



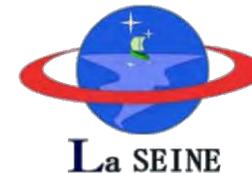
BIRDS Project Newsletter

Issue No. 5 (20 June 2016)



Edited by:

G. Maeda, Tejumola Taiwo, M. Cho,
Laboratory of Spacecraft Environment Interaction
Engineering (LaSEINE),
Kyushu Institute of Technology,
Kitakyushu, Japan.



Project website: <http://birds.ele.kyutech.ac.jp/>

Bangladesh



Nigeria



Mongolia



Ghana



Japan



Contents of this Issue

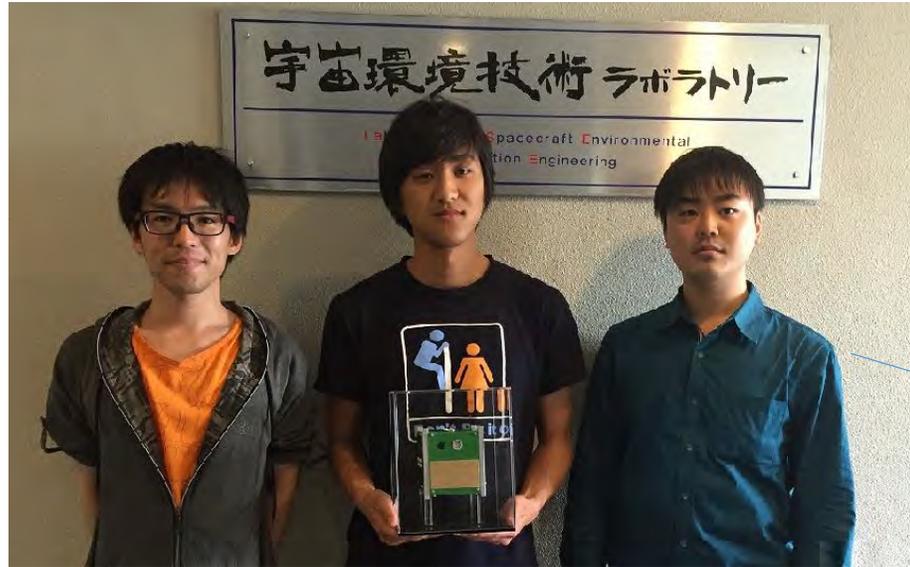
1. BIRDS Workshop: Welcome message from **Japan Team**
2. BIRDS Workshop: Welcome message from **Ghana Team**
3. BIRDS Workshop: Welcome message from **Mongolia Team**
4. BIRDS Workshop: Welcome message from **Nigeria Team**
5. BIRDS Workshop: Welcome message from **Bangladesh Team**
6. Delivery of Structure and Thermal Tests Model (STM)
7. Battery Screening Overview
8. Press coverage of BIRDS in Bangladesh
9. The first BIRDS article to appear in the Japanese news media
10. Subsystem Summary #11: ADCS (Attitude Determination . . .)
11. Ground Station in Taiwan
12. Assembly of the EM (Engineering Model)

The First International BIRDS Workshop and CDR takes place at Kyutech during 27-29 June 2016. The primary guests are our BIRDS partners from overseas – who will travel great distances to participate in this project-based workshop. Our five national teams present the following welcome messages to you, our partners.

1. BIRDS Workshop: Messages from the Japan Team

All students of Kyutech

Thank you for coming here from places that are far, far away from here. Although it is tough to work with big differences in culture and language, we (members of the project) are pulling together to develop the BIRDS satellites with the full spirit of international cooperation. We believe this type of “global experience” will help us in the future, wherever we may go. With a strong sense of team work, we will complete this project successfully. – *Student Tokunaga.*



Welcome to Japan and our school, Kyutech. We are engaged in a grand project – to put into space satellites built by the students of several countries. This means your students. With them, we have been working hard. At this workshop, please listen to and view our progress reports. – *Student Shigyou.*

Thank you for coming here from distant shores to attend our CDR. We are hard at work developing the BIRDS satellite. This CDR is our *Critical Design Review* – and it really is critical. During this review, please observe our work with deep scrutiny. – *Student Nakamura.*



2. BIRDS Workshop: Message from the Ghana Team

Dear Guests of the 2016 BIRDS Summer Workshop,

We welcome you all to the Birds Summer Workshop 2016.

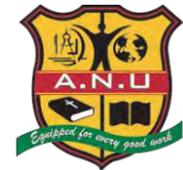
On behalf of the Ghana team we are extremely grateful for your support and your great leadership in making BIRDS project a reality.

As you know the mission of BIRDS project is a platform set to build the capacity of students from developing countries to build and operate their first satellite as the first step towards indigenous space program at each country.

From mission definition, system design, assembly and integration we have been able to reach our engineering model phase, which is one of the critical phase to the flight model phase. As well as building our knowledge in space science and technology, BIRDS Projects has produced cultural exhibition to enhance our understanding of the variety of human expression worldwide.

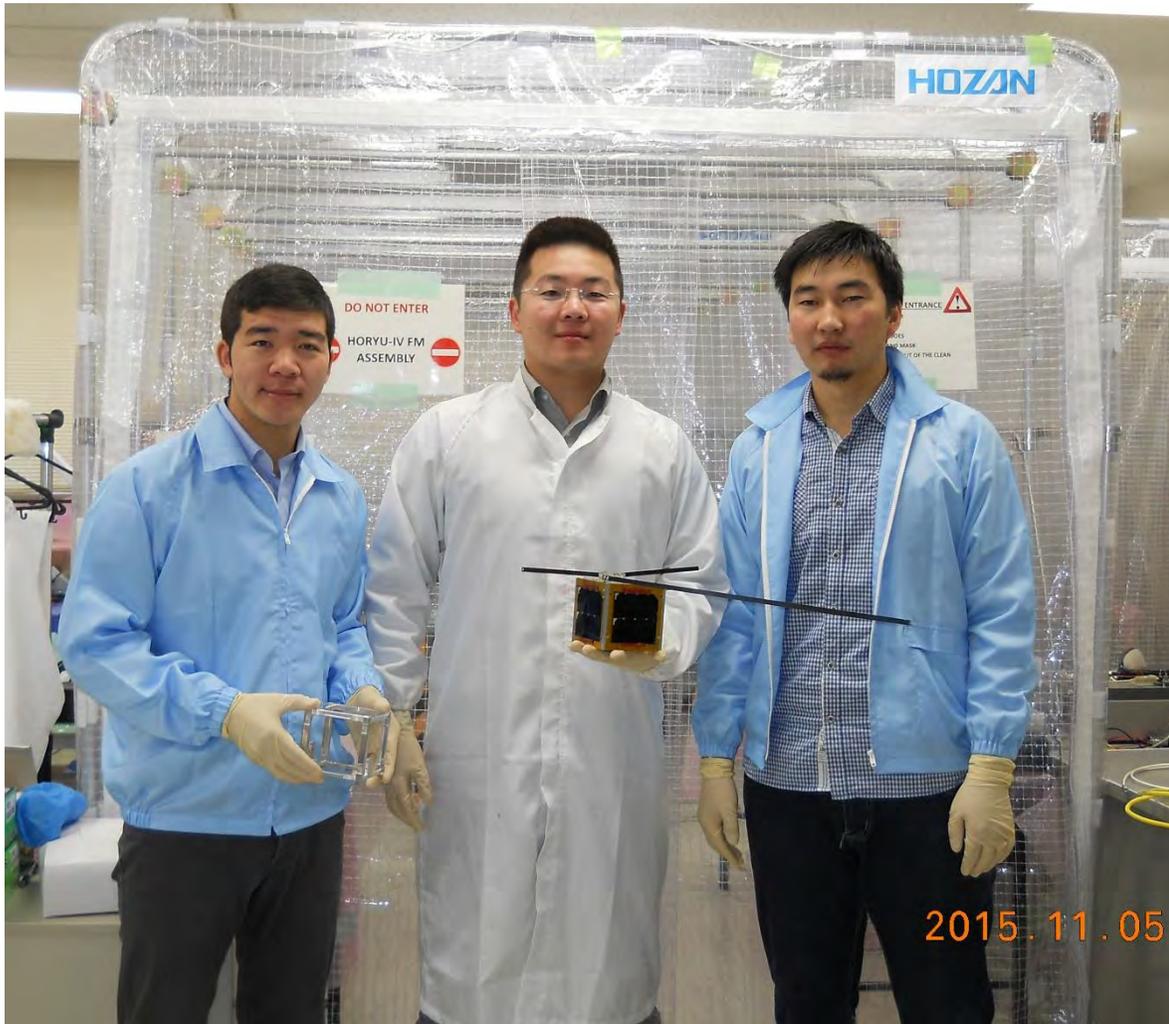
Thank you again for your generous sponsorship and support.

Sincerely,
Bonsu Benjamin, Joseph Quansah, Ernest Matey.



3. BIRDS Workshop: Message from the Mongolia Team

Students of the National
University of Mongolia
(NUM)



Dear Guests of the 2016 BIRDS Summer Workshop,

We are very delighted to have you come from far and near with us attending in this workshop of BIRDS Project. Your encouragement helps to move one step forward that our birds will be flying in the space. We would like to mention here that we are motivated with your generous support. We are working with our sincere spirit and put a lot of effort into having a successful mission that many people are waiting the result since you gave us a great confidence and promotion.

The project consists of five nano satellites operated by seven different ground stations. We strongly believe that it would be first starting point for further space technology collaboration between all members.

We wish good luck to everyone!

