



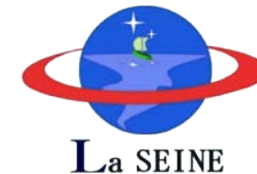
BIRDS Project Newsletter

Issue No. 2 (March 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



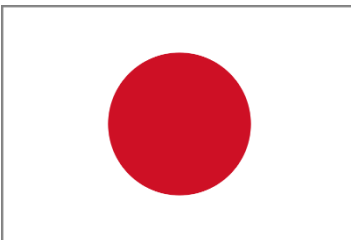
Mongolia



Ghana



Japan



The nations of the BIRDS Project

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More subsystems will be covered in future issues of the newsletter.

Kafi says, "My, this needs improvement"



Tokunaga in the lab.



1. The BIRDS Project Photo Contest



The Winning Photo
←

A project photo contest was held – this is the winning photo, by Maisun (in the foreground) of Bangladesh. Note the date, time, and place, of this photo. This photo deftly reveals the dedication and determination of the BIRDS Project team. The desks of team members are located in this one room – this is purposely done in order to facilitate lots of communication without using email, phones, etc.

On this page and on the next three pages are the photos that competed in this photo contest.



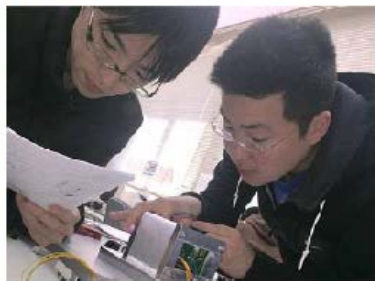
BIRDS weekly mtg

Serious brainstorming

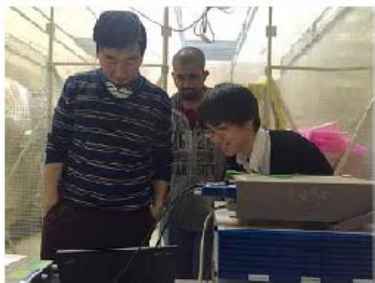
Mongolian Team

BIRDS Project
 Challenge Forum
 4A M., February 16, 2016





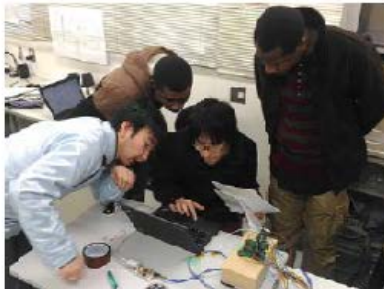
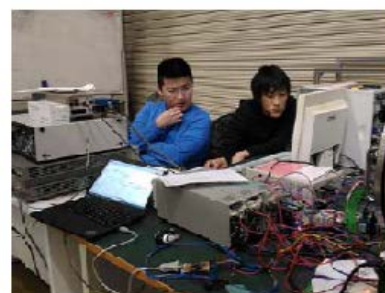
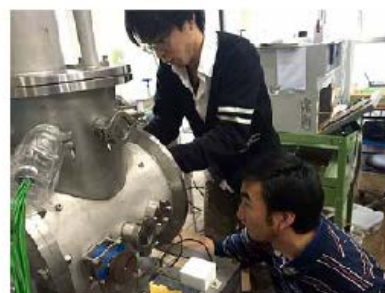
Ibukun and structure debate



Apiwat of Thailand



Thermal Vacuum Test



Programming H8

Mtg w/Sagami Tsushin



2. PDR of 29 Feb. 2016

Program

- 13:00~13:10 – Birds Project Introduction _ Taiwo
13:10~13:30 – Structure/Thermal (STR) _ Ibukun
13:30~13:50 – Onboard Computer (OBC) _ Turo
13:50~14:10 – Communication (COM) _ Maisun
14:10~14:30 – Electrical power system (EPS) _ Erka
- 14:30~14:40 – Break
- 14:40~15:00 – Single Event Latch-up Measurement Mission (SEL) _ Kafi
15:00~15:20 – Antenna deployment (ANT) _ Antara
15:20~15:40 – Camera Mission (CAM) _ Amara
15:40~16:00 – Digi-Singer Mission (SNG) _ Joseph
16:00~16:20 – Attitude determination & control system (ADC) _ Kafi

(continued in next column)



16:20~16:30 – Break

- 16:30~16:50 – Atmospheric Density Measurement (ATM) _ Joseph
16:50~17:10 – Ground Station Network (GST) _ Apiwat
17:10~17:30 – Determination of Satellite Precise Location (POS) _ Ernest
17:30~17:40 – PDR Wrap up _ Prof Cho

18:00 -- お疲れ様会



What is “Preliminary Design Review (PDR)” ?

The PDR demonstrates that the preliminary design meets all system requirements with acceptable risk and within the cost and schedule constraints and establishes the basis for proceeding with detailed design. It will show that the correct design options have been selected, interfaces have been identified, and verification methods have been described.

The following are typical objectives of a PDR:

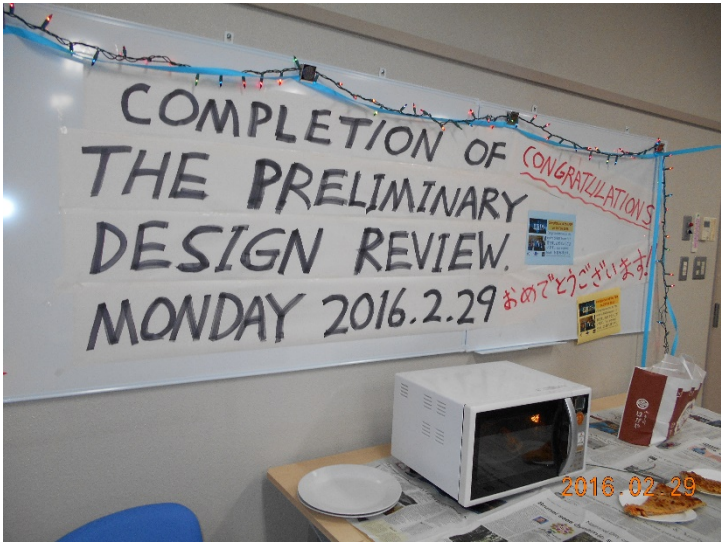
- Ensure that all system requirements have been allocated, the requirements are complete, and the flowdown is adequate to verify system performance
- Show that the proposed design is expected to meet the functional and performance requirements
- Show sufficient maturity in the proposed design approach to proceed to final design
- Show that the design is verifiable and that the risks have been identified, characterized, and mitigated where appropriate

[from [https://en.wikipedia.org/wiki/Design_review_\(U.S._government\)](https://en.wikipedia.org/wiki/Design_review_(U.S._government))]



Scenes of the PDR

お疲れ様会 (a party to celebrate the completion of the PDR, a major project milestone)



Good job, BIRDS !!!



