

SPACE SYSTEMS SYMPOSIUM (D1)
Training, Achievements, and Lessons Learned in Space Systems (5)

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DENEL SPACETEQ CUBE SATELLITE MISSIONS AND CAPABILITIES

Abstract

Denel Spaceteq is a provider of high-performance small- and medium-sized satellites and related systems and solutions for the South African government and international aerospace clients. Denel Spaceteq is developing two Cube Satellites. The Dynacube-1U satellite science mission is to measure radiation impact and temperature variations in the South Atlantic Anomaly and imaging. Primary payloads are a particle radiation sensor and temperature sensor. The Dynacube-3U satellite primary mission is maritime surveillance and tracking. The primary payload is an Automatic Identification System (AIS) and Camera system for imaging. AIS is an automatic tracking system used on ships and by vessel traffic services for identifying and locating vessels. The mission objective is to demonstrate the use of AIS in space and to compensate the existing coastal based receivers. The secondary payload is a Vacuum Arc Thruster Propulsion system that was developed through research in collaboration with the South African National Space Agency (SANSA) and the University of the Witwatersrand. They are currently 3 provisional patents on the research. The secondary mission objective is satellite maneuver and orbit control (as technology demonstrator), as well as de-orbiting the satellite at the end of the mission. In addition, the aim is to achieve South Africa's first flight-demonstration of a CubeSat plasma propulsion system. A full-satellite orbit simulation model was developed to model the environment and dynamics of a satellite orbiting the earth. Critical subsystems of the satellite were modelled for an integrated analysis of the estimator and controller design. The simulator was developed to facilitate hardware-in-the-loop (HIL) testing of the subsystems. A visualisation plugin was developed using a WebGL-based library to create a high performance 3D rendering of the satellite kinematics. The Mission Control Software (MCS) is a ground software suite, comprised of graphical user applications and background services, initially developed in support of the Sumbandila satellite mission (South Africa's earth observation satellite launched in 2009). MCS Lite is the CubeSat focussed spin off product which supports the ZA-AeroSat, a CubeSat being developed by Stellenbosch University as part of the QB50 project with an anticipated launch in 2016. MSC Lite also supports the ThepisoSat (ZACUBE-1), a satellite launched in 2013 that was developed by the French South African Institute (F'SATI) at the Cape Peninsula University of Technology (CPUT).