*Yours faithfully,
The Mongolian Team*



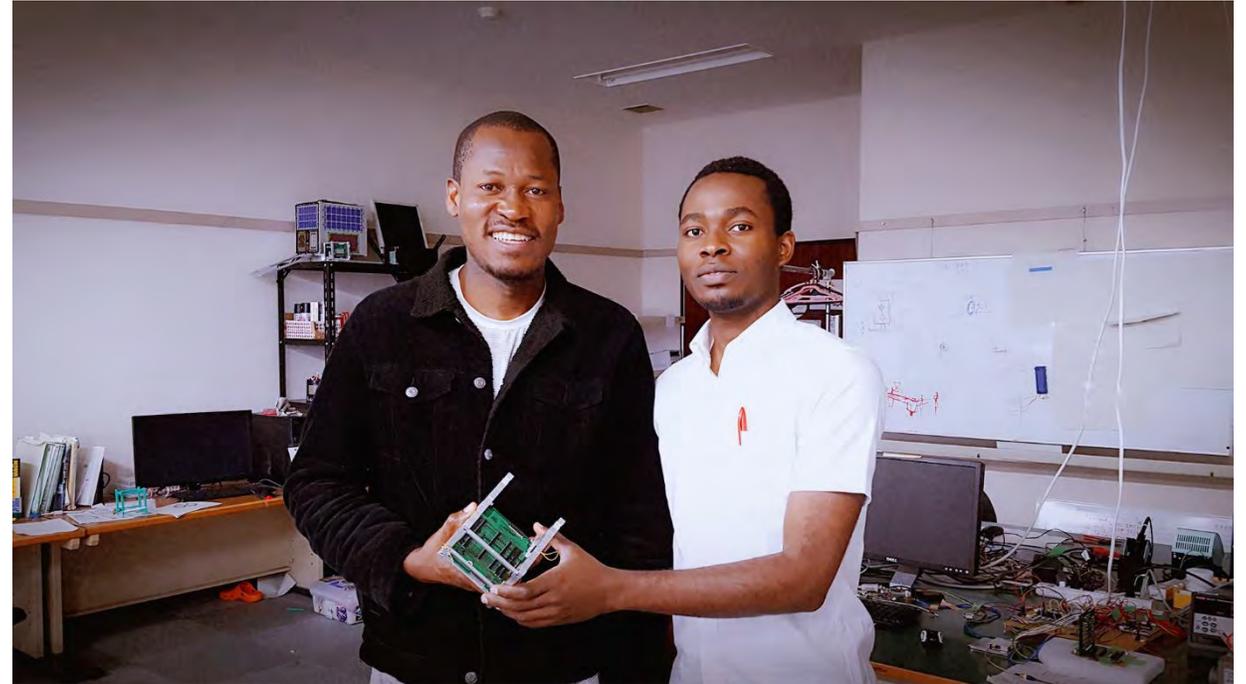
4. BIRDS Workshop: Message from the Nigeria Team

Students of Federal University of Technology, Akure (FUTA)

BIRDS Workshop Greetings from the Nigeria Team

The Nigerian Team wishes to express special greetings to all participants attending the *1st BIRDS International Workshop and CDR* at the **Kyushu Institute of Technology** and wishes everyone a successful stay here in Kitakyushu.

We have learnt a lot here and hope we shall replicate this knowledge back home especially in the area of developing university satellite and establishing stronger synergy between Nigerian universities and the National Space Research and Development Agency (NASRDA) towards sustainable space technology.



We are also glad about the special international human network we have established here with our colleagues participating in the BIRDS Project from Japan, Ghana, Mongolia, Bangladesh and Thailand.

Yours sincerely,
Tejumola Taiwo and Adebolu Ibukun



5. BIRDS Workshop: Message from the Bangladesh Team

Dear Guests of the 2016 BIRDS Summer Workshop,

We are very excited to learn that you will be joining us in the next milestone of the BIRDS project, “Critical Design Review (CDR)”. We are happy to tell you that we have already completed the First Engineering Model (EM-V1) and testing it thoroughly, every day to make it even better.

BIRDS project excites us not only because it is our first satellite project, but also the first experimental CubeSat for our country as well. We really want it to succeed, but at the same time we are only students, prone to make mistakes. Your presence and criticism during CDR is invaluable for not only us but also for the overall project success.

We would like to thank you for your continuous support and patronage in this project as they inspire us to work harder. We look forward to meet you in the 2016 BIRDS Summer Workshop.

EM



Sincerely,
Raihana S.I. Antara, Abdulla Hil Kafi,
Maisun Ibn Monowar
Team Bangladesh (A.K.A. “Team Centurions”)



6. Delivery of Structure and Thermal Tests Model (STM)



Ibukun explains the STM

During the weekly BIRDS meeting of 19 May 2016 in the CeNT Building, Student Ibukun showed and explained the first version of the **Structure and Thermal Tests Model (STM)** of the BIRDS Project. The purpose of the STM is to validate the mechanical design — to confirm that we have designed the right system for the intended mission. Modifications are performed on this STM, and in extreme cases, wholesale revisions occur, and afterwards the Engineering Model (EM) emerges. The STM shown on this page was fabricated by “Sankyo Seiki” 「三共精機」, a manufacturing company in Japan.



BIRDS Weekly Meeting



7. Battery Screening Overview

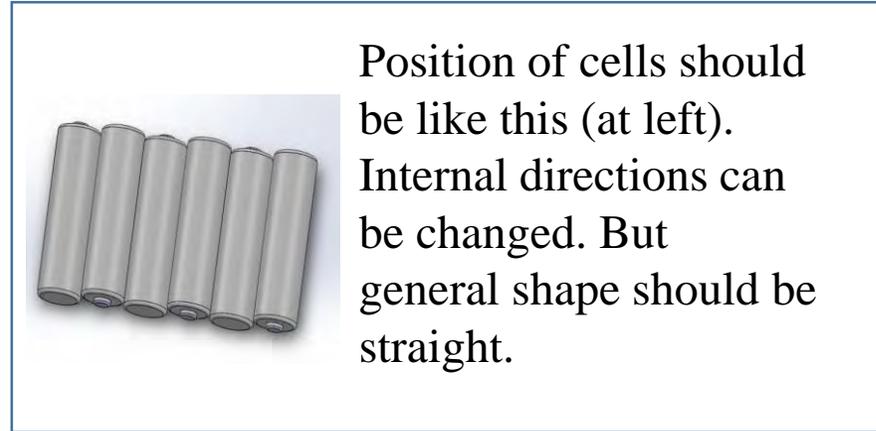
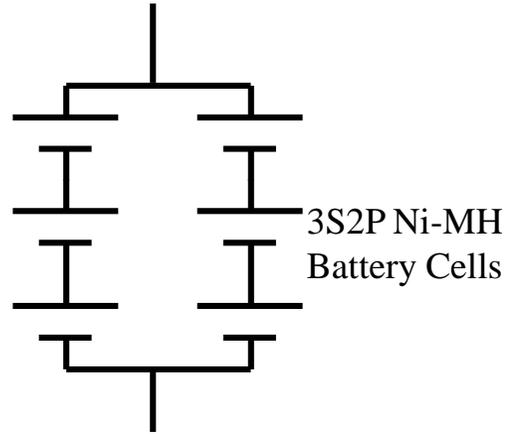
Battery Screening Basics

by Student Erka of Mongolia



BIRDS-EPSC

Battery construction (Eneloop HR-3UTGA)



Approx. 15mm*51mm*90mm

Type:	Nickel-Metal Hydride Battery
Size:	AA Consumer Type
Capacity:	3800-4000mAh
Nominal Voltage:	$1.2V * 3 = 3.6V$
Weight:	$27g * 6 = 162g$
Size : (Diameter) x (Height):	14.35(D) x 50.4(H) mm



Screening Process

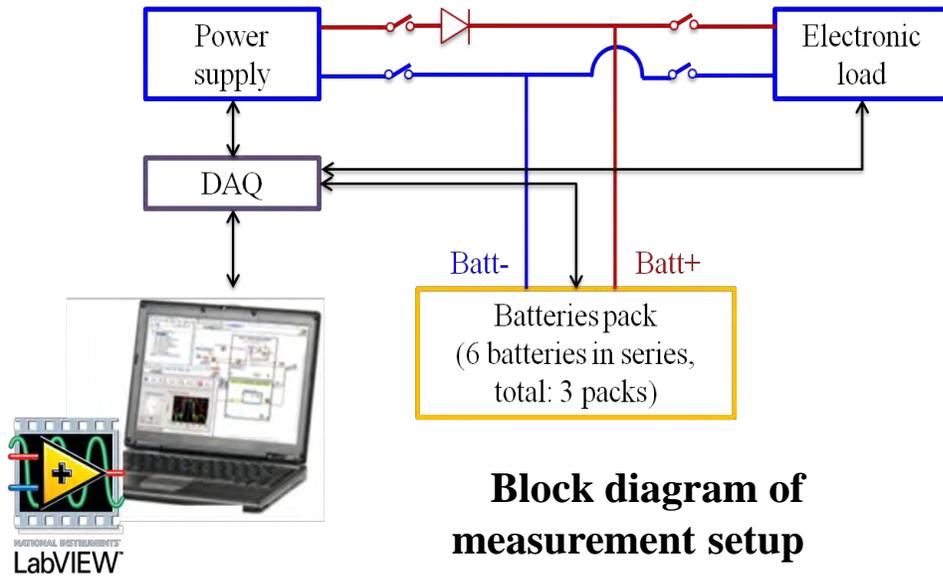
-- to select batteries for Flight and Engineering Models

The characterization process included two tests. The first test was Discharge/Charge test, and the second test was internal impedance estimation test. Eventually battery packs shall be constructed based on these test results. One of the tests is to estimate impedance of cells, which is a characteristic of battery self-discharge, just before and after the charge/discharge cycles in case of without environment test.

