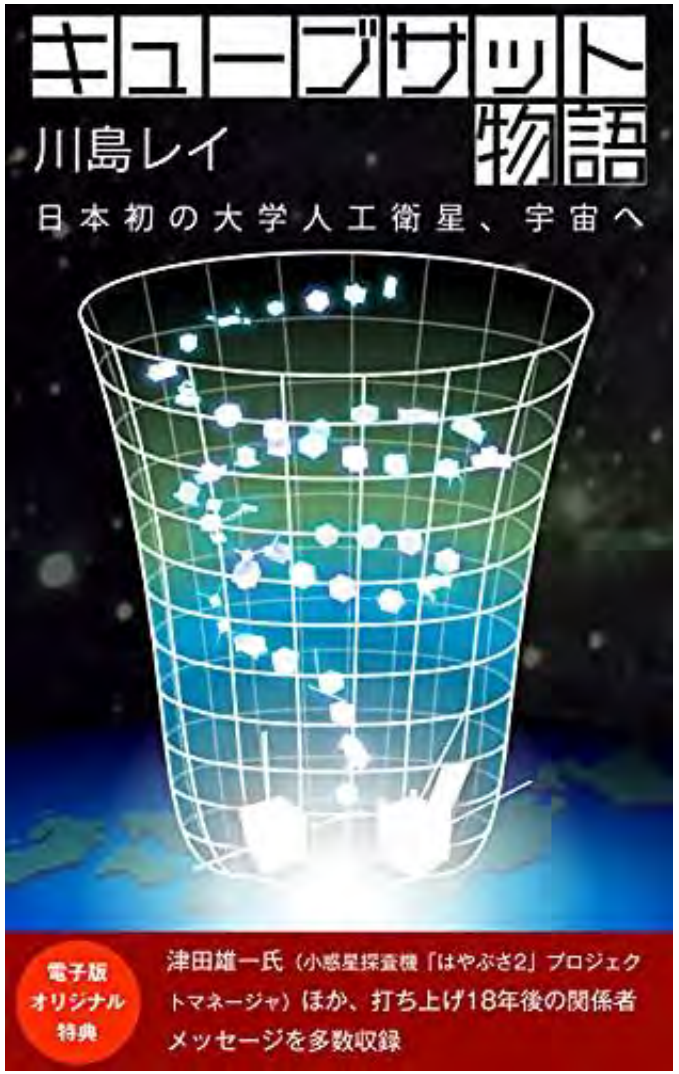
On the way to ISAS, I found many of these signs which show the directions to ISAS/JAXA



These pictures were taken on the last day at ISAS.

I was able to experience Ekiben when we were going back to Kitakyushu. As we took a train in the evening to back to Kitakyushu we had dinner in the Shinkansen.
This was my first time to travel far by Shinkansen. It was a great experience. **END**

20. Rei Kawashima's book about CubeSats is published



キューブサット物語：18年後のメッセージ収録 Kindle版

川島レイ (著) 形式: Kindle版

★★★★★ 10個の評価

Just published !

世界初のキューブサットを日本の学生たちが作って打ち上げるまでのドキュメント。1999年にハワイで1辺10センチメートルの立方体の超小型人工衛星キューブサットをみんなで作って打ち上げようという話を聞いた学生たちは、世界で誰も作ったことがない「キューブサット」に挑戦します。宇宙工学を学んでいる学生たちとはいえ、実際に宇宙へ打ち上げる人工衛星を作るなど初めてのこと。予算なし、設備なし、知識なし、経験なし、のないない尽くしの中で、情報を集め工夫を重ね、何とかキューブサットを作り上げます。打ち上げロケットの確保も二転三転しましたが、2003年6月30日に、キューブサットはついにロシアのロケットで宇宙へ打ち上げられました。打ち上げは見事成功し、2つのキューブサットは18年たった今でも、画像などのデータを送り続けています。

2003年の打ち上げから18年たった今、超小型衛星は、宇宙ビジネスやサイエンスなど実利用に普通に使われるようになりました。また、宇宙開発とは縁遠かった新興国の学生も超小型衛星開発に取り組むようになっています。当時の学生たちは当時の教員の年齢を超え、それぞれの分野で活躍しています。彼らはあの感動の打ち上げの18年後に何を思い、何をしているのでしょうか。電子版の本書では、登場人物達からの18年後のメッセージを巻末に収録しています。

www.amazon.co.jp/%E3%82%AD%E3%83%A5%E3%83%BC%E3%83%96%E3%82%B5%E3%83%83%E3%83%88%E7%89%A9%E8%AA%9E-18%E5%B9%B4%E5%BE%8C%E3%81%AE%E3%83%A1%E3%83%83%E3%82%BB%E3%83%BC%E3%82%B8%E5%8F%8E%E9%8C%B2-%E5%B7%9D%E5%B3%B6%E3%83%AC%E3%82%A4-ebook/dp/B09B4ZDHWW