3. Visit by Dr. Balt Suvdantsetseg (alias “Suvdaa”)



The *BIRDS Project* was fortunate to have a project partner (from Mongolia) visit us from Feb 12 through March 11, 2016. Her name is Suvdaa, and she is assistant professor at “NUM-ITC-UNESCO” Remote sensing and Space Science international laboratory, school of Science and Art, National University of Mongolia (NUM).



She graduated from the Physics and Electronics School of National University of Mongolia in 2005 with a bachelor degree in Applied Physics and Ecology -- and received Master degree of Remote Sensing and GIS in 2007. She earned a PhD in 2012 at the Environmental Design and Governance program, in Graduate School of Media and Governance of Keio University, Japan.

Her research interests are predominantly related to Ecological management planning for sustainable development and Remote Sensing/GIS application for spatial planning. Recently, she worked on spatial environmental planning using remote sensing satellite data for the policy formulation of the Mongolia government research institute, and also space engineering human development program in National University of Mongolia.

During her one-month stay at Kyutech she learnt the usage, procurement process, storage, and placement of the BIRDS ground station. She studied the installment of the necessary equipment for the development of cubesats at Kyutech. She observed the satellite launching process -- and examined the communication/control networks of ground stations and BIRDS satellites. As well, she learnt a great deal about the BIRDS project: how the students live and work, how the project is managed, and so on. Her visit to Kyutech was exceptionally productive.



Dr Suvdaa (standing at the center) at the BIRDS weekly meeting of 10 March 2016.

(Continued in the next column.)



4. Apiwat attends JAMSAT Symposium in Tokyo

The following text and photos were prepared by him; greatly edited from his original report.



JAMSAT Symposium 2016

Schedule: March 5-6, 2016

Organizer: NPO Japan Amateur Satellite Communications Association (JAMSAT)

Venue: The National Museum of Emerging Science and Innovation (Miraikan), Tokyo

Program schedule

March 5th (Sat)

14:30 - 14:35 "Welcome" Mikio Mouri JA3GEP

14:35 - 16:10 "JAS-1 30 Years Anniversary" Toshiyuki Kondou Eng. Mgr.,
JARL, JR1NVU

16:10 - 15:20 Break

16:20 - 17:30 Satellite communication (ground station side) by Eiji Nakamura
JA1CPA

17:30 - 17:45 Photography

18:00 - 20:00 Dinner meeting

March 6th (Sun)

09:30 - 10:00 Report from the AMSAT-DL (AMSAT Germany) via Skype
by Peter Guelzow DB2OS

10:00 - 10:10 Break

10:10 - 10:40 Report of EsHailSat-2 / Phase-4A from AMSAT-Qatar
by Mohamed bin Jabor Althani A71EY

10:40 - 1:20 "Development of Phase-4 Ground Station" Akira Kaneko, JA1OGZ

11:20 - 11:30 Break

11:30 - 12:10 "Development of JAMSAT Mode-J Transponder", Kan Fukai, JH1CEP

12:10 - 12:50 "USB Mini Tuner" Hiroshi Matsumoto, JA1SYK

12:50 - 13:20 "New Regulation on Spurious Emission" Akira Kaneko, JA1OGZ

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Day before JAMSAT symposium

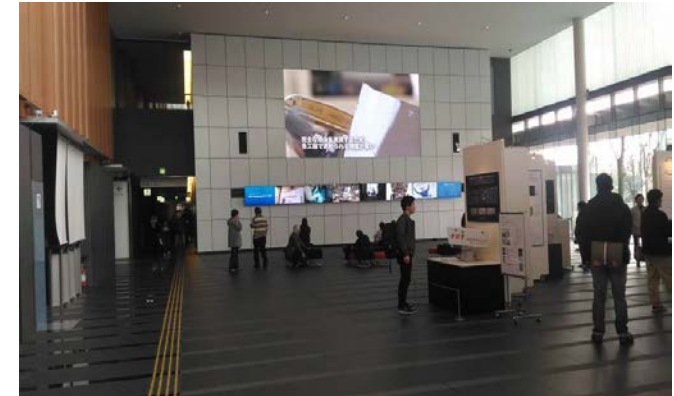
I had the opportunity to have a meeting with Mr. Mikio Mouri the president of JAMSAT and Mr. Kan Fukai transponder developer. I introduced the BIRDS Project in this meeting. Mouri san is interested in the SEL mission of BIRD; he asked me to explain more about SEL mission. Fukai san has developed transponders and satellite transmitters. We talked about the transponders and transmitters for CubeSats. Fukai san finished the transponder design and tested it in the thermal vacuum test. He introduced to me the testing results. After that we talked about amateur radio satellite activities.



From left: Apiwat, Mr. Kan Fukai, Mr. Mikio Mouri

JAMSAT Symposium 2016 was held at The National Museum of Emerging Science and Innovation (Miraikan) 7th floor. The Miraikan is about 5 minutes by walk from Telecom center station (Yurikamome line).

Inside of the museum 1st floor, on the weekend many of children with parent enjoy here.