Screening of Battery Cells

- Period: 12 ~ 25 May, 2016
- Quantity: 56 eneloop® Ni-MH cells
- Objective: to identify cells to have 3S2P Battery for both EM and FM
- Test Procedures:
 - Discharge/Charge characterization
 - Internal Impedance measurement

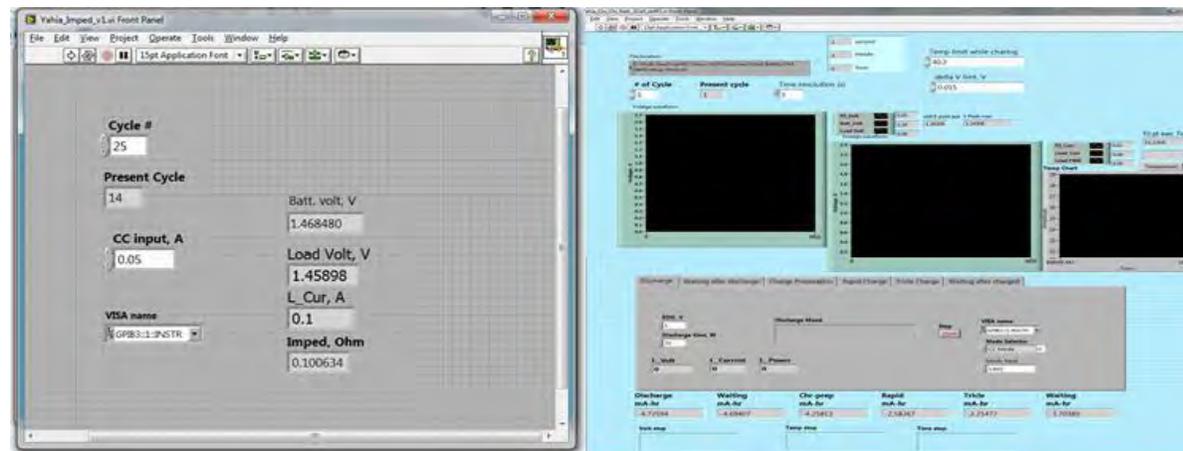
Screening configuration



Block diagram of measurement setup

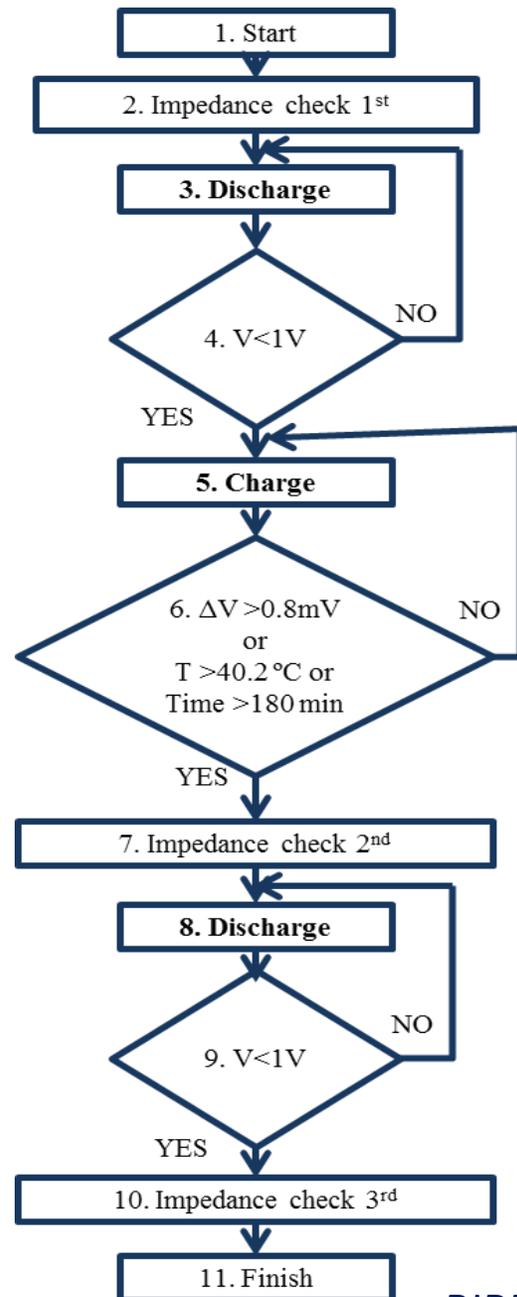


Actual appearance of measurement setup



Interface of LabView program

Procedural Flowchart



1. Charge/discharge program start
2. 1st impedance measurement (I=500mA, 100mA)
3. Discharge (C.C mode Current 1C=1900mA, EOD=1V)
4. Check EOD until 1V
5. Charge (preparation mode I=500mA, Rapid charge mode I=1000mA, Trickle charge I=100mA)
6. Three parallel conditions were checked
7. 2nd impedance measurement (I=500mA, 100mA)
8. Discharge (C.C mode Current 1C=1900mA, EOD=1V)
9. Check EOD until 1V
10. 3rd impedance measurement (I=500mA, 100mA)
11. Cycling process finish

8. Press coverage of BIRDS in Bangladesh

(1) Dr Khan at the University of Texas, El Paso, USA

On 15 June 2016, a major press conference took place on the campus of **BRAC University in Dhaka, Bangladesh**. Here, BRAC publicly and officially announced its participation in the **BIRDS Project** by inviting a large number of media people in Bangladesh (TV, print, etc.). It is significant news because BIRDS is the first indigenous satellite of Bangladesh.



(2) BRAC University side in Bangladesh – all three sides were connected via Skype

It was a lively cross-border press conference involving three locations: (1) Dr Khan in the USA, (2) BRAC University in Bangladesh, and (3) Kyutech in Japan.

Prof. Mengu Cho explains the satellite to the press corp in Bangladesh.

Some of the print media output is shown on the next page.

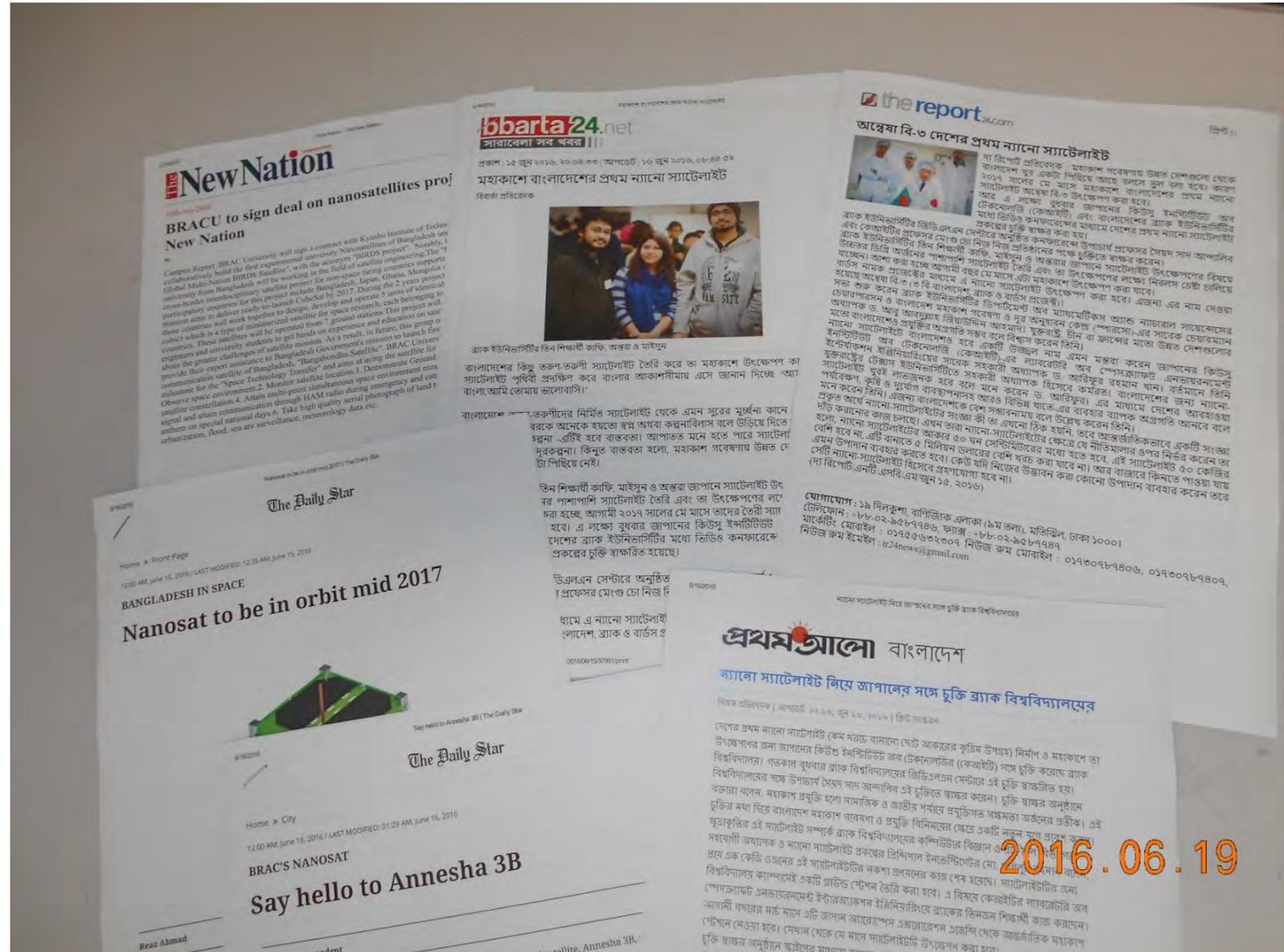
Antara makes a statement.