GST Column

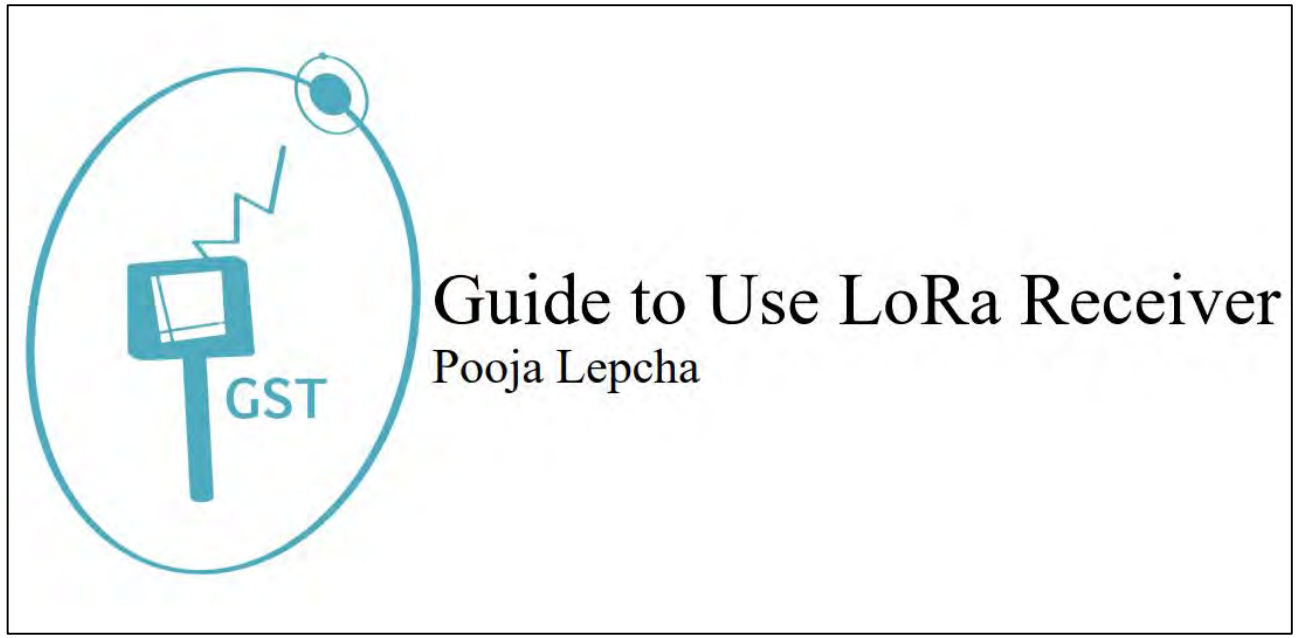
Tenth Issue:

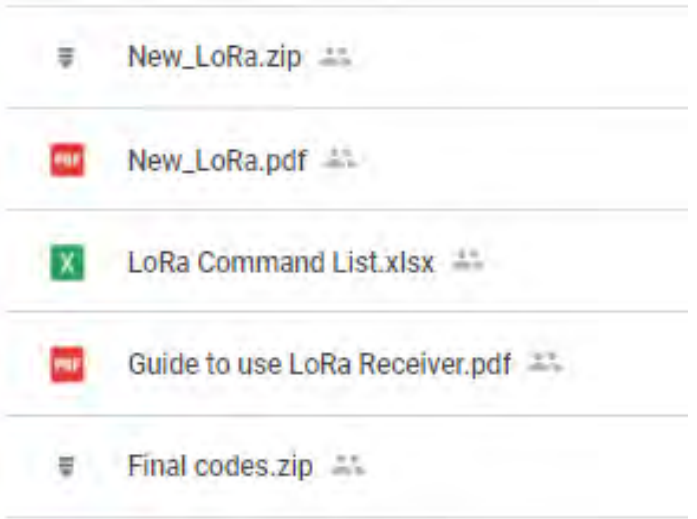
Updates from GST Network

Pooja Lepcha

15 August 2021

- KITSUNE Lora Receiver prototype was sent to GST Network countries
- Operation manual for the receiver was also created
- Source codes, schematic, eagle design, command lists were also shared

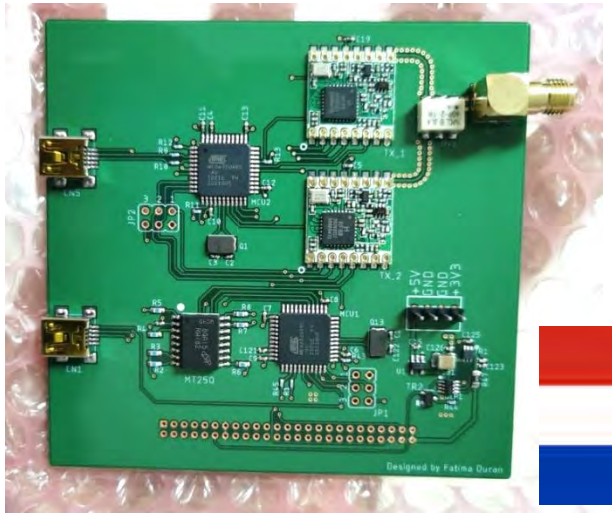




(Sent from Kyutech to participating GST Builders)

Nik Amirul
in Malaysia

KeYen in
Taiwan



Federico in Paraguay

GST Network meeting will be held in the last week of August. Everyone is invited to join. More details will be sent by email.

Thanking all GST Builders for their participation despite the delays due to pandemic. -- Pooja.

Editor's Note:
This document will show you how to make the antenna for the LoRa receiver:

https://drive.google.com/drive/folders/1DwtWMeN7XbMnjKnJCK7nxe3GecFFqs25?usp=sharing

Space Engineering Webinar 2021

by

Polimey IM (Cambodia) -- submitted 15 Aug 2021

(SEIC student starting Oct. 2021)

Space Engineering Webinar

This Webinar was created by the members of Dynamics and Control Laboratory with the support from KAXA, UT-ITC cubesat, STRIKE and American University of Phnom Penh. This Webinar conducted for 2 days via Microsoft Team. It had over 30 participants.

Objective of this Webinar

- Spread knowledge of space engineering and technology.
- Inspire and help students to have a good starting point to space technology.
- Connect students to our space enthusiast community.