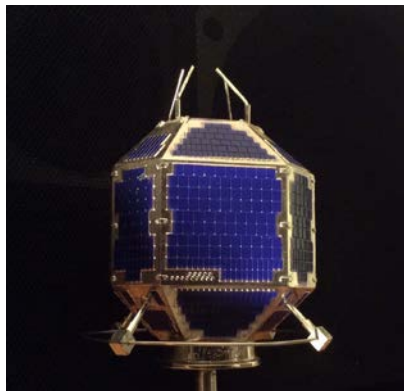
President's greeting,
by Mr. Mikio Mori, JA3GEP.





“JAS-1 30 Years Anniversary” by Mr. Toshiyuki Kondo JR1NVU and Mr. Mori Ohara JK1VXJ; picture from JAMSAT.

Mr. Mori Ohara was a member of the JAS-1 development team. He developed its transponder as a university student.



JAS-1: Japan Amateur Satellite 1

I joined dinner meeting with JAMSAT members after the 1st day of symposium:

From left:
Student from Teikyo University,
Tamora san from Nihon University,
Apiwat from Kyutech,
Suzuki san from Nihon University,
Nakagawa san JAMSAT member.



Mr.Hozumi Ueda is the director of JAMSAT. In this symposium he give me the opportunity to meet with the president of JAMSAT. He is contact person between AMSAT-Thailand (Amateur Satellite Group of Thailand) and JAMSAT. I know him when I was in Thailand. We have meeting together with member of AMSAT-Thailand. Currently, AMSAT-Thailand has developing CubeSat project name JAISAT-1. We have the cooperation with JAMSAT for the transponder development.



← Mr Ueda and Apiwat during symposium

Editor's Note
This report is abridged from the original report to reduce the number of pages.

End of Report, Thank you,
Apiwat Jirawattanaphol, 15 March 2016.



5. Subsystem Summary #1

Satellite Structure

March 18, 2016

Team Members
Naoki Nakamura
Ibukun Adeboku

BIRDS STRUCTURE

- The proposed BIRDS satellite is a 1U CubeSat with dimensions 100 mm × 100 mm × 113.5 mm and a mass of 1 kg.

Internal Configuration

- The BIRDS satellite has a single motherboard called the backplane. Power for mission and bus system is supplied mainly through circuits printed on the backplane. The backplane has six female connectors (front panel assembly, OBC, Battery, Transmitter, Mission and Antenna). This arrangement is based on University of Wolfsburg (UWE3) CubeSat. Minimum harnesses are used thus reducing the overall mass of the satellite. Two transmitters (9600 bps and 1200 bps) are mounted on the interior.

