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AOCS DESIGN AND EM AOCS TEST CAMPAIGN FOR THE SMALL GEO TELECOM SATELLITE

Abstract

The Small GEO telecommunications satellite is a new development managed by the European Space Agency (ESA) to fill a niche in the telecom industry for small platforms weighing about 1.5 tonnes and targeting payloads of 300 kg and 3 kW. The prime contractor for Small GEO is OHB-System AG. The Swedish Space Corporation is a partner in the consortium and supplies the Attitude and Orbit Control System (AOCS) and Electric Propulsion (EP) subsystems. The first mission, operated by Hispasat, will launch into Geostationary Transfer Orbit (GTO). The project is currently in Phase C/D and the satellite will fly in 2013. The Small GEO AOCS design is characterized by a number of advances in technology beyond traditional telecom satellite designs. It includes modern sensors, actuators, and software development techniques used to improve the mission capacity for the customer. The AOCS architecture is a three-axis stabilized system using reaction wheels for attitude control, and APS (Active Pixel Sensor) star trackers for attitude determination. Orbit control and angular momentum management rely solely upon EP in the nominal modes. In addition, a GPS sensor will be flown on-board as an experiment to prepare for future improvements of the AOCS design. The AOCS Software implementation is model-based and is entirely developed in Matlab / Simulink. The automatically generated C-code is then integrated into the whole on-board software by OHB-System. The project is now entering its Verification and Validation phase. In parallel with the formal On-Board Software validation, the AOCS Subsystem Testing will be completed by a series of Open Loop and Closed Loop tests, with both hardware and software in the loop. While the Open Loop tests aim at verifying the correct sensor-software-actuator chains, the Closed Loop tests will verify the functional behaviour of the AOCS Subsystem in operational scenarios. The GPS receiver will be tested on ground in combination with a RF-simulator to get a first assessment of its usability in geostationary orbit. The tests on the SGEO EM satellite start in March 2011 and will continue until autumn 2011. This article gives an overview of the Small GEO AOCS design, and describes the advances in the design that make it unique. It also presents the current AOCS activities, focusing on the EM Open Loop and Closed Loop tests on the EM satellite.