Course Outline

Day 1

Introduction
- •Course overview
- •What is outer space?
- •Human activities in space?

Kahoot Quiz 1
Question & Answer

Lecture on rocket and space propulsion
- •Type of rocket propulsion
- •Introduction to amateur rocket

Kahoot Quiz 2
Question & Answer
- •Rocket team & KAXA activities

Day 2

Satellite technology
- •Satellite system and orbital mechanics
- •Fundamental of remote sensing

Kahoot Quiz 3
Question & Answer

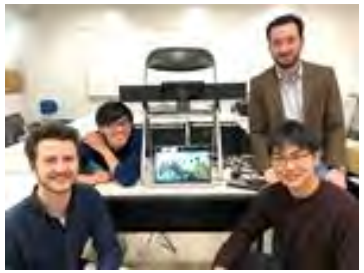
Guest speaker: Experience sharing by Ryohei TAKAHASHI (PhD Candidate)

Interactive activity: Space application for Cambodia
- •Working in a group to discuss the possible satellite application for Cambodia
- •Final presentation

Previous Seminars

Feb. 2019

Phase 1: Inspire
2-day hand-on activities on space engineering and policy.



Mar. 2020

Phase 2: Tacit knowledge
4-day course on CubeSat development

2021 to the present

Phase 3: Local space community
Sustainable community led by Cambodian space enthusiasts

Current Activities

Satellite Team

"Apsara-1"
CubeSat Project
Mentor: Mr. SAKAL Morokot

Rocket Team

"STRIKE"
Rocket Project
Mentor: Mr. TIM Hoksong

KAXA Team

"ARUN"
Rocket Project
Mentor: KAXA Team

KAXA Team

Kampuchea Aerospace Exploration Aspiration (KAXA) was created by 2nd year engineering students at *Institute of Technology of Cambodia* (ITC). They have the same dream to build the project related with robotics and aerospace. Currently, KAXA has 3 members, and they are actively recruiting more members.