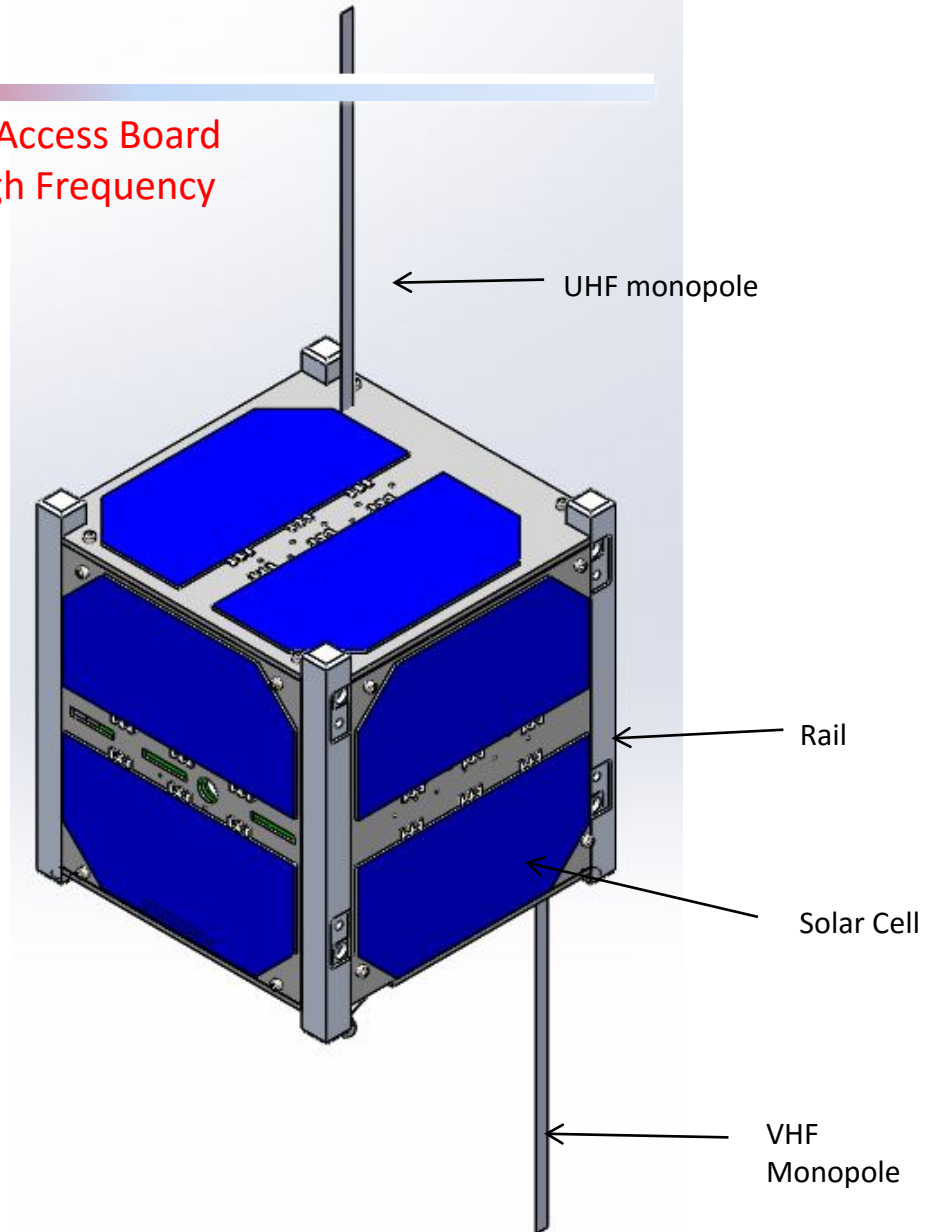
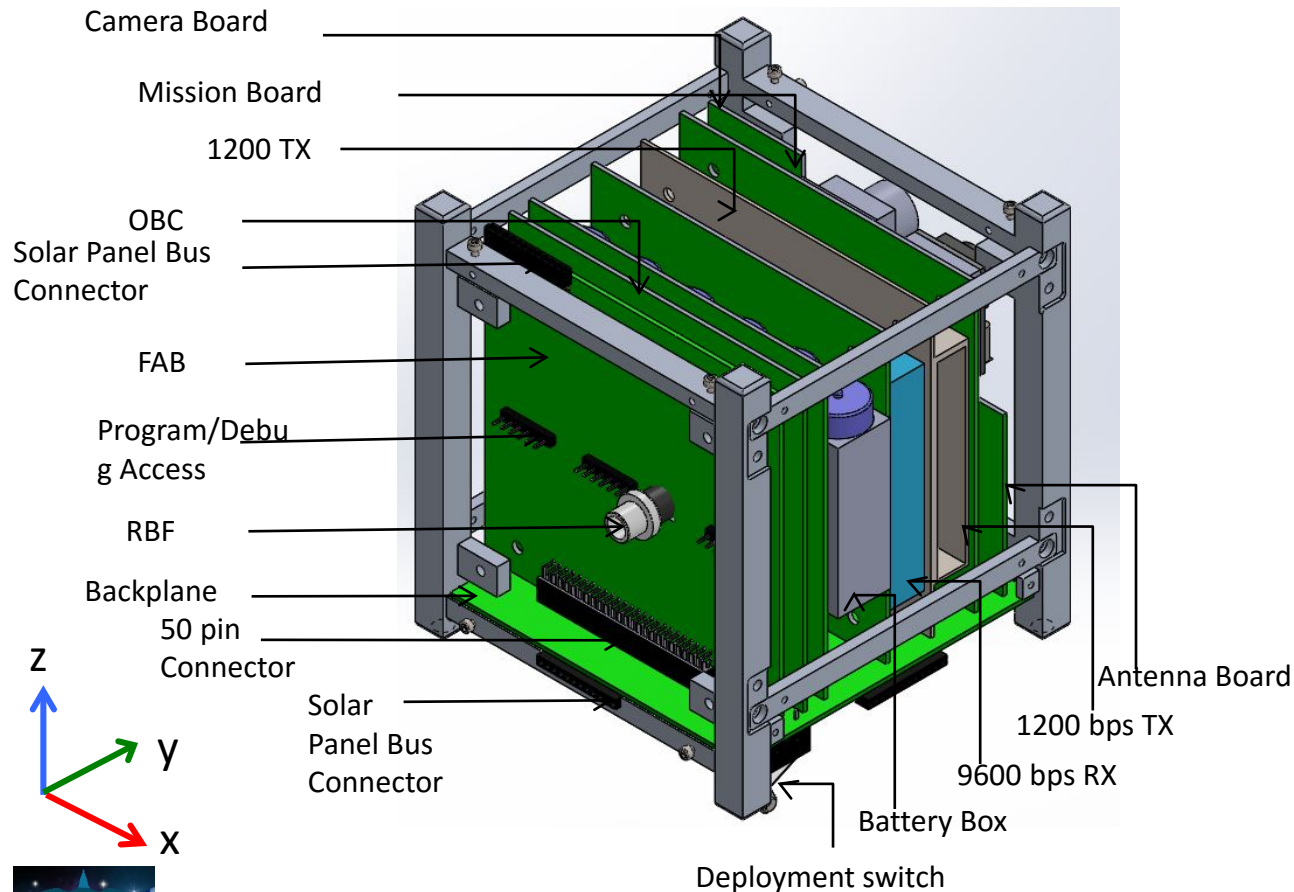
External Configuration

- Two Cameras and a patch antenna for the mission are mounted on the +Y face. Solar panels are mounted on other faces of the Cubesat. The Access port and RBF pins are on the –Y face. Deployable antennas shall be deployed from both + Z and -Z axis. Separation springs for interfacing with the Japan Experimental Module Small Satellite Orbital Deployer (J-SSOD) are mounted diagonally on the rail standoffs on the – Z face of the Cubesat. Deployment Switches are mounted adjacent to the two separation springs.



Sub-system Design Specifications

TX – Transmitter **RX** – Receiver **bps** – Bits per second **FAB** – Front Access Board
RBF – Remove Before Flight **VHF** – Very High Frequency **UHF** – Ultra High Frequency
OBC – On-Board Computer



6. Subsystem Summary #2

Digi Singer (SNG)

