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BUCCANEER RISK MITIGATION MISSION LESSONS LEARNT

Abstract

The collaborative Buccaneer Risk Mitigation CubeSat Mission (BRMM), conducted by Defence Science and Technology Group (DST Group) and the University of New South Wales (UNSW) Canberra, was successfully launched on 18 November 2017. The BRMM became one of only a few Australian Defence-developed satellites and is a risk mitigation mission for the yet to be launched Buccaneer Main Mission (BMM). The key objectives of BRMM are: (i) to undertake and monitor the complex deployment of a high frequency receiver and antenna to be used for Jindalee Operational Radar Network (JORN) calibration on BMM, (ii) to acquire accurate flight dynamics data for Astrodynamics and Space Situational Awareness models, and (iii) to further develop Australian expertise in small satellite development and operations.

Communication with BRMM was established during its first pass over the Australian ground stations, only hours after deployment from the Delta II launch vehicle. The first tranche of telemetry revealed all satellite subsystems to be healthy, including temperatures and battery voltages. During early operations, state-of-health telemetry was continually monitored and compared to expected behaviours, as the various subsystems were successively commissioned prior to high frequency antenna deployment. Particular attention was given to testing the operation of the attitude determination and control subsystem, including verification with hardware-in-the-loop simulations. This is due to the criticality of precise attitude control to the mission objectives and understanding manoeuvrability when a 3.2 metre antenna is deployed from the 35 centimetre-long cube satellite.

Early operations typically delivers numerous challenges, and so it was for the Buccaneer team, for whom it was their first satellite operations experience. The lessons learnt from BRMM early operations are informing the development and operation of the BMM satellite, expected to be launched in 2019-20 timeframe, as well as other future Australian missions. This presentation details the BRMM and the lessons captured through the course of the program, with a particular focus on early operations.