- Members

LAY Chanraksmey

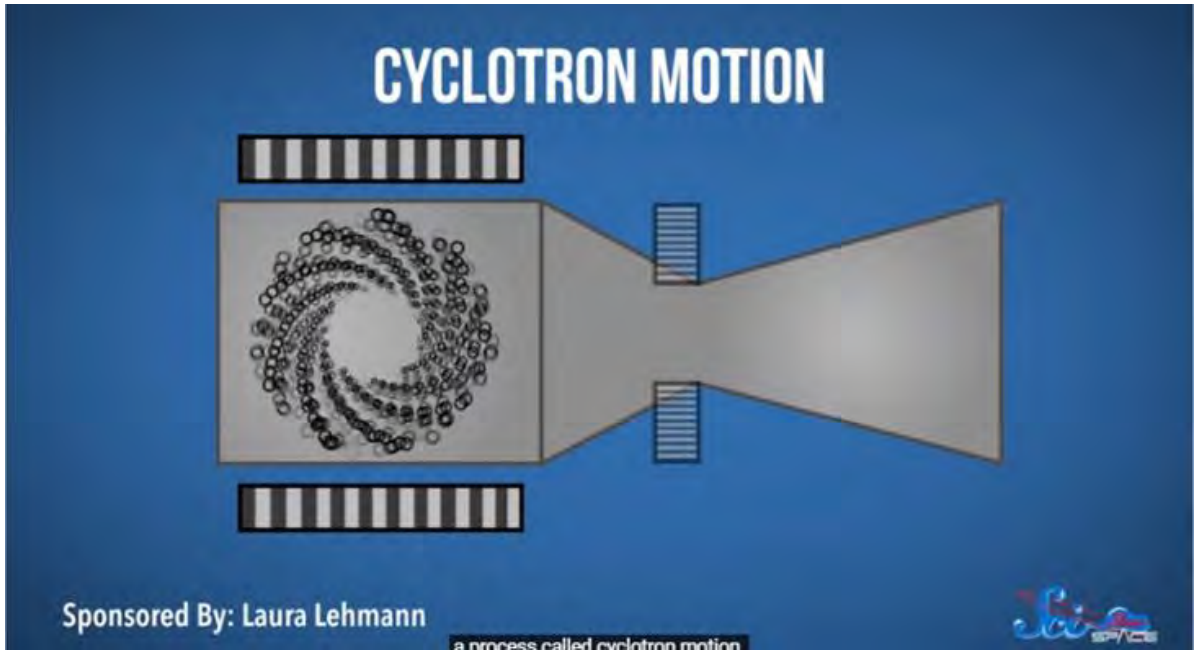
LY Pechvattana

CHHEANG Sopheakreach

THE END

THANK YOU

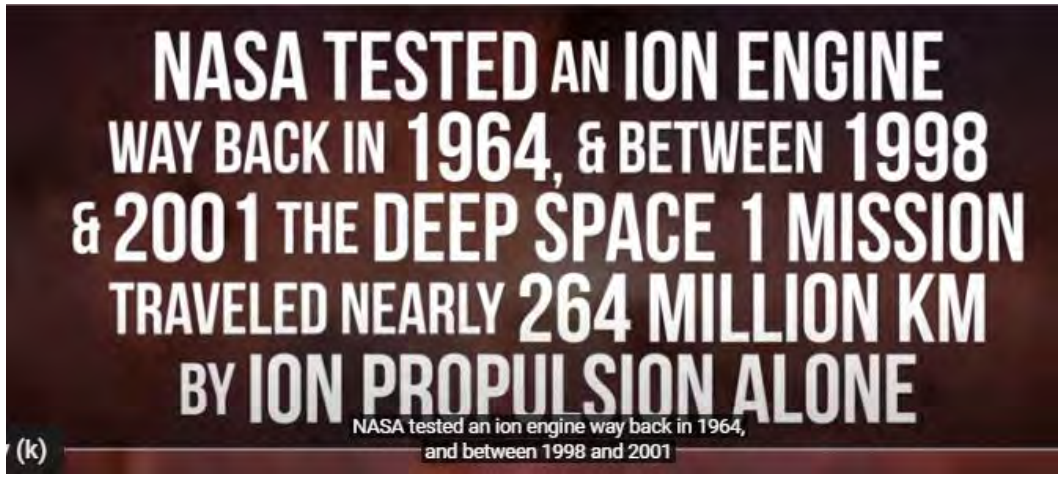
23. The Future of CubeSat Propulsion

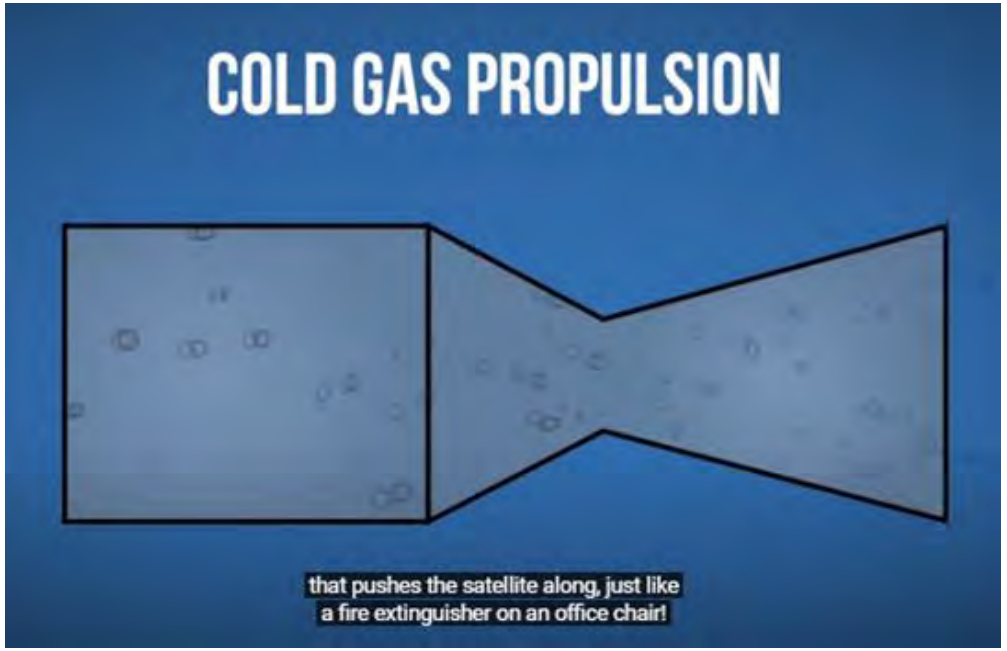


SciShow Space

CubeSats have a lot of advantages, but they need a way to move and still stay small, and that means new miniaturized propulsion systems that can help us get these tiny spacecraft out into the universe.