March 18, 2016

Team Members

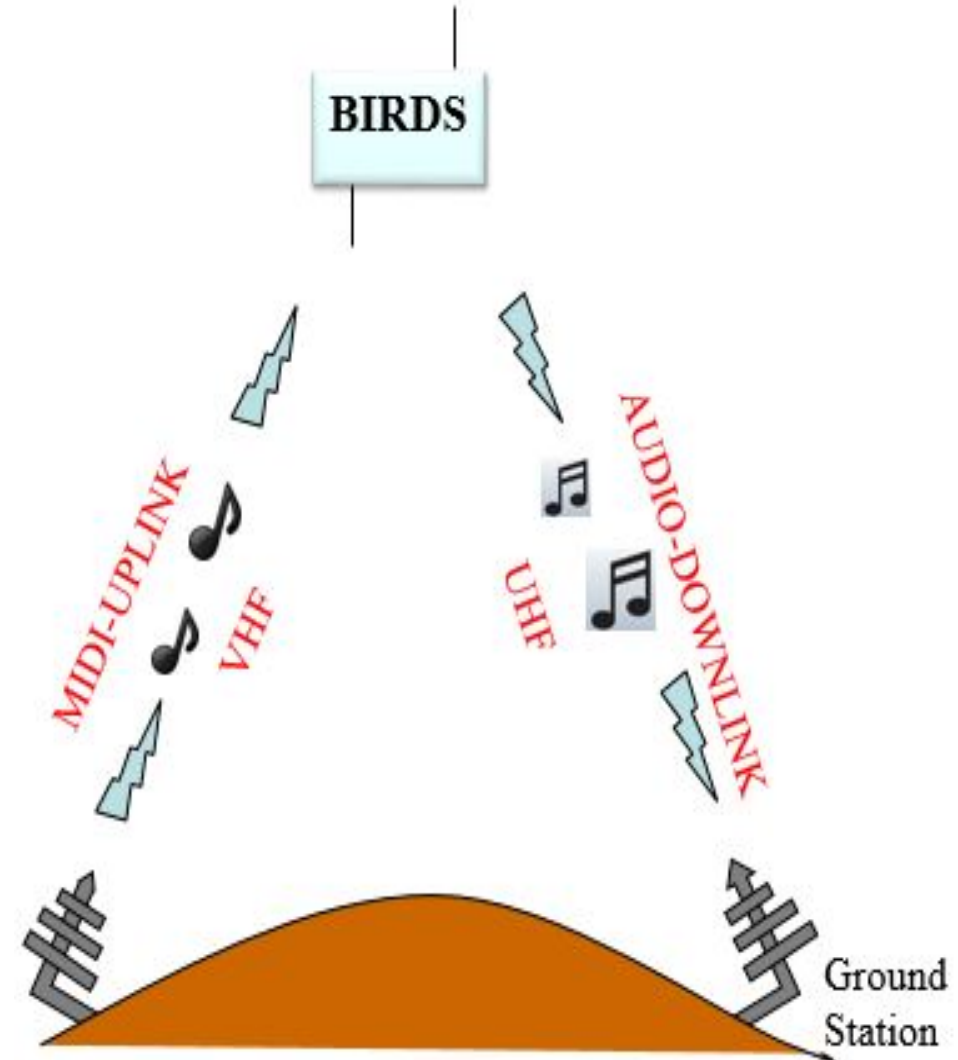
Quansah Joseph Neenyi Kojo Krobo

Abdulla Hil Kafi

Raihana Shams Islam Antara

Mission Overview

- ❑ Digi-Singer (SNG) is one of the on-board missions of Birds CubeSat.
- ❑ This mission aims at broadcasting music from space to ground.
- ❑ Following the heritage of the **HORYU-IV** satellite that was successfully launched on the 17th of February 2016 by LaSEINE of Kyutech, this mission shall “outreach” to the general public -- especially to the younger generation (students) and to amateur radio (“ham”) operators.



Mission Objectives

- ❑ Music files in a midi format shall be pre-installed in the mission memory before launch and can also be uplinked from ground station via the amateur VHF(145MHz) frequency.
- ❑ SNG system comprises of onboard midi and voice synthesizer which shall convert the midi files to audio files and broadcast them via amateur UHF (437.375MHz) frequency to ground receivers (e.g., ham radio operators).
- ❑ Music files to be uploaded could be national anthems, copyright-free music from the general public, and so on.
- ❑ Also, for popular and fun outreach functions, the general public will have the chance to request a favorite song to be uploaded to BIRDS CubeSat via the BIRDS Project Website. If you have other ideas, please let us know.



Mission Merits

❑ TECHNOLOGY EXPANSION

- This mission expands satellite radio communication technology (Amateur Radio Communication)

❑ EDUCATIONAL

- This mission helps to educate the younger generation on the benefits of using space, and to appreciate the beauty of this enterprise

- This mission helps to fire their imagination about space engineering and associated technology – the mission can excite them

- Students can be trained on how to make a simple handy receiver (see Fig 2).

❑ SOCIAL

- This mission gives the general public more awareness of satellite radio communications, and of its interesting applications.