===== (3) The Kyutech side =====



A very small sample of the media output in Bangladesh, in both English and in Bengali.

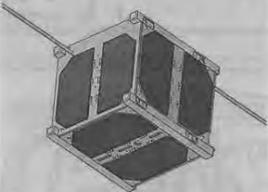


小型衛星 進む国際連携

九工大とナイジェリアなど海外大



タイウオ人2人、モラ・テジュさん(手前左から)ら「Birdsプロジェクト」のメンバーたち



「Birdsプロジェクト」で開発する超小型衛星のイメージ図(九州工業大提供)

4カ国の留学生と開発中

九州工業大(北九州市)がナイジェリアやバングラデシュなど4カ国の大学からの留学生を指導し、日本人学生も含めて個別に計5個の超小型衛星を開発する「Birdsプロジェクト」に取り組んでいる。これとは別に、シンガポールの大学と共同開発中の衛星の打ち上げも予定。いずれの衛星の運用にも海外の大学が加わり、九工大は各国の宇宙技術向上に貢献しながら衛星利用の国際ネットワーク構築を目指す。

昨年10月に始動した「Birdsプロジェクト」に参加するのは、他に方1ナ、モンゴルの大学。いずれも宇宙開発分野では「これからの国だ。日本人大学院生3人を含む計15人が同型

の衛星をそれぞれ開発し、後継機の開発も進めてお宇宙航空研究開発機構(JAXA)の支援事業を利用して2017年に国際宇宙ステーションから軌道に投入する計画という。衛星は、一辺約10センチの立方体で重さ約1キロ、搭載カメラを使った自国の撮影や電波通信を行う。プロジェクトのリーダーでナイジェリアの宇宙機関に勤めていたテジュモラ・タイウオさん(35)は「個別に競争することで優れた衛星を打ち上げることができると話す。」

一方、九工大はシンガポールの南洋理工大とも超小型衛星「AOBABEL OXIII」(愛称・あおは)を共同開発し、今夏以降に打ち上げる予定。縦横約10センチ、長さ約20センチ、重さ約2キロで、南洋理工大が作った推進器の噴射実験など衛星の可能性を広げそう(野村大輔)

9. The first BIRDS article to appear in the Japanese news media

From the 5 June 2016 issue of the *Nishi Nippon Newspaper*

The head line reads:

- Expanding international ties by developing nano satellites in an academic setting.
- Kyutech works with major universities in Nigeria and other countries.
- Satellite development occurring with students from Ghana, Mongolia, Nigeria, and Bangladesh.

10. Subsystem Summary #11: ADCS

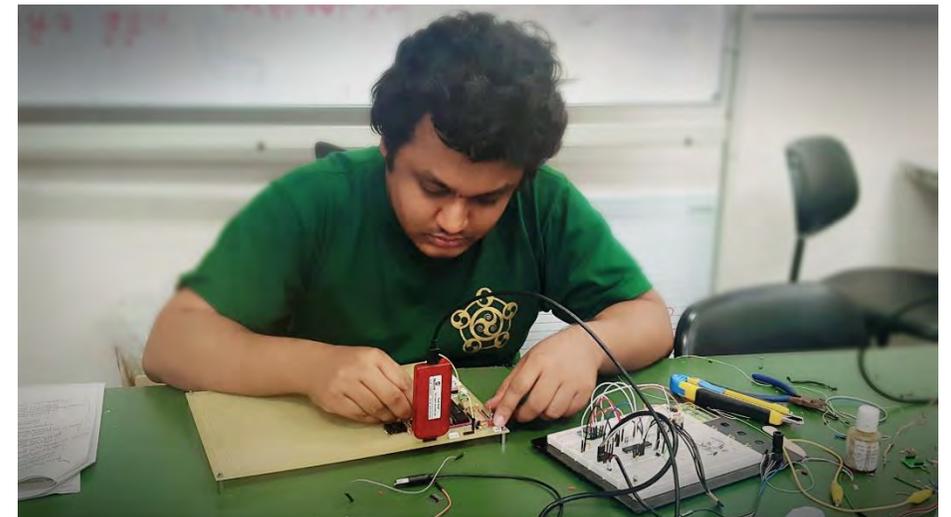
THIS IS THE FINAL SUBSYSTEM SUMMARY.

See previous newsletters for all other summaries.

Attitude Determination and Control System (ADCS)

Abdulla Hil Kafi, in the photo at right, working on ADCS

Joseph Quansah



Background

Attitude Determination and Control System

- Importance

 - Stabilizes the Satellite

 - Senses the orientation of the satellite relative to reference points.

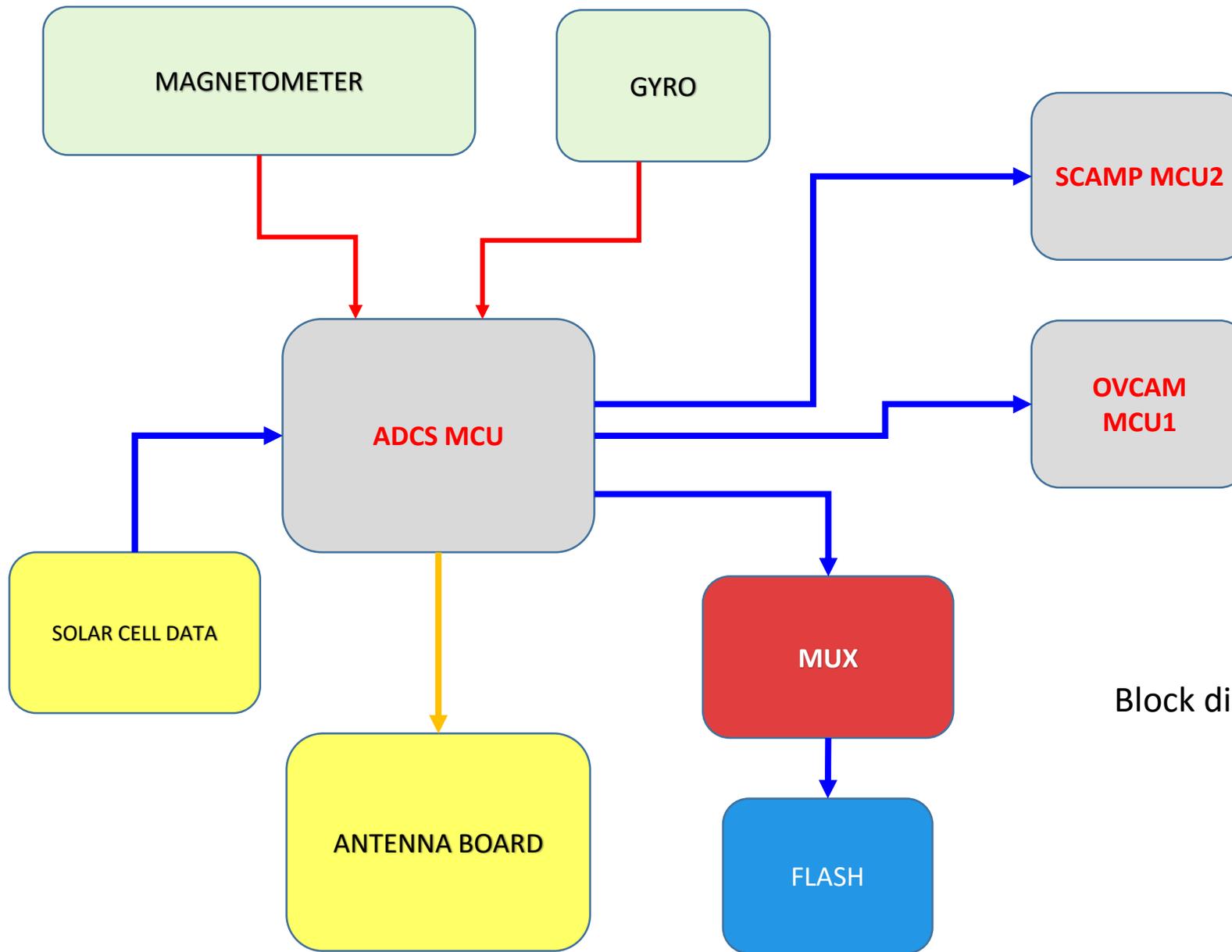
 - provide information of satellite attitude for satellite operation and mission

- Determination: Sensors (Gyro, Magnetometer)

- Passive Control: Permanent magnet, Hysteresis damper.