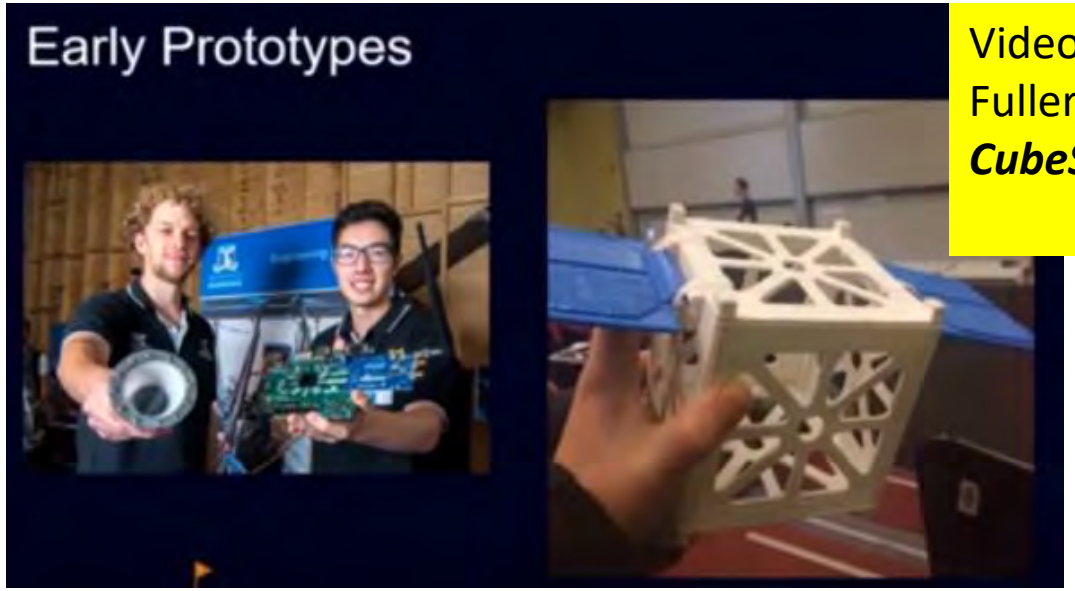
Hosted by: Hank Green





VIEW THIS YouTUBE VIDEO: https://www.youtube.com/watch?v=Y220vVJCp-g

24. The Melbourne Space Program (of Australia)

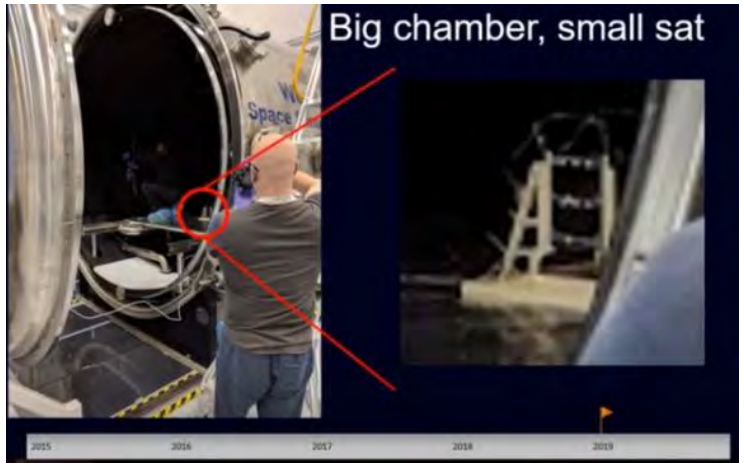


Video of a live stream presentation by Hydrix electronics engineer, Blake Fuller, sharing his journey in helping to design and launch the ***ACRUX-1 CubeSat.***

The event was hosted by the **Space Association of Australia**.

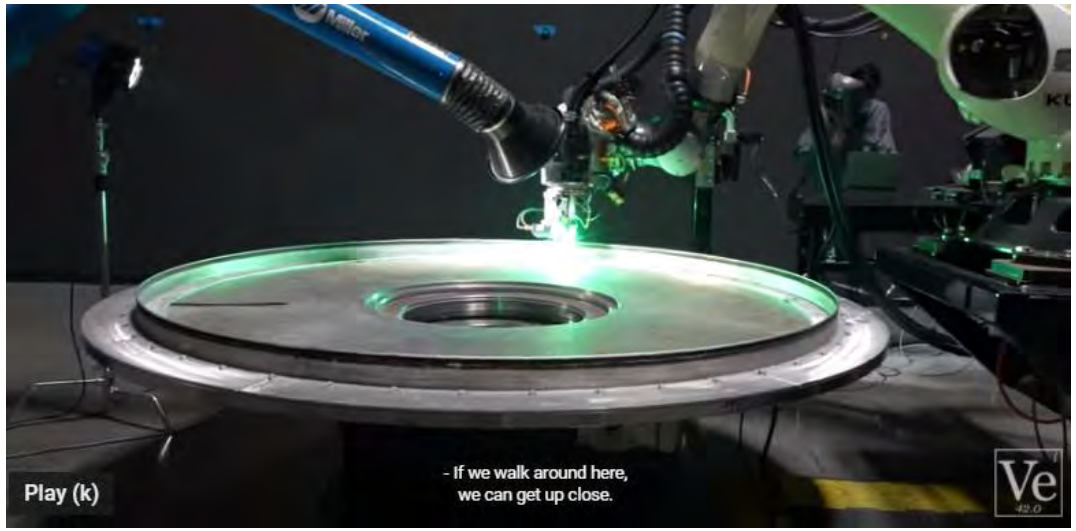
https://www.space.asn.au/

The Space Association of Australia is a non-profit, non-political interest group, whose members are keen to learn about and share with others their excitement and passion for spaceflight and space exploration.
The Association is based in Melbourne, Australia, with members across the country and has been active since 1981.
The Association exists to: promote, inform and educate the Australian public on the virtues of the peaceful exploration, utilisation and, colonisation of outer space; encourage space research and applications; and provide a regular forum for people to come together to share their knowledge and follow the latest space industry activities and space science developments from around the world.



VIEW THIS YouTUBE VIDEO: https://www.youtube.com/watch?v=TOE1t_vyuCE&t=21s

25. The Genius of 3D Printed Rockets



Veritasium

3D printed rockets save on up front tooling, enable rapid iteration, decrease part count, and facilitate radically new designs. For your chance to win 2 seats on one of the first Virgin Galactic flights to Space and support a great cause, go to https://www.omaze.com/veritasium

VIEW THIS YouTUBE VIDEO: https://www.youtube.com/watch?v=kz165f1g8-E

UiTMSAT COLUMN

Column No. 20

Editor: FATIMAH ZAHARAH BINTI ALI (*ali.fatimahzaharah@gmail.com*)
PhD CANDIDATE, LABORATORY OF SPACE WEATHER AND SATELLITE SYSTEM
SCHOOL OF ELECTRICAL ENGINEERING, COLLEGE OF ENGINEERING
UNIVERSITI TEKNOLOGI MARA (UiTM), SELANGOR, MALAYSIA

UNIVERSITI TEKNOLOGI MARA

UiTM Sentiasa Di Hatiku
"UiTM Always in My Heart"

THE INVOLVEMENT OF RISE PROGRAM IN ASEANSAT PROJECT

RISE which is a Researcher-Industry Scientific Exchange, is a program offered by Malaysian Ministry of Science, Technology, and Innovation (MOSTI) to its organizations or agencies. It is a platform for the researchers under the MOSTI's organizations or agencies to have research collaboration with related industries. This will enhance the opportunity of involved entities to develop the research capacity while adapting the developing technologies.

In May 2021, four (4) researchers from Malaysian Space Agency (MYSA), a space entity under MOSTI have officially joined the ASEANSAT project, through the RISE program. ASEANSAT is the first satellite collaboration project between Universiti Teknologi MARA (UiTM) Malaysia, University of Perpetual Help System DALTA (UPHSD) Philippines, and King Mongkut's University of Technology North Bangkok (KMUTNB) Thailand.