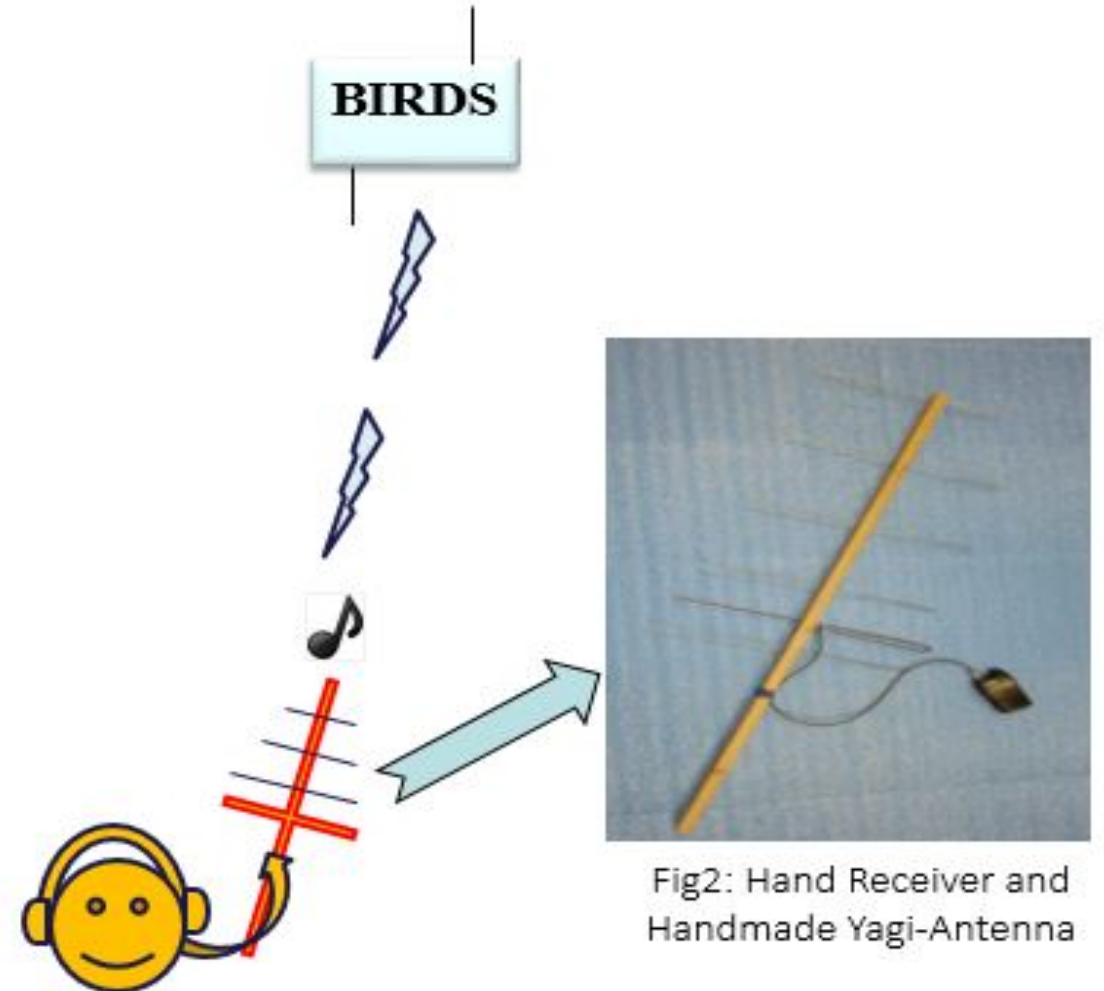
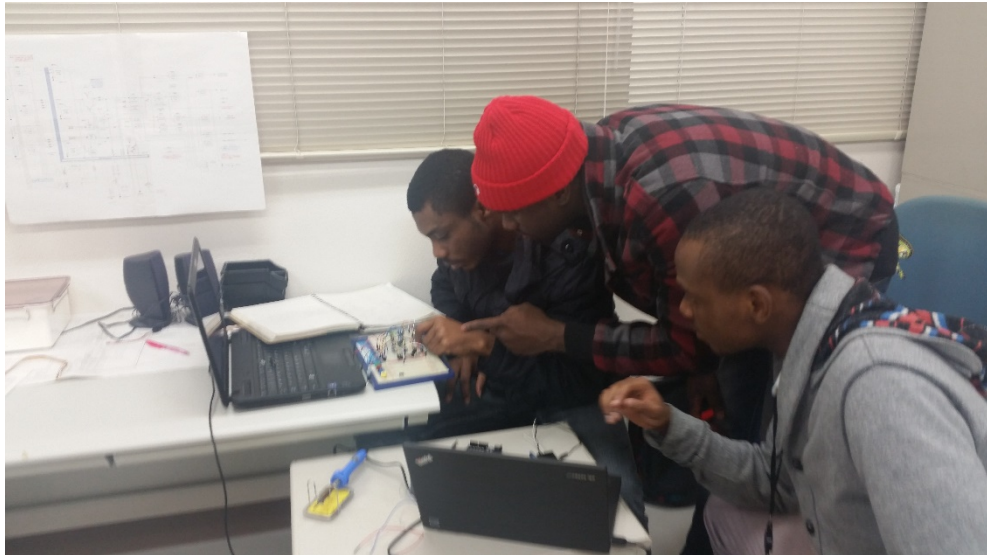


Fig2: Hand Receiver and Handmade Yagi-Antenna

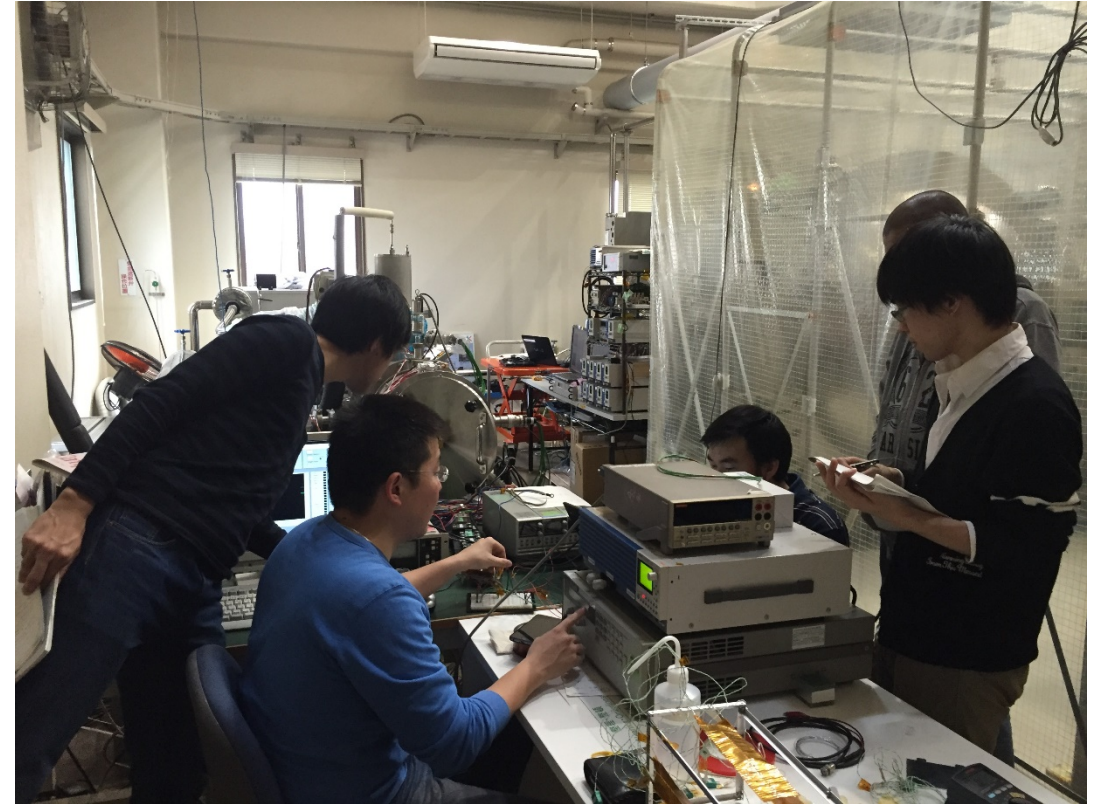
Individuals with handy receiver and handmade Yagi-antenna can listen to music from Birds CubeSat

References for Digi Singer

- [Fig 2] Tae Nakano, Tatsuo Shimizu, Danny Chen, Hala Almubarak, and Mengu Cho (2014). Space Education and Outreach using a Digi-singer on-Board a Nano-Satellite [65th International Astronautical Congress, Toronto, Canada]. IAC-14-D9.2.8 Page 1 of 4



Work proceeds on the Digi Singer (breadboard stage).



