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DST GROUP AND UNSW CANBERRA BUCCANEER PROGRAMME

Abstract

The DST Group and UNSW Canberra Buccaneer programme is the first sovereignly developed, Australian defence-science CubeSat programme. It consists of two missions with the key objectives; (1) calibration of the Jindalee Operational Radar Network (JORN) from space using an HF receiver payload, and (2) acquisition of high quality flight data for correlated Astrodynamics and Space Situational Awareness (SSA) experiments using the Buccaneer spacecraft in combination with ground sensor networks. The first launch in the programme is the 3U+ Buccaneer Risk Mitigation Mission (BRMM) Cubesat currently scheduled for Q3 2017 and led by UNSW. BRMM is a technology pathfinder for critical elements of the Buccaneer Main Mission (BMM). The BMM flight programme is to be led by DST Group and will consist of a 3U Cubesat launched approximately 18 months after the completion of BRMM flight operations.

The most demanding and novel technology to be tested in the BRMM flight is the High Frequency (HF) antenna for receiving JORN signals. This antenna has been designed and developed by DST Group. In order to meet the RF gain requirements across the JORN spectrum, a broadband bow-tie antenna with 1.7m elements has been selected. The mechanical requirements for the antenna include: that it is capable of being stowed into a launch configuration compatible with the volume interface requirements of a 3U+ Cubesat; have sufficient structural integrity to survive the launch environment; incorporate a mechanism to deploy the antenna during commissioning of the spacecraft; and have sufficient stability margins in the flight configuration to ensure the correct performance of the RF antenna as well as the Attitude Determination and Control System (ADACS). Meeting these RF and mechanical requirements within a 3U CubeSat form factor has necessitated highly innovative design and development strategies.

The Astrodynamics and SSA experiments are to be focussed on correlating and validating the drag predictions and reflectivity modelling with precise measurements of the orbit from a GPS receiver on the spacecraft and light-curve observations of the spacecraft from ground based tracking telescopes.