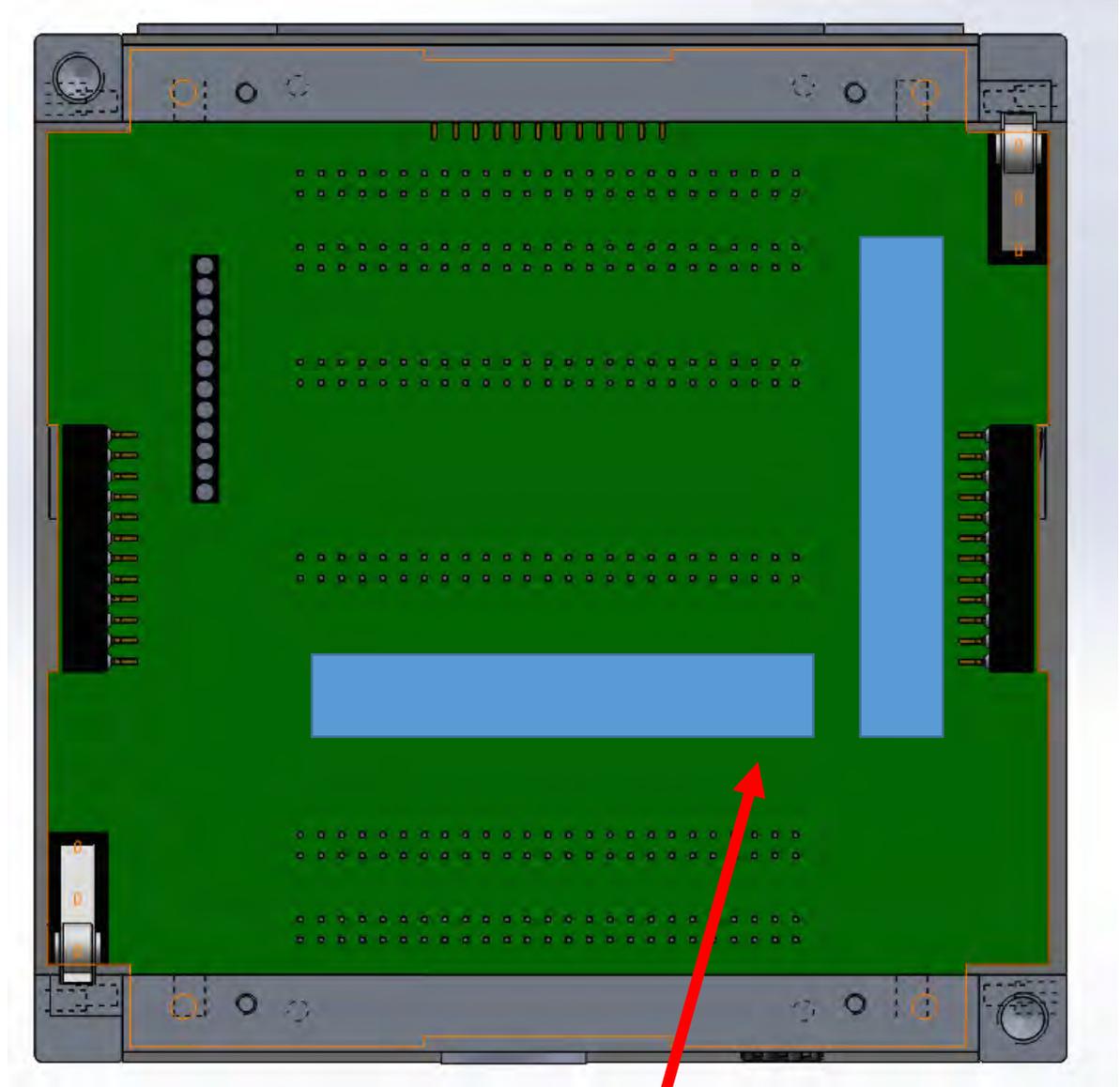
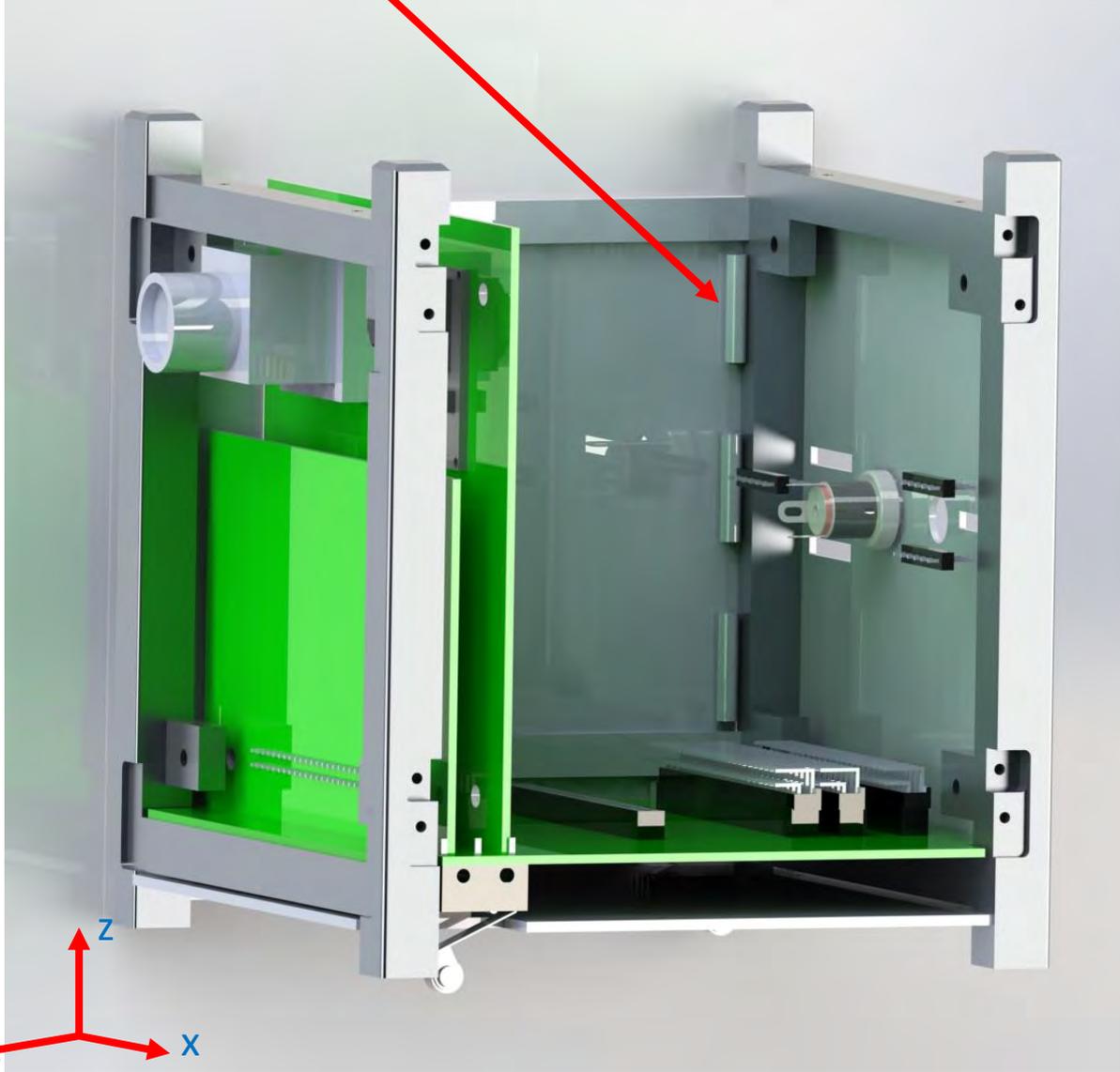
ADCS Objectives

- To determine the BIRDS orientation & attitude.
- To provide the BIRDS orientation and attitude data for sub system (CAM)
- To passively stabilize BIRDS attitude
- To ensure Antenna Deployment