Thermal vacuum testing on 13 February 2016
(not related to Digi Singer).

Photo from Dr. Masui.



7. Subsystem Summary #3

Precise Location of Satellite (POS)

March 18, 2016

Team Members

ERNEST TEYE MATEY

APIWAT JIRAWATTANAPHOL

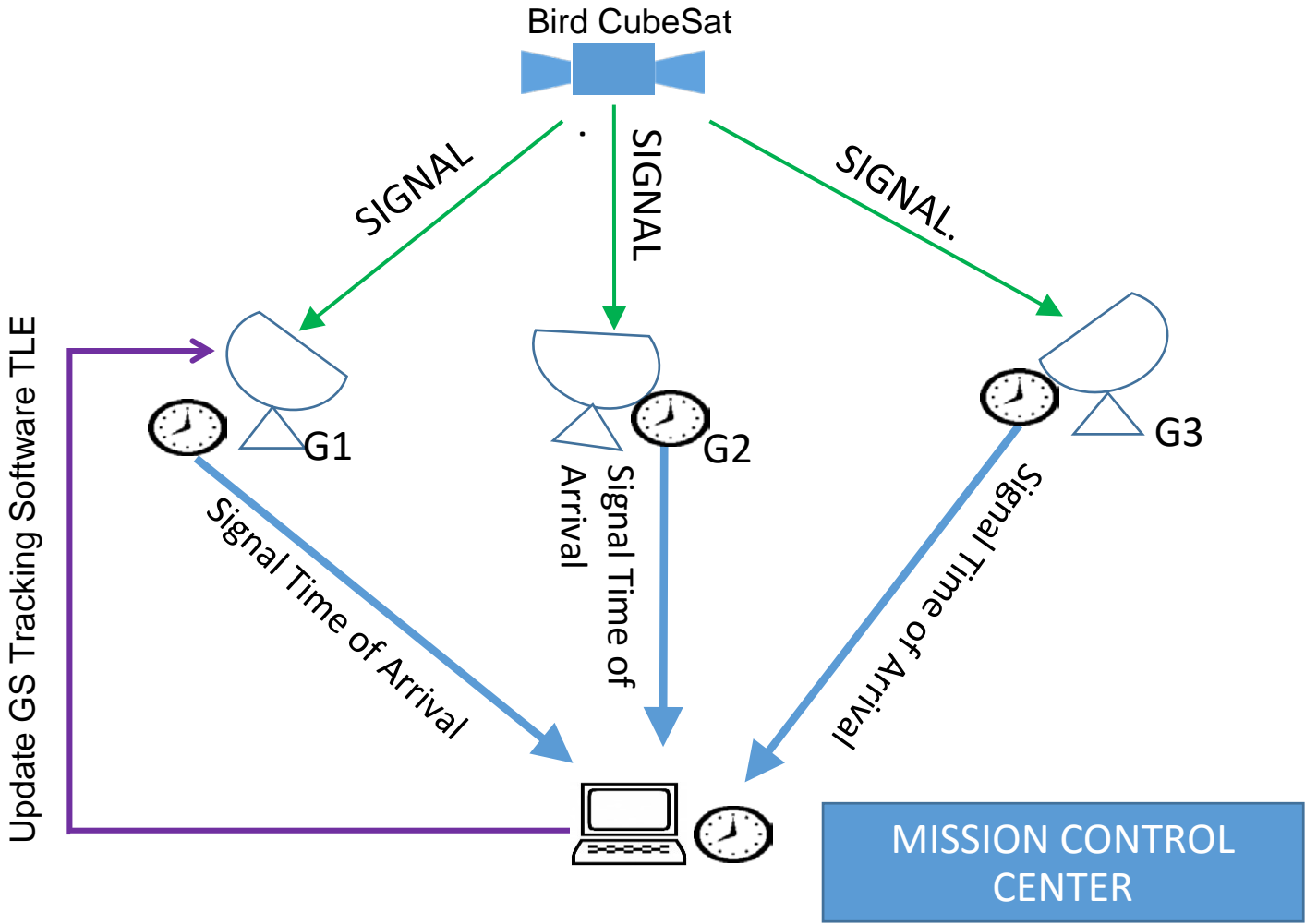
Introduction

- After the launch of BIRDS CubeSats, Ground Stations need to know the Precise Location of each one in space so as to accurately track it. This is to establish ground-to-satellite communications.
- Satellite ephemeris data (Two Line Elements – TLE's) are usually updated from the North American Air Defense (NORAD) ephemeris platform and are used to track Satellites.
- The goal of the BIRDS POS mission is to calculate the precise location of the BIRDS CubeSat in Space to attain more accurate TLE's for tracking.

Mission Concept

- BIRDS CubeSat position is going to be calculated using Signal Arrival Time Lag of BIRDS Signal at various Ground Stations (see **BIRDS Project Newsletter No. 1** for the location of these stations).
- The position calculation aims for an accuracy of 30 meters.
- The POS mission takes advantage of the BIRDS Ground Station Network of seven different participating countries for Signal Arrival Time Lag recording and measurement.

