43rd STUDENT CONFERENCE (E2)
Educational Pico and Nano Satellites (4)

Author: Mr. Jeremy Soh
The University of Sydney, Australia, jsoh8701@uni.sydney.edu.au

Mr. Xun Sun
The University of Sydney, Australia, xsun3938@uni.sydney.edu.au
Dr. Xiaofeng Wu
The University of Sydney, Australia, xiaofeng.wu@usyd.edu.au
Mr. Xueliang Bai
The University of Sydney, Australia, xbai9225@uni.sydney.edu.au
Mr. Joseph Stefano
Australia, jste5118@uni.sydney.edu.au

I-INSPIRE II: UNIVERSITY OF SYDNEY'S 2ND GENERATION NANOSATELLITE FOR INITIAL INTEGRATED NANO SPECTROGRAPH, PROPULSION, IMAGER AND RADIATION EXPLORER

Abstract

i-INSPIRE II is designed for the European's QB50 project, which is funded by FP7 and leaded by the von Karman Institute for Fluid Dynamics (VKI). QB50 has the scientific objective to study in situ the temporal and spatial variations of a number of key constituents and parameters in the lower thermosphere (90-300 km), a region which is very under-sampled, with a network of 50 CubeSats. QB50 will also study the re-entry process by measuring a number of key parameters during re-entry and by comparing predicted and actual CubeSat trajectories and orbital lifetimes. 50 CubeSats will be provided by universities all over the world, carrying the sensor packages from VKI.

Our i-INSPIRE II satellite will be a standard 2U CubeSat to be built by undergraduate and postgraduate students. In addition to the common science mission of the QB50, during the mission lifetime we will demonstrate innovative space technologies developed by the University of Sydney. The technologies include a charge exchange thruster for satellite attitude and orbit control, an improved space photonic device for remote sensing, a FPGA-based controller for OBDH and ADCS. Also a camera will be integrated for taking images of the Earth and other QB50 satellites; and a radiation counter will be used for recording the level of radiation.

The i-INSPIRE II satellite bus is developed using commercial-off-the-shelf parts. The satellite equips a 30Wh power board with an intelligent power management controller. We are using the 30% efficiency solar cells. Although we will demonstrate the FPGA for OBDH, the main on-board computer will be a low power MSP430 controller. The satellite will be controlled using our novel reaction wheels, which show great advantage over traditional reaction wheels. The attitude determination system includes a MEMS IMU and sun sensors. The satellite will use VHF for uplink at 1200bps and UHF for downlink at 9600bps.