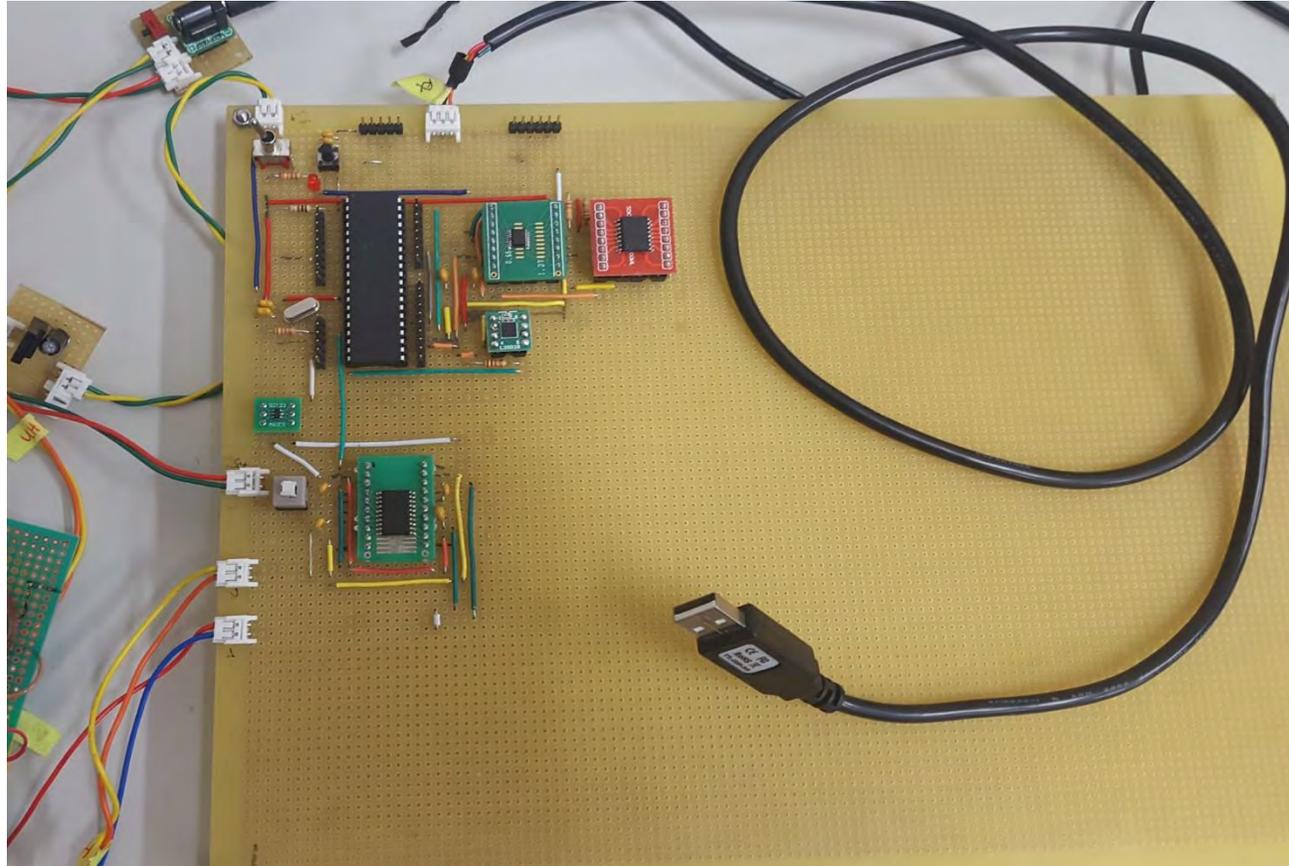
Block diagram of ADCS

Permanent Magnet

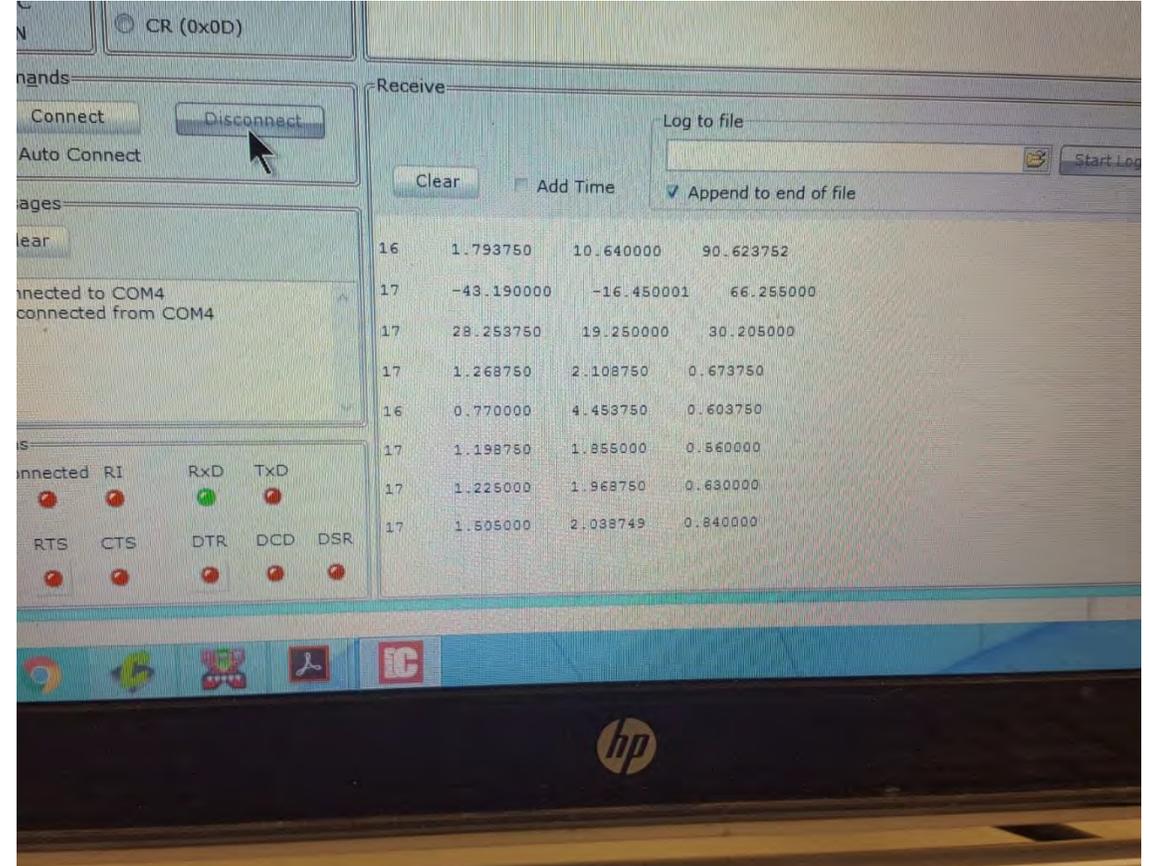


Hysteresis damper

ADCS SYSTEM



ADCS SYSTEM (Bread Board Model)



GYRO VALUE

11. Ground Station in Taiwan

National Cheng Kung University Ground Station

Written by

Mr. Kevin Liu

Prof. Jyh-Ching Juang

Edited by Apiwat Jirawattanaphol



NCKU Ground station

- NCKU ground station is located in Kuei-Jen Campus and the ground station parameters are shown in below.
- Longitude: 120°16'38''E
- Latitude: 22°56'17''N
- High above ground: 31m
- Antenna Frequency: VHF/UHF Band

NCKU Location



National Cheng Kung University (NCKU) is located in Tainan city, Taiwan.

Tainan city is located at the southern part of Taiwan Island



- 1931 Founded as the "Tainan District School for Higher Industrial Education"
- 1946 Upgraded to "Taiwan Provincial College of Engineering"
- 1956 Expanded to "Taiwan Provincial Cheng Kung University"
- 1971 Renamed as "National Cheng Kung University"

Ground Station Architecture



NCKU ground station architecture

Communication flow of ground station



Outdoor Equipment

Ground Station Staff performs maintenance on a VHF/UHF antenna at roof top of building.



Low Noise Amplifier (LNA) installed near to the antenna

Indoor Equipment



Radio Transceiver and Terminal Node Controller (TNC)



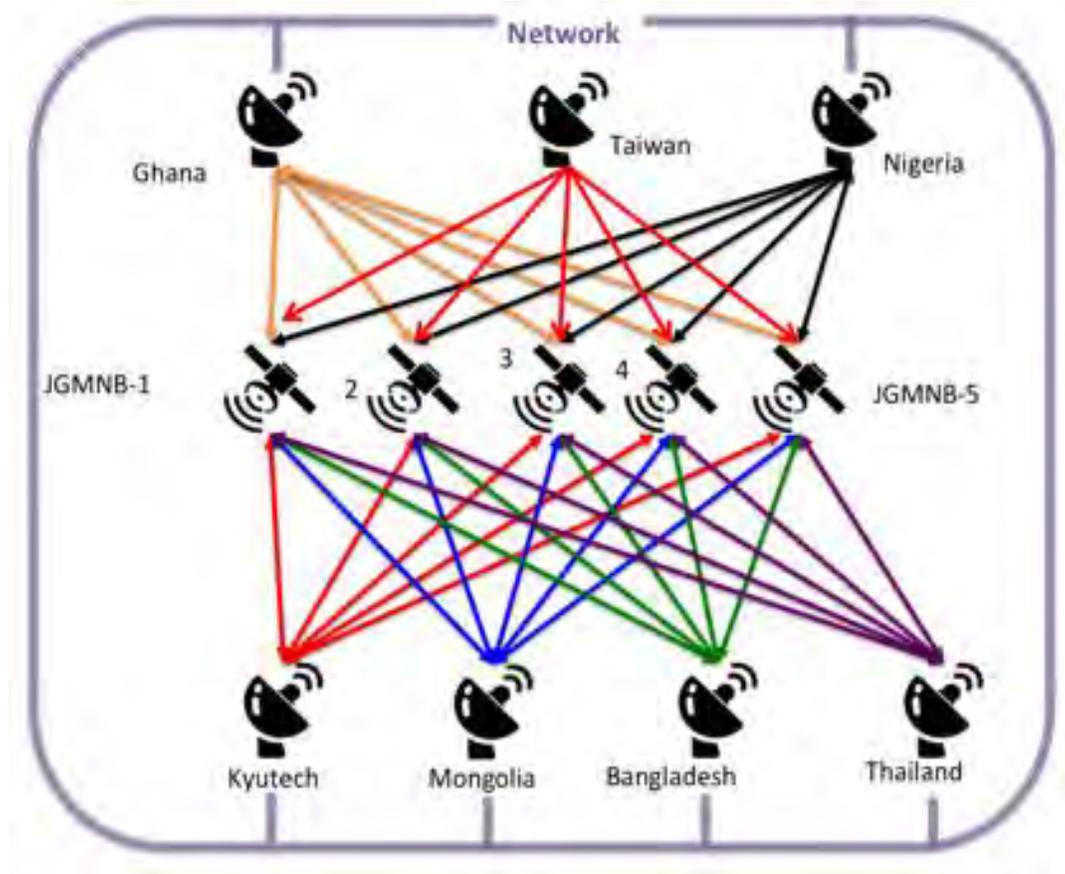
The indoor environment of ground station



Indoor Ground Station System

Connect with BIRDS Ground Station Network

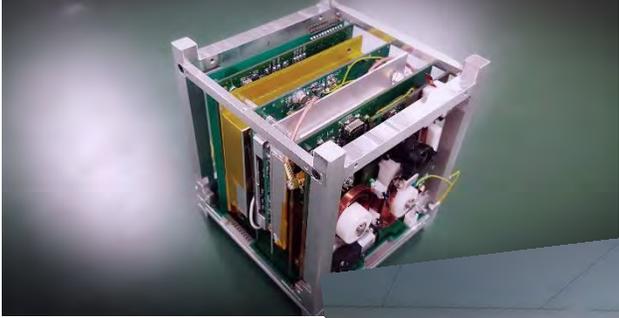
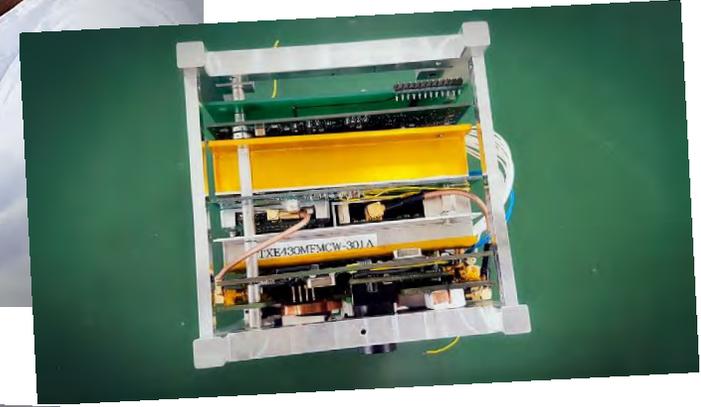
- NCKU ground station will be connect with the BIRD ground station via the internet network.
- In the operation, when the GS receive downlink data from satellites the GS system will be forward data to achieve in a central server.
- NCKU GS will be install special equipment for BIRD project POS mission such as Software Define Radio (SDR), Digital Oscilloscope and GPS clock.