POS -- Mission Flow Diagram



8. Subsystem Summary #4

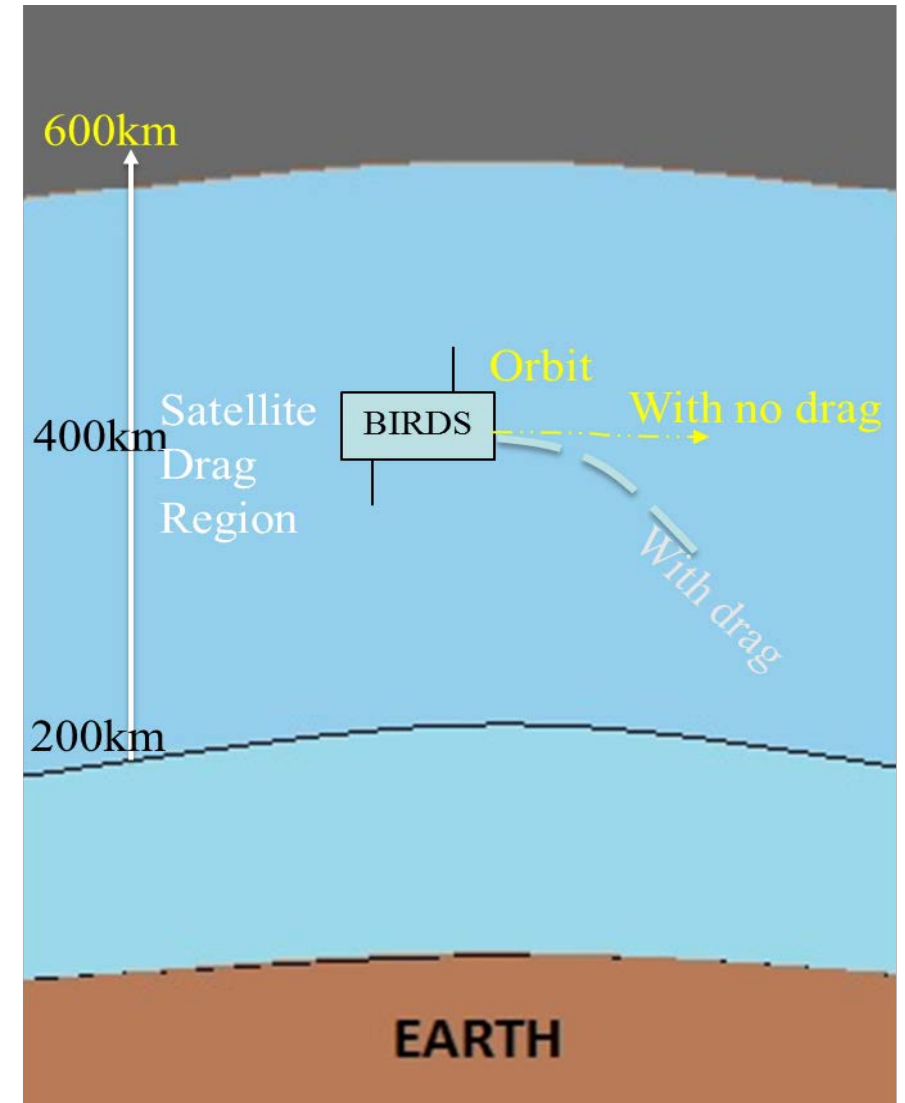
Atmospheric Density Measurement Via Precise Satellite Tracking (ATM)

March 18, 2016

Joseph Quansah

Mission Overview

- ❑ Limited orbital life cycle is one of the major effects on most satellites orbiting in Low Earth Orbit (LEO)
- ❑ This drag effect is mostly as a result of atmospheric density and there is, therefore, the need to know the amount of drag effect at that altitude.
- ❑ Most LEO satellites life cycle ranges from about a minimum of 3 months to a maximum of 6 months period.
- ❑ With the aid of precise tracking of a constellation of 5 BIRDS CubeSats, precise atmospheric data can be measured.
- ❑ This is as a result of drag effect that occurs at that altitude range (200 km to 600km)



Mission Objectives

- ❑ This mission aims at precisely keeping track of the changes in the position and velocity of BIRDS CubeSats during each overhead pass.
- ❑ This data shall be acquired from the **BIRDS Precise Satellite Tracking (POS) Mission**.
- ❑ The periodic changes in position and velocity result of BIRDS CubeSat orbital parameters shall be used to predict atmospheric density.

Mission Merits

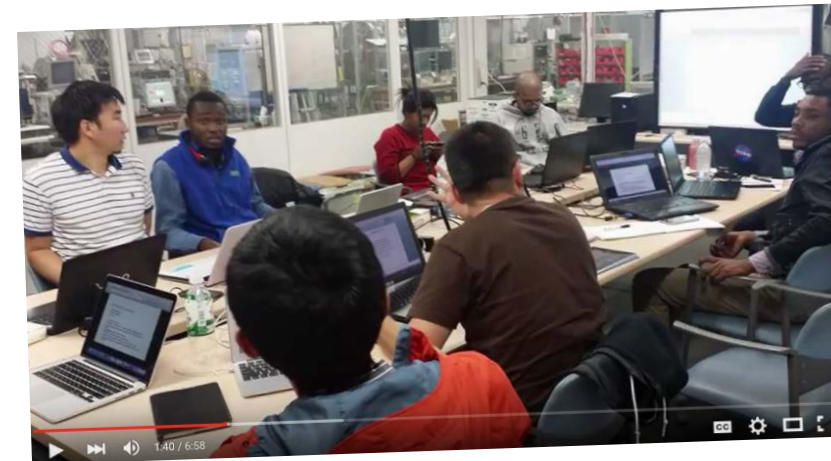
- ❑ Create a database of atmospheric density in Low Earth Orbit (LEO).
- ❑ Knowing the atmospheric density of LEO, the orbital lifetime of LEO satellites can be predicted with more accuracy.
- ❑ This data shall be accessible to the general public via the **BIRDS Website**.

9. A Very Good Video by our Mongolian Team



<https://www.youtube.com/watch?v=iyh7ZFD0ypQ&feature=youtu.be>

This 7-minute video was produced by our three-man Mongolian team of Amar, Erka, and Turo (shown at the right). You'll find the pictures interesting – the explanation is spoken in Mongolian, however. It is about the BIRDS Project.



END OF ISSUE NO. 2