The involvement of the MYSA researchers as RISE participants in the project is to support the satellite development project. Each of the researchers possesses backgrounds that would assist the technical team of ASEANSAT project especially during the phase of space environment testing.

On the other hand, the RISE participants will have the opportunity to learn the process of developing a CubeSat in the ASEAN project as the BIRDS program is adopted. This is one of ways of exchanging space knowledge and enliven the space technology for the benefit of developing country. Furthermore, the RISE program has become a bridge between the government agency and other entities in research and project collaborations.

Figure 1: Online meeting to introduce the MYSA researchers under RISE program to the ASEANSAT team and to brief the ASEANSAT project to the MYSA researchers.

As aforementioned that RISE is a program of exchanging expertise between industry and researchers under MOSTI's agencies or organization, the RISE participants are technically attached with Orbital Space Sdn. Bhd. In ASEANSAT project. Orbital Space is a start-up company that also involves in the ASEANSAT project for value engineering related part.

The RISE participants participate in the ASEANSAT project on part-time basis in which they still have responsibility as MYSA employees. Thus, the involvement of the RISE participants will be based on the workload and upon requirement in assisting and supporting the ASEANSAT members. Apart of assisting the project during the space environment testing phase, they are also given tasks based on their interest and backgrounds to work along with the technical members of ASEANSAT in developing the satellite. Below are the subsystems that are assigned to the RISE participants:

- Antenna Subsystem
- Structure
- Electrical Power Subsystem
- Communication Subsystem

With the involvement of MYSA researchers through this MOSTI's program in the ASEANSAT project, the mission of the project in developing a satellite with utilization of local experts and facilities can be flourished and achieved. It can be seen that the ASEANSAT project can be the medium in promoting and catalyzing the space technology specifically in satellite development for Malaysia and other developing countries in ASEAN region.

End of Malaysia's Column

27. YouTube video about satellite development at Kyutech

【九州工業大学】 学生が衛星開発!?｜工学部宇宙システム工学科で世界と宇宙とつながる技術を磨く!!

Dec 3, 2020

THIS IS THE LINK FOR VIEWING: https://www.youtube.com/watch?v=0czcmsv3qJ8

28. Column #6 by Fatima of El Salvador

BPN Español

- No. 6 -

Fatima Duran

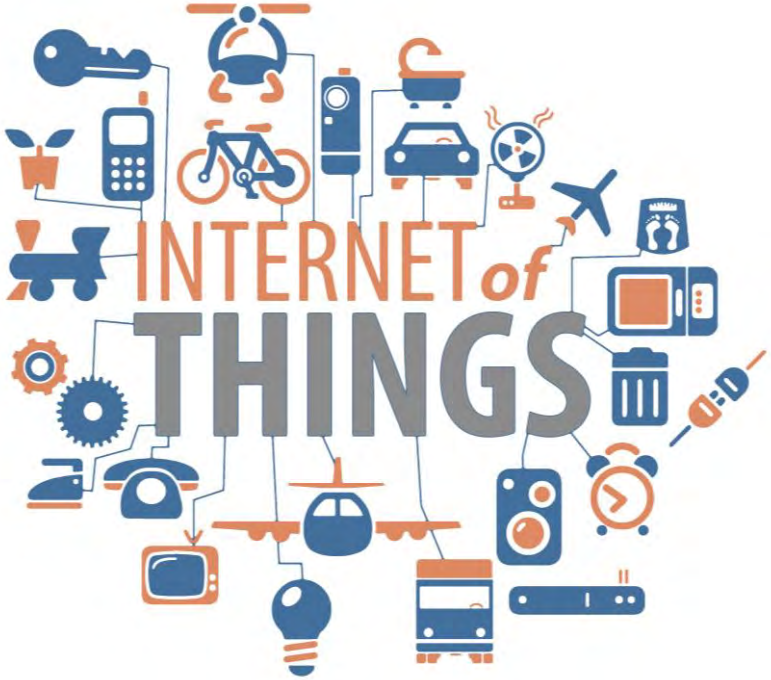
El Salvador

Estudiante SEIC/PNST

Satélites & IoT

¡Hola! En esta columna #6 de BPN Español, te compartiré un poco sobre el creciente uso del Internet of Things (IoT) en el área espacial y específicamente cómo se espera que esta tendencia revolucione las comunicaciones y servicios satelitales.

Internet of Things (IoT)