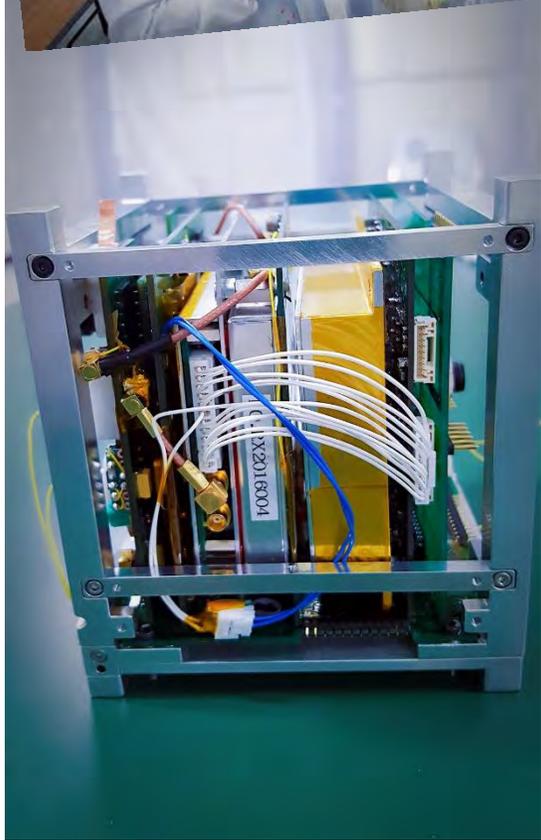
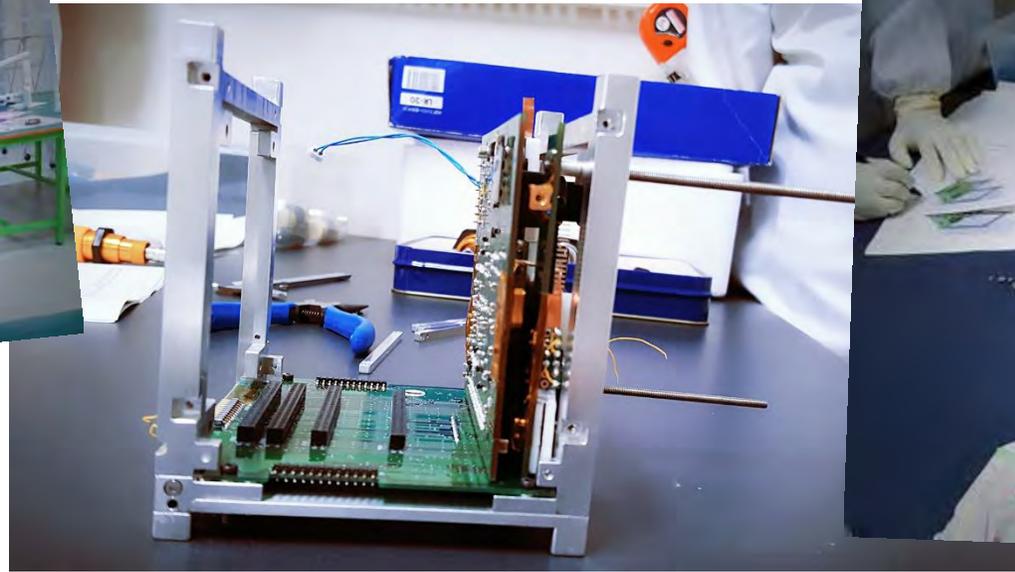


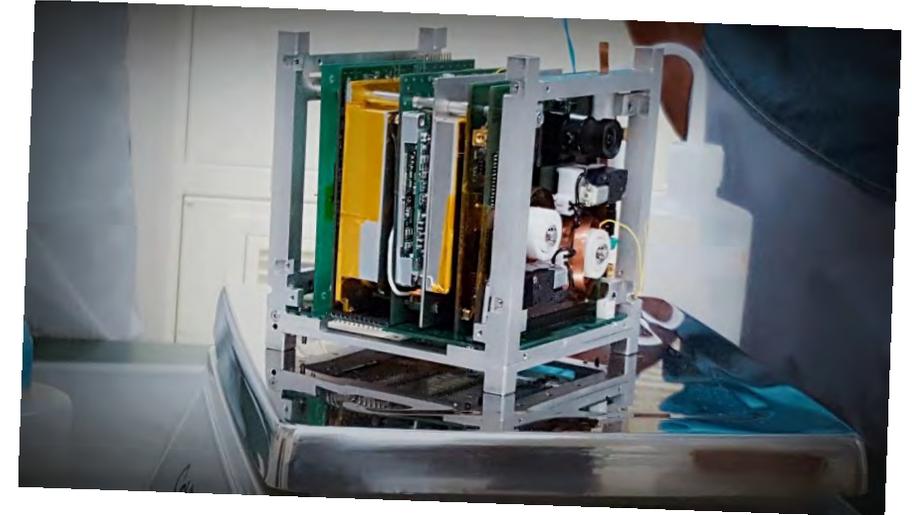
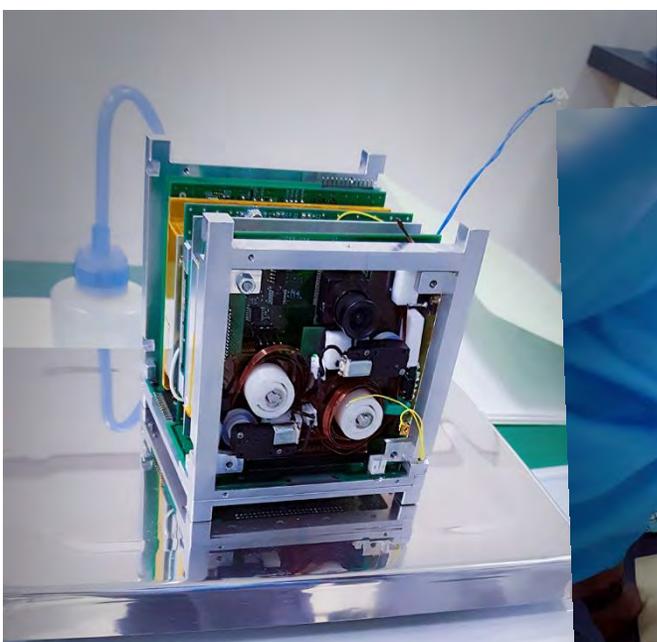
12. Assembly of the EM (Engineering Model)

For the remaining pages of this newsletter, we present scenes of EM assembly in the BIRDS clean room of Kyutech.

