

June 29 2016

「Joint Global Multi Nation Birds (Birds Satellite Project)」

INTRODUCTION

The *Joint Global Multi Nation Birds Satellite Project*, “**BIRDS Project**” for short, is a cross-border interdisciplinary satellite project for non-space faring countries supported by Japan (participating countries are: Japan, Ghana, Mongolia, and Bangladesh). During this 2-year project students shall design, assemble, test and operate 4 units of identical 1U CubeSats (1kg, 10cm-cubic satellite) belonging to the four participating countries and operated from 7 ground stations (operation is done at 7 ground stations; the 4 participating countries as well as Nigeria, Thailand and Taiwan) to form for the first time in the world a constellation of 4 CubeSats operated using 7 networked ground stations.

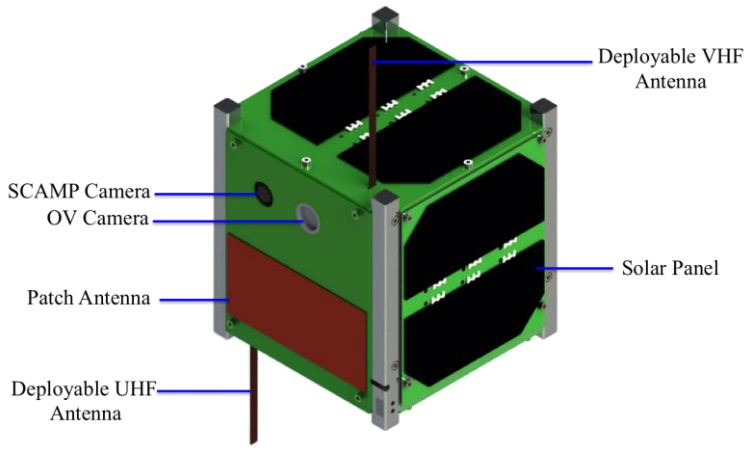
Fifteen students from 6 of the 7 participating countries/regions who belong to the Graduate School of Engineering of Kyushu Institute of Technology (“Kyutech” for short) and who are enrolled as a Master or Doctoral degree students in the Space Engineering International Course (SEIC) are implementing this project with the guidance of four faculty members. Up until the satellite design verification stage, all 15 BIRDS students work together as a team. Once the satellite flight model (FM) assembly commences in July 2016, the students from Ghana, Mongolia and Bangladesh form teams of three students each to assemble, integrate and test their country’s first satellite. Once 4 satellites are built and tested, they will be released from the International Space Station in the fiscal year 2017.

This cross-border university project will provide great leverage to students from developing nations for hands-on satellite development. It lays down the foundation for them to carry out similar space technology projects when they return to their home countries -- and to ultimately establish a *sustainable space program* in their own countries. Hence, the BIRDS Project is meaningful and effective capacity building as defined by the United Nations.

Objectives

- Teach to developing-nation students the entire process of a satellite development program -- from mission planning to satellite disposal

- Lay down the foundation for a sustainable space program by building human resources inside of participating universities and by launching a space research and education program at each one of them
- Create international human networks to promote and mutually assist infant space programs of each network member

Project Name		JOINT GLOBAL MULTI NATION BIRDS
Participating Institutions		<ol style="list-style-type: none"> 1. Japan; Kyushu Institute of Technology, Kitakyushu 2. Ghana; All Nations University College, Koforidua, Eastern Region 3. Mongolia; National University of Mongolia, Ulaanbaatar 4. Bangladesh; BRAC University. 5. Nigeria; Federal University of Technology, Akure. 6. Thailand; King Mongkut's University of Technology North Bangkok, Bangkok 7. Taiwan; National Cheng Kung University, Tainan
Expected Launch	Year	2017
	Launcher	TBD (To be released from International Space Station)
Satellite Parameters	Mass (g)	1130
	Size (mm)	100 x 100 x 111.5
		
Orbital Parameter	Type	Circular
	Altitude	~ 460km
	Inclination	51.6°
	Period	92.6 minutes
Satellite Onboard Missions		<ol style="list-style-type: none"> 1) Earth Imaging of homeland via onboard cameras -Using 2 Cameras (SCAMP at 0.3MP, OV5642 at 5MP)

<p>Mission Summary</p>	<p>2) Digi-singer Mission (SNG) -Exchange of song from satellites to Ham Radio receivers (UHF band)</p> <p>3) Measure single-event-Latchup in orbit (SEL) -By taking log of microcontroller reset events over period of time.</p> <p>Ground Station Missions</p> <p>4) Determination of Satellite Precise Location (POS) -Using analysis of TOA from time lag among multiple ground stations.</p> <p>5) Atmospheric Density Measurement (ATM) -Using Orbital analysis from precise satellite tracking information (POS).</p> <p>6) Demonstrate Ground Station Network for CubeSat Constellation (NET) -Using Amateur radio frequency.</p>	
<p>Integrated Bus System</p> <p><i>(Heritage from HORYU-II and HORYU-IV Satellites)</i></p>	<p>Onboard Computer (OBC)</p>	<ul style="list-style-type: none"> ✧ Renesas H8 36057F microcontroller ✧ PIC16F1787 microcontroller
	<p>Electric Power System (EPS)</p>	<ul style="list-style-type: none"> ✧ NiMH battery (3series × 2parallel), ✧ 4V, 3800mAh ✧ Nominal output: about 2W ✧ Peak output: about 3W
	<p>Communication System (COM) <i>(Amateur Radio)</i></p>	<ul style="list-style-type: none"> ✧ Downlink: UHF 437.375MHz (9600bps and 1200bps) ✧ Uplink: VHF (145MHz)
	<p>Attitude Determination and Control System (ADCS)</p>	<ul style="list-style-type: none"> ✧ Gyroscope ✧ Magnetometer ✧ Permanent Magnet ✧ Hysteresis damper