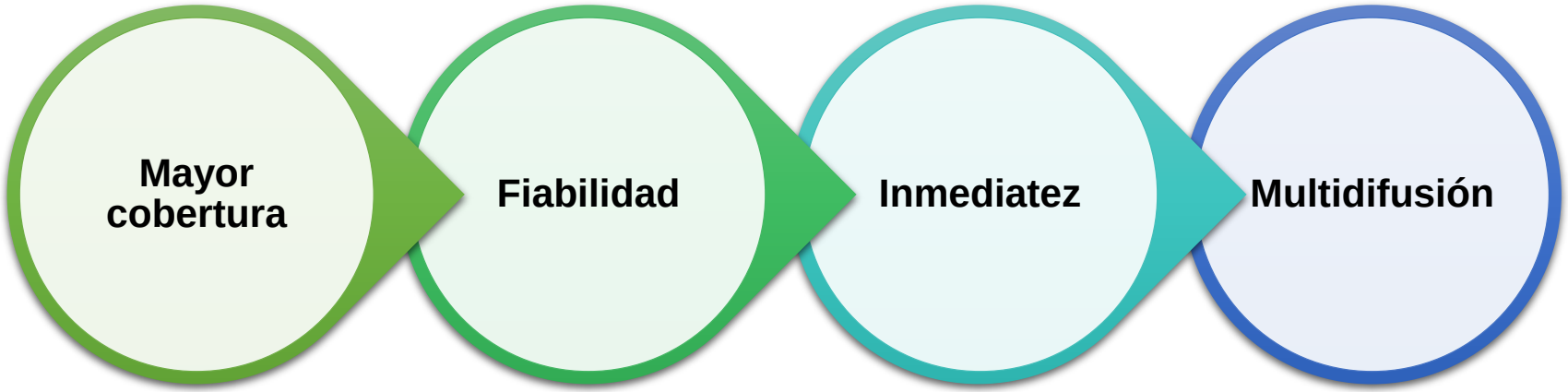


Internet of Things (IoT). Fuente: Unisystem

Internet of Things (IoT) se refiere a una red de objectos físicos (cosas) incluyendo sensores, software y otras tecnologías, que conectadas entre sí, tiene por objetivo intercambiar datos con otros dispositivos y sistemas a través de Internet. Además, recientemente se ha demostrado que las tecnologías IoT pueden implementarse en distintas áreas permitiendo conectar a Internet desde objetos de uso cotidiano y doméstico, hasta distintos objetos de diversas áreas industriales incluyendo la industria espacial, en la cual, se espera tendrá abundantes beneficios.

Satélites & IoT

De acuerdo a Alén Space, una compañía española, dedicada a ofrecer servicios satelitales, sostiene que el uso de IoT es esencial para garantizar conexiones de 5G inalámbricas, pero todavía hay ciertas limitantes como el acceso y monitoreo de áreas remotas, mayor ancho de banda y mayor capacidad para recopilar datos. Es por ello, que la implementación de IoT en satélites propone una solución integral en órbita, y se espera que las comunicaciones y servicios IoT aumenten de forma gradual la demanda de soluciones satelitales alrededor del mundo. Algunos beneficios de incorporar satélites IoT son las siguientes:



Para más información…

https://alen.space/es/pequenos-satelites-para-servicios-iot/#0

END OF COLUMN #6

29. Report from the Philippines

Philippine Space Agency

PREPARED BY:

Tricia Zafra
Jo Briones
Pricila Aquino
Public Relations and Information Division (PRID)
Philippine Space Agency

FILIPINO KIDS TALK TO JAPANESE ASTRONAUT!

In celebration of 65 years of formal diplomatic relations between the Philippines and Japan, the Philippine Space Agency (PhilSA), with the support of the Philippine Department of Foreign Affairs (DFA), released a video of Filipino kids sending messages to JAXA astronaut NOGUCHI Soichi.

In the video, Astronaut Noguchi responds to the children that while he could not answer all the questions sent to him, he wishes to be able to travel to the Philippines in the future and talk to the children in person.

Noguchi, a veteran astronaut, was most recently on the International Space Station (ISS) as one of the mission specialists of the SpaceX Crew-1. He famously took photos of Palawan island and the archipelago of the Philippines from his view in space earlier this year.

Crew-1 safely returned to Earth in May.

https://www.facebook.com/PhilSpaceAgency/posts/302215798304987
https://www.youtube.com/watch?v=W0Hp5L9CNGc&t=2s

PhilSA celebrates 2nd anniversary

The Philippine Space Agency (PhilSA) is celebrating its 2nd year with the theme "*Gabay mula Kalawakan, Tanglaw sa Pagbangon*" (guiding light from space towards recovery).

PhilSA highlights the role of space science and technology applications (SSTA) and innovations in the country's recovery from the pandemic, and in forging the nation's path toward digital governance and knowledge economy.

Take a look at PhilSA's two-year journey.

https://philsa.gov.ph/news/philsa-marks-2nd-year-highlights-vital-role-of-space-st-in-economic-recovery-and-development

STAMINA4SPACE

PREPARED BY:

Mae Ericka Jean C. Picar
Information Officer, STeP-UP Project
STAMINA4Space
Overall Graphics/Layout Artist and Contributing Writer

Nicole V. Ignacio
Information Officer, ASP Project
STAMINA4Space
Contributing Writer/Editor

F. Mara Mendoza
Project Manager, STeP-UP Project
STAMINA4Space
Contributing Writer/Editor

Maya-1 Deployment Anniversary

Courtesy of ESA/Alexander Gerst

ON THIS DAY

BIRDS-2 Cube Satellites (CubeSats) Maya-1, UiTMSAT-1, and BHUTAN-1 were released to space from the International Space Station (ISS).

Maya-1 is the Philippines' first CubeSat designed and built for technology demonstration and as an educational platform for CubeSat development under the 2nd Joint Global Multi-Nation Birds Satellite or BIRDS Project initiated by then Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE; now Laboratory of Lean Satellite Enterprises and In-Orbit Experiments) at the Kyushu Institute of Technology (Kyutech) in Japan. It was built by Fliipino engineers Joven Javier and Adrian Salces, who were sent to Kyutech with the support of the Department of Science and Technology's Science Education Institute (DOST-SEI).

It was decommissioned on November 23, 2020, and is succeeded by Maya-2 (in orbit since March 2021) and Maya-3, 4, 5, and 6 (upcoming).

Look back on Maya-1's journey:
https://stamina4space.upd.edu.ph/maya-1/

Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

Annual Small Satellite Conference

On its 35th year, the Annual Small Satellite Conference is themed "Mission Operations & Autonomy: Operations and data delivery at the speed of light". It aims to "explore the realm of the possible in new space mission operations and autonomy enablers that will drive the speed of information exchange".