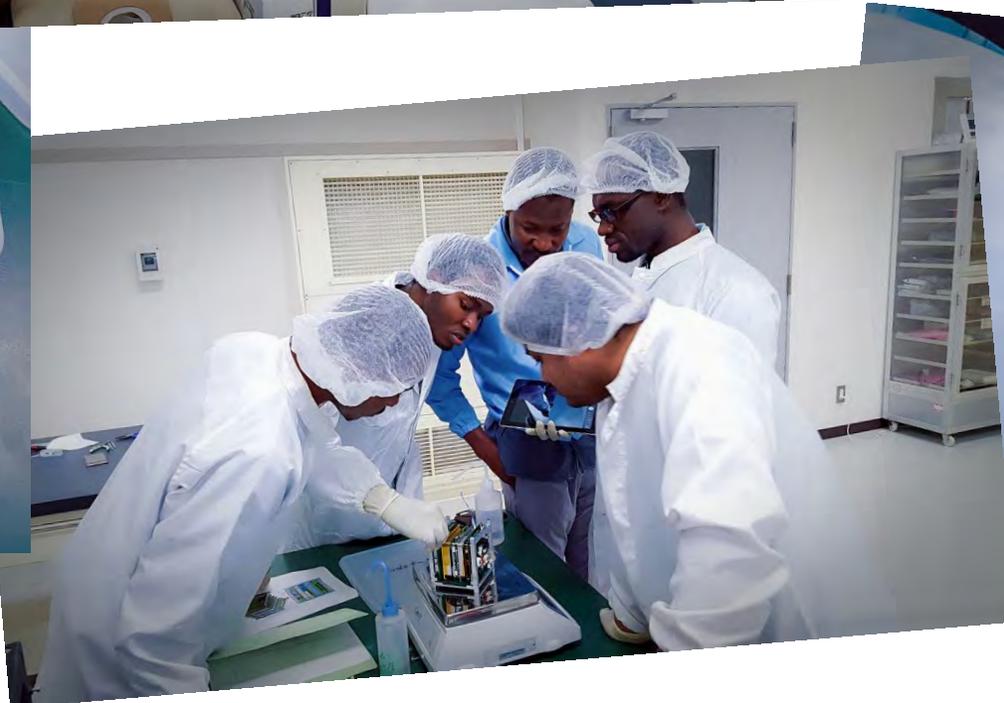








Weight control



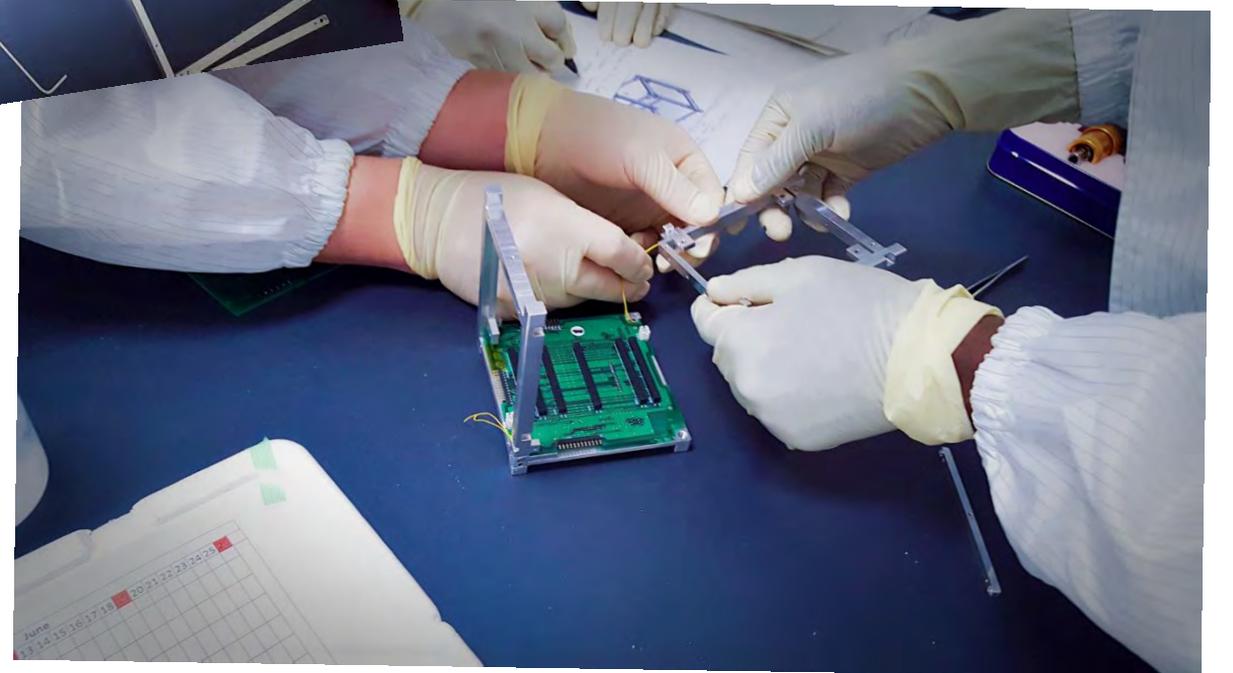
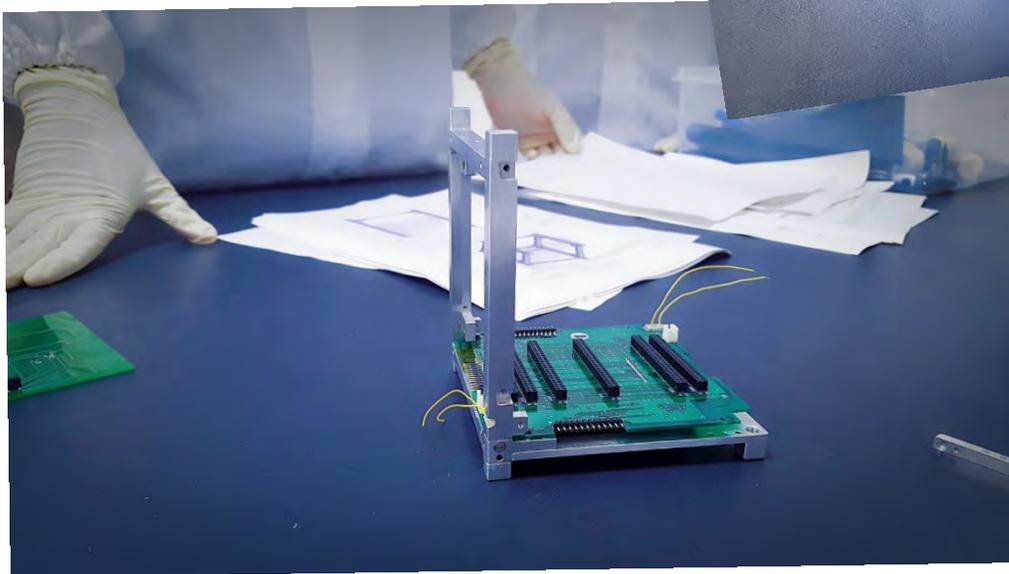
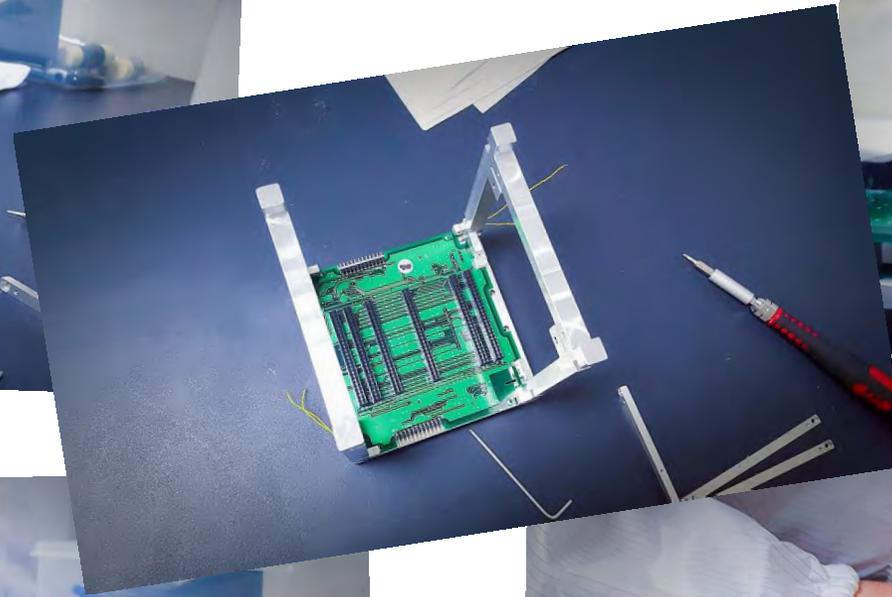
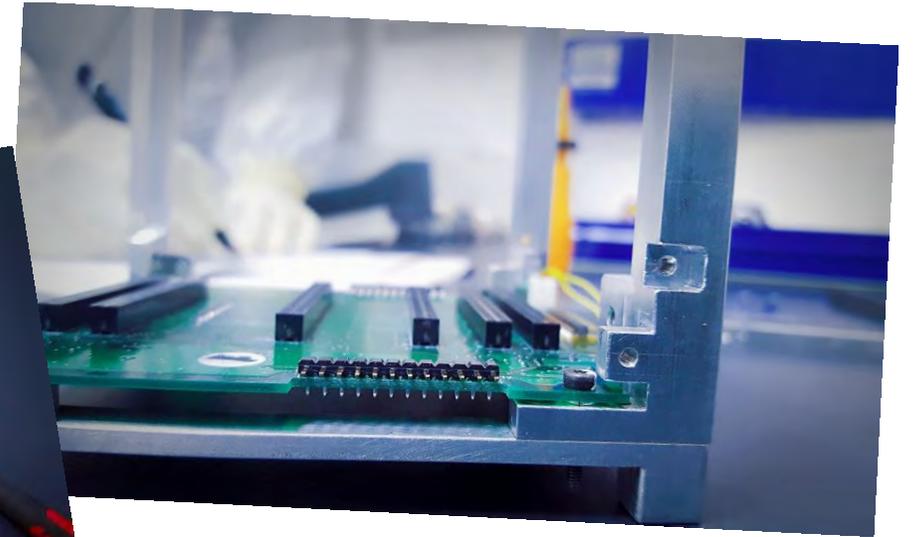
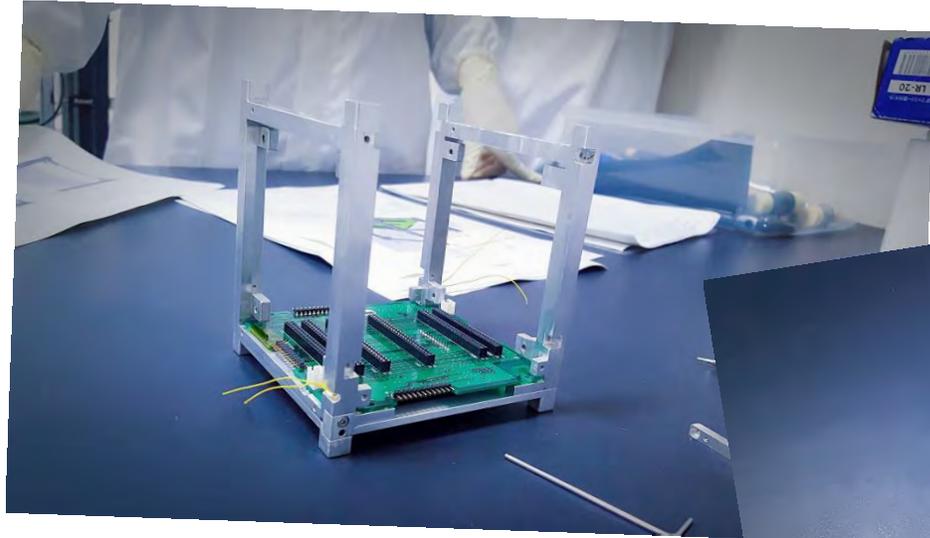


Taiwo, BIRDS
Project Manager

Team Work in Action



The pieces come together . . .





END OF ISSUE NO. 5

***Thank you for your
attention!***

