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BIRDS PROJECT: AN INNOVATIVE WAY TO EDUCATE POST-GRADUATE STUDENTS FROM DEVELOPING COUNTRIES

Abstract

With help of the United Nation's "Post-graduate study on Nano-Satellite Technologies (PNST)", Kyushu Institute of Technology (Kyutech) has an unusually large number of space engineering graduate students from developing countries (currently 33 such students from 19 countries). All PNST fellows and all self-funded overseas students are enrolled in our "Space Engineering International Course (SEIC)", which has a strong emphasis on hands-on training. We believe the best way to master satellite technology is to design, build, launch, and operate, a real satellite, within given time constraints – in Japan the standard duration for a masters degree is two years.

We wish to describe one hands-on international project of SEIC, which in October of 2016 will be past the halfway point. The BIRDS Project started in October of 2015 with 15 students – 3 Japanese and 12 from developing countries. None have designed a spacecraft before. They represent five nations, and the goal is for the students of each nation to build a 1U cubesat for their nation – of which four are non-space faring nations. The students hammer out the design themselves, and then each cubesat is built to that common design using commercially available parts. Hence, when in LEO, the five cubesats will form the first constellation of 1U cubesats designed, built, and flown, by university students. Launch (to the ISS) is set for second quarter of 2017. The schedule is exceedingly ambitious.

The project has six missions: (1) capture images of their homelands, (2) broadcast songs to ham radio stations of their homelands (using the onboard "Digi Singer" device), (3) determine precise satellite location by examining the time lag of signals received at several ground stations (because there is no room for GPS in BIRDS cubesat), (4) measure atmospheric density based on the aforementioned precise location information, (5) demonstrate the feasibility of a ground station network based on university facilities in developing nations, and (6) investigate single-event latch-up's by carefully assessing onboard resets.

When students go through all of the above, it becomes a uniquely intensive and extensive space technology learning experience. Of course, each student is assigned specific roles (e.g., mechanical design of the cubesat frame or design of the camera system). However, in the end, each will have participated in the entire process from design to in-orbit operation.