Engr. Vanessa Tan, a University Researcher from our "Building PHL-50: Localizing the Diwata-1, 2 Bus System as the Country's Space Heritage 50 kg Microsatellite Bus" (PHL-50) Project, will be presenting two papers co-authored with fellow STAMINA4Space researchers:

MATA-RL: Continuous Reaction Wheel Attitude Control Using the MATA Simulation Software and Reinforcement Learning

- Discusses a satellite attitude control using reinforcement learning
- Authors: Vanessa Tan, Marc Caesar Talampas, John Leur Labrador

Access the paper: https://digitalcommons.usu.edu/smallsat/2021/all2021/246/

MATA-Cloud: A Cloud Detection and Dynamic Attitude Correction Evaluation Software

- Presents a cloud detection and attitude correction evaluation software
- Authors: Vanessa Tan, Julie Ann Banatao, John Leur Labrador, Lia Cristina Mabaquiao, Floyd Ferrant Fortes,Marc Caesar Talampas

Access the paper: https://digitalcommons.usu.edu/smallsat/2021/all2021/103/

MATA-Cloud: A Cloud Detection and Dynamic Attitude Correction Evaluation Software

These works are derived from their TENCON2020 paper titled "MATA: Mission, Attitude, and Telemetry Analysis Software for Micro-Satellites".

Read the paper here: https://ieeexplore.ieee.org/abstract/document/9293937

Philippine Space Agency

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Feature: Maya-2 Engineers

Izrael Zenar Bautista, Mark Angelo Purio, and Marloun Sejera, the three student-engineers who developed the Philippines' second cube satellite Maya-2, has been recently featured by the Department of Science and Technology (DOST). In the feature, they shared their once-in-a-lifetime experience in building the Maya-2 cube satellite.

Photo courtesy of Department of Science and Technology Facebook Page

PINOY SPACE ENGINEERS SHARE THEIR ONCE-IN-A-LIFETIME EXPERIENCE IN BUILDING MAYA-2 CUBE SATELLITE

It is all about grabbing the opportunities in front of them and to be part of something revolutionary for our country. These are all the common answers shared by Izrael Zenar Bautista, Mark Angelo Purio, and Marloun Sejera, the three student-engineers who developed the country's second cube satellite called Maya-2.

DEPARTMENT OF SCIENCE AND TECHNOLOGY

www.dost.gov.ph /dostph

Philippine Space Agency

STAMINA4Space Program

STeP-UP Scholars Batch 1

STeP-UP Scholars Batch 2

Buwan ng Wikang Pambansa (National Language Month)

In the Philippines, the national language month is celebrated annually every August.
For this year's celebration, we shared the origins and translation of our Philippine satellites' names and how they are written in *Baybayin*.
Baybayin is one of the writing systems native to the Philippines, attested from before Spanish colonization through to at least the 18th century.

diwata (n.)
Tagalog
a muse, nymph, fairy

maya (n.)
Tagalog
The term maya refers to a folk taxonomy often used in the Philippines to refer to a variety of small, commonly observed passerine birds, including a number of sparrows, finches and munias.

mula (n.)
Ilokano
plant

Philippine Space Agency
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STeP-UP Scholars Batch 2

Preparation of STeP-UP Batch 1 tean
Maya-3 and Maya-4 Mission Operations

While the team is awaiting for the launch of Maya-3 and Maya-4 cubesats to the ISS, ground station operation preparations are being made. Among of the preparations is the Ground Station (GS) software testing.

Maya-3 & Maya-4 GS Software Main Frame

Maya-3 & Maya-4 GS Software Command Frame

PREPARED BY:

Renzo S. Wee
Derick B. Canceran
Bryan R. Custodio
Judiel L. Reyes
Layout Designer & Contributing Writer

Marielle M. Gregorio
Gladys A. Bajaro
Christy A. Raterta
Lorilyn P. Daquioag
Contributing Writers

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Ground Station Software Testing for Maya-3 and Maya-4 Mission Operations

Engr. Bajaro performing the GS software testing

Engr. Custodio preparing Maya-3 EM for GS software testing

To test the GS software's changes and updates, the team used the Maya-3 Engineering Model as the receiver of command uplink and transmitter of beacons and mission data. The software testing was successfully done with data collected from Maya-3 EM completely received and properly decoded.

STeP-UP PROJECT

PREPARED BY:

Khazmir Camille Valerie Macaraeg
Layout Editor & Contributing Writer

Angela Clarisse Chua
Graphic Artist & Contributing Writer

Joseph Jonathan Co
Anna Ruth Alvarez
Gio Asher Tagabi
Genesis Remocaldo
Chandler Timm Doloriel
Ronald Collamar
Contributing Writers

INTEGRATION TESTS

Partial Integration Tests lead by Ronald, the AIT lead, resumed last July 29 and 30. Tests include the overall functionality of the cube satellite's different missions and subsystems. A series of GS uplink commands were sent to the cube satellite to monitor the behavior of each mission and subsystem. Remaining EM Functionality tests will resume once the scholars have access to the laboratory.

20:03
10/05/2108

Philippine Space Agency
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End of this **BIRDS Project Newsletter**

(ISSN 2433-8818)

Issue Number Sixty-Seven

This newsletter is archived at the BIRDS Project website:
http://birds1.birds-project.com/newsletter.html

When a new issue is entered in to the archive, an email message is sent out over a mailing list maintained by the Editor (G. Maeda, Kyutech). If you wish to be on this mailing list, or know persons who might be interested in getting notification of issue releases, please let me know.

This newsletter is issued once per month. The main purpose of it is to keep BIRDS stakeholders (the owners of the satellites) informed of project developments.